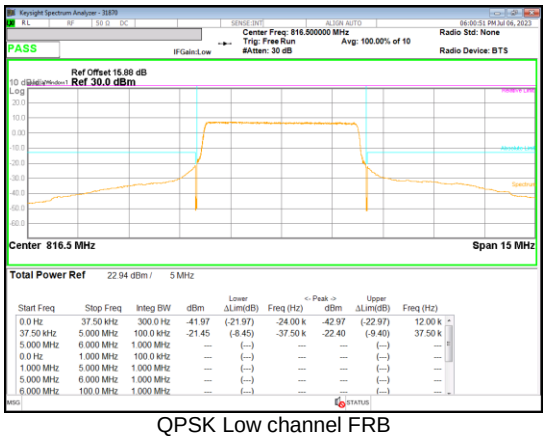
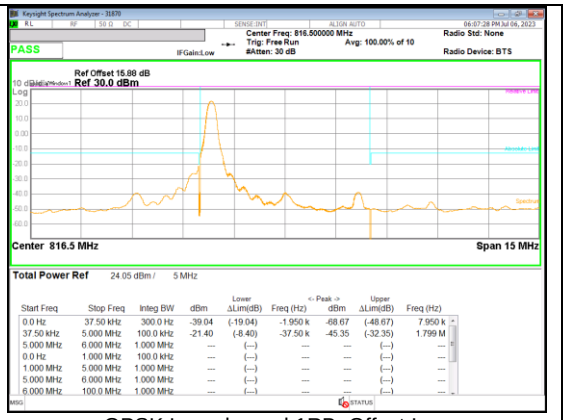
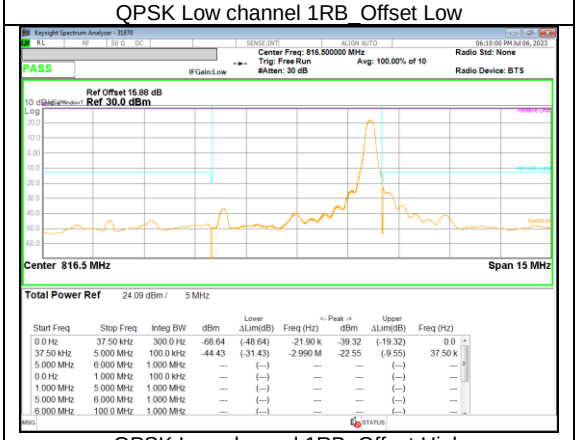
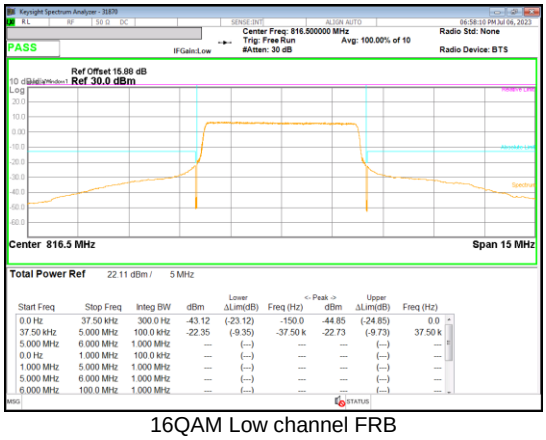
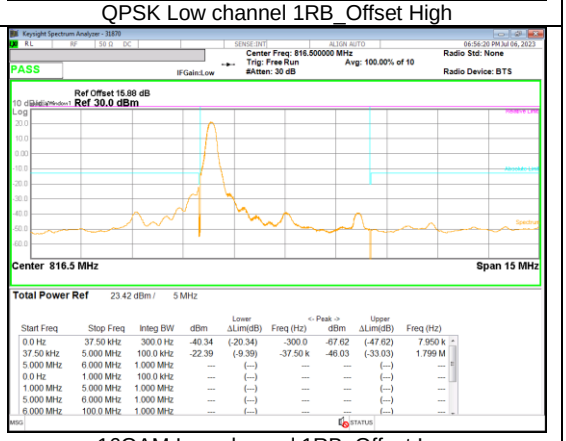
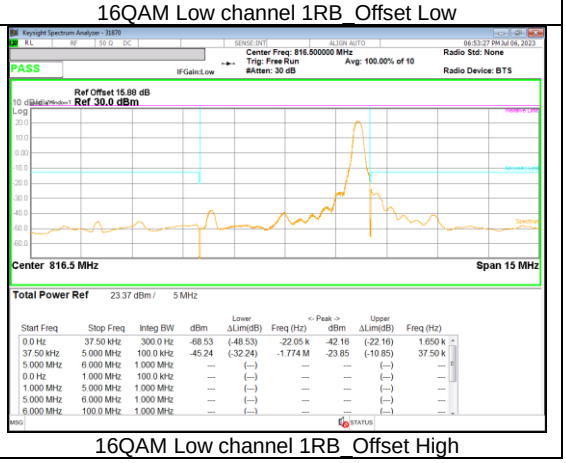
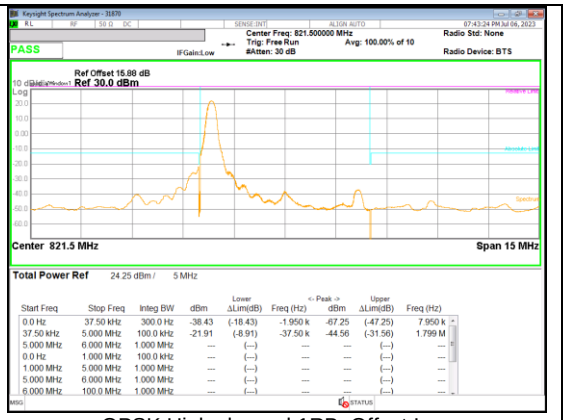
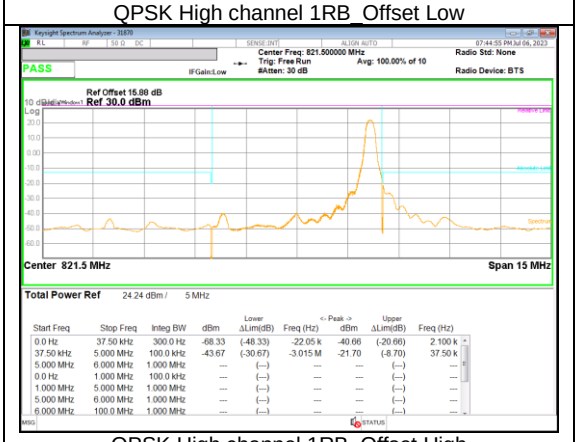
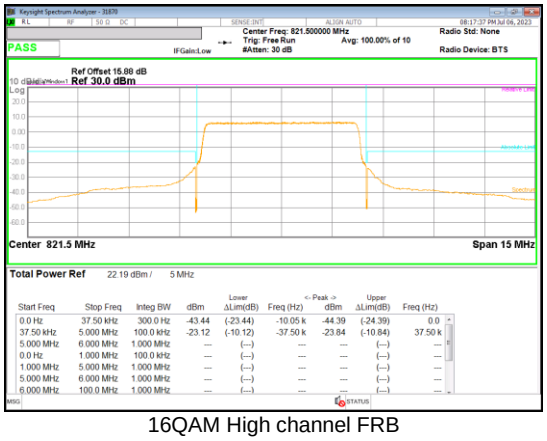
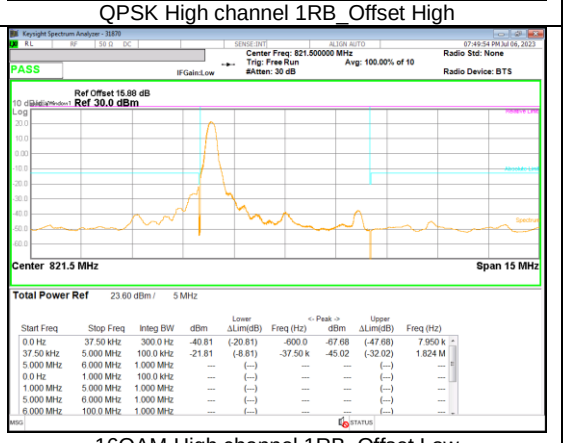
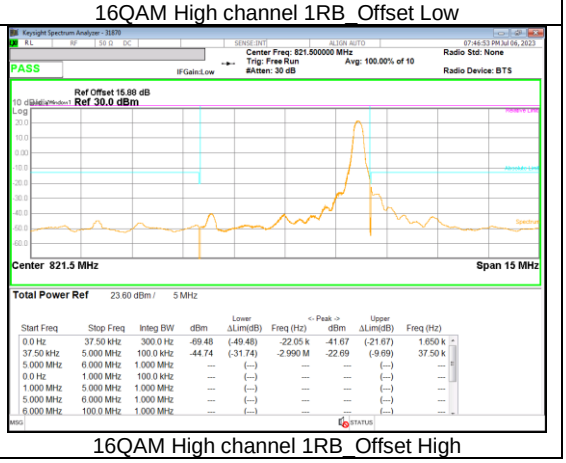
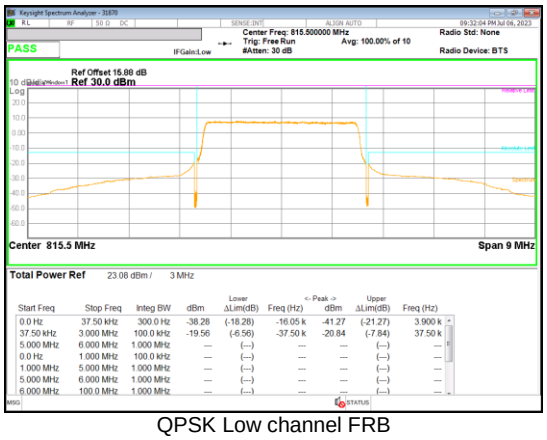
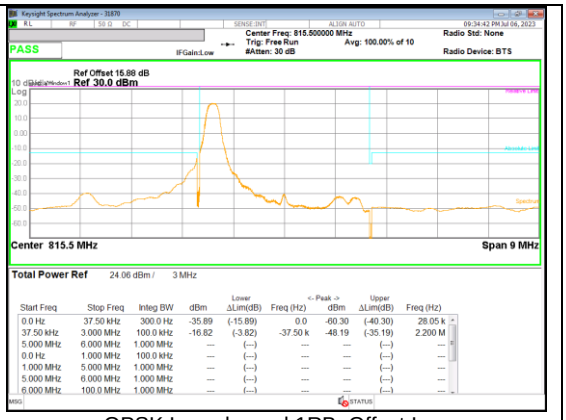
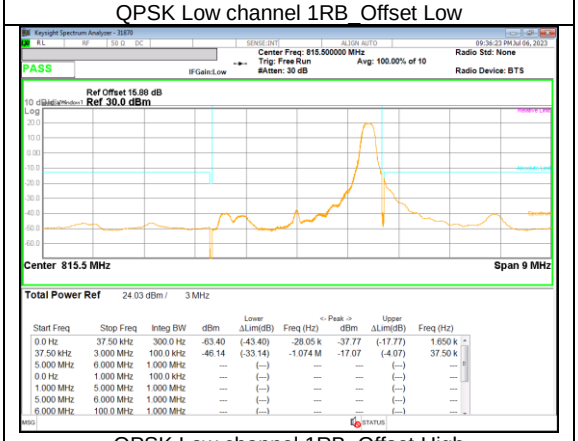
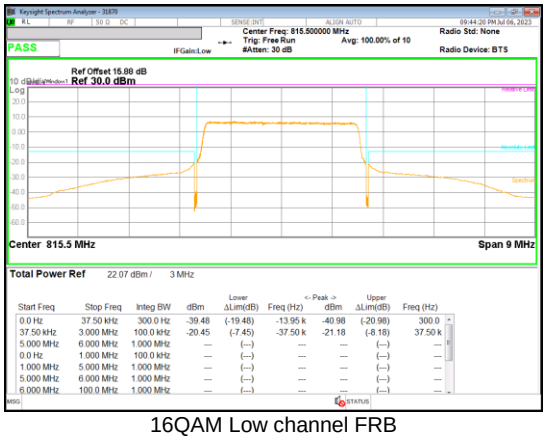
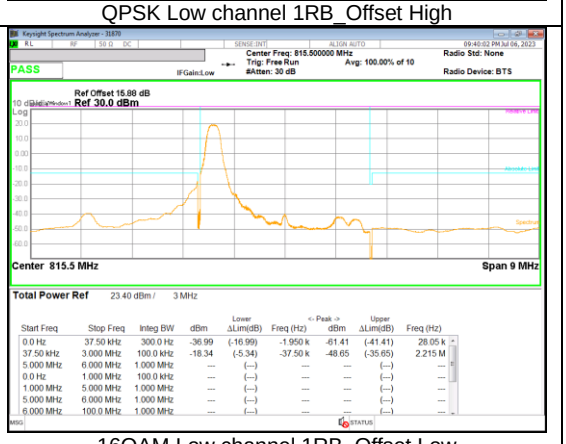
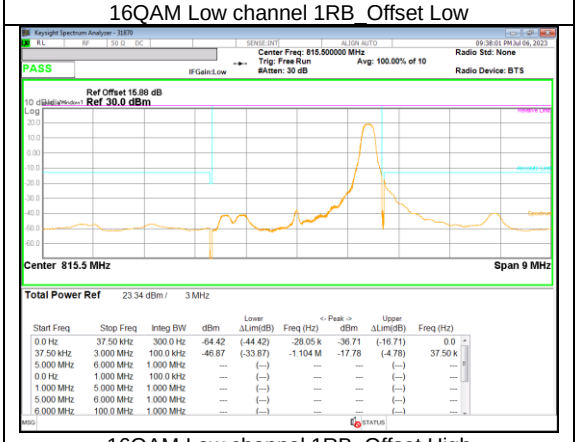
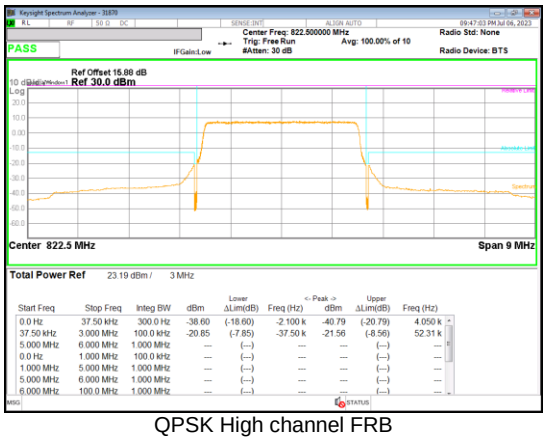
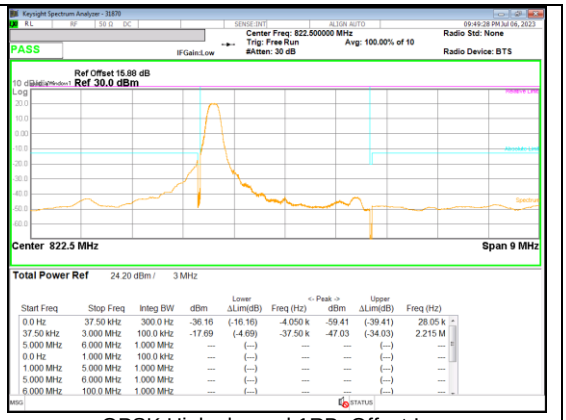
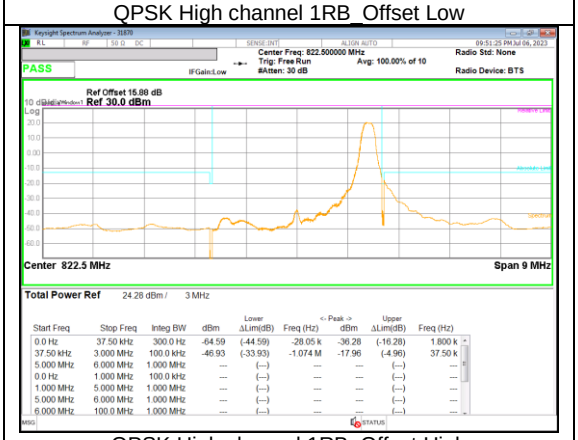
