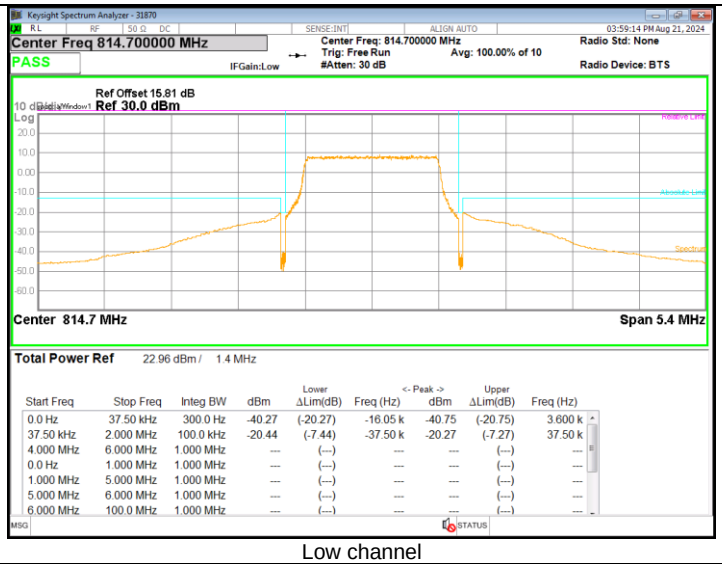
1.4 MHz 16QAM FRB	 Low channel
	  High channel

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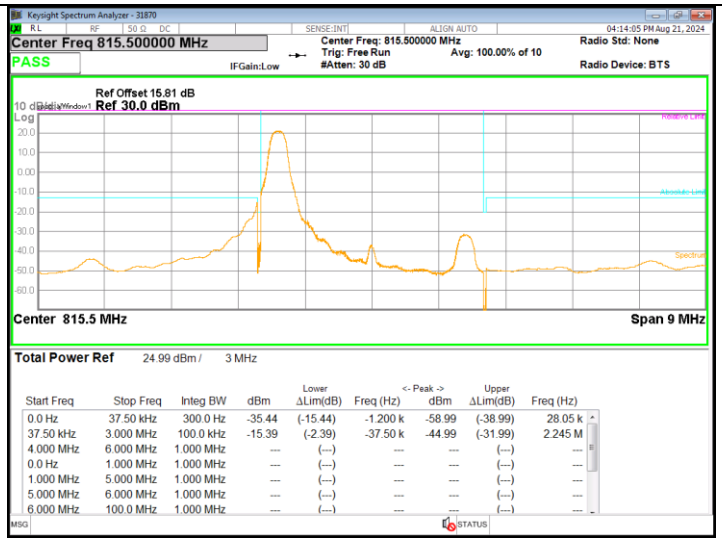
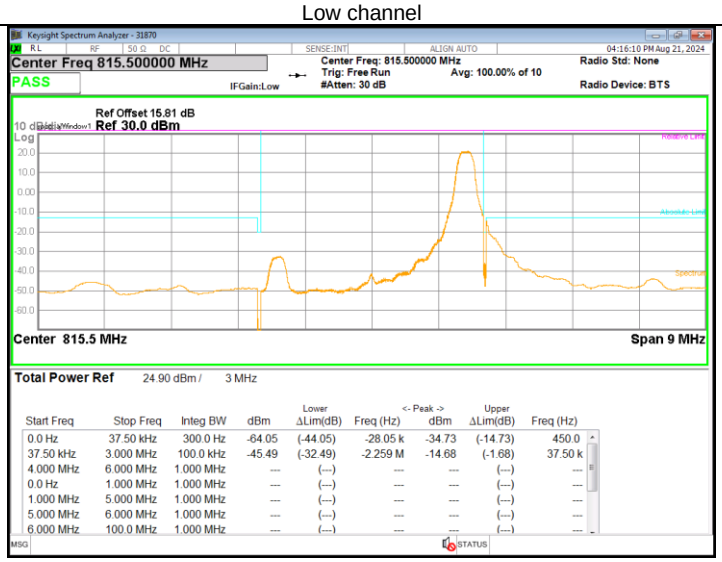
LTE Band 26 (Part 90) 1 RB (Worst Case)

3 MHz QPSK 1RB offstet 0	 Low channel
3 MHz QPSK 1RB offstet 14	 Low channel

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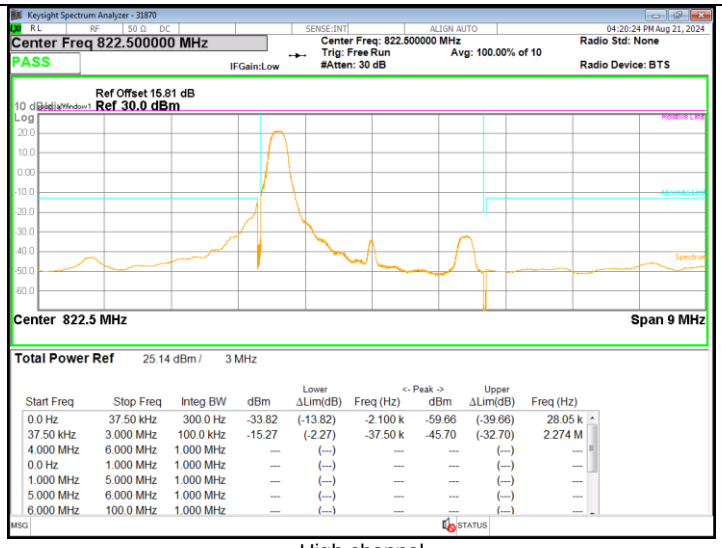
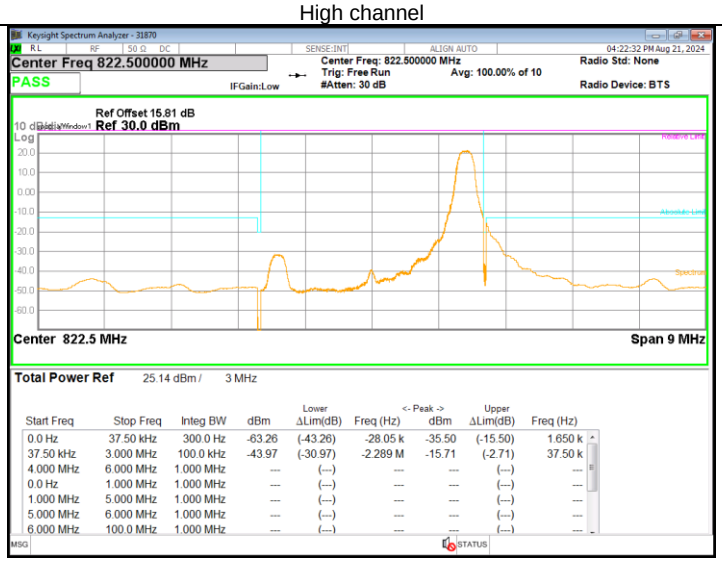
3 MHz QPSK 1RB offstet 0	 High channel
3 MHz QPSK 1RB offstet 14	 High channel

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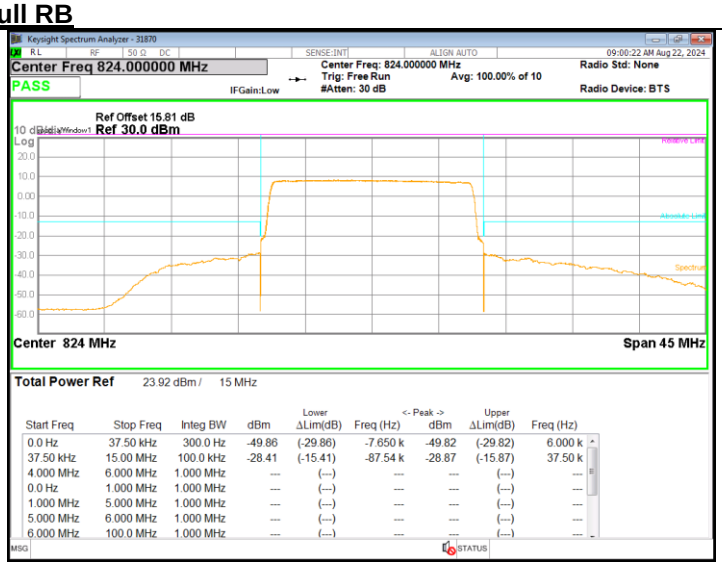
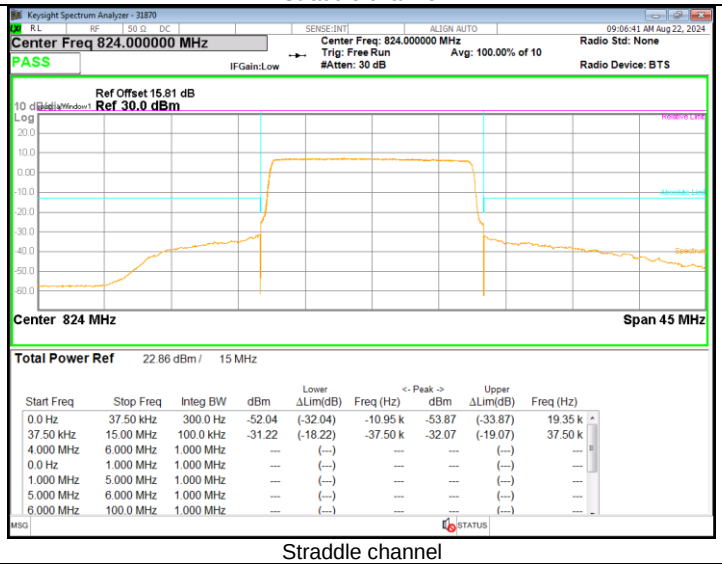
LTE Band 26 (Straddle) Full RB

