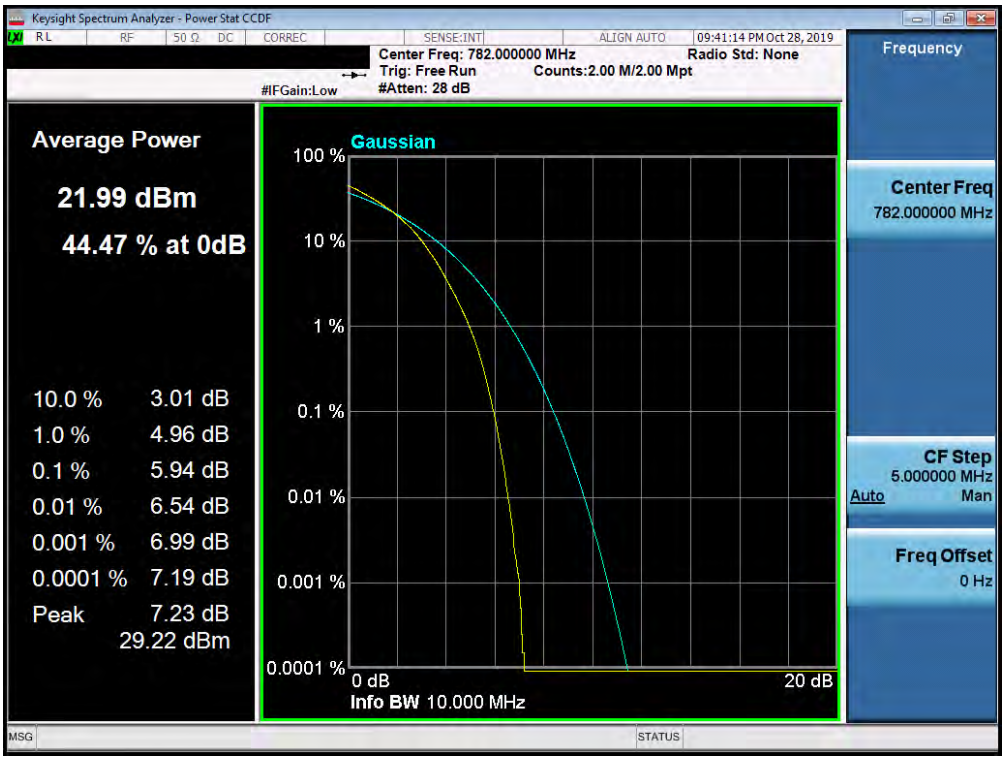
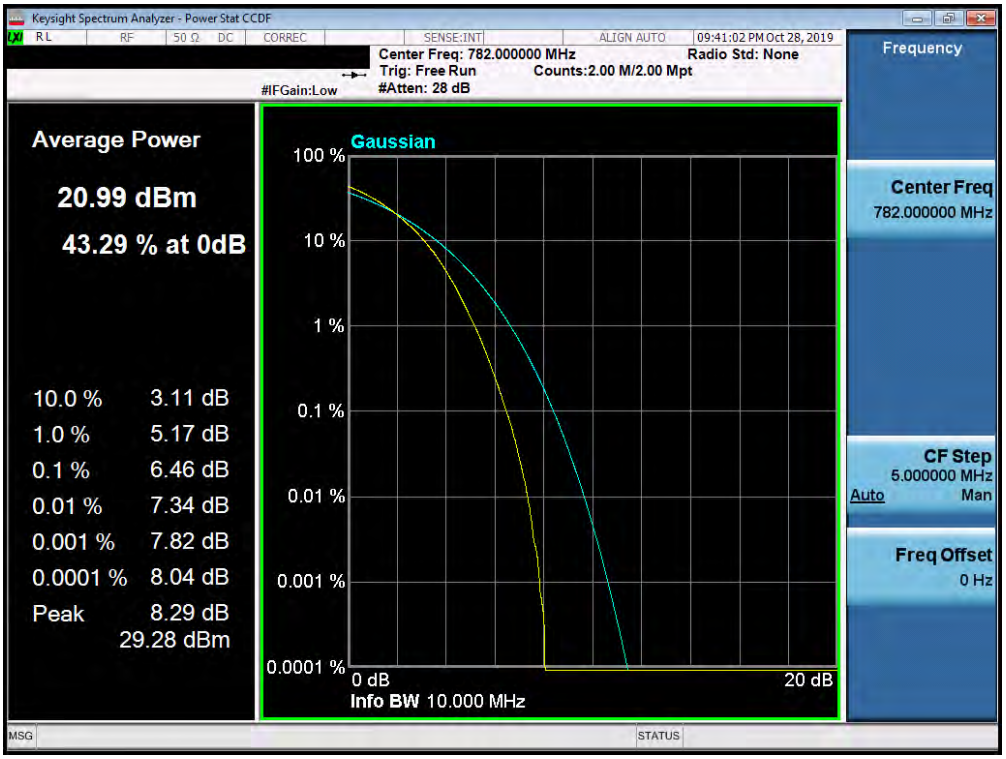
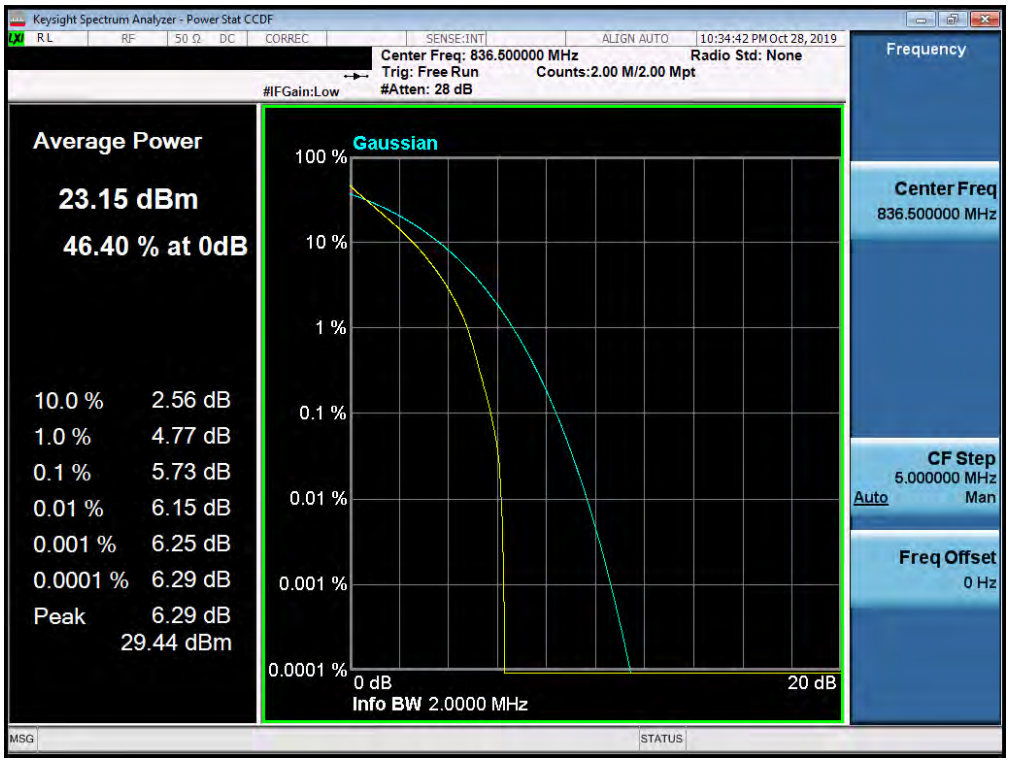


Plot 7-168. PAR Plot (Band 13 - 10.0MHz 16-QAM - Full RB Configuration)

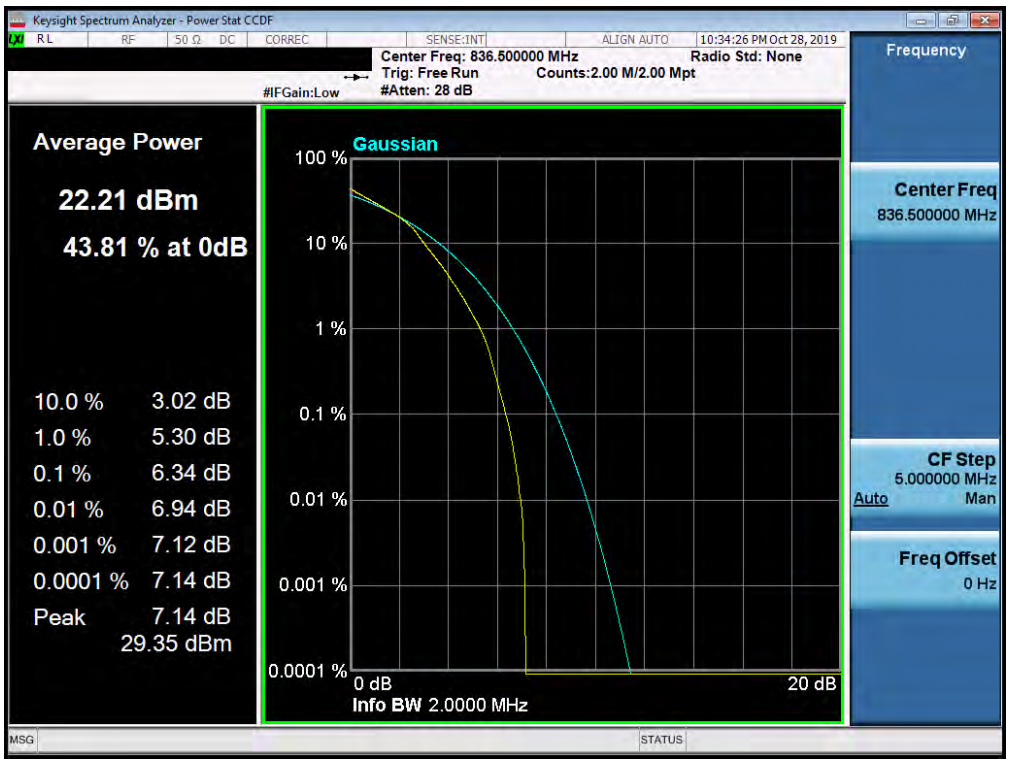


Plot 7-169. PAR Plot (Band 13 - 10.0MHz 64-QAM - Full RB Configuration)

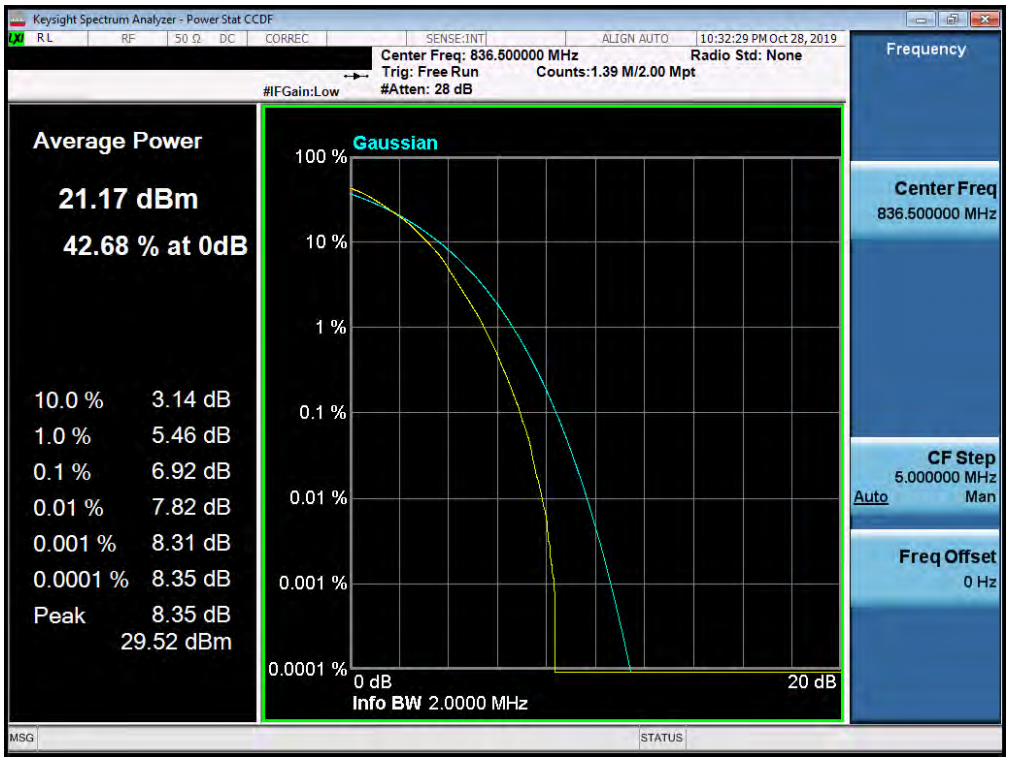
Band 5



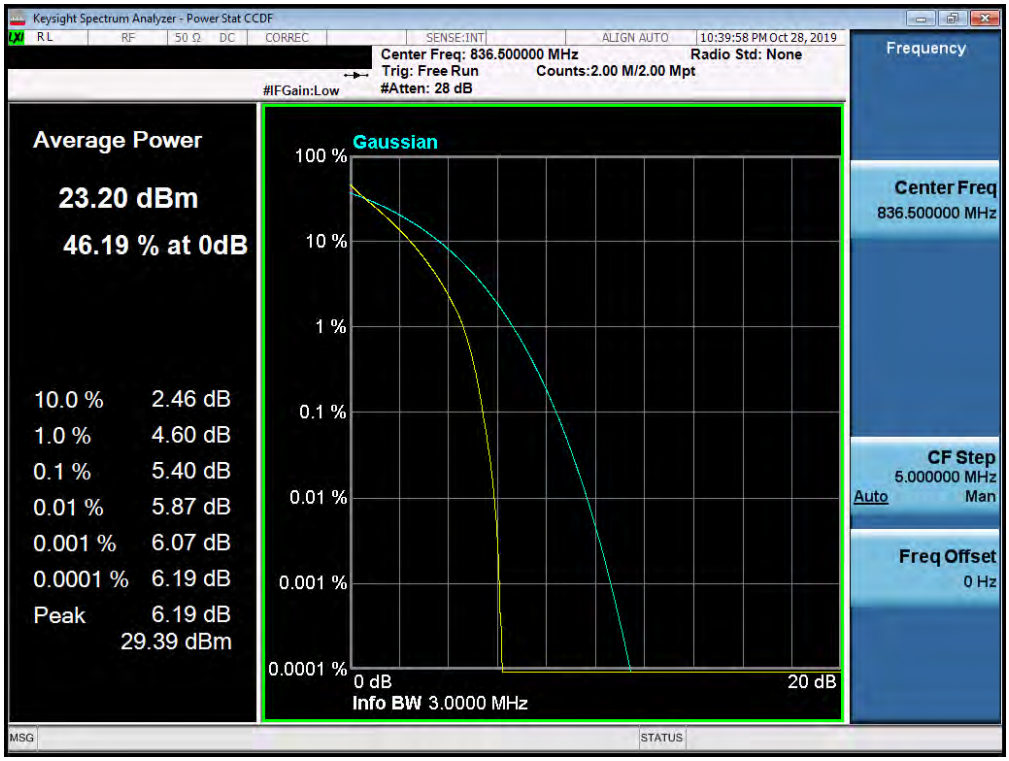
Plot 7-170. PAR Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)



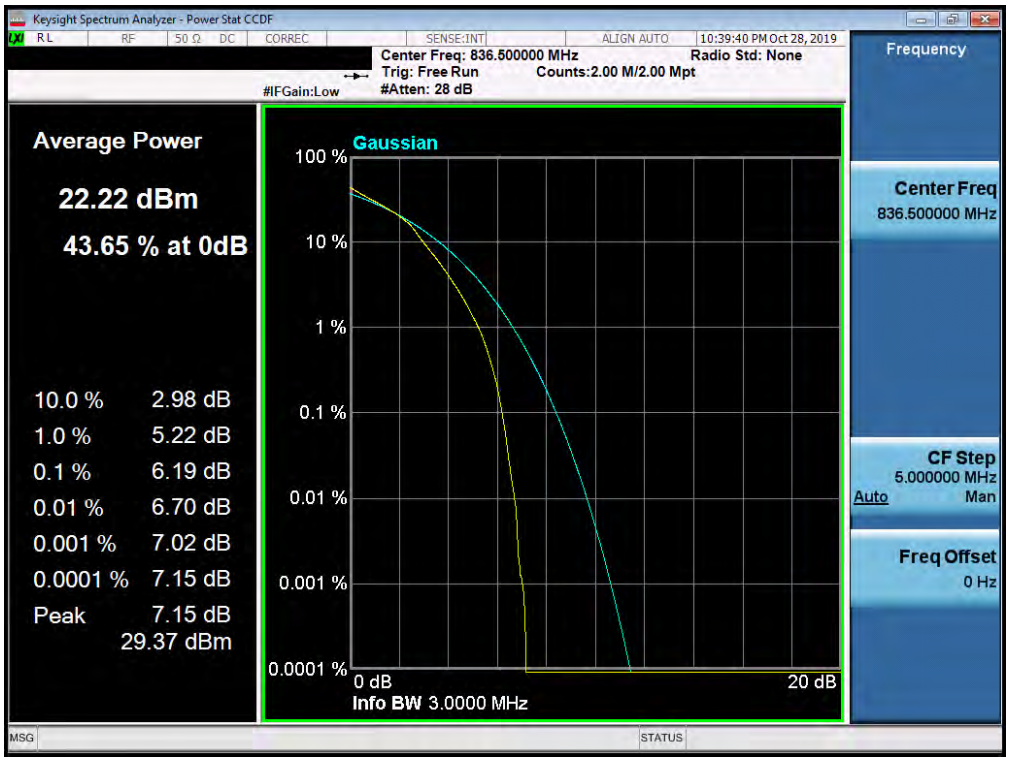
Plot 7-171. PAR Plot (Band 5 - 1.4MHz 16-QAM - Full RB Configuration)



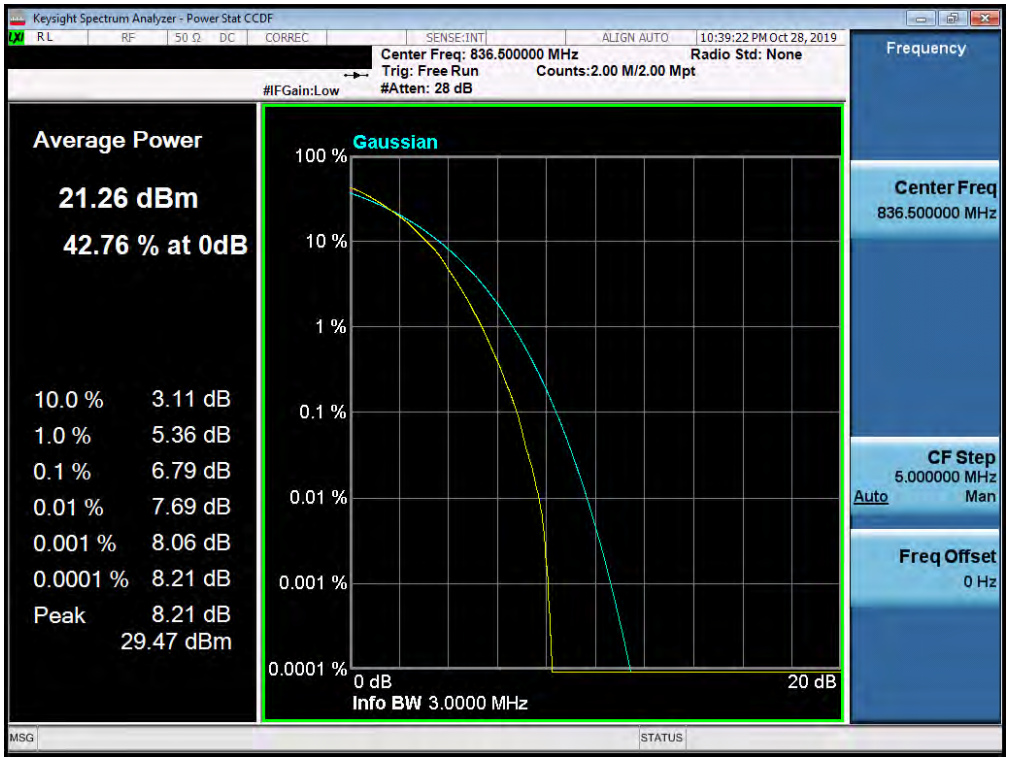
Plot 7-172. PAR Plot (Band 5 - 1.4MHz 64-QAM - Full RB Configuration)



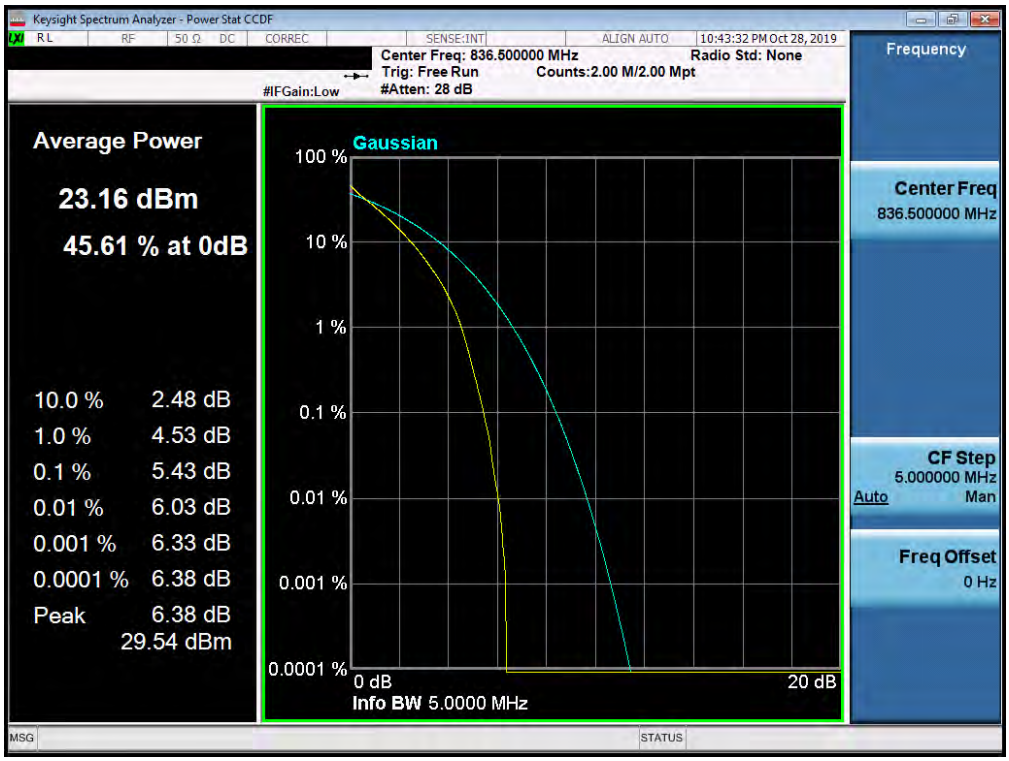
Plot 7-173. PAR Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)



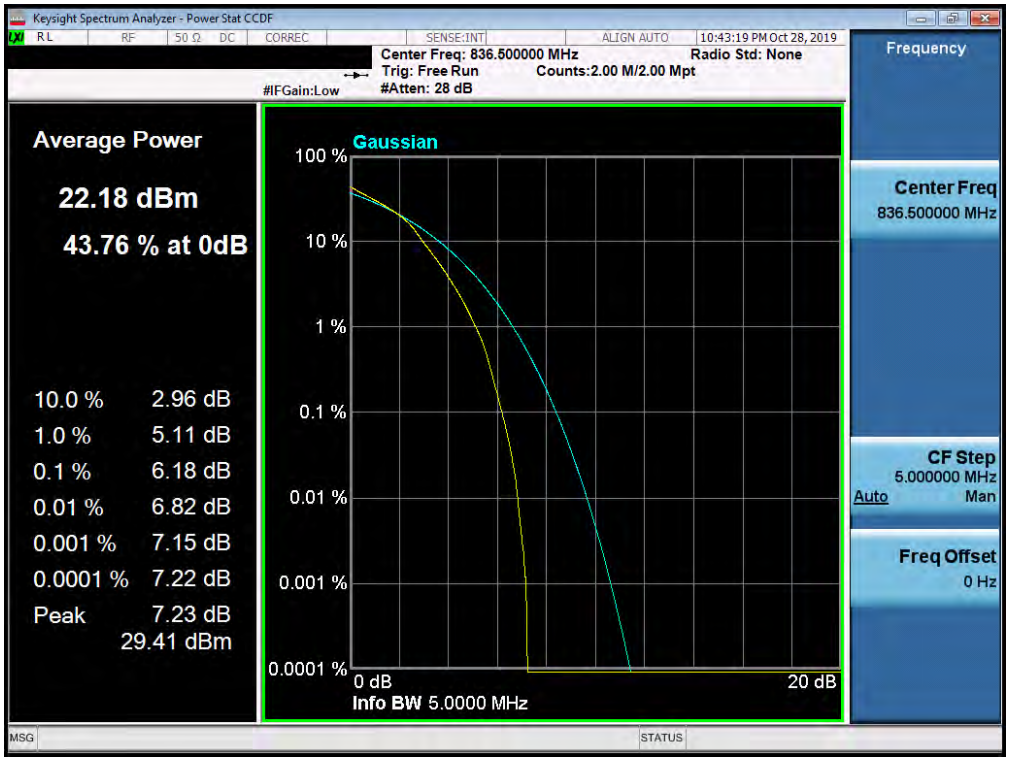
Plot 7-174. PAR Plot (Band 5 - 3.0MHz 16-QAM - Full RB Configuration)



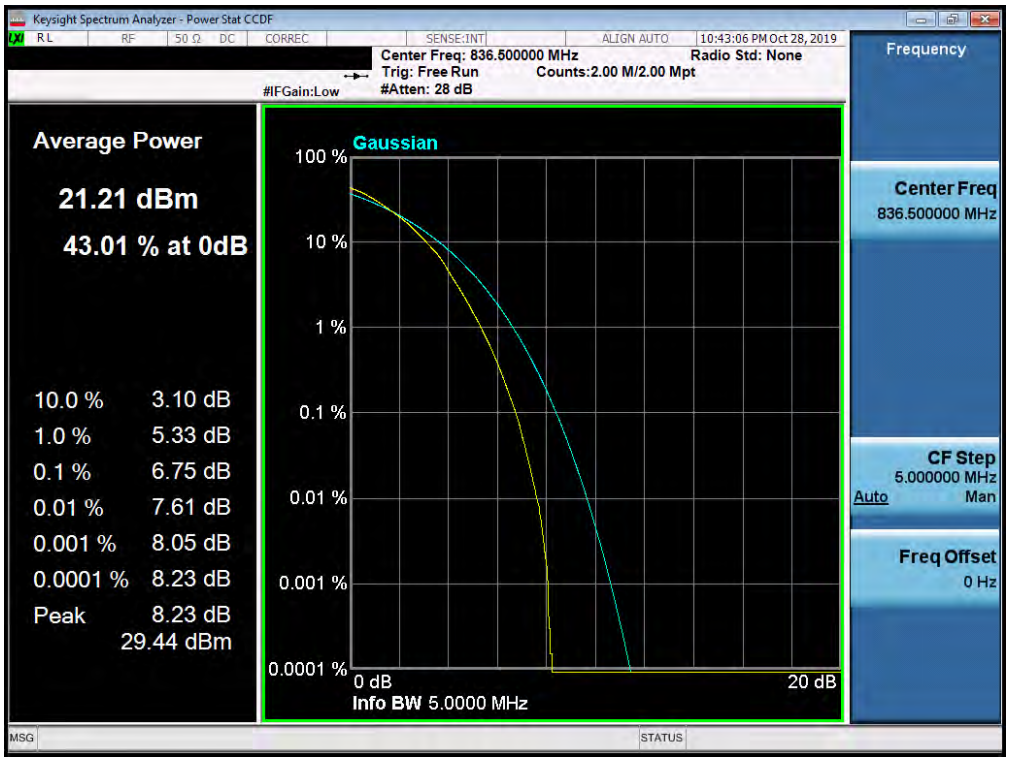
Plot 7-175. PAR Plot (Band 5 - 3.0MHz 64-QAM - Full RB Configuration)



