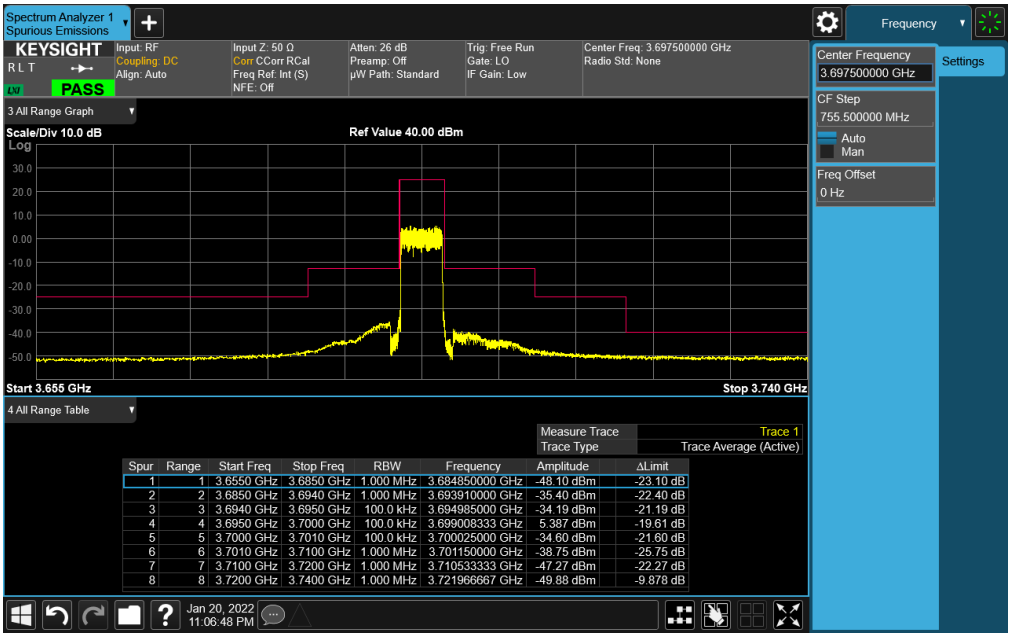
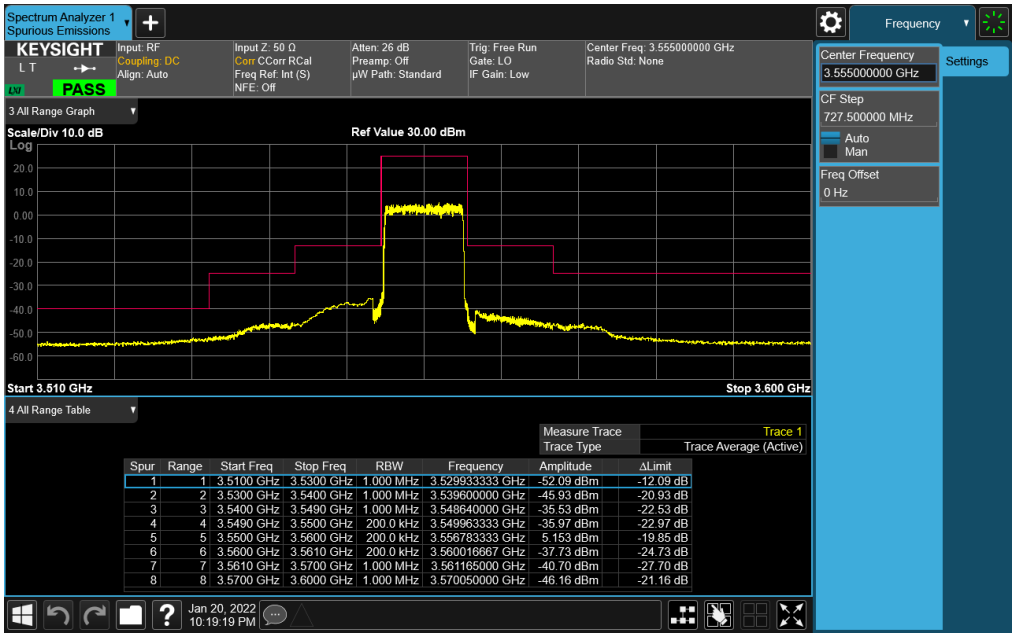


Plot 7-59. Channel Edge Plot (LTE Band 48 - 5MHz QPSK - High Channel)



Plot 7-60. Channel Edge Plot (LTE Band 48 - 10MHz QPSK - Low Channel)

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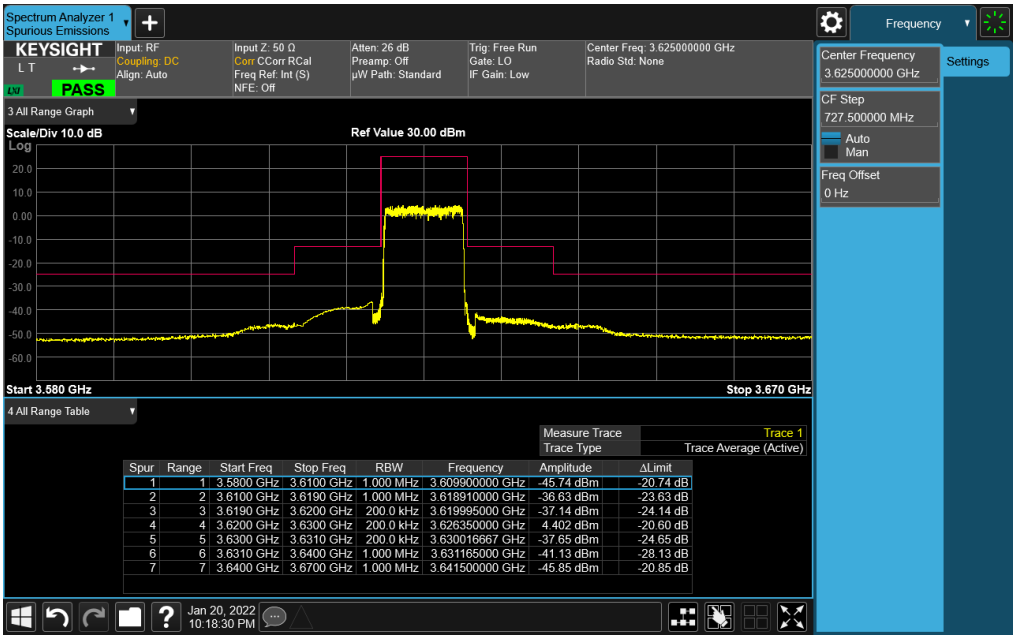
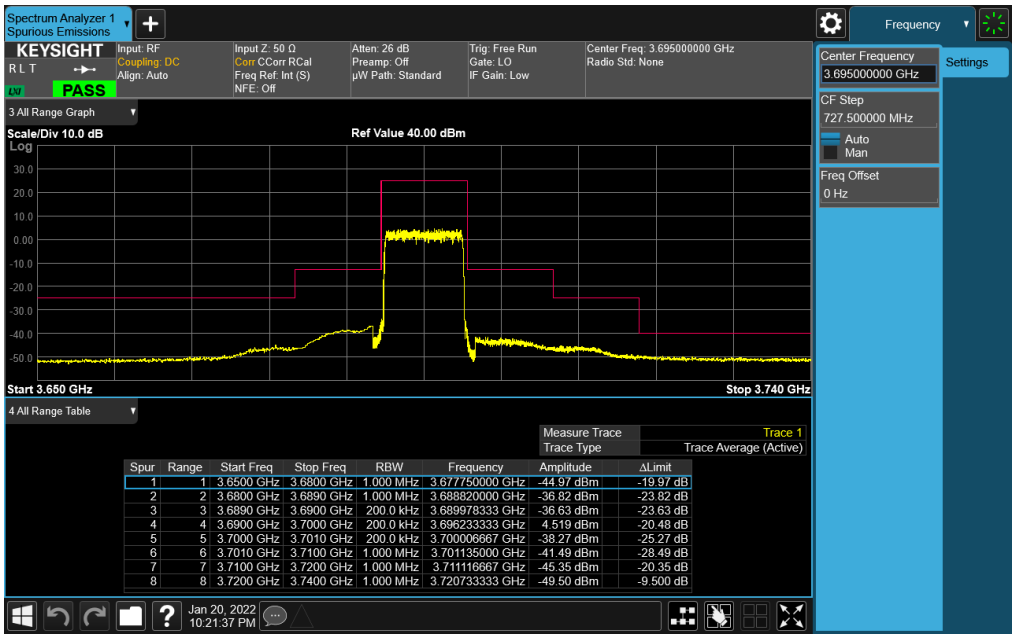


Plot 7-61. Channel Edge Plot (LTE Band 48 - 10MHz QPSK - Mid Channel)



Plot 7-62. Channel Edge Plot (LTE Band 48 - 10MHz QPSK - High Channel)

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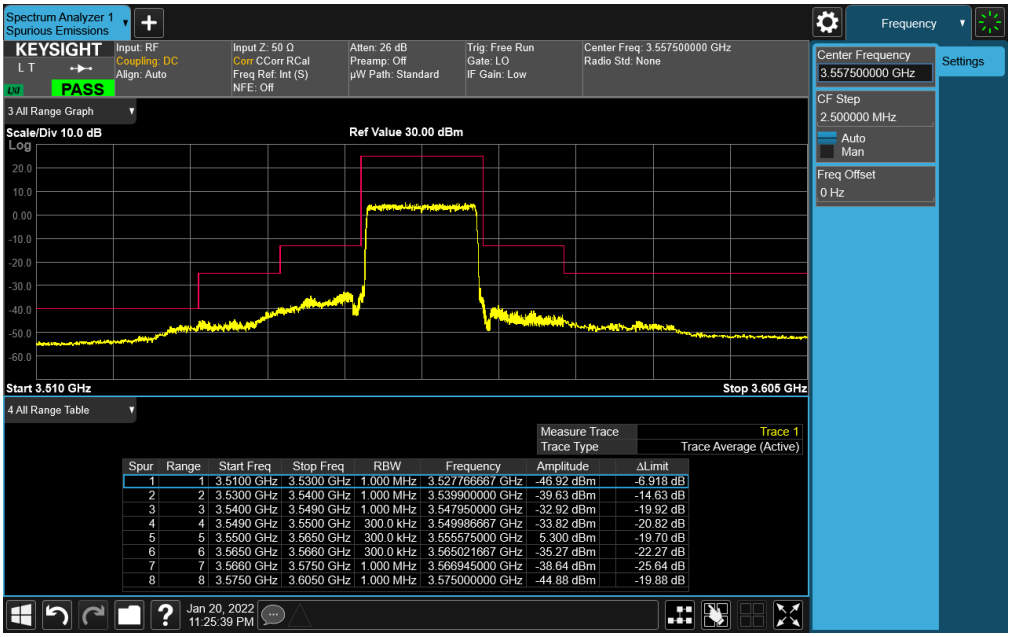
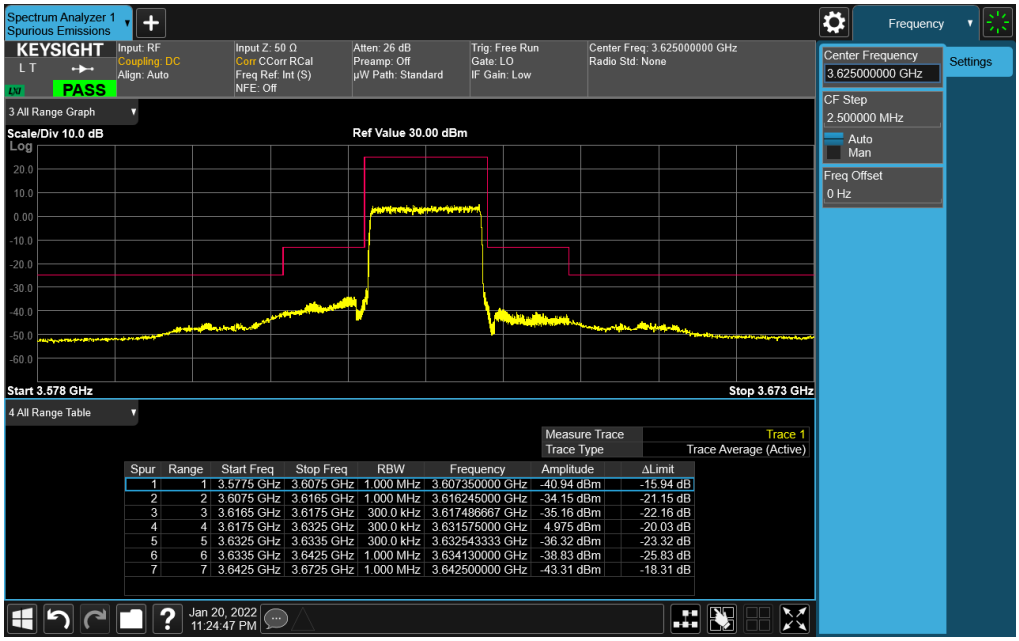


Plot 7-63. Channel Edge Plot (LTE Band 48 - 15MHz QPSK - Low Channel)



Plot 7-64. Channel Edge Plot (LTE Band 48 - 15MHz QPSK - Low Channel)

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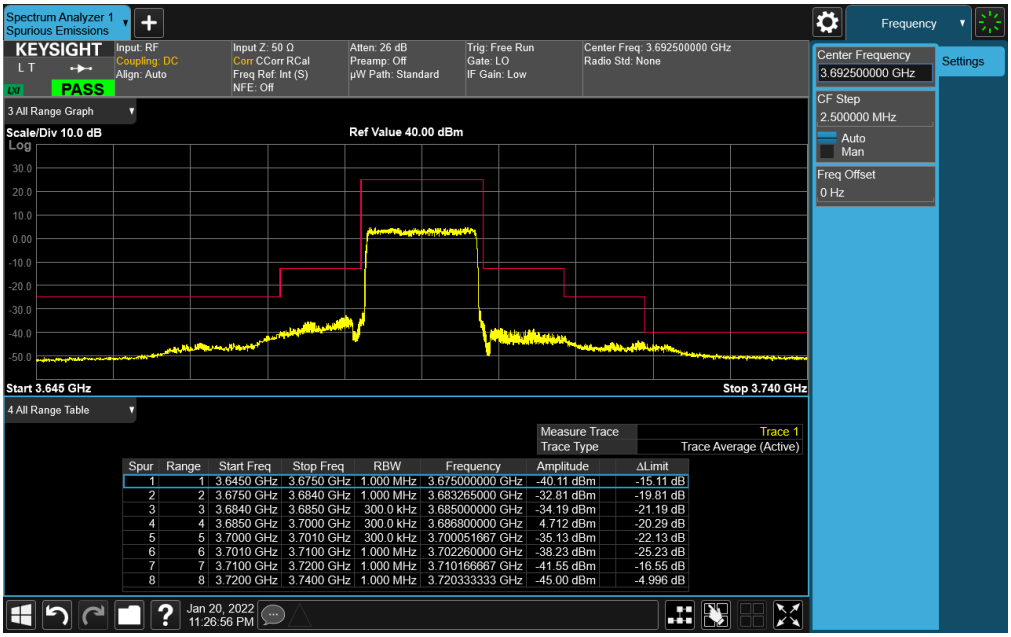
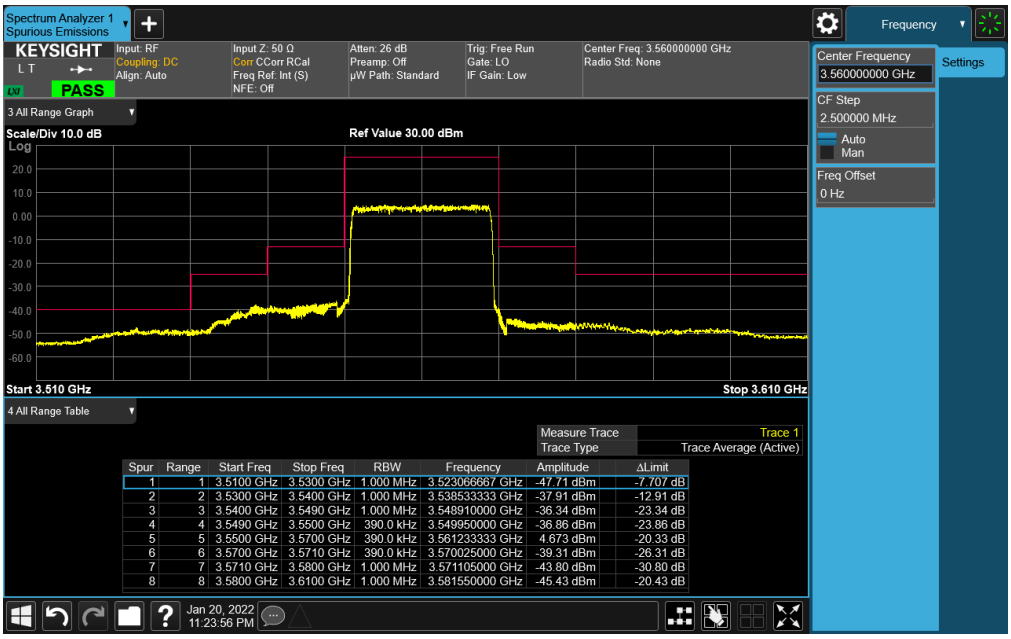


