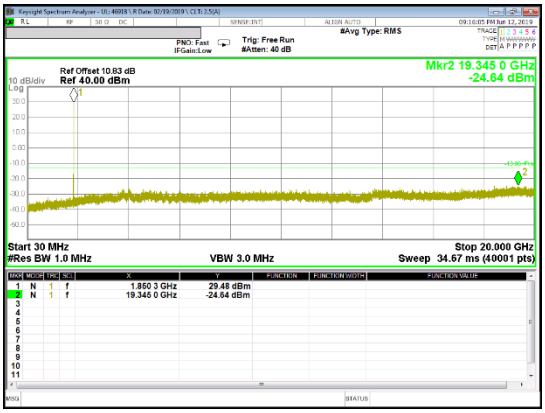
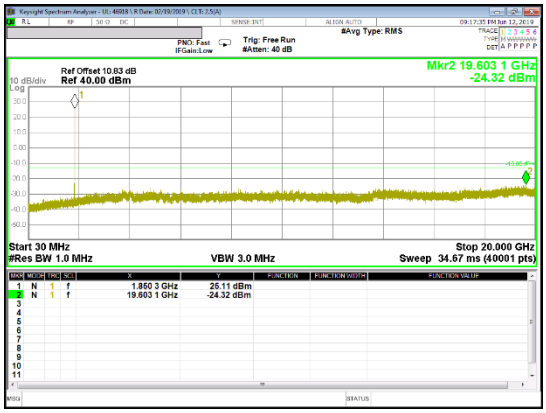
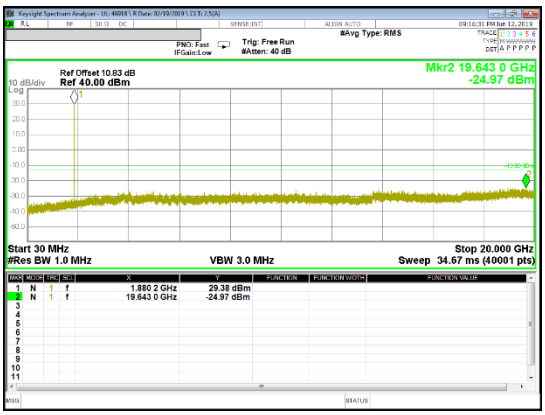
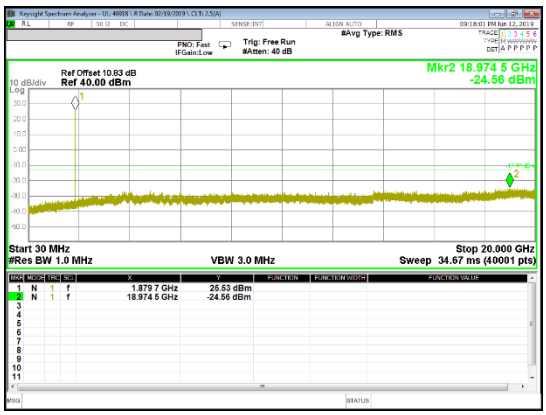
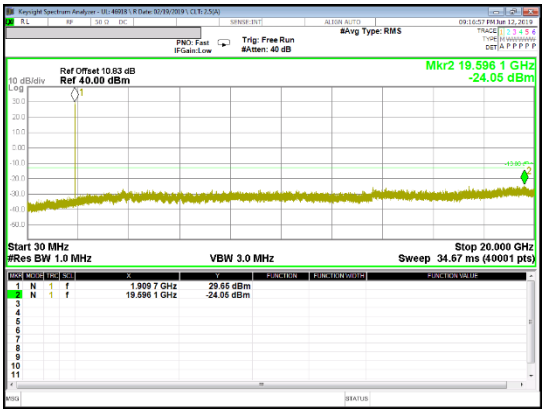
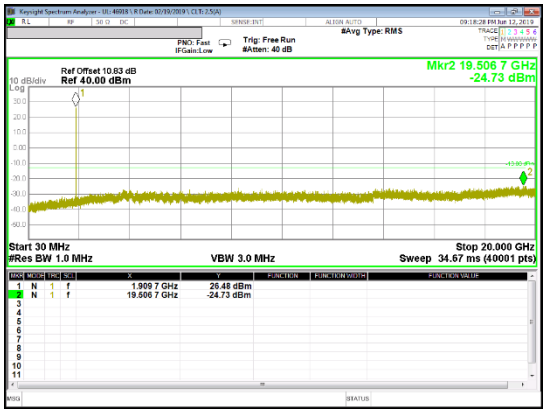