15 MHz QPSK FRB	 Straddle channel
15 MHz 16QAM FRB	 Straddle channel

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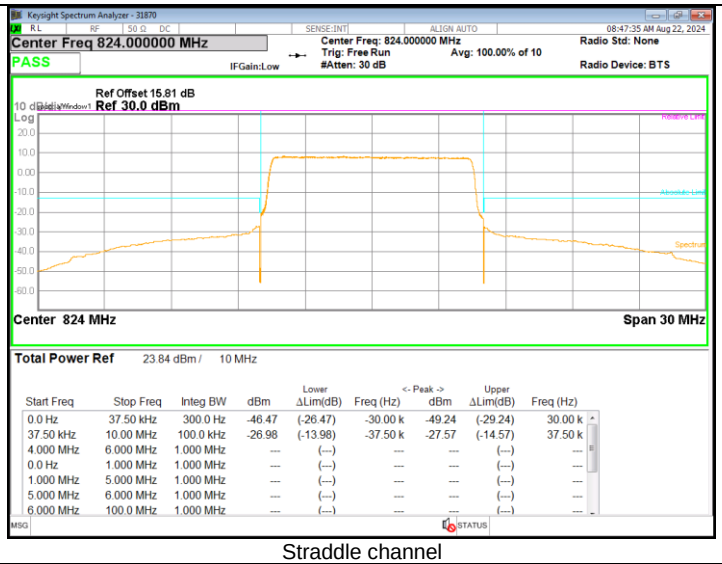
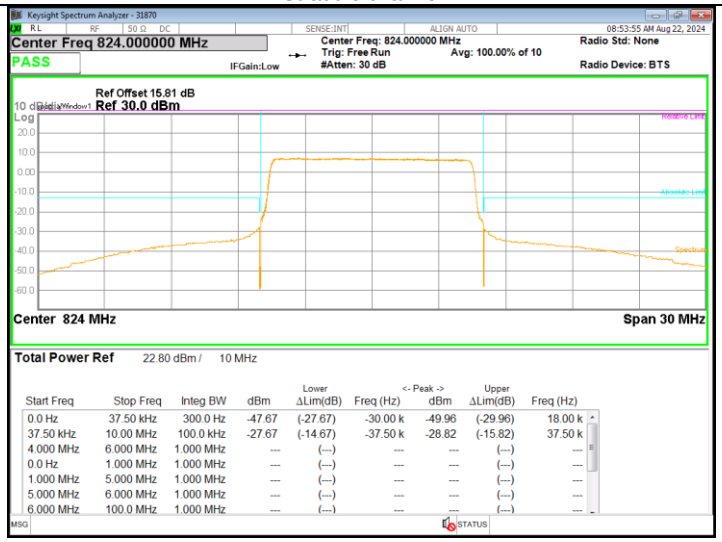
10 MHz QPSK FRB	 Straddle channel
10 MHz 16QAM FRB	 Straddle channel

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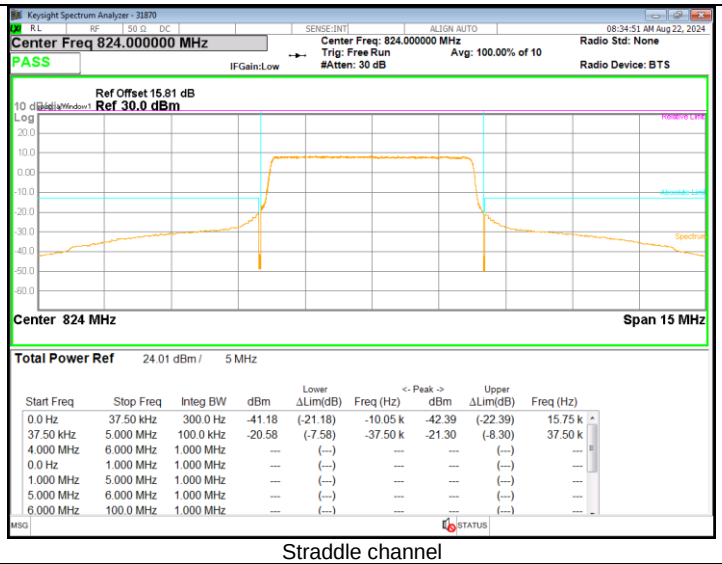
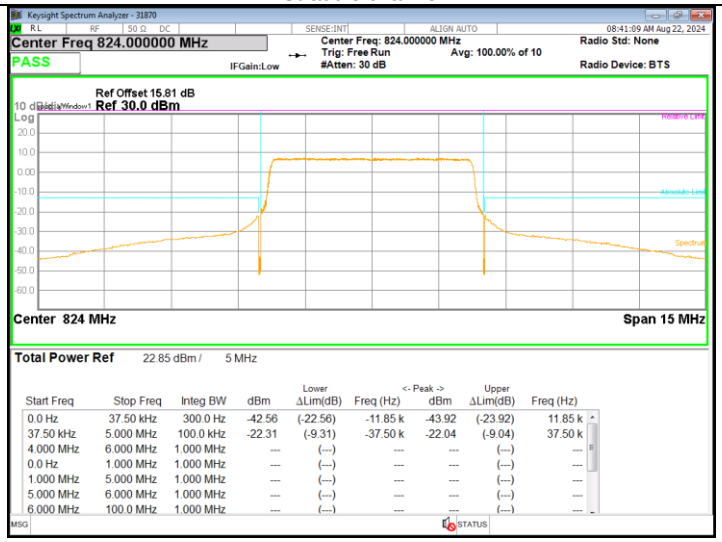
5 MHz QPSK FRB	 Straddle channel
5 MHz 16QAM FRB	 Straddle channel

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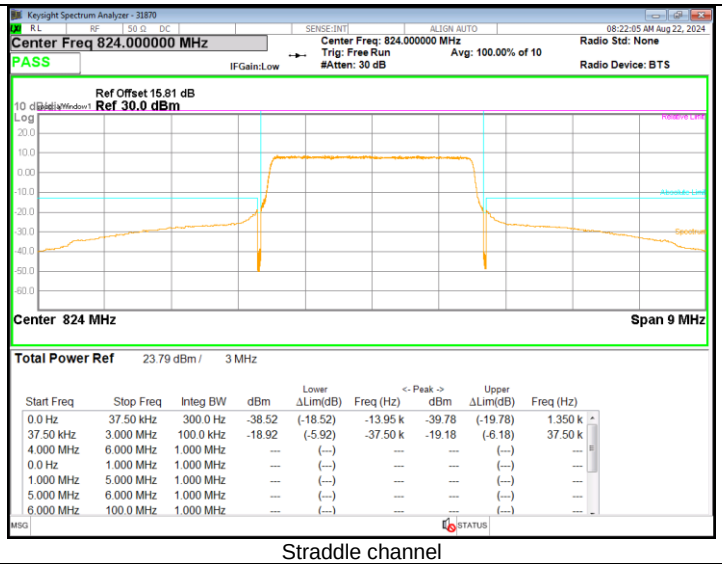
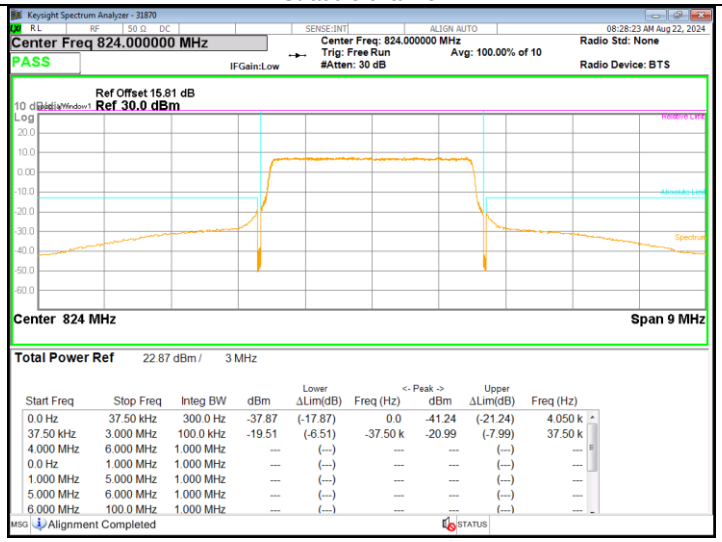
3 MHz QPSK FRB	 Straddle channel
3 MHz 16QAM FRB	 Straddle channel