Plot 7-65. Channel Edge Plot (LTE Band 48 - 15MHz QPSK - High Channel)



Plot 7-66. Channel Edge Plot (LTE Band 48 - 20MHz QPSK - Low Channel)

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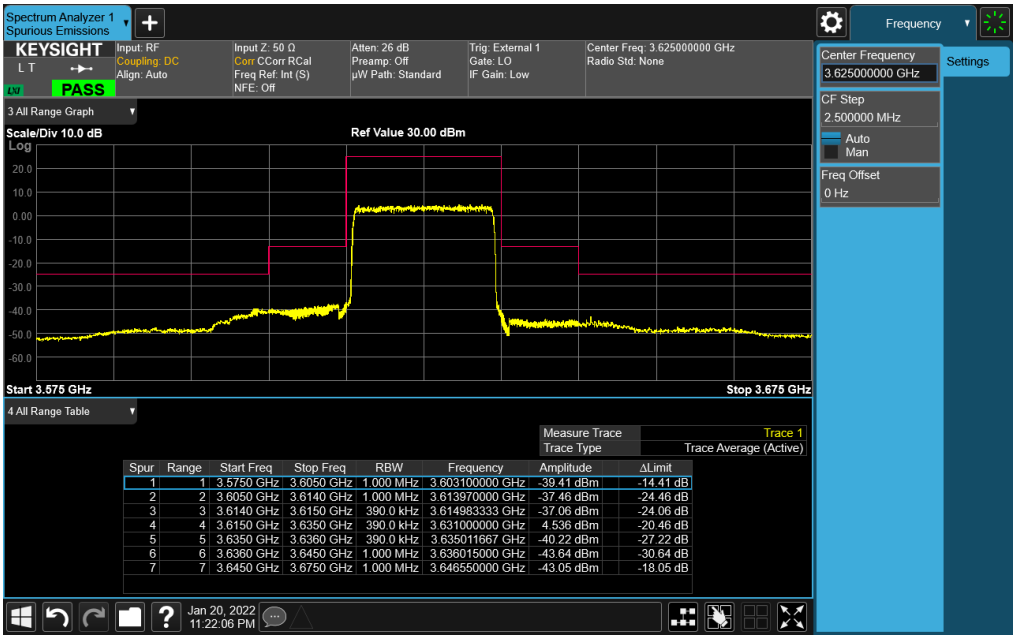
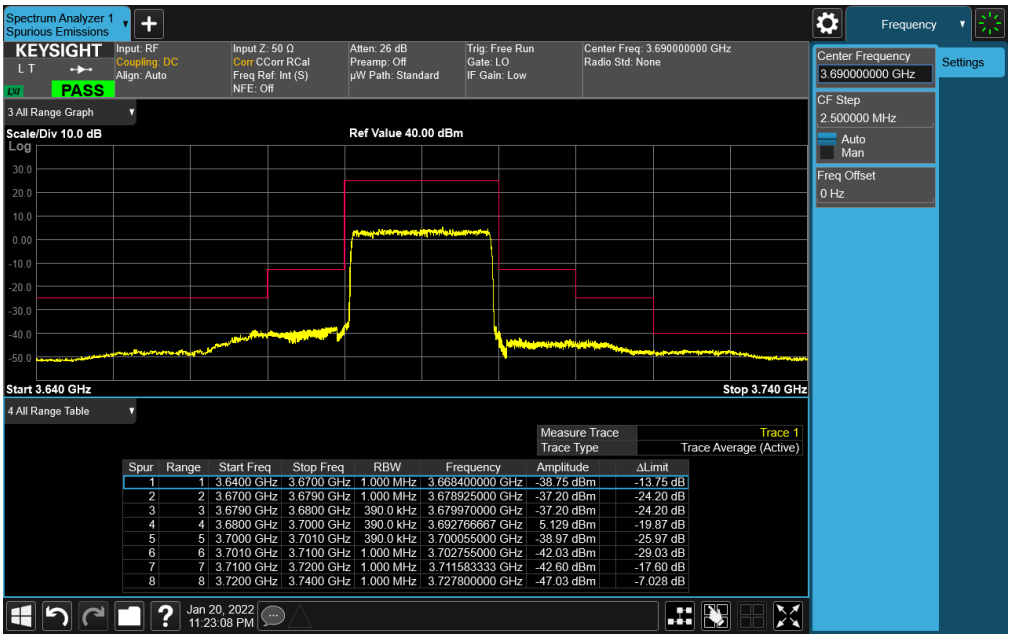


Plot 7-67. Channel Edge Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)



Plot 7-68. Channel Edge Plot (LTE Band 48 - 20MHz QPSK - High Channel)

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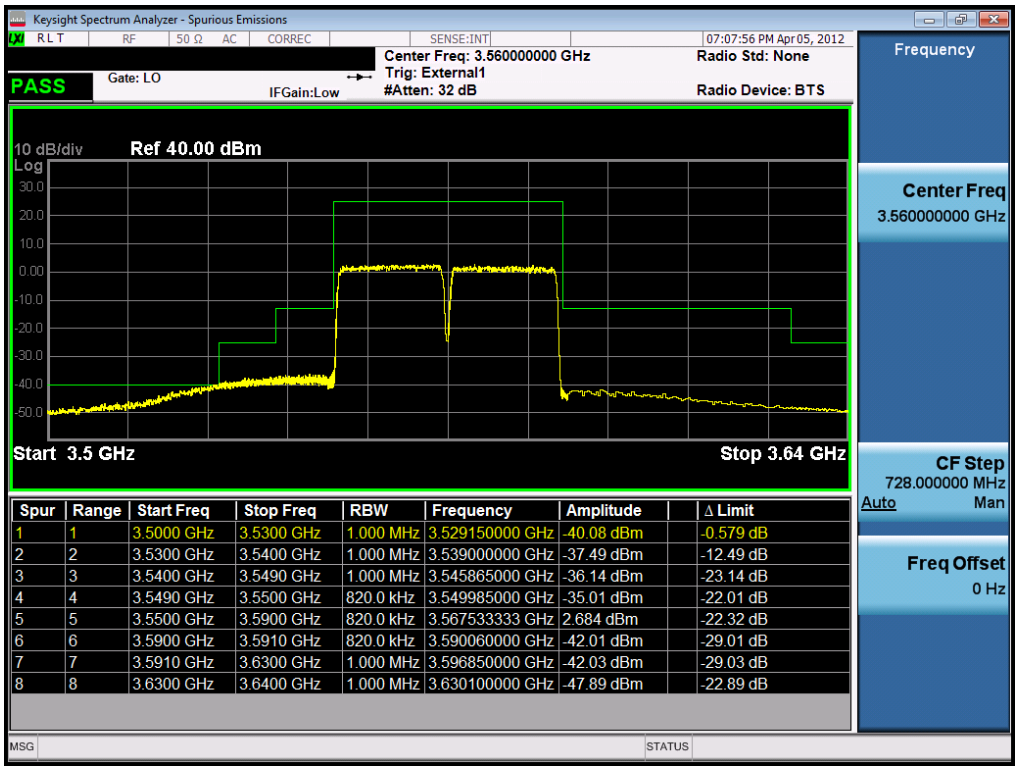
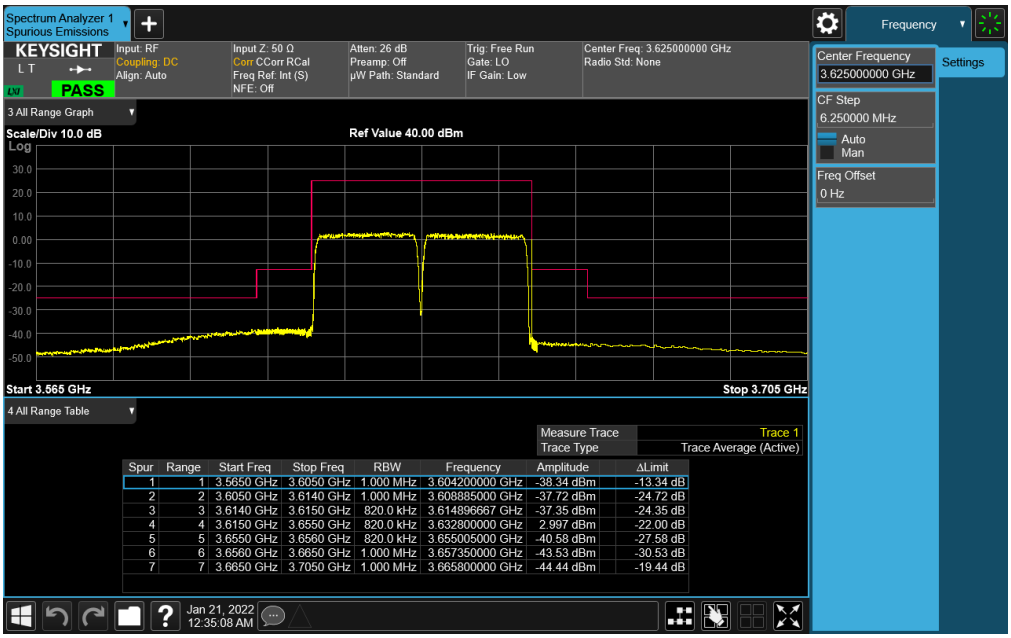
ULCA LTE Band 48



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5000 GHz	3.5300 GHz	1.000 MHz	3.529150000 GHz	-40.08 dBm	-0.579 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539000000 GHz	-37.49 dBm	-12.49 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.545865000 GHz	-36.14 dBm	-23.14 dB
4	4	3.5490 GHz	3.5500 GHz	820.0 kHz	3.549985000 GHz	-35.01 dBm	-22.01 dB
5	5	3.5500 GHz	3.5900 GHz	820.0 kHz	3.567533333 GHz	2.684 dBm	-22.32 dB
6	6	3.5900 GHz	3.5910 GHz	820.0 kHz	3.590060000 GHz	-42.01 dBm	-29.01 dB
7	7	3.5910 GHz	3.6300 GHz	1.000 MHz	3.596850000 GHz	-42.03 dBm	-29.03 dB
8	8	3.6300 GHz	3.6400 GHz	1.000 MHz	3.630100000 GHz	-47.89 dBm	-22.89 dB

Plot 7-69. Channel Edge Plot (ULCA Band 48 – 20+20MHz QPSK - Low Channel)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	ΔLimit
1	1	3.5650 GHz	3.6050 GHz	1.000 MHz	3.604200000 GHz	-38.34 dBm	-13.34 dB
2	2	3.6050 GHz	3.6140 GHz	1.000 MHz	3.608885000 GHz	-37.72 dBm	-24.72 dB
3	3	3.6140 GHz	3.6150 GHz	820.0 kHz	3.614896667 GHz	-37.35 dBm	-24.35 dB
4	4	3.6150 GHz	3.6550 GHz	820.0 kHz	3.632800000 GHz	2.997 dBm	-22.00 dB
5	5	3.6550 GHz	3.6560 GHz	820.0 kHz	3.655005000 GHz	-40.58 dBm	-27.58 dB
6	6	3.6560 GHz	3.6650 GHz	1.000 MHz	3.657350000 GHz	-43.53 dBm	-30.53 dB
7	7	3.6650 GHz	3.7050 GHz	1.000 MHz	3.665800000 GHz	-44.44 dBm	-19.44 dB

Plot 7-70. Channel Edge Plot (ULCA Band 48 – 20+20MHz QPSK - Mid Channel)

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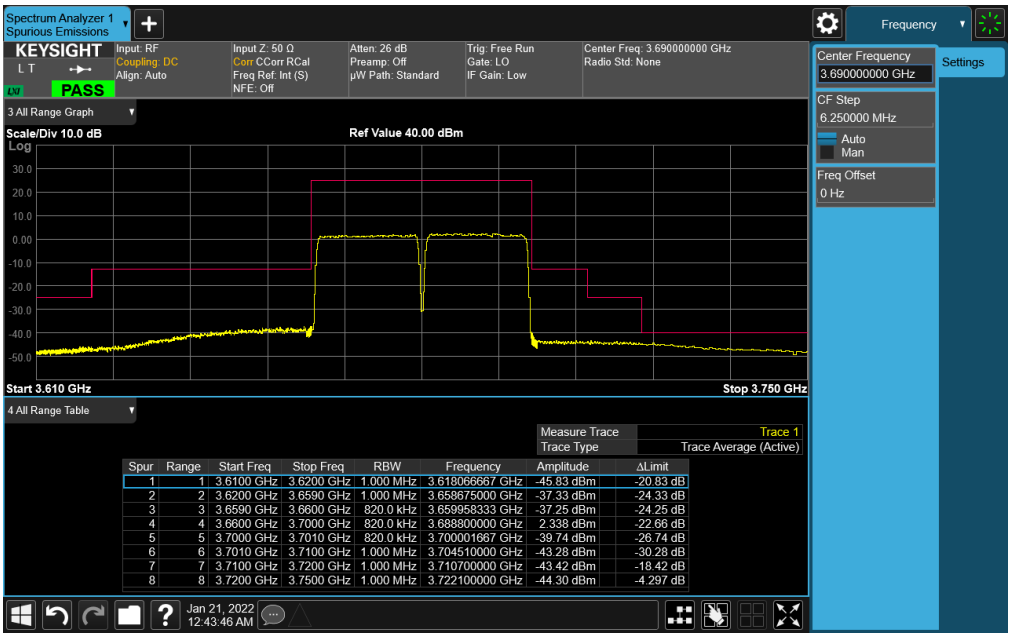

Plot 7-71. Channel Edge Plot (ULCA Band 48 – 20+20MHz QPSK - High Channel)

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7.5 Peak-Average Ratio

§96.41(g):

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. All ports were tested and only the worst case data were reported.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 5.7.1

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.