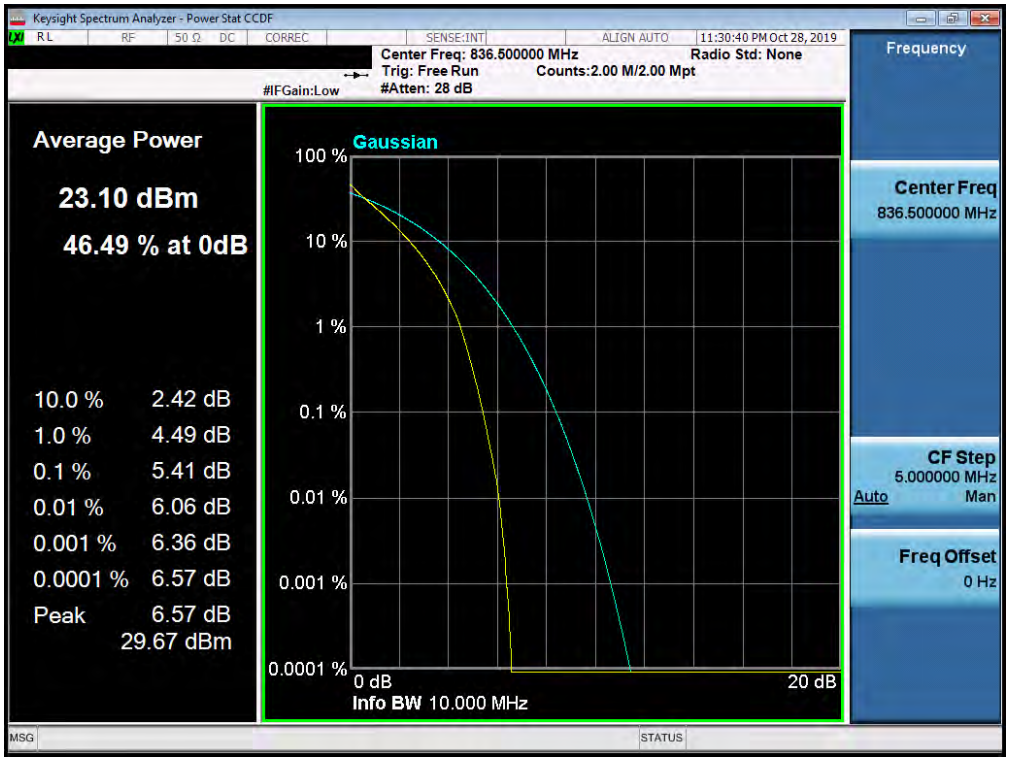
Plot 7-176. PAR Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)



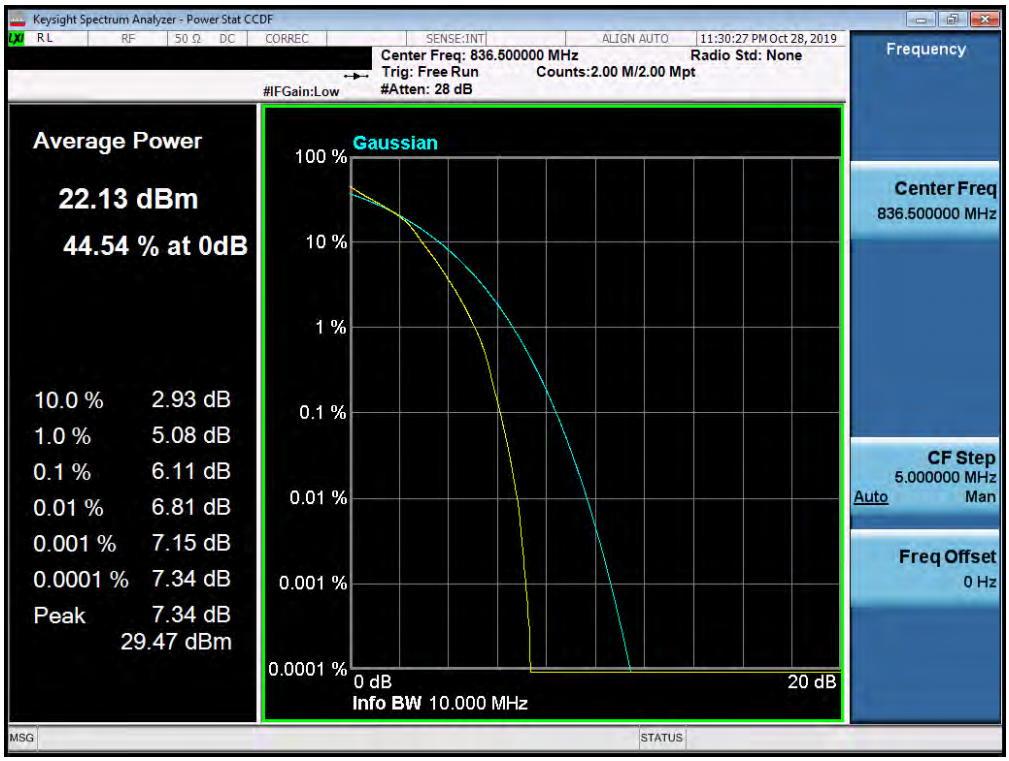
Plot 7-177. PAR Plot (Band 5 - 5.0MHz 16-QAM - Full RB Configuration)



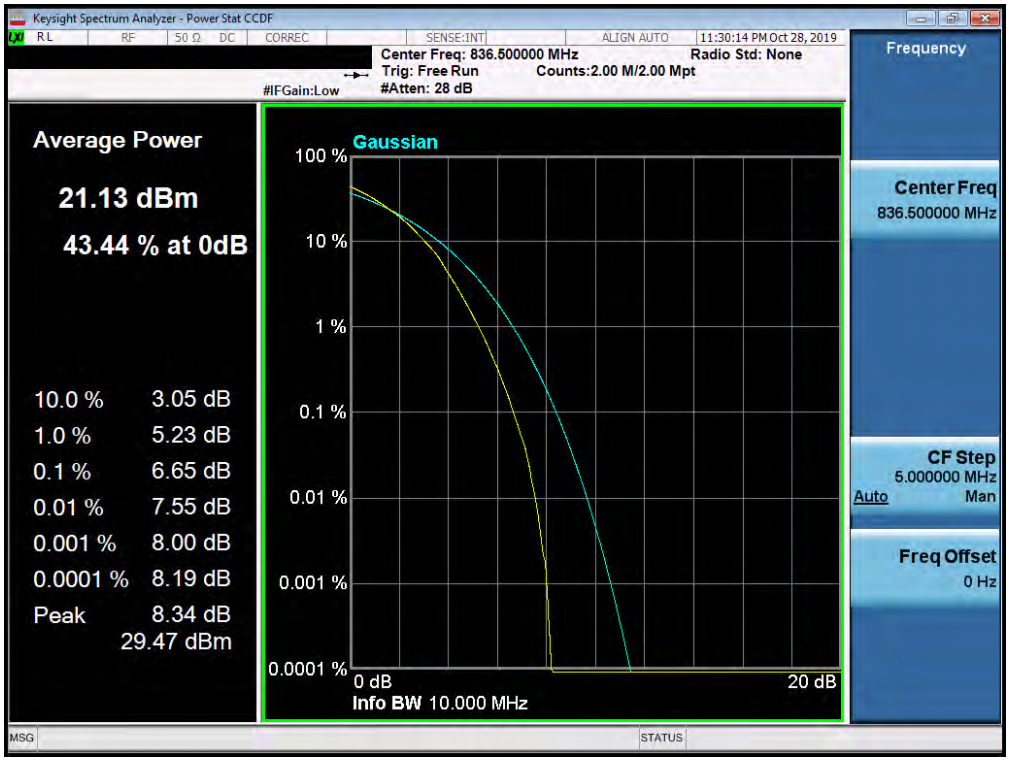
Plot 7-178. PAR Plot (Band 5 - 5.0MHz 64-QAM - Full RB Configuration)



Plot 7-179. PAR Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

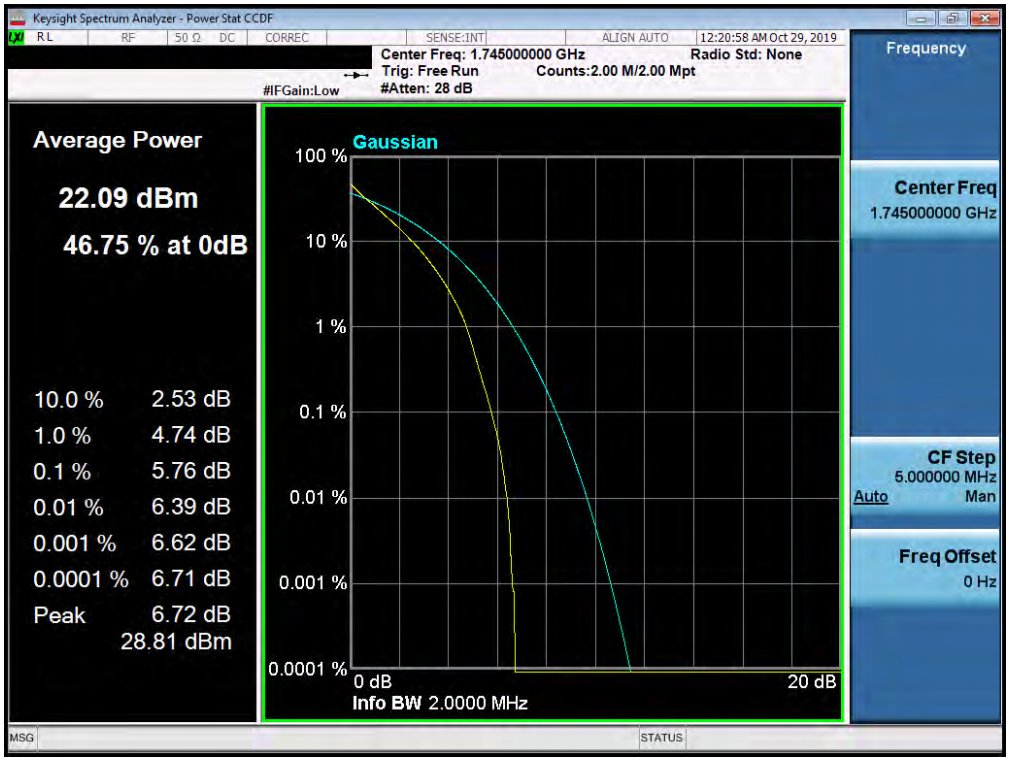


Plot 7-180. PAR Plot (Band 5 - 10.0MHz 16-QAM - Full RB Configuration)

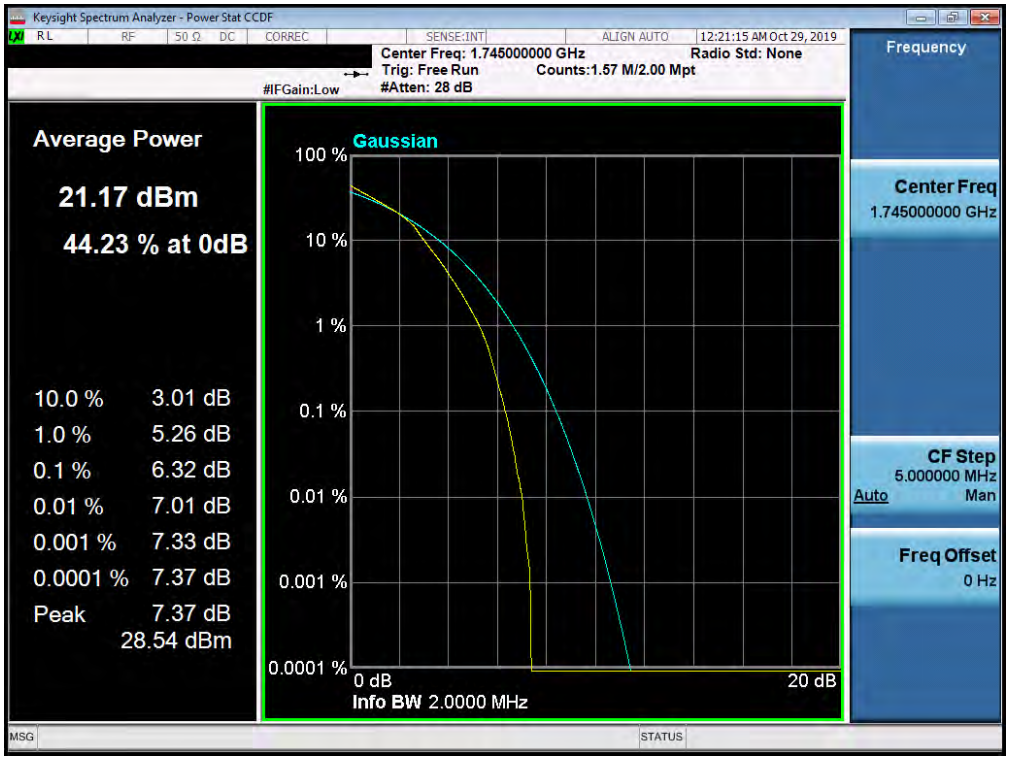


Plot 7-181. PAR Plot (Band 5 - 10.0MHz 64-QAM - Full RB Configuration)

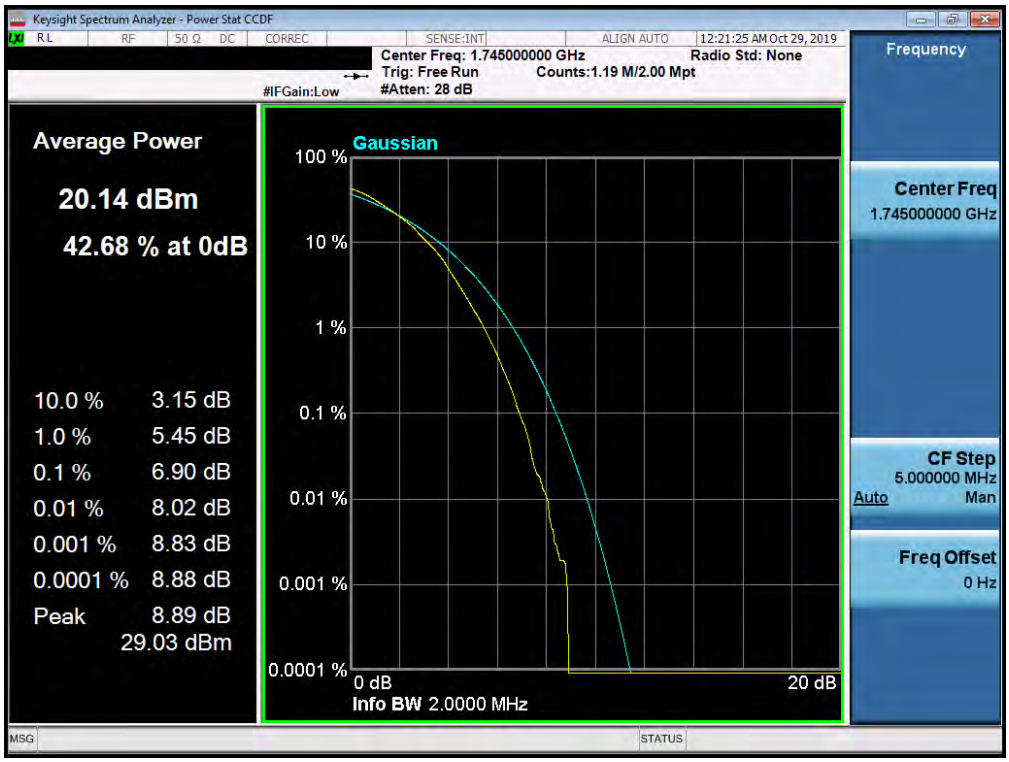
Band 4



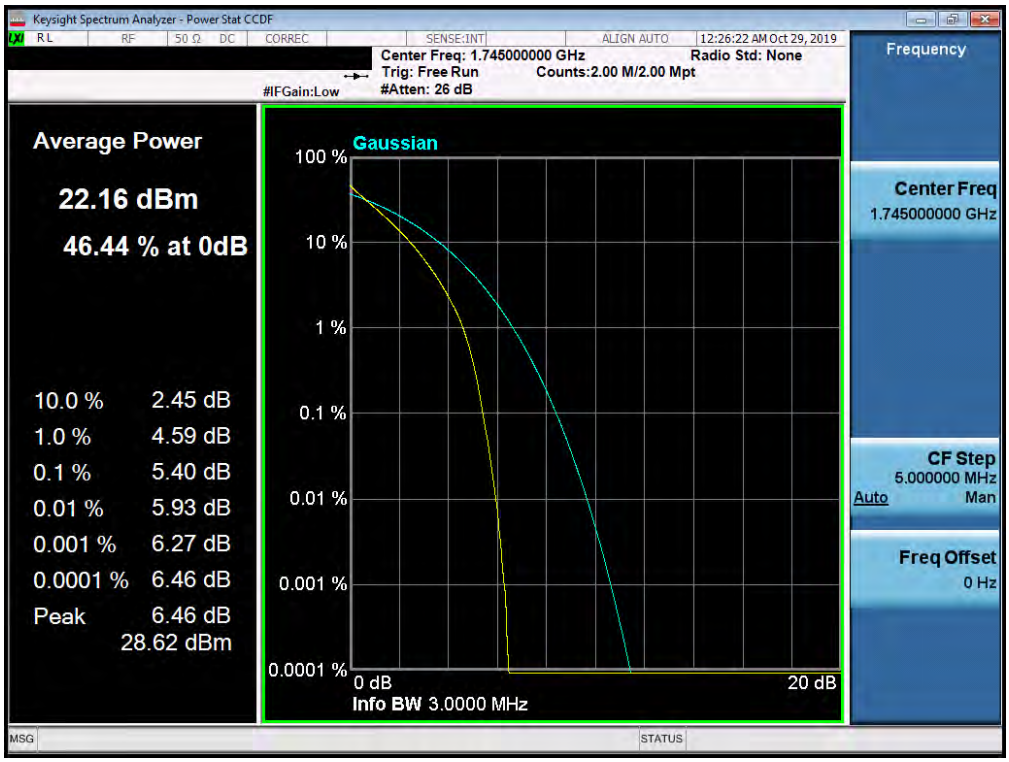
Plot 7-182. PAR Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



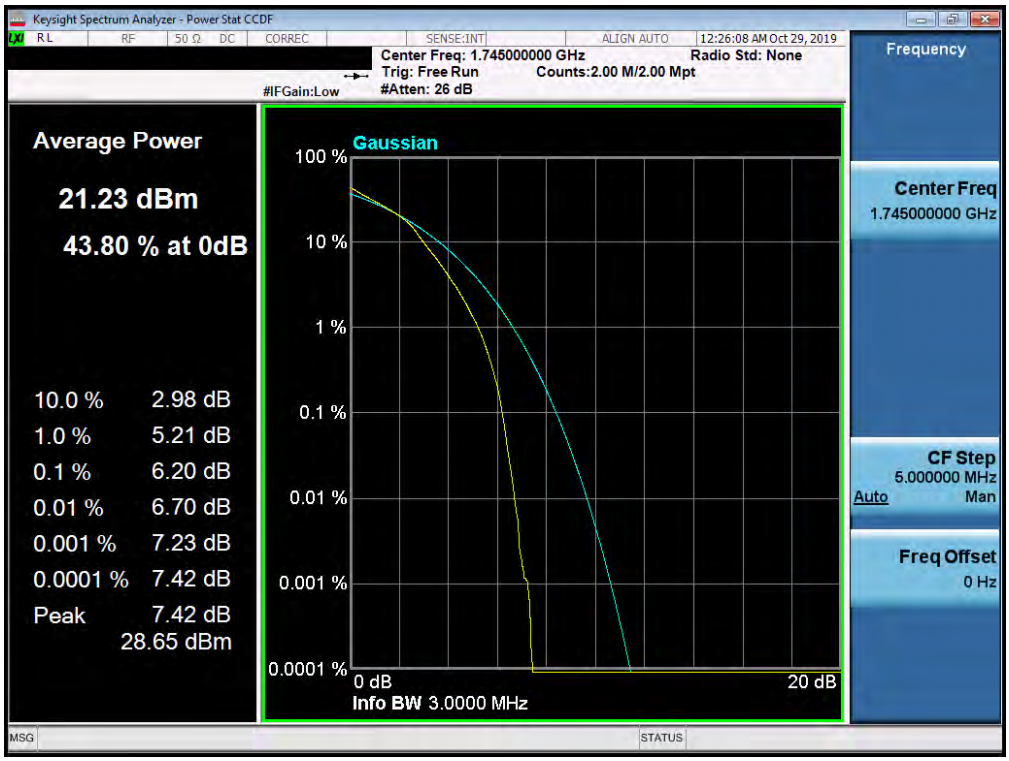
Plot 7-183. PAR Plot (Band 4 - 1.4MHz 16-QAM - Full RB Configuration)



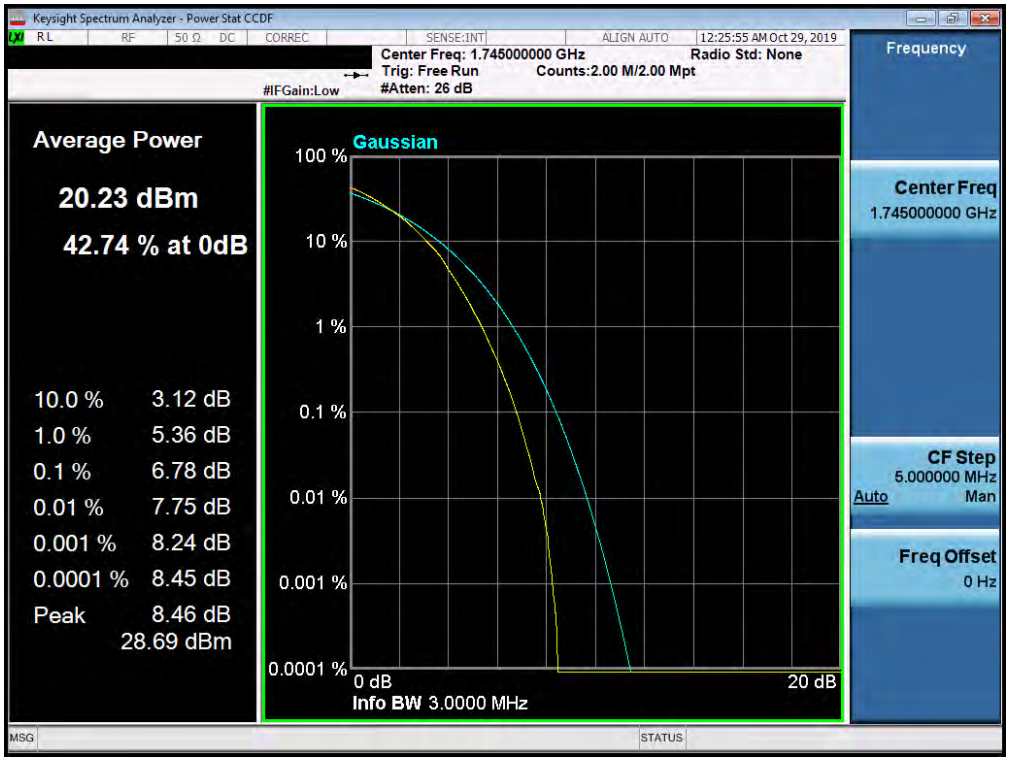
Plot 7-184. PAR Plot (Band 4 - 1.4MHz 64-QAM - Full RB Configuration)



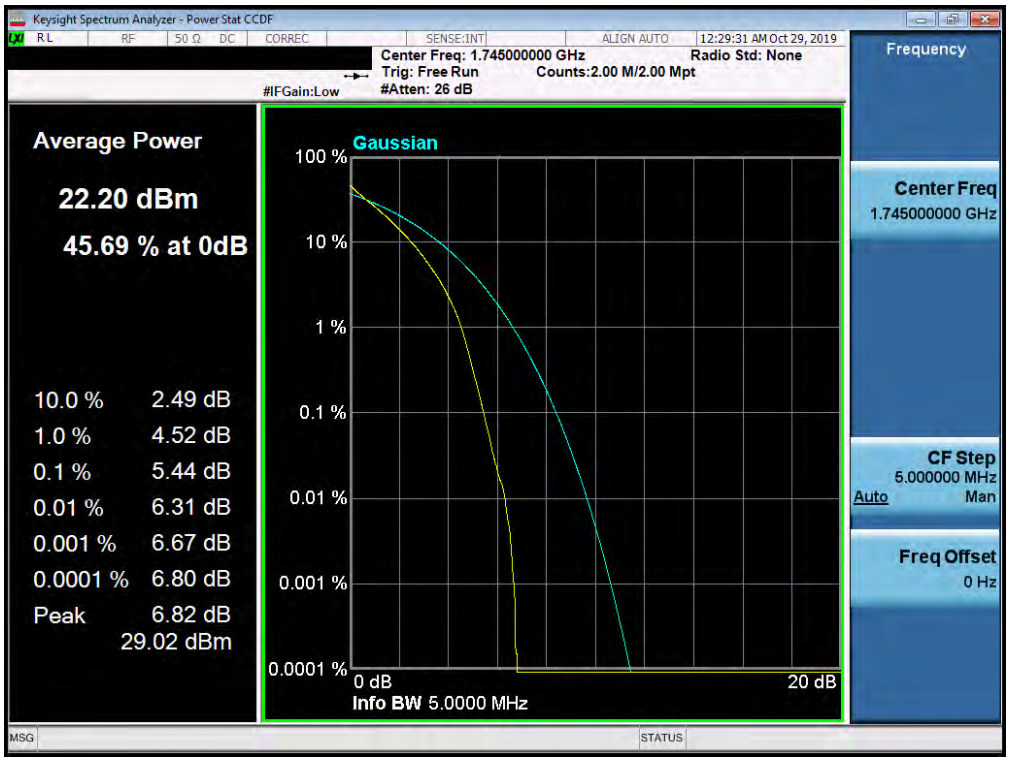
Plot 7-185. PAR Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



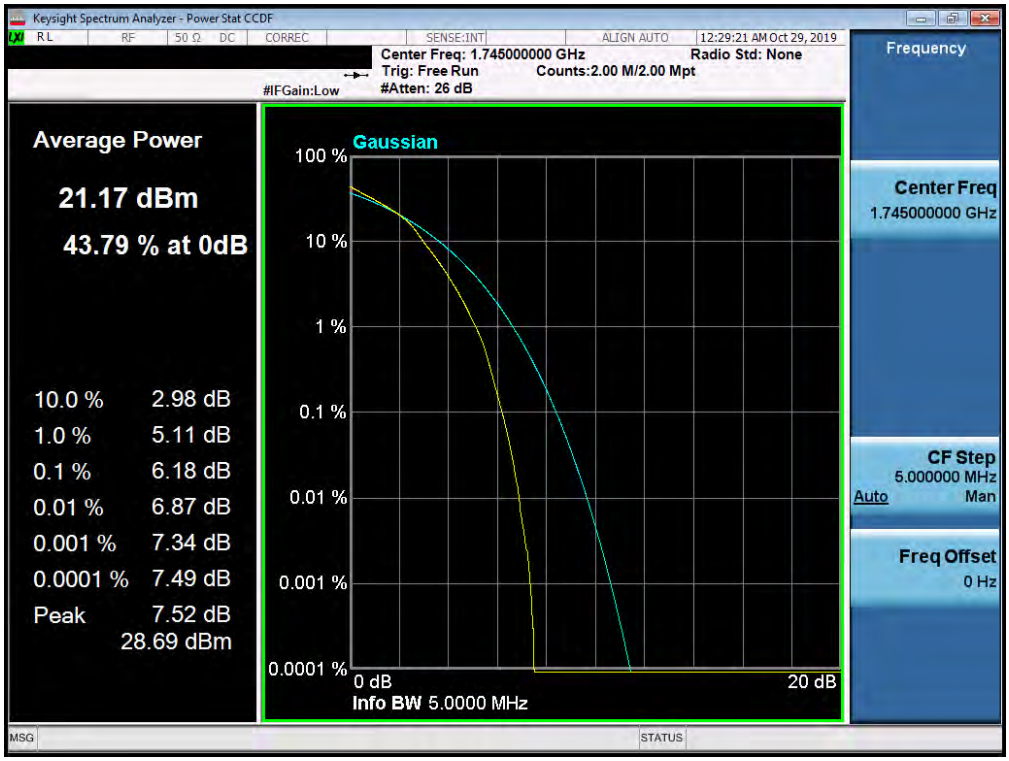
Plot 7-186. PAR Plot (Band 4 - 3.0MHz 16-QAM - Full RB Configuration)