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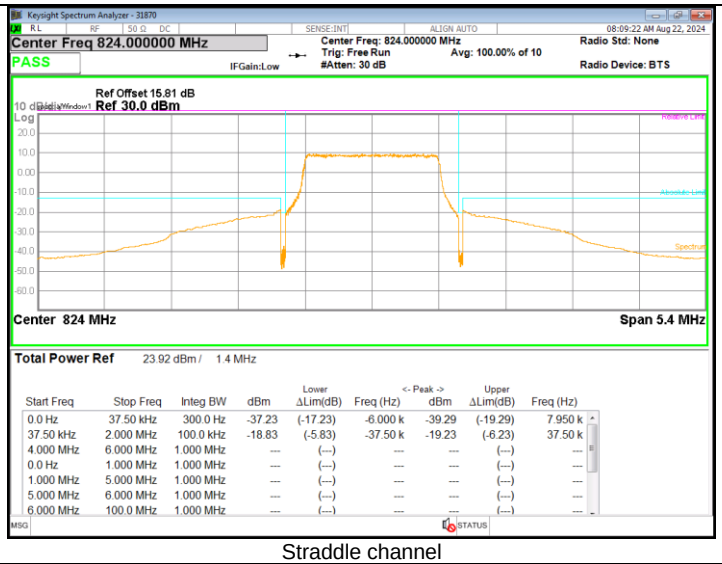
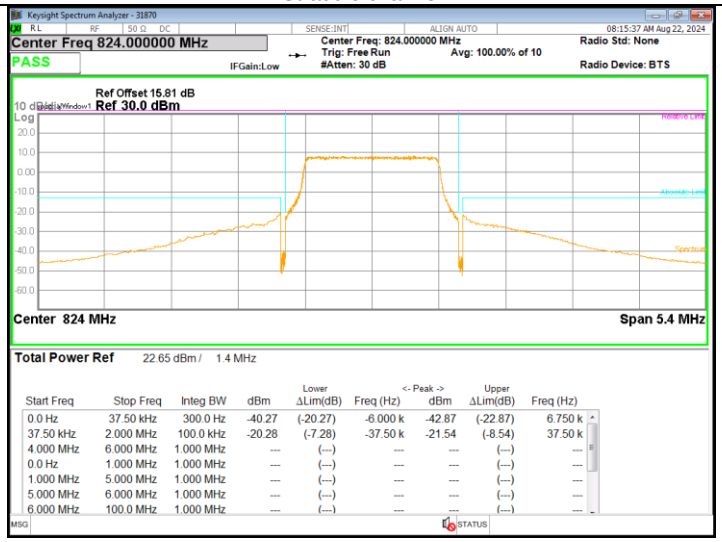
1.4 MHz QPSK FRB	 Straddle channel
1.4 MHz 16QAM FRB	 Straddle channel

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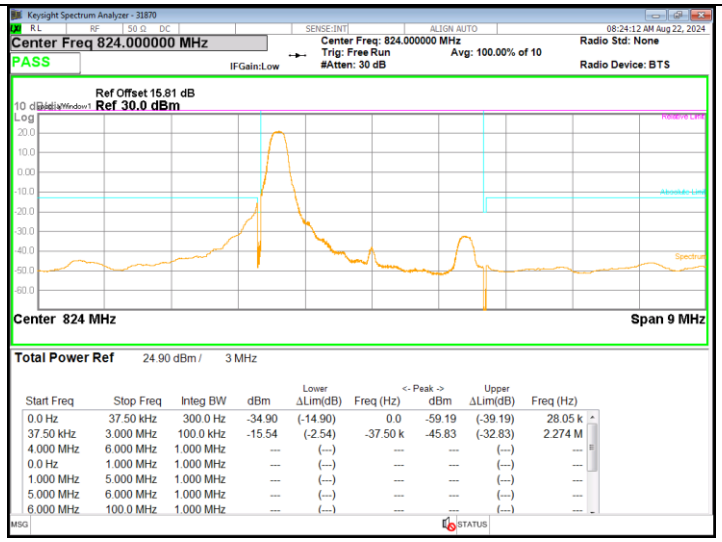
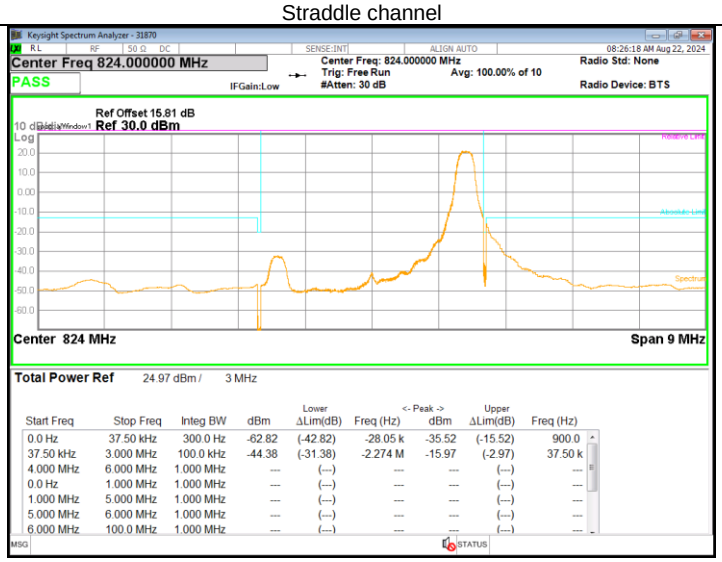
LTE Band 26 (Straddle) 1 RB (Worst Case)

3 MHz QPSK 1RB offstet 0	 Straddle channel
3 MHz QPSK 1RB offstet 14	 Straddle channel

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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 + 10Log10(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), Max hold(GSM);

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NOTE1

GSM : It was tested at GPRS as worst case (the highst output power and density).
UMTS: It was tested at REL 99 as worst case (the highst output power and density).
LTE: It was tested at 1RB QPSK as worst case (the highst output power and density).
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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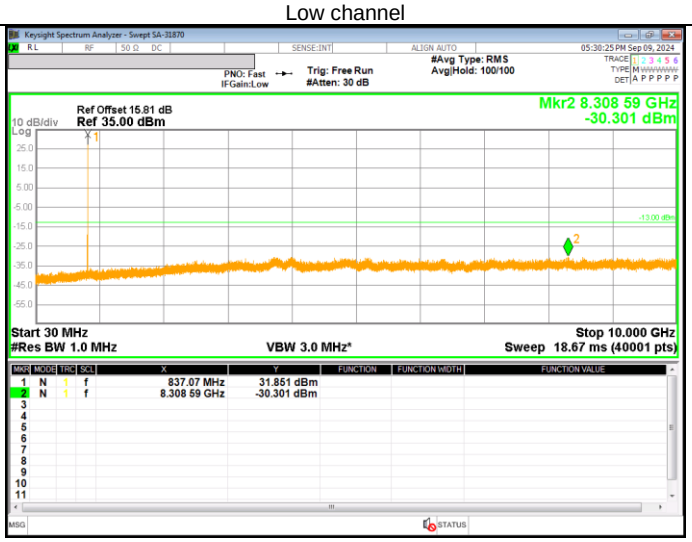
8.5.1. OUT OF BAND EMISSIONS RESULT