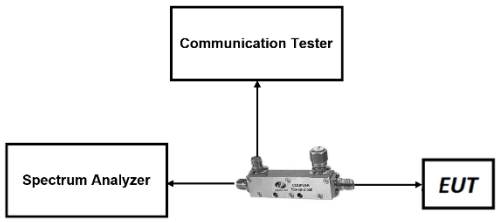

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

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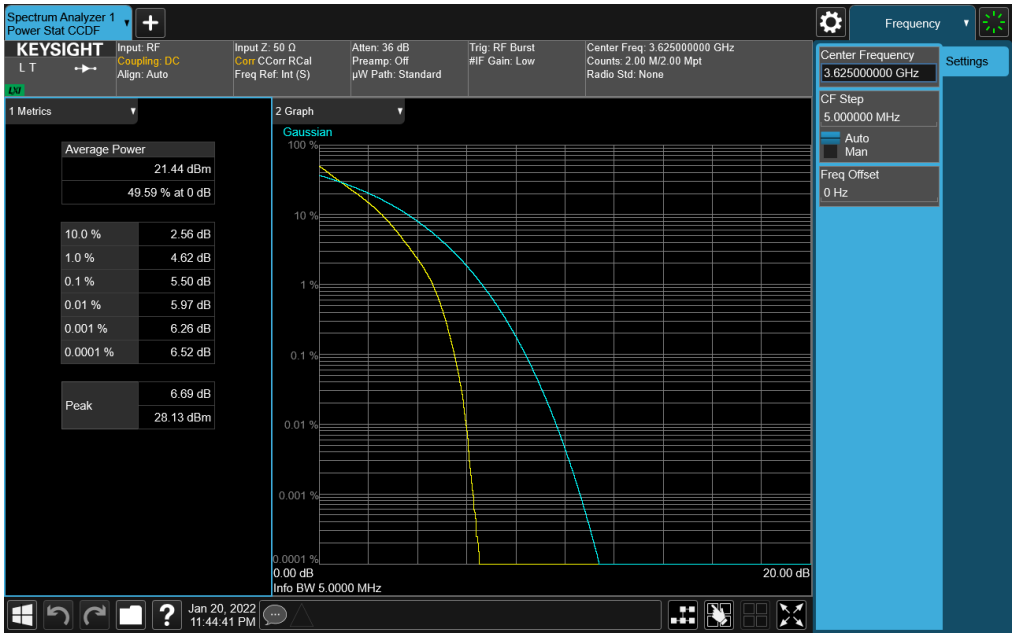
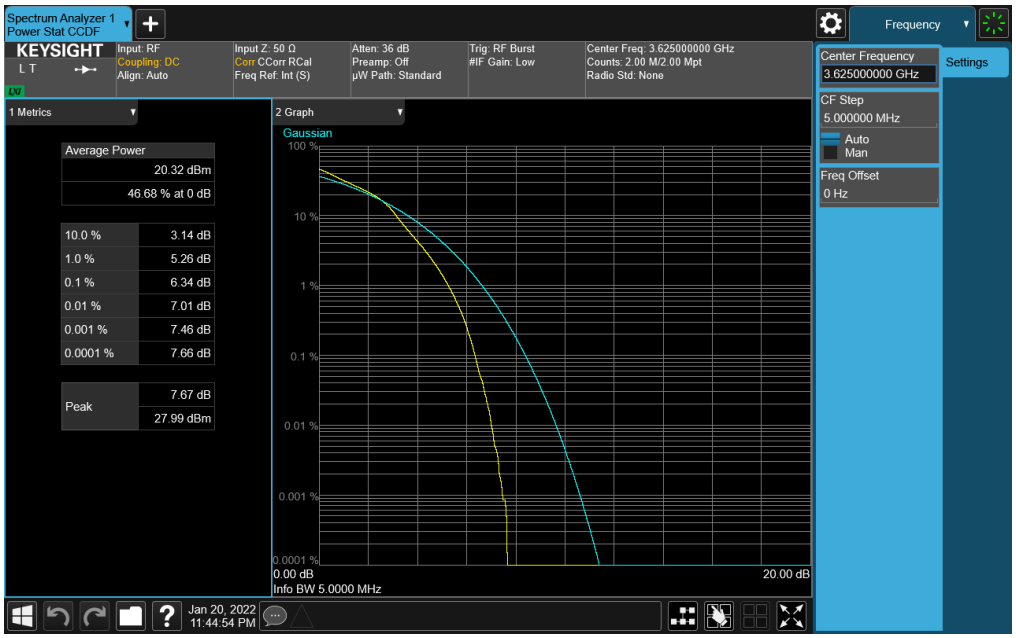
LTE Band 48



Plot 7-72. PAR Plot (LTE Band 48 - 5MHz QPSK - Full RB)



Plot 7-73. PAR Plot (LTE Band 48 - 5MHz 16-QAM - Full RB)

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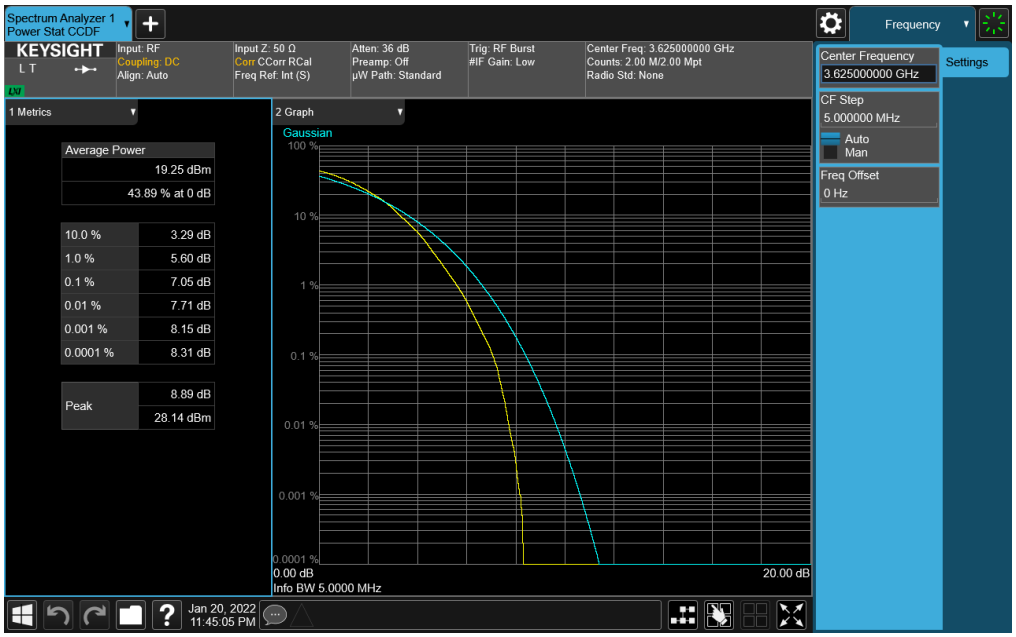
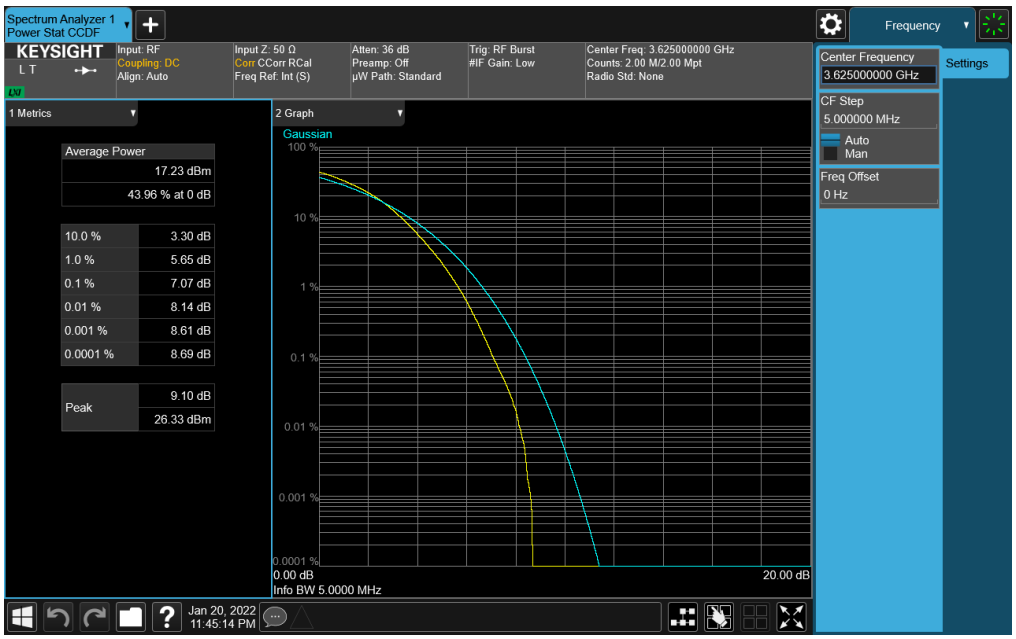


Plot 7-74. PAR Plot (LTE Band 48 - 5MHz 64-QAM - Full RB)



Plot 7-75. PAR Plot (LTE Band 48 - 5MHz 256-QAM - Full RB)

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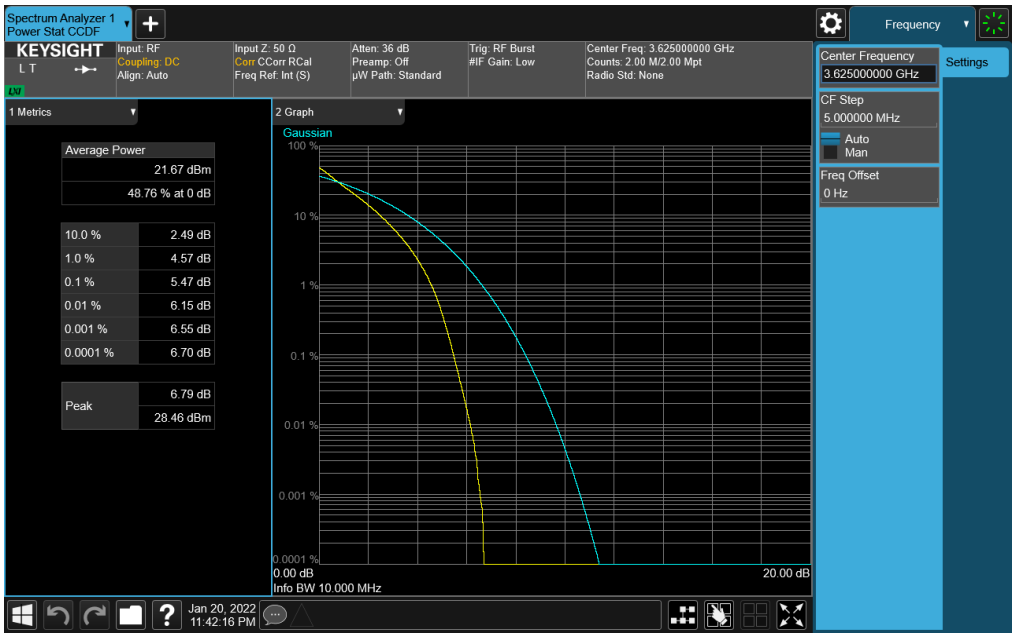
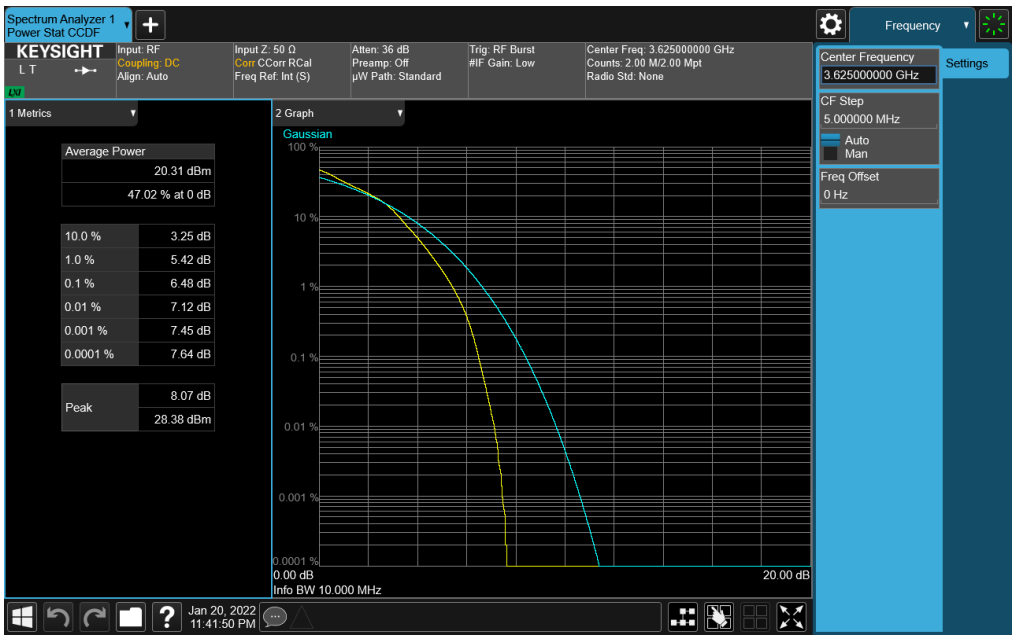


Plot 7-76. PAR Plot (LTE Band 48 - 10MHz QPSK - Full RB)



Plot 7-77. PAR Plot (LTE Band 48 - 10MHz 16-QAM - Full RB)

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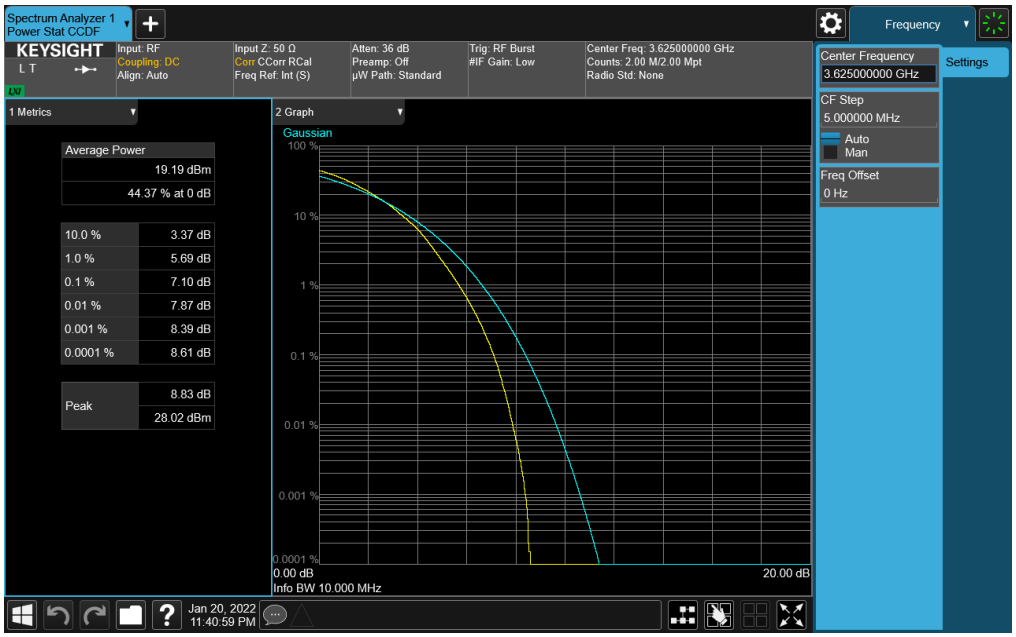
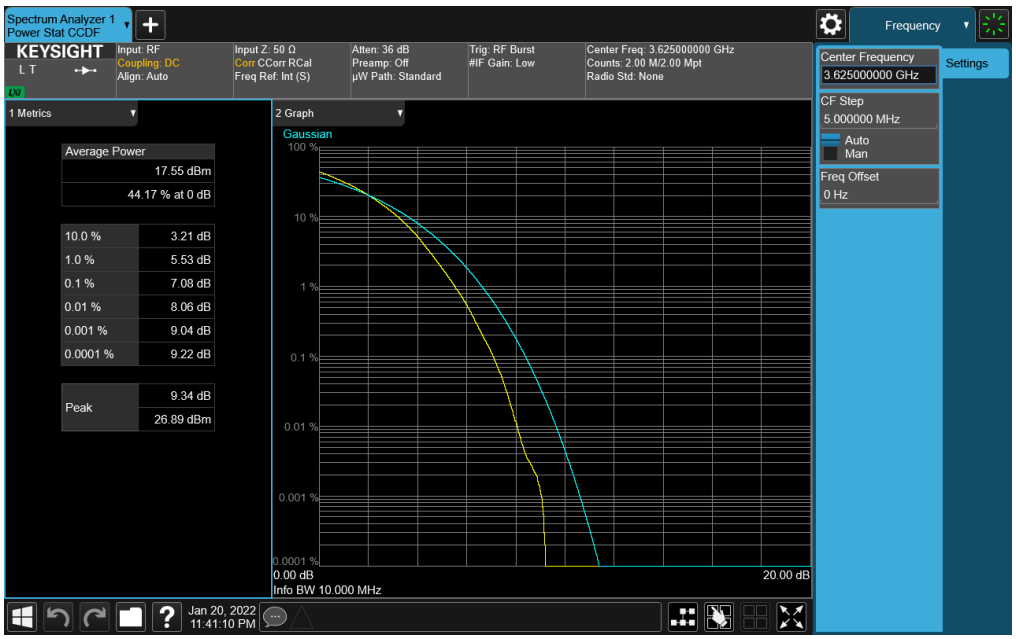


Plot 7-78. PAR Plot (LTE Band 48 - 10MHz 64-QAM - Full RB)



Plot 7-79. PAR Plot (LTE Band 48 - 10MHz 256-QAM - Full RB)