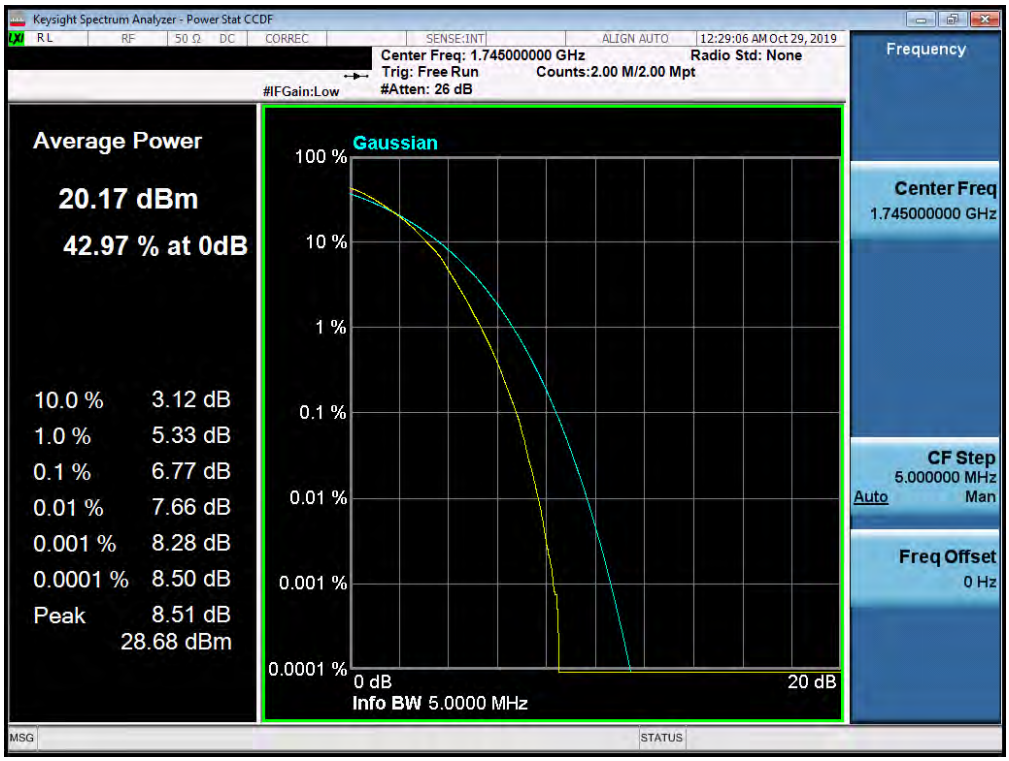
Plot 7-187. PAR Plot (Band 4 - 3.0MHz 64-QAM - Full RB Configuration)



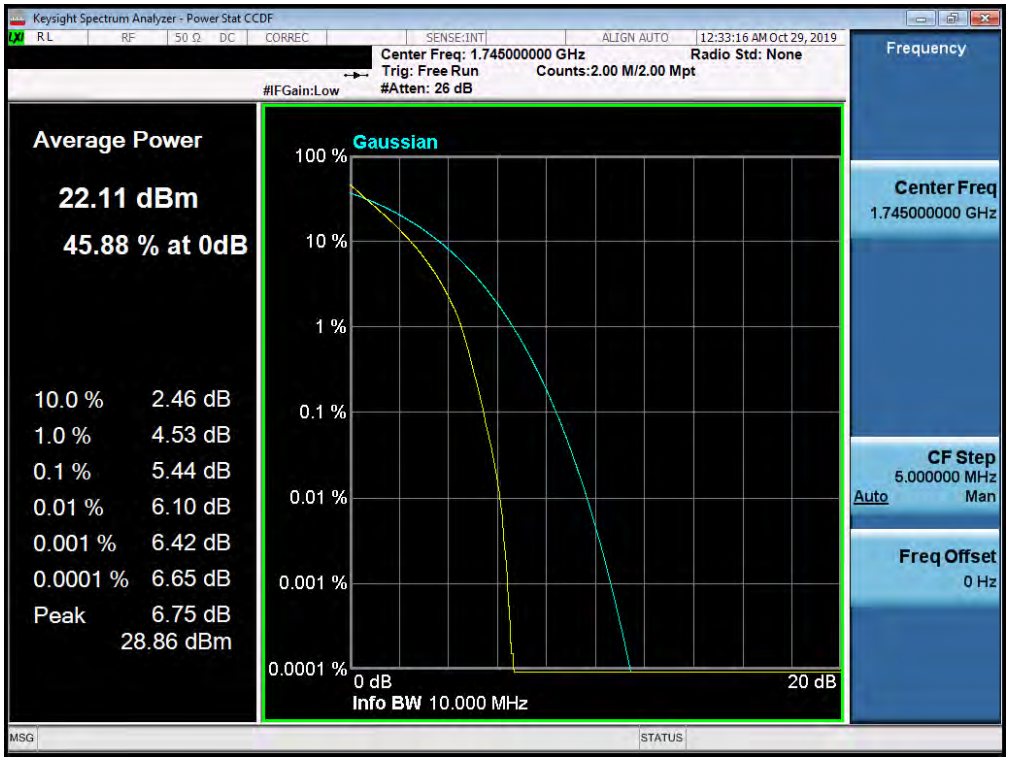
Plot 7-188. PAR Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)



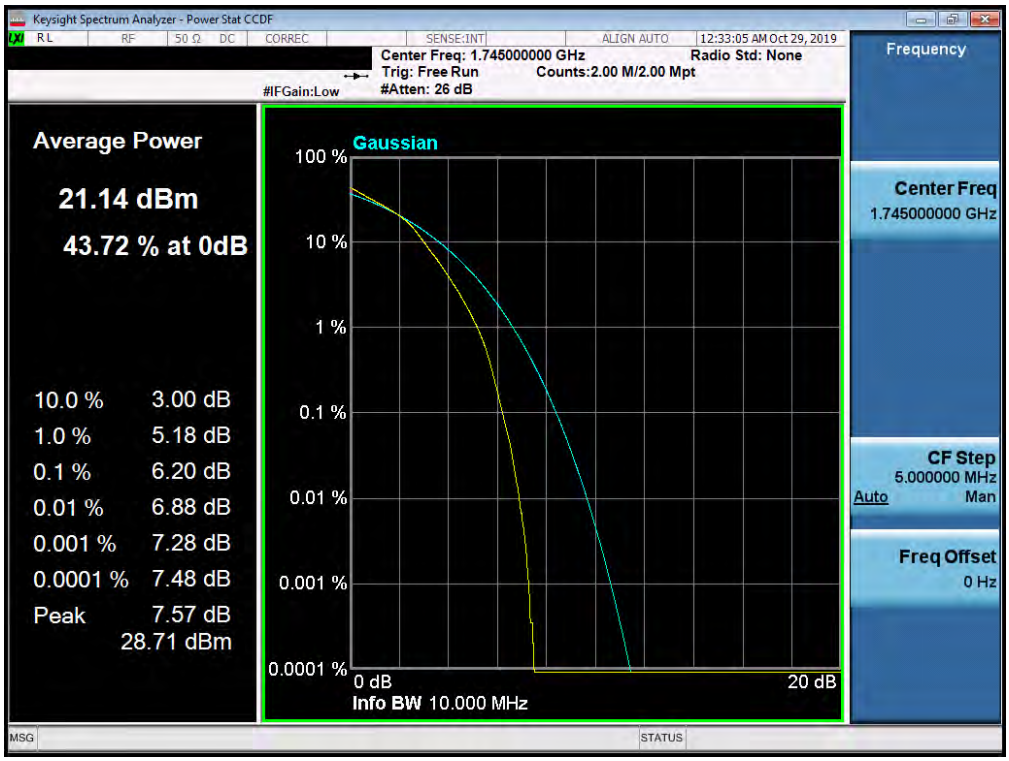
Plot 7-189. PAR Plot (Band 4 - 5.0MHz 16-QAM - Full RB Configuration)



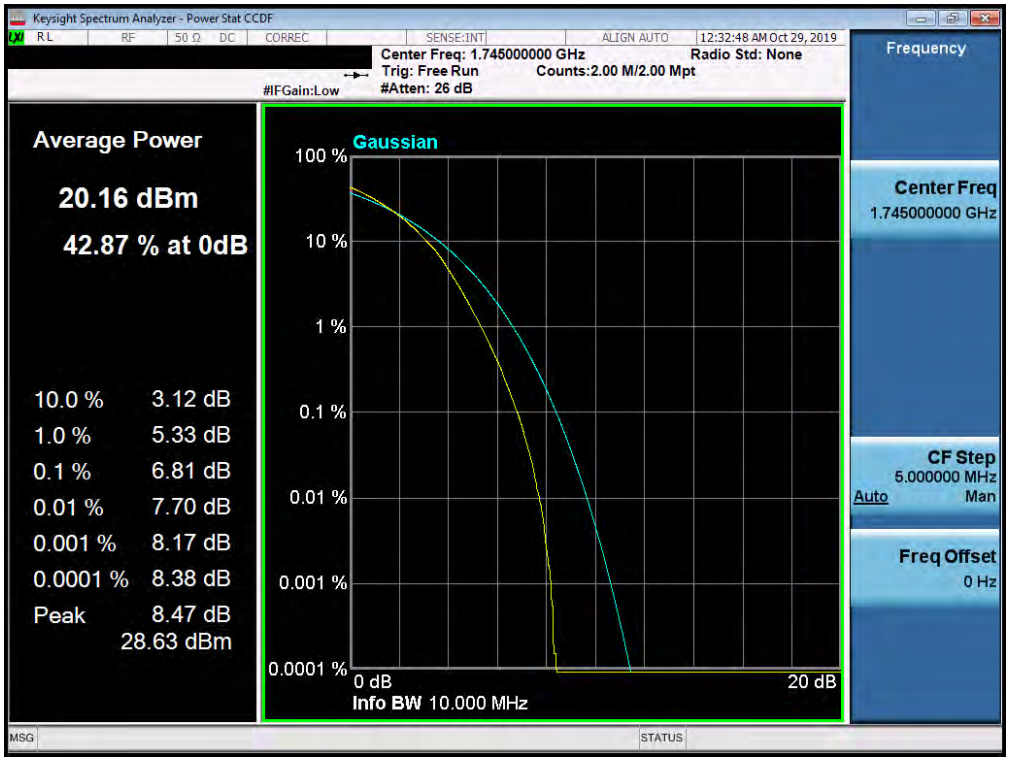
Plot 7-190. PAR Plot (Band 4 - 5.0MHz 64-QAM - Full RB Configuration)



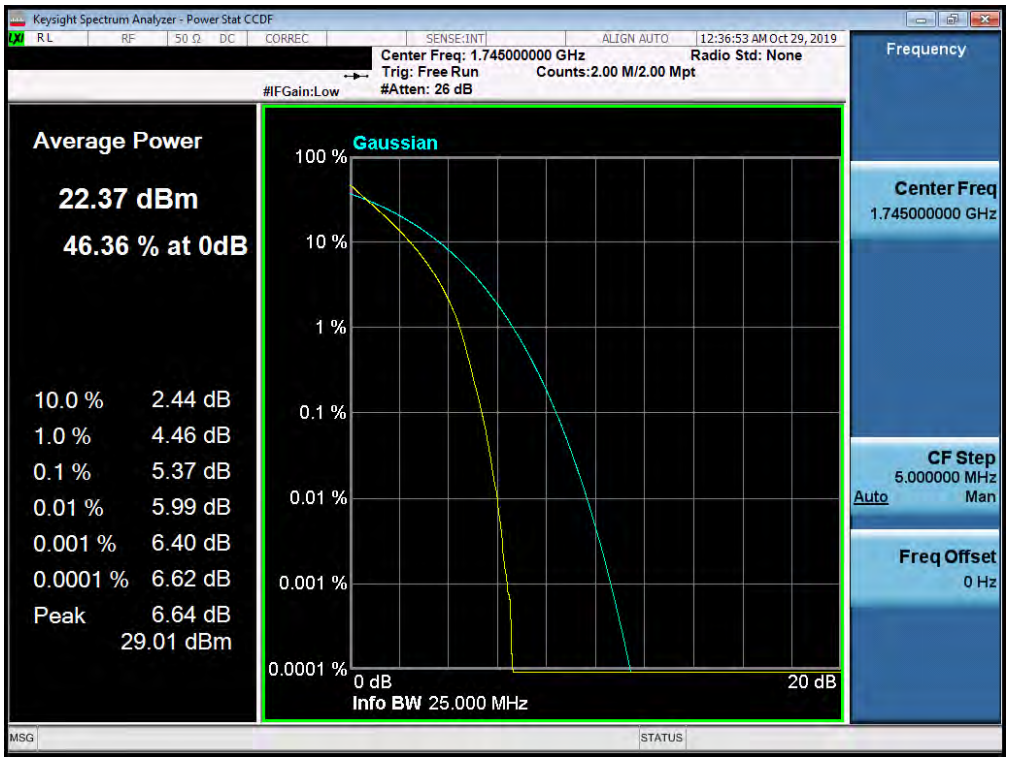
Plot 7-191. PAR Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



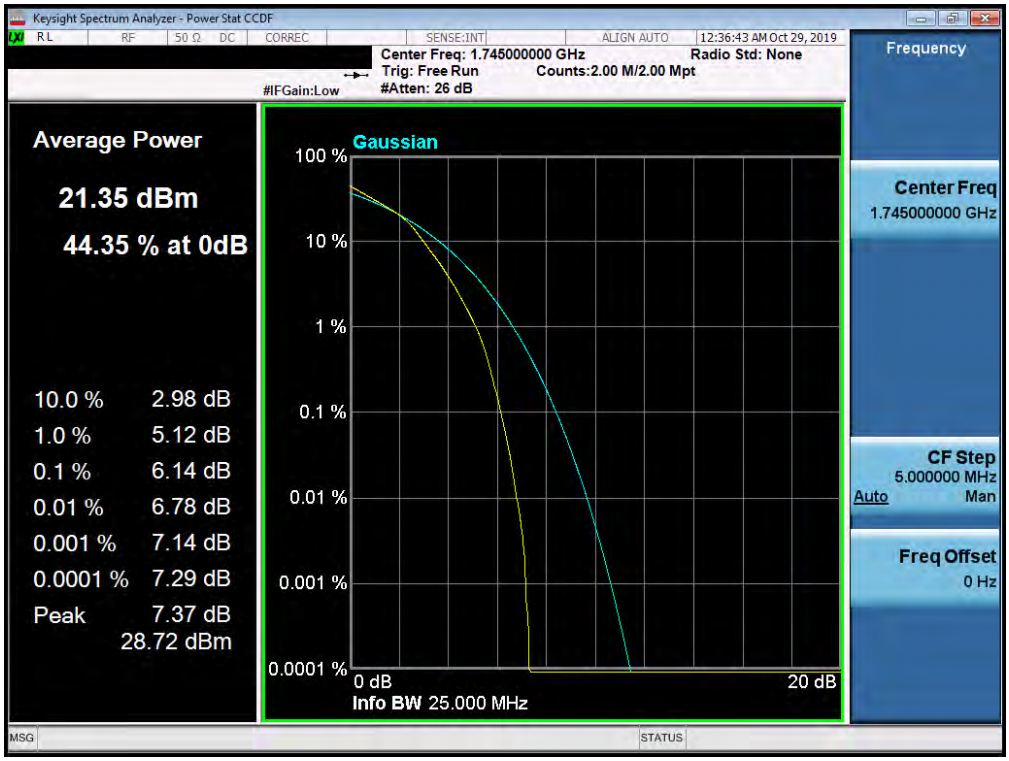
Plot 7-192. PAR Plot (Band 4 - 10.0MHz 16-QAM - Full RB Configuration)



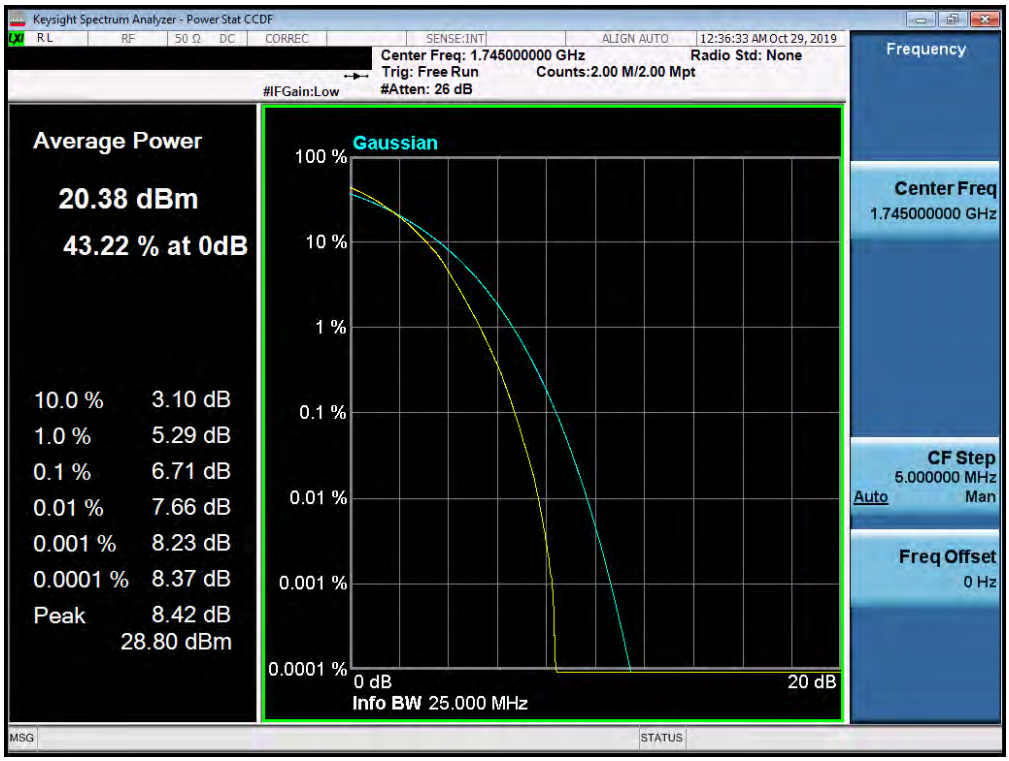
Plot 7-193. PAR Plot (Band 4 - 10.0MHz 64-QAM - Full RB Configuration)



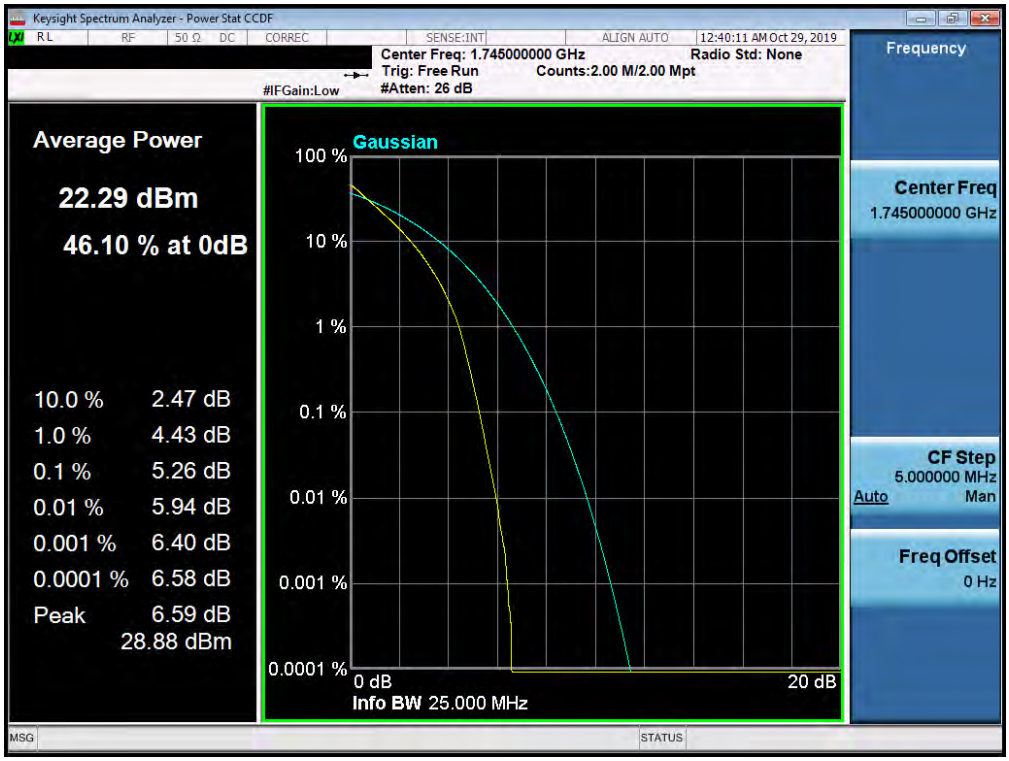
Plot 7-194. PAR Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



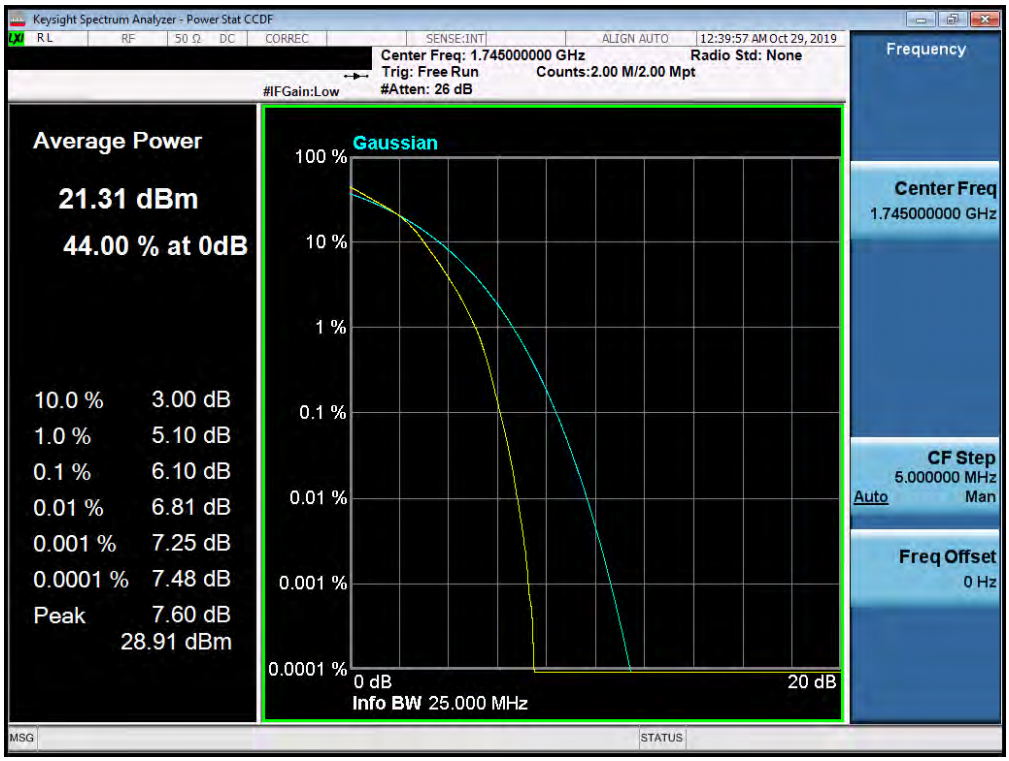
Plot 7-195. PAR Plot (Band 4 - 15.0MHz 16-QAM - Full RB Configuration)



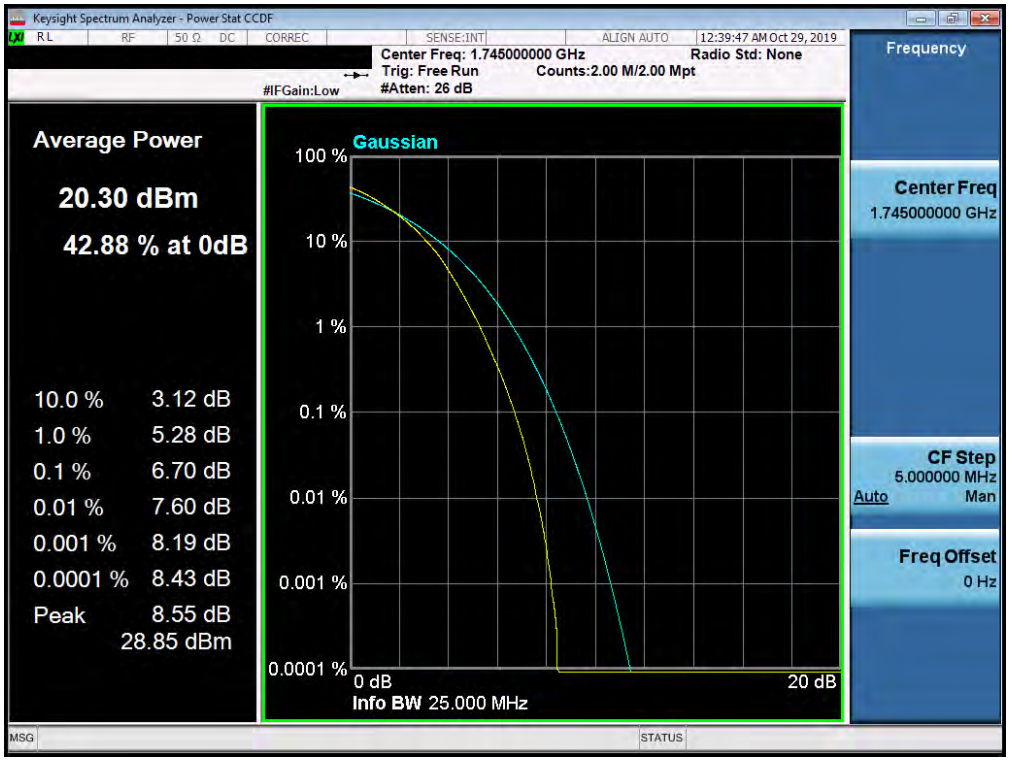
Plot 7-196. PAR Plot (Band 4 - 15.0MHz 64-QAM - Full RB Configuration)



