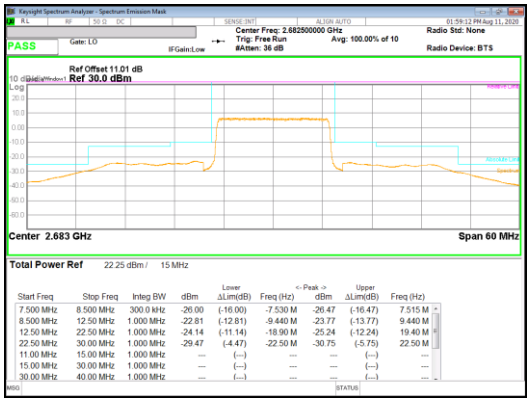
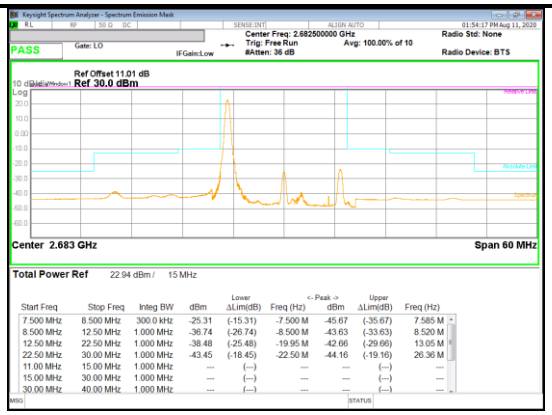
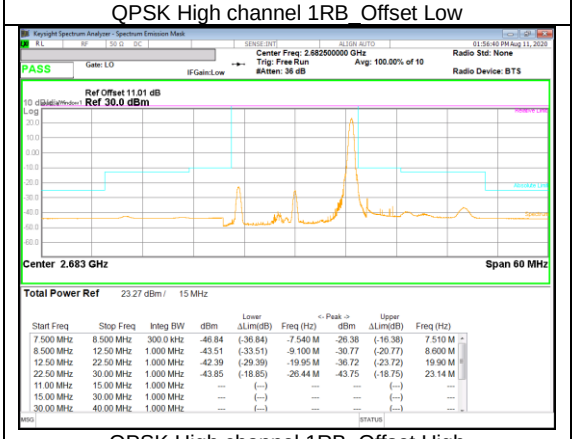
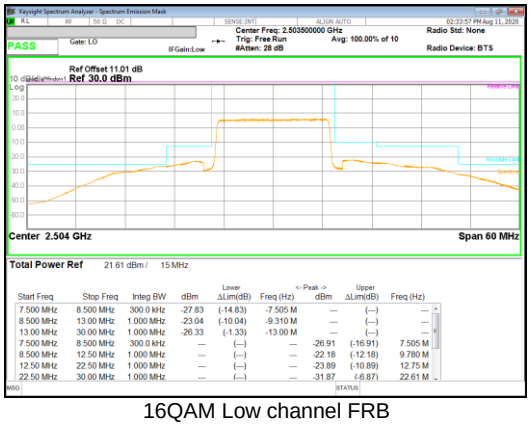
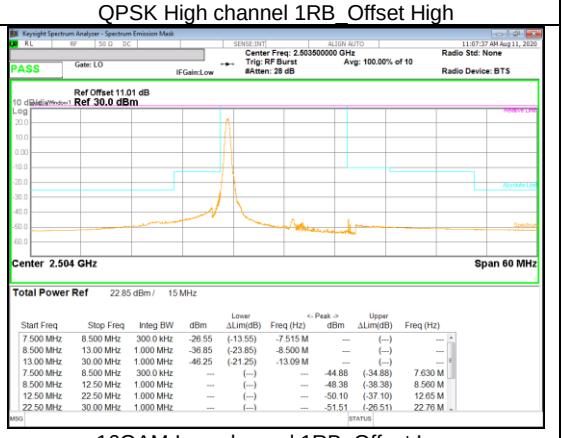
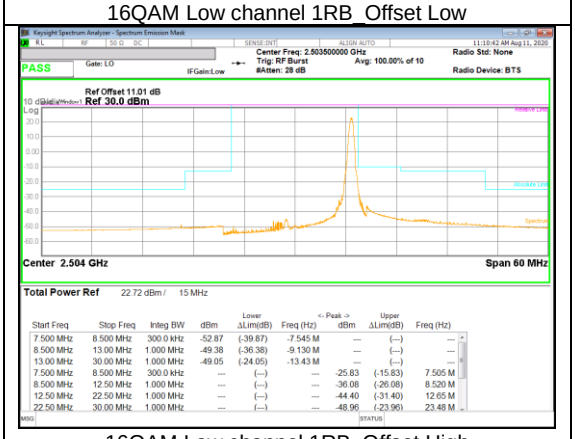
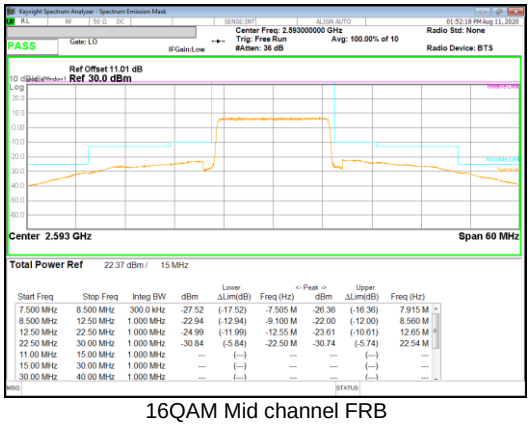
Band 41 15MHz QPSK	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low  QPSK High channel 1RB_Offset High
Band 41 15MHz 16QAM	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low  16QAM Low channel 1RB_Offset High