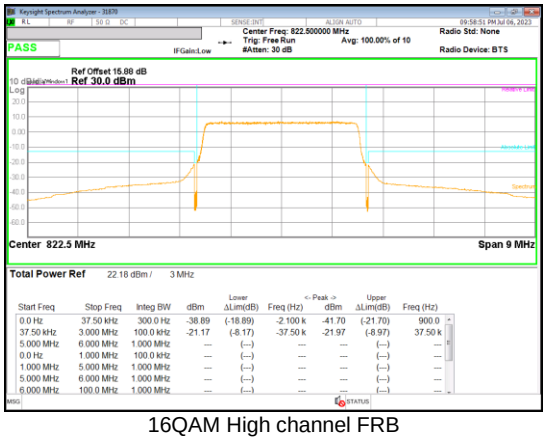
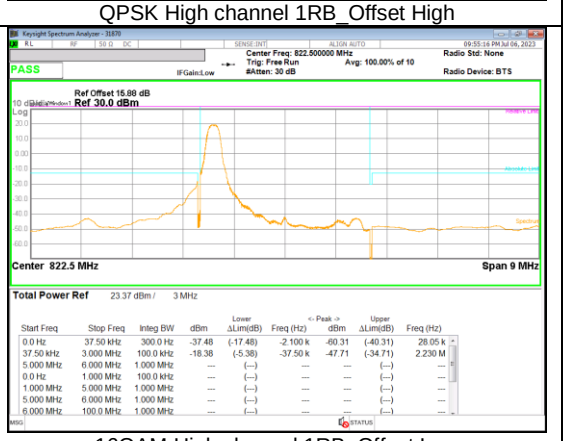
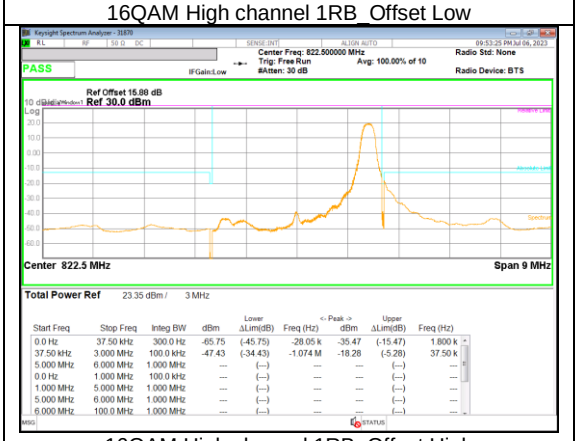
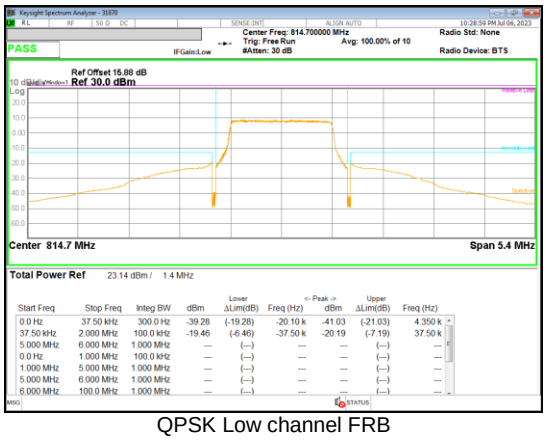
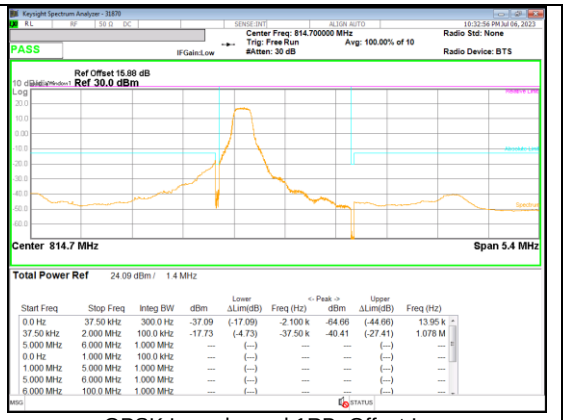
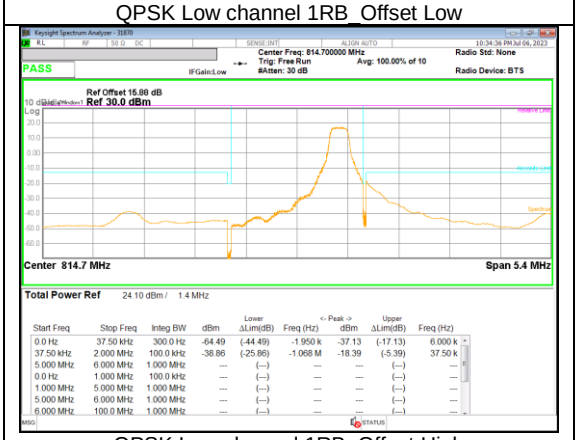
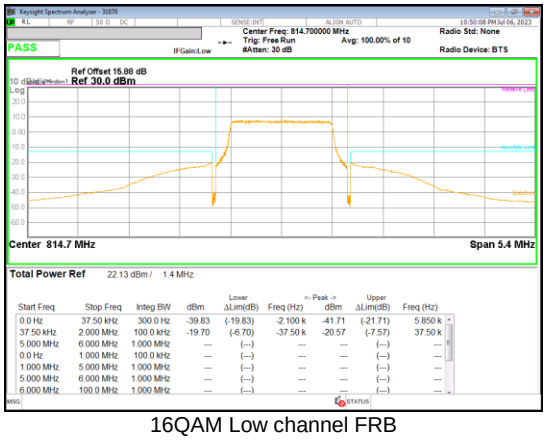
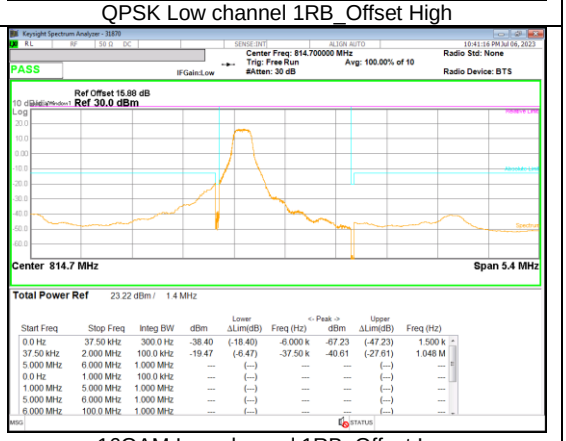
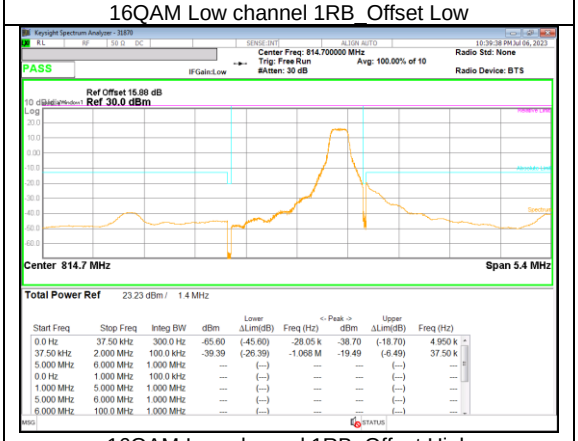
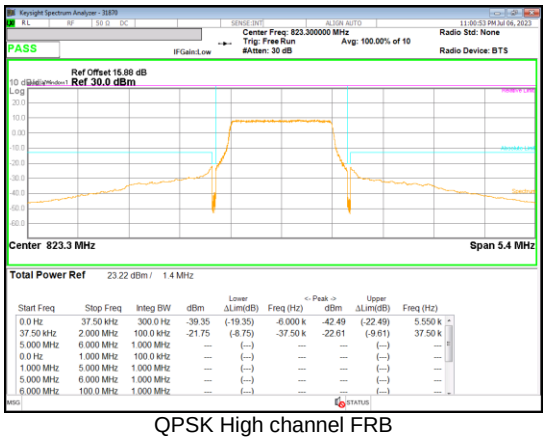
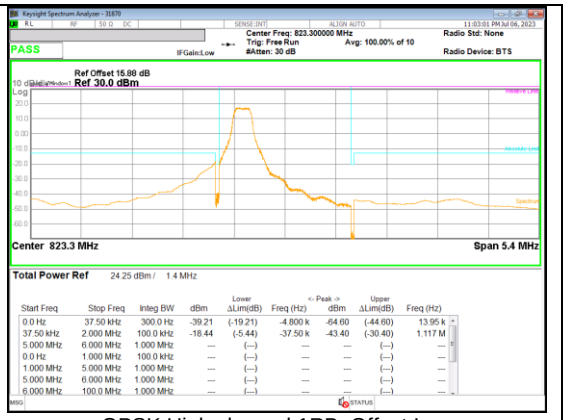
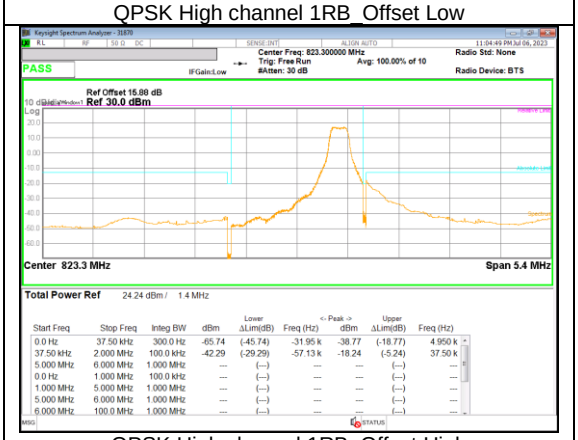
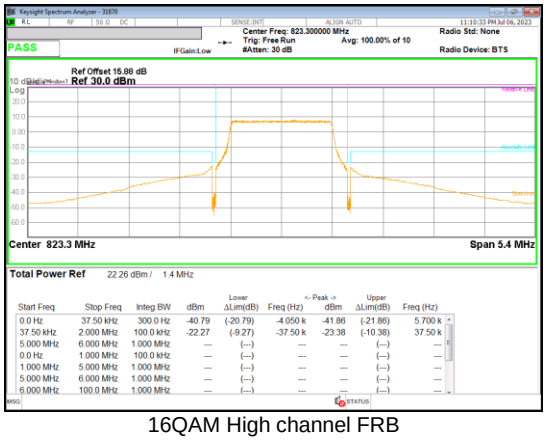
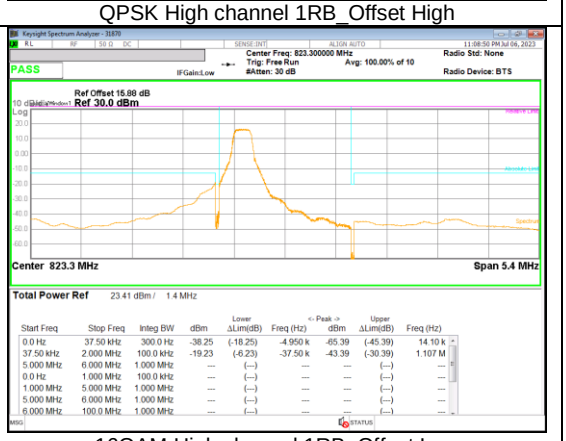
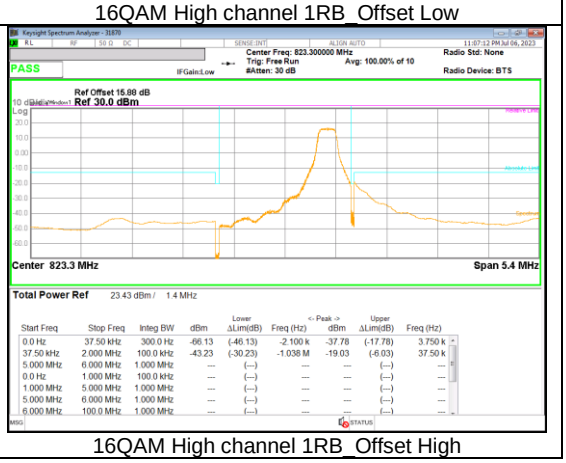
5MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB_Offset Low
		 QPSK Low channel 1RB_Offset High
	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low
		 16QAM Low channel 1RB_Offset High