Plot 7-197. PAR Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

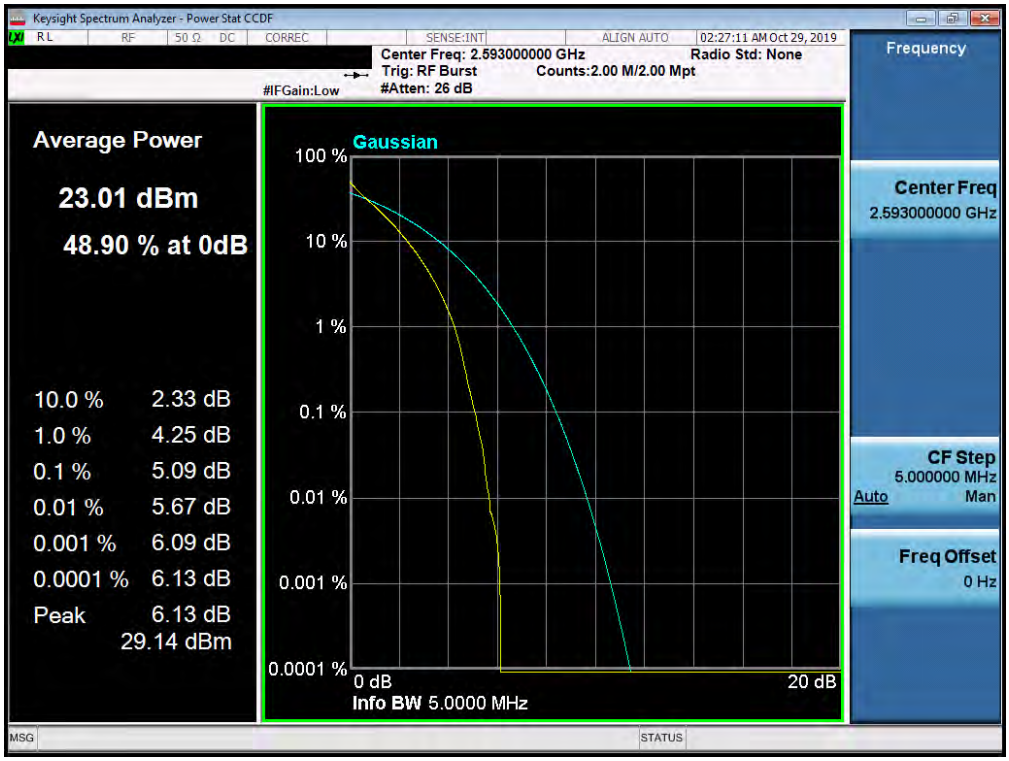


Plot 7-198. PAR Plot (Band 4 - 20.0MHz 16-QAM - Full RB Configuration)

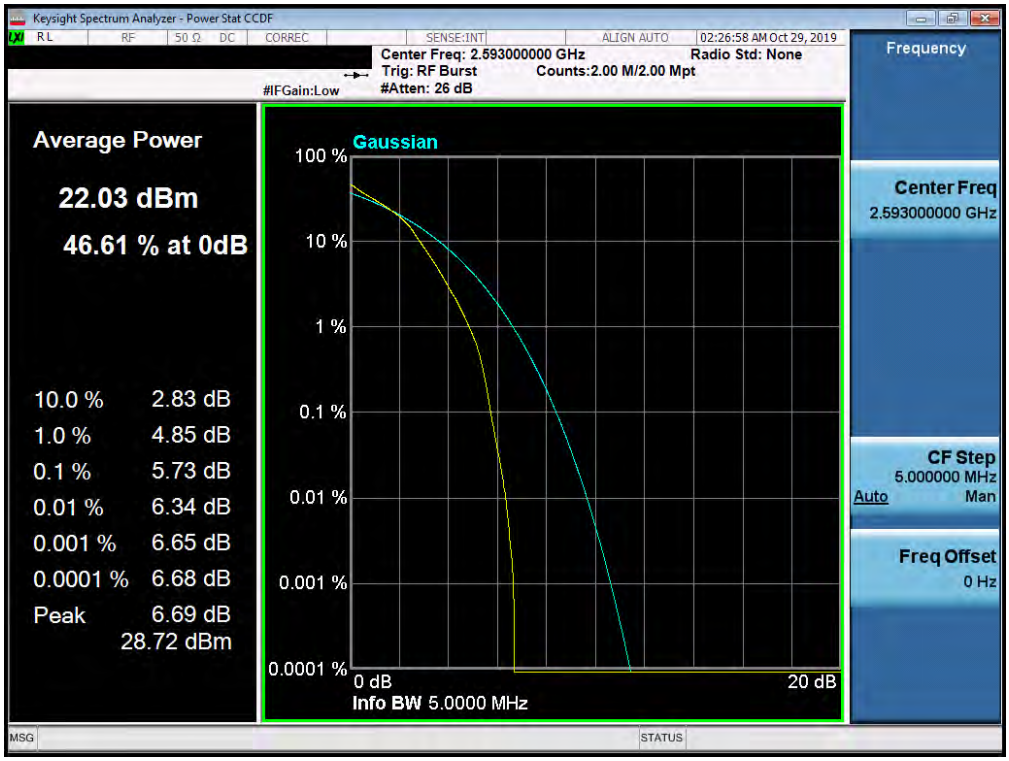


Plot 7-199. PAR Plot (Band 4 - 20.0MHz 64-QAM - Full RB Configuration)

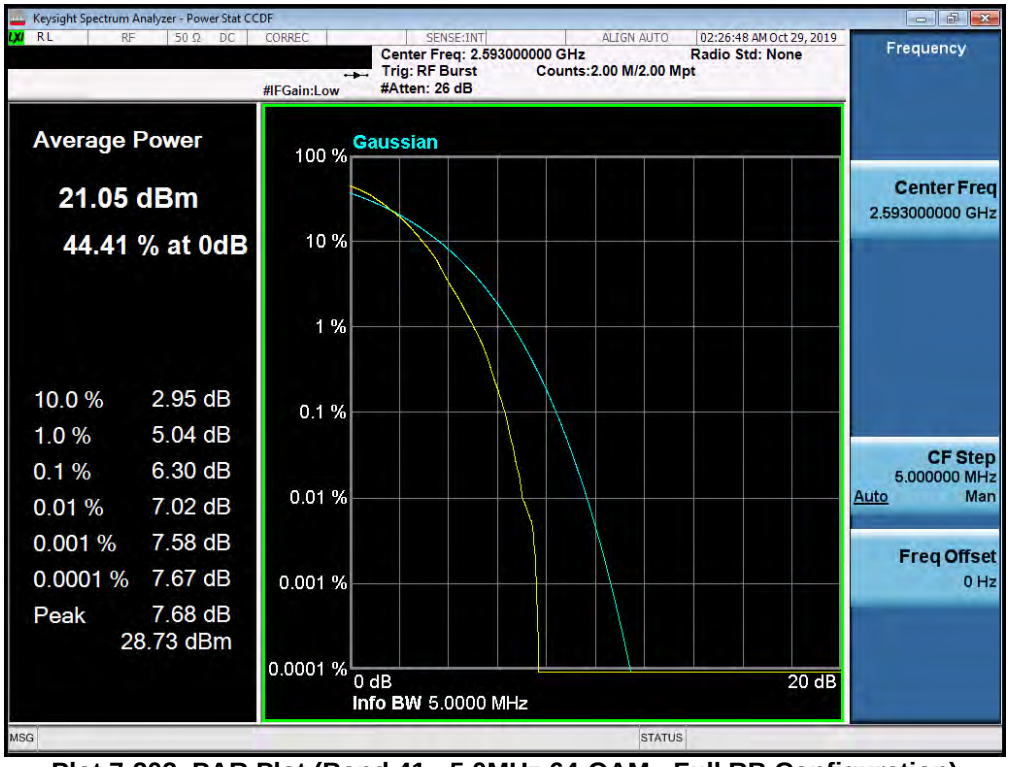
Band 41



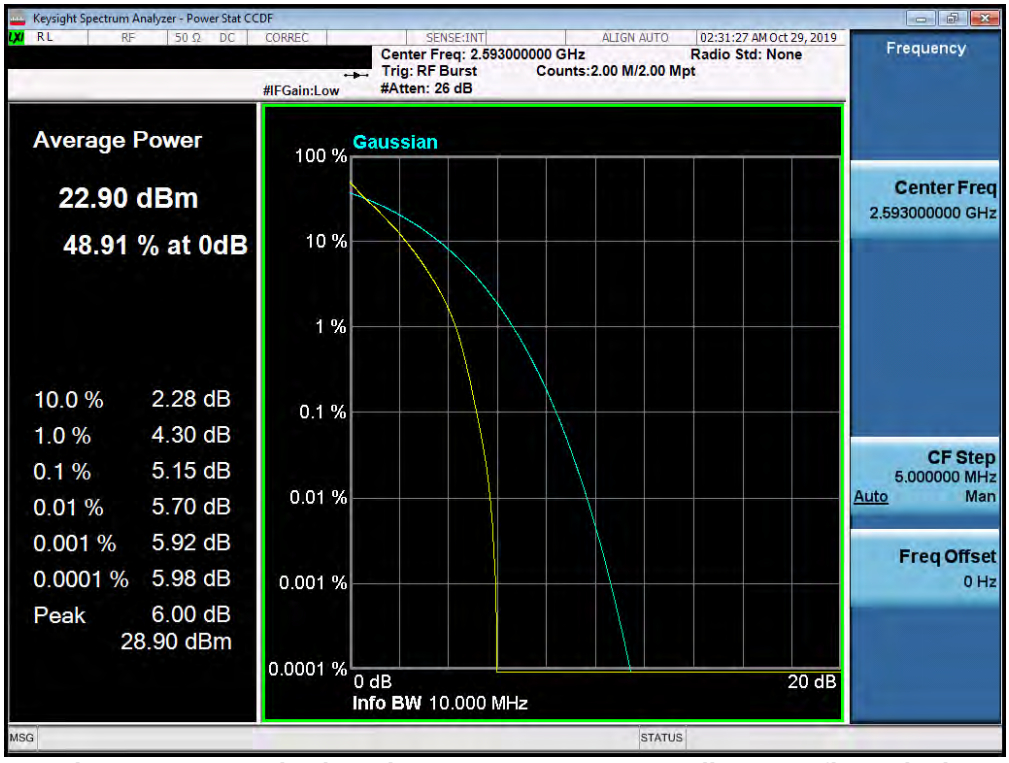
Plot 7-200. PAR Plot (Band 41 - 5.0MHz QPSK - Full RB Configuration)



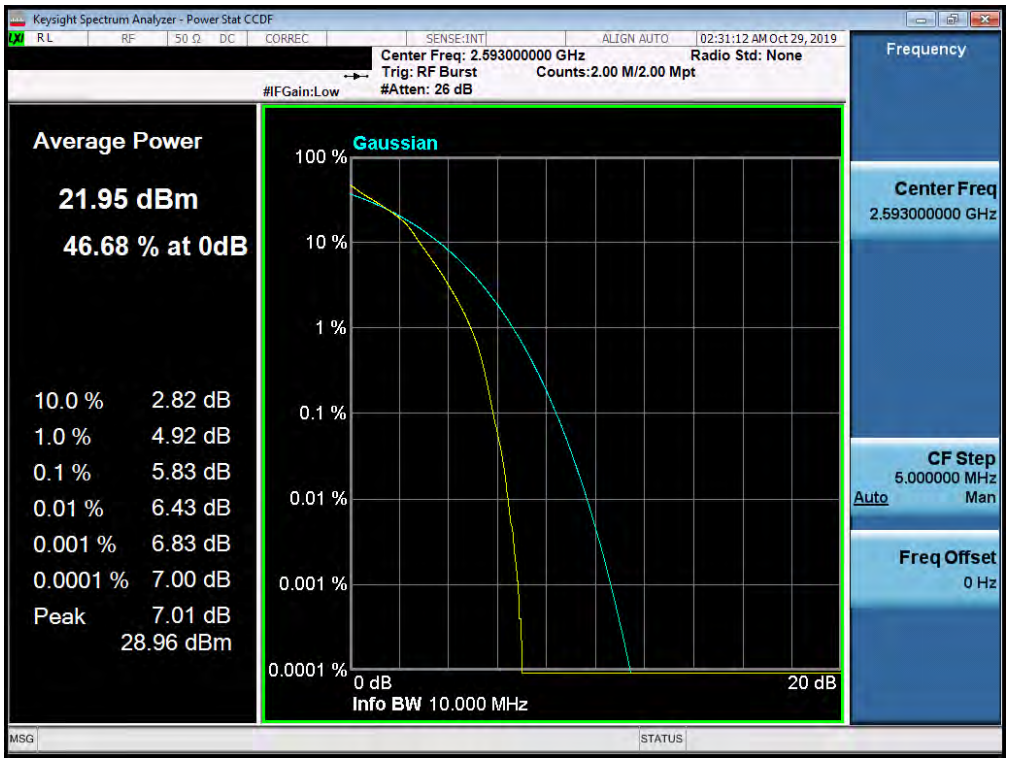
Plot 7-201. PAR Plot (Band 41 - 5.0MHz 16QAM - Full RB Configuration)



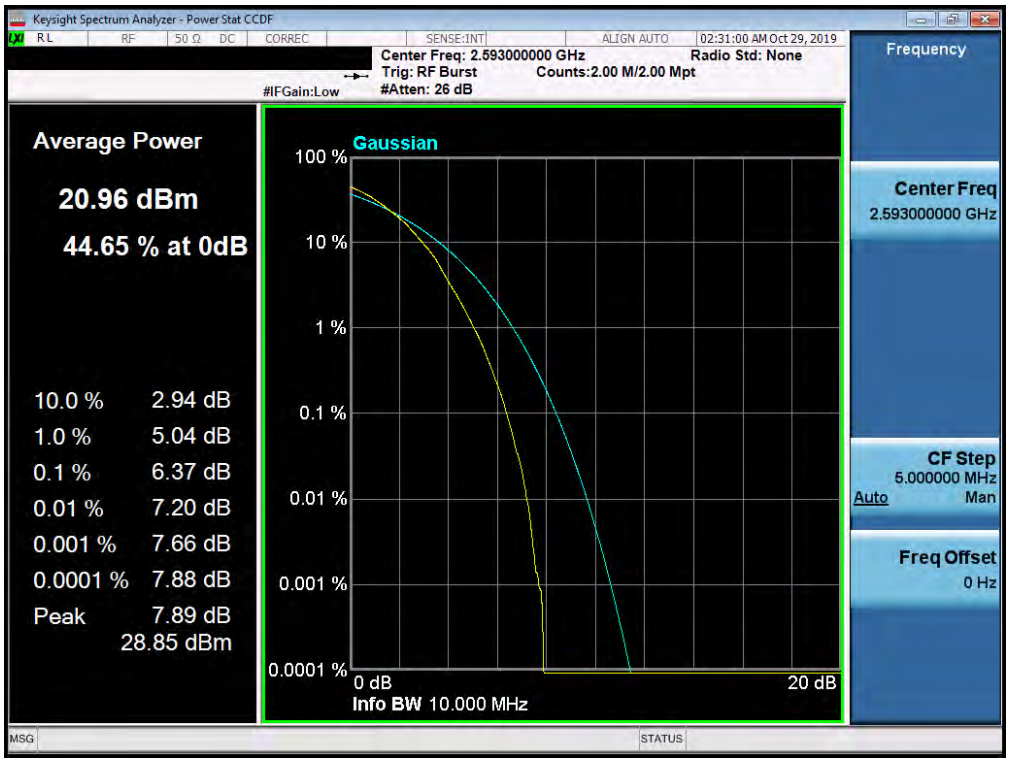
Plot 7-202. PAR Plot (Band 41 - 5.0MHz 64-QAM - Full RB Configuration)



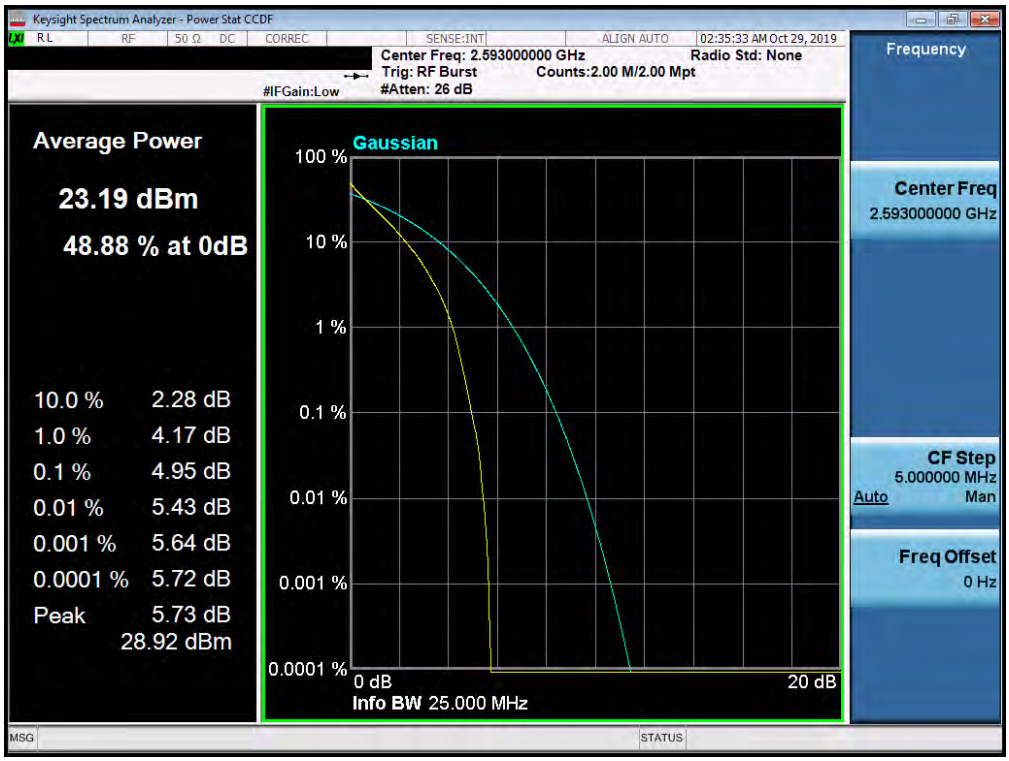
Plot 7-203. PAR Plot (Band 41 - 10.0MHz QPSK - Full RB Configuration)



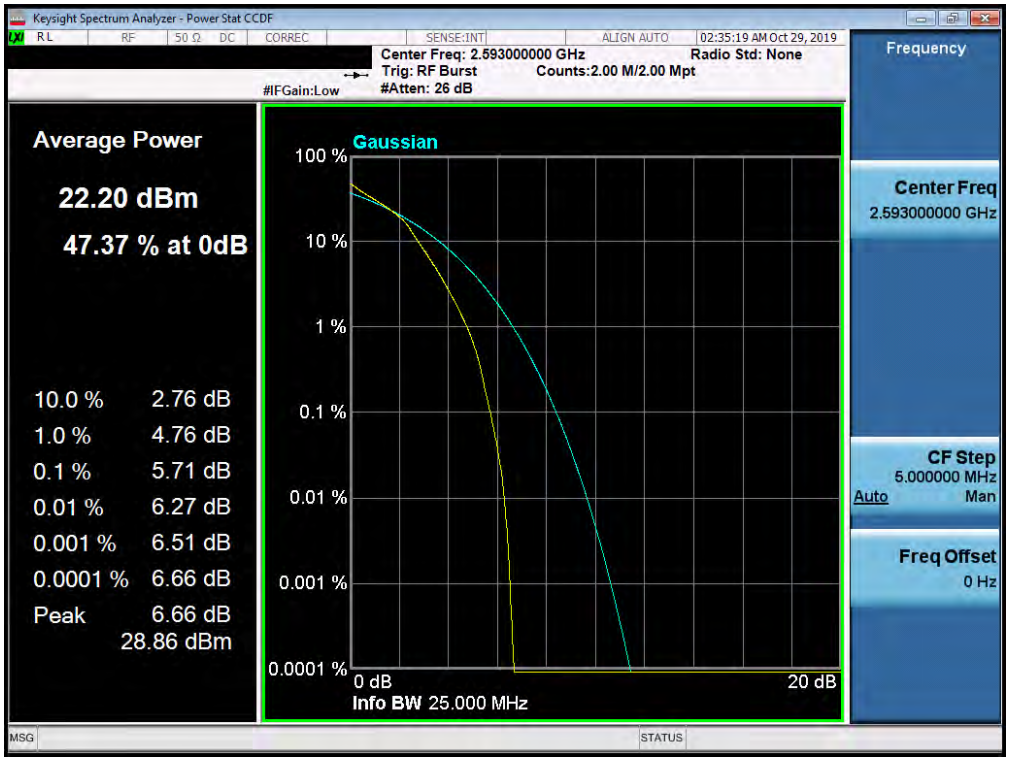
Plot 7-204. PAR Plot (Band 41 - 10.0MHz 16-QAM - Full RB Configuration)



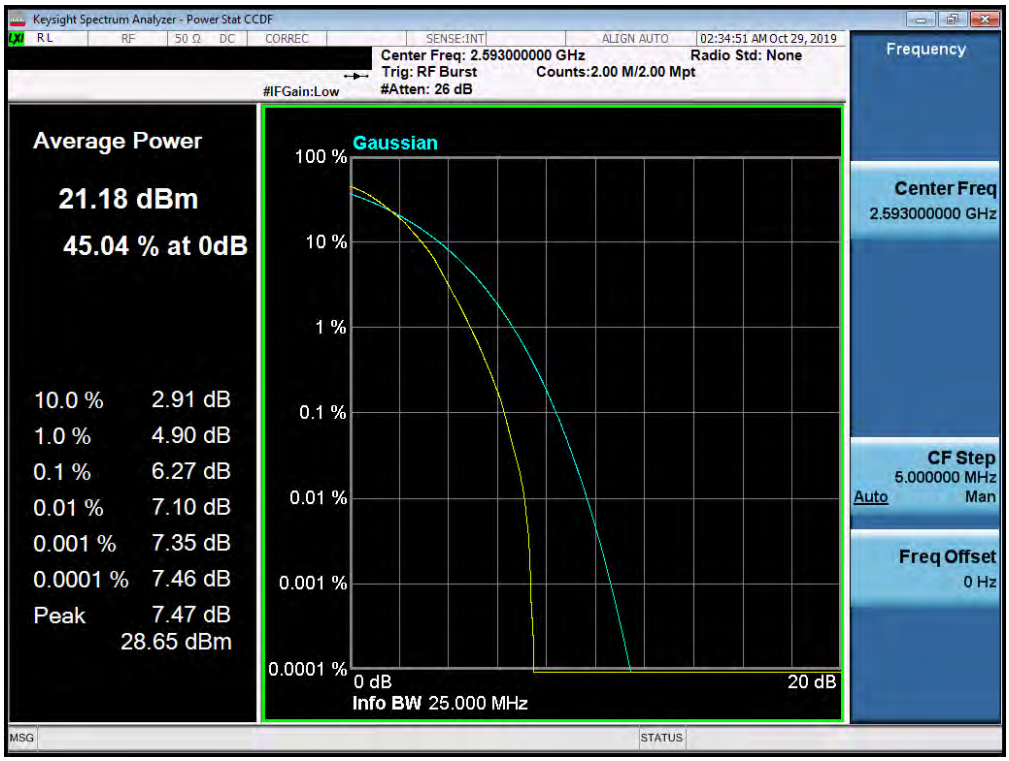
Plot 7-205. PAR Plot (Band 41 - 10.0MHz 64-QAM - Full RB Configuration)



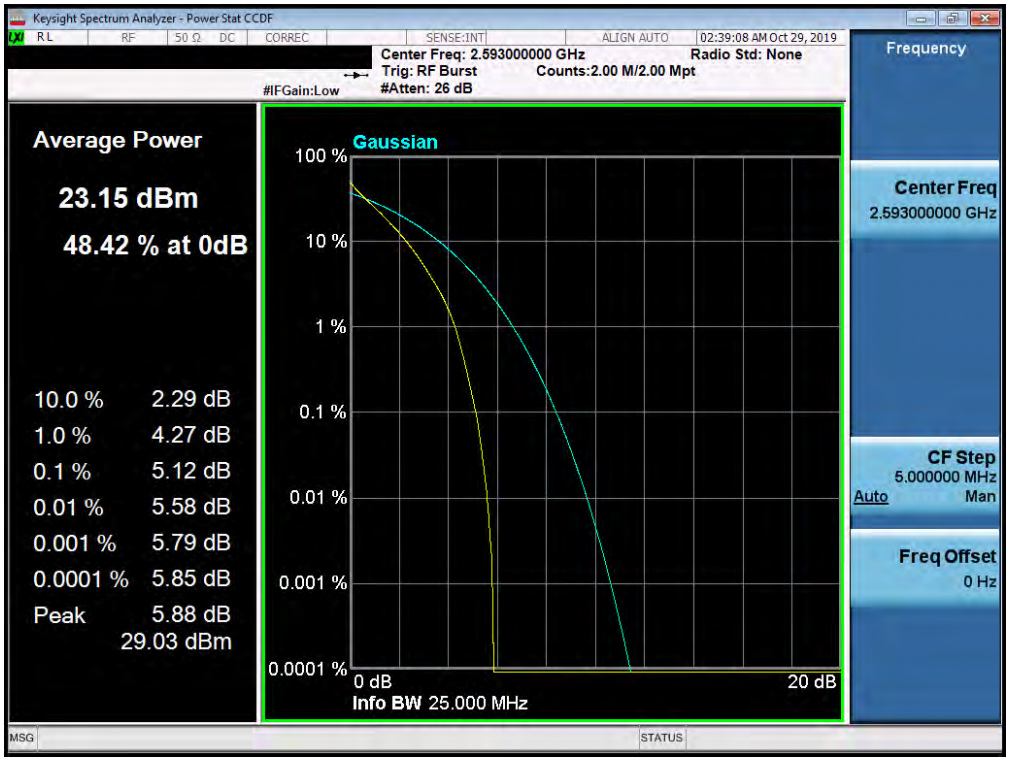
Plot 7-206. PAR Plot (Band 41 - 15.0MHz QPSK - Full RB Configuration)



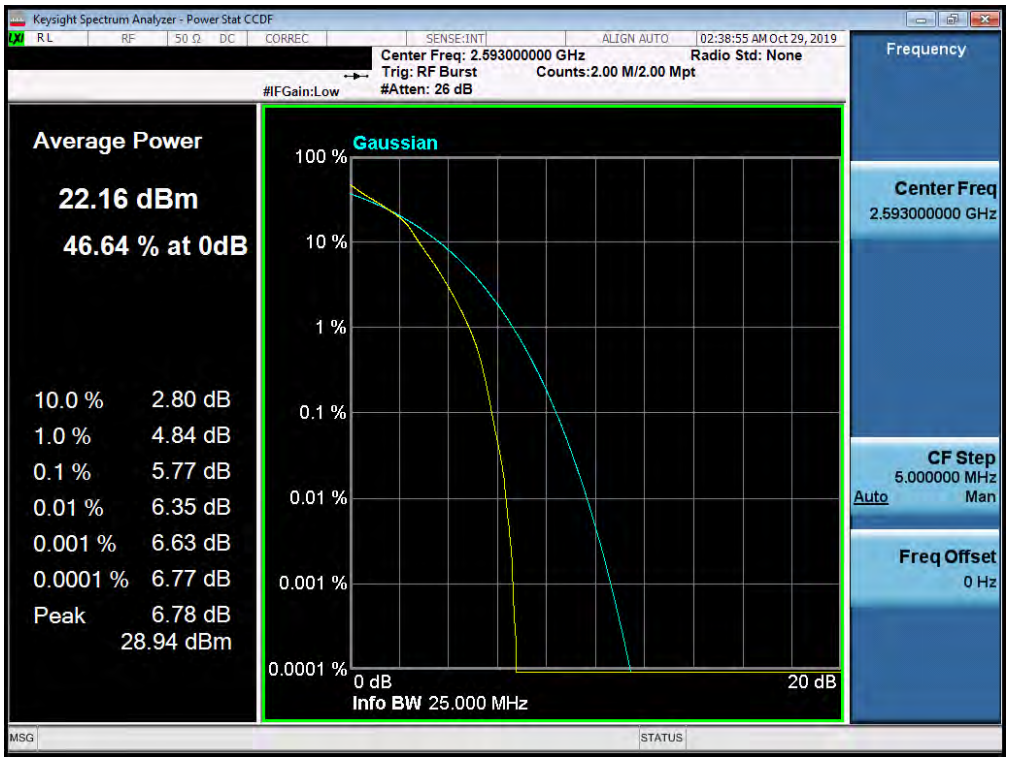
Plot 7-207. PAR Plot (Band 41 - 15.0MHz 16-QAM - Full RB Configuration)



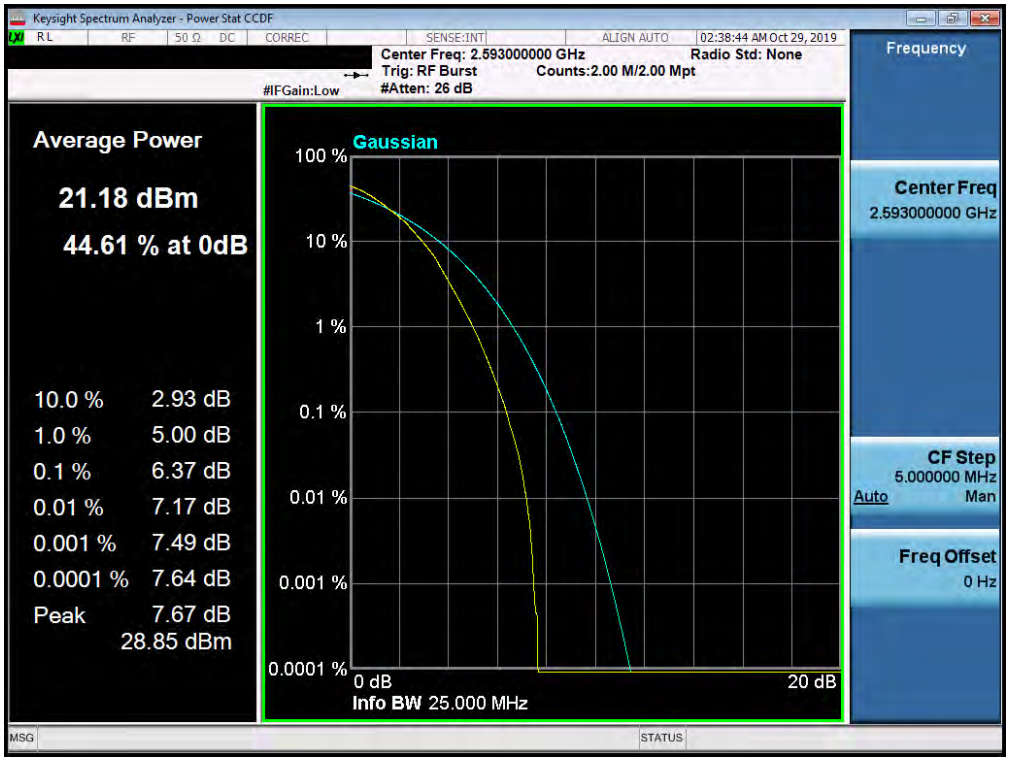
Plot 7-208. PAR Plot (Band 41 - 15.0MHz 64-QAM - Full RB Configuration)



Plot 7-209. PAR Plot (Band 41 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-210. PAR Plot (Band 41 - 20.0MHz 16-QAM - Full RB Configuration)



Plot 7-211. PAR Plot (Band 41 - 20.0MHz 64-QAM - Full RB Configuration)

7.6 Uplink Carrier Aggregation

§27.53(m)

Test Overview

The EUT is set up to transmit two contiguous LTE channels. The power level of both carriers and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. 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 its maximum duty cycle, 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.