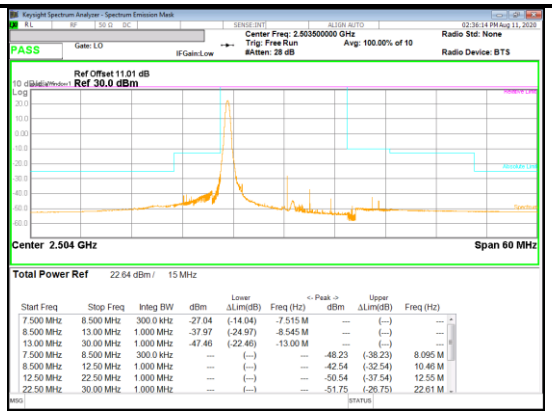
Band 41

15MHz

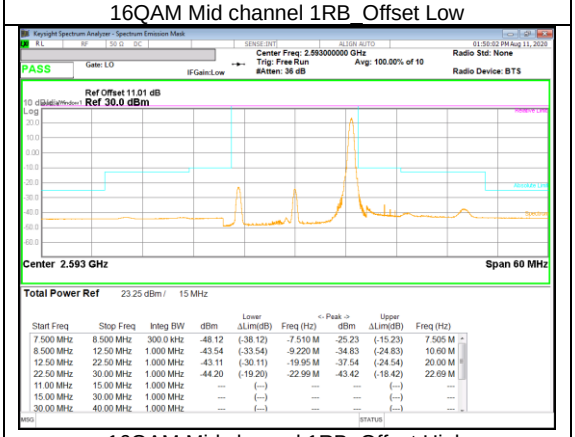
16QAM



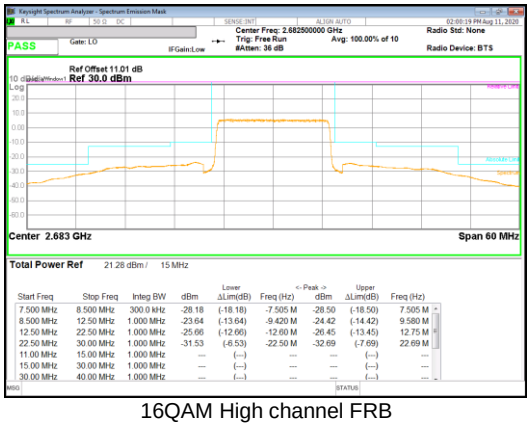
16QAM Mid channel FRB



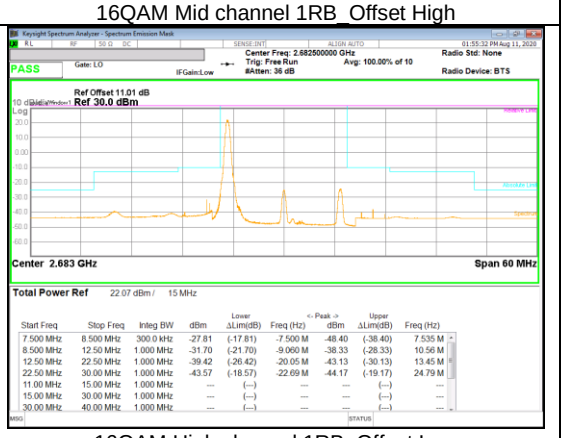
16QAM Mid channel 1RB_Offset Low



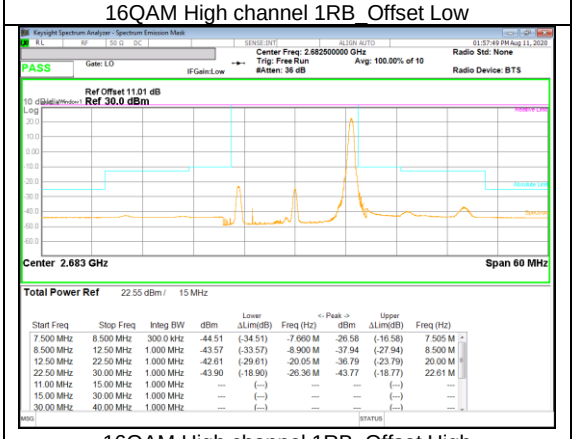
16QAM Mid channel 1RB_Offset High



16QAM High channel FRB



16QAM High channel 1RB_Offset Low

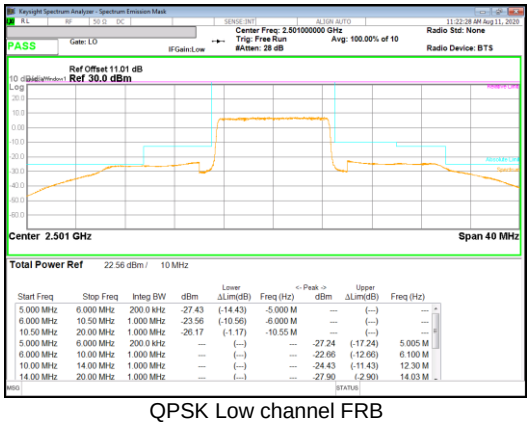


16QAM High channel 1RB_Offset High

Band 41

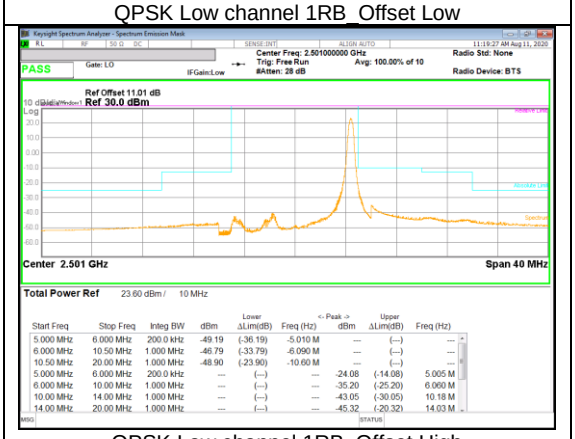
10MHz

QPSK

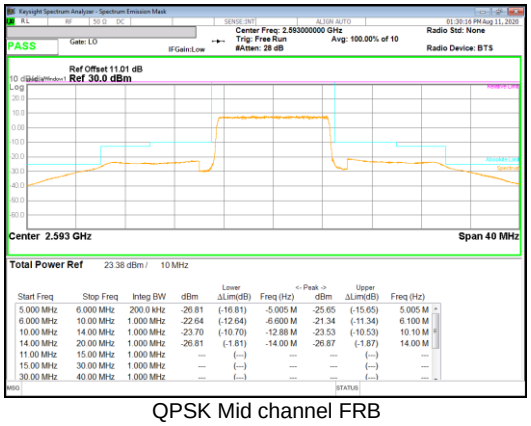


QPSK Low channel FRB

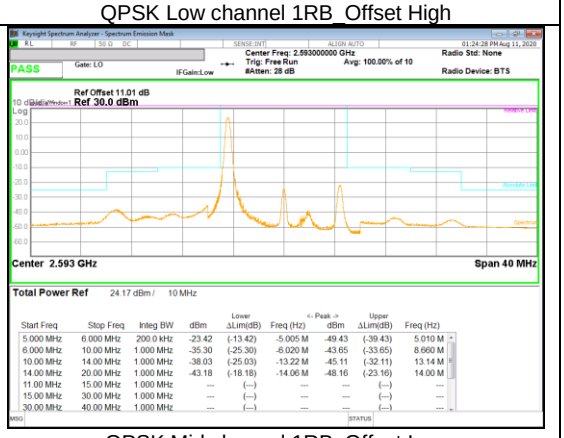
QPSK Low channel 1RB_Offset Low



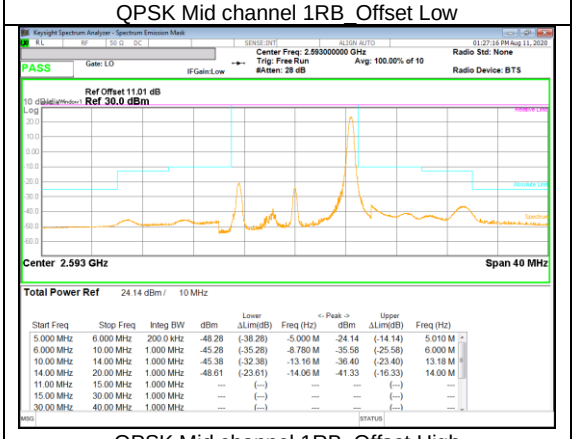
QPSK Low channel 1RB_Offset High



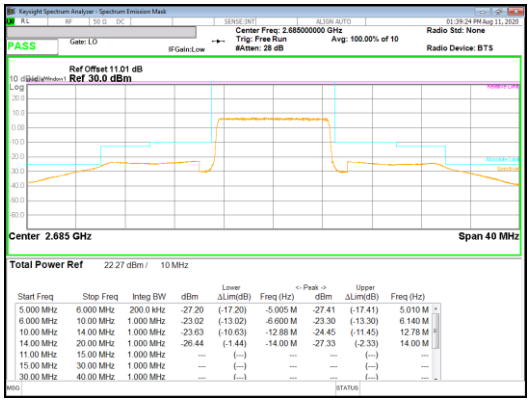
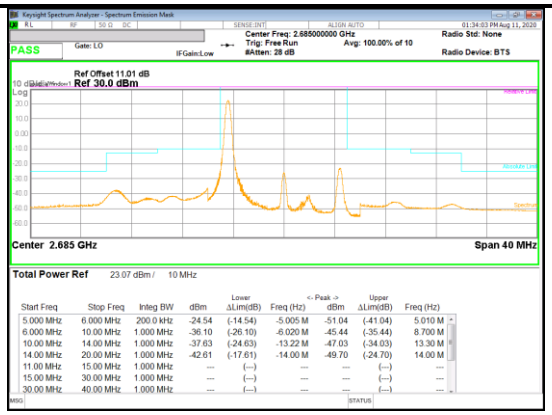
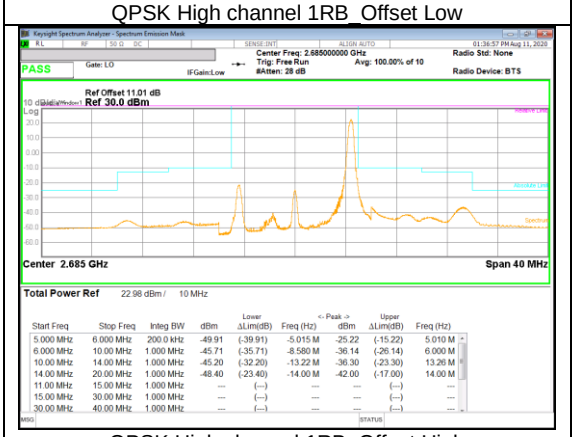
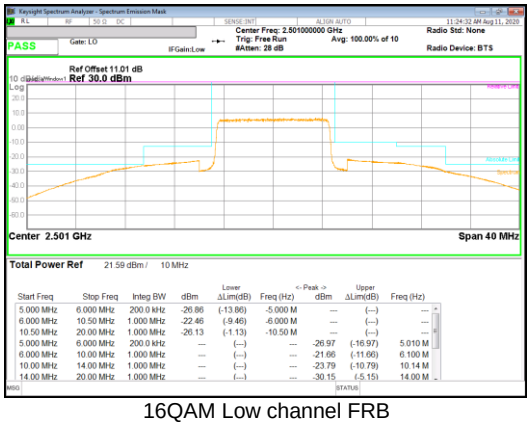
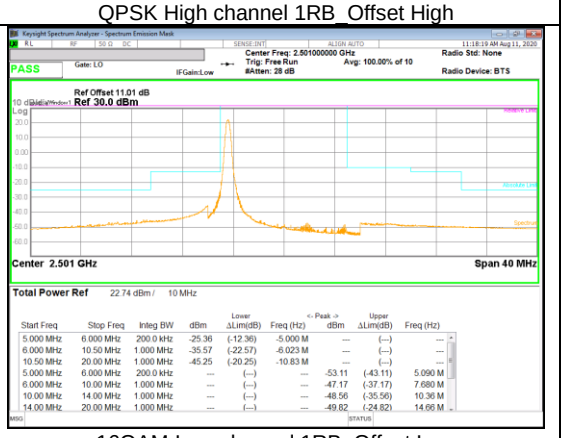
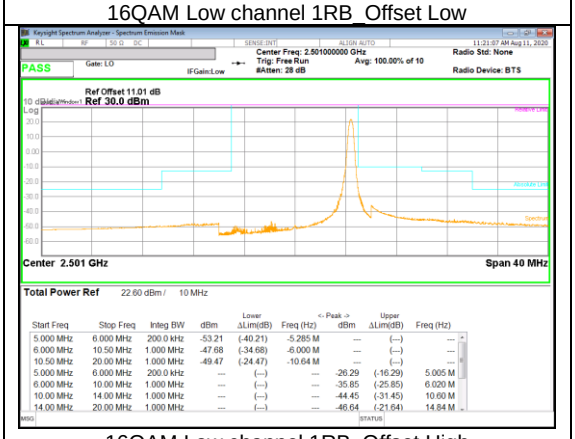
QPSK Mid channel FRB

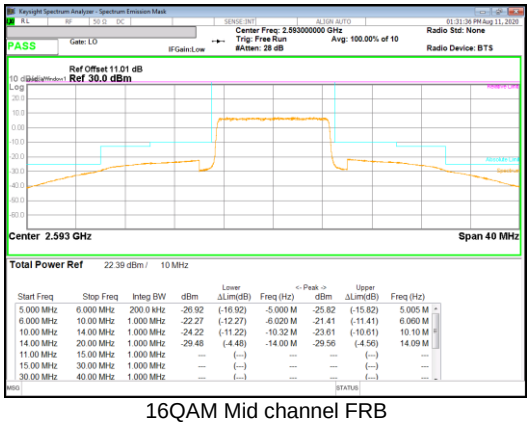
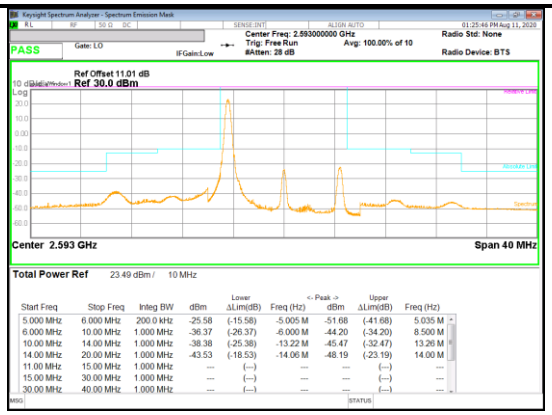
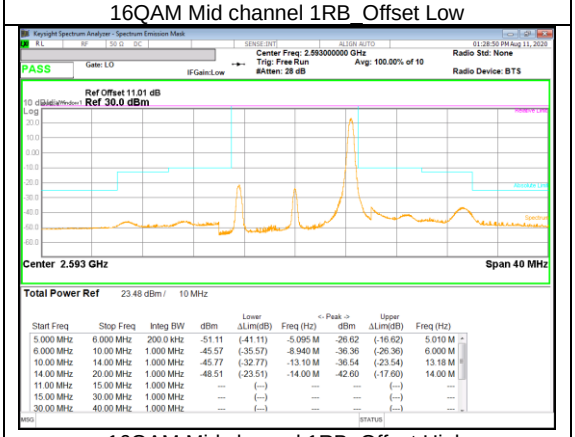
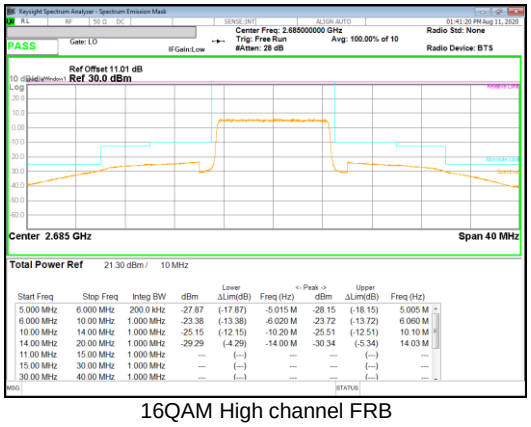
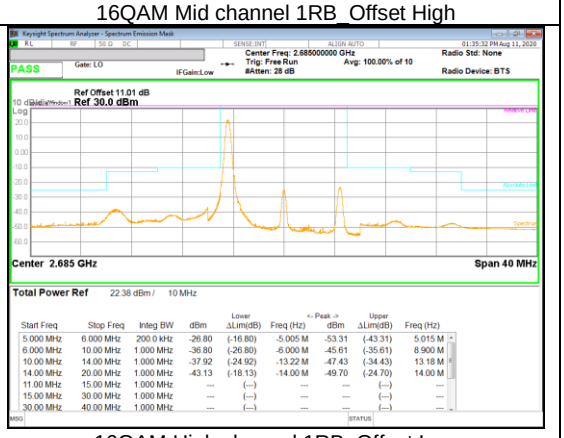
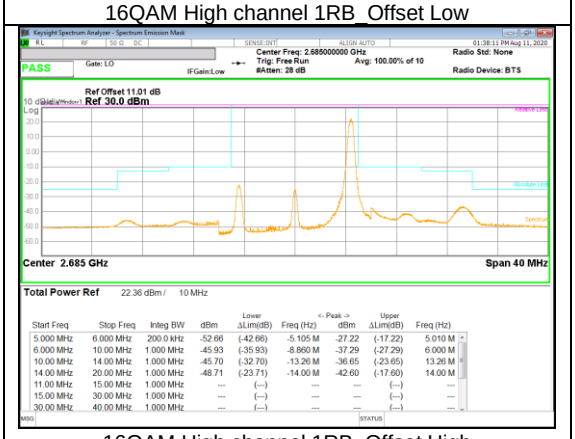