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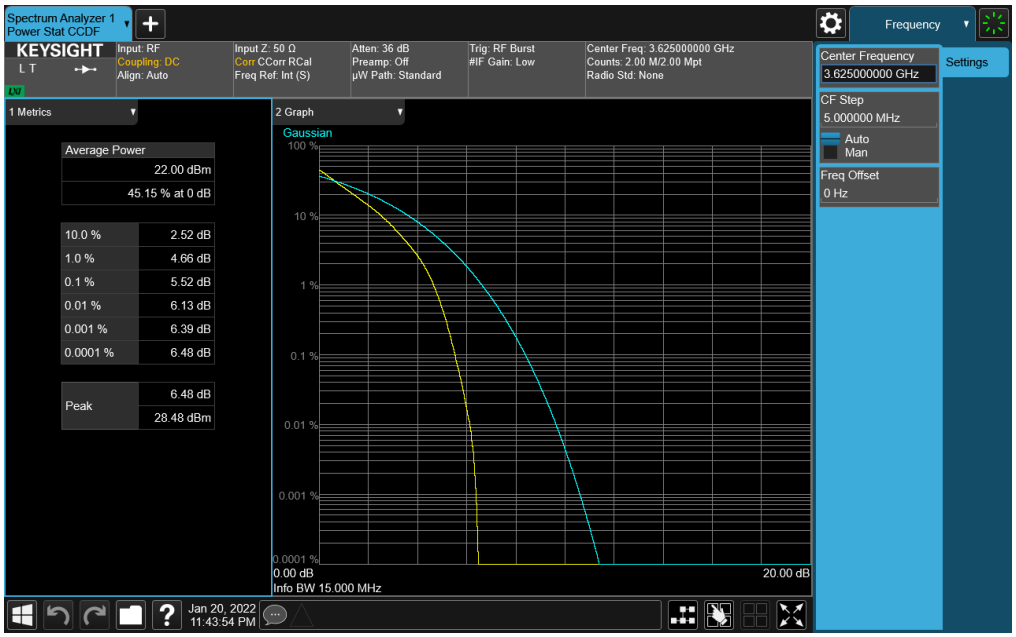
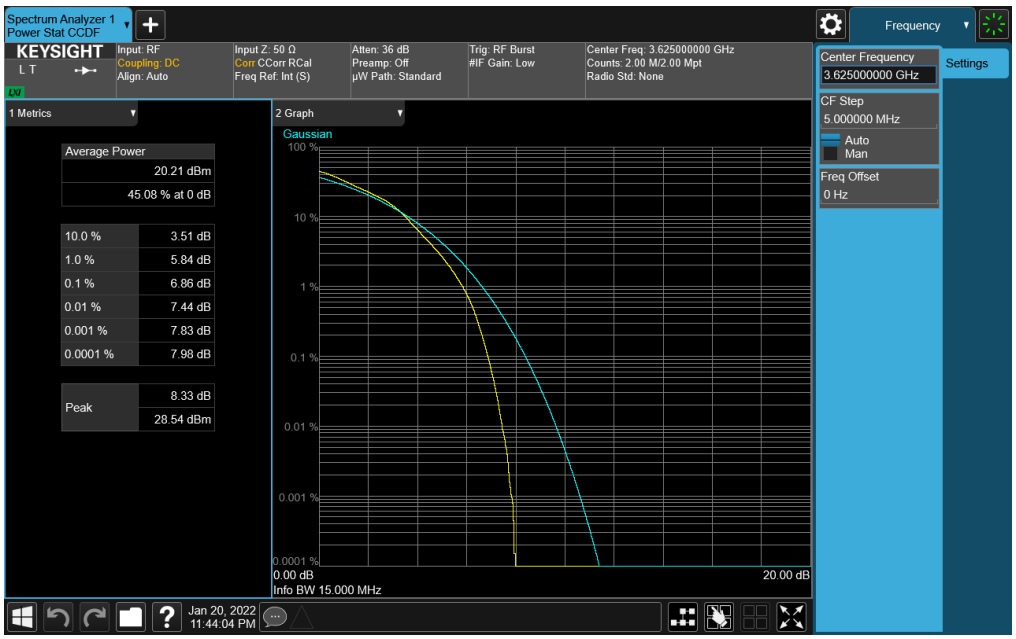


Plot 7-80. PAR Plot (LTE Band 48 - 15MHz QPSK - Full RB)



Plot 7-81. PAR Plot (LTE Band 48 - 15MHz 16-QAM - Full RB)

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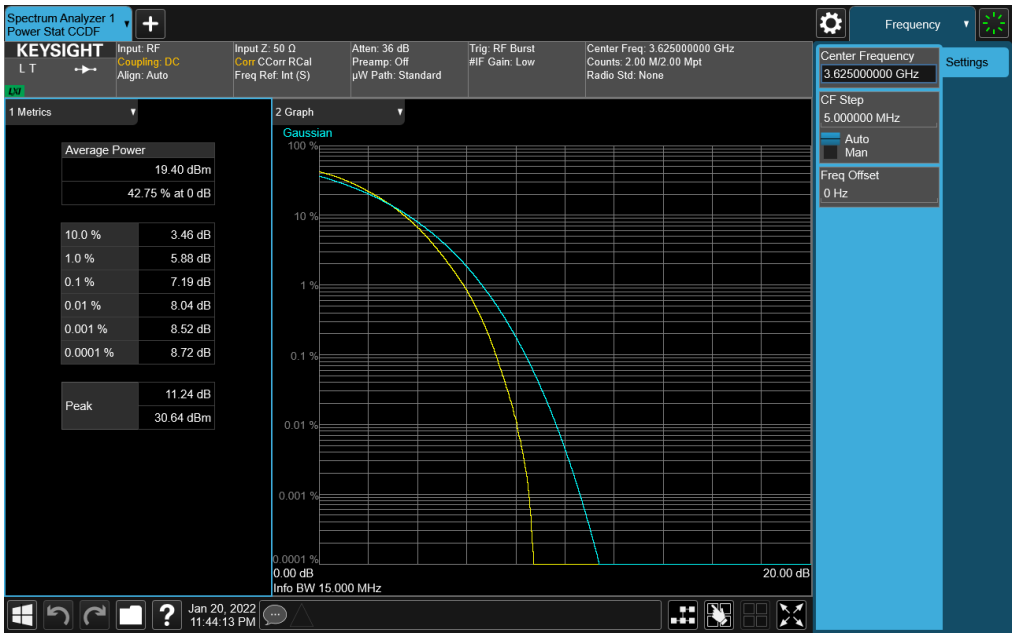
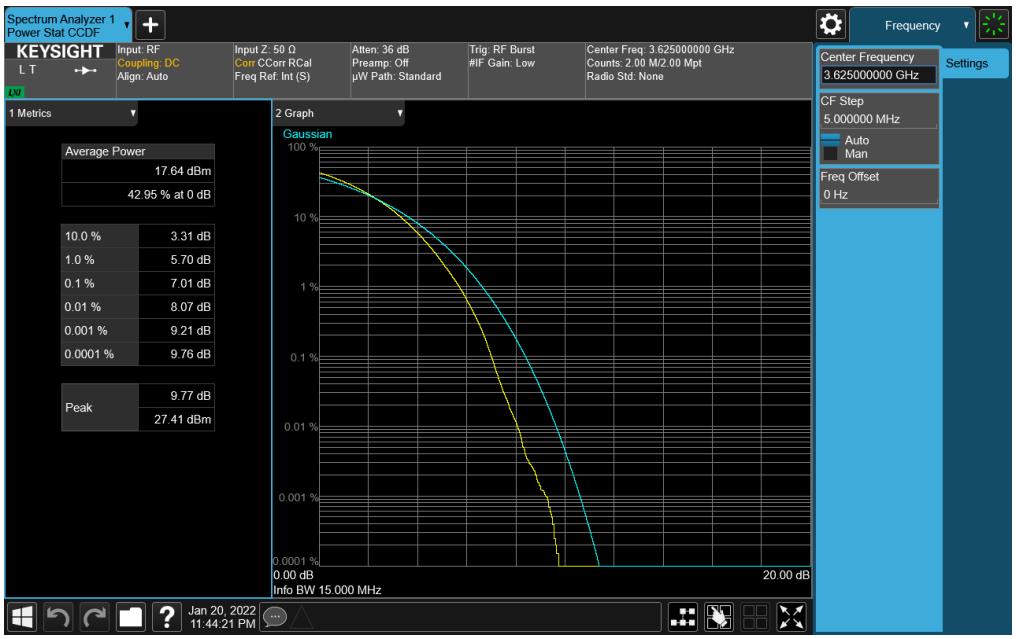


Plot 7-82. PAR Plot (LTE Band 48 - 15MHz 64-QAM - Full RB)



Plot 7-83. PAR Plot (LTE Band 48 - 15MHz 256-QAM - Full RB)

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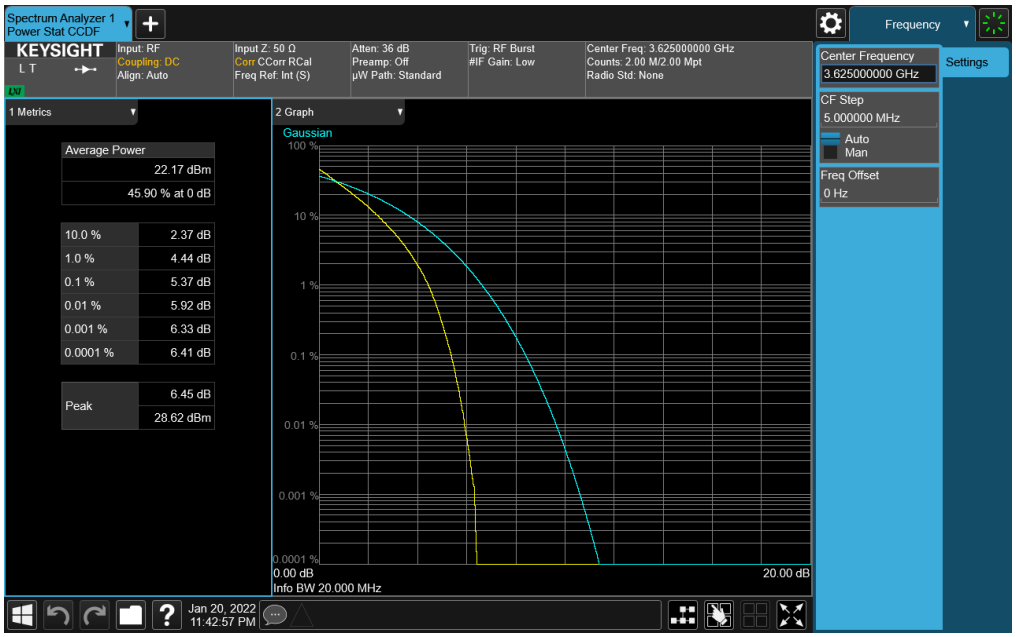
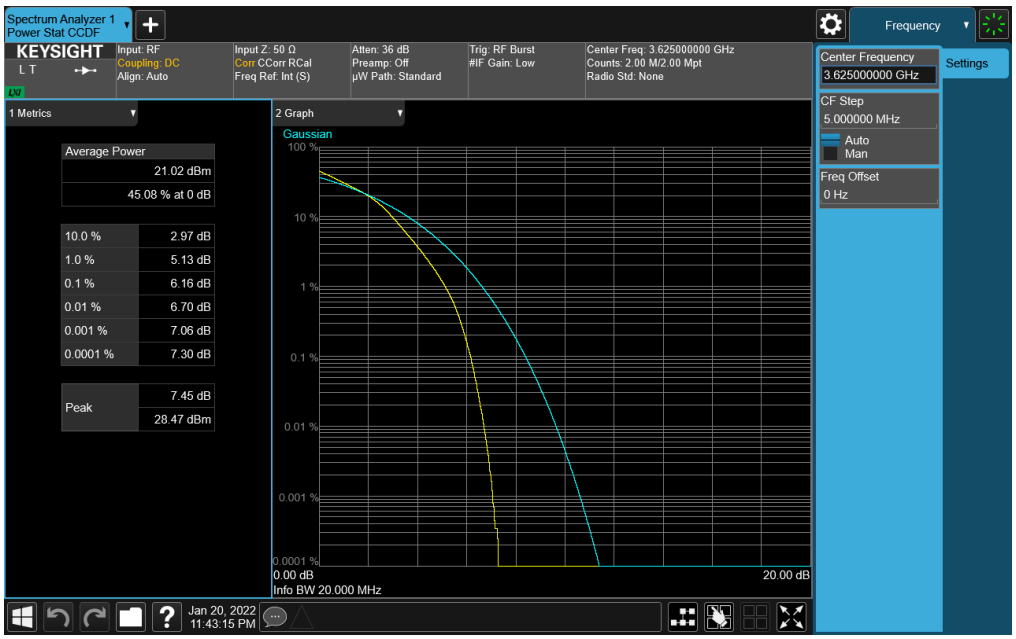


Plot 7-84. PAR Plot (LTE Band 48 - 20MHz QPSK - Full RB)



Plot 7-85. PAR Plot (LTE Band 48 - 20MHz 16-QAM - Full RB)

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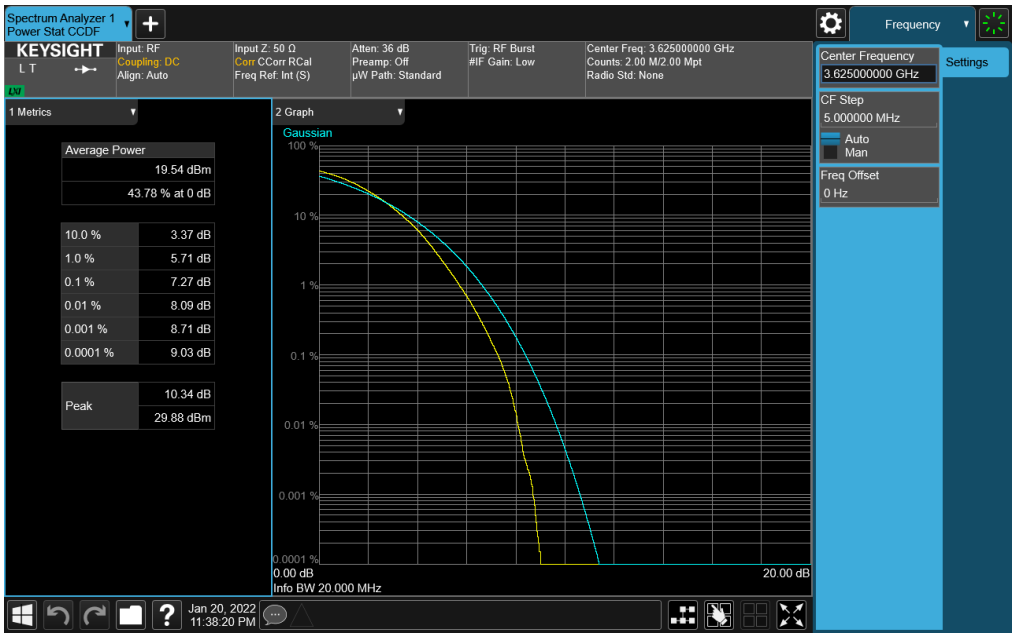
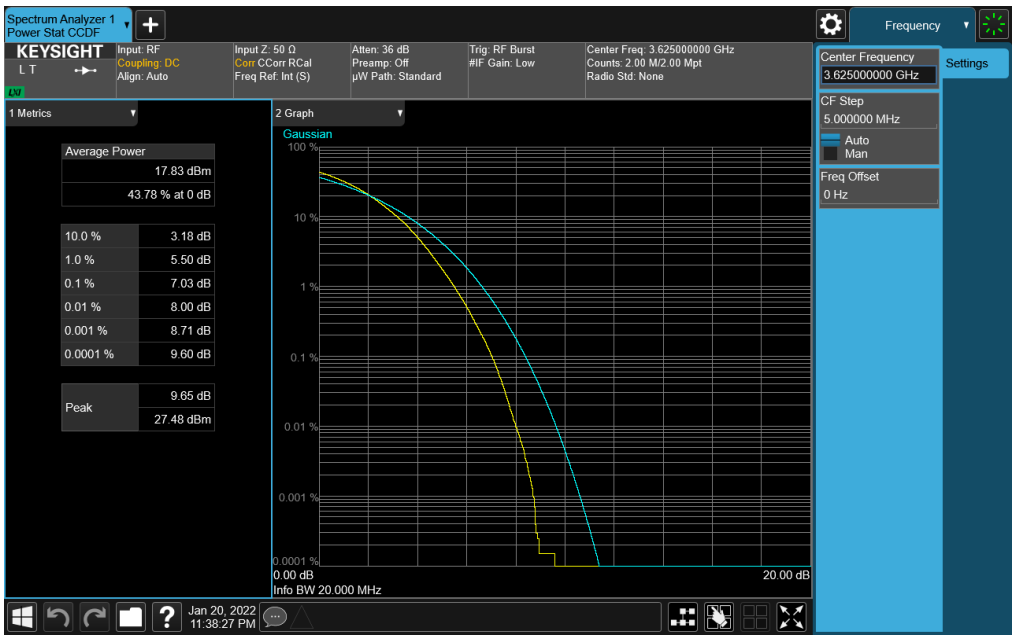


Plot 7-86. PAR Plot (LTE Band 48 - 20MHz 64-QAM - Full RB)



Plot 7-87. PAR Plot (LTE Band 48 - 20MHz 256-QAM - Full RB)

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7.6 Radiated Power (EIRP)

§96.41(b)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are calculated by adding highest antenna gain to maximum measured conducted output power. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI C63.26-2015

Test Settings

The relevant equation for determining the EIRP from the conducted RF output power measured is:

EIRP = PMeas – LC + GT

Where:

EIRP = Equivalent Isotropic Radiated Power (expressed in the same units as PMeas, typically dBW or dBm)

PMeas = measured transmitter output power or PSD, in dBW or dBm

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

GT = gain of the transmitting antenna, in dBi (EIRP)

Test Setup

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

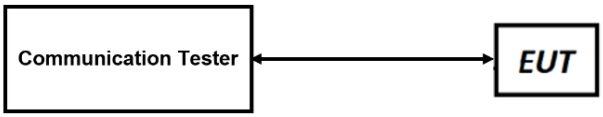

Figure 7-5. EIRP Measurement Setup

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Test Notes

1) The worst case emissions are reported with the modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

2) This unit was tested with its standard battery.