5MHz	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low
		 QPSK High channel 1RB_Offset High
	 16QAM High channel FRB	 16QAM High channel 1RB_Offset Low
		 16QAM High channel 1RB_Offset High

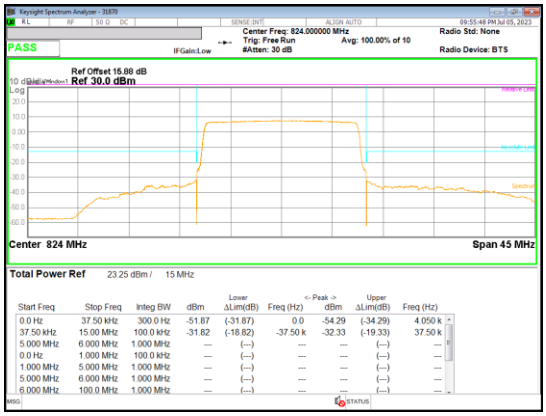
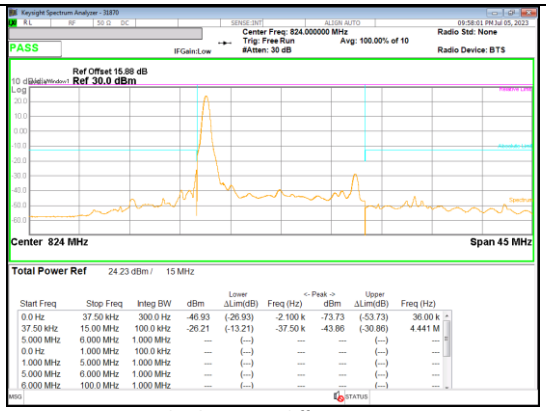
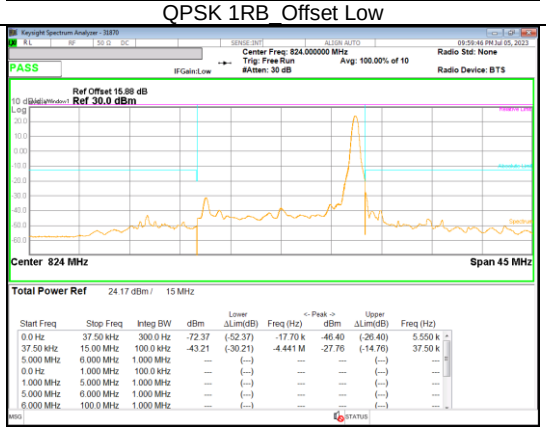
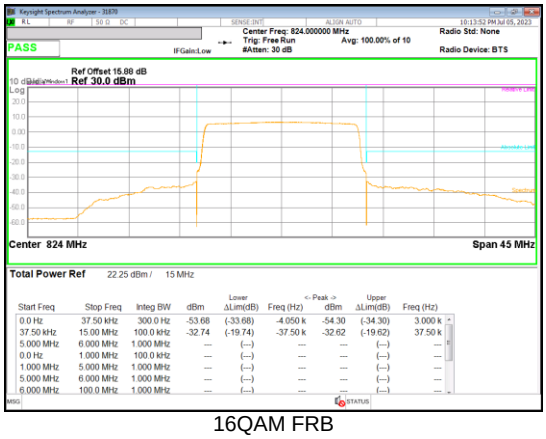
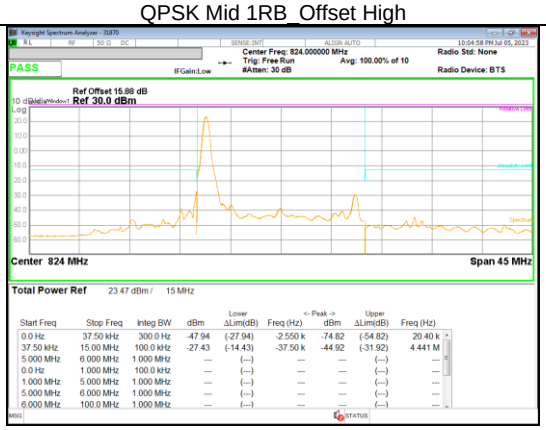
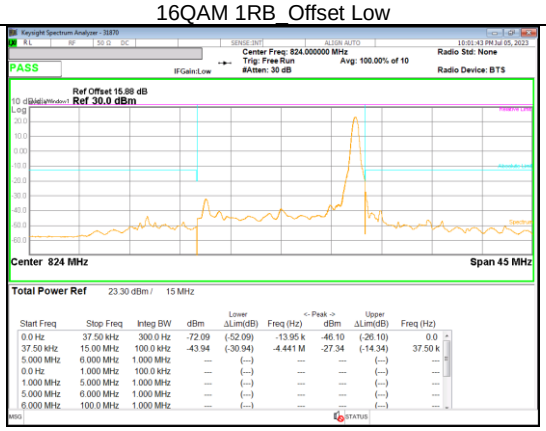
3MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB_Offset Low  QPSK Low channel 1RB_Offset High
	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low  16QAM Low channel 1RB_Offset High