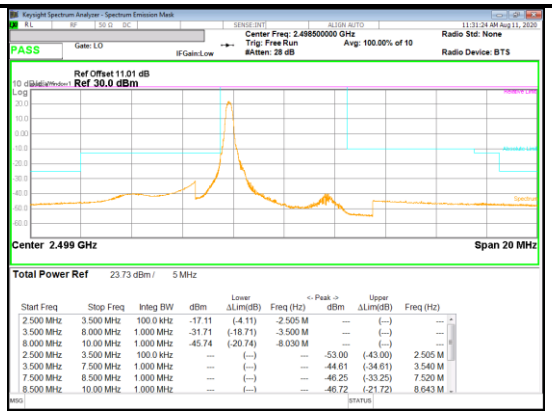
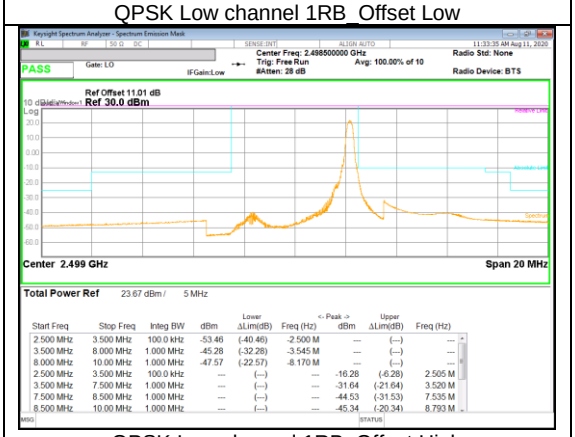
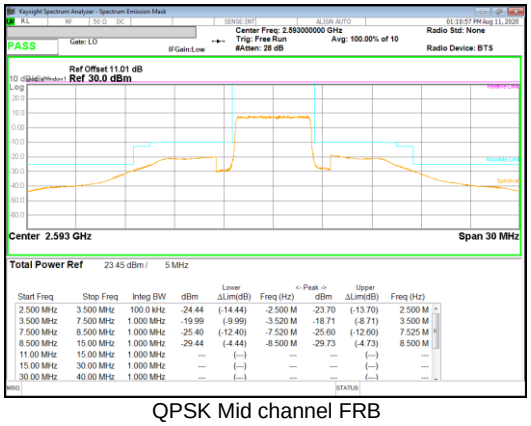
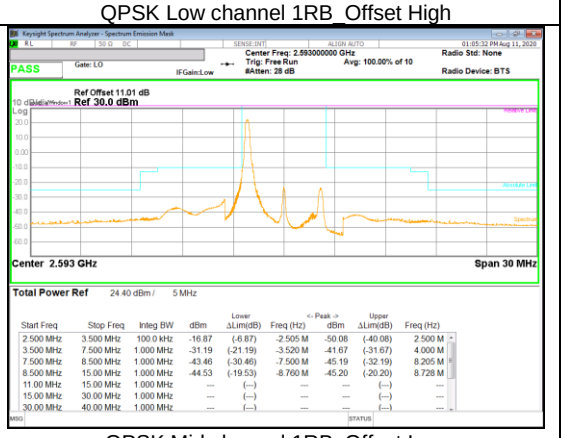
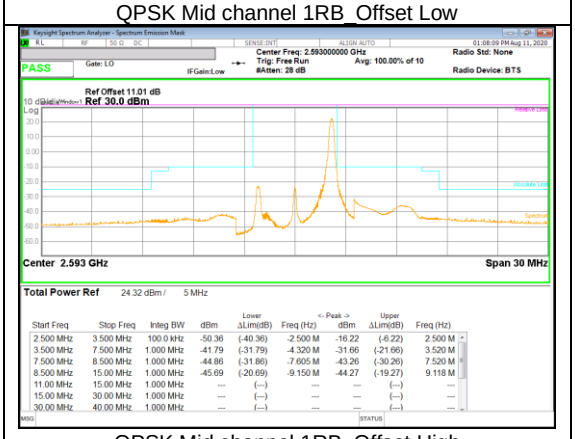
QPSK Mid channel 1RB_Offset Low

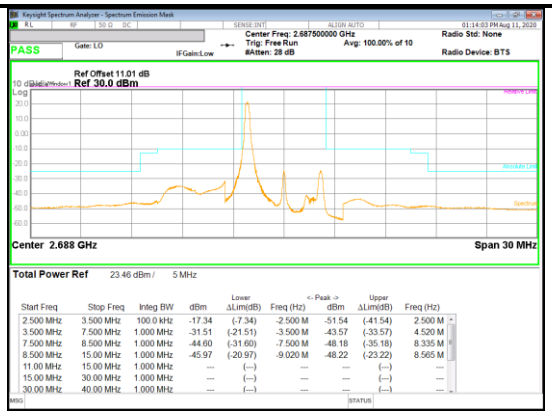
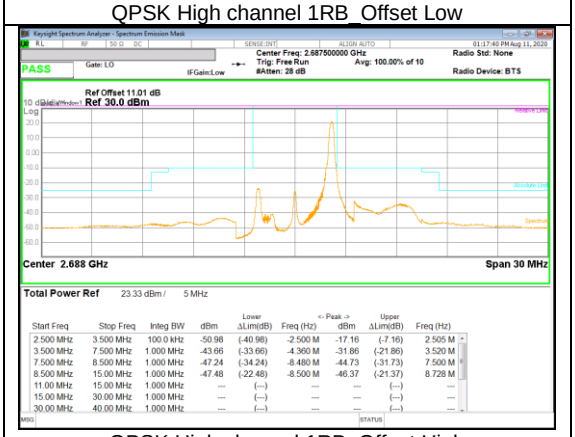
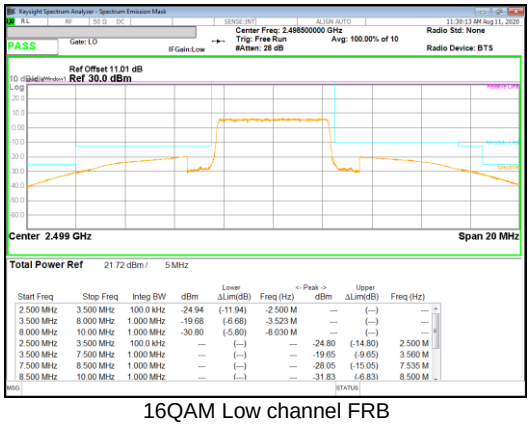
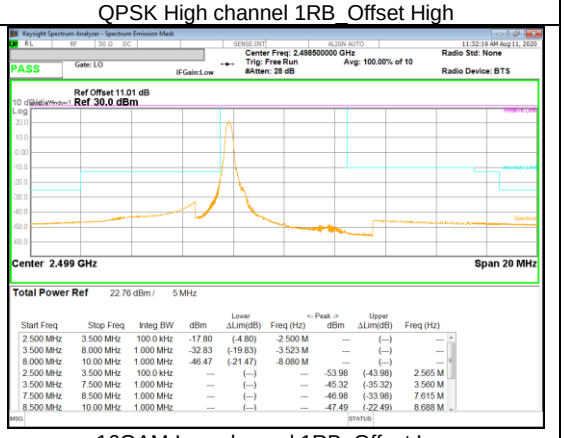
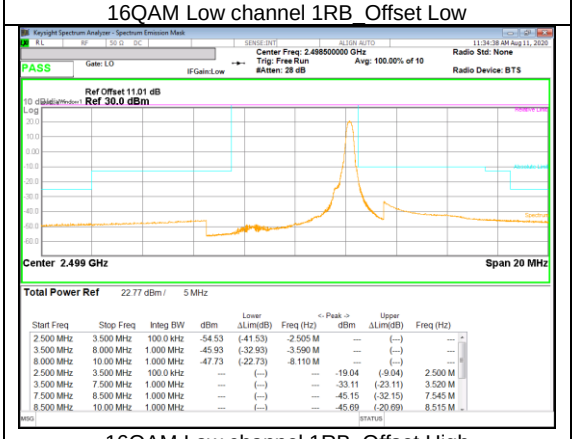


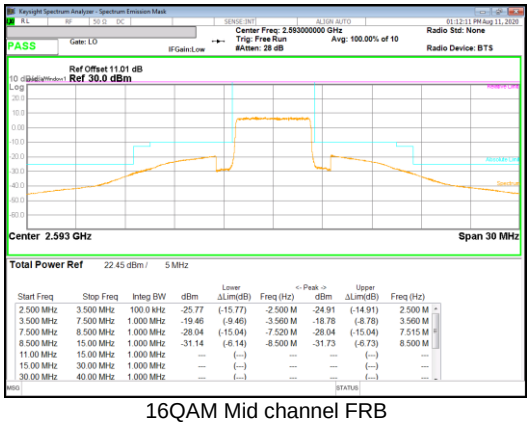
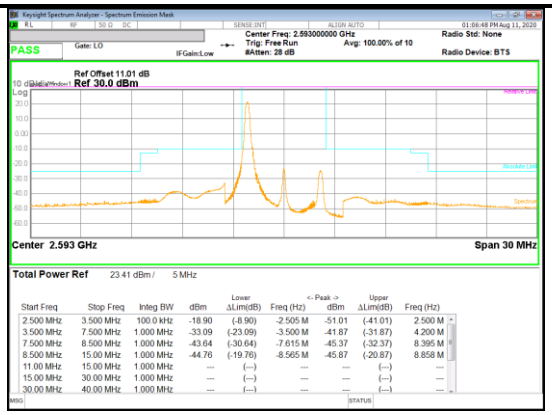
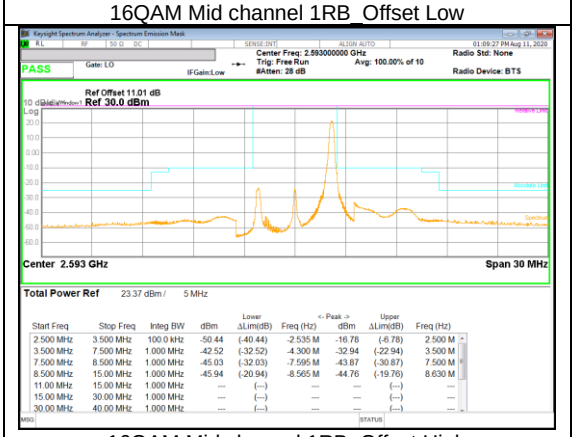
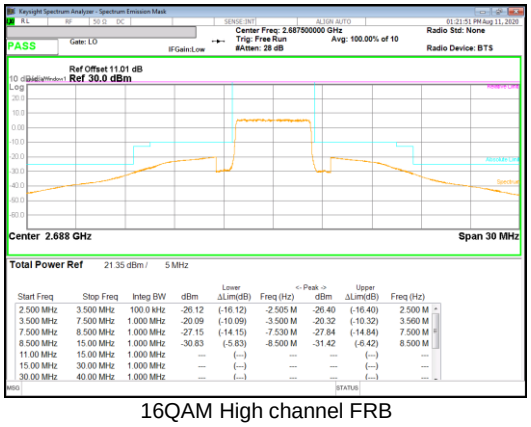
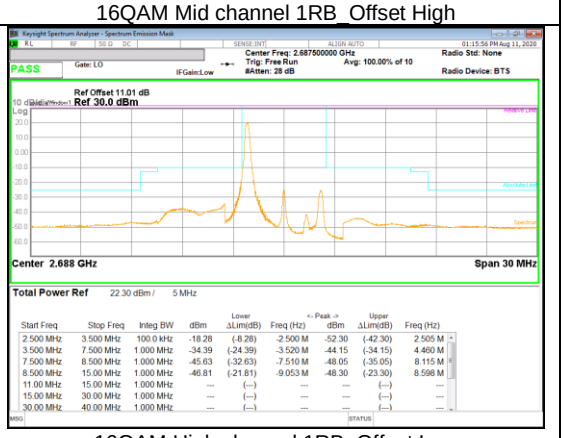
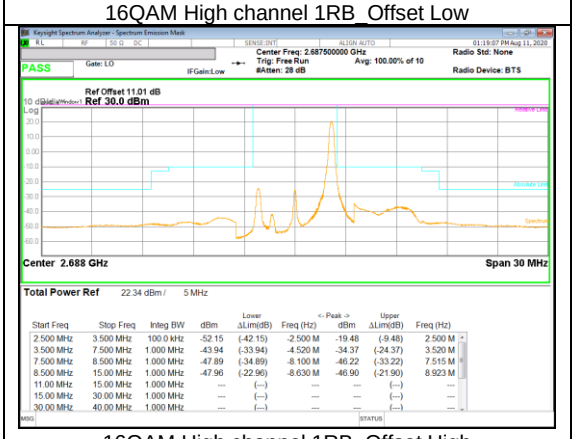
QPSK Mid channel 1RB_Offset High

Band 41 10MHz QPSK	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low  QPSK High channel 1RB_Offset High
Band 41 10MHz 16QAM	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low  16QAM Low channel 1RB_Offset High

Band 41 10MHz 16QAM	 16QAM Mid channel FRB	 16QAM Mid channel 1RB_Offset Low
		 16QAM Mid channel 1RB_Offset High
	 16QAM High channel FRB	 16QAM High channel 1RB_Offset Low
		 16QAM High channel 1RB_Offset High

Band 41 5MHz QPSK	 QPSK Low channel FRB	 QPSK Low channel 1RB_Offset Low
		 QPSK Low channel 1RB_Offset High
	 QPSK Mid channel FRB	 QPSK Mid channel 1RB_Offset Low
		 QPSK Mid channel 1RB_Offset High

Band 41 5MHz QPSK	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low  QPSK High channel 1RB_Offset High
Band 41 5MHz 16QAM	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low  16QAM Low channel 1RB_Offset High

Band 41 5MHz 16QAM	 16QAM Mid channel FRB	 16QAM Mid channel 1RB_Offset Low
		 16QAM Mid channel 1RB_Offset High
	 16QAM High channel FRB	 16QAM High channel 1RB_Offset Low
		 16QAM High channel 1RB_Offset High

LTE Band 4

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

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9.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §27.53 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 27.53:
(c)(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

(h) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

(m) (4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

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 = 100KHz for emission below 1GHz and 1MHz for emissions above 1GHz (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), Max hold(GSM, LTE Band41);

RESULTS

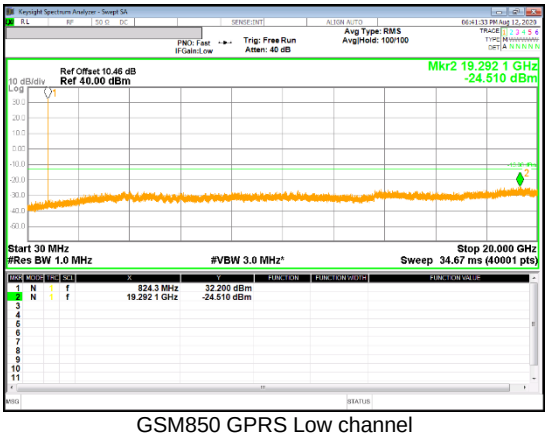
See the following pages.