3) The Level (dBm) readings in the table were taken with a correction table loaded into the base station simulator. The correction table was used to account for the signal attenuation in the connecting cable between the transmitter and antenna.

4) The worst case EIRP shown in this section is found with LTE operating only using 1RB. As such, the EIRP/10MHz and full channel EIRP values will be identical since 1RB is fully contained within all available channel bandwidths for LTE Band 48 (i.e. 5, 10, 15, 20MHz).

5) Uplink carrier aggregation for LTE B48 is only supported in this EUT while operating in Power Class 3.

6) For ULCA, conducted power measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.

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Antenna 3B – EIRP

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
5 MHz	QPSK	3552.5	2.20	1 / 12	19.80	22.00	0.16	23.00	-1.00
		3625.0	2.20	1 / 24	19.69	21.89	0.15	23.00	-1.11
		3697.5	2.20	1 / 12	19.71	21.91	0.16	23.00	-1.09
	16-QAM	3552.5	2.20	1 / 12	18.78	20.98	0.13	23.00	-2.02
	64-QAM	3552.5	2.20	1 / 24	18.14	20.34	0.11	23.00	-2.66
	256-QAM	3552.5	2.20	1 / 12	15.07	17.27	0.05	23.00	-5.73
10 MHz	QPSK	3555.0	2.20	1 / 25	19.69	21.89	0.15	23.00	-1.11
		3625.0	2.20	1 / 49	19.52	21.72	0.15	23.00	-1.28
		3695.0	2.20	1 / 25	19.56	21.76	0.15	23.00	-1.24
	16-QAM	3625.0	2.20	1 / 49	18.74	20.94	0.12	23.00	-2.06
	64-QAM	3555.0	2.20	1 / 25	17.67	19.87	0.10	23.00	-3.13
	256-QAM	3555.0	2.20	1 / 49	14.72	16.92	0.05	23.00	-6.08
15 MHz	QPSK	3557.5	2.20	1 / 74	19.74	21.94	0.16	23.00	-1.06
		3625.0	2.20	1 / 74	19.80	22.00	0.16	23.00	-1.00
		3692.5	2.20	1 / 74	19.80	22.00	0.16	23.00	-1.00
	16-QAM	3625.0	2.20	1 / 74	19.06	21.26	0.13	23.00	-1.74
	64-QAM	3625.0	2.20	1 / 74	17.88	20.08	0.10	23.00	-2.92
	256-QAM	3692.5	2.20	1 / 37	15.35	17.55	0.06	23.00	-5.45
20 MHz	QPSK	3560.0	2.20	1 / 50	19.80	22.00	0.16	23.00	-1.00
		3625.0	2.20	1 / 99	19.79	21.99	0.16	23.00	-1.01
		3690.0	2.20	1 / 50	19.69	21.89	0.15	23.00	-1.11
	16-QAM	3560.0	2.20	1 / 50	19.04	**21.24**	**0.133**	23.00	-1.76
	64-QAM	3625.0	2.20	1 / 99	17.95	20.15	0.104	23.00	-2.85
	256-QAM	3625.0	2.20	1 / 50	15.61	17.81	**0.060**	23.00	-5.19

Table 7-2. EIRP Data (LTE Band 48)

Power State	Band	Bandwidth (PCC + SCC)	PCC					SCC					ULCA Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
			Modulation	UL Channel	UL Frequency [MHz]	UL # RB	UL RB Offset	Modulation	UL Channel	UL Frequency [MHz]	UL # RB	UL RB Offset						
Max	LTE B48	20MHz + 5MHz	QPSK	55340	3560.0	1	99	QPSK	55457	3571.7	1	0	19.71	2.20	21.91	0.155	23.00	-1.09
				55990	3625.0	1	99		56107	3636.7	1	0	19.80	2.20	22.00	0.158	23.00	-1.00
				56640	3690.0	1	0		56757	3701.7	1	99	19.76	2.20	21.96	0.157	23.00	-1.04
			QPSK	55990	3625	100	0	QPSK	56107	3636.7	100	0	17.86	2.20	20.06	0.101	23.00	-2.94
			16-QAM	55990	3625	100	0	16-QAM	56107	3636.7	100	0	17.00	2.20	19.20	0.083	23.00	-3.80
			64-QAM	55990	3625	100	0	64-QAM	56107	3636.7	100	0	16.87	2.20	19.07	0.081	23.00	-3.93
			256-QAM	55990	3625	100	0	256-QAM	56107	3636.7	100	0	14.87	2.20	17.07	0.051	23.00	-5.93
Max	LTE B48	20MHz + 10MHz	QPSK	55340	3560.0	1	99	QPSK	55484	3574.4	1	0	19.76	2.20	21.96	0.157	23.00	-1.04
				55990	3625.0	1	99		56134	3639.4	1	0	19.79	2.20	21.99	0.158	23.00	-1.01
				56640	3690.0	1	0		56784	3704.4	1	99	19.80	2.20	22.00	0.158	23.00	-1.00
			QPSK	56640	3690	100	0	QPSK	56784	3704.4	100	0	17.91	2.20	20.11	0.103	23.00	-2.89
			16-QAM	56640	3690	100	0	16-QAM	56784	3704.4	100	0	16.89	2.20	19.09	0.081	23.00	-3.91
			64-QAM	56640	3690	100	0	64-QAM	56784	3704.4	100	0	16.88	2.20	19.08	0.081	23.00	-3.92
			256-QAM	56640	3690	100	0	256-QAM	56784	3704.4	100	0	15.09	2.20	17.29	0.054	23.00	-5.71
Max	LTE B48	20MHz + 15MHz	QPSK	55340	3560.0	1	99	QPSK	55511	3577.1	1	0	19.73	2.20	21.93	0.156	23.00	-1.07
				55990	3625.0	1	99		56161	3642.1	1	0	19.80	2.20	22.00	0.158	23.00	-1.00
				56640	3690.0	1	0		56811	3707.1	1	99	19.80	2.20	22.00	0.158	23.00	-1.00
			QPSK	55990	3625	100	0	QPSK	56161	3642.1	100	0	18.48	2.20	20.68	0.117	23.00	-2.32
			16-QAM	55990	3625	100	0	16-QAM	56161	3642.1	100	0	16.95	2.20	19.15	0.082	23.00	-3.85
			64-QAM	55990	3625	100	0	64-QAM	56161	3642.1	100	0	16.91	2.20	19.11	0.081	23.00	-3.89
			256-QAM	55990	3625	100	0	256-QAM	56161	3642.1	100	0	15.11	2.20	17.31	0.054	23.00	-5.69
Max	LTE B48	20MHz + 20MHz	QPSK	55340	3560.0	1	99	QPSK	55538	3579.8	1	0	19.79	2.20	21.99	0.158	23.00	-1.01
				55990	3625.0	1	99		56188	3644.8	1	0	19.80	2.20	22.00	0.158	23.00	-1.00
				56640	3690.0	1	0		56442	3670.2	1	99	19.70	2.20	21.90	0.155	23.00	-1.10
			QPSK	55990	3625	100	0	QPSK	56188	3644.8	100	0	17.98	2.20	20.18	0.104	23.00	-2.82
			16-QAM	55990	3625	100	0	16-QAM	56188	3644.8	100	0	17.00	2.20	19.20	0.083	23.00	-3.80
			64-QAM	55990	3625	100	0	64-QAM	56188	3644.8	100	0	16.95	2.20	19.15	0.082	23.00	-3.85
			256-QAM	55990	3625	100	0	256-QAM	56188	3644.8	100	0	14.96	2.20	17.16	0.052	23.00	-5.84

Table 7-3. EIRP Data (ULCA Band 48)

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Antenna 1B – EIRP

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
5 MHz	QPSK	3552.5	-3.80	1 / 12	22.67	18.87	0.077	23.00	-4.13
		3625.0	-3.80	1 / 12	22.63	18.83	0.076	23.00	-4.17
		3697.5	-3.80	1 / 0	22.70	**18.90**	**0.078**	23.00	-4.10
	16-QAM	3625.0	-3.80	1 / 12	21.43	17.63	0.058	23.00	-5.37
	64-QAM	3625.0	-3.80	1 / 24	20.65	16.85	0.048	23.00	-6.15
	256-QAM	3625.0	-3.80	1 / 12	17.58	13.78	**0.024**	23.00	-9.22
10 MHz	QPSK	3555.0	-3.80	1 / 49	22.70	**18.90**	**0.078**	23.00	-4.10
		3625.0	-3.80	1 / 25	22.61	18.81	0.076	23.00	-4.19
		3695.0	-3.80	1 / 0	22.43	18.63	0.073	23.00	-4.37
	16-QAM	3555.0	-3.80	1 / 49	21.64	17.84	0.061	23.00	-5.16
	64-QAM	3625.0	-3.80	1 / 25	20.88	17.08	0.051	23.00	-5.92
	256-QAM	3625.0	-3.80	1 / 25	17.74	13.94	**0.025**	23.00	-9.06
15 MHz	QPSK	3557.5	-3.80	1 / 74	22.67	18.87	0.077	23.00	-4.13
		3625.0	-3.80	1 / 37	22.70	**18.90**	**0.078**	23.00	-4.10
		3692.5	-3.80	1 / 37	22.42	18.62	0.073	23.00	-4.38
	16-QAM	3692.5	-3.80	1 / 37	21.77	17.97	0.063	23.00	-5.03
	64-QAM	3692.5	-3.80	1 / 37	20.63	16.83	0.048	23.00	-6.17
	256-QAM	3692.5	-3.80	1 / 74	17.63	13.83	**0.024**	23.00	-9.17
20 MHz	QPSK	3560.0	-3.80	1 / 99	22.66	18.86	0.077	23.00	-4.14
		3625.0	-3.80	1 / 99	22.70	**18.90**	**0.078**	23.00	-4.10
		3690.0	-3.80	1 / 0	22.63	18.83	0.076	23.00	-4.17
	16-QAM	3690.0	-3.80	1 / 0	21.58	17.78	0.060	23.00	-5.22
	64-QAM	3625.0	-3.80	1 / 50	20.66	16.86	0.049	23.00	-6.14
	256-QAM	3690.0	-3.80	1 / 99	17.76	13.96	**0.025**	23.00	-9.04

Table 7-4. EIRP Data (LTE Band 48)

Power State	Band	Bandwidth (PCC + SCC)	PCC					SCC					ULCA Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
			Modulation	UL Channel	UL Frequency [MHz]	UL # RB	UL RB Offset	Modulation	UL Channel	UL Frequency [MHz]	UL # RB	UL RB Offset						
Max	LTE B48	20MHz + 5MHz	QPSK	55340	3560.0	1	99	QPSK	55457	3571.7	1	0	22.93	-3.80	19.13	0.082	23.00	-3.87
				55990	3625.0	1	99		56107	3636.7	1	0	23.00	-3.80	19.20	0.083	23.00	-3.80
				56640	3690.0	1	0		56757	3701.7	1	99	23.00	-3.80	19.20	0.083	23.00	-3.80
			QPSK	55990	3625	100	0	QPSK	56107	3636.7	100	0	21.68	-3.80	17.88	0.061	23.00	-5.12
			16-QAM	55990	3625	100	0	16-QAM	56107	3636.7	100	0	20.15	-3.80	16.35	0.043	23.00	-6.65
			64-QAM	55990	3625	100	0	64-QAM	56107	3636.7	100	0	20.11	-3.80	16.31	0.043	23.00	-6.69
			256-QAM	55990	3625	100	0	256-QAM	56107	3636.7	100	0	18.31	-3.80	14.51	0.028	23.00	-8.49
Max	LTE B48	20MHz + 10MHz	QPSK	55340	3560.0	1	99	QPSK	55484	3574.4	1	0	22.99	-3.80	19.19	0.083	23.00	-3.81
				55990	3625.0	1	99		56134	3639.4	1	0	23.00	-3.80	19.20	0.083	23.00	-3.80
				56640	3690.0	1	0		56784	3704.4	1	99	22.90	-3.80	19.10	0.081	23.00	-3.90
			QPSK	55990	3625	100	0	QPSK	56134	3639.4	100	0	21.18	-3.80	17.38	0.055	23.00	-5.62
			16-QAM	55990	3625	100	0	16-QAM	56134	3639.4	100	0	20.20	-3.80	16.40	0.044	23.00	-6.60
			64-QAM	55990	3625	100	0	64-QAM	56134	3639.4	100	0	20.15	-3.80	16.35	0.043	23.00	-6.65
			256-QAM	55990	3625	100	0	256-QAM	56134	3639.4	100	0	18.16	-3.80	14.36	0.027	23.00	-8.64
Max	LTE B48	20MHz + 15MHz	QPSK	55340	3560.0	1	99	QPSK	55511	3577.1	1	0	22.96	-3.80	19.16	0.082	23.00	-3.84
				55990	3625.0	1	99		56161	3642.1	1	0	22.99	-3.80	19.19	0.083	23.00	-3.81
				56640	3690.0	1	0		56811	3707.1	1	99	23.00	-3.80	19.20	0.083	23.00	-3.80
			QPSK	56640	3690	100	0	QPSK	56811	3707.1	100	0	21.11	-3.80	17.31	0.054	23.00	-5.69
			16-QAM	56640	3690	100	0	16-QAM	56811	3707.1	100	0	20.09	-3.80	16.29	0.043	23.00	-6.71
			64-QAM	56640	3690	100	0	64-QAM	56811	3707.1	100	0	20.08	-3.80	16.28	0.042	23.00	-6.72
			256-QAM	56640	3690	100	0	256-QAM	56811	3707.1	100	0	18.29	-3.80	14.49	0.028	23.00	-8.51
Max	LTE B48	20MHz + 20MHz	QPSK	55340	3560.0	1	99	QPSK	55538	3579.8	1	0	22.91	-3.80	19.11	0.081	23.00	-3.89
				55990	3625.0	1	99		56188	3644.8	1	0	23.00	-3.80	19.20	0.083	23.00	-3.80
				56640	3690.0	1	0		56442	3670.2	1	99	22.96	-3.80	19.16	0.082	23.00	-3.84
			QPSK	55990	3625	100	0	QPSK	56188	3644.8	100	0	21.06	-3.80	17.26	0.053	23.00	-5.74
			16-QAM	55990	3625	100	0	16-QAM	56188	3644.8	100	0	20.20	-3.80	16.40	0.044	23.00	-6.60
			64-QAM	55990	3625	100	0	64-QAM	56188	3644.8	100	0	20.07	-3.80	16.27	0.042	23.00	-6.73
			256-QAM	55990	3625	100	0	256-QAM	56188	3644.8	100	0	18.07	-3.80	14.27	0.027	23.00	-8.73