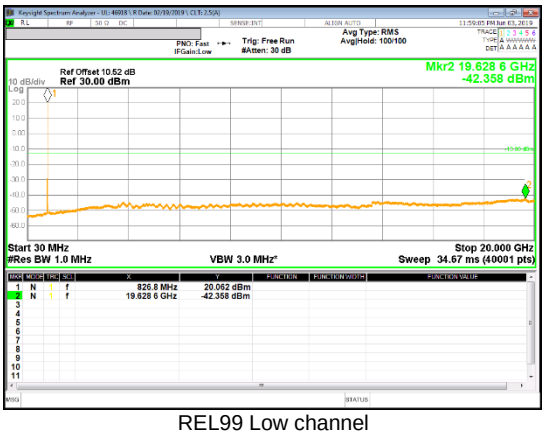
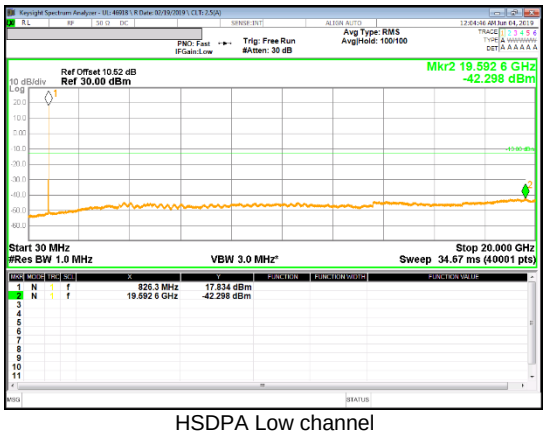
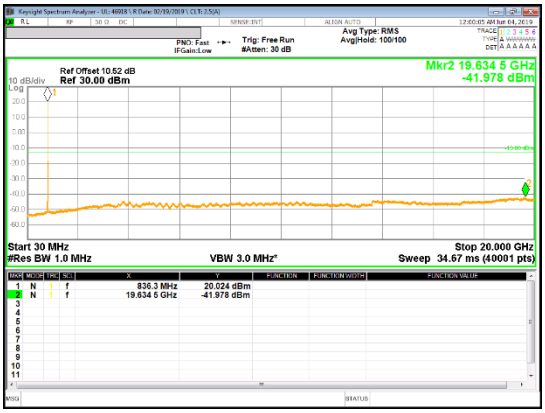
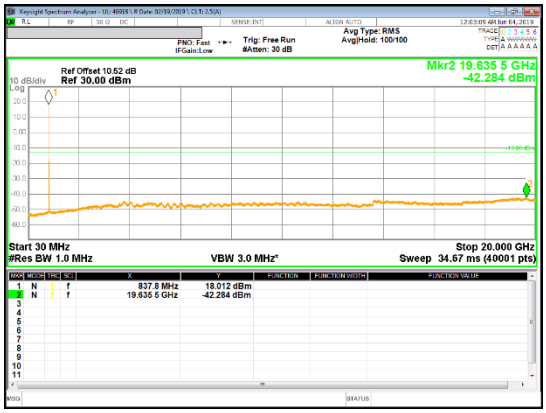
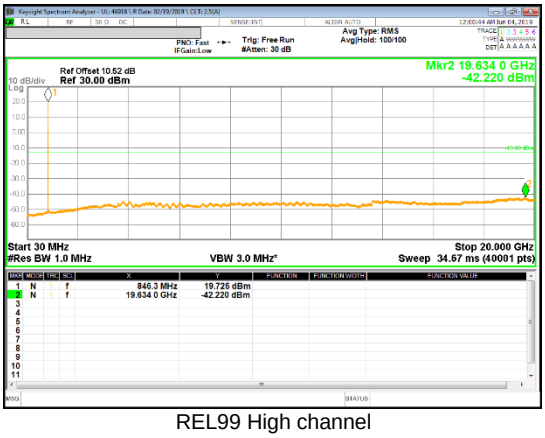