For Band 38/41, the minimum permissible attenuation level of any spurious emission is 55 + 10 $log_{10}(P_{[Watts]})$.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

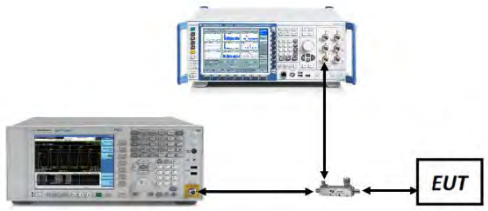


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

1. Uplink carrier aggregation is only supported in this EUT while operating in Power Class 3.

2. Conducted power and spurious emissions 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. The worst case (highest) powers were found while operating with QPSK modulation, as shown in Table 7-503 and 7-504 below, with both carriers set to transmit using 1RB.

3. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, 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.

Power State	PCC							SCC							Power
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	ULCA Tx.Power (dBm)
Max	LTE B41	20	39750	2506	QPSK	1	99	LTE B41	20	39948	2525.8	QPSK	1	0	23.90
Max	LTE B41	20	40620	2593	QPSK	1	99	LTE B41	20	40818	2612.8	QPSK	1	0	24.60
Max	LTE B41	20	41490	2680	QPSK	1	0	LTE B41	20	41292	2660.2	QPSK	1	99	25.12

Table 7-3. Conducted Powers (B41 – Left Carrier: RB Size 1 Offset Max Right Carrier: RB Size 1 Offset 0)

Power State	PCC							SCC							Power
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	ULCA Tx.Power (dBm)
Max	LTE B41	20	41490	2680	QPSK	100	0	LTE B41	20	41292	2660.2	QPSK	100	0	18.50
Max	LTE B41	20	41490	2680	16-QAM	100	0	LTE B41	20	41292	2660.2	16-QAM	100	0	17.67
Max	LTE B41	20	41490	2680	64-QAM	100	0	LTE B41	20	41292	2660.2	64-QAM	100	0	16.45
Max	LTE B41	20	41490	2680	256-QAM	100	0	LTE B41	20	41292	2660.2	256-QAM	100	0	14.69

Table 7-4. Conducted Powers (B41 with Various Combinations for 20MHz Channel Bandwidth)

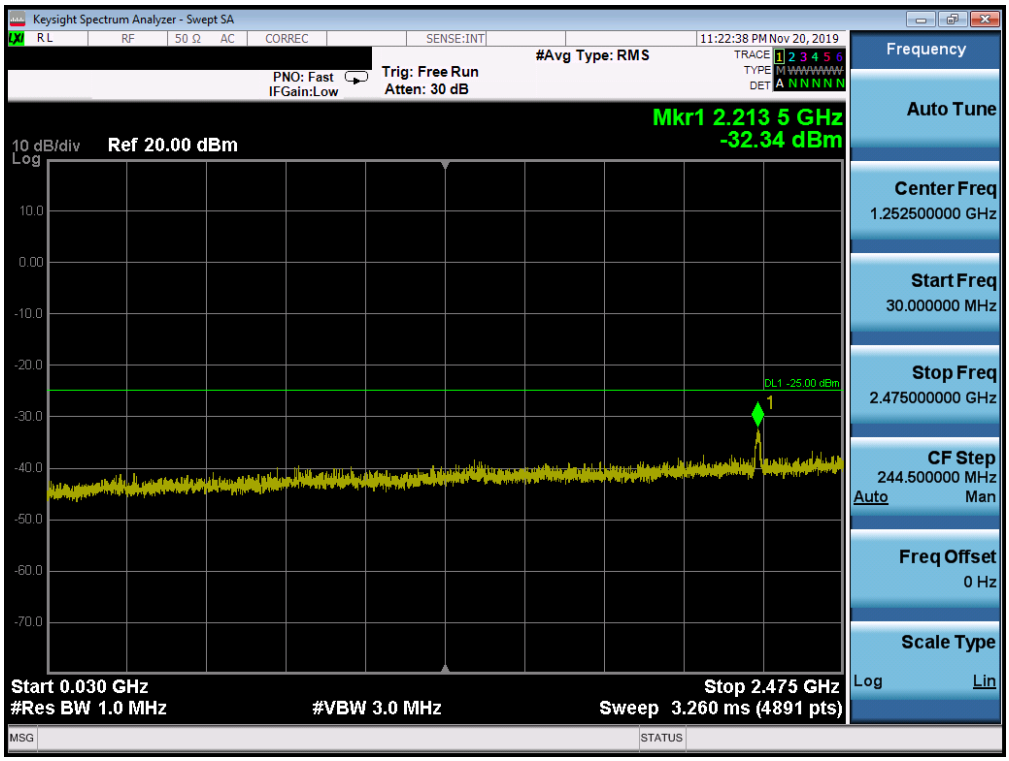


Table 7-212. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/99 Right Carrier 1/0 – Low Channel)

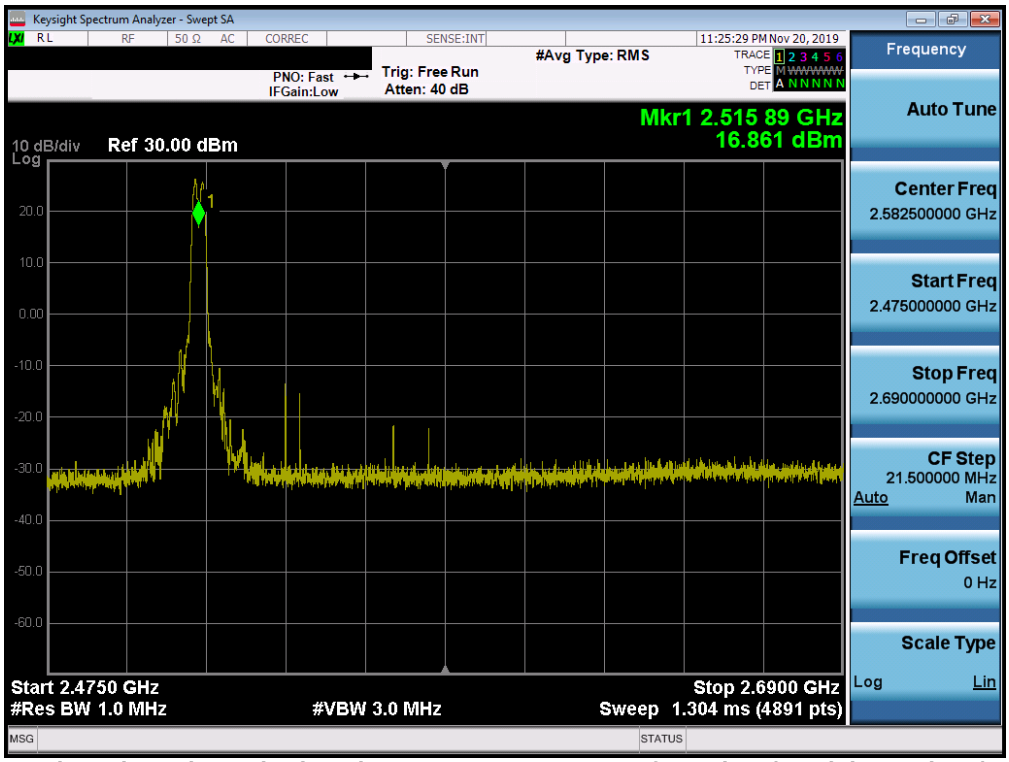


Table 7-213. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/99 Right Carrier 1/0 – Low Channel)

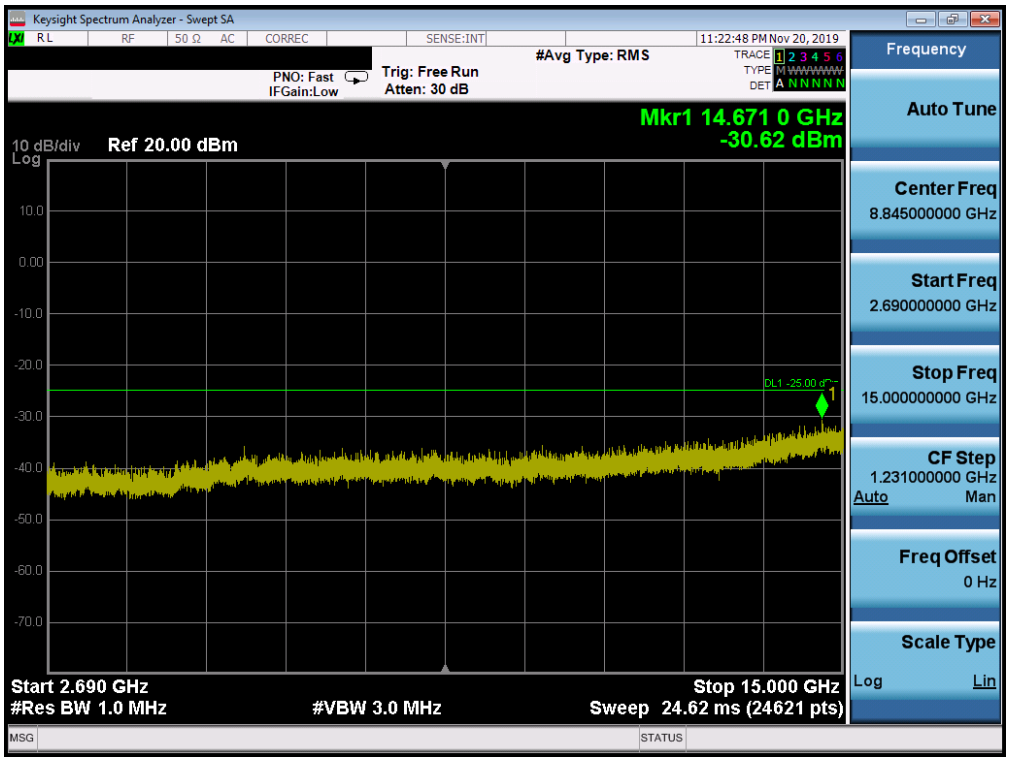


Table 7-214. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/99 Right Carrier 1/0 – Low Channel)

Table 7-215. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/99 Right Carrier 1/0 – Low Channel)

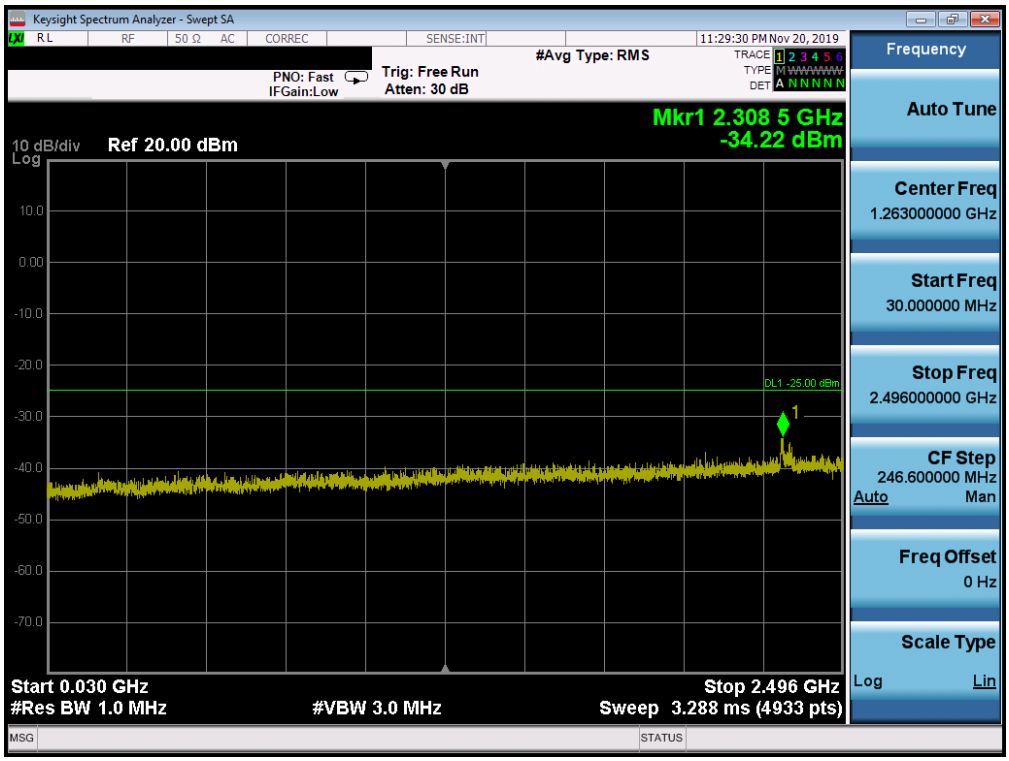


Table 7-216. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/99 Right Carrier 1/0 – Mid Channel)

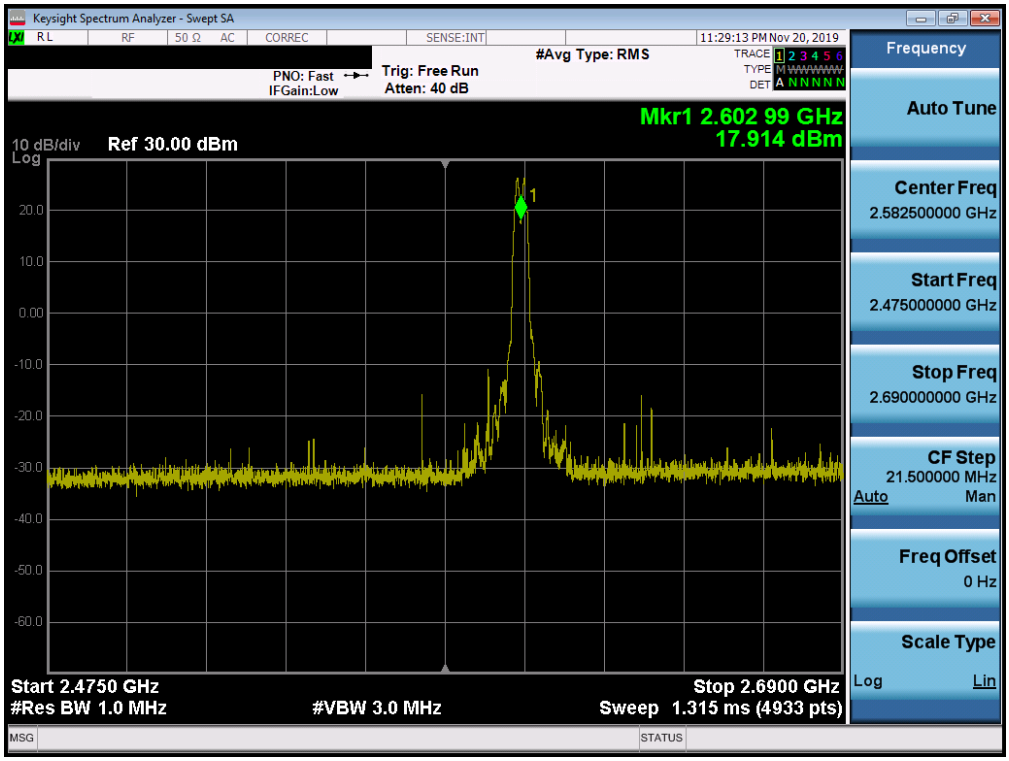


Table 7-217. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/99 Right Carrier 1/0 – Mid Channel)

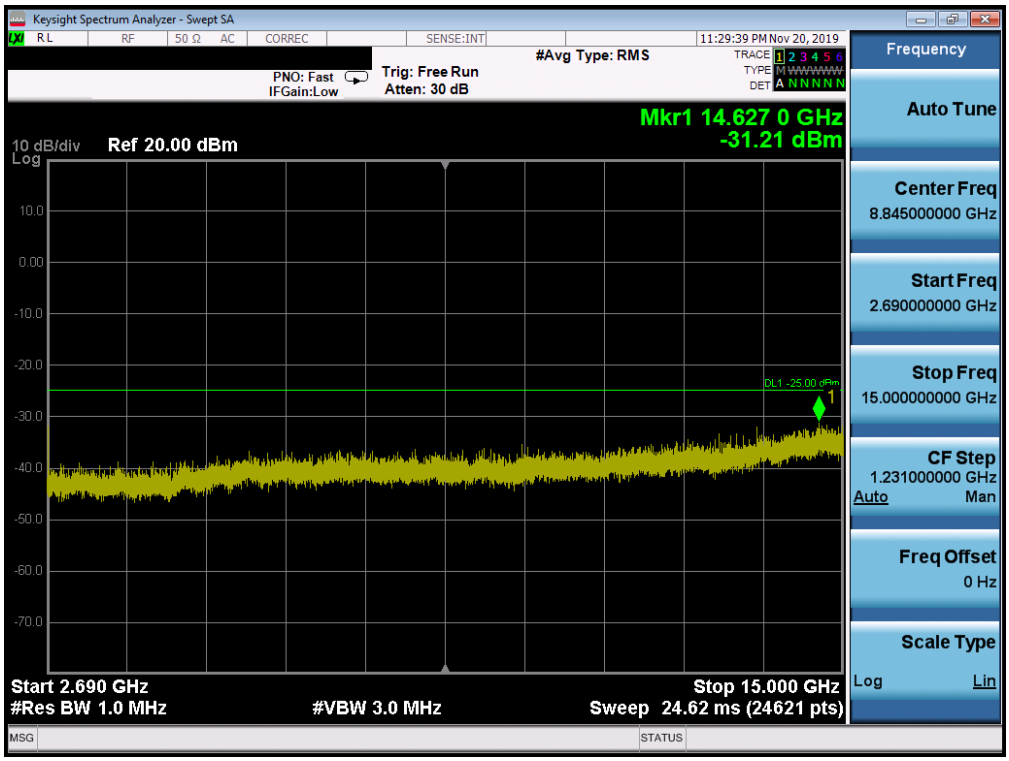


Table 7-218. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/99 Right Carrier 1/0 – Mid Channel)

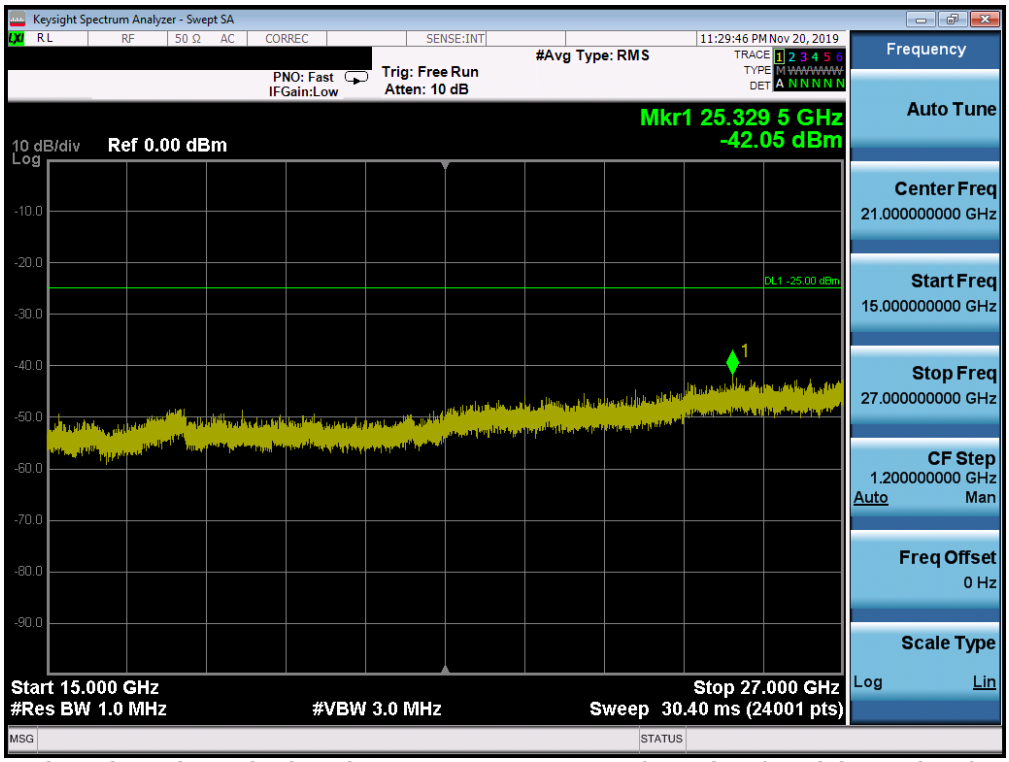


Table 7-219. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/99 Right Carrier 1/0 – Mid Channel)

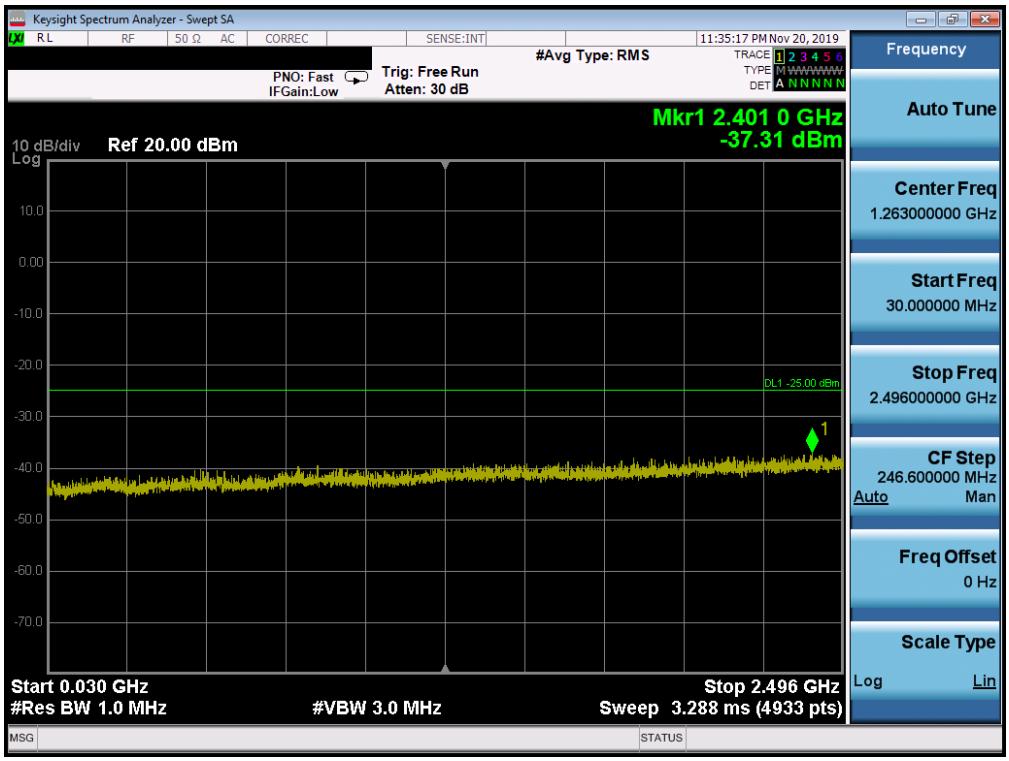


Table 7-220. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/99 – High Channel)

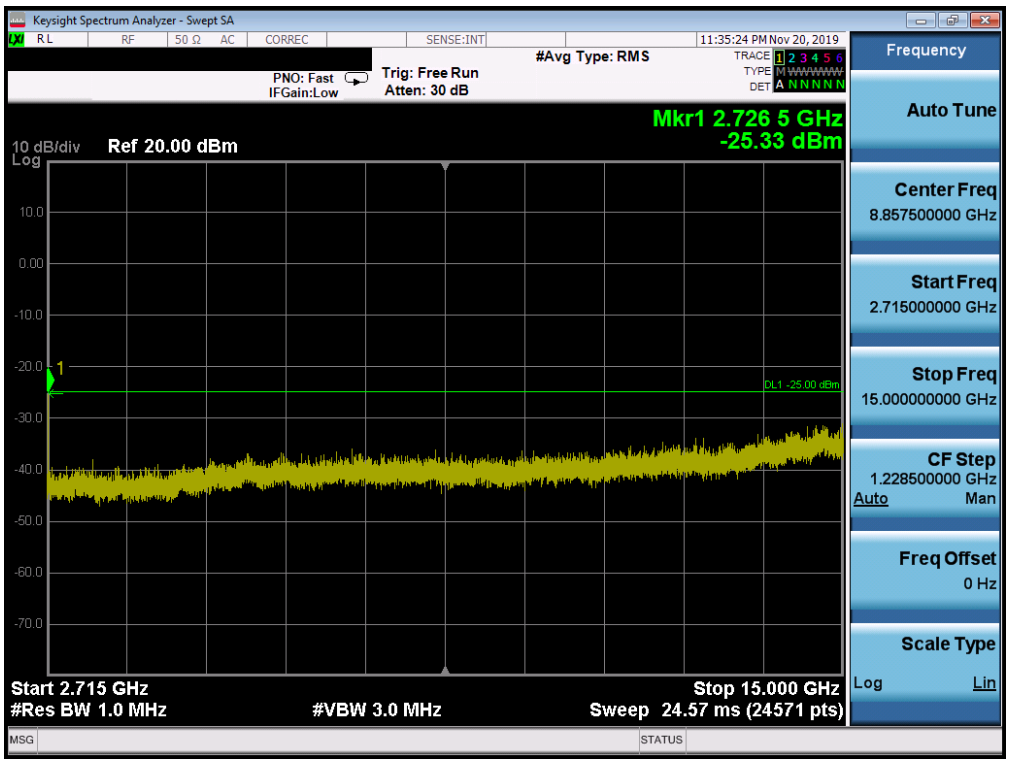


Table 7-221. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/99 – High Channel)