Table 7-5. EIRP Data (ULCA Band 48)

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Antenna 4 – EIRP

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
5 MHz	QPSK	3552.5	3.60	1 / 12	18.37	21.97	0.157	23.00	-1.03
		3625.0	3.60	1 / 12	18.33	21.93	0.156	23.00	-1.07
		3697.5	3.60	1 / 0	18.40	**22.00**	**0.158**	23.00	-1.00
	16-QAM	3625.0	3.60	1 / 12	17.13	20.73	0.118	23.00	-2.27
	64-QAM	3625.0	3.60	1 / 24	16.35	19.95	0.099	23.00	-3.05
	256-QAM	3625.0	3.60	1 / 12	13.28	16.88	**0.049**	23.00	-6.12
10 MHz	QPSK	3555.0	3.60	1 / 49	18.40	**22.00**	**0.158**	23.00	-1.00
		3625.0	3.60	1 / 25	18.31	21.91	0.155	23.00	-1.09
		3695.0	3.60	1 / 0	18.13	21.73	0.149	23.00	-1.27
	16-QAM	3555.0	3.60	1 / 49	17.34	20.94	0.124	23.00	-2.06
	64-QAM	3625.0	3.60	1 / 25	16.58	20.18	0.104	23.00	-2.82
	256-QAM	3625.0	3.60	1 / 25	13.44	17.04	**0.051**	23.00	-5.96
15 MHz	QPSK	3557.5	3.60	1 / 74	18.37	21.97	0.157	23.00	-1.03
		3625.0	3.60	1 / 37	18.40	**22.00**	**0.158**	23.00	-1.00
		3692.5	3.60	1 / 37	18.12	21.72	0.149	23.00	-1.28
	16-QAM	3692.5	3.60	1 / 37	17.47	21.07	0.128	23.00	-1.93
	64-QAM	3692.5	3.60	1 / 37	16.33	19.93	0.098	23.00	-3.07
	256-QAM	3692.5	3.60	1 / 74	13.33	16.93	**0.049**	23.00	-6.07
20 MHz	QPSK	3560.0	3.60	1 / 99	18.36	21.96	0.157	23.00	-1.04
		3625.0	3.60	1 / 99	18.40	**22.00**	**0.158**	23.00	-1.00
		3690.0	3.60	1 / 0	18.33	21.93	0.156	23.00	-1.07
	16-QAM	3690.0	3.60	1 / 0	17.28	20.88	0.122	23.00	-2.12
	64-QAM	3625.0	3.60	1 / 50	16.36	19.96	0.099	23.00	-3.04
	256-QAM	3690.0	3.60	1 / 99	13.46	17.06	**0.051**	23.00	-5.94

Table 7-6. EIRP Data (LTE Band 48)

Power State	Band	Bandwidth (PCC + SCC)	PCC					SCC					ULCA Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
			Modulation	UL Channel	UL Frequency [MHz]	UL # RB	UL RB Offset	Modulation	UL Channel	UL Frequency [MHz]	UL # RB	UL RB Offset						
Max	LTE B48	20MHz + 5MHz	QPSK	55340	3560.0	1	99	QPSK	55457	3571.7	1	0	18.39	3.60	21.99	0.158	23.00	-1.01
				55990	3625.0	1	99		56107	3636.7	1	0	18.40	3.60	22.00	0.158	23.00	-1.00
				56640	3690.0	1	0		56757	3701.7	1	99	18.30	3.60	21.90	0.155	23.00	-1.10
			QPSK	55990	3625	100	0	QPSK	56107	3636.7	100	0	16.58	3.60	20.18	0.104	23.00	-2.82
			16-QAM	55990	3625	100	0	16-QAM	56107	3636.7	100	0	15.60	3.60	19.20	0.083	23.00	-3.80
			64-QAM	55990	3625	100	0	64-QAM	56107	3636.7	100	0	15.55	3.60	19.15	0.082	23.00	-3.85
			256-QAM	55990	3625	100	0	256-QAM	56107	3636.7	100	0	13.56	3.60	17.16	0.052	23.00	-5.84
Max	LTE B48	20MHz + 10MHz	QPSK	55340	3560.0	1	99	QPSK	55484	3574.4	1	0	18.36	3.60	21.96	0.157	23.00	-1.04
				55990	3625.0	1	99		56134	3639.4	1	0	18.39	3.60	21.99	0.158	23.00	-1.01
				56640	3690.0	1	0		56784	3704.4	1	99	18.40	3.60	22.00	0.158	23.00	-1.00
			QPSK	56640	3690	100	0	QPSK	56784	3704.4	100	0	16.51	3.60	20.11	0.103	23.00	-2.89
			16-QAM	56640	3690	100	0	16-QAM	56784	3704.4	100	0	15.49	3.60	19.09	0.081	23.00	-3.91
			64-QAM	56640	3690	100	0	64-QAM	56784	3704.4	100	0	15.48	3.60	19.08	0.081	23.00	-3.92
			256-QAM	56640	3690	100	0	256-QAM	56784	3704.4	100	0	13.69	3.60	17.29	0.054	23.00	-5.71
Max	LTE B48	20MHz + 15MHz	QPSK	55340	3560.0	1	99	QPSK	55511	3577.1	1	0	18.33	3.60	21.93	0.156	23.00	-1.07
				55990	3625.0	1	99		56161	3642.1	1	0	18.40	3.60	22.00	0.158	23.00	-1.00
				56640	3690.0	1	0		56811	3707.1	1	99	18.40	3.60	22.00	0.158	23.00	-1.00
			QPSK	55990	3625	100	0	QPSK	56161	3642.1	100	0	17.08	3.60	20.68	0.117	23.00	-2.32
			16-QAM	55990	3625	100	0	16-QAM	56161	3642.1	100	0	15.55	3.60	19.15	0.082	23.00	-3.85
			64-QAM	55990	3625	100	0	64-QAM	56161	3642.1	100	0	15.51	3.60	19.11	0.081	23.00	-3.89
			256-QAM	55990	3625	100	0	256-QAM	56161	3642.1	100	0	13.71	3.60	17.31	0.054	23.00	-5.69
Max	LTE B48	20MHz + 20MHz	QPSK	55340	3560.0	1	99	QPSK	55538	3579.8	1	0	18.31	3.60	21.91	0.155	23.00	-1.09
				55990	3625.0	1	99		56188	3644.8	1	0	18.40	3.60	22.00	0.158	23.00	-1.00
				56640	3690.0	1	0		56442	3670.2	1	99	18.36	3.60	21.96	0.157	23.00	-1.04
			QPSK	55990	3625	100	0	QPSK	56188	3644.8	100	0	16.46	3.60	20.06	0.101	23.00	-2.94
			16-QAM	55990	3625	100	0	16-QAM	56188	3644.8	100	0	15.60	3.60	19.20	0.083	23.00	-3.80
			64-QAM	55990	3625	100	0	64-QAM	56188	3644.8	100	0	15.47	3.60	19.07	0.081	23.00	-3.93
			256-QAM	55990	3625	100	0	256-QAM	56188	3644.8	100	0	13.47	3.60	17.07	0.051	23.00	-5.93

Table 7-7. EIRP Data (ULCA Band 48)

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Antenna 2B – EIRP

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
5 MHz	QPSK	3552.5	-4.50	1 / 12	21.17	16.67	0.046	23.00	-6.33
		3625.0	-4.50	1 / 12	21.13	16.63	0.046	23.00	-6.37
		3697.5	-4.50	1 / 0	21.20	**16.70**	**0.047**	23.00	-6.30
	16-QAM	3625.0	-4.50	1 / 12	19.93	15.43	0.035	23.00	-7.57
	64-QAM	3625.0	-4.50	1 / 24	19.15	14.65	0.029	23.00	-8.35
	256-QAM	3625.0	-4.50	1 / 12	16.08	11.58	**0.014**	23.00	-11.42
10 MHz	QPSK	3555.0	-4.50	1 / 49	21.20	**16.70**	**0.047**	23.00	-6.30
		3625.0	-4.50	1 / 25	21.11	16.61	0.046	23.00	-6.39
		3695.0	-4.50	1 / 0	20.93	16.43	0.044	23.00	-6.57
	16-QAM	3555.0	-4.50	1 / 49	20.14	15.64	0.037	23.00	-7.36
	64-QAM	3625.0	-4.50	1 / 25	19.38	14.88	0.031	23.00	-8.12
	256-QAM	3625.0	-4.50	1 / 25	16.24	11.74	**0.015**	23.00	-11.26
15 MHz	QPSK	3557.5	-4.50	1 / 74	21.17	16.67	0.046	23.00	-6.33
		3625.0	-4.50	1 / 37	21.20	**16.70**	**0.047**	23.00	-6.30
		3692.5	-4.50	1 / 37	20.92	16.42	0.044	23.00	-6.58
	16-QAM	3692.5	-4.50	1 / 37	20.27	15.77	0.038	23.00	-7.23
	64-QAM	3692.5	-4.50	1 / 37	19.13	14.63	0.029	23.00	-8.37
	256-QAM	3692.5	-4.50	1 / 74	16.13	11.63	**0.015**	23.00	-11.37
20 MHz	QPSK	3560.0	-4.50	1 / 99	21.16	16.66	0.046	23.00	-6.34
		3625.0	-4.50	1 / 99	21.20	**16.70**	**0.047**	23.00	-6.30
		3690.0	-4.50	1 / 0	21.13	16.63	0.046	23.00	-6.37
	16-QAM	3690.0	-4.50	1 / 0	20.08	15.58	0.036	23.00	-7.42
	64-QAM	3625.0	-4.50	1 / 50	19.16	14.66	0.029	23.00	-8.34
	256-QAM	3690.0	-4.50	1 / 99	16.26	11.76	**0.015**	23.00	-11.24

Table 7-8. EIRP Data (LTE Band 48)

Power State	Band	Bandwidth (PCC + SCC)	PCC					SCC					ULCA Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
			Modulation	UL Channel	UL Frequency [MHz]	UL # RB	UL RB Offset	Modulation	UL Channel	UL Frequency [MHz]	UL # RB	UL RB Offset						
Max	LTE B48	20MHz + 5MHz	QPSK	55340	3560.0	1	99	QPSK	55457	3571.7	1	0	21.46	-4.50	16.96	0.050	23.00	-6.04
				55990	3625.0	1	99		56107	3636.7	1	0	21.49	-4.50	16.99	0.050	23.00	-6.01
				56640	3690.0	1	0		56757	3701.7	1	99	21.50	-4.50	17.00	0.050	23.00	-6.00
			QPSK	56640	3690	100	0	QPSK	56757	3701.7	100	0	19.61	-4.50	15.11	0.032	23.00	-7.89
			16-QAM	56640	3690	100	0	16-QAM	56757	3701.7	100	0	18.59	-4.50	14.09	0.026	23.00	-8.91
			64-QAM	56640	3690	100	0	64-QAM	56757	3701.7	100	0	18.58	-4.50	14.08	0.026	23.00	-8.92
			256-QAM	56640	3690	100	0	256-QAM	56757	3701.7	100	0	16.79	-4.50	12.29	0.017	23.00	-10.71
Max	LTE B48	20MHz + 10MHz	QPSK	55340	3560.0	1	99	QPSK	55484	3574.4	1	0	21.41	-4.50	16.91	0.049	23.00	-6.09
				55990	3625.0	1	99		56134	3639.4	1	0	21.50	-4.50	17.00	0.050	23.00	-6.00
				56640	3690.0	1	0		56784	3704.4	1	99	21.46	-4.50	16.96	0.050	23.00	-6.04
			QPSK	55990	3625	100	0	QPSK	56134	3639.4	100	0	19.56	-4.50	15.06	0.032	23.00	-7.94
			16-QAM	55990	3625	100	0	16-QAM	56134	3639.4	100	0	18.70	-4.50	14.20	0.026	23.00	-8.80
			64-QAM	55990	3625	100	0	64-QAM	56134	3639.4	100	0	18.57	-4.50	14.07	0.026	23.00	-8.93
			256-QAM	55990	3625	100	0	256-QAM	56134	3639.4	100	0	16.57	-4.50	12.07	0.016	23.00	-10.93
Max	LTE B48	20MHz + 15MHz	QPSK	55340	3560.0	1	99	QPSK	55511	3577.1	1	0	21.43	-4.50	16.93	0.049	23.00	-6.07
				55990	3625.0	1	99		56161	3642.1	1	0	21.50	-4.50	17.00	0.050	23.00	-6.00
				56640	3690.0	1	0		56811	3707.1	1	99	21.49	-4.50	16.99	0.050	23.00	-6.01
			QPSK	55990	3625	100	0	QPSK	56161	3642.1	100	0	20.18	-4.50	15.68	0.037	23.00	-7.32
			16-QAM	55990	3625	100	0	16-QAM	56161	3642.1	100	0	18.65	-4.50	14.15	0.026	23.00	-8.85
			64-QAM	55990	3625	100	0	64-QAM	56161	3642.1	100	0	18.61	-4.50	14.11	0.026	23.00	-8.89
			256-QAM	55990	3625	100	0	256-QAM	56161	3642.1	100	0	16.81	-4.50	12.31	0.017	23.00	-10.69
Max	LTE B48	20MHz + 20MHz	QPSK	55340	3560.0	1	99	QPSK	55538	3579.8	1	0	21.49	-4.50	16.99	0.050	23.00	-6.01
				55990	3625.0	1	99		56188	3644.8	1	0	21.50	-4.50	17.00	0.050	23.00	-6.00
				56640	3690.0	1	0		56442	3670.2	1	99	21.40	-4.50	16.90	0.049	23.00	-6.10
			QPSK	55990	3625	100	0	QPSK	56188	3644.8	100	0	19.68	-4.50	15.18	0.033	23.00	-7.82
			16-QAM	55990	3625	100	0	16-QAM	56188	3644.8	100	0	18.70	-4.50	14.20	0.026	23.00	-8.80
			64-QAM	55990	3625	100	0	64-QAM	56188	3644.8	100	0	18.65	-4.50	14.15	0.026	23.00	-8.85
			256-QAM	55990	3625	100	0	256-QAM	56188	3644.8	100	0	16.66	-4.50	12.16	0.016	23.00	-10.84

Table 7-9. EIRP Data (ULCA Band 48)

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7.7 Radiated Spurious Emissions

§2.1053 §96.41(e)

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in KDB 971168 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized broadband hybrid antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed while the EUT is operating at maximum power and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI C63.26-2015

TIA-603-E-2016 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Max Hold (In cases where the level is within 2dB of the limit, the final measurement is taken using triggering/gating and trace averaging.)
7. The trace was allowed to stabilize

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Test Setup

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

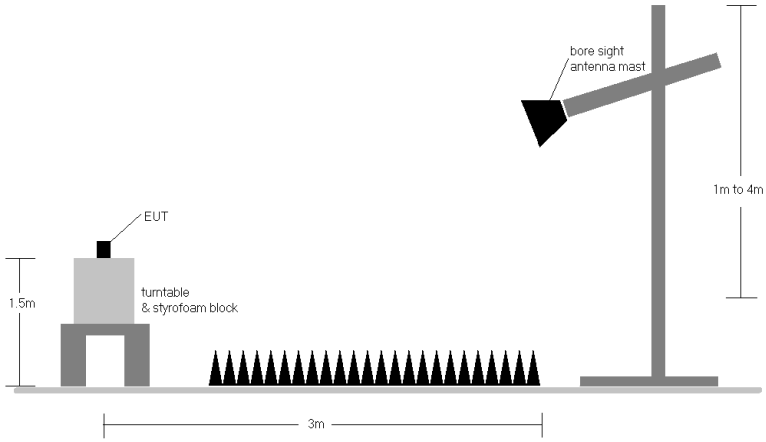

Figure 7-6. Test Instrument & Measurement Setup

Test Notes

1. Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
   a. E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   b. EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

2. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below. 1RB config was found and reported as a worst case RB size.

3. This unit was tested with its standard battery.

4. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

5. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

7. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

8. For LTE Band 48 pre-scans 1-18GHz, the RBW is set to 1MHz and VBW to 30kHz. For final measurements above 1GHz, the RBW is set to 1MHz and VBW to 3MHz when measuring with an RMS detector and max hold trace.