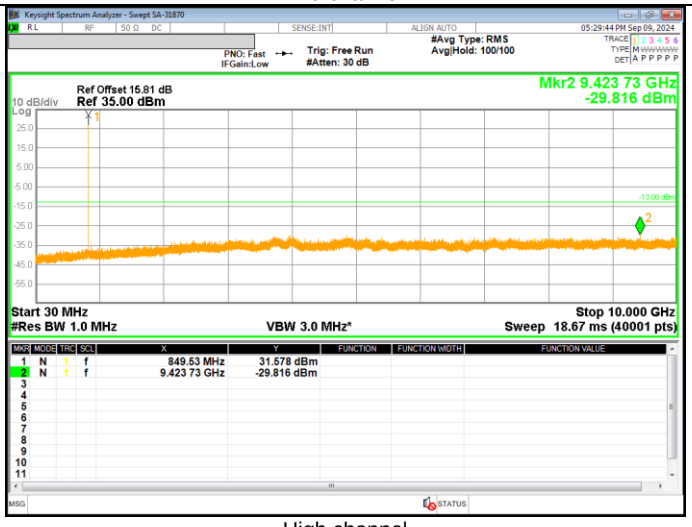
GSM 850

GPRS

Low channel



Mid channel



High channel

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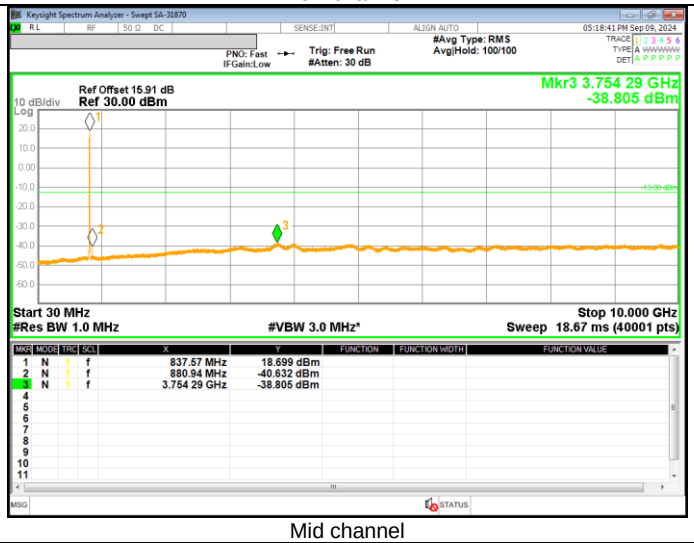
WCDMA Band 5

REL99

Low channel



Mid channel

High channel

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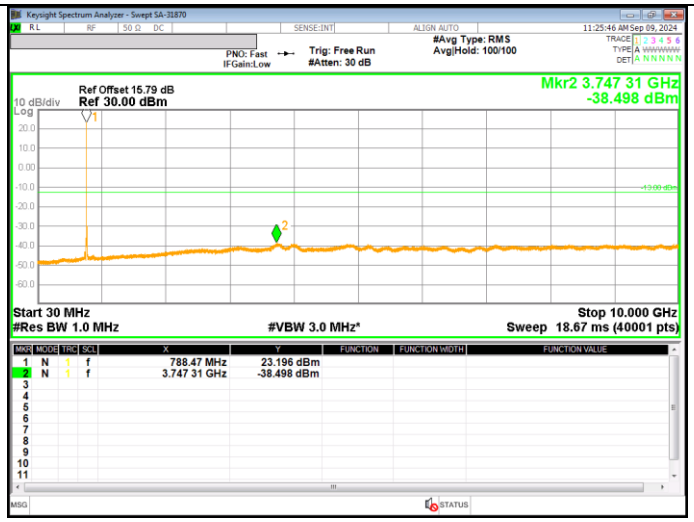
LTE Band 14

10 MHz QPSK



Mid channel

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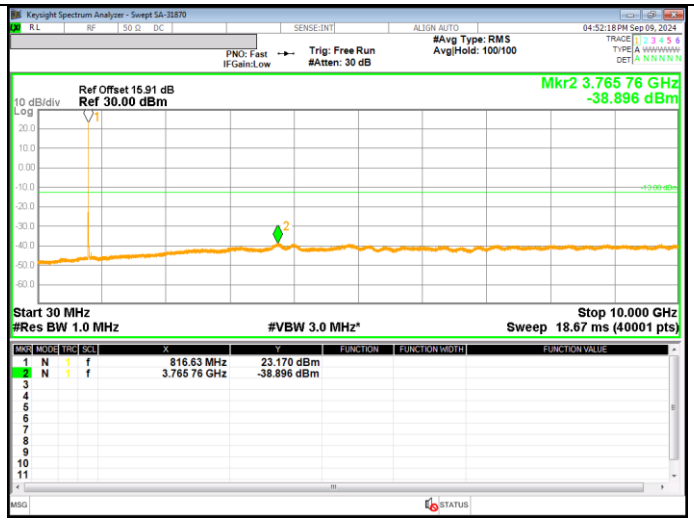
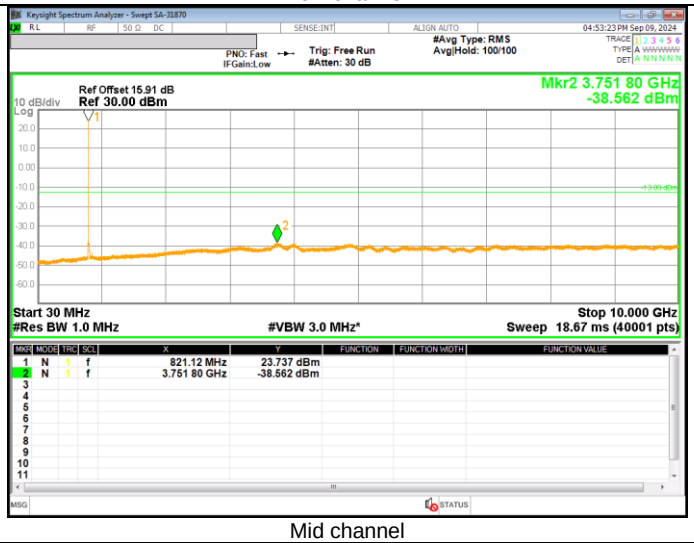
LTE Band 26 (Part 90)

3 MHz QPSK



Low channel



Mid channel

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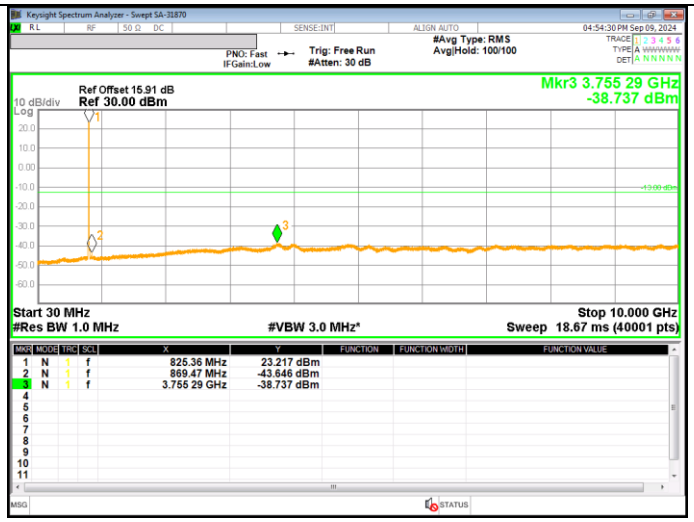
LTE Band 26 (Straddle)