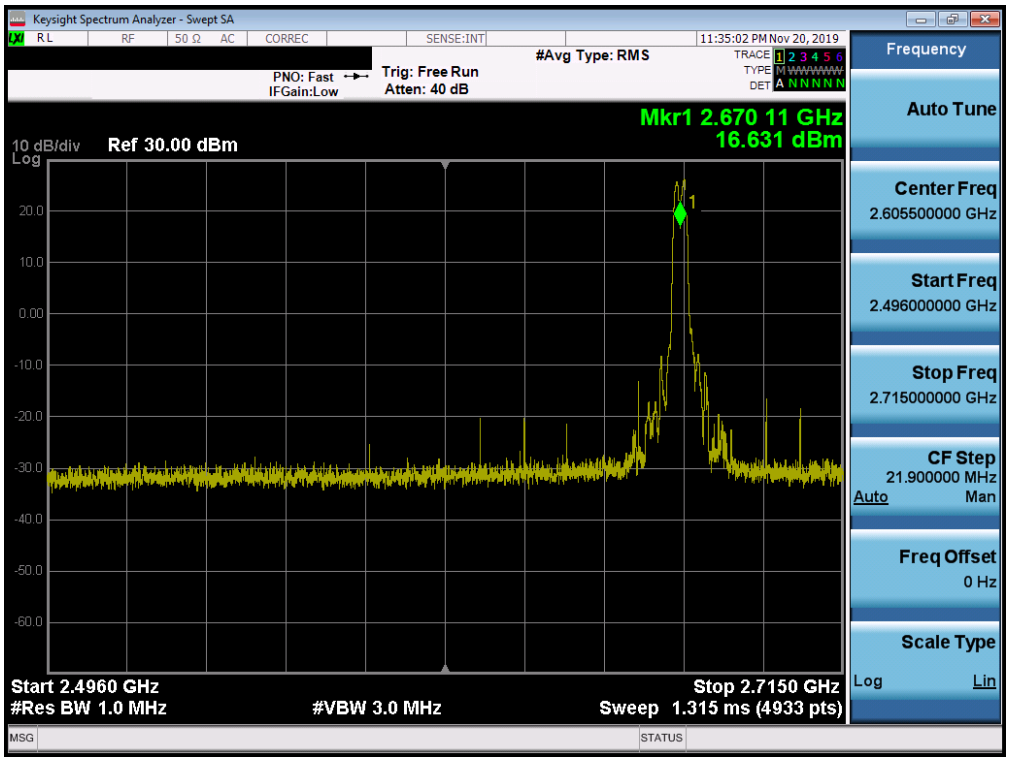


Table 7-222. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 100/0 Right Carrier 100/0 – High Channel)

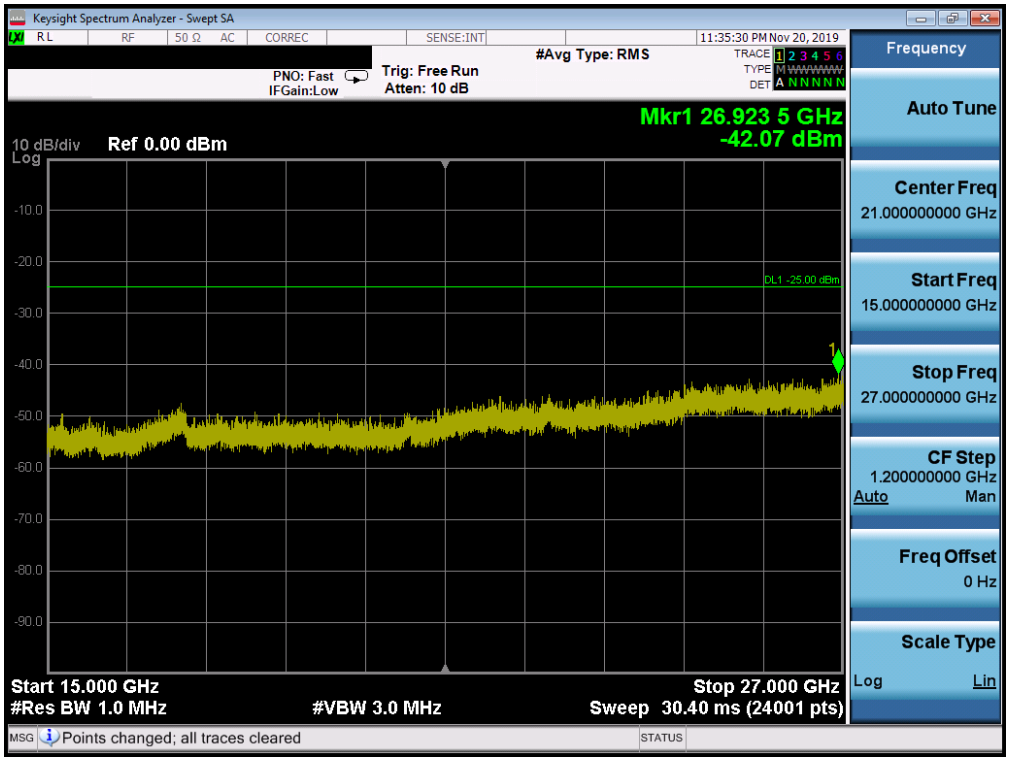
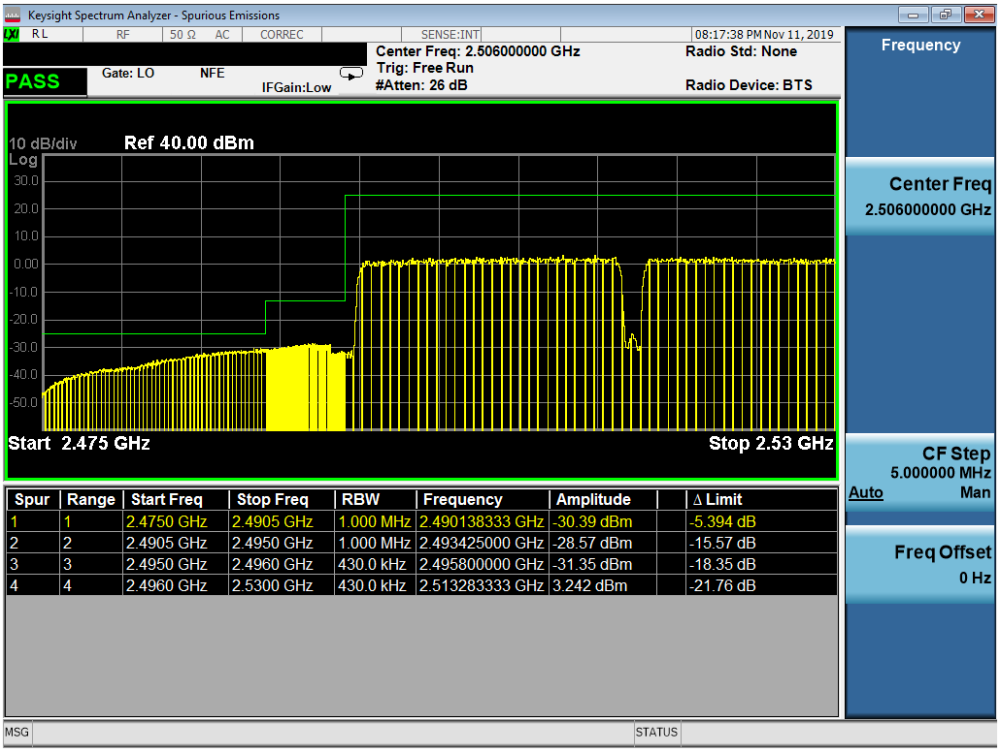
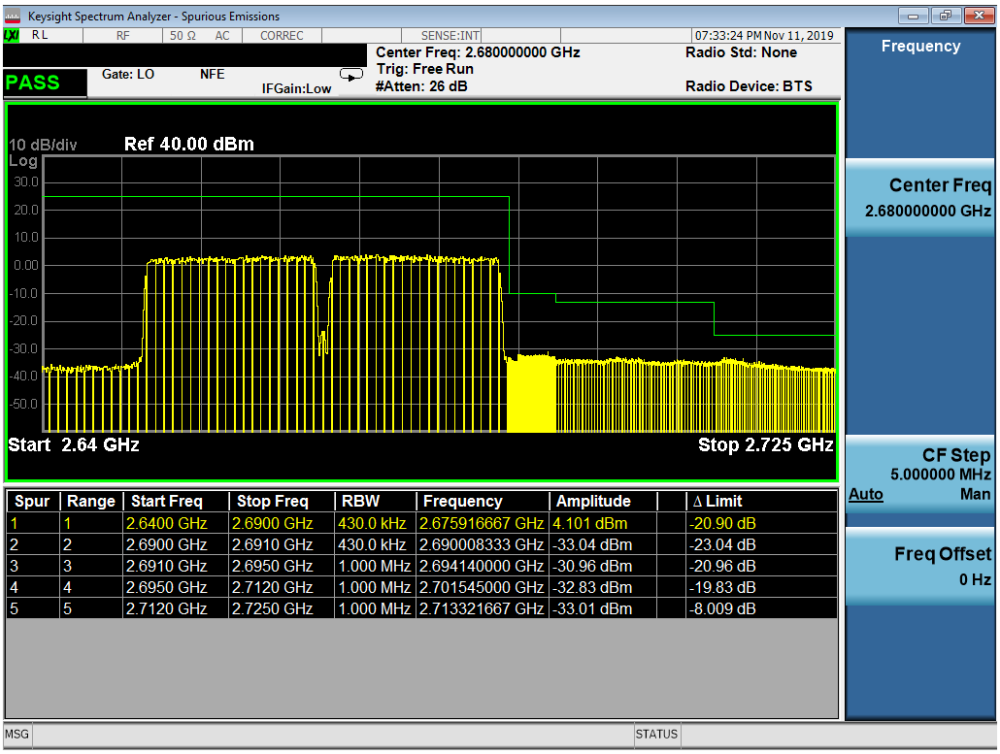


Table 7-223. Conducted Spurious Plot (Band 41 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/99 – High Channel)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490138333 GHz	-30.39 dBm	-5.394 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.493425000 GHz	-28.57 dBm	-15.57 dB
3	3	2.4950 GHz	2.4960 GHz	430.0 kHz	2.495800000 GHz	-31.35 dBm	-18.35 dB
4	4	2.4960 GHz	2.5300 GHz	430.0 kHz	2.513283333 GHz	3.242 dBm	-21.76 dB

Table 7-224. Lower ACP Plot (Band 41 QPSK – Left Carrier:20 MHz Right Carrier:20 MHz – Full RB)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6400 GHz	2.6900 GHz	430.0 kHz	2.675916667 GHz	4.101 dBm	-20.90 dB
2	2	2.6900 GHz	2.6910 GHz	430.0 kHz	2.690008333 GHz	-33.04 dBm	-23.04 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.694140000 GHz	-30.96 dBm	-20.96 dB
4	4	2.6950 GHz	2.7120 GHz	1.000 MHz	2.701545000 GHz	-32.83 dBm	-19.83 dB
5	5	2.7120 GHz	2.7250 GHz	1.000 MHz	2.713321667 GHz	-33.01 dBm	-8.009 dB

Table 7-225. Upper ACP Plot (Band 41 QPSK – Left Carrier:20 MHz Right Carrier:20 MHz – Full RB)

7.7 Radiated Power (ERP/EIRP)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. 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/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Setup

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

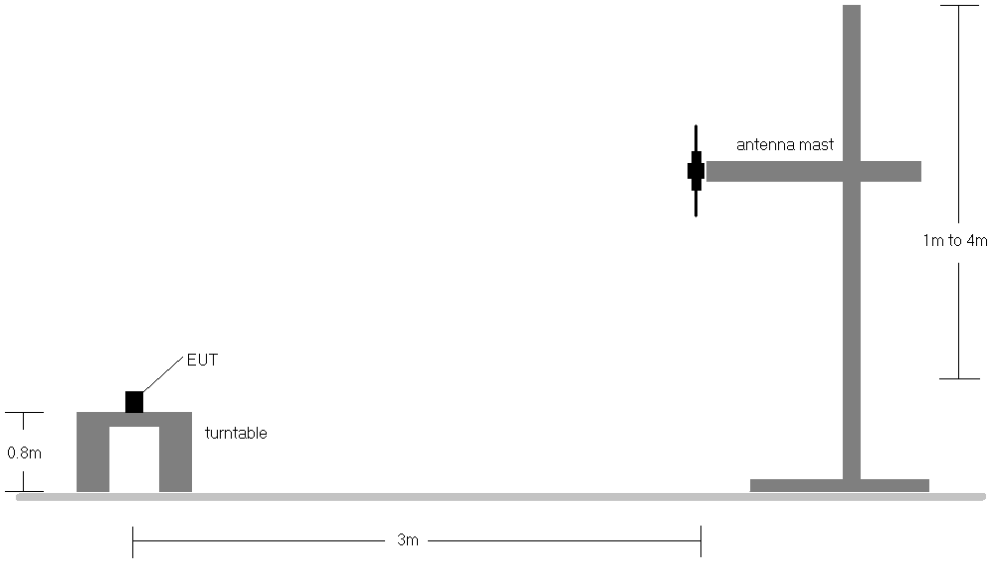


Figure 7-6. Radiated Test Setup <1GHz

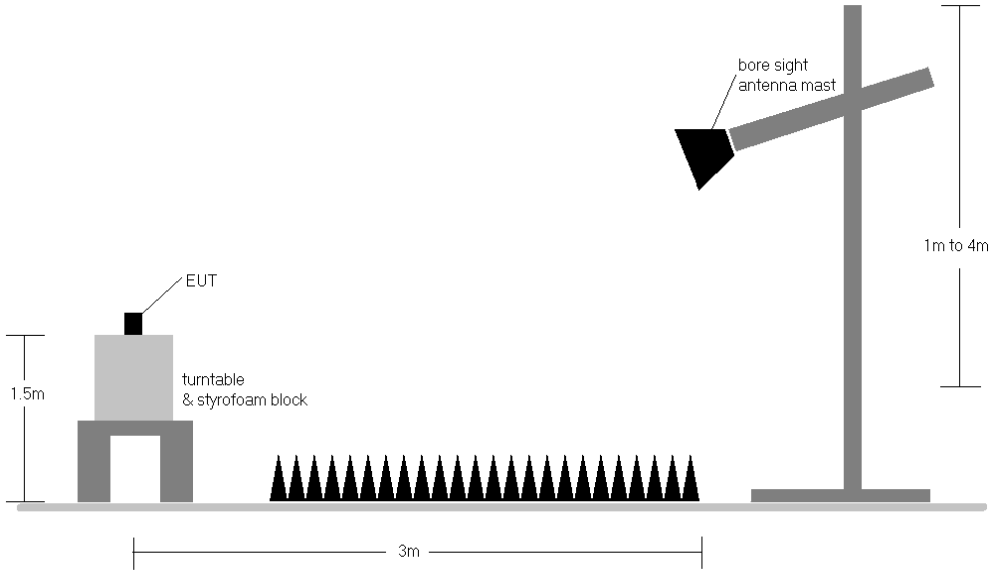


Figure 7-7. Radiated Test Setup >1GHz

Test Notes

1) 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.

2) This unit was tested with its standard battery.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	V	103	328	1 / 5	13.44	4.50	15.79	0.038	34.77	-18.98	17.94	0.062	36.99	-19.05
707.50	1.4	QPSK	V	104	326	1 / 5	13.49	4.60	15.94	0.039	34.77	-18.83	18.09	0.064	36.99	-18.90
715.30	1.4	QPSK	V	101	324	1 / 2	13.65	4.63	**16.13**	**0.041**	34.77	-18.64	**18.28**	**0.067**	36.99	-18.71
715.30	1.4	16-QAM	V	101	324	1 / 2	12.82	4.63	**15.30**	0.034	34.77	-19.47	**17.45**	0.056	36.99	-19.54
715.30	1.4	64-QAM	V	101	324	1 / 2	11.71	4.63	**14.19**	0.026	34.77	-20.58	**16.34**	0.043	36.99	-20.65
700.50	3	QPSK	V	103	328	1 / 14	13.44	4.55	15.84	0.038	34.77	-18.93	17.99	0.063	36.99	-19.00
707.50	3	QPSK	V	104	326	1 / 7	13.51	4.60	15.96	0.039	34.77	-18.81	18.11	0.065	36.99	-18.88
714.50	3	QPSK	V	101	324	1 / 14	13.64	4.60	**16.09**	0.041	34.77	-18.68	**18.24**	0.067	36.99	-18.75
714.50	3	16-QAM	V	101	324	1 / 14	12.81	4.60	**15.26**	0.034	34.77	-19.51	**17.41**	0.055	36.99	-19.58
714.50	3	64-QAM	V	101	324	1 / 14	11.70	4.60	**14.15**	0.026	34.77	-20.62	**16.30**	0.043	36.99	-20.69
701.50	5	QPSK	V	103	328	1 / 12	13.61	4.60	**16.06**	0.040	34.77	-18.71	**18.21**	0.066	36.99	-18.78
707.50	5	QPSK	V	104	326	1 / 0	13.54	4.60	15.99	0.040	34.77	-18.78	18.14	0.065	36.99	-18.85
713.50	5	QPSK	V	101	324	1 / 12	13.59	4.60	16.04	0.040	34.77	-18.73	18.19	0.066	36.99	-18.80
701.50	5	16-QAM	V	103	328	1 / 12	12.70	4.60	**15.15**	0.033	34.77	-19.62	**17.30**	0.054	36.99	-19.69
701.50	5	64-QAM	V	103	328	1 / 12	11.64	4.60	**14.09**	0.026	34.77	-20.68	**16.24**	0.042	36.99	-20.75
704.00	10	QPSK	V	103	328	1 / 25	13.56	4.50	15.91	0.039	34.77	-18.86	18.06	0.064	36.99	-18.93
707.50	10	QPSK	V	104	326	1 / 0	13.28	4.60	15.73	0.037	34.77	-19.04	17.88	0.061	36.99	-19.11
711.00	10	QPSK	V	101	324	1 / 0	13.47	4.60	**15.92**	0.039	34.77	-18.85	**18.07**	0.064	36.99	-18.92
711.00	10	16-QAM	V	101	324	1 / 0	12.66	4.60	**15.11**	0.032	34.77	-19.66	**17.26**	0.053	36.99	-19.73
711.00	10	64-QAM	V	101	324	1 / 0	11.59	4.60	**14.04**	0.025	34.77	-20.73	**16.19**	0.042	36.99	-20.80
715.30	1.4	QPSK	H	176	366	1 / 2	12.33	4.60	14.78	0.030	34.77	-19.99	16.93	0.049	36.99	-20.06
715.30	1.4 (WCP)	QPSK	V	100	133	1 / 2	8.12	4.60	10.57	0.011	34.77	-24.20	12.72	0.019	36.99	-24.27

Table 7-5. ERP Data (Band 12)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
779.50	5	QPSK	V	139	280	1 / 24	14.78	5.70	18.33	0.068	34.77	-16.44	20.48	0.112	36.99	-16.51
782.00	5	QPSK	V	145	270	1 / 24	15.13	5.80	18.78	0.076	34.77	-15.99	20.93	0.124	36.99	-16.06
784.50	5	QPSK	V	154	274	1 / 24	15.26	5.80	**18.91**	**0.078**	34.77	-15.86	**21.06**	**0.128**	36.99	-15.93
782.00	5	16-QAM	V	145	270	1 / 24	14.55	5.80	**18.20**	0.066	34.77	-16.57	**20.35**	0.108	36.99	-16.64
784.50	5	64-QAM	V	154	274	1 / 24	13.79	5.80	**17.44**	0.055	34.77	-17.33	**19.59**	0.091	36.99	-17.40
782.00	10	QPSK	V	145	279	1 / 49	15.05	5.80	**18.70**	0.074	34.77	-16.07	**20.85**	0.122	36.99	-16.14
782.00	10	16-QAM	V	145	279	1 / 49	14.38	5.80	**18.03**	0.064	34.77	-16.74	**20.18**	0.104	36.99	-16.81
782.00	10	64-QAM	V	145	279	1 / 49	13.32	5.80	**16.97**	0.050	34.77	-17.80	**19.12**	0.082	36.99	-17.87
784.50	5	QPSK	H	370	253	1 / 24	12.31	5.80	15.96	0.039	34.77	-18.81	18.11	0.065	36.99	-18.88
784.50	5 (WCP)	QPSK	V	139	174	1 / 24	9.72	5.80	13.37	0.022	34.77	-21.40	15.52	0.036	36.99	-21.47

Table 7-6. ERP Data (Band 13)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	V	247	248	1 / 2	12.78	6.30	**16.93**	0.049	38.45	-21.52	**19.08**	0.081	40.61	-21.53
836.50	1.4	QPSK	V	234	286	1 / 2	12.64	6.40	16.89	0.049	38.45	-21.56	19.04	0.080	40.61	-21.57
848.30	1.4	QPSK	V	273	274	1 / 2	12.56	6.50	16.91	0.049	38.45	-21.54	19.06	0.081	40.61	-21.55
824.70	1.4	16-QAM	V	247	248	1 / 2	11.92	6.30	**16.07**	0.040	38.45	-22.38	**18.22**	0.066	40.61	-22.39
824.70	1.4	64-QAM	V	247	248	1 / 2	11.92	6.30	**16.07**	0.040	38.45	-22.38	**18.22**	0.066	40.61	-22.39
825.50	3	QPSK	V	247	248	1 / 7	12.75	6.30	16.90	0.049	38.45	-21.55	19.05	0.080	40.61	-21.56
836.50	3	QPSK	V	234	286	1 / 14	12.73	6.40	**16.98**	0.050	38.45	-21.47	**19.13**	0.082	40.61	-21.48
847.50	3	QPSK	V	273	274	1 / 0	12.59	6.50	16.94	0.049	38.45	-21.51	19.09	0.081	40.61	-21.52
836.50	3	16-QAM	V	234	286	1 / 14	11.88	6.40	**16.13**	0.041	38.45	-22.32	**18.28**	0.067	40.61	-22.33
836.50	3	64-QAM	V	234	286	1 / 14	11.40	6.40	**15.65**	0.037	38.45	-22.80	**17.80**	0.060	40.61	-22.81
826.50	5	QPSK	V	247	248	1 / 24	12.81	6.30	16.96	0.050	38.45	-21.49	19.11	0.081	40.61	-21.50
836.50	5	QPSK	V	234	286	1 / 12	12.75	6.40	**17.00**	**0.050**	38.45	-21.45	**19.15**	**0.082**	40.61	-21.46
846.50	5	QPSK	V	273	274	1 / 24	12.55	6.50	16.90	0.049	38.45	-21.55	19.05	0.080	40.61	-21.56
836.50	5	16-QAM	V	234	286	1 / 12	12.21	6.40	**16.46**	0.044	38.45	-21.99	**18.61**	0.073	40.61	-22.00
836.50	5	64-QAM	V	234	286	1 / 12	11.45	6.40	**15.70**	0.037	38.45	-22.75	**17.85**	0.061	40.61	-22.76
829.00	10	QPSK	V	247	248	1 / 49	12.22	6.30	16.37	0.043	38.45	-22.08	18.52	0.071	40.61	-22.09
836.50	10	QPSK	V	234	286	1 / 49	12.58	6.40	**16.83**	0.048	38.45	-21.62	**18.98**	0.079	40.61	-21.63
844.00	10	QPSK	V	273	274	1 / 49	11.72	6.40	15.97	0.040	38.45	-22.48	18.12	0.065	40.61	-22.49
836.50	10	16-QAM	V	234	286	1 / 49	11.64	6.40	**15.89**	0.039	38.45	-22.56	**18.04**	0.064	40.61	-22.57
836.50	10	64-QAM	V	234	286	1 / 49	10.61	6.40	**14.86**	0.031	38.45	-23.59	**17.01**	0.050	40.61	-23.60
836.50	5	QPSK	H	153	157	1 / 12	10.27	6.40	14.52	0.028	38.45	-23.93	16.67	0.046	40.61	-23.94
836.50	5 (WCP)	QPSK	V	135	169	1 / 12	9.22	6.40	13.47	0.022	38.45	-24.98	15.62	0.036	40.61	-24.99

Table 7-7. ERP Data (Band 5)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	V	138	44	1 / 2	13.40	9.35	22.75	0.188	30.00	-7.25
1732.50	1.4	QPSK	V	153	130	1 / 0	13.53	9.20	22.73	0.187	30.00	-7.27
1754.30	1.4	QPSK	V	139	135	1 / 2	13.72	9.09	**22.81**	0.191	30.00	-7.19
1754.30	1.4	16-QAM	V	139	135	1 / 2	12.69	9.09	**21.78**	0.151	30.00	-8.22
1754.30	1.4	64-QAM	V	139	135	1 / 2	11.59	9.09	**20.68**	0.117	30.00	-9.32
1711.50	3	QPSK	V	138	44	1 / 14	13.59	9.34	**22.93**	0.196	30.00	-7.07
1732.50	3	QPSK	V	153	130	1 / 7	13.68	9.20	22.88	0.194	30.00	-7.12
1753.50	3	QPSK	V	139	135	1 / 0	13.61	9.09	22.70	0.186	30.00	-7.30
1711.50	3	16-QAM	V	138	44	1 / 14	12.79	9.34	**22.13**	0.163	30.00	-7.87
1711.50	3	64-QAM	V	138	44	1 / 14	11.65	9.34	**20.99**	0.126	30.00	-9.01
1712.50	5	QPSK	V	138	44	1 / 12	13.36	9.34	22.70	0.186	30.00	-7.30
1732.50	5	QPSK	V	153	130	1 / 12	13.62	9.20	**22.82**	0.191	30.00	-7.18
1752.50	5	QPSK	V	139	135	1 / 12	13.68	9.08	22.76	0.189	30.00	-7.24
1732.50	5	16-QAM	V	153	130	1 / 12	12.71	9.20	**21.91**	0.155	30.00	-8.09
1732.50	5	64-QAM	V	153	130	1 / 12	11.68	9.20	**20.88**	0.122	30.00	-9.12
1715.00	10	QPSK	V	138	44	1 / 25	13.30	9.32	22.62	0.183	30.00	-7.38
1732.50	10	QPSK	V	153	130	1 / 25	13.56	9.20	**22.76**	0.189	30.00	-7.24
1750.00	10	QPSK	V	139	135	1 / 25	13.63	9.07	22.70	0.186	30.00	-7.30
1732.50	10	16-QAM	V	153	130	1 / 25	12.74	9.20	**21.94**	0.156	30.00	-8.06
1732.50	10	64-QAM	V	153	130	1 / 25	11.85	9.20	**21.05**	0.127	30.00	-8.95
1717.50	15	QPSK	V	138	44	1 / 36	13.62	9.30	22.92	0.196	30.00	-7.08
1732.50	15	QPSK	V	153	130	1 / 36	13.84	9.20	23.04	0.201	30.00	-6.96
1747.50	15	QPSK	V	139	135	1 / 0	14.01	9.09	**23.10**	0.204	30.00	-6.90
1747.50	15	16-QAM	V	139	135	1 / 0	12.86	9.09	**21.95**	0.157	30.00	-8.05
1747.50	15	64-QAM	V	139	135	1 / 0	12.03	9.09	**21.12**	0.129	30.00	-8.88
1720.00	20	QPSK	V	138	44	1 / 99	12.36	9.28	21.64	0.146	30.00	-8.36
1732.50	20	QPSK	V	153	130	1 / 99	13.93	9.20	**23.13**	**0.205**	30.00	-6.87
1745.00	20	QPSK	V	139	135	1 / 99	13.10	9.11	22.21	0.166	30.00	-7.79
1732.50	20	16-QAM	V	153	130	1 / 99	13.09	9.20	**22.29**	0.169	30.00	-7.71
1732.50	20	64-QAM	V	153	130	1 / 99	12.15	9.20	**21.35**	0.136	30.00	-8.65
1732.50	20	QPSK	H	137	182	1 / 99	12.34	9.20	21.54	0.142	30.00	-8.46
1732.50	20 (WCP)	QPSK	V	101	364	1 / 99	12.61	9.20	21.81	0.152	30.00	-8.19