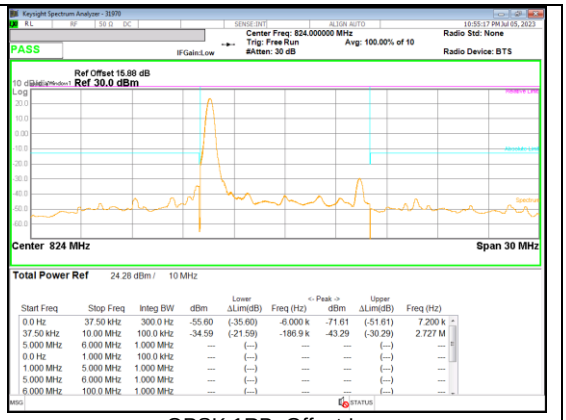
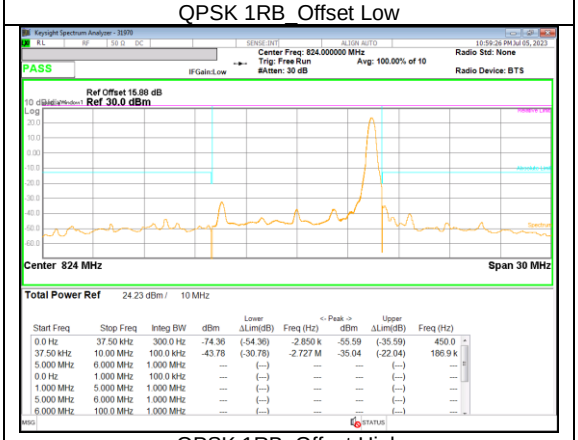
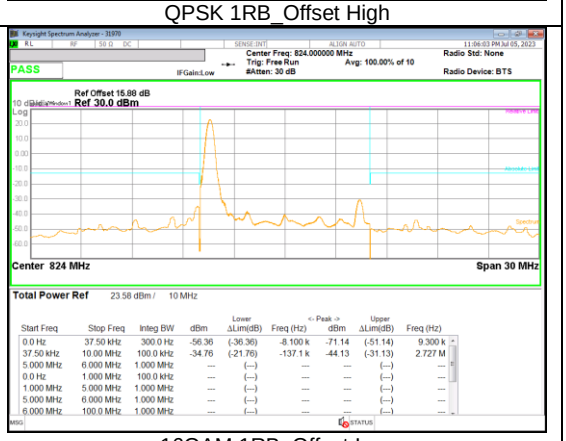
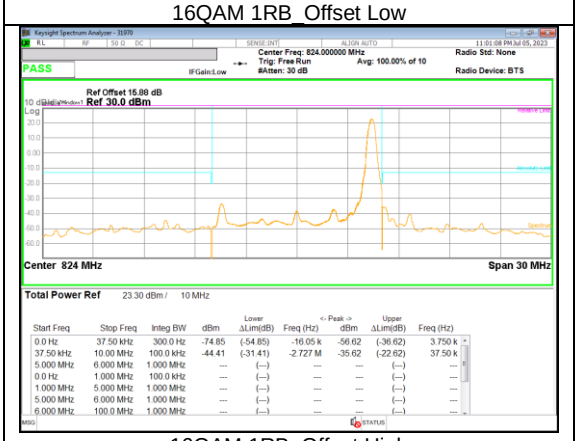
3MHz	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low
		 QPSK High channel 1RB_Offset High
	 16QAM High channel FRB	 16QAM High channel 1RB_Offset Low
		 16QAM High channel 1RB_Offset High

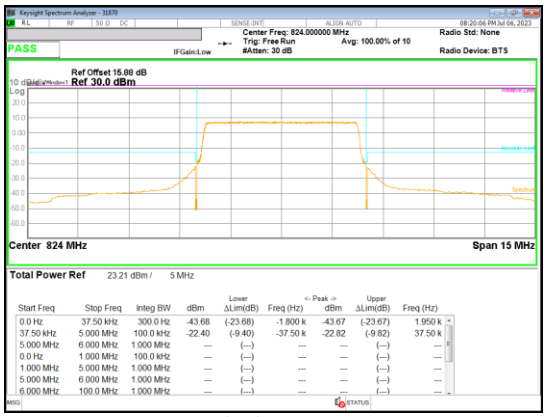
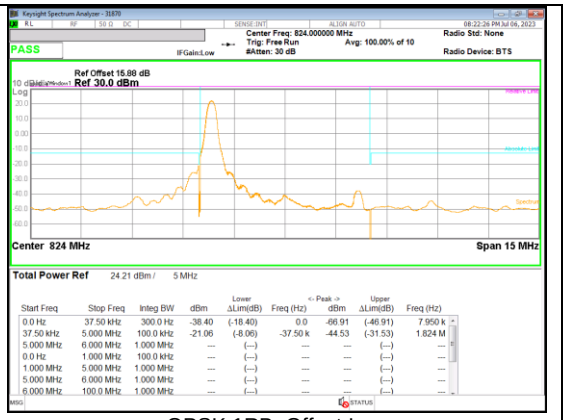
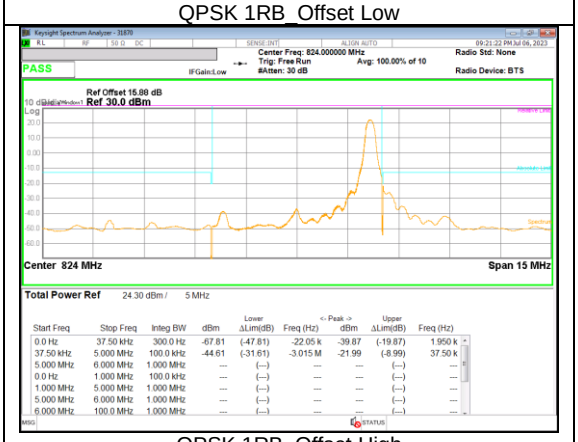
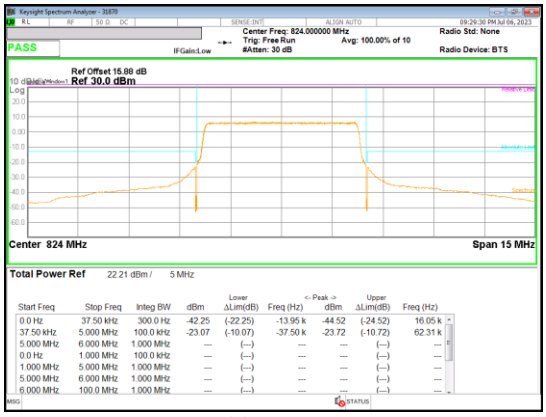
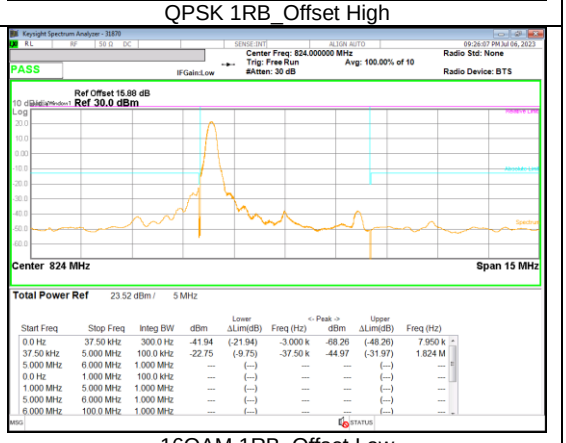
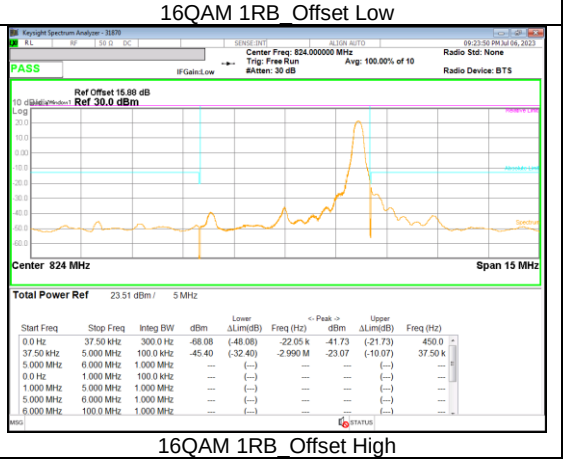
1.4MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB_Offset Low
		 QPSK Low channel 1RB_Offset High
	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low
		 16QAM Low channel 1RB_Offset High

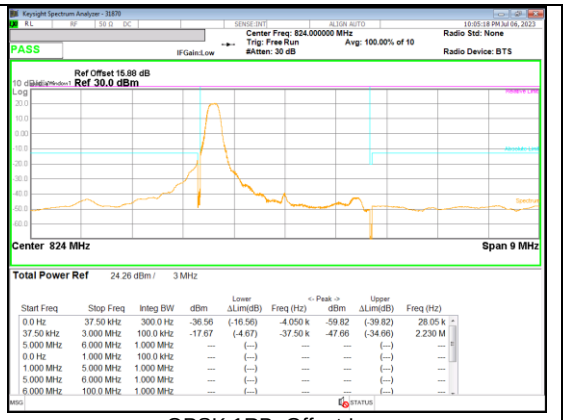
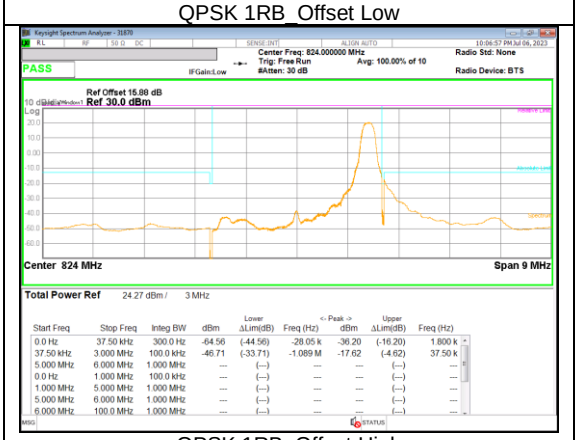
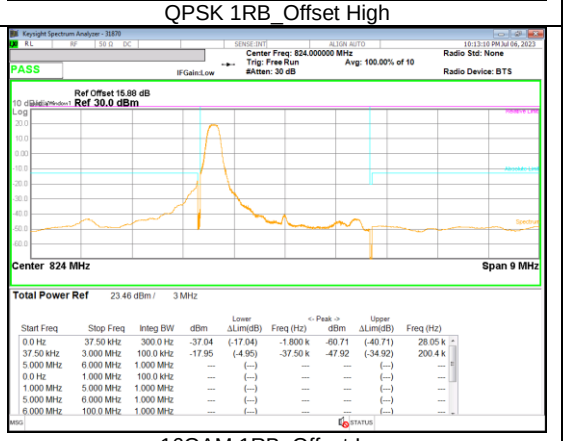
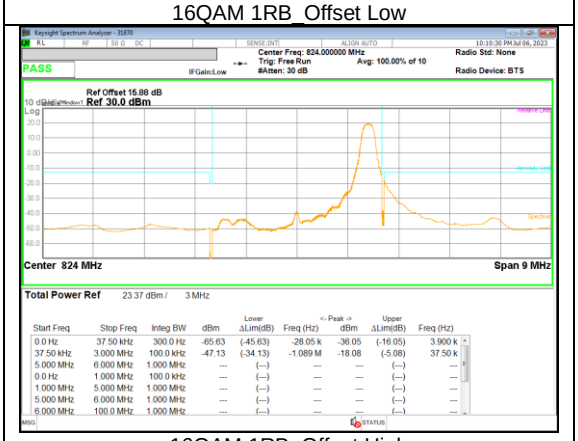
1.4MHz	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low
		 QPSK High channel 1RB_Offset High
	 16QAM High channel FRB	 16QAM High channel 1RB_Offset Low
		 16QAM High channel 1RB_Offset High