3 MHz QPSK



Low channel

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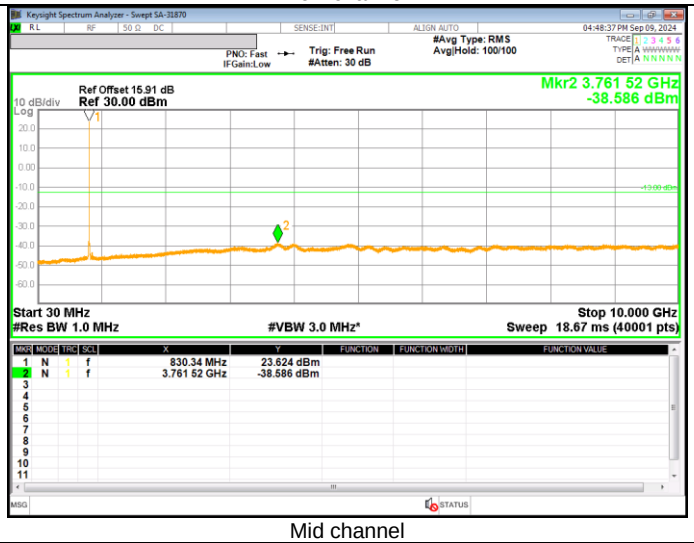
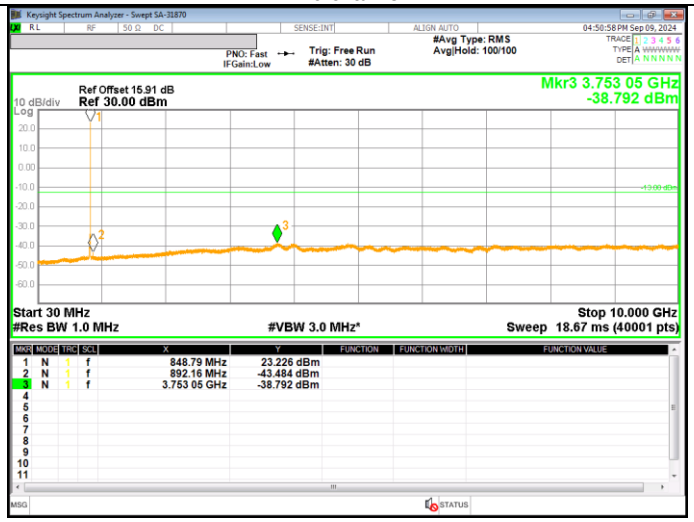
LTE Band 26 (Part 22)

3 MHz QPSK

Low channel



Mid channel



High channel

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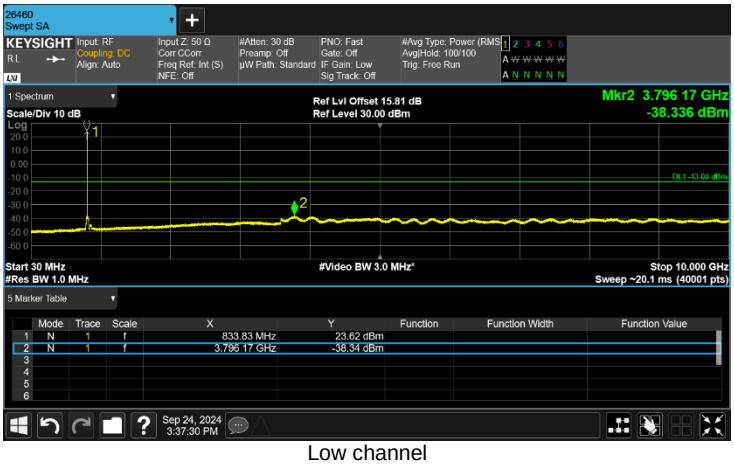
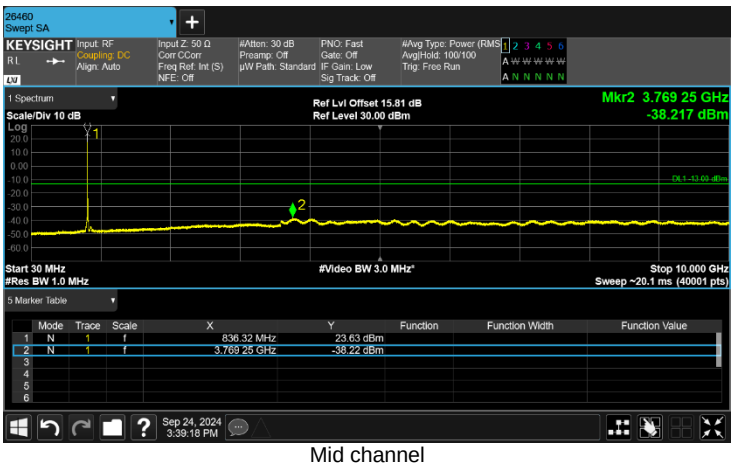
NR Band n5

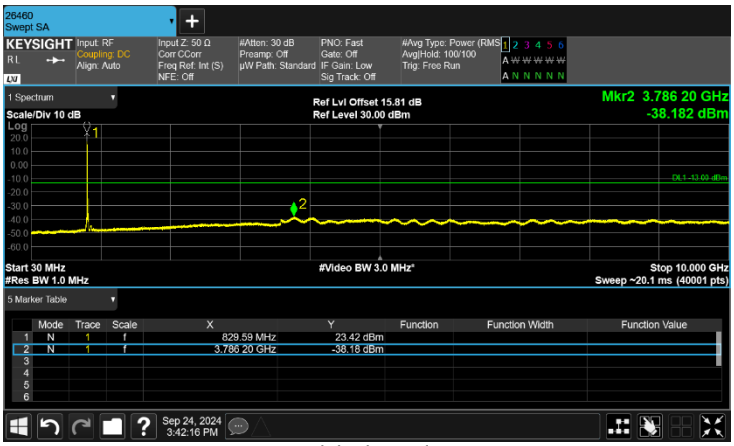
10 MHz QPSK



Low channel



Mid channel



High channel

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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 OBW results)

RESULTS

See the following pages.

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8.6.1. FREQUENCY STABILITY RESULT

GSM 850, Channel 128/251, Frequency 824.2/848.8 MHz

Test Date	2024-09-02
Test Engineer	31870

Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2060.500 Hz		High Channel	2122.000 Hz	
Power Supply [Vdc]	Environment Temperature [ºC]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	50	824.20002230	-0.013	848.80003125	-0.013	2.5
3.88	40	824.20002137	-0.012	848.80002384	-0.005	2.5
3.88	30	824.20001423	-0.004	848.80002511	-0.006	2.5
3.88	***20***	***824.20001122***	***0.000***	***848.80001985***	***0.000***	***2.5***
3.88	10	824.20001653	-0.006	848.80002111	-0.001	2.5
3.88	0	824.20001791	-0.008	848.80002547	-0.007	2.5
3.88	-10	824.20001833	-0.009	848.80002346	-0.004	2.5
3.88	-20	824.20002236	-0.014	848.80002954	-0.011	2.5
3.88	-30	824.20002313	-0.014	848.80003173	-0.014	2.5

Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2060.500 Hz		High Channel	2122.000 Hz	
Power Supply [Vdc]	Environment Temperature [ºC]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	***20***	***824.20001122***	***0***	***848.80001985***	***0***	***2.5***
4.47	20	824.20001323	-0.002	848.80002585	-0.007	2.5
3.65	20	824.20001958	-0.010	848.80002722	-0.009	2.5

WCDMA Band 5

Test Date	2024-09-03
Test Engineer	31870

Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2066.000 Hz		High Channel	2116.500 Hz	
Power Supply [Vdc]	Environment Temperature [ºC]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	50	826.40005180	-0.022	846.60004580	-0.020	2.5
3.88	40	826.40004450	-0.014	846.60004120	-0.015	2.5
3.88	30	826.40002350	0.012	846.60003310	-0.005	2.5
3.88	***20***	***826.40003333***	***0.000***	***846.60002860***	***0.000***	***2.5***
3.88	10	826.40002569	0.009	846.60003120	-0.003	2.5
3.88	0	826.40002510	0.010	846.60001560	0.015	2.5
3.88	-10	826.40003680	-0.004	846.60002250	0.007	2.5
3.88	-20	826.40003250	0.001	846.60003160	-0.004	2.5
3.88	-30	826.40003120	0.003	846.60002880	0.000	2.5

Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2066.000 Hz		High Channel	2116.500 Hz	
Power Supply [Vdc]	Environment Temperature [ºC]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	***20***	***826.40003333***	***0***	***846.60002860***	***0***	***2.5***
4.47	20	826.40003160	0.002	846.60002310	0.006	2.5
3.65	20	826.40002850	0.006	846.60001580	0.015	2.5

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

Test Date	2024-09-09
Test Engineer	31870

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	788.2470	797.7460		
Extreme (50C)		788.2470	797.7460	41.3	0.052
Extreme (40C)		788.2470	797.7460	38.3	0.048
Extreme (30C)		788.2470	797.7460	31.5	0.040
Extreme (10C)		788.2470	797.7460	22.6	0.028
Extreme (0C)		788.2470	797.7460	25.3	0.032
Extreme (-10C)		788.2470	797.7460	22.1	0.028
Extreme (-20C)		788.2470	797.7460	30.6	0.039
Extreme (-30C)		788.2470	797.7460	31.3	0.039
20C	15%	788.2470	797.7460	28.6	0.036
	-15%	788.2470	797.7460	18.6	0.023
	End Point	788.2470	797.7460	19.6	0.025