NOTE : Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

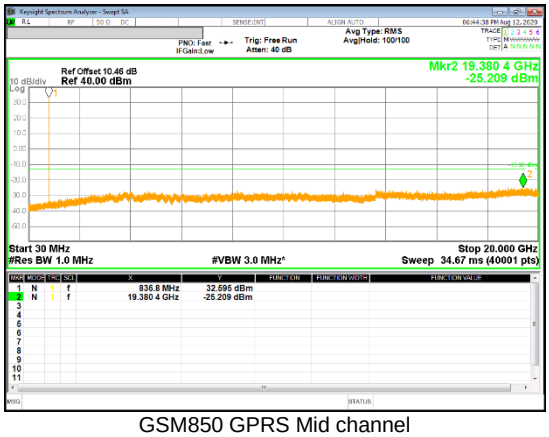
9.3.1. OUT OF BAND EMISSIONS RESULT

GSM 850

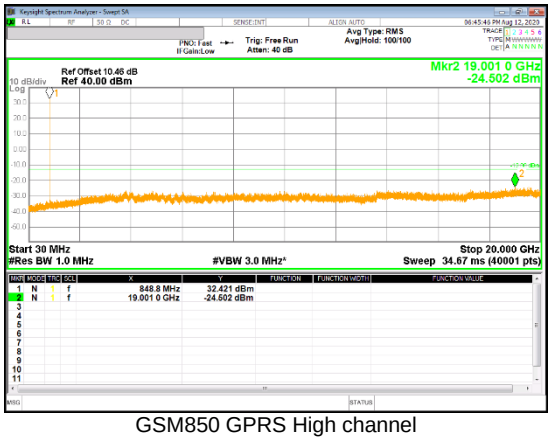
GSM 850



GSM850 GPRS Low channel

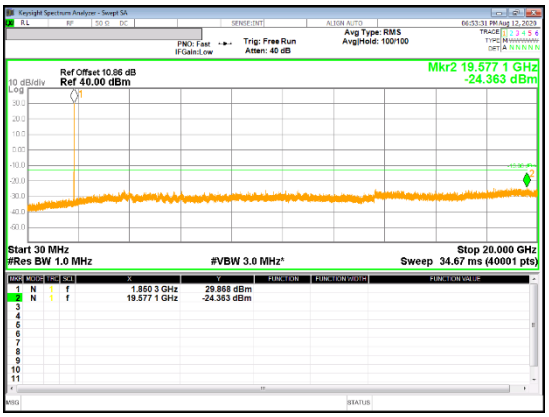
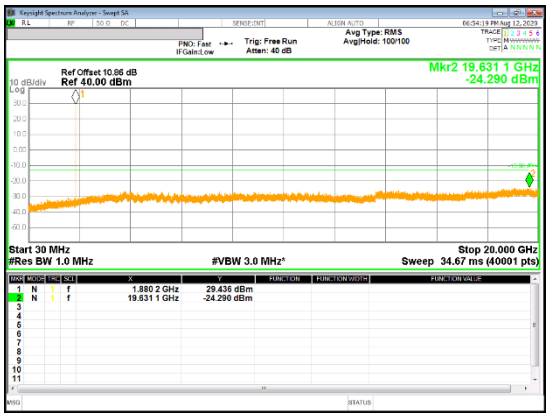
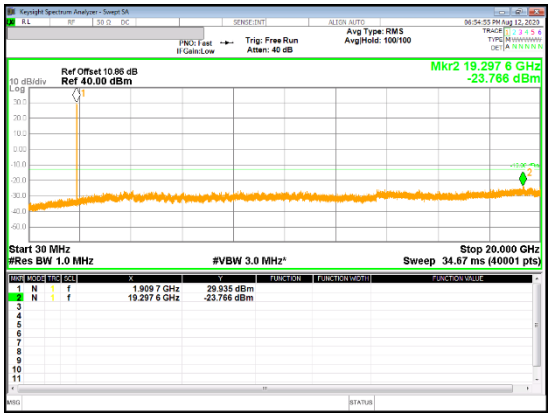


GSM850 GPRS Mid channel

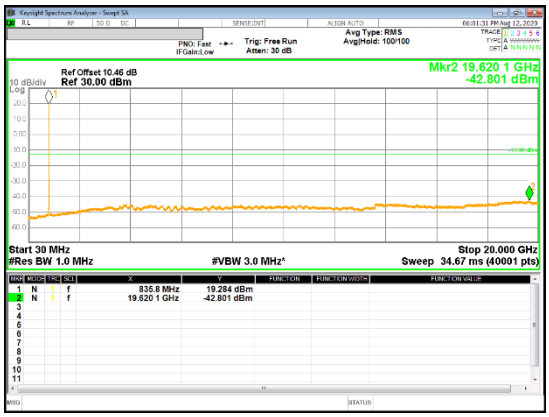
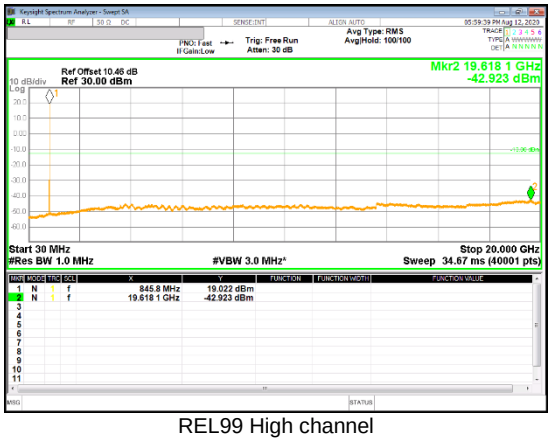


GSM850 GPRS High channel

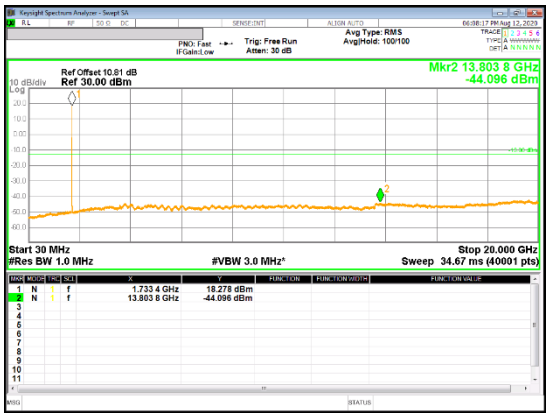
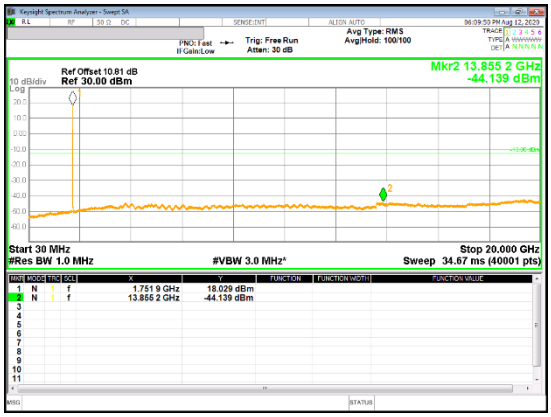
GSM 1900

GSM 1900	 GSM1900 GPRS Low channel	 GSM1900 GPRS Mid channel
	 GSM1900 GPRS High channel	

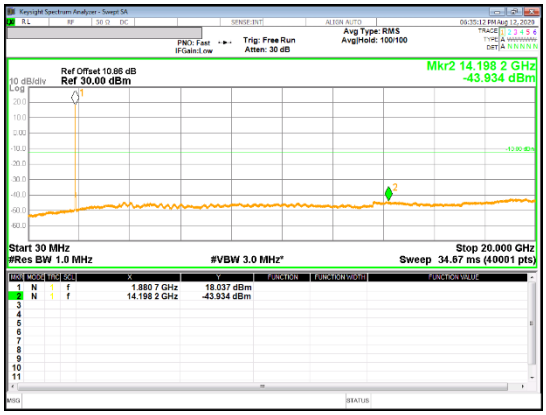
WCDMA Band 5

Band 5	 REL99 Low channel	 REL99 Mid channel
	 REL99 High channel	

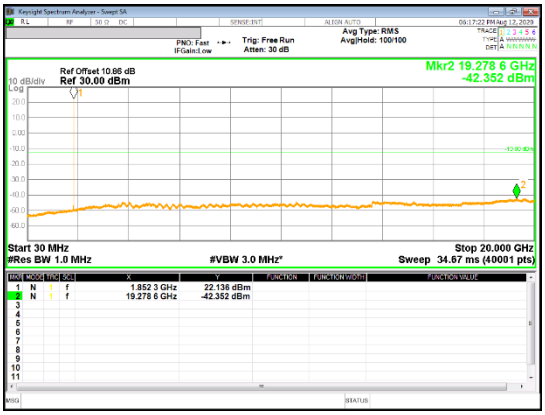
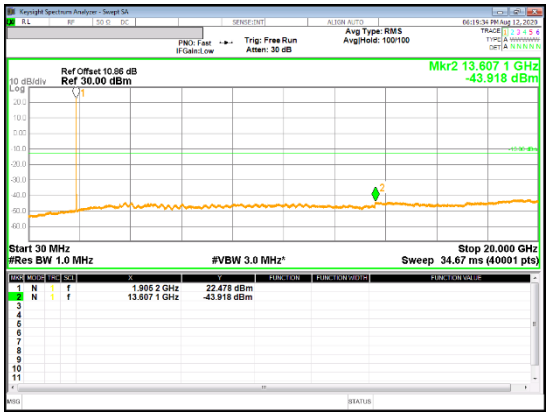
WCDMA Band 4

Band 4	 REL99 Low channel	 REL99 Mid channel
	 REL99 High channel	

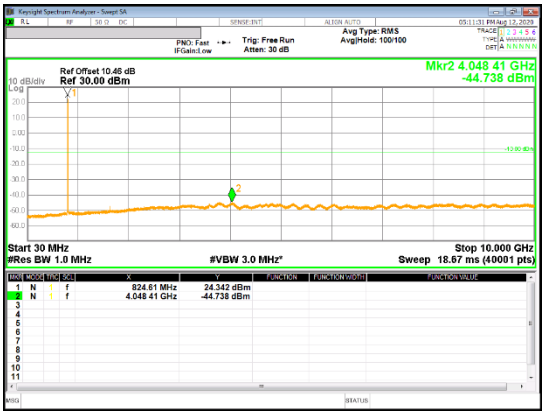
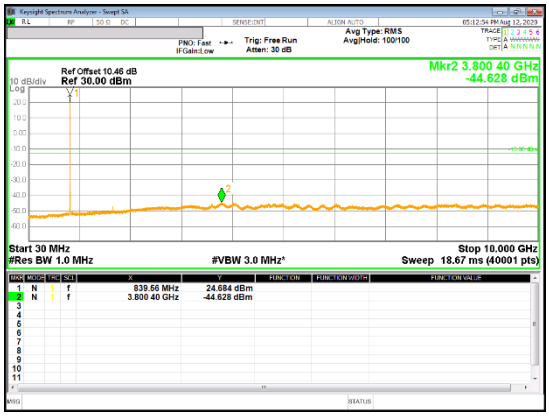
WCDMA Band 2

Band 2	 REL99 Low channel	 REL99 Mid channel
	 REL99 High channel	

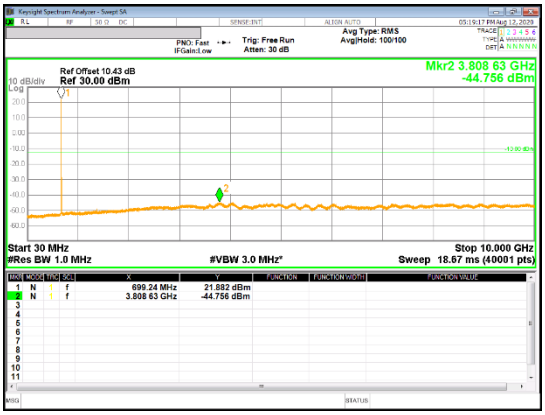
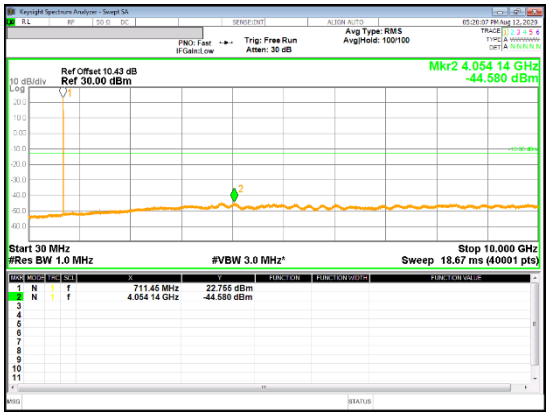
LTE Band 2