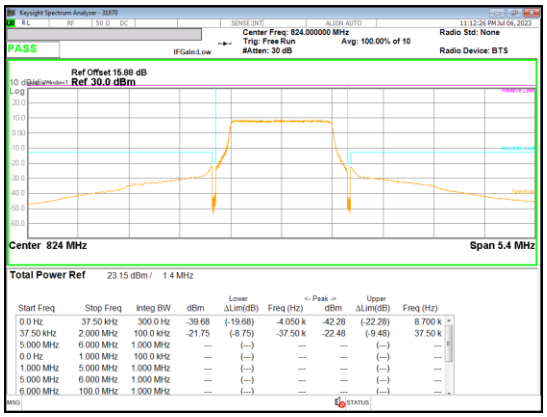
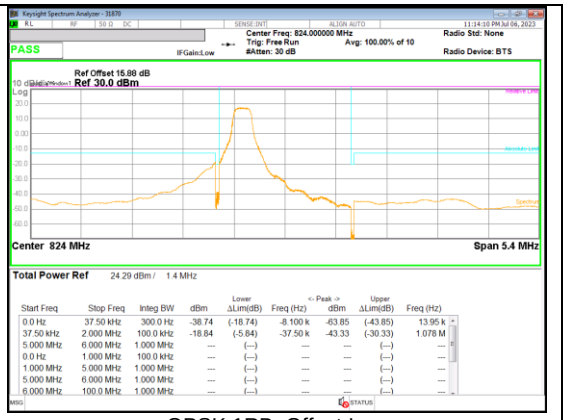
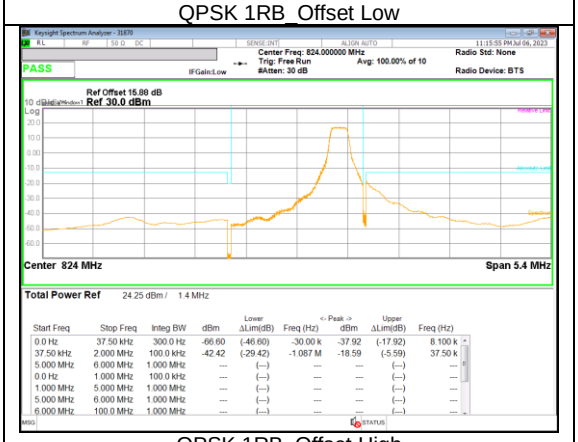
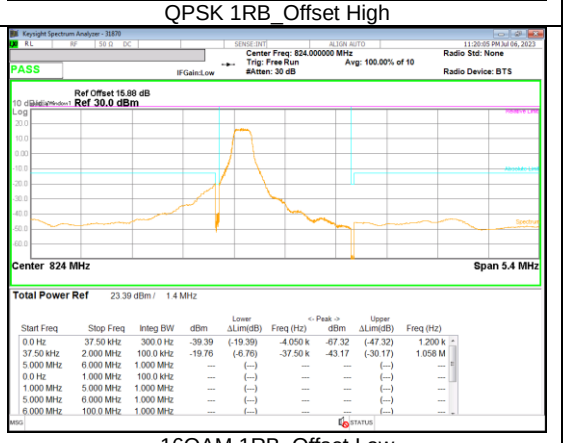
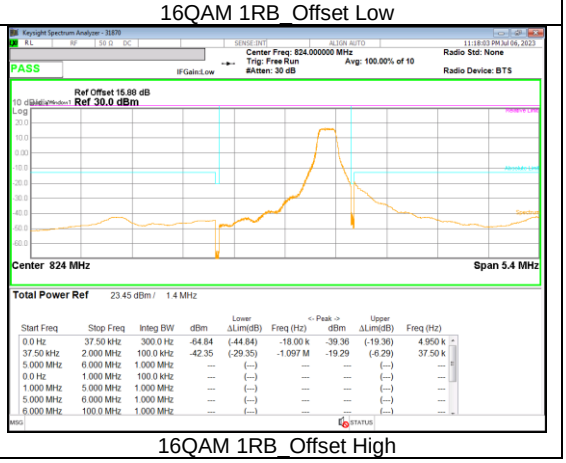
LTE Band 26 (Straddle)

15MHz	 QPSK FRB	 QPSK 1RB_Offset Low
		 QPSK Mid 1RB_Offset High
	 16QAM FRB	 16QAM 1RB_Offset Low
		 16QAM 1RB_Offset High

10MHz	 QPSK FRB	 QPSK 1RB_Offset Low  QPSK 1RB_Offset High
	 16QAM FRB	 16QAM 1RB_Offset Low  16QAM 1RB_Offset High

5MHz	 QPSK FRB	 QPSK 1RB_Offset Low
		 QPSK 1RB_Offset High
	 16QAM FRB	 16QAM 1RB_Offset Low
		 16QAM 1RB_Offset High

3MHz	 QPSK FRB	 QPSK 1RB_Offset Low  QPSK 1RB_Offset High
	 16QAM FRB	 16QAM 1RB_Offset Low  16QAM 1RB_Offset High

1.4MHz	 QPSK FRB	 QPSK 1RB_Offset Low  QPSK 1RB_Offset High
	 16QAM FRB	 16QAM 1RB_Offset Low  16QAM 1RB_Offset High

8.5. CONDUCTED SPURIOUS EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917 and 90.691

LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

Part 90.691(a):
(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log_{10}(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.(NOTE : Use 100kHz reference bandwidth)

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01
The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

a) Set the RBW = 100 kHz for emission below 1 GHz;

   (Tests were performed 1MHz [Worst case], to sweep 1 time for all frequency range)

b) Set VBW ≥ 3 × RBW;

c) Set span ≥ 1.5 times the OBW;

d) Sweep time = auto couple;

e) Detector = rms;

f) Ensure that the number of measurement points = Max (40001);

g) Trace mode = average(WCDMA, LTE, 5G NR);

NOTE1

5G NR: All Waveforms (CP-OFDM vs DFT-s_OFDM) and modulations (π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM) 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.

NOTE2

Please refer to section 5.4 for bandwidth and RB setting about LTE, 5G NR bands.

RESULTS

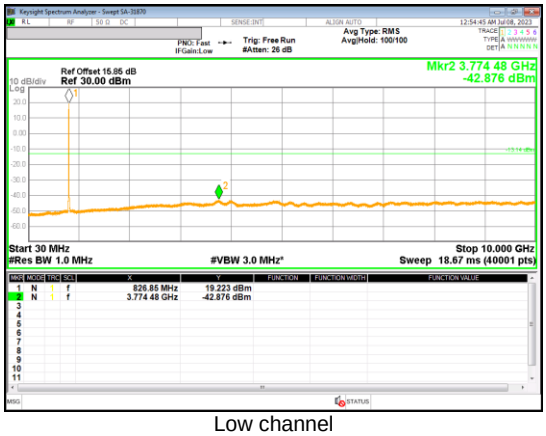
See the following pages.

8.5.1. OUT OF BAND EMISSIONS RESULT

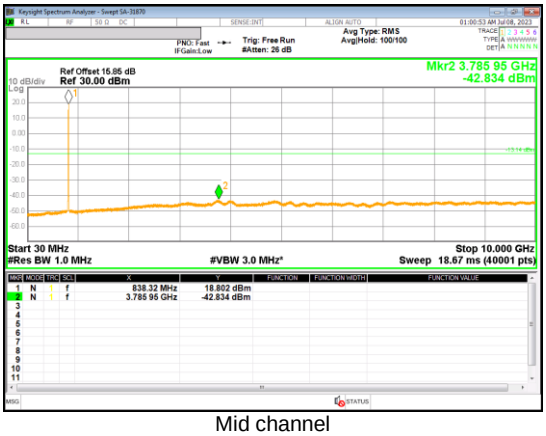
WCDMA

Band 5

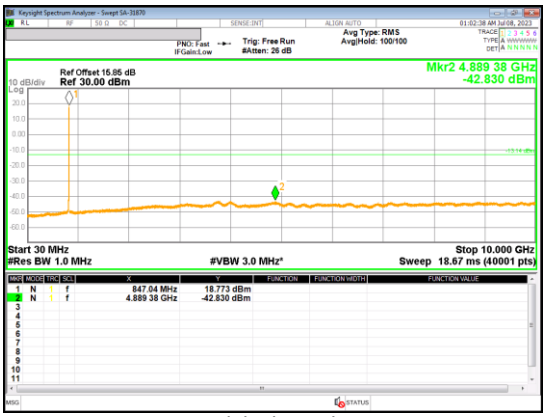
REL99



Low channel

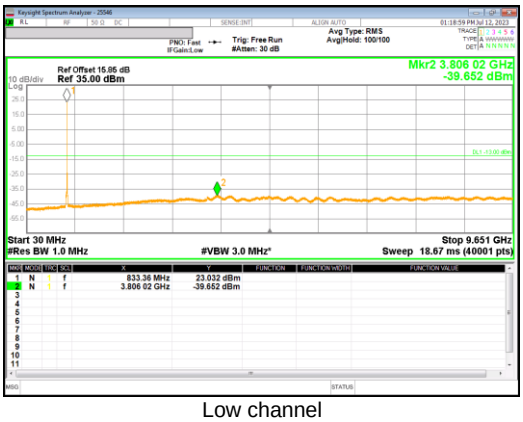
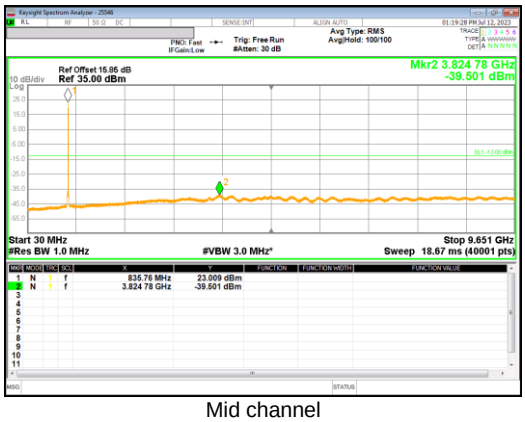
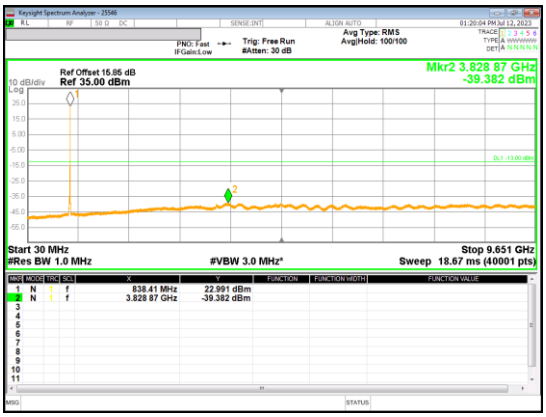