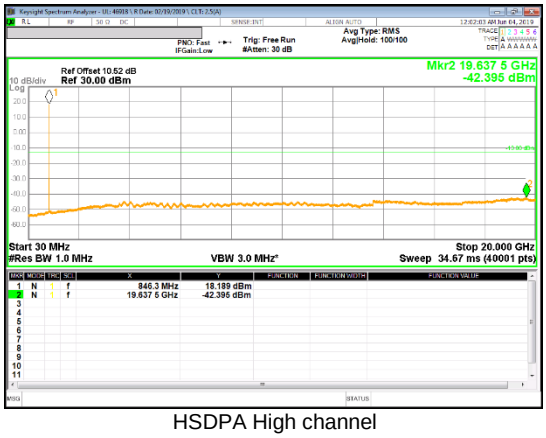
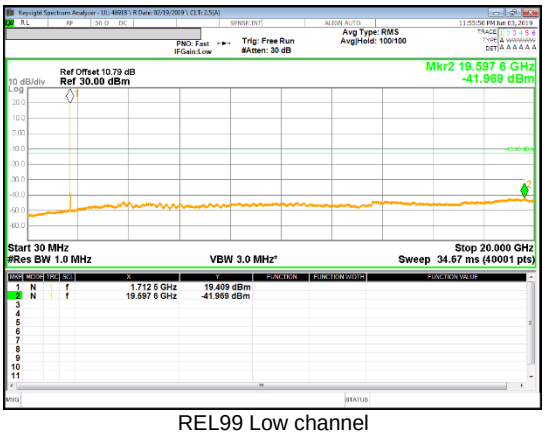
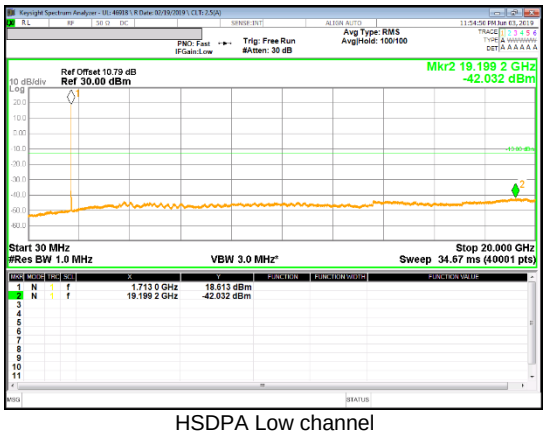
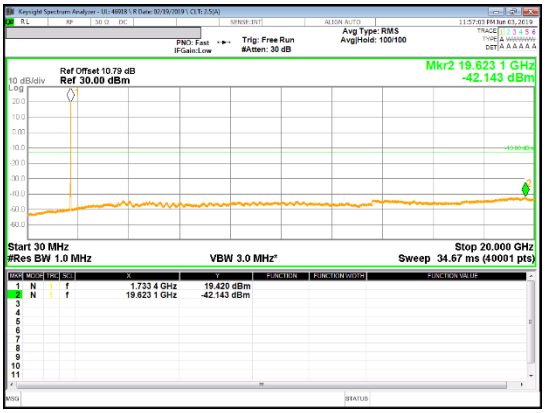
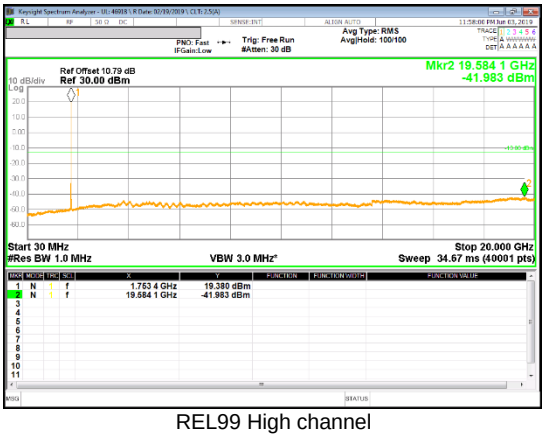
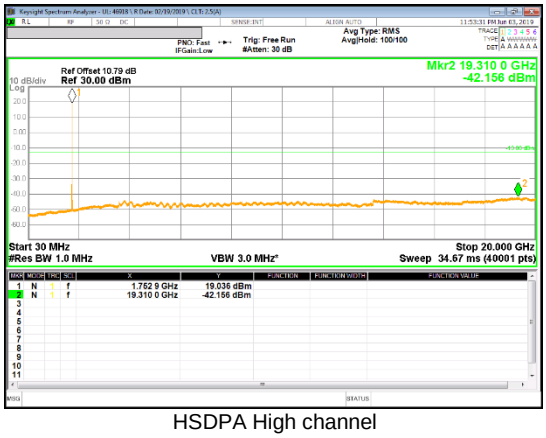
GSM 1900