9. Uplink carrier aggregation intra-band radiated spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. The worst case (highest) emissions were found while operating with QPSK modulation with both carriers set to transmit using 1RB

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7.7.1 Antenna 3B Radiated Spurious Emissions Measurements

LTE Band 48

Bandwidth (MHz):	20
Frequency (MHz):	3560.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7120.0	V	272	182	-75.89	12.75	43.86	-51.40	-40.00	-11.40
10680.0	V	-	-	-84.36	16.43	39.07	-56.19	-40.00	-16.19
14240.0	V	-	-	-84.65	18.40	40.75	-54.51	-40.00	-14.51
17800.0	V	-	-	-84.82	23.14	45.32	-49.94	-40.00	-9.94

Table 7-10. Radiated Spurious Data (LTE Band 48 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3625.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7250.0	V	270	174	-72.47	11.99	46.52	-48.73	-40.00	-8.73
10875.0	V	-	-	-84.27	16.66	39.39	-55.86	-40.00	-15.86
14500.0	V	-	-	-84.11	19.30	42.19	-53.07	-40.00	-13.07

Table 7-11. Radiated Spurious Data (LTE Band 48 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3690.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7380.0	V	268	185	-73.78	12.39	45.61	-49.65	-40.00	-9.65
11070.0	V	-	-	-84.52	16.16	38.64	-56.62	-40.00	-16.62
14760.0	V	-	-	-84.73	19.85	42.12	-53.14	-40.00	-13.14

Table 7-12. Radiated Spurious Data (LTE Band 48 – High Channel)

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ULCA Band 48

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3560.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3579.8
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7120.0	V	234	179	-77.16	12.13	41.97	-53.29	-40.00	-13.29
10680.0	V	-	-	-82.55	15.31	39.76	-55.50	-40.00	-15.50
14240.0	V	-	-	-84.27	19.12	41.85	-53.40	-40.00	-13.40
17800.0	V	-	-	-83.29	21.73	45.44	-49.81	-40.00	-9.81

Table 7-13. Radiated Spurious Data (ULCA Band 48– Low Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3625.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3644.8
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7250.0	V	383	203	-75.10	11.45	43.35	-51.91	-40.00	-11.91
10875.0	V	-	-	-82.04	15.52	40.48	-54.78	-40.00	-14.78
14500.0	V	-	-	-83.77	18.93	42.16	-53.10	-40.00	-13.10

Table 7-14. Radiated Spurious Data (ULCA Band 48– Mid Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3690.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3670.2
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7380.0	V	-	-	-82.69	12.62	36.93	-58.33	-40.00	-18.33
11070.0	V	-	-	-83.52	16.43	39.91	-55.35	-40.00	-15.35
14760.0	V	-	-	-84.00	19.35	42.35	-52.91	-40.00	-12.91

Table 7-15. Radiated Spurious Data (ULCA Band 48– High Channel)

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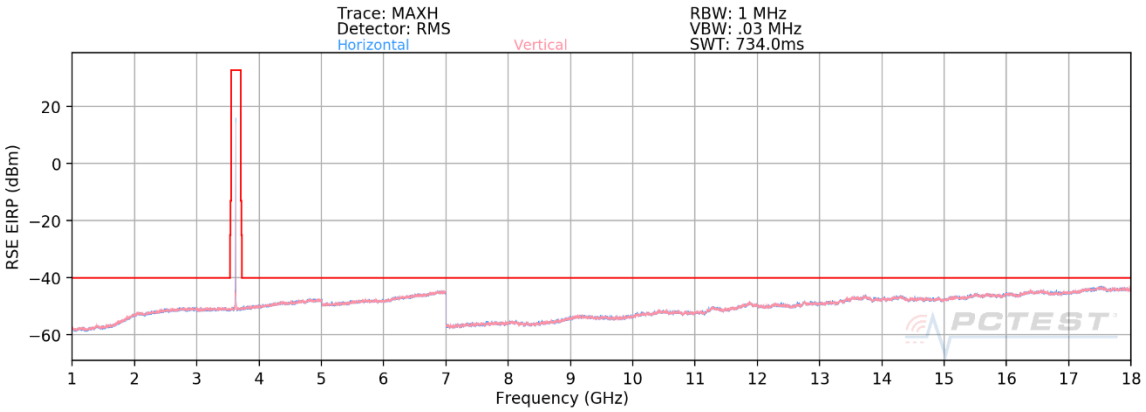
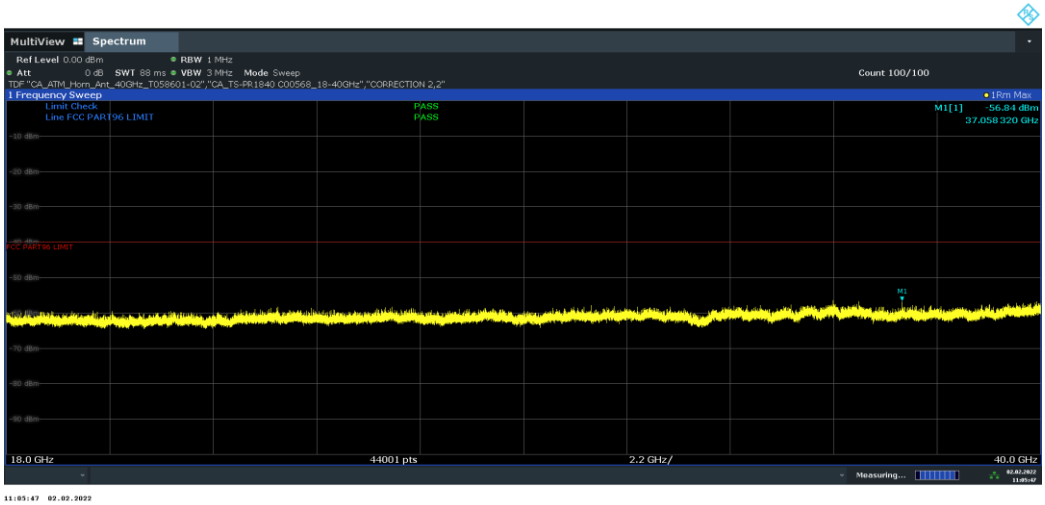
7.7.2 Antenna 1B Radiated Spurious Emissions Measurements

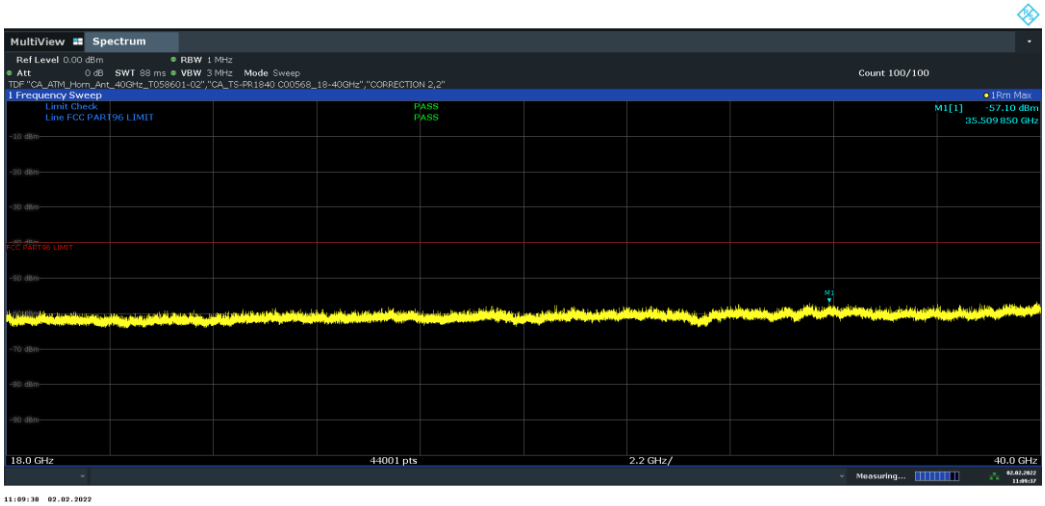
LTE Band 48



Plot 7-88. Radiated Spurious Plot 1 – 18GHz (LTE Band 48)



Plot 7-89. Radiated Spurious Plot 18 – 40GHz (LTE Band 48 – Ant. Pol H)



Plot 7-90. Radiated Spurious Plot 18 – 40GHz (LTE Band 48 – Ant. Pol V)

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Bandwidth (MHz):	20
Frequency (MHz):	3560.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7120.0	V	-	-	-79.51	10.49	37.98	-57.28	-40.00	-17.28
10680.0	V	-	-	-79.98	16.19	43.21	-52.05	-40.00	-12.05
14240.0	V	-	-	-80.99	21.70	47.71	-47.55	-40.00	-7.55

Table 7-16. Radiated Spurious Data (LTE Band 48 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3625
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7250.0	V	-	-	-79.36	10.46	38.10	-57.16	-40.00	-17.16
10875.0	V	-	-	-81.00	16.16	42.16	-53.10	-40.00	-13.10
14500.0	V	-	-	-81.19	21.80	47.61	-47.65	-40.00	-7.65

Table 7-17. Radiated Spurious Data (LTE Band 48 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3690
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7380.0	V	-	-	-79.22	10.77	38.55	-56.71	-40.00	-16.71
11070.0	V	-	-	-80.93	16.46	42.53	-52.73	-40.00	-12.73
14760.0	V	-	-	-81.37	21.58	47.21	-48.05	-40.00	-8.05

Table 7-18. Radiated Spurious Data (LTE Band 48 – High Channel)

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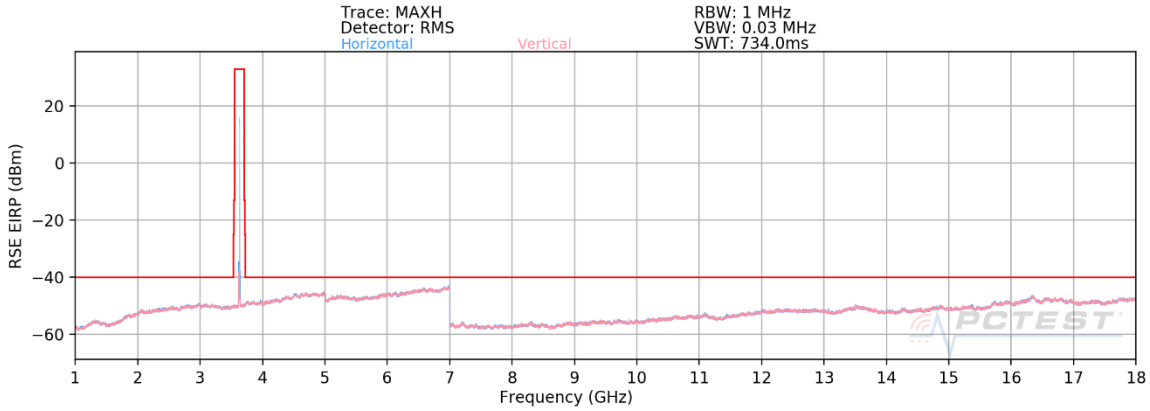
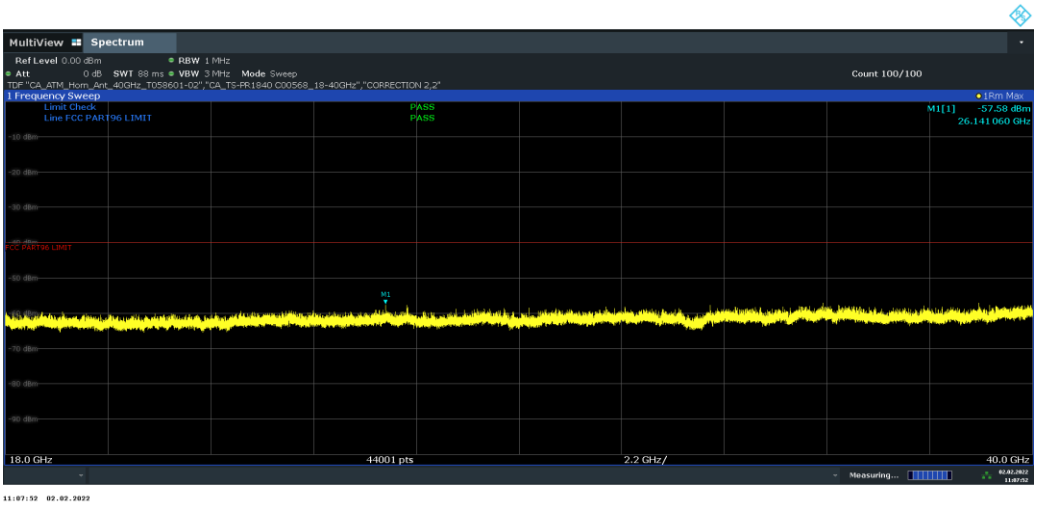
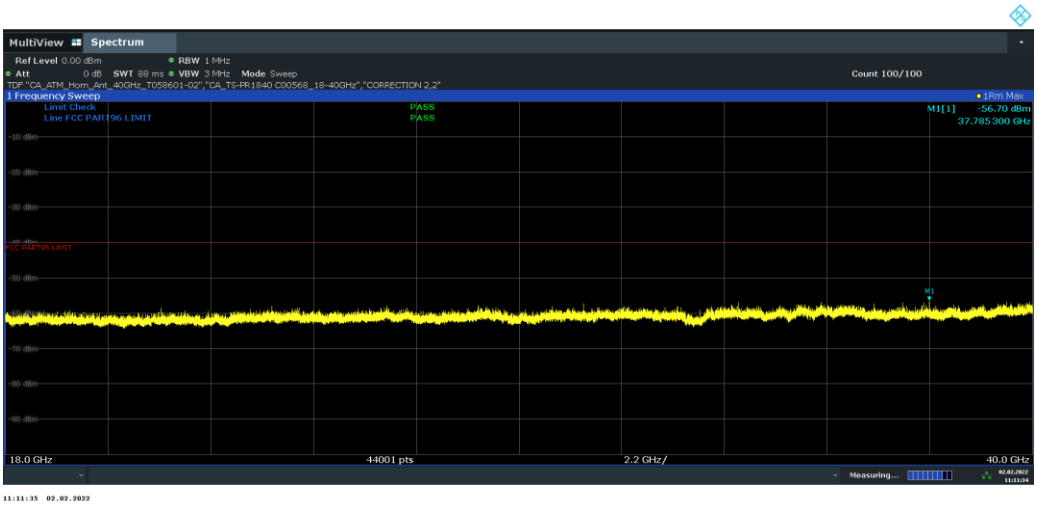
ULCA Band 48



Plot 7-91. Radiated Spurious Plot 1 – 18GHz (ULCA Band 48)



Plot 7-92. Radiated Spurious Plot 18 – 40GHz (ULCA Band 48, Ant. Pol H)



Plot 7-93. Radiated Spurious Plot 18 – 40GHz (ULCA Band 48, Ant. Pol V)

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PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3560.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3579.8
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7120.0	V	-	-	-81.75	12.13	37.38	-57.88	-40.00	-17.88
10680.0	V	-	-	-82.54	15.31	39.77	-55.49	-40.00	-15.49
14240.0	V	-	-	-84.37	19.12	41.75	-53.50	-40.00	-13.50
17800.0	V	-	-	-83.28	21.73	45.45	-49.80	-40.00	-9.80

Table 7-19. Radiated Spurious Data (ULCA Band 48– Low Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3625.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3644.8
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7250.0	V	-	-	-81.58	11.45	36.87	-58.39	-40.00	-18.39
10875.0	V	-	-	-82.30	15.52	40.22	-55.04	-40.00	-15.04
14500.0	V	-	-	-83.50	18.93	42.43	-52.83	-40.00	-12.83

Table 7-20. Radiated Spurious Data (ULCA Band 48– Mid Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3690.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3670.2
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7380.0	V	-	-	-82.49	12.62	37.13	-58.13	-40.00	-18.13
11070.0	V	-	-	-83.59	16.43	39.84	-55.42	-40.00	-15.42
14760.0	V	-	-	-84.01	19.35	42.34	-52.92	-40.00	-12.92

Table 7-21. Radiated Spurious Data (ULCA Band 48– High Channel)

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7.7.3 Antenna 4 Radiated Spurious Emissions Measurements