Mid channel

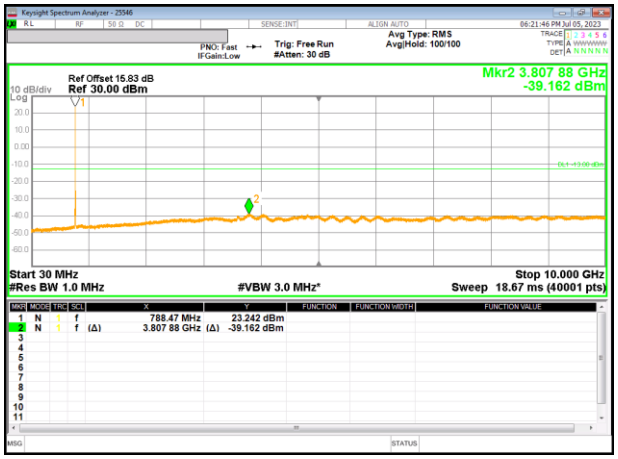


High channel

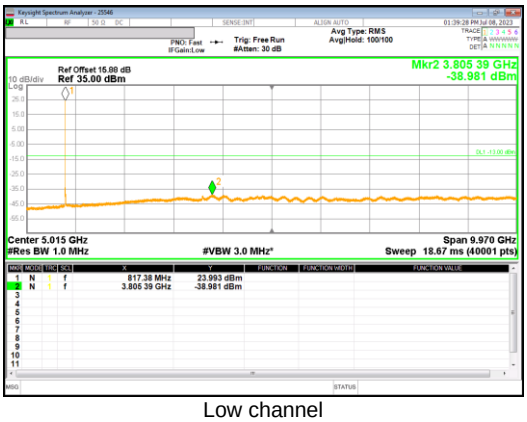
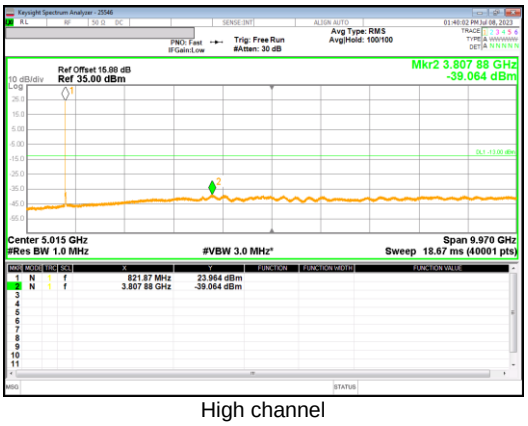
LTE Band 5B (UL CA)

10+10 MHz QPSK	 Low channel	 Mid channel
	 High channel	

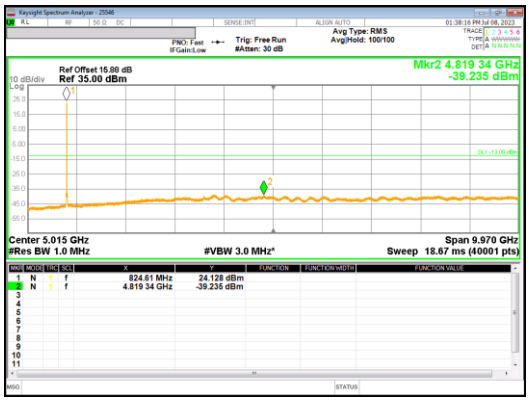
LTE Band 14

10 MHz QPSK	 Mid channel

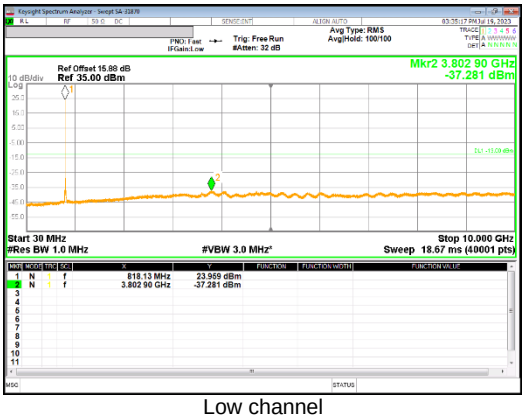
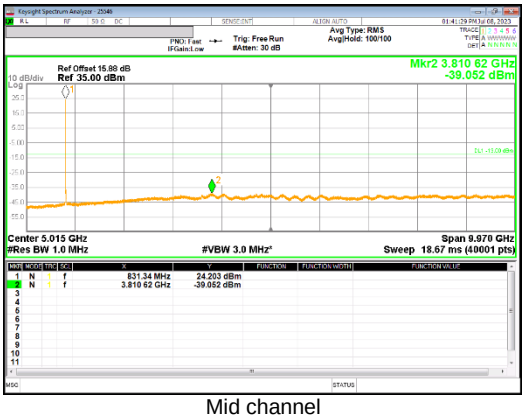
LTE Band 26(Part 90)

3 MHz QPSK	 Low channel	 High channel

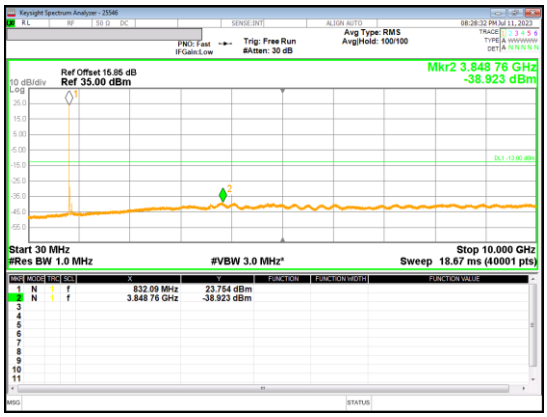
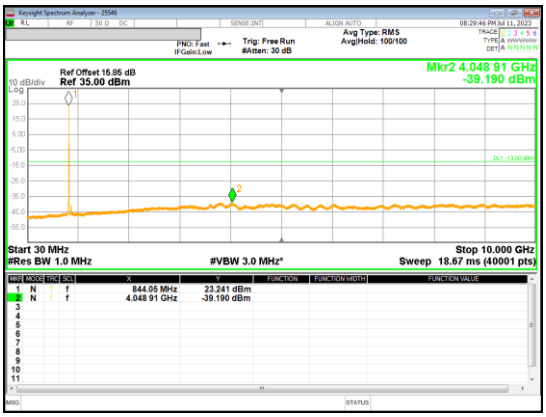
LTE Band 26 (Straddle)

15 MHz QPSK	 Straddle channel

LTE Band 26 (Part 22)

1.4 MHz QPSK	 Low channel	 Mid channel
	 High channel	

NR Band n5

10 MHz QPSK	 DFT-OFDM_Low channel	 DFT-OFDM_Mid channel
	 DFT-OFDM_High channel	

8.6. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355 and §90.213

LIMITS

§22.355 - The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

§90.213 - The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

NOTE

Test were performed each lowest or highest frequency on the modulation condition of more wide bandwidth.(Please refer to section 9.1.1 OBW results)

RESULTS

See the following pages.

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8.6.1. FREQUENCY STABILITY RESULTS

WCDMA Band 5

Test Date	2023-06-14
Test Engineer	19568

Limit: +- 2.5 ppm =	Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20°C Low Channel 2066.000 Hz High Channel 2116.500 Hz					
Power Supply [Vdc]	Environment Temperature [°C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	826.40000434	0.000	846.60000326	0.000	2.5
3.85	40	826.40000416	0.000	846.60000384	-0.001	2.5
3.85	30	826.40000414	0.000	846.60000426	-0.001	2.5
3.85	***20***	***826.40000449***	***0.000***	***846.60000327***	***0.000***	***2.5***
3.85	10	826.40000397	0.001	846.60000236	0.001	2.5
3.85	0	826.40000359	0.001	846.60000279	0.001	2.5
3.85	-10	826.40000318	0.002	846.60000307	0.000	2.5
3.85	-20	826.40000520	-0.001	846.60000307	0.000	2.5
3.85	-30	826.40000607	-0.002	846.60000609	-0.003	2.5

Limit: +- 2.5 ppm =	Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20°C Low Channel 2066.000 Hz High Channel 2116.500 Hz					
Power Supply [Vdc]	Environment Temperature [°C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	**826.40000449**	***0***	**846.60000327**	***0***	***2.5***
4.40	20	826.40000687	-0.003	846.60000262	0.001	2.5
3.65	20	826.40000561	-0.001	846.60000342	0.000	2.5

LTE Band 14 (Lowest Frequency: QPSK / Highest Frequency: 16QAM)

Test Date	2023-06-20
Test Engineer	19568

Limit		788	798	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	788.2526	797.7582		
Extreme (50C)		788.2526	797.7582	3.6	0.005
Extreme (40C)		788.2526	797.7582	4.5	0.006
Extreme (30C)		788.2526	797.7582	4.3	0.005
Extreme (10C)		788.2526	797.7582	3.4	0.004
Extreme (0C)		788.2526	797.7582	3.8	0.005
Extreme (-10C)		788.2526	797.7582	4.2	0.005
Extreme (-20C)		788.2526	797.7582	3.7	0.005
Extreme (-30C)		788.2526	797.7582	4.5	0.006
20C	15%	788.2526	797.7582	3.8	0.005
	-15%	788.2526	797.7582	3.5	0.004
	End Point	788.2526	797.7582	3.7	0.005

LTE Band 26

Test Date	2023-06-22
Test Engineer	19568

Reference Frequency : Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20°C						
Limit: +- 2.5 ppm =	Low Channel	2036.750	Hz	High Channel	2120.750	Hz
Power Supply [Vdc]	Environment Temperature [°C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	814.70000454	-0.001	848.30000508	-0.001	2.5
3.85	40	814.70000409	-0.001	848.30000516	-0.001	2.5
3.85	30	814.70000442	-0.001	848.30000494	0.000	2.5
3.85	***20***	***814.70000346***	***0.000***	***848.30000456***	***0.000***	***2.5***
3.85	10	814.70000364	0.000	848.30000433	0.000	2.5
3.85	0	814.70000439	-0.001	848.30000418	0.000	2.5
3.85	-10	814.70000363	0.000	848.30000412	0.001	2.5
3.85	-20	814.70000579	-0.003	848.30000568	-0.001	2.5
3.85	-30	814.70000638	-0.004	848.30000661	-0.002	2.5

Reference Frequency : Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20°C						
Limit: +- 2.5 ppm =	Low Channel	2036.750	Hz	High Channel	2120.750	Hz
Power Supply [Vdc]	Environment Temperature [°C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	**814.70000346**	***0***	**848.30000456**	***0***	***2.5***
4.40	20	814.70000490	-0.002	848.30000372	0.001	2.5
3.65	20	814.70000584	-0.003	848.30000352	0.001	2.5

NR Band n5

Test Date	2023-06-30
Test Engineer	19568

Reference Frequency : Low Channel 826.5 MHz / High Channel 846.5 MHz @ 20°C						
Limit: +- 2.5 ppm =	Low Channel	2066.250	Hz	High Channel	2116.250	Hz
Power Supply [Vdc]	Environment Temperature [°C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	826.50002336	-0.002	846.50001762	0.015	2.5
3.85	40	826.50003523	-0.016	846.50002765	0.003	2.5
3.85	30	826.50004023	-0.022	846.50002341	0.008	2.5
3.85	***20***	***826.50002212***	***0.000***	***846.50003036***	***0.000***	***2.5***
3.85	10	826.50004524	-0.028	846.50003200	-0.002	2.5
3.85	0	826.50003765	-0.019	846.50005041	-0.024	2.5
3.85	-10	826.50002912	-0.008	846.50002226	0.010	2.5
3.85	-20	826.50003536	-0.016	846.50003026	0.000	2.5
3.85	-30	826.50004654	-0.030	846.50002522	0.006	2.5

Reference Frequency : Low Channel 826.5 MHz / High Channel 846.5 MHz @ 20°C						
Limit: +- 2.5 ppm =	Low Channel	2066.250	Hz	High Channel	2116.250	Hz
Power Supply [Vdc]	Environment Temperature [°C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	**826.50002212**	***0***	**846.50003036**	***0***	***2.5***
4.40	20	826.50002023	0.002	846.50003335	-0.004	2.5
3.65	20	826.50003036	-0.010	846.50001523	0.018	2.5

9. RADIATED RESULTS

9.1. RADIATED POWER (ERP)

RULE PART(S)

FCC: §2.1046, §22.913, §90.542 and §90.635

LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

90.542(a)(7) - Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

90.635(b) The maximum output power of the transmitter for mobile stations is 100 watts (20dBw).