LTE Band 26

Test Date	2024-09-10
Test Engineer	31870

Reference Frequency : Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20ºC

Limit: +- 2.5 ppm = Low Channel 2036.750 Hz High Channel 2120.750 Hz

Power Supply [Vdc]	Environment Temperature [ºC]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	50	814.70003810	-0.009	848.30004030	-0.011	2.5
3.88	40	814.70004230	-0.014	848.30004510	-0.016	2.5
3.88	30	814.70003690	-0.008	848.30003840	-0.008	2.5
3.88	***20***	***814.70003050***	***0.000***	***848.30003123***	***0.000***	***2.5***
3.88	10	814.70002910	0.002	848.30002840	0.003	2.5
3.88	0	814.70002130	0.011	848.30002660	0.005	2.5
3.88	-10	814.70002290	0.009	848.30002570	0.007	2.5
3.88	-20	814.70003040	0.000	848.30003120	0.000	2.5
3.88	-30	814.70003160	-0.001	848.30003350	-0.003	2.5

Reference Frequency : Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20ºC

Limit: +- 2.5 ppm = Low Channel 2036.750 Hz High Channel 2120.750 Hz

Power Supply [Vdc]	Environment Temperature [ºC]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	***20***	**814.70003050**	***0***	**848.30003123**	***0***	***2.5***
4.47	20	814.70003940	-0.011	848.30004130	-0.012	2.5
3.65	20	814.70002150	0.011	848.30002240	0.010	2.5

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NR Band n5

Test Date	2024-09-19
Test Engineer	31870

Reference Frequency : Low Channel 826.5 MHz / High Channel 846.5 MHz @ 20ºC						
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				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	50	826.50004810	-0.017	846.50005130	-0.019	2.5
3.88	40	826.50004150	-0.009	846.50004340	-0.010	2.5
3.88	30	826.50003960	-0.007	846.50004080	-0.007	2.5
3.88	***20***	***826.50003420***	***0.000***	***846.50003510***	***0.000***	***2.5***
3.88	10	826.50003610	-0.002	846.50003450	0.001	2.5
3.88	0	826.50002530	0.011	846.50002750	0.009	2.5
3.88	-10	826.50002340	0.013	846.50002160	0.016	2.5
3.88	-20	826.50002560	0.010	846.50002730	0.009	2.5
3.88	-30	826.50002810	0.007	846.50003120	0.005	2.5

Reference Frequency : Low Channel 826.5 MHz / High Channel 846.5 MHz @ 20ºC						
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				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	***20***	**826.50003420**	***0***	**846.50003510**	***0***	***2.5***
4.47	20	826.50004630	-0.015	846.50003950	-0.005	2.5
3.65	20	826.50002430	0.012	846.50002930	0.007	2.5

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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(GSM, WCDMA), average(LTE, 5G NR);

TEST RESULTS

See the following pages.

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9.1.1. ERP RESULT

GSM

Band	Mode	Frequency (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)
GSM 850	GPRS	824.20	32.48	V	3.01	-1.03	28.44	698.23	38.50	-10.06
		836.60	32.64	V	3.03	-0.97	28.64	731.14	38.50	-9.86
		848.80	31.01	V	3.05	-0.91	27.05	506.99	38.50	-11.45
	EGPRS	824.20	29.56	V	3.01	-1.03	25.52	356.45	38.50	-12.98
		836.60	27.88	V	3.03	-0.97	23.88	244.34	38.50	-14.62
		848.80	26.92	V	3.05	-0.91	22.96	197.70	38.50	-15.54

WCDMA

Band	Mode	Frequency (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	23.43	V	3.01	-1.02	19.40	87.10	38.50	-19.10
		836.60	24.32	V	3.03	-0.97	20.32	107.65	38.50	-18.18
		846.60	23.77	V	3.05	-0.92	19.80	95.50	38.50	-18.70
	HSDPA	826.40	23.29	V	3.01	-1.02	19.26	84.33	38.50	-19.24
		836.60	24.27	V	3.03	-0.97	20.27	106.41	38.50	-18.23
		846.60	23.76	V	3.05	-0.92	19.79	95.28	38.50	-18.71

LTE Band 14

BW (MHz)	Modulation	Frequency (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	22.65	V	2.95	-1.16	18.53	71.29	34.77	-16.24	1/0
	16-QAM	793.00	22.08	V	2.95	-1.16	17.96	62.52	34.77	-16.81	1/49
5	QPSK	790.50	22.33	V	2.95	-1.17	18.22	66.37	34.77	-16.55	1/0
		793.00	22.60	V	2.95	-1.16	18.48	70.47	34.77	-16.29	1/0
		795.50	22.38	V	2.96	-1.16	18.27	67.14	34.77	-16.50	1/12
	16-QAM	790.50	21.78	V	2.95	-1.17	17.67	58.48	34.77	-17.10	1/12
		793.00	21.57	V	2.95	-1.16	17.45	55.59	34.77	-17.32	1/24
		795.50	21.20	V	2.96	-1.16	17.09	51.17	34.77	-17.68	1/0

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LTE Band 26

BW (MHz)	Modulation	Frequency (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	23.20	V	3.01	-1.04	19.15	82.22	50.00	-30.85	1/0
		824.00	23.81	V	3.01	-1.03	19.77	94.84	38.50	-18.73	1/0
		831.50	24.46	V	3.02	-0.99	20.45	110.92	38.50	-18.05	1/0
		836.50	24.81	V	3.03	-0.97	20.81	120.50	38.50	-17.69	1/0
		841.50	24.31	V	3.04	-0.94	20.33	107.89	38.50	-18.17	1/0
	16-QAM	821.50	22.25	V	3.01	-1.04	18.20	66.07	50.00	-31.80	1/37
		824.00	22.53	V	3.01	-1.03	18.49	70.63	38.50	-20.01	1/0
		831.50	22.99	V	3.02	-0.99	18.98	79.07	38.50	-19.52	1/0
		836.50	23.46	V	3.03	-0.97	19.46	88.31	38.50	-19.04	1/0
		841.50	23.15	V	3.04	-0.93	19.17	82.60	38.50	-19.33	1/74
10	QPSK	819.00	23.05	V	3.00	-1.06	19.00	79.43	50.00	-31.00	1/0
		824.00	23.44	V	3.01	-1.03	19.40	87.10	38.50	-19.10	1/0
		829.00	24.32	V	3.02	-1.01	20.30	107.15	38.50	-18.20	1/0
		831.50	24.14	V	3.02	-0.99	20.13	103.04	38.50	-18.37	1/0
		844.00	24.03	V	3.04	-0.93	20.06	101.39	38.50	-18.44	1/0
	16-QAM	819.00	21.99	V	3.00	-1.06	17.94	62.23	50.00	-32.06	1/0
		824.00	22.32	V	3.01	-1.03	18.28	67.30	38.50	-20.22	1/0
		829.00	22.87	V	3.02	-1.01	18.85	76.74	38.50	-19.65	1/0
		831.50	23.10	V	3.02	-0.99	19.09	81.10	38.50	-19.41	1/0
		844.00	22.66	V	3.04	-0.93	18.69	73.96	38.50	-19.81	1/25
5	QPSK	816.50	23.33	V	3.00	-1.07	19.27	79.43	50.00	-31.00	1/24
		821.50	23.05	V	3.01	-1.04	19.00	86.90	50.00	-30.61	1/0
		824.00	23.43	V	3.01	-1.03	19.39	92.26	38.50	-18.85	1/12
		826.50	23.68	V	3.01	-1.02	19.65	105.44	38.50	-18.27	1/12
		831.50	24.24	V	3.02	-0.99	20.23	97.05	38.50	-18.63	1/0
		846.50	23.84	V	3.05	-0.92	19.87	65.16	38.50	-20.36	1/0
	16-QAM	816.50	22.20	V	3.00	-1.07	18.14	62.37	50.00	-32.05	1/0
		821.50	22.00	V	3.01	-1.04	17.95	69.82	50.00	-31.56	1/0
		824.00	22.48	V	3.01	-1.03	18.44	71.78	38.50	-19.94	1/12
		826.50	22.60	V	3.01	-1.03	18.56	83.95	38.50	-19.26	1/0
		831.50	23.25	V	3.02	-0.99	19.24	72.95	38.50	-19.87	1/0
		846.50	22.60	V	3.05	-0.92	18.63	72.95	38.50	-19.87	1/0
3	QPSK	815.50	23.45	V	2.99	-1.07	19.38	86.70	50.00	-30.62	1/14
		822.50	23.25	V	3.01	-1.04	19.20	83.18	50.00	-30.80	1/0
		824.00	23.54	V	3.01	-1.03	19.50	89.13	38.50	-19.00	1/14
		825.50	23.57	V	3.01	-1.02	19.54	89.95	38.50	-18.96	1/0
		831.50	24.28	V	3.02	-0.99	20.27	106.41	38.50	-18.23	1/0
		847.50	23.54	V	3.05	-0.91	19.58	90.78	38.50	-18.92	1/14
	16-QAM	815.50	22.21	V	2.99	-1.07	18.14	65.16	50.00	-31.86	1/0
		822.50	22.20	V	3.01	-1.04	18.15	65.31	50.00	-31.85	1/0
		824.00	22.05	V	3.01	-1.03	18.01	63.24	38.50	-20.49	1/0
		825.50	22.78	V	3.01	-1.02	18.75	74.99	38.50	-19.75	1/0
		831.50	22.81	V	3.02	-0.99	18.80	75.86	38.50	-19.70	1/0
		847.50	22.20	V	3.05	-0.92	18.23	66.53	38.50	-20.27	1/14
1.4	QPSK	814.70	23.39	V	2.99	-1.08	19.32	85.51	50.00	-30.68	1/0
		823.30	23.25	V	3.01	-1.03	19.21	83.37	50.00	-30.79	1/5
		824.00	23.39	V	3.01	-1.03	19.35	86.10	38.50	-19.15	1/0
		824.70	23.49	V	3.01	-1.03	19.46	88.31	38.50	-19.04	1/5
		831.50	23.97	V	3.02	-0.99	19.96	99.08	38.50	-18.54	1/5
		848.30	22.98	V	3.05	-0.91	19.02	79.80	38.50	-19.48	1/0
	16-QAM	814.70	22.32	V	2.99	-1.08	18.25	66.83	50.00	-31.75	1/5
		823.30	22.31	V	3.01	-1.03	18.27	67.14	50.00	-31.73	1/5
		824.00	22.58	V	3.01	-1.03	18.54	71.45	38.50	-19.96	1/0
		824.70	22.53	V	3.01	-1.03	18.50	70.79	38.50	-20.00	1/3
		831.50	22.67	V	3.02	-0.99	18.66	73.45	38.50	-19.84	1/5
		848.30	21.91	V	3.05	-0.91	17.95	62.37	38.50	-20.55	1/0