LTE Band 48

Bandwidth (MHz):	20
Frequency (MHz):	3560.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7120.0	V	-	-	-81.53	11.86	37.33	-57.93	-40.00	-17.93
10680.0	V	-	-	-83.00	16.01	40.01	-55.25	-40.00	-15.25
14240.0	V	-	-	-84.38	19.73	42.35	-52.91	-40.00	-12.91
17800.0	V	-	-	-83.31	22.32	46.01	-49.25	-40.00	-9.25

Table 7-22. Radiated Spurious Data (LTE Band 48 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3625.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7250.0	V	-	-	-81.81	12.49	37.68	-57.58	-40.00	-17.58
10875.0	V	-	-	-83.01	16.38	40.37	-54.89	-40.00	-14.89
14500.0	V	-	-	-84.20	20.16	42.96	-52.30	-40.00	-12.30

Table 7-23. Radiated Spurious Data (LTE Band 48 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3690.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7380.0	V	-	-	-82.58	12.88	37.30	-57.96	-40.00	-17.96
11070.0	V	-	-	-83.54	16.80	40.26	-55.00	-40.00	-15.00
14760.0	V	-	-	-84.08	19.93	42.85	-52.40	-40.00	-12.40

Table 7-24. Radiated Spurious Data (LTE Band 48 – High Channel)

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ULCA Band 48

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3560.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3579.8
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7120.0	V	-	-	-81.63	12.13	37.50	-57.76	-40.00	-17.76
10680.0	V	-	-	-82.58	15.31	39.73	-55.53	-40.00	-15.53
14240.0	V	-	-	-84.51	19.12	41.61	-53.64	-40.00	-13.64
17800.0	V	-	-	-83.24	21.73	45.49	-49.76	-40.00	-9.76

Table 7-25. Radiated Spurious Data (ULCA Band 48– Low Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3625.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3644.8
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7250.0	V	-	-	-81.39	11.45	37.06	-58.20	-40.00	-18.20
10875.0	V	-	-	-82.16	15.52	40.36	-54.90	-40.00	-14.90
14500.0	V	-	-	-83.71	18.93	42.22	-53.04	-40.00	-13.04

Table 7-26. Radiated Spurious Data (ULCA Band 48– Mid Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3690.0
PCC RB / Offset:	1/ 0
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3670.2
SCC RB / Offset:	1/ 99
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7380.0	V	-	-	-82.62	12.62	37.00	-58.26	-40.00	-18.26
11070.0	V	-	-	-83.60	16.43	39.83	-55.43	-40.00	-15.43
14760.0	V	-	-	-83.98	19.35	42.37	-52.89	-40.00	-12.89

Table 7-27. Radiated Spurious Data (ULCA Band 48– High Channel)

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7.7.4 Antenna 2B Radiated Spurious Emissions Measurements

LTE Band 48

Bandwidth (MHz):	20
Frequency (MHz):	3560
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7120.0	v	-	-	-79.51	10.49	37.98	-57.28	-40.00	-17.28
10680.0	v	-	-	-80.07	16.19	43.12	-52.14	-40.00	-12.14
14240.0	v	-	-	-84.14	19.70	42.56	-52.70	-40.00	-12.70

Table 7-28. Radiated Spurious Data (LTE Band 48 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3625
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7250.0	V	-	-	-79.31	10.46	38.15	-57.11	-40.00	-17.11
10875.0	V	-	-	-80.84	16.16	42.32	-52.94	-40.00	-12.94
14500.0	V	-	-	-83.93	19.80	42.87	-52.39	-40.00	-12.39

Table 7-29. Radiated Spurious Data (LTE Band 48 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3690
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7380.0	V	-	-	-79.22	10.77	38.55	-56.71	-40.00	-16.71
11070.0	V	-	-	-81.09	16.46	42.37	-52.89	-40.00	-12.89
14760.0	V	-	-	-84.19	19.58	42.39	-52.87	-40.00	-12.87

Table 7-30. Radiated Spurious Data (LTE Band 48 – High Channel)

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ULCA Band 48

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3560.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3579.8
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7120.0	V	250	194	-76.73	12.13	42.40	-52.86	-40.00	-12.86
10680.0	V	-	-	-82.38	15.31	39.93	-55.33	-40.00	-15.33
14240.0	V	-	-	-84.34	19.12	41.78	-53.47	-40.00	-13.47
17800.0	V	-	-	-83.23	21.73	45.50	-49.75	-40.00	-9.75

Table 7-31. Radiated Spurious Data (ULCA Band 48– Low Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3625.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3644.8
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7250.0	V	-	-	-81.52	11.45	36.93	-58.33	-40.00	-18.33
10875.0	V	-	-	-82.58	15.52	39.94	-55.32	-40.00	-15.32
14500.0	V	-	-	-84.19	18.93	41.74	-53.52	-40.00	-13.52

Table 7-32. Radiated Spurious Data (ULCA Band 48– Mid Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3690.0
PCC RB / Offset:	1/ 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3670.2
SCC RB / Offset:	1/ 0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
7380.0	V	-	-	-82.62	12.62	37.00	-58.26	-40.00	-18.26
11070.0	V	-	-	-83.43	16.43	40.00	-55.26	-40.00	-15.26
14760.0	V	-	-	-84.05	19.35	42.30	-52.96	-40.00	-12.96

Table 7-33. Radiated Spurious Data (ULCA Band 48– High Channel)

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7.8 Frequency Stability / Temperature Variation

§2.1055

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015 and TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **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.

For Part 96, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI C63.26-2015

TIA-603-E-2016

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

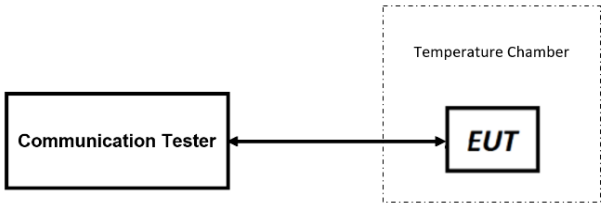

Figure 7-7. Test Instrument & Measurement Setup

Test Notes

All ports were tested and only the worst case data were reported.

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Frequency Stability / Temperature Variation

LTE Band 48

Low Channel Frequency (Hz):	3,560,000,000
High Channel Frequency (Hz):	3,690,000,000
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Low Freq. (Hz)	High Freq. (Hz)	Low Freq. Dev. (Hz)	High Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	3,559,999,985	3,689,999,985	-15	-15	-0.000000429
		- 20	3,559,999,984	3,689,999,986	-16	-14	-0.000000460
		- 10	3,559,999,985	3,689,999,986	-15	-14	-0.000000419
		0	3,559,999,985	3,689,999,987	-15	-13	-0.000000416
		+ 10	3,559,999,986	3,689,999,987	-14	-13	-0.000000400
		+ 20 (Ref)	3,560,000,000	3,690,000,000	0	0	0.000000000
		'+ 30	3,559,999,985	3,689,999,990	-15	-10	-0.000000409
		+ 40	3,559,999,988	3,689,999,993	-13	-7	-0.000000351
		+ 50	3,559,999,987	3,689,999,991	-13	-9	-0.000000367
Battery Endpoint	3.23	+ 20	3,559,999,987	3,689,999,992	-13	-8	-0.000000366

Table 7-34. LTE Band 48 Frequency Stability Data

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7.9 End User Device Additional Requirement (CBSD Protocol)

§96.47

Test Overview and Limit

End user device additional requirements (CBSD Protocol) are tested per the test procedures listed below. During testing, the EUT is connected to a certified CBSD (Ruckus FCC ID: S9GQ910US00) as a companion device to show compliance with Part 96.47.

End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.

An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.

Test Procedure Used

KDB 940660 D01 v03

WINNF-TS-0122 v1.0.2

Test Setup/Method

The EUT was connected via an RF cable to a certified CBSD and spectrum analyzer. The following procedure is performed by applying WINNF-TS-0122 CBRS CBSD Test Specification.

1. Run#1:
    a. Setup WINNF.PT.C.HBT.1 with 3550MHz – 3560MHz.
    b. Enable AP service from Ruckus Cloud management.
    c. Check EUT Tx frequency.
    d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.
2. Run#2:
    a. Setup WINNF.PT.C.HBT.1 with 3570MHz – 3590MHz.
    b. Enable AP service from Ruckus Cloud management.
    c. Check EUT Tx frequency.
    d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.

Test Notes

The EUT is an End User Device.

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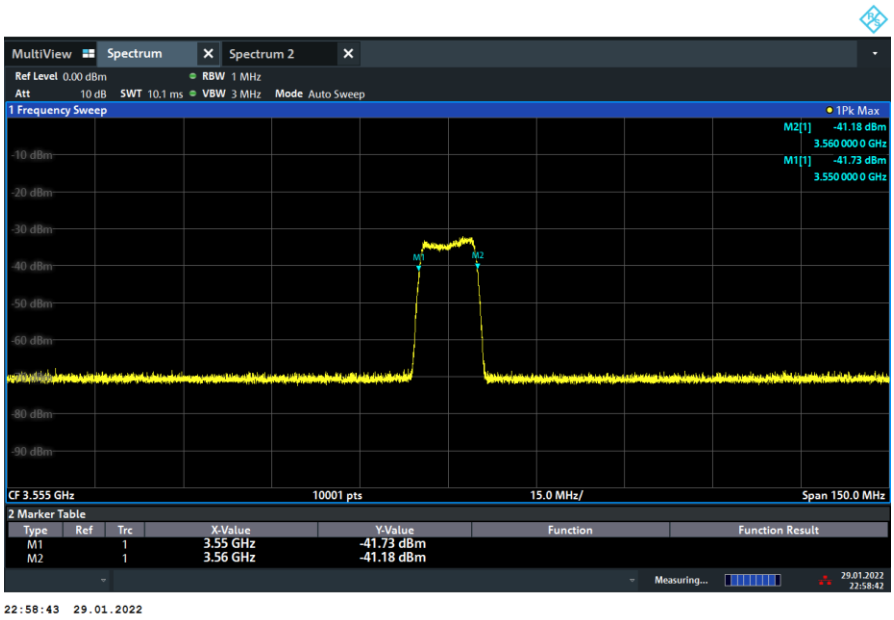
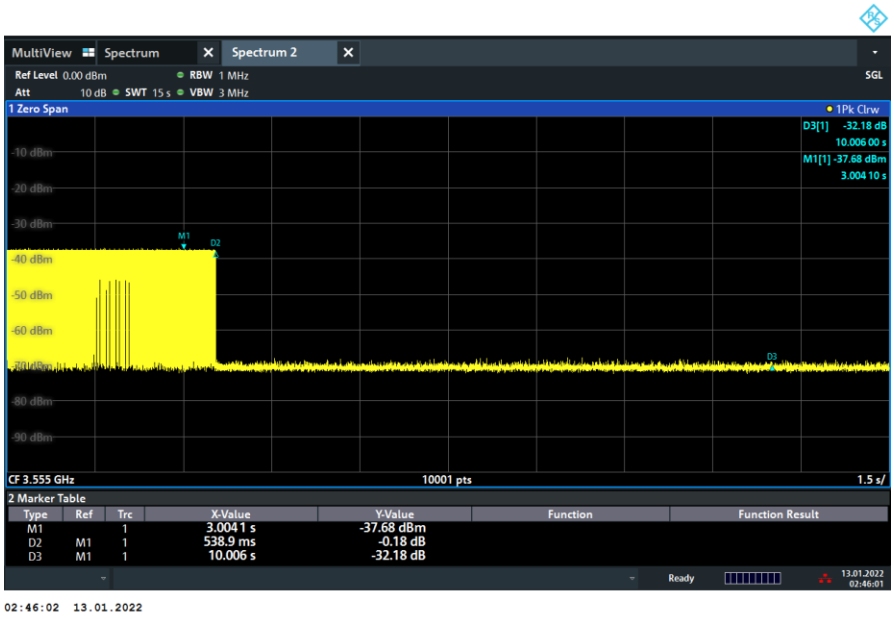
Run#1:

- Tx Frequency Set: 3550 – 3560MHz
- MaxEIRP Set: 10dBm/MHz



Plot 7-94. Run#1 End User Device Frequency of Operations



Plot 7-95. Run#1 End User Device Discontinues Operations within 10s

Note:

Marker 1: CBSD sends instructions to discontinue LTE operations.
Marker 2: EUT discontinues operation.
Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

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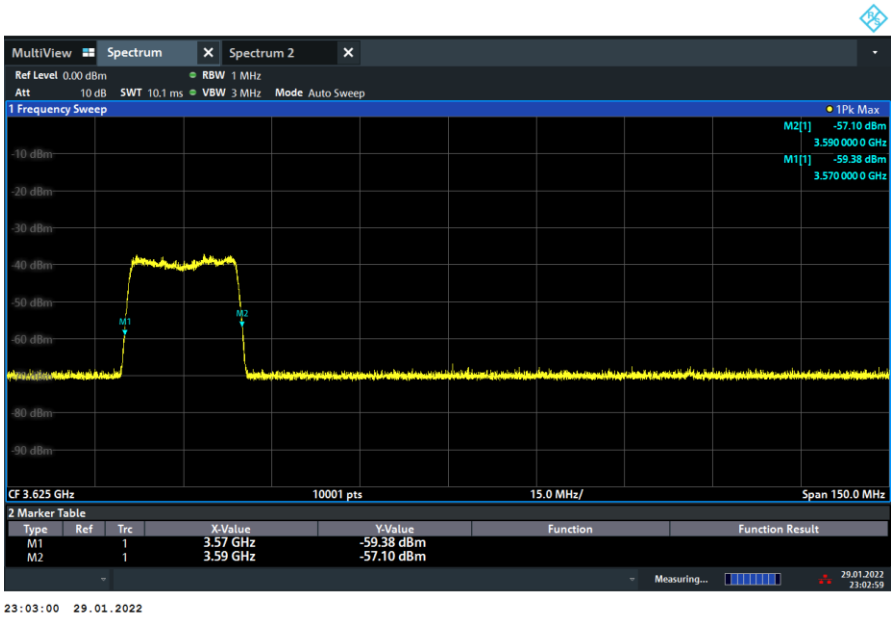
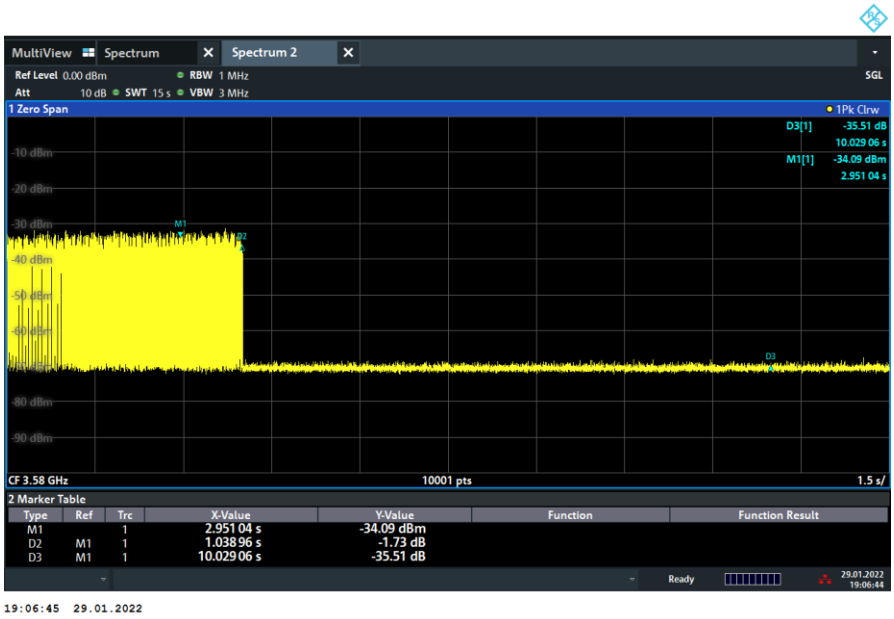
Run#2:

- Tx Frequency Set: 3570 – 3590MHz
- MaxEIRP Set: 10dBm/MHz



Plot 7-96. Run#2 End User Device Frequency of Operations



Plot 7-97. Run#2 End User Device Discontinues Operations within 10s

Note:

Marker 1: CBSD sends instructions to discontinue LTE operations.
Marker 2: EUT discontinues operation.
Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the Apple **Tablet Devices FCC ID: BCGA2589** complies with all of the End User Device requirements of Part 96 of the FCC Rules for LTE operation only.

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