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.17; ESU40 setting reference to 971168 D01 v03r01

For radiated output power measurement with a ESU40:

a) Set the RBW ≥ OBW;
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 2 x RBW;
d) Sweep time = auto couple or 1 second;
e) Detector = rms;
f) Ensure that the number of measurement points ≥ span/RBW;
g) Trace mode = max hold(WCDMA), average(LTE, 5G NR);

TEST RESULTS

See the following pages.

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9.1.1. ERP Results

WCDMA

Band	Mode	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)
Band 5	REL99	826.40	27.06	V	3.01	-1.02	23.03	200.89	38.50	-15.47
		836.60	28.04	V	3.03	-0.97	24.04	253.71	38.50	-14.46
		846.60	27.96	V	3.05	-0.92	23.99	250.87	38.50	-14.51
	HSDPA	826.40	26.59	V	3.01	-1.02	22.56	180.28	38.50	-15.94
		836.60	27.23	V	3.03	-0.97	23.23	210.54	38.50	-15.27
		846.60	27.04	V	3.05	-0.92	23.07	202.97	38.50	-15.43

LTE Band 14

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
10	QPSK	793.00	28.52	V	2.95	-1.16	24.41	276.06	34.77	-10.36	1/0
	16-QAM	793.00	27.27	V	2.95	-1.16	23.16	207.01	34.77	-11.61	1/25
5	QPSK	790.50	28.38	V	2.95	-1.17	24.26	266.69	34.77	-10.51	1/12
		793.00	28.31	V	2.95	-1.16	24.20	263.03	34.77	-10.57	1/0
		795.50	28.11	V	2.96	-1.16	23.99	250.61	34.77	-10.78	1/12
	16-QAM	790.50	27.23	V	2.95	-1.17	23.11	204.64	34.77	-11.66	1/0
		793.00	27.17	V	2.95	-1.16	23.06	202.30	34.77	-11.71	1/0
		795.50	26.89	V	2.96	-1.16	22.77	189.23	34.77	-12.00	1/12

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LTE Band 26

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
15	QPSK	821.50	24.18	V	3.01	-1.04	24.18	261.82	50.00	-25.82	1/0
		831.50	29.43	V	3.02	-0.99	25.41	347.54	38.50	-13.09	1/0
		836.50	27.97	V	3.03	-0.97	23.98	249.78	38.50	-14.52	1/0
		841.50	29.82	V	3.04	-0.94	25.84	383.71	38.50	-12.66	1/0
	16-QAM	821.50	27.17	V	3.01	-1.04	23.12	205.12	50.00	-26.88	1/0
		831.50	28.45	V	3.02	-0.99	24.43	277.33	38.50	-14.07	1/0
		836.50	26.83	V	3.03	-0.97	22.83	191.96	38.50	-15.67	1/0
		841.50	28.72	V	3.04	-0.94	24.74	297.85	38.50	-13.76	1/0
10	QPSK	819.00	27.92	V	3.00	-1.06	23.87	243.77	50.00	-26.13	1/0
		829.00	29.32	V	3.02	-1.01	25.29	338.06	38.50	-13.21	1/0
		831.50	29.50	V	3.02	-0.99	25.48	353.18	38.50	-13.02	1/25
		844.00	29.37	V	3.04	-0.93	25.39	345.94	38.50	-13.11	1/0
	16-QAM	819.00	26.91	V	3.00	-1.06	22.86	193.20	50.00	-27.14	1/25
		829.00	28.15	V	3.02	-1.01	24.12	258.23	38.50	-14.38	1/0
		831.50	28.46	V	3.02	-0.99	24.44	277.97	38.50	-14.06	1/25
		844.00	28.24	V	3.04	-0.93	24.26	266.69	38.50	-14.24	1/0
5	QPSK	816.50	27.60	V	3.00	-1.07	23.53	225.42	50.00	-26.47	1/12
		821.50	28.39	V	3.01	-1.04	24.34	271.64	50.00	-25.66	1/12
		826.50	28.97	V	3.01	-1.02	24.94	311.89	38.50	-13.56	1/0
		831.50	29.60	V	3.02	-0.99	25.58	361.41	38.50	-12.92	1/12
		846.50	29.06	V	3.05	-0.92	25.09	322.85	38.50	-13.41	1/0
	16-QAM	816.50	26.44	V	3.00	-1.07	22.37	172.58	50.00	-27.63	1/24
		821.50	27.38	V	3.02	-0.99	23.37	217.27	50.00	-26.63	1/12
		826.50	27.95	V	3.01	-1.02	23.92	246.60	38.50	-14.58	1/0
		831.50	28.61	V	3.02	-0.99	24.59	287.74	38.50	-13.91	1/0
		846.50	27.88	V	3.05	-0.92	23.91	246.04	38.50	-14.59	1/0
3	QPSK	815.50	27.55	V	2.99	-1.07	23.48	222.84	50.00	-26.52	1/14
		822.50	28.53	V	3.01	-1.04	24.48	280.54	50.00	-25.52	1/0
		825.50	28.76	V	3.01	-1.02	24.73	297.17	38.50	-13.77	1/0
		831.50	29.62	V	3.02	-0.99	25.60	363.08	38.50	-12.90	1/0
		847.50	28.95	V	3.05	-0.91	24.99	315.50	38.50	-13.51	1/14
	16-QAM	815.50	26.48	V	2.99	-1.07	22.41	174.18	50.00	-27.59	1/8
		822.50	27.42	V	3.02	-0.99	23.40	218.78	50.00	-26.60	1/0
		825.50	27.78	V	3.01	-1.02	23.75	237.14	38.50	-14.75	1/0
		831.50	28.48	V	3.02	-0.99	24.46	279.25	38.50	-14.04	1/0
		847.50	27.91	V	3.05	-0.91	23.95	248.31	38.50	-14.55	1/14
1.4	QPSK	814.70	27.47	V	2.99	-1.08	23.40	218.78	50.00	-26.60	1/5
		823.30	28.68	V	3.01	-1.03	24.64	291.07	50.00	-25.36	1/0
		824.70	28.71	V	3.01	-1.03	24.67	293.09	38.50	-13.83	1/0
		831.50	29.44	V	3.02	-0.99	25.42	348.34	38.50	-13.08	1/3
		848.30	28.90	V	3.05	-0.91	24.94	311.89	38.50	-13.56	1/5
	16-QAM	814.70	26.59	V	2.99	-1.08	22.52	178.65	50.00	-27.48	1/3
		823.30	27.44	V	3.02	-0.99	23.42	219.79	50.00	-26.58	1/0
		824.70	27.65	V	3.01	-1.03	23.61	229.61	38.50	-14.89	1/0
		831.50	28.36	V	3.02	-0.99	24.34	271.64	38.50	-14.16	1/5
		848.30	27.99	V	3.05	-0.91	24.03	252.93	38.50	-14.47	1/5

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
15	QPSK	824.00	28.79	V	3.01	-1.03	24.75	298.54	38.50	-13.75	1/37
	16-QAM		27.64	V	3.01	-1.03	23.60	229.09	38.50	-14.90	1/37
10	QPSK		28.69	V	3.01	-1.03	24.65	291.74	38.50	-13.85	1/0
	16-QAM		27.62	V	3.01	-1.03	23.58	228.03	38.50	-14.92	1/0
5	QPSK		28.87	V	3.01	-1.03	24.83	304.09	38.50	-13.67	1/0
	16-QAM		27.85	V	3.01	-1.03	23.81	240.44	38.50	-14.69	1/0
3	QPSK		28.56	V	3.01	-1.03	24.52	283.14	38.50	-13.98	1/14
	16-QAM		27.52	V	3.01	-1.03	23.48	222.84	38.50	-15.02	1/14
1.4	QPSK		28.79	V	3.01	-1.03	24.75	298.54	38.50	-13.75	1/0
	16-QAM		27.54	V	3.01	-1.03	23.50	223.87	38.50	-15.00	1/0

NR Band n5

DFT-OFDM_

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
20	QPSK	834.00	29.87	V	3.03	-0.98	25.86	385.48	38.50	-12.64	1/53
		836.50	29.37	V	3.03	-0.97	25.38	345.14	38.50	-13.12	1/1
		839.00	29.54	V	3.03	-0.96	25.55	358.92	38.50	-12.95	1/1
	16-QAM	834.00	28.86	V	3.03	-0.98	24.85	305.49	38.50	-13.65	1/53
		836.50	28.37	V	3.03	-0.97	24.38	274.16	38.50	-14.12	1/1
		839.00	28.50	V	3.03	-0.96	24.51	282.49	38.50	-13.99	1/1
15	QPSK	831.50	29.73	V	3.02	-0.99	25.71	372.39	38.50	-12.79	1/1
		836.50	29.45	V	3.03	-0.97	25.46	351.56	38.50	-13.04	1/1
		841.50	29.70	V	3.04	-0.94	25.72	373.25	38.50	-12.78	1/1
	16-QAM	831.50	28.67	V	3.02	-0.99	24.65	291.74	38.50	-13.85	1/1
		836.50	28.58	V	3.03	-0.97	24.59	287.74	38.50	-13.91	1/1
		841.50	28.67	V	3.04	-0.94	24.69	294.44	38.50	-13.81	1/1
10	QPSK	829.00	29.28	V	3.02	-1.01	25.25	334.97	38.50	-13.25	1/26
		836.50	29.55	V	3.03	-0.97	25.56	359.75	38.50	-12.94	1/1
		844.00	29.69	V	3.04	-0.93	25.71	372.39	38.50	-12.79	1/26
	16-QAM	829.00	28.33	V	3.02	-1.01	24.30	269.15	38.50	-14.20	1/26
		836.50	28.39	V	3.03	-0.97	24.40	275.42	38.50	-14.10	1/1
		844.00	28.70	V	3.04	-0.93	24.72	296.48	38.50	-13.78	1/26
5	QPSK	826.50	28.98	V	3.01	-1.02	24.95	312.61	38.50	-13.55	1/1
		836.50	29.50	V	3.03	-0.97	25.51	355.63	38.50	-12.99	1/1
		846.50	28.88	V	3.05	-0.92	24.91	309.74	38.50	-13.59	1/1
	16-QAM	826.50	27.83	V	3.01	-1.02	23.80	239.88	38.50	-14.70	1/1
		836.50	28.57	V	3.03	-0.97	24.58	287.08	38.50	-13.92	1/1
		846.50	27.86	V	3.05	-0.92	23.89	244.91	38.50	-14.61	1/1

9.2. RADIATIED SPURIOUS EMISSION

RULE PART(S)

FCC: §2.1053, §22.917, §90.543 and §90.691

LIMIT

Part 22.917(a)
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

Part 90.543(c)
On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz

Part 90.543(f)
For operations in the 758–775 MHz and 788–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation

Part 90.691(a):
(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\text{Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.(NOTE : Use 100kHz reference bandwidth)

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_22/90(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.12; ESU40 setting reference to 971168 D01 v03r01

For peak power measurement with a ESU40:

a) Set the RBW = 100 kHz for emission below 1 GHz;
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 1.5 times the OBW;
d) Sweep time = auto couple;
e) Detector = rms;
f) Ensure that the number of measurement points ≥ span/RBW;
g) Trace mode = average(WCDMA, LTE, 5G NR);

NOTE1

5G NR: All Waveforms (CP-OFDM vs DFT-s_OFDM) and modulations (π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM) 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.