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

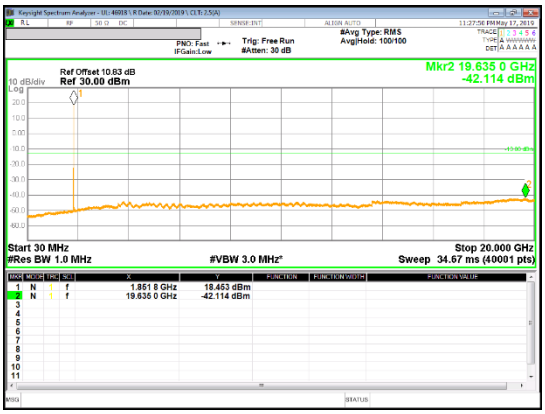
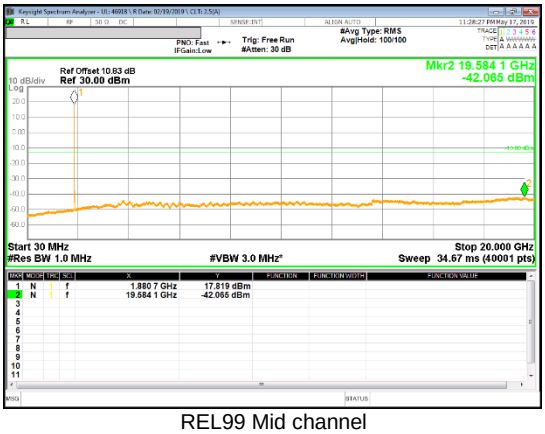
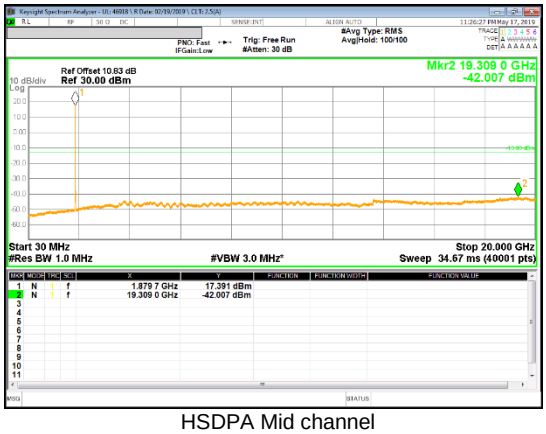
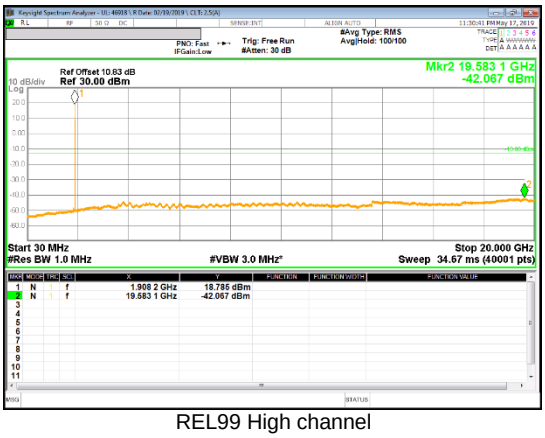
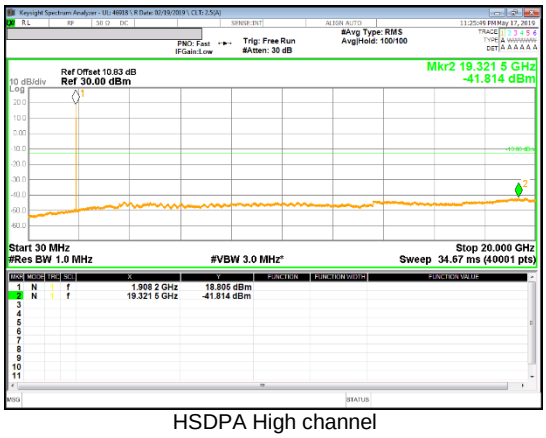
WCDMA Band 5

Band 5	 REL99 Low channel	 HSDPA Low channel
	 REL99 Mid channel	 HSDPA Mid channel
	 REL99 High channel	 HSDPA High channel