Table 7-8. EIRP Data (Band 4)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
2498.50	5	QPSK	H	120	197	1 / 0	14.03	9.43	**23.46**	0.222	33.01	-9.55
2593.00	5	QPSK	H	104	203	1 / 12	13.89	9.55	23.44	0.221	33.01	-9.57
2687.50	5	QPSK	H	158	199	1 / 12	13.50	9.82	23.32	0.215	33.01	-9.69
2498.50	5	16-QAM	H	120	197	1 / 0	13.11	9.43	**22.54**	0.179	33.01	-10.47
2498.50	5	64-QAM	H	120	197	1 / 0	12.12	9.43	**21.55**	0.143	33.01	-11.46
2501.00	10	QPSK	H	120	197	1 / 0	14.02	9.43	23.45	0.221	33.01	-9.56
2593.00	10	QPSK	H	104	203	1 / 25	13.91	9.55	**23.46**	0.222	33.01	-9.55
2685.00	10	QPSK	H	158	199	1 / 25	13.54	9.82	23.36	0.217	33.01	-9.65
2593.00	10	16-QAM	H	104	203	1 / 25	12.99	9.55	**22.54**	0.179	33.01	-10.47
2593.00	10	64-QAM	H	104	203	1 / 25	11.95	9.55	**21.50**	0.141	33.01	-11.51
2503.50	15	QPSK	H	120	197	1 / 0	14.17	9.43	23.60	0.229	33.01	-9.41
2593.00	15	QPSK	H	104	203	1 / 36	14.07	9.55	**23.62**	**0.230**	33.01	-9.39
2682.50	15	QPSK	H	158	199	1 / 36	13.61	9.83	**23.44**	0.221	33.01	-9.57
2593.00	15	16-QAM	H	104	203	1 / 36	13.17	9.55	**22.72**	0.187	33.01	-10.29
2593.00	15	64-QAM	H	104	203	1 / 36	11.98	9.55	**21.53**	0.142	33.01	-11.48
2506.00	20	QPSK	H	120	197	1 / 0	13.98	9.42	**23.40**	0.219	33.01	-9.61
2593.00	20	QPSK	H	104	203	1 / 0	12.42	9.55	21.97	0.158	33.01	-11.04
2680.00	20	QPSK	H	158	199	1 / 99	12.01	9.83	21.84	0.153	33.01	-11.17
2506.00	20	16-QAM	H	120	197	1 / 99	13.11	9.42	**22.53**	0.179	33.01	-10.48
2506.00	20	64-QAM	H	120	197	1 / 99	11.84	9.42	**21.26**	0.134	33.01	-11.75
2593.00	15	QPSK	V	136	241	1 / 36	12.85	9.55	22.40	0.174	33.01	-10.61
2593.00	15 (WCP)	QPSK	V	174	202	1 / 36	11.56	9.55	21.11	0.129	33.01	-11.90

Table 7-9. EIRP Data (Band 41 – PC3)

7.8 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/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 = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

Test Setup

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

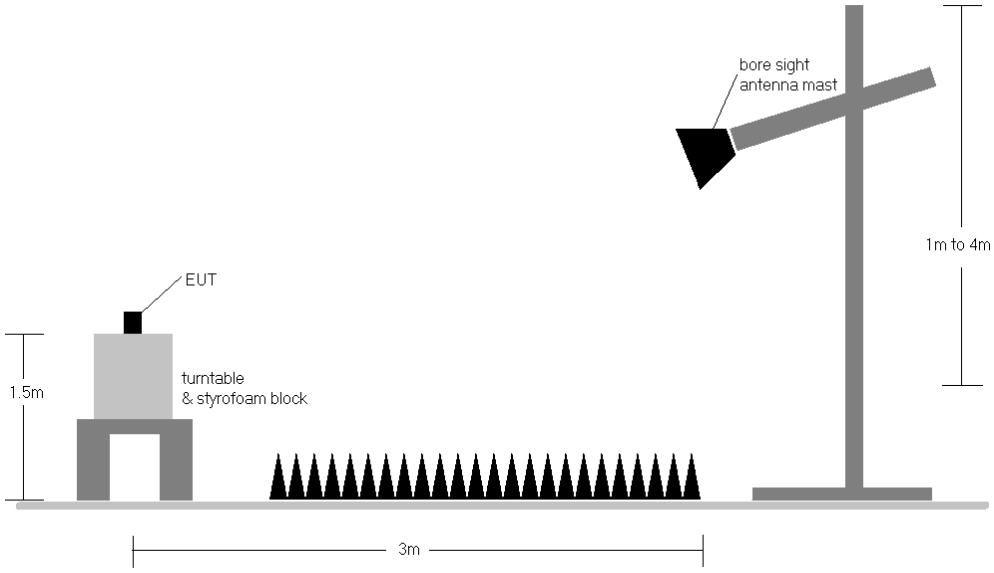


Figure 7-8. Test Instrument & Measurement Setup

Test Notes

1) 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.

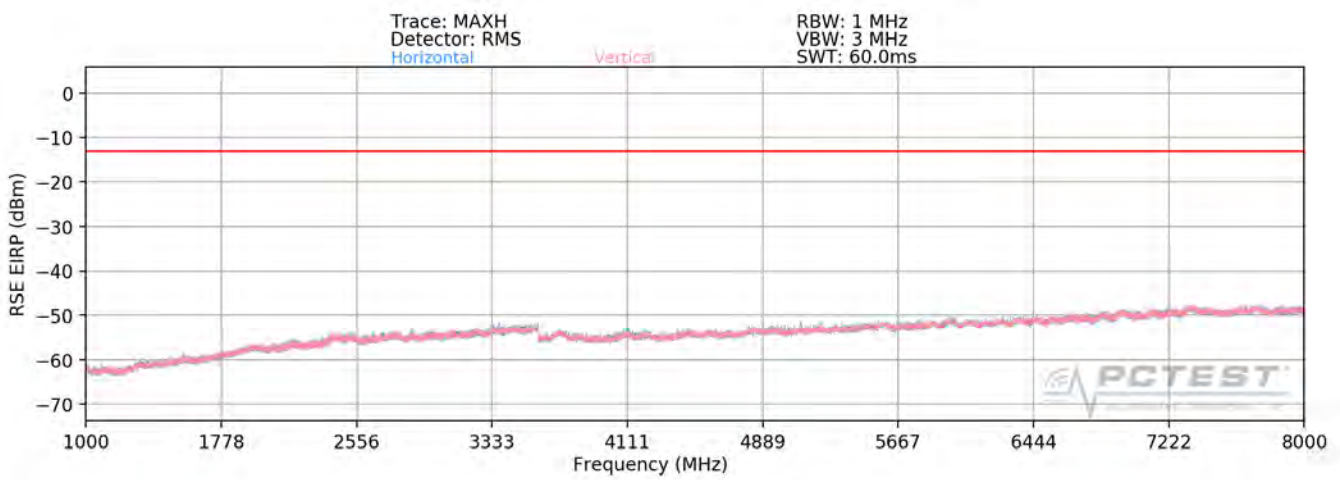
2) This unit was tested with its standard battery.

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

4) 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.

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

Band 12



Plot 7-226. Radiated Spurious Plot above 1GHz (Band 12)

OPERATING FREQUENCY:	699.70	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1399.40	H	275	2	-61.24	2.71	-58.53	-45.5
2099.10	H	267	14	-59.08	3.57	-55.51	-42.5
2798.80	H	-	-	-61.67	4.98	-56.69	-43.7
3498.50	H	-	-	-61.49	6.33	-55.16	-42.2

Table 7-10. Radiated Spurious Data (Band 12 – Low Channel)

OPERATING FREQUENCY:	707.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1415.00	H	221	323	-63.28	2.80	-60.48	-47.5
2122.50	H	236	337	-60.20	3.57	-56.63	-43.6
2830.00	H	-	-	-61.51	5.02	-56.49	-43.5
3537.50	H	-	-	-62.38	6.31	-56.08	-43.1

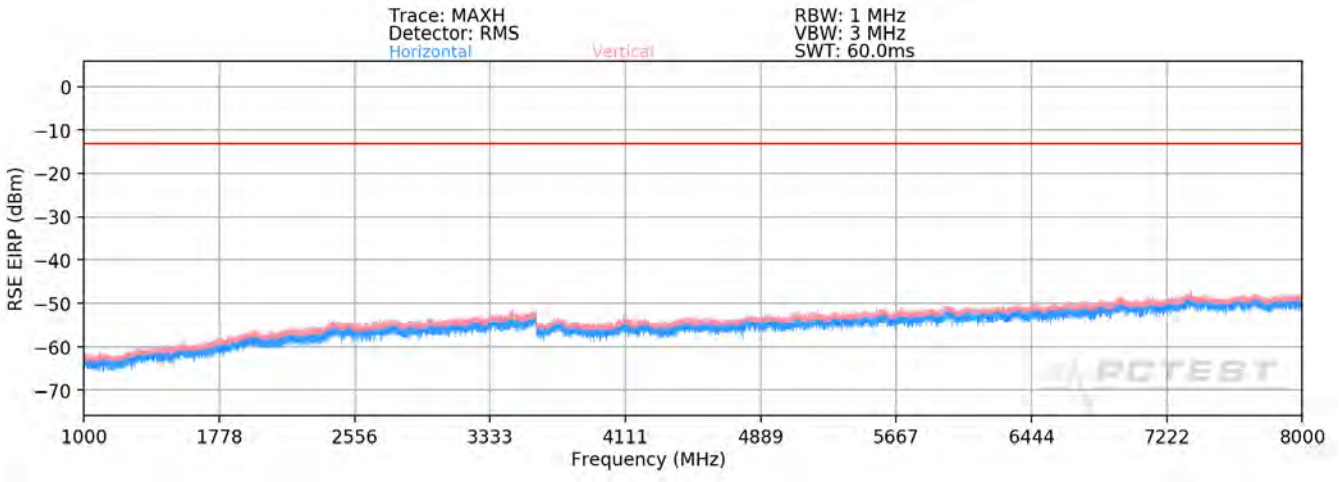
Table 7-11. Radiated Spurious Data (Band 12 – Mid Channel)

OPERATING FREQUENCY:	715.30	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1430.60	H	133	359	-62.95	2.88	-60.06	-47.1
2145.90	H	119	351	-60.55	3.58	-56.97	-44.0
2861.20	H	-	-	-61.14	5.07	-56.07	-43.1
3576.50	H	-	-	-61.43	6.31	-55.12	-42.1

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

Band 13



Plot 7-227. Radiated Spurious Plot above 1GHz (Band 13)

OPERATING FREQUENCY:	782.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2346.00	H	114	357	-60.52	4.00	-56.51	-43.5
3128.00	H	-	-	-60.58	5.38	-55.19	-42.2
3910.00	H	-	-	-65.98	7.09	-58.89	-45.9

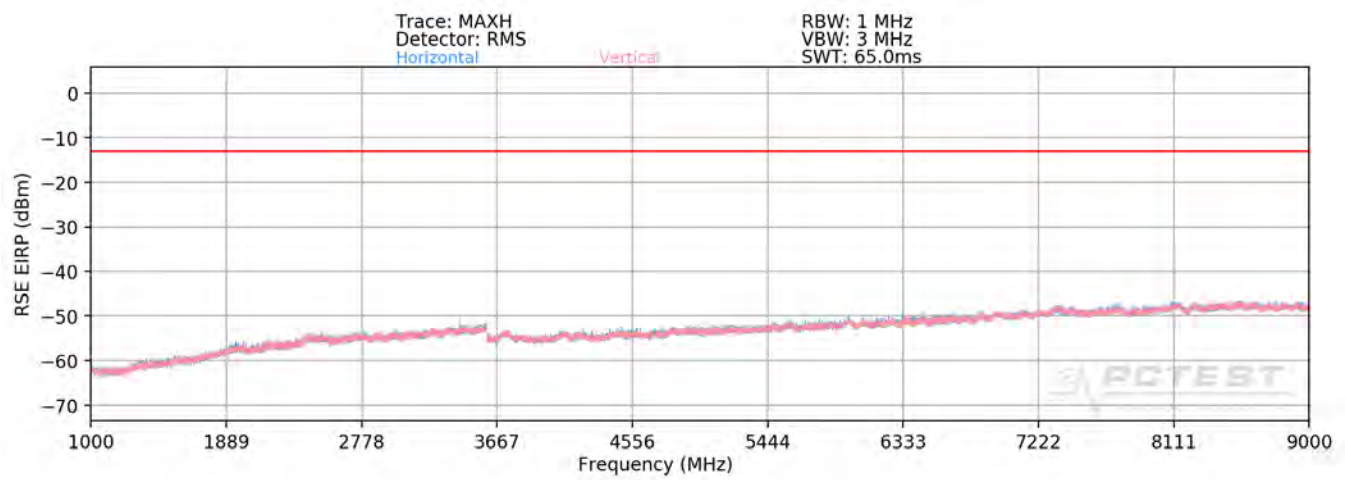
Table 7-13. Radiated Spurious Data (Band 13 – Mid Channel)

MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.00	MHz
DISTANCE:	3	meters
NARROWBAND EMISSION LIMIT:	-50	dBm
WIDEBAND EMISSION LIMIT:	-40	dBm/MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1564.00	H	-	-	-64.07	3.53	-60.54	-20.5

Table 7-14. Radiated Spurious Data (Band 13 – Mid Channel)

Band 5



Plot 7-228. Radiated Spurious Plot above 1GHz (Band 5)

OPERATING FREQUENCY:	826.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1653.00	V	-	-	-63.33	3.61	-59.71	-46.7
2479.50	V	149	12	-54.22	4.25	-49.97	-37.0
3306.00	V	-	-	-61.30	5.83	-55.47	-42.5
4132.50	V	-	-	-67.01	7.66	-59.34	-46.3

Table 7-15. Radiated Spurious Data (Band 5 – Low Channel)

OPERATING FREQUENCY:	836.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1673.00	V	278	286	-63.30	3.62	-59.68	-46.7
2509.50	V	147	271	-52.96	4.33	-48.63	-35.6
3346.00	V	-	-	-60.36	5.92	-54.44	-41.4
4182.50	V	-	-	-65.91	7.69	-58.22	-45.2

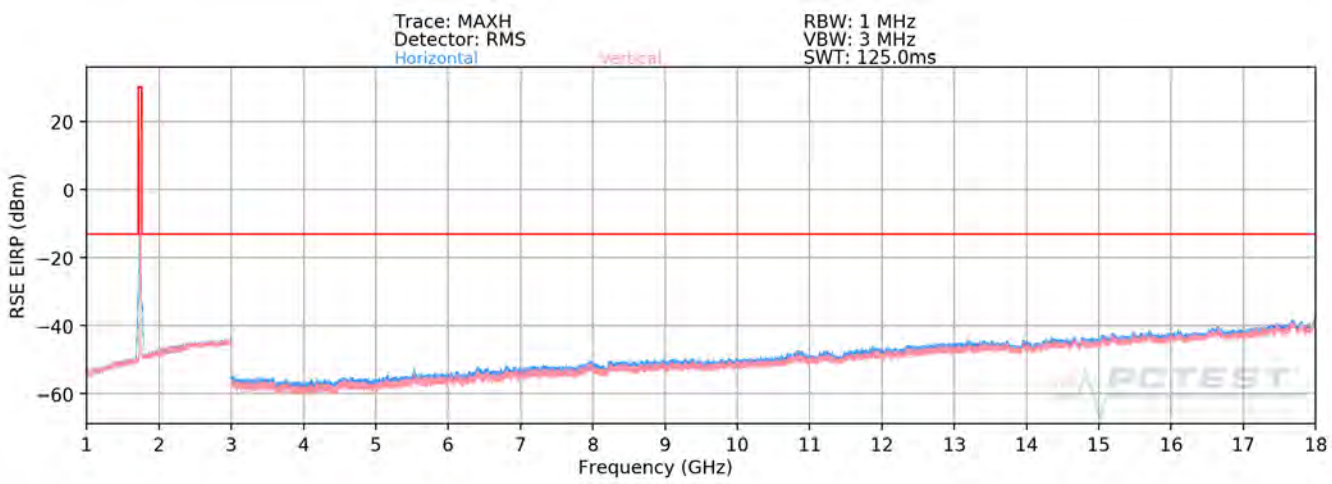
Table 7-16. Radiated Spurious Data (Band 5 – Mid Channel)

OPERATING FREQUENCY:	846.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1693.00	V	-	-	-63.04	3.63	-59.42	-46.4
2539.50	V	180	266	-51.64	4.47	-47.17	-34.2
3386.00	V	-	-	-60.34	6.05	-54.30	-41.3
4232.50	V	-	-	-65.94	7.75	-58.20	-45.2

Table 7-17. Radiated Spurious Data (Band 5 – High Channel)

Band 4



Plot 7-229. Radiated Spurious Plot above 1GHz (Band 4)

OPERATING FREQUENCY:	1720.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3440.00	V	-	-	-61.23	6.22	-55.01	-42.0
5160.00	V	-	-	-65.40	8.68	-56.73	-43.7
6880.00	V	-	-	-63.73	8.76	-54.97	-42.0

Table 7-18. Radiated Spurious Data (Band 4 – Low Channel)

OPERATING FREQUENCY:	1732.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3465.00	V	-	-	-60.51	6.27	-54.24	-41.2
5197.50	V	-	-	-66.05	8.71	-57.34	-44.3
6930.00	V	-	-	-62.84	8.72	-54.12	-41.1

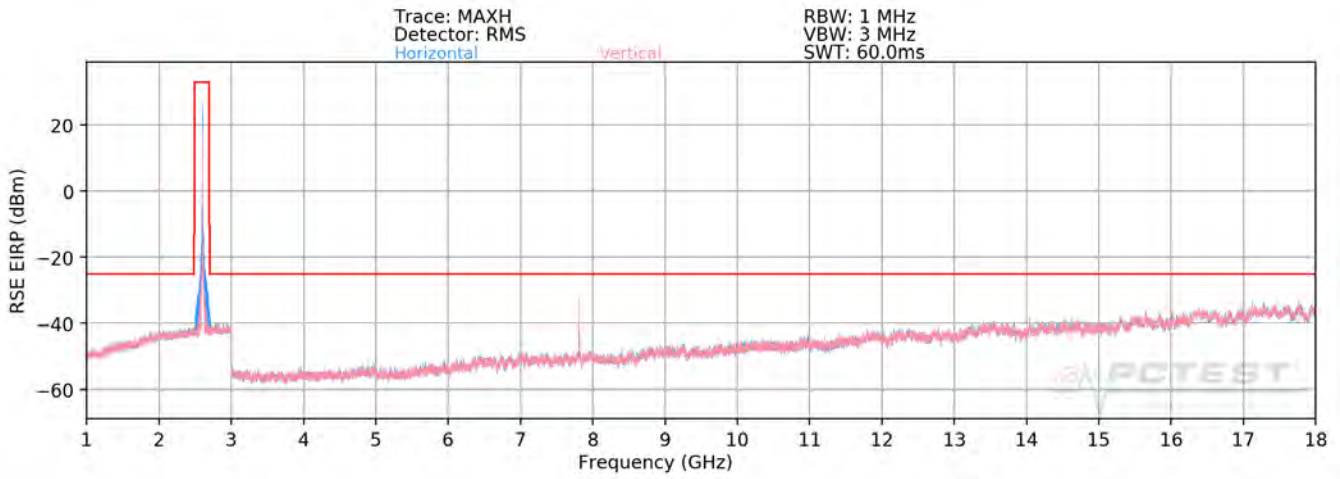
Table 7-19. Radiated Spurious Data (Band 4 – Mid Channel)

OPERATING FREQUENCY:	1745.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

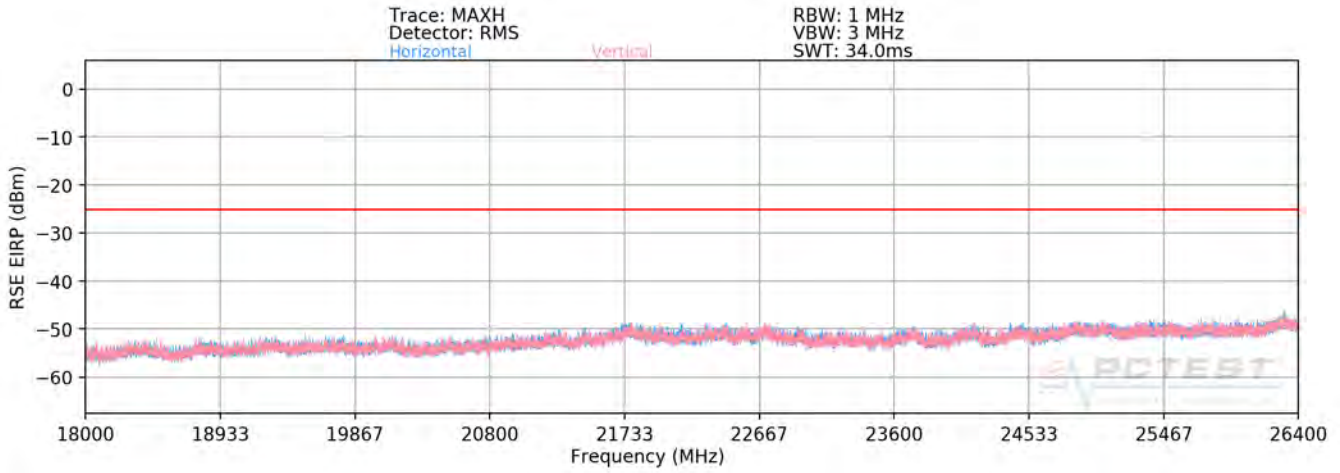
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3490.00	V	-	-	-60.47	6.32	-54.15	-41.1
5235.00	V	-	-	-65.95	8.71	-57.24	-44.2
6980.00	V	-	-	-63.79	8.74	-55.06	-42.1

Table 7-20. Radiated Spurious Data (Band 4 – High Channel)

Band 41 PC3



Plot 7-230. Radiated Spurious Plot 1GHz - 18GHz (Band 41)



Plot 7-231. Radiated Spurious Plot 18GHz – 26.5GHz (Band 41)

OPERATING FREQUENCY:	2506.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5012.00	H	120	34	-61.63	8.56	-53.07	-28.1
7518.00	H	319	359	-61.13	8.49	-52.64	-27.6
10024.00	H	-	-	-61.30	9.85	-51.45	-26.4

Table 7-21. Radiated Spurious Data (Band 41 – Low Channel)

OPERATING FREQUENCY:	2593.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5186.00	H	100	33	-62.18	8.70	-53.48	-28.5
7779.00	H	115	45	-54.16	8.69	-45.47	-20.5
10372.00	H	-	-	-60.65	9.62	-51.02	-26.0
12965.00	H	-	-	-56.45	8.99	-47.46	-22.5

Table 7-22. Radiated Spurious Data (Band 41 – Mid Channel)

OPERATING FREQUENCY:	2680.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5360.00	H	101	325	-58.66	8.70	-49.96	-25.0
8040.00	H	114	304	-49.42	8.95	-40.46	-15.5
10720.00	H	-	-	-59.55	9.32	-50.23	-25.2
13400.00	H	-	-	-54.62	8.77	-45.84	-20.8

Table 7-23. Radiated Spurious Data (Band 41 – High Channel)

OPERATING FREQUENCY:	2680.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5360.00	H	126	248	-59.56	8.70	-50.86	-25.9
8040.00	H	134	195	-50.65	8.95	-41.69	-16.7
10720.00	H	-	-	-60.34	9.32	-51.02	-26.0
13400.00	H	-	-	-55.39	8.77	-46.61	-21.6

Table 7-24. Radiated Spurious Data (Band 41 – WCP)

7.9 Uplink Carrier Aggregation Radiated Measurements

§2.1053, §27.53(m)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak 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 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – 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. No. of sweep points ≥ 2 x span / RBW
4. Detector = RMS
5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
6. The trace was allowed to stabilize

Test Setup

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

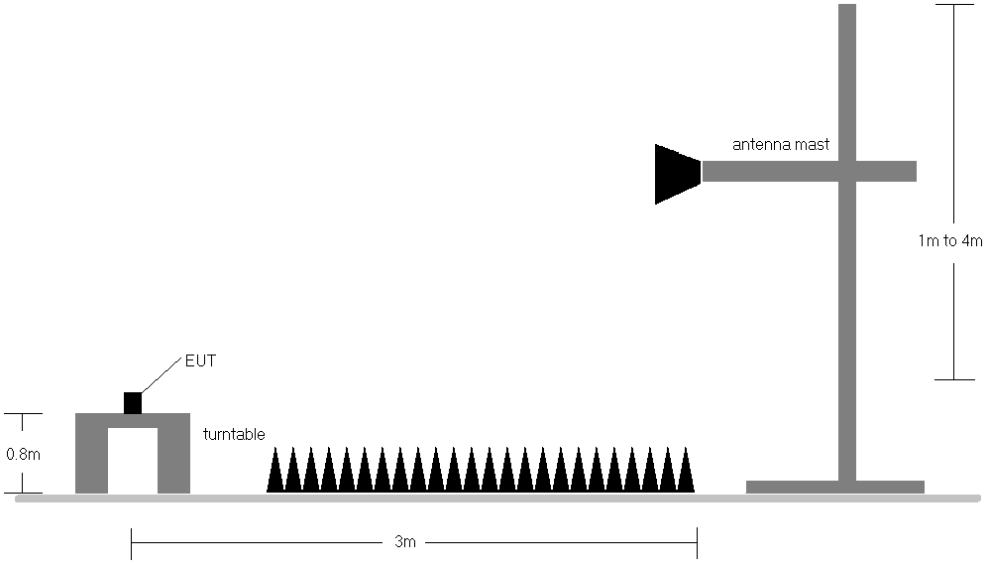


Figure 7-9. Test Instrument & Measurement Setup

Test Notes

1) 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.

2) This unit was tested with its standard battery.