NOTE2

Please refer to section 5.4 for bandwidth and RB setting about LTE, 5G NR bands.

RESULTS

See the following pages.

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9.2.1. SPURIOUS RADIATION PLOTS

WCDMA Band 5

REL99

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 4790841154
Date: 2023-06-21
Test Engineer: 24542
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 2
Mode: Rel99 Band 5 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-15.1	V	3.0	40.7	1.0	-54.8	-13.0	-41.8	
2479.20	-12.3	V	3.0	41.3	1.0	-52.6	-13.0	-39.6	
3305.60	-9.9	V	3.0	42.1	1.0	-51.0	-13.0	-38.0	
1652.80	-15.8	H	3.0	40.7	1.0	-55.5	-13.0	-42.5	
2479.20	-12.5	H	3.0	41.3	1.0	-52.8	-13.0	-39.8	
3305.60	-10.1	H	3.0	42.1	1.0	-51.2	-13.0	-38.2	
Mid Ch, 836.6MHz									
1673.20	-15.1	V	3.0	40.7	1.0	-54.7	-13.0	-41.7	
2509.80	-12.2	V	3.0	41.3	1.0	-52.6	-13.0	-39.6	
3346.40	-9.5	V	3.0	42.1	1.0	-50.5	-13.0	-37.5	
1673.20	-15.5	H	3.0	40.7	1.0	-55.2	-13.0	-42.2	
2509.80	-12.3	H	3.0	41.3	1.0	-52.6	-13.0	-39.6	
3346.40	-9.7	H	3.0	42.1	1.0	-50.7	-13.0	-37.7	
High Ch, 846.6MHz									
1693.20	-15.0	V	3.0	40.7	1.0	-54.7	-13.0	-41.7	
2539.80	-12.2	V	3.0	41.4	1.0	-52.6	-13.0	-39.6	
3386.40	-9.3	V	3.0	42.1	1.0	-50.4	-13.0	-37.4	
1693.20	-15.7	H	3.0	40.7	1.0	-55.3	-13.0	-42.3	
2539.80	-12.2	H	3.0	41.4	1.0	-52.6	-13.0	-39.6	
3386.40	-9.5	H	3.0	42.1	1.0	-50.6	-13.0	-37.6	

LTE Band 5B (UL CA)

10+10 MHz

QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 4790841154
Date: 2023-06-29
Test Engineer: 19568
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Harmonics, 10+10MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, PCC : 829 MHz SCC : 838.9MHz									
1667.90	-15.1	V	3.0	40.7	1.0	-54.8	-13.0	-41.8	
2501.85	-12.4	V	3.0	41.3	1.0	-52.7	-13.0	-39.7	
3335.80	-9.7	V	3.0	42.1	1.0	-50.8	-13.0	-37.8	
1667.90	-15.7	H	3.0	40.7	1.0	-55.4	-13.0	-42.4	
2501.85	-12.6	H	3.0	41.3	1.0	-52.9	-13.0	-39.9	
3335.80	-10.0	H	3.0	42.1	1.0	-51.0	-13.0	-38.0	
Mid Ch, PCC : 831.5MHz SCC : 841.4MHz									
1672.90	-15.0	V	3.0	40.7	1.0	-54.6	-13.0	-41.6	
2509.35	-12.3	V	3.0	41.3	1.0	-52.6	-13.0	-39.6	
3345.80	-9.6	V	3.0	42.1	1.0	-50.7	-13.0	-37.7	
1672.90	-15.7	H	3.0	40.7	1.0	-55.4	-13.0	-42.4	
2509.35	-12.5	H	3.0	41.3	1.0	-52.8	-13.0	-39.8	
3345.80	-9.8	H	3.0	42.1	1.0	-50.9	-13.0	-37.9	
High Ch, PCC : 834.1MHz SCC : 844MHz									
1678.10	-15.1	V	3.0	40.7	1.0	-54.8	-13.0	-41.8	
2517.15	-12.2	V	3.0	41.4	1.0	-52.6	-13.0	-39.6	
3356.20	-9.6	V	3.0	42.1	1.0	-50.7	-13.0	-37.7	
1678.10	-15.6	H	3.0	40.7	1.0	-55.3	-13.0	-42.3	
2517.15	-12.4	H	3.0	41.4	1.0	-52.8	-13.0	-39.8	
3356.20	-9.7	H	3.0	42.1	1.0	-50.8	-13.0	-37.8	

LTE Band 14

10 MHz

QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 4790841154
Date: 2023-06-26
Test Engineer: 19568
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 14 Harmonics, 10MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Mid Ch, 793MHz									
1586.00	-19.0	V	3.0	46.4	1.0	-64.4	-40.0	-24.4	
2379.00	-11.3	V	3.0	46.9	1.0	-57.2	-13.0	-44.2	
3172.00	-10.0	V	3.0	46.8	1.0	-55.8	-13.0	-42.8	
1586.00	-20.1	H	3.0	46.4	1.0	-65.4	-40.0	-25.4	
2379.00	-11.9	H	3.0	46.9	1.0	-57.7	-13.0	-44.7	
3172.00	-9.8	H	3.0	46.8	1.0	-55.7	-13.0	-42.7	

LTE Band 26 (Part 90)

1.4 MHz

QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 4790841154
Date: 2023-06-21
Test Engineer: 26087
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Harmonics, 1.4MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 814.7MHz									
1629.40	-14.5	V	3.0	46.4	1.0	-59.9	-13.0	-46.9	
2444.10	-11.5	V	3.0	46.9	1.0	-57.3	-13.0	-44.3	
3258.80	-9.5	V	3.0	46.7	1.0	-55.2	-13.0	-42.2	
1629.40	-15.2	H	3.0	46.4	1.0	-60.7	-13.0	-47.7	
2444.10	-11.8	H	3.0	46.9	1.0	-57.7	-13.0	-44.7	
3258.80	-9.3	H	3.0	46.7	1.0	-55.0	-13.0	-42.0	
Mid Ch, 823.3MHz									
1646.60	-14.3	V	3.0	46.4	1.0	-59.8	-13.0	-46.8	
2469.90	-11.4	V	3.0	46.9	1.0	-57.3	-13.0	-44.3	
3293.20	-9.3	V	3.0	46.6	1.0	-54.9	-13.0	-41.9	
1646.60	-18.2	H	3.0	46.4	1.0	-63.6	-13.0	-50.6	
2469.90	-11.8	H	3.0	46.9	1.0	-57.6	-13.0	-44.6	
3293.20	-9.3	H	3.0	46.6	1.0	-54.9	-13.0	-41.9	

LTE Band 26 (Straddle)

5 MHz

QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 4790841154
Date: 2023-06-21
Test Engineer: 26087
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Harmonics, 5MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Straddle Ch, 824MHz									
1648.00	-14.4	V	3.0	46.4	1.0	-59.8	-13.0	-46.8	
2472.00	-11.5	V	3.0	46.9	1.0	-57.4	-13.0	-44.4	
3296.00	-9.6	V	3.0	46.6	1.0	-55.2	-13.0	-42.2	
1648.00	-15.5	H	3.0	46.4	1.0	-60.9	-13.0	-47.9	
2472.00	-11.9	H	3.0	46.9	1.0	-57.8	-13.0	-44.8	
3296.00	-9.4	H	3.0	46.6	1.0	-55.0	-13.0	-42.0	

LTE Band 26 (Part 22)

15 MHz

QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 4790841154
Date: 2023-07-21
Test Engineer: 26087
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Harmonics, 15MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 831.5MHz									
1663.00	-14.3	V	3.0	46.4	1.0	-59.8	-13.0	-46.8	
2494.50	-11.7	V	3.0	46.9	1.0	-57.6	-13.0	-44.6	
3326.00	-9.5	V	3.0	46.6	1.0	-55.1	-13.0	-42.1	
1663.00	-15.3	H	3.0	46.4	1.0	-60.7	-13.0	-47.7	
2494.50	-12.0	H	3.0	46.9	1.0	-57.8	-13.0	-44.8	
3326.00	-9.3	H	3.0	46.6	1.0	-54.9	-13.0	-41.9	
Mid Ch, 836.5MHz									
1673.00	-14.4	V	3.0	46.4	1.0	-59.9	-13.0	-46.9	
2509.50	-11.4	V	3.0	46.9	1.0	-57.3	-13.0	-44.3	
3346.00	-9.7	V	3.0	46.6	1.0	-55.2	-13.0	-42.2	
1673.00	-15.5	H	3.0	46.4	1.0	-61.0	-13.0	-48.0	
2509.50	-11.9	H	3.0	46.9	1.0	-57.8	-13.0	-44.8	
3346.00	-9.4	H	3.0	46.6	1.0	-54.9	-13.0	-41.9	
High Ch, 841.5MHz									
1683.00	-14.4	V	3.0	46.5	1.0	-59.9	-13.0	-46.9	
2524.50	-11.7	V	3.0	46.9	1.0	-57.6	-13.0	-44.6	
3366.00	-9.2	V	3.0	46.5	1.0	-54.7	-13.0	-41.7	
1683.00	-15.4	H	3.0	46.5	1.0	-60.8	-13.0	-47.8	
2524.50	-11.9	H	3.0	46.9	1.0	-57.8	-13.0	-44.8	
3366.00	-8.8	H	3.0	46.5	1.0	-54.3	-13.0	-41.3	

NR Band n5

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company:	Samsung
Project #:	4790841154
Date:	2023-06-23
Test Engineer:	26087
Configuration:	EUT / AC Adapter, Y-Position
Location:	Chamber 1
Mode:	5G NR_QPSK NR n5 Harmonics, 20MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

20 MHz

DFT-OFDM

QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5MHz									
1668.00	-14.1	V	3.0	46.4	1.0	-59.5	-13.0	-46.5	
2502.00	-7.3	V	3.0	46.9	1.0	-53.2	-13.0	-40.2	
3336.00	-9.3	V	3.0	46.6	1.0	-54.9	-13.0	-41.9	
1668.00	-15.0	H	3.0	46.4	1.0	-60.5	-13.0	-47.5	
2502.00	-6.8	H	3.0	46.9	1.0	-52.7	-13.0	-39.7	
3336.00	-9.1	H	3.0	46.6	1.0	-54.6	-13.0	-41.6	
Mid Ch, 836.5MHz									
1673.00	-10.4	V	3.0	46.4	1.0	-55.8	-13.0	-42.8	
2509.50	-1.7	V	3.0	46.9	1.0	-47.6	-13.0	-34.6	
3346.00	-9.3	V	3.0	46.6	1.0	-54.8	-13.0	-41.8	
1673.00	-13.8	H	3.0	46.4	1.0	-59.3	-13.0	-46.3	
2509.50	-0.2	H	3.0	46.9	1.0	-46.1	-13.0	-33.1	
3346.00	-9.1	H	3.0	46.6	1.0	-54.6	-13.0	-41.6	
High Ch, 839MHz									
1678.00	-13.7	V	3.0	46.4	1.0	-59.2	-13.0	-46.2	
2517.00	-6.6	V	3.0	46.9	1.0	-52.5	-13.0	-39.5	
3356.00	-9.1	V	3.0	46.5	1.0	-54.6	-13.0	-41.6	
1678.00	-14.8	H	3.0	46.4	1.0	-60.2	-13.0	-47.2	
2517.00	-5.6	H	3.0	46.9	1.0	-51.4	-13.0	-38.4	
3356.00	-8.9	H	3.0	46.5	1.0	-54.5	-13.0	-41.5	

END OF REPORT

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