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NR Band n5

BW (MHz)	Modulation	Frequency (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	24.82	V	3.03	-0.98	20.81	120.50	38.50	-17.69	1/53
		836.50	24.60	V	3.03	-0.97	20.60	114.82	38.50	-17.90	1/53
		839.00	25.00	V	3.03	-0.96	21.01	126.18	38.50	-17.49	1/1
	16-QAM	834.00	23.76	V	3.03	-0.98	19.75	94.41	38.50	-18.75	1/53
		836.50	23.59	V	3.03	-0.97	19.59	90.99	38.50	-18.91	1/53
		839.00	23.82	V	3.03	-0.96	19.83	96.16	38.50	-18.67	1/53
15	QPSK	831.50	24.54	V	3.02	-0.99	20.53	112.98	38.50	-17.97	1/77
		836.50	24.87	V	3.03	-0.97	20.87	122.18	38.50	-17.63	1/40
		841.50	24.39	V	3.04	-0.94	20.41	109.90	38.50	-18.09	1/1
	16-QAM	831.50	23.40	V	3.02	-0.99	19.39	86.90	38.50	-19.11	1/77
		836.50	23.75	V	3.03	-0.97	19.75	94.41	38.50	-18.75	1/1
		841.50	23.42	V	3.04	-0.94	19.44	87.90	38.50	-19.06	1/1
10	QPSK	829.00	24.28	V	3.02	-1.01	20.26	106.17	38.50	-18.24	1/50
		836.50	25.02	V	3.03	-0.97	21.02	126.47	38.50	-17.48	1/26
		844.00	24.03	V	3.04	-0.93	20.06	101.39	38.50	-18.44	1/1
	16-QAM	829.00	23.40	V	3.02	-1.01	19.38	86.70	38.50	-19.12	1/50
		836.50	24.10	V	3.03	-0.97	20.10	102.33	38.50	-18.40	1/26
		844.00	22.78	V	3.04	-0.93	18.81	76.03	38.50	-19.69	1/1
5	QPSK	826.50	23.73	V	3.01	-1.02	19.70	93.33	38.50	-18.80	1/23
		836.50	24.63	V	3.03	-0.97	20.63	115.61	38.50	-17.87	1/1
		846.50	23.63	V	3.05	-0.92	19.66	92.47	38.50	-18.84	1/1
	16-QAM	826.50	22.84	V	3.01	-1.02	18.81	76.03	38.50	-19.69	1/23
		836.50	23.47	V	3.03	-0.97	19.47	88.51	38.50	-19.03	1/1
		846.50	22.71	V	3.05	-0.92	18.72	74.47	38.50	-19.78	1/1

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9.2. RADIATIED SPURIOUS EMISSION

RULE PART(S)

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

LIMIT

§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.

§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

§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.

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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), Maxhold(GSM);

NOTE1

GSM : It was tested at GPRS as worst case (the highst output power and density).
UMTS: It was tested at REL 99 as worst case (the highst output power and density).
LTE: It was tested at 1RB QPSK as worst case (the highst output power and density).
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 RESULT

GSM850

GPRS

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

Company: Samsung
Project #: 4791440365
Date: 2024-08-30
Test Engineer: 24542
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 2
Mode: GPRS 850 MHz 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, 824.2MHz									
1648.40	-7.5	V	3.0	42.0	1.0	-48.5	-13.0	-35.5	
2472.60	1.0	V	3.0	42.3	1.0	-40.3	-13.0	-27.3	
3296.80	-4.0	V	3.0	42.9	1.0	-45.8	-13.0	-32.8	
1648.40	-9.2	H	3.0	42.0	1.0	-50.1	-13.0	-37.1	
2472.60	0.3	H	3.0	42.3	1.0	-41.1	-13.0	-28.1	
3296.80	-3.8	H	3.0	42.9	1.0	-45.7	-13.0	-32.7	
Mid Ch, 836.6MHz									
1673.20	-8.6	V	3.0	42.0	1.0	-49.6	-13.0	-36.6	
2509.80	-1.3	V	3.0	42.4	1.0	-42.6	-13.0	-29.6	
3346.40	-3.5	V	3.0	42.9	1.0	-45.4	-13.0	-32.4	
1673.20	-10.6	H	3.0	42.0	1.0	-51.5	-13.0	-38.5	
2509.80	-3.0	H	3.0	42.4	1.0	-44.4	-13.0	-31.4	
3346.40	-3.0	H	3.0	42.9	1.0	-45.0	-13.0	-32.0	
High Ch, 848.8MHz									
1697.60	-8.5	V	3.0	42.0	1.0	-49.4	-13.0	-36.4	
2546.40	-5.6	V	3.0	42.4	1.0	-47.1	-13.0	-34.1	
3395.20	-4.2	V	3.0	42.9	1.0	-46.1	-13.0	-33.1	
1697.60	-10.0	H	3.0	42.0	1.0	-51.0	-13.0	-38.0	
2546.40	-5.7	H	3.0	42.4	1.0	-47.2	-13.0	-34.2	
3395.20	-2.1	H	3.0	42.9	1.0	-44.0	-13.0	-31.0	