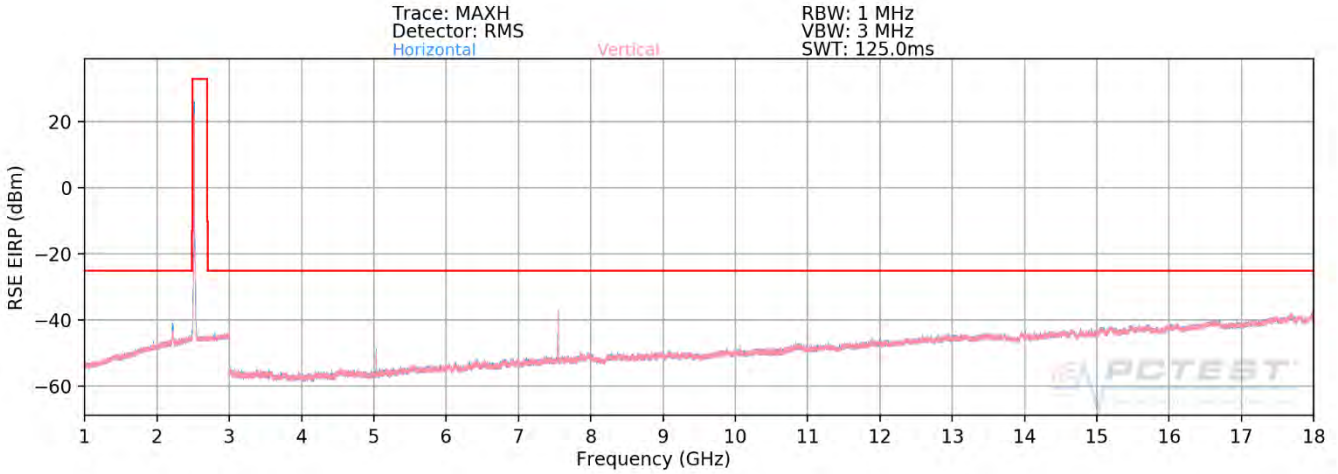
3) Radiated spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. The worst case (highest) emissions were found while operating with QPSK modulation with both carriers set to transmit using 1RB.

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

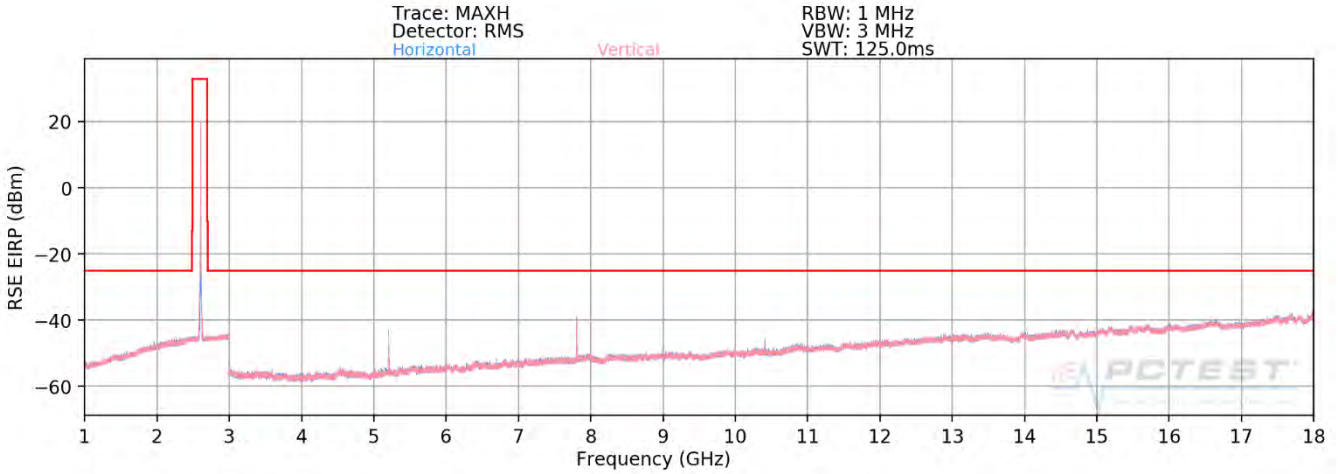
5) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

6) No significant emissions were found as a result of two uplink carriers operating contiguously.

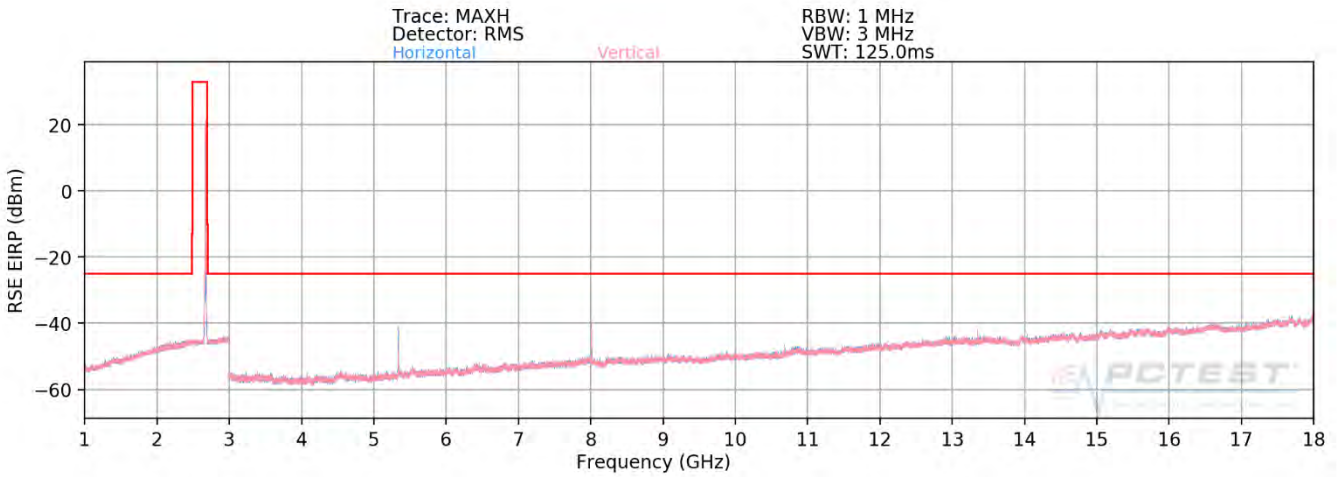
Band 41 ULCA



Plot 7-232. Radiated Spurious Plot 1GHz - 18GHz (ULCA PCC/SCC: 1RB – Low Channel)



Plot 7-233. Radiated Spurious Plot 1GHz - 18GHz (ULCA PCC/SCC: 1RB – Mid Channel)



Plot 7-234. Radiated Spurious Plot 1GHz - 18GHz (ULCA PCC/SCC: 1RB – High Channel)

OPERATING FREQUENCY (PCC):	2506.00	MHz
OPERATING FREQUENCY (SCC):	2525.80	MHz
CHANNEL (PCC):	39750	
CHANNEL (SCC):	39948	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5012.00	V	100	274	-58.16	8.75	-49.41	-24.4
7518.00	V	109	341	-47.64	9.32	-38.32	-13.3
10024.00	V	104	233	-53.79	9.80	-43.99	-19.0
12530.00	V	-	-	-49.89	8.87	-41.02	-16.0
15036.00	V	-	-	-48.45	8.84	-39.61	-14.6

Plot 7-25. Radiated Spurious Plot (ULCA B41 Left Carrier: RB 1 Offset 99, Right Carrier: RB 1 Offset 0)

OPERATING FREQUENCY (PCC):	2593.00	MHz
OPERATING FREQUENCY (SCC):	2612.80	MHz
CHANNEL (PCC):	40620	
CHANNEL (SCC):	40818	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5186.00	V	128	173	-58.20	9.03	-49.17	-24.2
7779.00	V	119	331	-42.86	9.29	-33.57	-8.6
10372.00	V	100	248	-53.22	9.50	-43.72	-18.7
12965.00	V	-	-	-50.44	8.75	-41.68	-16.7
15558.00	V	-	-	-44.66	8.47	-36.20	-11.2

Plot 7-26. Radiated Spurious Plot (ULCA B41 Left Carrier: RB 100 Offset 0, Right Carrier: RB 100 Offset 0)

OPERATING FREQUENCY (PCC):	2680.00	MHz
OPERATING FREQUENCY (SCC):	2660.20	MHz
CHANNEL (PCC):	41490	
CHANNEL (SCC):	41292	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5360.00	V	121	185	-55.52	8.99	-46.53	-21.5
8040.00	V	106	317	-42.70	9.35	-33.34	-8.3
10720.00	V	107	201	-52.30	9.39	-42.91	-17.9
13400.00	V	104	335	-45.97	8.67	-37.30	-12.3
16080.00	V	-	-	-44.08	8.46	-35.63	-10.6

Plot 7-27. Radiated Spurious Data (ULCA B41 Left Carrier: RB 1 Offset 0, Right Carrier: RB 1 Offset 99)

7.10 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/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 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24, Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/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

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

None

Band 12 Frequency Stability Measurements

OPERATING FREQUENCY:	707,500,000	Hz
CHANNEL:	23790	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	707,499,984	-16	-0.0000023
100 %		- 20	707,500,305	305	0.0000431
100 %		- 10	707,500,013	13	0.0000018
100 %		0	707,500,230	230	0.0000325
100 %		+ 10	707,500,167	167	0.0000236
100 %		+ 20	707,500,353	353	0.0000499
100 %		+ 30	707,499,820	-180	-0.0000254
100 %		+ 40	707,500,020	20	0.0000028
100 %		+ 50	707,499,873	-127	-0.0000180
BATT. ENDPOINT	2.76	+ 20	707,499,769	-231	-0.0000327

Table 7-28. Frequency Stability Data (Band 12)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 12 Frequency Stability Measurements

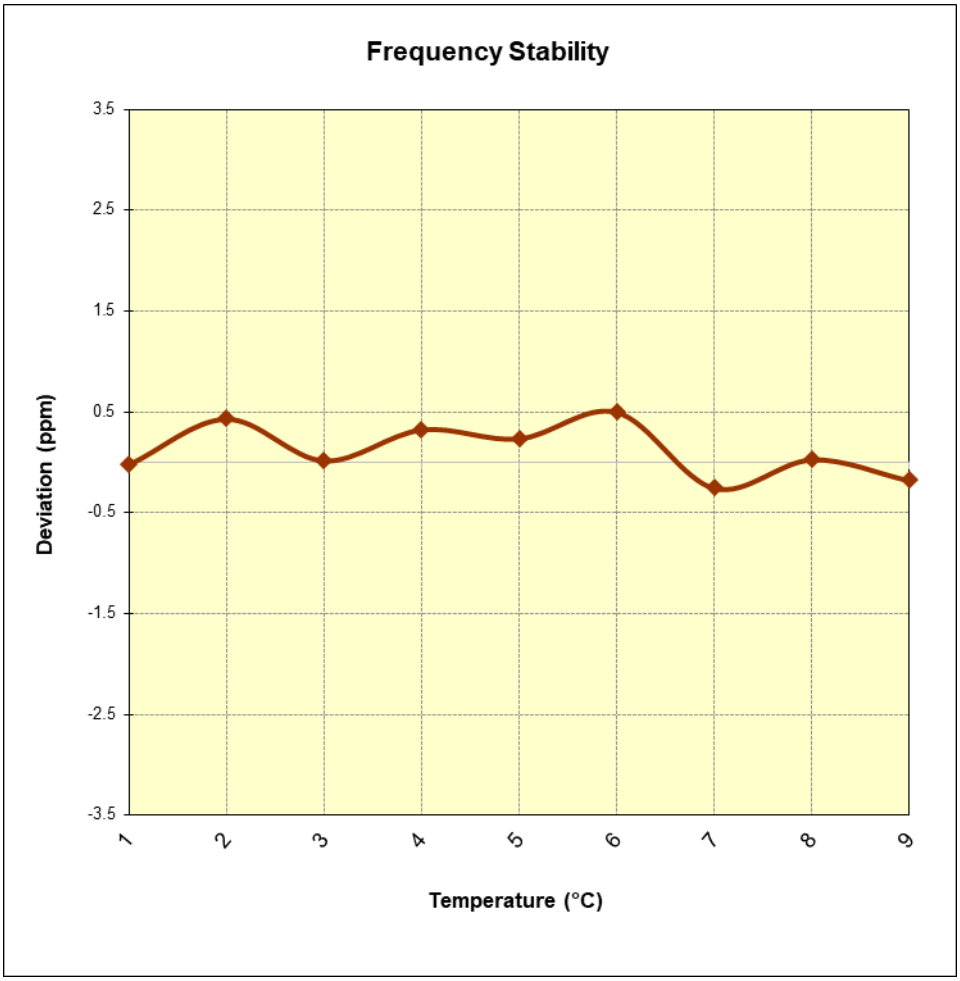


Figure 7-10. Frequency Stability Graph (Band 12)

Band 13 Frequency Stability Measurements

OPERATING FREQUENCY:	782,000,000	Hz
CHANNEL:	23230	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	781,999,961	-39	-0.0000050
100 %		- 20	782,000,119	119	0.0000152
100 %		- 10	782,000,048	48	0.0000061
100 %		0	782,000,336	336	0.0000430
100 %		+ 10	782,000,088	88	0.0000113
100 %		+ 20	781,999,997	-3	-0.0000004
100 %		+ 30	782,000,024	24	0.0000031
100 %		+ 40	781,999,992	-8	-0.0000010
100 %		+ 50	781,999,936	-64	-0.0000082
BATT. ENDPOINT	2.76	+ 20	782,000,071	71	0.0000091

Table 7-29. Frequency Stability Data (Band 13)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 13 Frequency Stability Measurements

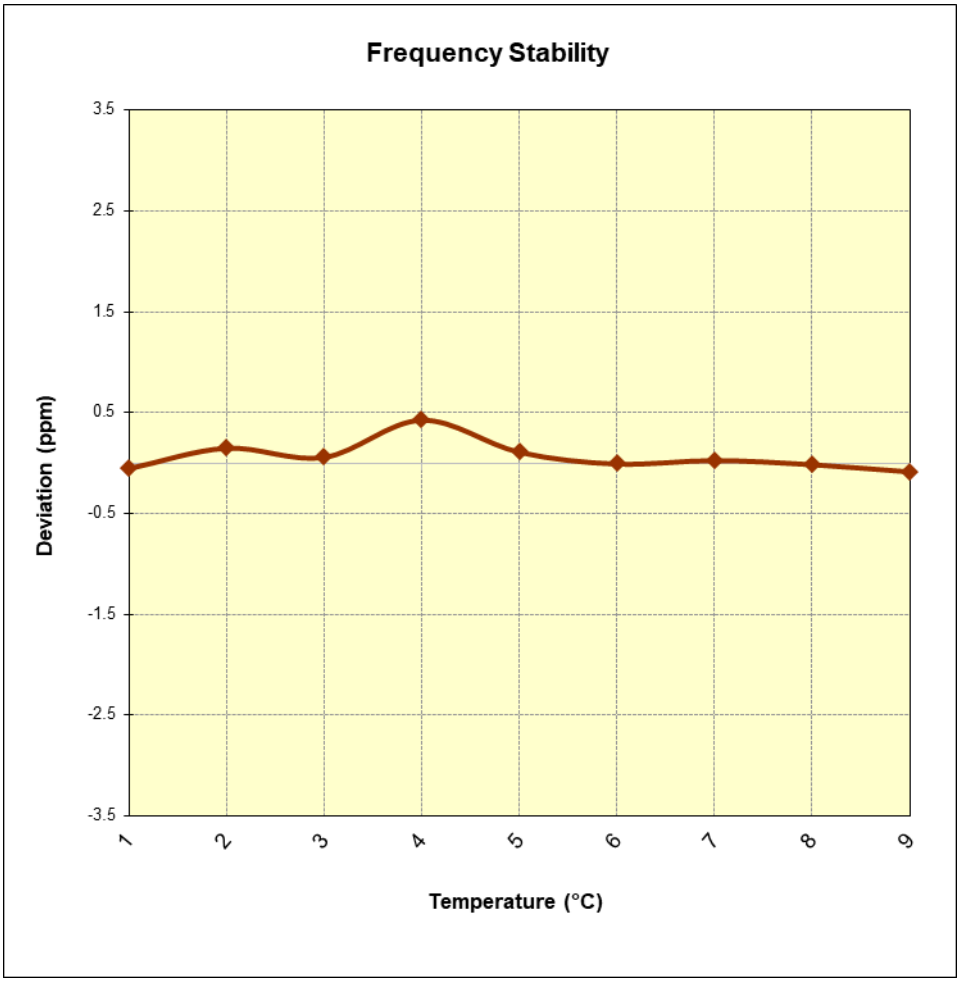


Figure 7-11. Frequency Stability Graph (Band 13)

Band 5 Frequency Stability Measurements

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	
REFERENCE VOLTAGE:	3.80	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	836,500,220	220	0.0000263
100 %		- 20	836,499,793	-207	-0.0000247
100 %		- 10	836,500,123	123	0.0000147
100 %		0	836,500,053	53	0.0000063
100 %		+ 10	836,499,908	-92	-0.0000110
100 %		+ 20	836,500,156	156	0.0000186
100 %		+ 30	836,499,613	-387	-0.0000463
100 %		+ 40	836,499,762	-238	-0.0000285
100 %		+ 50	836,500,026	26	0.0000031
BATT. ENDPOINT	2.76	+ 20	836,499,745	-255	-0.0000305

Table 7-30. Frequency Stability Data (Band 5)

Band 5 Frequency Stability Measurements

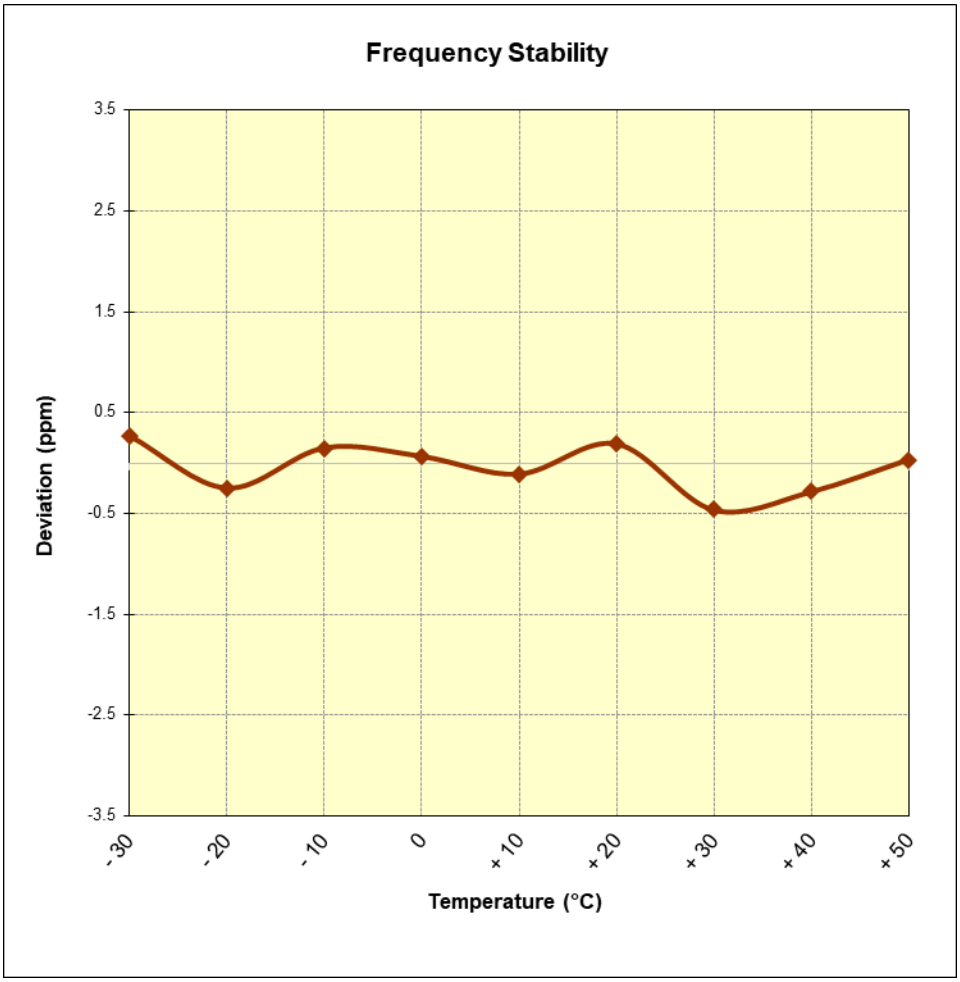


Figure 7-12. Frequency Stability Graph (Band 5)

Band 4 Frequency Stability Measurements

OPERATING FREQUENCY:	1,732,500,000	Hz
CHANNEL:	20175	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	1,732,499,823	-177	-0.0000102
100 %		- 20	1,732,499,974	-26	-0.0000015
100 %		- 10	1,732,499,886	-114	-0.0000066
100 %		0	1,732,500,055	55	0.0000032
100 %		+ 10	1,732,499,622	-378	-0.0000218
100 %		+ 20	1,732,500,141	141	0.0000081
100 %		+ 30	1,732,500,119	119	0.0000069
100 %		+ 40	1,732,500,057	57	0.0000033
100 %		+ 50	1,732,499,871	-129	-0.0000074
BATT. ENDPOINT	2.76	+ 20	1,732,499,968	-32	-0.0000018

Table 7-31. Frequency Stability Data (Band 4)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 4 Frequency Stability Measurements

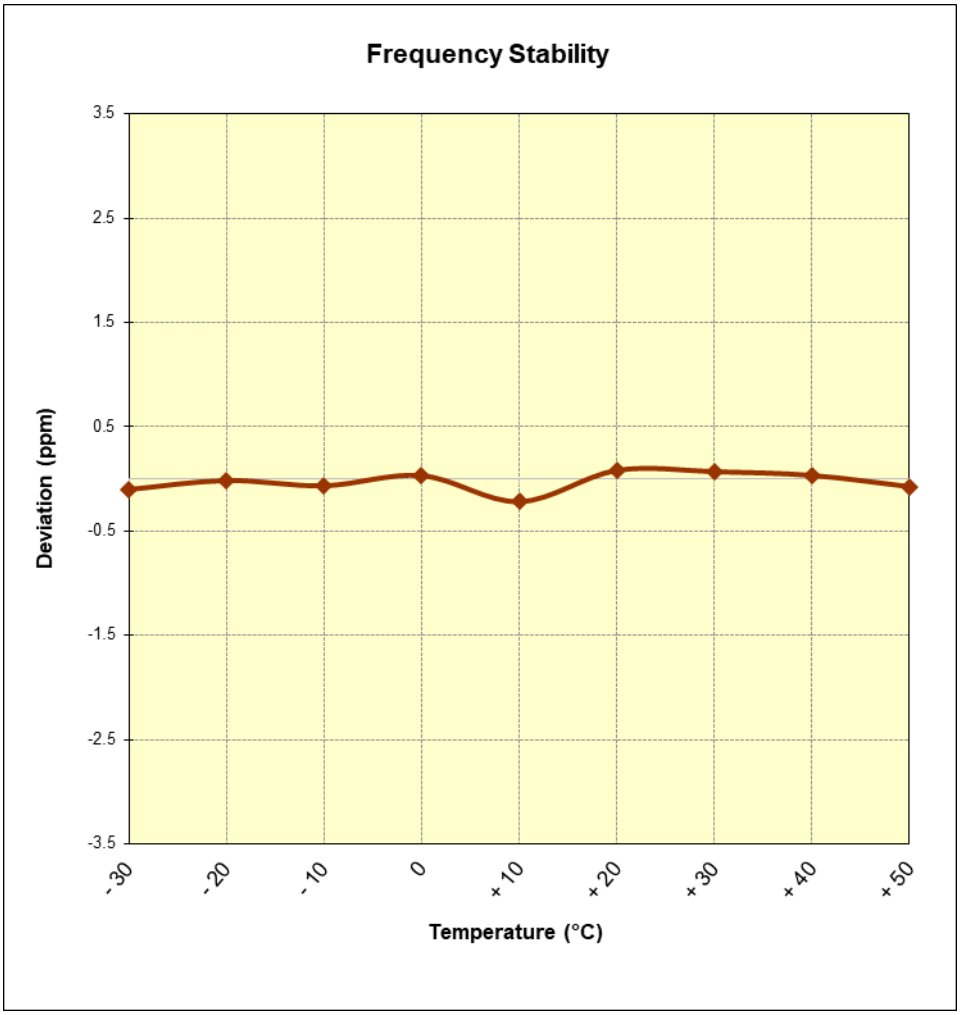


Figure 7-13. Frequency Stability Graph (Band 4)

Band 41 Frequency Stability Measurements

OPERATING FREQUENCY:	2,593,000,000	Hz
CHANNEL:	40620	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	2,592,999,781	-219	-0.0000084
100 %		- 20	2,592,999,731	-269	-0.0000104
100 %		- 10	2,593,000,045	45	0.0000017
100 %		0	2,592,999,779	-221	-0.0000085
100 %		+ 10	2,592,999,886	-114	-0.0000044
100 %		+ 20	2,593,000,158	158	0.0000061
100 %		+ 30	2,593,000,009	9	0.0000003
100 %		+ 40	2,592,999,765	-235	-0.0000091
100 %		+ 50	2,593,000,232	232	0.0000089
BATT. ENDPOINT	2.76	+ 20	2,592,999,963	-37	-0.0000014

Table 7-32. Frequency Stability Data (Band 41)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 41 Frequency Stability Measurements

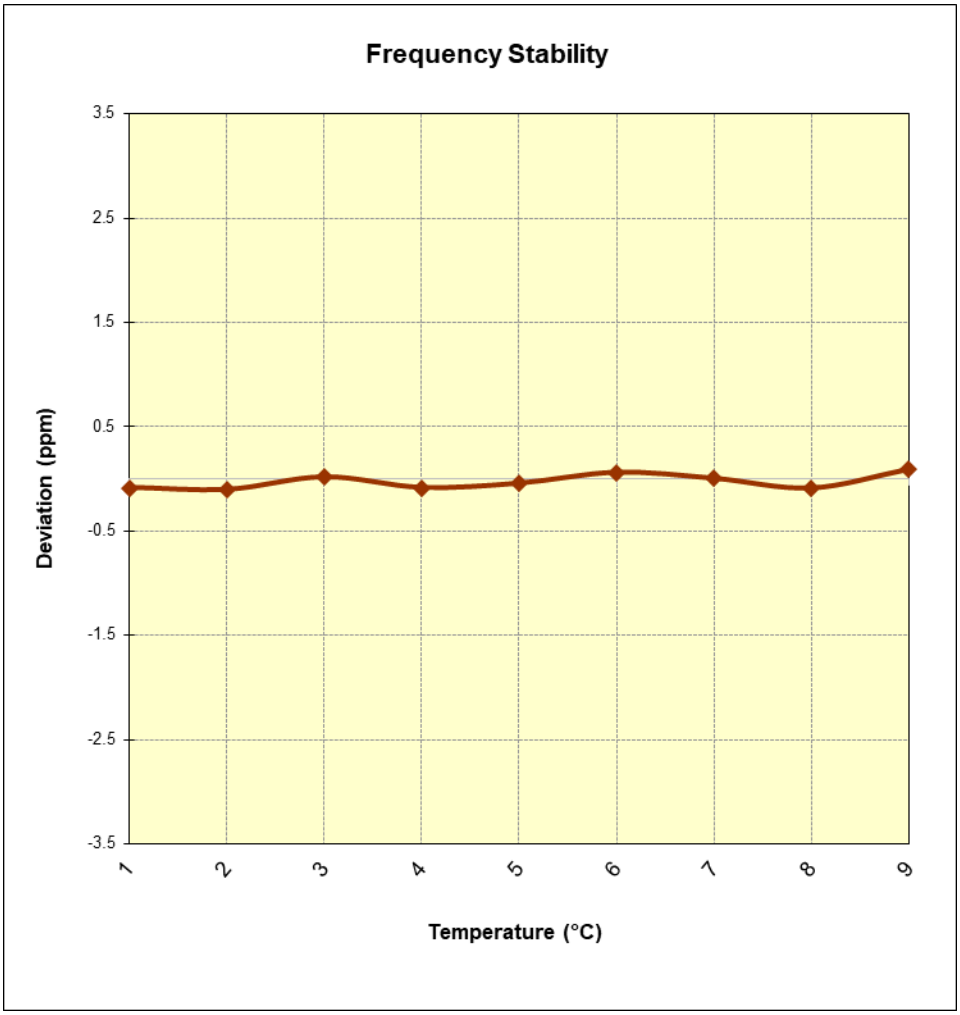


Figure 7-14. Frequency Stability Graph (Band 41)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMG981JPN** complies with all the requirements of Part 22 & 27 of the FCC Rules for LTE operation only.