Band 2 5MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

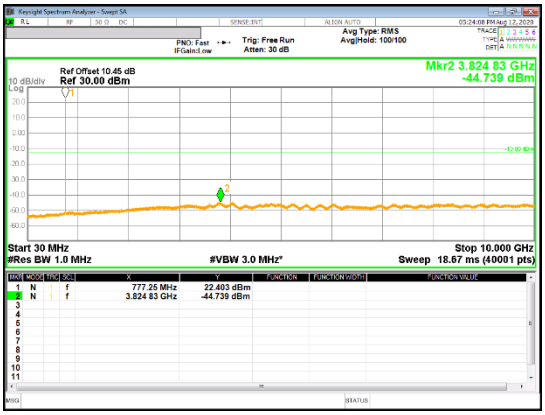
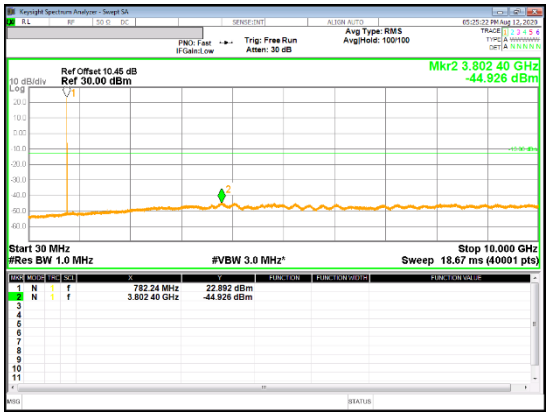
LTE Band 5

Band 5 10MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

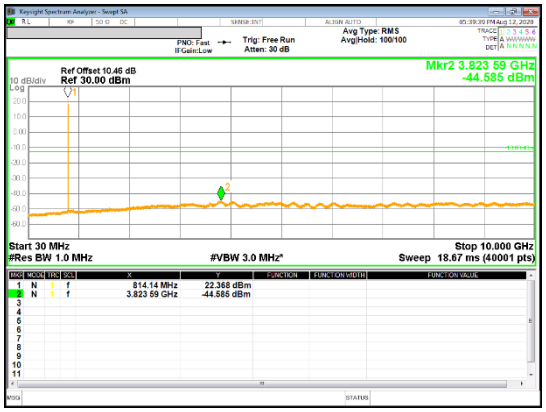
LTE Band 12

Band 12 5MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

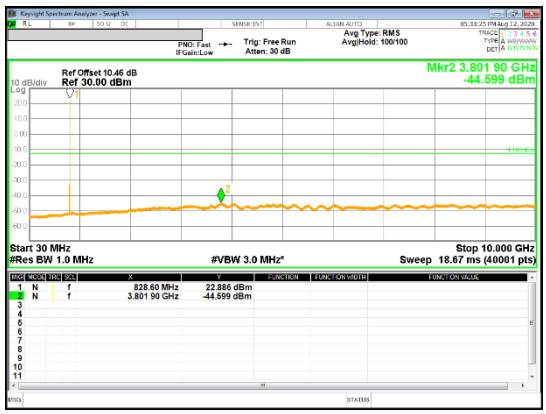
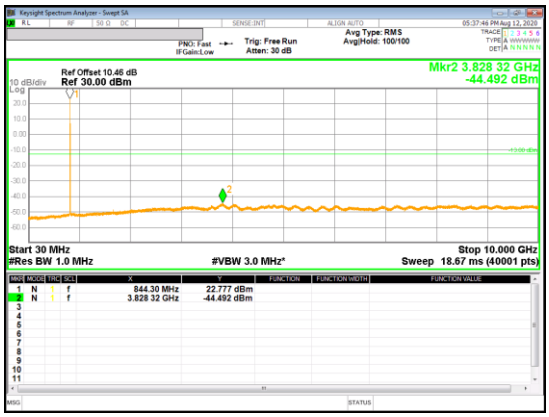
LTE Band 13

Band 13 5MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

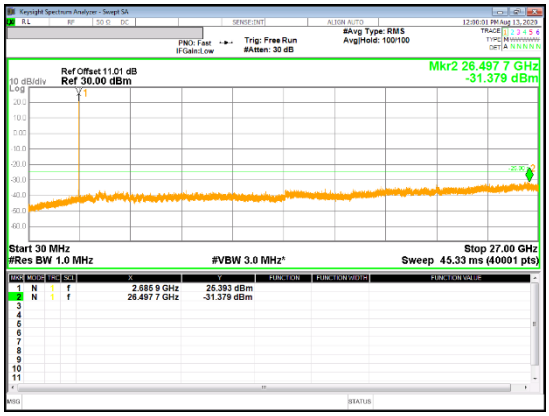
LTE Band 26(Part 90)

Band 26 (Part90) 3MHz	 QPSK Low channel	 QPSK High channel

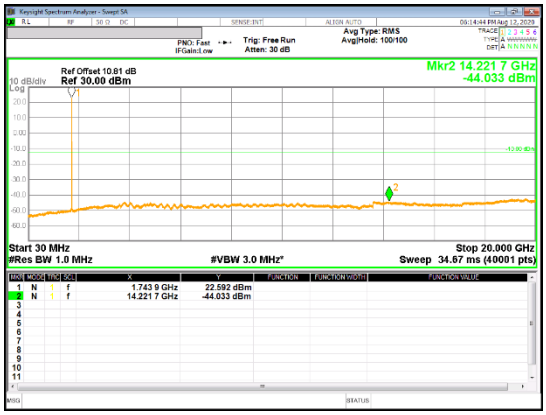
LTE Band 26(Part 22)

Band 26 (Part 22) 5MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 41(PC3)

Band 41 10MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 66

Band 66 3MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 4

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27(04)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235,§27.54 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.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

§27.54 - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

§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

RESULTS

See the following pages.

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)

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9.4.1. FREQUENCY STABILITY RESULTS

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

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 [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	50	824.20002541	0.006	848.80002919	-0.001	2.5
3.86	40	824.20002883	0.002	848.80002799	0.000	2.5
3.86	30	824.20002870	0.002	848.80003135	-0.003	2.5
3.86	***20***	***824.20003028***	***0.000***	***848.80002838***	***0.000***	***2.5***
3.86	10	824.20003109	-0.001	848.80002748	0.001	2.5
3.86	0	824.20003351	-0.004	848.80003222	-0.005	2.5
3.86	-10	824.20002844	0.002	848.80002938	-0.001	2.5
3.86	-20	824.20002699	0.004	848.80002647	0.002	2.5
3.86	-30	824.20003531	-0.006	848.80002961	-0.001	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 [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	***20***	**824.20003028**	***0***	**848.80002838**	***0***	***2.5***
4.40	20	824.20003371	-0.004	848.80003200	-0.004	2.5
3.65	20	824.20003571	-0.007	848.80003497	-0.008	2.5

GSM 1900, Channel 512/810, Frequency 1850.0/1910.0 MHz (Lowest Frequency:EGPRS / Highest Frequency: GPRS)

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.0787	1909.9216		
Extreme (50C)		1850.0787	1909.9216	32.0	0.017
Extreme (40C)		1850.0787	1909.9216	29.1	0.015
Extreme (30C)		1850.0787	1909.9216	31.0	0.016
Extreme (10C)		1850.0787	1909.9216	40.9	0.022
Extreme (0C)		1850.0787	1909.9216	42.1	0.022
Extreme (-10C)		1850.0787	1909.9217	67.9	0.036
Extreme (-20C)		1850.0787	1909.9217	57.1	0.030
Extreme (-30C)		1850.0788	1909.9217	70.1	0.037
20C	15%	1850.0787	1909.9216	40.6	0.022
	-15%	1850.0787	1909.9216	44.7	0.024
	End Point	1850.0787	1909.9216	44.1	0.023

WCDMA Band 5

Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20ºC					
Low Channel	2066.000	Hz	High Channel	2116.500	Hz

Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
	Low Channel		High Channel		
	[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
50	826.40000895	0.002	846.60001091	-0.004	2.5
40	826.40000882	0.002	846.60000489	0.003	2.5
30	826.40000951	0.001	846.60000581	0.002	2.5
20	***826.40001032***	***0.000***	***846.60000768***	***0.000***	***2.5***
10	826.40000770	0.003	846.60001064	-0.003	2.5
0	826.40000832	0.002	846.60000738	0.000	2.5
-10	826.40001671	-0.008	846.60001551	-0.009	2.5
-20	826.40001302	-0.003	846.60001582	-0.010	2.5
-30	826.40001024	0.000	846.60001635	-0.010	2.5

Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20ºC					
Low Channel	2066.000	Hz	High Channel	2116.500	Hz

Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
	Low Channel		High Channel		
	[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
20	***826.40001032***	***0***	***846.60000768***	***0***	***2.5***
20	826.40000691	0.004	846.60000375	0.005	2.5
20	826.40000294	0.009	846.60000377	0.005	2.5

WCDMA Band 4 (Lowest Frequency:HSDPA / Highest Frequency: HSDPA)

Limit		1710	1755	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.3307	1754.6782		
Extreme (50C)		1710.3307	1754.6782	34.6	0.020
Extreme (40C)		1710.3307	1754.6782	25.2	0.015
Extreme (30C)		1710.3307	1754.6782	18.7	0.011
Extreme (10C)		1710.3307	1754.6782	24.1	0.014
Extreme (0C)		1710.3307	1754.6782	26.6	0.015
Extreme (-10C)		1710.3307	1754.6782	22.6	0.013
Extreme (-20C)		1710.3307	1754.6782	19.3	0.011
Extreme (-30C)		1710.3307	1754.6782	18.2	0.010
20C	15%	1710.3307	1754.6782	13.5	0.008
	-15%	1710.3307	1754.6782	12.3	0.007
	End Point	1710.3307	1754.6782	13.6	0.008

WCDMA Band 2 (Lowest Frequency:Rel99 / Highest Frequency: HSDPA)

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.3269	1909.6783		
Extreme (50C)		1850.3269	1909.6783	18.1	0.010
Extreme (40C)		1850.3269	1909.6783	18.0	0.010
Extreme (30C)		1850.3269	1909.6783	12.6	0.007
Extreme (10C)		1850.3269	1909.6783	12.9	0.007
Extreme (0C)		1850.3269	1909.6783	12.2	0.006
Extreme (-10C)		1850.3269	1909.6783	11.7	0.006
Extreme (-20C)		1850.3269	1909.6783	13.4	0.007
Extreme (-30C)		1850.3269	1909.6783	13.6	0.007
20C	15%	1850.3269	1909.6783	20.5	0.011
	-15%	1850.3269	1909.6783	18.1	0.010
	End Point	1850.3269	1909.6783	28.2	0.015

LTE Band 2 (Lowest Frequency:16QAM / Highest Frequency: 16QAM)

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.1559	1909.8414		
Extreme (50C)		1850.1559	1909.8414	38.6	0.021
Extreme (40C)		1850.1559	1909.8414	47.9	0.025
Extreme (30C)		1850.1559	1909.8414	46.0	0.024
Extreme (10C)		1850.1559	1909.8414	42.2	0.022
Extreme (0C)		1850.1559	1909.8414	43.7	0.023
Extreme (-10C)		1850.1559	1909.8414	47.3	0.025
Extreme (-20C)		1850.1559	1909.8414	44.3	0.024
Extreme (-30C)		1850.1559	1909.8414	41.7	0.022
20C	15%	1850.1559	1909.8434	2044.8	1.088
	-15%	1850.1559	1909.8439	2569.7	1.367
	End Point	1850.1559	1909.8441	2761.8	1.469

LTE Band 5

Reference Frequency : LTE Band 5 Low Channel 824.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2061.750	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	824.70002891	-0.008	848.30004001	-0.026	2.5
3.85	40	824.70002697	-0.006	848.30003203	-0.016	2.5
3.85	30	824.70002109	0.001	848.30002938	-0.013	2.5
3.85	***20***	***824.70002230***	***0.000***	***848.30001835***	***0.000***	***2.5***
3.85	10	824.70001947	0.003	848.30002497	-0.008	2.5
3.85	0	824.70003038	-0.010	848.30001883	-0.001	2.5
3.85	-10	824.70003021	-0.010	848.30002027	-0.002	2.5
3.85	-20	824.70003216	-0.012	848.30001868	0.000	2.5
3.85	-30	824.70004267	-0.025	848.30002127	-0.003	2.5