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WCDMA Band 5

REL99

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

Company: Samsung
Project #: 4791440365
Date: 2024-09-04
Test Engineer: 28775
Configuration: EUT / Z-Position
Location: Chamber 1
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	-14.2	V	3.0	43.3	1.0	-56.5	-13.0	-43.5	
2479.20	-10.6	V	3.0	43.6	1.0	-53.2	-13.0	-40.2	
3305.60	-8.6	V	3.0	43.9	1.0	-51.5	-13.0	-38.5	
1652.80	-15.0	H	3.0	43.3	1.0	-57.3	-13.0	-44.3	
2479.20	-10.9	H	3.0	43.6	1.0	-53.5	-13.0	-40.5	
3305.60	-8.4	H	3.0	43.9	1.0	-51.4	-13.0	-38.4	
Mid Ch, 836.6MHz									
1673.20	-12.0	V	3.0	43.3	1.0	-54.3	-13.0	-41.3	
2509.80	-10.0	V	3.0	43.6	1.0	-52.6	-13.0	-39.6	
3346.40	-8.9	V	3.0	43.9	1.0	-51.8	-13.0	-38.8	
1673.20	-15.1	H	3.0	43.3	1.0	-57.4	-13.0	-44.4	
2509.80	-10.8	H	3.0	43.6	1.0	-53.4	-13.0	-40.4	
3346.40	-8.7	H	3.0	43.9	1.0	-51.6	-13.0	-38.6	
High Ch, 846.6MHz									
1693.20	-8.7	V	3.0	43.3	1.0	-51.0	-13.0	-38.0	
2539.80	-8.4	V	3.0	43.6	1.0	-51.0	-13.0	-38.0	
3386.40	-9.1	V	3.0	44.0	1.0	-52.1	-13.0	-39.1	
1693.20	-10.3	H	3.0	43.3	1.0	-52.6	-13.0	-39.6	
2539.80	-10.0	H	3.0	43.6	1.0	-52.6	-13.0	-39.6	
3386.40	-8.9	H	3.0	44.0	1.0	-51.8	-13.0	-38.8	

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LTE Band 14

10 MHz

QPSK

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

Company:	Samsung
Project #:	4791440365
Date:	2024-08-29
Test Engineer:	26087
Configuration:	EUT / AC Adapter, X-Position
Location:	Chamber 2
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	-14.9	V	3.0	42.0	1.0	-55.8	-40.0	-15.8	
2379.00	-11.9	V	3.0	42.3	1.0	-53.2	-13.0	-40.2	
3172.00	-9.0	V	3.0	42.8	1.0	-50.8	-13.0	-37.8	
1586.00	-15.9	H	3.0	42.0	1.0	-56.9	-40.0	-16.9	
2379.00	-11.9	H	3.0	42.3	1.0	-53.2	-13.0	-40.2	
3172.00	-8.3	H	3.0	42.8	1.0	-50.2	-13.0	-37.2	

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LTE Band 26 (Part 90)

3 MHz

QPSK

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

Company: Samsung
Project #: 4791440365
Date: 2024-08-29
Test Engineer: 26087
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 26 Harmonics, 3MHz 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, 815.5MHz									
1631.00	-14.7	V	3.0	42.0	1.0	-55.7	-13.0	-42.7	
2446.50	-11.8	V	3.0	42.3	1.0	-53.1	-13.0	-40.1	
3262.00	-9.6	V	3.0	42.9	1.0	-51.5	-13.0	-38.5	
1631.00	-15.7	H	3.0	42.0	1.0	-56.7	-13.0	-43.7	
2446.50	-11.6	H	3.0	42.3	1.0	-53.0	-13.0	-40.0	
3262.00	-9.0	H	3.0	42.9	1.0	-50.8	-13.0	-37.8	
Mid Ch, 822.5MHz									
1645.00	-14.6	V	3.0	42.0	1.0	-55.5	-13.0	-42.5	
2467.50	-11.6	V	3.0	42.3	1.0	-53.0	-13.0	-40.0	
3290.00	-9.5	V	3.0	42.9	1.0	-51.4	-13.0	-38.4	
1645.00	-15.6	H	3.0	42.0	1.0	-56.5	-13.0	-43.5	
2467.50	-11.7	H	3.0	42.3	1.0	-53.0	-13.0	-40.0	
3290.00	-8.9	H	3.0	42.9	1.0	-50.8	-13.0	-37.8	

LTE Band 26 (Straddle)

15 MHz

QPSK

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

Company: Samsung
Project #: 4791440365
Date: 2024-08-29
Test Engineer: 26087
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 2
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
Straddle Ch, 824MHz									
1648.00	-14.6	V	3.0	42.0	1.0	-55.6	-13.0	-42.6	
2472.00	-11.6	V	3.0	42.3	1.0	-52.9	-13.0	-39.9	
3296.00	-9.5	V	3.0	42.9	1.0	-51.4	-13.0	-38.4	
1648.00	-15.6	H	3.0	42.0	1.0	-56.5	-13.0	-43.5	
2472.00	-11.4	H	3.0	42.3	1.0	-52.7	-13.0	-39.7	
3296.00	-8.9	H	3.0	42.9	1.0	-50.8	-13.0	-37.8	

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LTE Band 26 (Part 22)

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

Company:	Samsung
Project #:	4791440365
Date:	2024-08-29
Test Engineer:	26087
Configuration:	EUT / AC Adapter, Z-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 26 Harmonics, 15MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

15 MHz

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, 831.5MHz									
1663.00	-14.5	V	3.0	42.0	1.0	-55.5	-13.0	-42.5	
2494.50	-11.6	V	3.0	42.4	1.0	-53.0	-13.0	-40.0	
3326.00	-9.2	V	3.0	42.9	1.0	-51.1	-13.0	-38.1	
1663.00	-15.4	H	3.0	42.0	1.0	-56.4	-13.0	-43.4	
2494.50	-11.4	H	3.0	42.4	1.0	-52.8	-13.0	-39.8	
3326.00	-8.8	H	3.0	42.9	1.0	-50.7	-13.0	-37.7	
Mid Ch, 836.5MHz									
1673.00	-14.5	V	3.0	42.0	1.0	-55.5	-13.0	-42.5	
2509.50	-11.5	V	3.0	42.4	1.0	-52.8	-13.0	-39.8	
3346.00	-9.0	V	3.0	42.9	1.0	-50.9	-13.0	-37.9	
1673.00	-15.4	H	3.0	42.0	1.0	-56.4	-13.0	-43.4	
2509.50	-11.5	H	3.0	42.4	1.0	-52.9	-13.0	-39.9	
3346.00	-8.6	H	3.0	42.9	1.0	-50.5	-13.0	-37.5	
High Ch, 841.5MHz									
1683.00	-14.6	V	3.0	42.0	1.0	-55.5	-13.0	-42.5	
2524.50	-11.6	V	3.0	42.4	1.0	-52.9	-13.0	-39.9	
3366.00	-8.8	V	3.0	42.9	1.0	-50.7	-13.0	-37.7	
1683.00	-15.5	H	3.0	42.0	1.0	-56.5	-13.0	-43.5	
2524.50	-11.4	H	3.0	42.4	1.0	-52.8	-13.0	-39.8	
3366.00	-8.4	H	3.0	42.9	1.0	-50.3	-13.0	-37.3	

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NR Band n5

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

Company: Samsung
Project #: 4791440365
Date: 2024-09-04
Test Engineer: 26087
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 2
Mode: 5G NR_QPSK NR n5 Harmonics, 10MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

10 MHz

DFT-s-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, 829MHz									
1658.00	-14.7	V	3.0	42.0	1.0	-55.6	-13.0	-42.6	
2487.00	-11.7	V	3.0	42.4	1.0	-53.1	-13.0	-40.1	
3316.00	-9.2	V	3.0	42.9	1.0	-51.1	-13.0	-38.1	
1658.00	-15.5	H	3.0	42.0	1.0	-56.5	-13.0	-43.5	
2487.00	-11.6	H	3.0	42.4	1.0	-53.0	-13.0	-40.0	
3316.00	-8.8	H	3.0	42.9	1.0	-50.7	-13.0	-37.7	
Mid Ch, 836.5MHz									
1673.00	-14.5	V	3.0	42.0	1.0	-55.5	-13.0	-42.5	
2509.50	-11.6	V	3.0	42.4	1.0	-53.0	-13.0	-40.0	
3346.00	-8.7	V	3.0	42.9	1.0	-50.7	-13.0	-37.7	
1673.00	-15.5	H	3.0	42.0	1.0	-56.5	-13.0	-43.5	
2509.50	-11.4	H	3.0	42.4	1.0	-52.8	-13.0	-39.8	
3346.00	-8.2	H	3.0	42.9	1.0	-50.1	-13.0	-37.1	
High Ch, 844MHz									
1688.00	-14.4	V	3.0	42.0	1.0	-55.3	-13.0	-42.3	
2532.00	-11.5	V	3.0	42.4	1.0	-52.9	-13.0	-39.9	
3376.00	-9.1	V	3.0	42.9	1.0	-51.0	-13.0	-38.0	
1688.00	-15.4	H	3.0	42.0	1.0	-56.3	-13.0	-43.3	
2532.00	-11.4	H	3.0	42.4	1.0	-52.8	-13.0	-39.8	
3376.00	-8.6	H	3.0	42.9	1.0	-50.5	-13.0	-37.5	

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