Reference Frequency : LTE Band 5 Low Channel 824.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2061.750	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]	
3.86	***20***	**824.70002230**	***0***	**848.30001835**	***0***	***2.5***
4.40	20	824.70124630	-1.484	848.30101928	-1.180	2.5
3.65	20	824.70107397	-1.275	848.30106582	-1.235	2.5

LTE Band 12 (Lowest Frequency:QPSK / Highest Frequency: 16QAM)

Limit		699	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	699.1545	715.8444		
Extreme (50C)		699.1545	715.8444	32.1	0.045
Extreme (40C)		699.1545	715.8444	30.2	0.043
Extreme (30C)		699.1545	715.8444	33.2	0.047
Extreme (10C)		699.1545	715.8444	31.3	0.044
Extreme (0C)		699.1545	715.8444	39.5	0.056
Extreme (-10C)		699.1545	715.8444	46.7	0.066
Extreme (-20C)		699.1545	715.8444	37.7	0.053
Extreme (-30C)		699.1545	715.8444	27.3	0.039
20C	15%	699.1545	715.8454	1011.8	1.430
	-15%	699.1545	715.8454	1033.3	1.461
	End Point	699.1545	715.8454	1042.4	1.473

LTE Band 13 (QPSK)

Limit		777	787	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	777.2541	786.7387		
Extreme (50C)		777.2541	786.7387	18.3	0.023
Extreme (40C)		777.2541	786.7387	14.8	0.019
Extreme (30C)		777.2541	786.7387	15.7	0.020
Extreme (10C)		777.2541	786.7387	15.6	0.020
Extreme (0C)		777.2541	786.7387	19.3	0.025
Extreme (-10C)		777.2541	786.7387	16.1	0.021
Extreme (-20C)		777.2541	786.7387	15.3	0.020
Extreme (-30C)		777.2541	786.7387	16.7	0.021
20C	15%	777.2541	786.7406	1873.6	2.396
	-15%	777.2541	786.7407	1974.3	2.525
	End Point	777.2541	786.7398	1078.5	1.379

LTE Band 26

Reference Frequency : LTE Band 26 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 [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	814.70002764	-0.005	848.30002875	-0.002	2.5
3.85	40	814.70004219	-0.023	848.30004043	-0.016	2.5
3.85	30	814.70003907	-0.019	848.30002913	-0.003	2.5
3.85	***20***	***814.70002382***	***0.000***	***848.30002679***	***0.000***	***2.5***
3.85	10	814.70002757	-0.005	848.30002319	0.004	2.5
3.85	0	814.70002427	-0.001	848.30002541	0.002	2.5
3.85	-10	814.70004017	-0.020	848.30004767	-0.025	2.5
3.85	-20	814.70004171	-0.022	848.30004569	-0.022	2.5
3.85	-30	814.70002724	-0.004	848.30004689	-0.024	2.5

Reference Frequency : LTE Band 26 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 [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	***20***	**814.70002382**	***0***	**848.30002679**	***0***	***2.5***
4.40	20	814.70105301	-1.263	848.30106798	-1.227	2.5
3.65	20	814.70105103	-1.261	848.30105676	-1.214	2.5

LTE Band 41 PC3 (QPSK)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2496.2561	2689.7425		
Extreme (50C)		2496.2562	2689.7426	50.9	0.020
Extreme (40C)		2496.2561	2689.7425	41.5	0.016
Extreme (30C)		2496.2561	2689.7425	39.8	0.015
Extreme (10C)		2496.2561	2689.7425	38.1	0.015
Extreme (0C)		2496.2561	2689.7425	41.7	0.016
Extreme (-10C)		2496.2562	2689.7426	58.3	0.022
Extreme (-20C)		2496.2561	2689.7425	49.7	0.019
Extreme (-30C)		2496.2562	2689.7426	51.2	0.020
20C	15%	2496.2562	2689.7425	29.7	0.011
	-15%	2496.2561	2689.7425	29.1	0.011
	End Point	2496.2561	2689.7425	28.3	0.011

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27(04)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

LTE Band 66 (Lowest Frequency:QPSK / Highest Frequency: 16QAM)

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.6995	1779.3005		
Extreme (50C)		1710.6995	1779.3006	46.3	0.027
Extreme (40C)		1710.6995	1779.3006	33.7	0.019
Extreme (30C)		1710.6995	1779.3006	47.3	0.027
Extreme (10C)		1710.6995	1779.3006	57.7	0.033
Extreme (0C)		1710.6995	1779.3006	46.6	0.027
Extreme (-10C)		1710.6995	1779.3006	50.0	0.029
Extreme (-20C)		1710.6995	1779.3006	45.9	0.026
Extreme (-30C)		1710.6995	1779.3006	44.7	0.026
20C	15%	1710.6995	1779.3016	1069.4	0.613
	-15%	1710.6995	1779.3027	2130.1	1.221
	End Point	1710.6995	1779.3029	2386.7	1.368

LTE Band 4

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

9.5. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232, §27.50, §27.53 and §90.635

LIMITS

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

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

27.50:

(b)(10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

(c) (10) - Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

(d) (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

(h) The following power limits shall apply in the BRS and EBS:

(2) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

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;

e) Detector = rms;

f) Ensure that the number of measurement points ≥ span/RBW;

g) Trace mode = max hold(GSM, WCDMA), average(LTE);

TEST RESULTS

9.5.1. ERP/EIRP Results

GSM

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
GSM850	GPRS	128	824.2	**28.54**	**714.50**
		190	836.6	28.37	687.07
		251	848.8	28.04	636.80
	EGPRS	128	824.2	22.93	196.34
		190	836.6	22.81	190.99
		251	848.8	**23.03**	**200.91**
GSM1900	GPRS	512	1850.2	27.93	620.87
		661	1880	27.82	605.34
		810	1909.8	**27.97**	**626.61**
	EGPRS	512	1850.2	23.53	225.42
		661	1880	24.08	255.86
		810	1909.8	**24.10**	**257.04**

WCDMA

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
Band 5	REL99	4132	826.4	19.28	84.68
		4183	836.6	**19.66**	**92.47**
		4233	846.6	19.20	83.18
	HSDPA	4132	826.4	18.21	66.22
		4183	836.6	18.84	76.56
		4233	846.6	**19.19**	**82.99**
Band 4	REL99	1312	1712.4	24.20	263.03
		1413	1732.6	**25.22**	**332.66**
		1513	1752.6	25.12	325.09
	HSDPA	1312	1712.4	23.67	232.81
		1413	1732.6	**24.51**	**282.49**
		1513	1752.6	24.07	255.27
Band 2	REL99	9262	1852.4	20.89	122.74
		9400	1880.0	20.69	117.22
		9538	1907.6	**21.24**	**133.05**
	HSDPA	9262	1852.4	19.64	92.04
		9400	1880.0	19.62	91.62
		9538	1907.6	**20.02**	**100.46**

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LTE Band 2

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 2	20	QPSK	1/49	1860.0	20.58	114.29
			1/0	1880.0	20.99	125.60
			1/0	1900.0	**21.24**	**133.05**
		16QAM	1/0	1860.0	19.67	92.68
			1/0	1880.0	19.85	96.61
			1/0	1900.0	**20.35**	**108.39**
	15	QPSK	1/37	1857.5	**20.97**	**125.03**
			1/0	1880.0	20.57	114.02
			1/0	1902.5	20.87	122.18
		16QAM	1/37	1857.5	**19.89**	**97.50**
			1/74	1880.0	17.79	60.12
			1/0	1902.5	19.86	96.83
	10	QPSK	1/25	1855.0	20.76	119.12
			1/25	1880.0	20.15	103.51
			1/0	1905.0	**20.94**	**124.17**
		16QAM	1/25	1855.0	19.58	90.78
			1/25	1880.0	19.10	81.28
			1/0	1905.0	**19.94**	**98.63**
	5	QPSK	1/12	1852.5	20.74	118.58
			1/12	1880.0	20.77	119.40
			1/0	1907.5	**21.19**	**131.52**
		16QAM	1/12	1852.5	19.96	99.08
			1/12	1880.0	19.73	93.97
			1/12	1907.5	**20.08**	**101.86**
	3	QPSK	1/0	1851.5	**20.99**	**125.60**
			1/0	1880.0	20.41	109.90
			1/0	1908.5	20.82	120.78
		16QAM	1/0	1851.5	**20.09**	**102.09**
			1/0	1880.0	19.44	87.90
			1/0	1908.5	19.74	94.19
	1.4	QPSK	1/0	1850.7	20.77	119.40
			1/0	1880.0	**20.94**	**124.17**
			1/3	1909.3	20.66	116.41
		16QAM	1/3	1850.7	**19.83**	**96.16**
			1/3	1880.0	19.14	82.04
			1/3	1909.3	19.43	87.70

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LTE Band 5

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 5	10	QPSK	1/0	704.0	19.59	90.99
			1/49	707.5	**20.90**	**123.03**
			1/0	711.0	20.59	114.55
		16QAM	1/0	704.0	18.66	73.45
			1/0	711.0	19.68	92.90
	5	QPSK	1/0	701.5	19.53	89.74
			1/12	707.5	20.70	117.49
		16QAM	1/0	701.5	18.60	72.44
			1/24	707.5	19.59	90.99
			1/0	713.5	**20.07**	**101.62**
	3	QPSK	1/14	707.5	20.79	119.95
			1/0	714.5	**21.05**	**127.35**
		16QAM	1/0	700.5	18.63	72.95
			1/0	714.5	**20.09**	**102.09**
	1.4	QPSK	1/3	699.7	19.33	85.70
			1/3	707.5	**20.57**	**114.02**
			1/3	715.3	20.41	109.90
		16QAM	1/3	699.7	18.38	68.87
			1/5	707.5	**19.32**	**85.51**
			1/3	715.3	19.08	80.91

LTE Band 12

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 12	10	QPSK	1/49	704.0	**16.82**	**48.08**
			1/49	707.5	16.57	45.39
			1/25	711.0	**16.82**	**48.08**
		16QAM	1/49	704.0	15.53	35.73
			1/49	707.5	15.41	34.75
			1/25	711.0	**15.67**	**36.90**
	5	QPSK	1/0	701.5	**16.87**	**48.64**
			1/24	707.5	16.51	44.77
			1/0	713.5	16.81	47.97
		16QAM	1/0	701.5	**15.96**	**39.45**
			1/24	707.5	15.57	36.06
			1/0	713.5	15.84	38.37
	3	QPSK	1/0	700.5	**16.95**	**49.55**
			1/14	707.5	16.90	48.98
			1/0	714.5	16.87	48.64
		16QAM	1/0	700.5	15.91	38.99
			1/14	707.5	15.90	38.90
			1/0	714.5	**16.07**	**40.46**
	1.4	QPSK	1/3	699.7	16.81	47.97
			1/3	707.5	**16.93**	**49.32**
			1/3	715.3	16.74	47.21
		16QAM	1/3	699.7	15.88	38.73
			1/3	707.5	**15.98**	**39.63**
			1/3	715.3	15.95	39.36

LTE Band 13

Band	BW [MHz]	Mode	RB size / RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 13	10	QPSK	1/0	782.0	**17.77**	**59.84**
		16QAM	1/0	782.0	16.89	48.87
	5	QPSK	1/0	779.5	17.60	57.54
			1/12	782.0	17.73	59.29
			1/0	784.5	**17.89**	**61.52**
		16QAM	1/0	779.5	16.74	47.21
			1/0	782.0	**17.03**	**50.47**
			1/0	784.5	16.97	49.77

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LTE Band 26

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP/EIRP [dBm]	ERP/EIRP [mW]
Band 26	15	QPSK	1/0	821.5	17.28	53.46
			1/74	831.5	18.17	65.61
			1/0	841.5	**18.57**	**71.94**
		16QAM	1/0	821.5	16.16	41.30
			1/74	831.5	17.13	51.64
			1/37	841.5	**17.81**	**60.39**
	10	QPSK	1/0	819.0	17.17	52.12
			1/25	829.0	17.63	57.94
			1/49	831.5	18.07	64.12
			1/0	844.0	**18.54**	**71.45**
		16QAM	1/0	819.0	16.42	43.85
			1/49	829.0	16.32	42.85
			1/25	831.5	17.14	51.76
			1/0	844.0	**17.46**	**55.72**
	5	QPSK	1/12	816.5	17.24	52.97
			1/24	821.5	17.32	53.95
			1/0	826.5	17.63	57.94
			1/24	831.5	18.13	65.01
			1/0	846.5	**19.01**	**79.62**
		16QAM	1/12	816.5	16.28	42.46
			1/0	821.5	16.44	44.06
			1/0	826.5	16.57	45.39
			1/24	831.5	17.32	53.95
			1/0	846.5	**17.82**	**60.53**
	3	QPSK	1/0	815.5	17.39	54.83
			1/8	822.5	17.33	54.08
			1/8	825.5	17.59	57.41
			1/14	831.5	18.15	65.31
			1/0	847.5	**19.15**	**82.22**
		16QAM	1/0	815.5	16.21	41.78
			1/8	822.5	16.33	42.95
			1/8	825.5	16.59	45.60
			1/14	831.5	17.05	50.70
			1/0	847.5	**18.49**	**70.63**
	1.4	QPSK	1/3	814.7	17.46	55.72
			1/3	823.3	17.44	55.46
			1/3	824.7	17.60	57.54
			1/3	831.5	18.11	64.71
			1/3	848.3	**19.26**	**84.33**
		16QAM	1/3	814.7	16.56	45.29
			1/3	823.3	16.38	43.45
			1/3	824.7	16.27	42.36
			1/3	831.5	16.83	48.19
			1/3	848.3	**17.82**	**60.53**

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27(04)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

LTE Band 41(PC3)

BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
20	QPSK	1/0	2506.0	22.03	159.59
		1/49	2593.0	23.67	232.81
		1/49	2680.0	**23.87**	**243.78**
	16QAM	1/0	2506.0	22.36	172.19
		1/49	2593.0	23.51	224.39
		1/49	2680.0	**24.32**	**270.40**
15	QPSK	1/37	2503.5	23.32	214.78
		1/37	2593.0	23.45	221.31
		1/37	2682.5	**23.84**	**242.10**
	16QAM	1/37	2503.5	23.49	223.36
		1/37	2593.0	23.67	232.81
		1/37	2682.5	**23.78**	**238.78**
10	QPSK	1/25	2501.0	23.31	214.29
		1/25	2593.0	**24.86**	**306.20**
		1/25	2685.0	23.35	216.27
	16QAM	1/25	2501.0	23.64	231.21
		1/25	2593.0	**24.36**	**272.90**
		1/25	2685.0	22.97	198.15
5	QPSK	1/24	2498.5	22.94	196.79
		1/0	2593.0	**24.39**	**274.79**
		1/0	2687.5	23.47	222.33
	16QAM	1/24	2498.5	23.67	232.81
		1/12	2593.0	**24.70**	**295.12**
		1/12	2687.5	23.43	220.29

LTE Band 66

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 66	20	QPSK	1/49	1720.0	20.37	108.89
			1/49	1745.0	20.86	121.90
			1/0	1770.0	**21.19**	**131.52**
		16QAM	1/49	1720.0	20.06	101.39
			1/49	1745.0	**20.56**	**113.76**
			1/0	1770.0	19.88	97.27
	15	QPSK	1/37	1717.5	**21.38**	**137.40**
			1/37	1747.5	21.36	136.77
			1/0	1772.5	21.12	129.42
		16QAM	1/0	1717.5	19.89	97.50
			1/74	1747.5	**20.51**	**112.46**
			1/0	1772.5	20.25	105.93
	10	QPSK	1/25	1715.0	21.09	128.53
			1/25	1745.0	**21.64**	**145.88**
			1/25	1775.0	19.12	81.66
		16QAM	1/25	1715.0	19.96	99.08
			1/25	1745.0	**20.54**	**113.24**
			1/25	1775.0	18.05	63.83
	5	QPSK	1/0	1712.5	20.65	116.14
			1/24	1745.0	**21.87**	**153.82**
			1/12	1777.5	19.69	93.11
		16QAM	1/0	1712.5	19.96	99.08
			1/24	1745.0	**20.47**	**111.43**
			1/24	1777.5	20.42	110.15
	3	QPSK	1/0	1711.5	20.47	111.43
			1/0	1745.0	**21.61**	**144.88**
			1/0	1778.5	21.41	138.36
		16QAM	1/0	1711.5	19.56	90.36
			1/14	1745.0	**20.72**	**118.03**
			1/0	1778.5	20.56	113.76
	1.4	QPSK	1/3	1710.7	20.05	101.16
			1/3	1745.0	**21.44**	**139.32**
			1/3	1779.3	20.30	107.15
		16QAM	1/3	1710.7	19.00	79.43
			1/3	1745.0	**20.54**	**113.24**
			1/3	1779.3	19.28	84.72

LTE Band 4

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

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9.5.2. ERP/EIRP DATA

GSM850

GSM850

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 22943
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: GPRS 850 MHz Fundamentals

Test Equpment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.20	32.50	V	3.0	-1.0	28.54	38.5	-10.0	
824.20	23.92	H	3.0	-1.0	19.96	38.5	-18.5	
Mid Ch								
836.60	32.31	V	3.0	-0.9	28.37	38.5	-10.1	
836.60	23.53	H	3.0	-0.9	19.59	38.5	-18.9	
High Ch								
848.80	31.95	V	3.1	-0.9	28.04	38.5	-10.5	
848.80	22.98	H	3.1	-0.9	19.07	38.5	-19.4	

GSM850

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 22943
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: EGPRS 850 MHz Fundamentals

Test Equpment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.20	26.89	V	3.0	-1.0	22.93	38.5	-15.6	
824.20	18.17	H	3.0	-1.0	14.21	38.5	-24.3	
Mid Ch								
836.60	26.75	V	3.0	-0.9	22.81	38.5	-15.7	
836.60	18.00	H	3.0	-0.9	14.06	38.5	-24.4	
High Ch								
848.80	26.94	V	3.1	-0.9	23.03	38.5	-15.5	
848.80	18.04	H	3.1	-0.9	14.13	38.5	-24.4	

GSM1900

GSM1900

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-06
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: GPRS 1900 MHz Fundamentals

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	18.95	V	4.5	9.5	23.96	33.0	-9.0	
1850.20	22.92	H	4.5	9.5	27.93	33.0	-5.1	
Mid Ch								
1880.00	19.46	V	4.5	9.3	24.23	33.0	-8.8	
1880.00	23.05	H	4.5	9.3	27.82	33.0	-5.2	
High Ch								
1909.80	19.25	V	4.6	9.1	23.74	33.0	-9.3	
1909.80	23.49	H	4.6	9.1	27.97	33.0	-5.0	

GSM1900

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-06
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: EGPRS 1900 MHz Fundamentals

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	15.18	V	4.5	9.5	20.19	33.0	-12.8	
1850.20	18.52	H	4.5	9.5	23.53	33.0	-9.5	
Mid Ch								
1880.00	16.09	V	4.5	9.3	20.86	33.0	-12.1	
1880.00	19.31	H	4.5	9.3	24.08	33.0	-8.9	
High Ch								
1909.80	15.45	V	4.6	9.1	19.94	33.0	-13.1	
1909.80	19.62	H	4.6	9.1	24.10	33.0	-8.9	

WCDMA Band 5

WCDMA

Band 5
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 22943
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: Rel99 Band 5 Fundamentals

Test Equpment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.40	23.23	V	3.0	-0.9	19.27	38.5	-19.2	
826.40	14.24	H	3.0	-0.9	10.28	38.5	-28.2	
Mid Ch								
836.60	23.60	V	3.0	-0.9	19.66	38.5	-18.8	
836.60	14.49	H	3.0	-0.9	10.55	38.5	-28.0	
High Ch								
846.60	23.11	V	3.1	-0.9	19.20	38.5	-19.3	
846.60	13.82	H	3.1	-0.9	9.91	38.5	-28.6	

WCDMA

Band 5
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 22943
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: HSDPA Band 5 Fundamentals

Test Equpment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.40	22.17	V	3.0	-0.9	18.21	38.5	-20.3	
826.40	12.36	H	3.0	-0.9	8.40	38.5	-30.1	
Mid Ch								
836.60	22.78	V	3.0	-0.9	18.84	38.5	-19.7	
836.60	13.33	H	3.0	-0.9	9.39	38.5	-29.1	
High Ch								
846.60	23.10	V	3.1	-0.9	19.19	38.5	-19.3	
846.60	12.56	H	3.1	-0.9	8.65	38.5	-29.9	

WCDMA Band 4

WCDMA

Band 4
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-07
Test Engineer: 20882
Configuration: EUT, X-Position
Location: Chamber 1
Mode: Rel99 Band 4 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.40	11.52	V	4.3	9.4	16.60	30.0	-13.4	
1712.40	19.12	H	4.3	9.4	24.20	30.0	-5.8	
Mid Ch								
1732.60	14.89	V	4.3	9.5	20.02	30.0	-10.0	
1732.60	20.09	H	4.3	9.5	25.22	30.0	-4.8	
High Ch								
1752.60	14.08	V	4.4	9.5	19.26	30.0	-10.7	
1752.60	19.94	H	4.4	9.5	25.12	30.0	-4.9	

WCDMA

Band 4
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-07
Test Engineer: 20882
Configuration: EUT, X-Position
Location: Chamber 1
Mode: HSDPA Band 4 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.40	10.88	V	4.3	9.4	15.96	30.0	-14.0	
1712.40	18.59	H	4.3	9.4	23.67	30.0	-6.3	
Mid Ch								
1732.60	14.12	V	4.3	9.5	19.25	30.0	-10.8	
1732.60	19.38	H	4.3	9.5	24.51	30.0	-5.5	
High Ch								
1752.60	13.26	V	4.4	9.5	18.44	30.0	-11.6	
1752.60	18.89	H	4.4	9.5	24.07	30.0	-5.9	

WCDMA Band 2

WCDMA

Band 2
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-06
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 1
Mode: Rel99 Band 2 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.40	12.56	V	4.5	9.5	17.55	33.0	-15.4	
1852.40	15.91	H	4.5	9.5	20.89	33.0	-12.1	
Mid Ch								
1880.00	11.93	V	4.5	9.3	16.70	33.0	-16.3	
1880.00	15.92	H	4.5	9.3	20.69	33.0	-12.3	
High Ch								
1907.60	12.74	V	4.6	9.1	17.26	33.0	-15.7	
1907.60	16.72	H	4.6	9.1	21.24	33.0	-11.8	

WCDMA

Band 2
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-06
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 1
Mode: HSDPA Band 2 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.40	11.60	V	4.5	9.5	16.59	33.0	-16.4	
1852.40	14.66	H	4.5	9.5	19.64	33.0	-13.4	
Mid Ch								
1880.00	11.32	V	4.5	9.3	16.09	33.0	-16.9	
1880.00	14.85	H	4.5	9.3	19.62	33.0	-13.4	
High Ch								
1907.60	11.95	V	4.6	9.1	16.47	33.0	-16.5	
1907.60	15.53	H	4.6	9.1	20.05	33.0	-13.0	

LTE Band 2

LTE Band 2 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-06
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 2 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1860.00	11.31	V	4.5	9.4	16.24	33.0	-16.8	
1860.00	15.66	H	4.5	9.4	20.58	33.0	-12.4	
Mid Ch								
1880.00	11.23	V	4.5	9.3	16.00	33.0	-17.0	
1880.00	16.22	H	4.5	9.3	20.99	33.0	-12.0	
High Ch								
1900.00	12.15	V	4.6	9.2	16.77	33.0	-16.2	
1900.00	16.62	H	4.6	9.2	21.24	33.0	-11.8	

LTE Band 2 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-06
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 2 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1860.00	10.97	V	4.5	9.4	15.90	33.0	-17.1	
1860.00	14.75	H	4.5	9.4	19.67	33.0	-13.3	
Mid Ch								
1880.00	10.14	V	4.5	9.3	14.91	33.0	-18.1	
1880.00	15.08	H	4.5	9.3	19.85	33.0	-13.2	
High Ch								
1900.00	11.09	V	4.6	9.2	15.71	33.0	-17.3	
1900.00	15.73	H	4.6	9.2	20.35	33.0	-12.6	

LTE

Band 2

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-06
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 2 Fundamentals, 15MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1857.50	11.56	V	4.5	9.5	16.51	33.0	-16.5	
1857.50	16.02	H	4.5	9.5	20.97	33.0	-12.0	
Mid Ch								
1880.00	9.60	V	4.5	9.3	14.37	33.0	-18.6	
1880.00	15.80	H	4.5	9.3	20.57	33.0	-12.4	
High Ch								
1902.50	11.85	V	4.6	9.1	16.43	33.0	-16.6	
1902.50	16.28	H	4.6	9.1	20.87	33.0	-12.1	

LTE

Band 2

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-06
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 2 Fundamentals, 15MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1857.50	10.39	V	4.5	9.5	15.34	33.0	-17.7	
1857.50	14.94	H	4.5	9.5	19.89	33.0	-13.1	
Mid Ch								
1880.00	10.09	V	4.5	9.3	14.86	33.0	-18.1	
1880.00	13.02	H	4.5	9.3	17.79	33.0	-15.2	
High Ch								
1902.50	11.09	V	4.6	9.1	15.67	33.0	-17.3	
1902.50	15.27	H	4.6	9.1	19.86	33.0	-13.1	

LTE

Band 2

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-06
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 2 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1855.00	11.61	V	4.5	9.5	16.58	33.0	-16.4	
1855.00	15.79	H	4.5	9.5	20.76	33.0	-12.2	
Mid Ch								
1880.00	11.41	V	4.5	9.3	16.18	33.0	-16.8	
1880.00	15.38	H	4.5	9.3	20.15	33.0	-12.9	
High Ch								
1905.00	12.36	V	4.6	9.1	16.91	33.0	-16.1	
1905.00	16.39	H	4.6	9.1	20.94	33.0	-12.1	

LTE

Band 2

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-06
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 2 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1855.00	10.59	V	4.5	9.5	15.56	33.0	-17.4	
1855.00	14.61	H	4.5	9.5	19.58	33.0	-13.4	
Mid Ch								
1880.00	10.45	V	4.5	9.3	15.22	33.0	-17.8	
1880.00	14.33	H	4.5	9.3	19.10	33.0	-13.9	
High Ch								
1905.00	11.28	V	4.6	9.1	15.83	33.0	-17.2	
1905.00	15.39	H	4.6	9.1	19.94	33.0	-13.1	

LTE

Band 2

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-04
Test Engineer: 20896
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 2 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.50	11.42	V	4.5	9.5	16.41	33.0	-16.6	
1852.50	15.75	H	4.5	9.5	20.74	33.0	-12.3	
Mid Ch								
1880.00	11.78	V	4.5	9.3	16.55	33.0	-16.4	
1880.00	16.00	H	4.5	9.3	20.77	33.0	-12.2	
High Ch								
1907.50	13.29	V	4.6	9.1	17.81	33.0	-15.2	
1907.50	16.67	H	4.6	9.1	21.19	33.0	-11.8	

LTE

Band 2

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-04
Test Engineer: 20896
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 2 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.50	10.47	V	4.5	9.5	15.46	33.0	-17.5	
1852.50	14.97	H	4.5	9.5	19.96	33.0	-13.0	
Mid Ch								
1880.00	10.88	V	4.5	9.3	15.65	33.0	-17.3	
1880.00	14.96	H	4.5	9.3	19.73	33.0	-13.3	
High Ch								
1907.50	11.88	V	4.6	9.1	16.40	33.0	-16.6	
1907.50	15.56	H	4.6	9.1	20.08	33.0	-12.9	

LTE

Band 2

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-04
Test Engineer: 20896
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 2 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1851.50	11.28	V	4.5	9.5	16.28	33.0	-16.7	
1851.50	15.99	H	4.5	9.5	20.99	33.0	-12.0	
Mid Ch								
1880.00	11.77	V	4.5	9.3	16.54	33.0	-16.5	
1880.00	15.64	H	4.5	9.3	20.41	33.0	-12.6	
High Ch								
1908.50	12.87	V	4.6	9.1	17.38	33.0	-15.6	
1908.50	16.31	H	4.6	9.1	20.82	33.0	-12.2	

LTE

Band 2

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-04
Test Engineer: 20896
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 2 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1851.50	10.47	V	4.5	9.5	15.47	33.0	-17.5	
1851.50	15.09	H	4.5	9.5	20.09	33.0	-12.9	
Mid Ch								
1880.00	10.79	V	4.5	9.3	15.56	33.0	-17.4	
1880.00	14.67	H	4.5	9.3	19.44	33.0	-13.6	
High Ch								
1908.50	11.76	V	4.6	9.1	16.27	33.0	-16.7	
1908.50	15.23	H	4.6	9.1	19.74	33.0	-13.3	

LTE

Band 2

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-04
Test Engineer: 20896
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 2 Fundamentals, 1.4MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.70	10.63	V	4.5	9.5	15.63	33.0	-17.4	
1850.70	15.77	H	4.5	9.5	20.77	33.0	-12.2	
Mid Ch								
1880.00	11.84	V	4.5	9.3	16.61	33.0	-16.4	
1880.00	16.17	H	4.5	9.3	20.94	33.0	-12.1	
High Ch								
1909.30	12.12	V	4.6	9.1	16.61	33.0	-16.4	
1909.30	16.16	H	4.6	9.1	20.66	33.0	-12.3	

LTE

Band 2

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-08-04
Test Engineer: 20896
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 2 Fundamentals, 1.4MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.70	9.54	V	4.5	9.5	14.54	33.0	-18.5	
1850.70	14.83	H	4.5	9.5	19.83	33.0	-13.2	
Mid Ch								
1880.00	10.42	V	4.5	9.3	15.19	33.0	-17.8	
1880.00	14.37	H	4.5	9.3	19.14	33.0	-13.9	
High Ch								
1909.30	10.89	V	4.6	9.1	15.38	33.0	-17.6	
1909.30	14.93	H	4.6	9.1	19.43	33.0	-13.6	

LTE Band 5

LTE Band 5 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	23.55	V	3.0	-0.9	19.59	38.5	-18.9	
829.00	14.84	H	3.0	-0.9	10.89	38.5	-27.6	
Mid Ch								
836.50	24.84	V	3.0	-0.9	20.90	38.5	-17.6	
836.50	15.27	H	3.0	-0.9	11.33	38.5	-27.2	
High Ch								
844.00	24.51	V	3.0	-0.9	20.59	38.5	-17.9	
844.00	15.40	H	3.0	-0.9	11.48	38.5	-27.0	

LTE Band 5 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	22.62	V	3.0	-0.9	18.66	38.5	-19.8	
829.00	13.75	H	3.0	-0.9	9.80	38.5	-28.7	
Mid Ch								
836.50	24.17	V	3.0	-0.9	20.23	38.5	-18.3	
836.50	14.75	H	3.0	-0.9	10.81	38.5	-27.7	
High Ch								
844.00	23.60	V	3.0	-0.9	19.68	38.5	-18.8	
844.00	14.21	H	3.0	-0.9	10.29	38.5	-28.2	

LTE

Band 5

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	23.49	V	3.0	-0.9	19.53	38.5	-19.0	
826.50	15.01	H	3.0	-0.9	11.05	38.5	-27.5	
Mid Ch								
836.50	24.64	V	3.0	-0.9	20.70	38.5	-17.8	
836.50	15.63	H	3.0	-0.9	11.69	38.5	-26.8	
High Ch								
846.50	24.78	V	3.0	-0.9	20.86	38.5	-17.6	
846.50	15.36	H	3.0	-0.9	11.44	38.5	-27.1	

LTE

Band 5

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	22.56	V	3.0	-0.9	18.60	38.5	-19.9	
826.50	14.09	H	3.0	-0.9	10.13	38.5	-28.4	
Mid Ch								
836.50	23.53	V	3.0	-0.9	19.59	38.5	-18.9	
836.50	14.32	H	3.0	-0.9	10.38	38.5	-28.1	
High Ch								
846.50	23.99	V	3.0	-0.9	20.07	38.5	-18.4	
846.50	14.48	H	3.0	-0.9	10.56	38.5	-27.9	

LTE

Band 5

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
825.50	23.65	V	3.0	-0.9	19.69	38.5	-18.8	
825.50	15.14	H	3.0	-0.9	11.18	38.5	-27.3	
Mid Ch								
836.50	24.73	V	3.0	-0.9	20.79	38.5	-17.7	
836.50	15.48	H	3.0	-0.9	11.54	38.5	-27.0	
High Ch								
847.50	24.96	V	3.1	-0.9	21.05	38.5	-17.4	
847.50	14.77	H	3.1	-0.9	10.86	38.5	-27.6	

LTE

Band 5

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
825.50	22.59	V	3.0	-0.9	18.63	38.5	-19.9	
825.50	14.08	H	3.0	-0.9	10.12	38.5	-28.4	
Mid Ch								
836.50	23.69	V	3.0	-0.9	19.75	38.5	-18.7	
836.50	14.48	H	3.0	-0.9	10.54	38.5	-28.0	
High Ch								
847.50	24.00	V	3.1	-0.9	20.09	38.5	-18.4	
847.50	13.75	H	3.1	-0.9	9.84	38.5	-28.7	

LTE

Band 5

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 1.4MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.70	23.30	V	3.0	-1.0	19.33	38.5	-19.2	
824.70	14.61	H	3.0	-1.0	10.65	38.5	-27.9	
Mid Ch								
836.50	24.51	V	3.0	-0.9	20.57	38.5	-17.9	
836.50	15.61	H	3.0	-0.9	11.67	38.5	-26.8	
High Ch								
848.30	24.32	V	3.0	-0.9	20.41	38.5	-18.1	
848.30	14.51	H	3.0	-0.9	10.60	38.5	-27.9	

LTE

Band 5

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 1.4MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.70	22.35	V	3.0	-1.0	18.38	38.5	-20.1	
824.70	13.43	H	3.0	-1.0	9.47	38.5	-29.0	
Mid Ch								
836.50	23.26	V	3.0	-0.9	19.32	38.5	-19.2	
836.50	14.27	H	3.0	-0.9	10.33	38.5	-28.2	
High Ch								
848.30	22.99	V	3.0	-0.9	19.08	38.5	-19.4	
848.30	13.29	H	3.0	-0.9	9.38	38.5	-29.1	

LTE Band 12

LTE Band 12 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
704.00	12.15	V	2.8	-1.1	8.31	34.8	-26.5	
704.00	20.66	H	2.8	-1.1	16.82	34.8	-17.9	
Mid Ch								
707.50	12.01	V	2.8	-1.1	8.17	34.8	-26.6	
707.50	20.42	H	2.8	-1.1	16.57	34.8	-18.2	
High Ch								
711.00	12.29	V	2.8	-1.1	8.43	34.8	-26.3	
711.00	20.68	H	2.8	-1.1	16.82	34.8	-17.9	

LTE Band 12 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
704.00	10.98	V	2.8	-1.1	7.14	34.8	-27.6	
704.00	19.37	H	2.8	-1.1	15.53	34.8	-19.2	
Mid Ch								
707.50	10.92	V	2.8	-1.1	7.08	34.8	-27.7	
707.50	19.26	H	2.8	-1.1	15.41	34.8	-19.4	
High Ch								
711.00	11.51	V	2.8	-1.1	7.65	34.8	-27.1	
711.00	19.53	H	2.8	-1.1	15.67	34.8	-19.1	

LTE

Band 12

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
701.50	12.63	V	2.8	-1.1	8.80	34.8	-26.0	
701.50	20.71	H	2.8	-1.1	16.87	34.8	-17.9	
Mid Ch								
707.50	12.24	V	2.8	-1.1	8.40	34.8	-26.4	
707.50	20.36	H	2.8	-1.1	16.51	34.8	-18.3	
High Ch								
713.50	12.33	V	2.8	-1.1	8.46	34.8	-26.3	
713.50	20.67	H	2.8	-1.1	16.81	34.8	-18.0	

LTE

Band 12

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
701.50	11.85	V	2.8	-1.1	8.02	34.8	-26.8	
701.50	19.80	H	2.8	-1.1	15.96	34.8	-18.8	
Mid Ch								
707.50	11.49	V	2.8	-1.1	7.65	34.8	-27.1	
707.50	19.42	H	2.8	-1.1	15.57	34.8	-19.2	
High Ch								
713.50	11.52	V	2.8	-1.1	7.65	34.8	-27.1	
713.50	19.70	H	2.8	-1.1	15.84	34.8	-18.9	

LTE

Band 12

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
700.50	12.52	V	2.8	-1.1	8.69	34.8	-26.1	
700.50	20.78	H	2.8	-1.1	16.95	34.8	-17.8	
Mid Ch								
707.50	12.17	V	2.8	-1.1	8.33	34.8	-26.4	
707.50	20.75	H	2.8	-1.1	16.90	34.8	-17.9	
High Ch								
714.50	12.19	V	2.8	-1.1	8.33	34.8	-26.4	
714.50	20.73	H	2.8	-1.1	16.87	34.8	-17.9	

LTE

Band 12

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789555428
Date: 2020-07-28
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: VULB9163-750, and Chamber 1 SMA Cables
Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
700.50	11.43	V	2.8	-1.1	7.60	34.8	-27.2	
700.50	19.74	H	2.8	-1.1	15.91	34.8	-18.9	
Mid Ch								
707.50	11.00	V	2.8	-1.1	7.16	34.8	-27.6	
707.50	19.75	H	2.8	-1.1	15.90	34.8	-18.9	
High Ch								
714.50	11.31	V	2.8	-1.1	7.45	34.8	-27.3	
714.50	19.93	H	2.8	-1.1	16.07	34.8	-18.7	