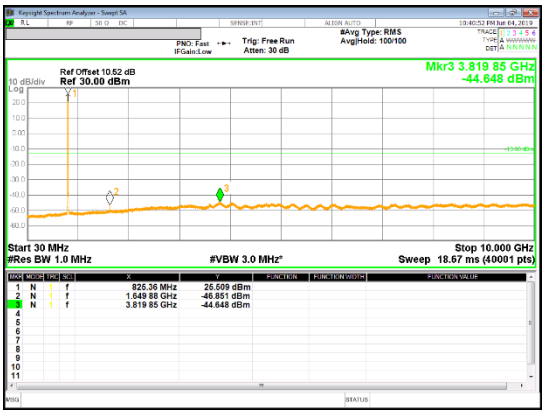
WCDMA Band 4

Band 4	 REL99 Low channel	 HSDPA Low channel
	 REL99 Mid channel	 HSDPA Mid channel
	 REL99 High channel	 HSDPA High channel

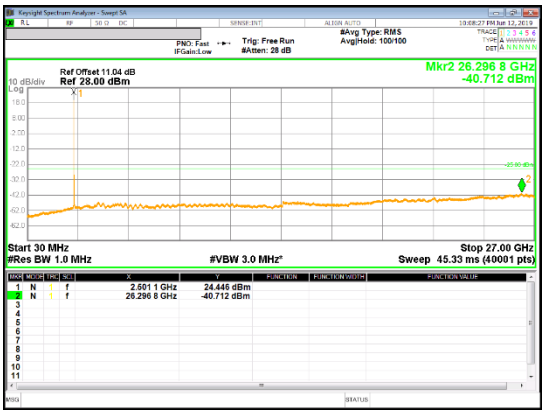
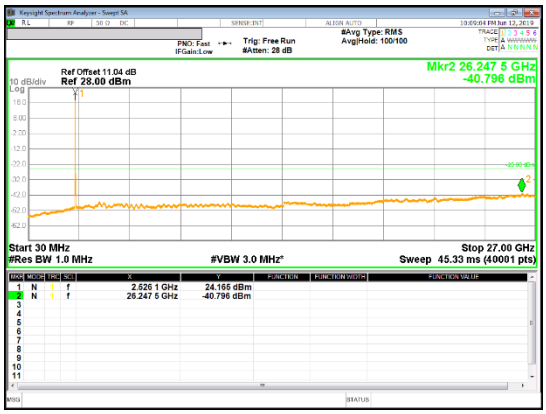
WCDMA Band 2

Band 2	 REL99 Low channel	 HSDPA Low channel
	 REL99 Mid channel	 HSDPA Mid channel
	 REL99 High channel	 HSDPA High channel

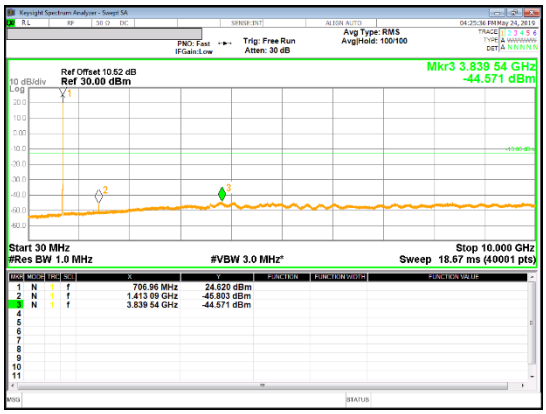
LTE Band 5

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

LTE Band 7

Band 7 20MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 12

Band 12 3MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 13

<table>
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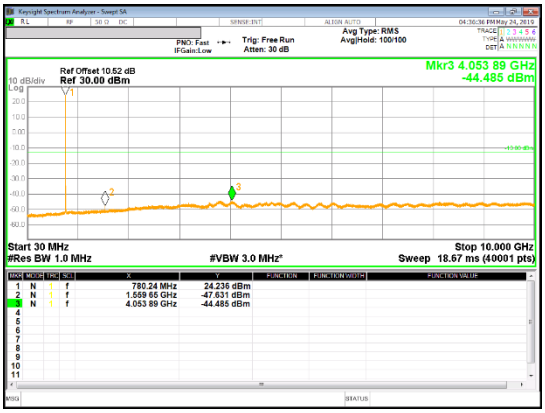
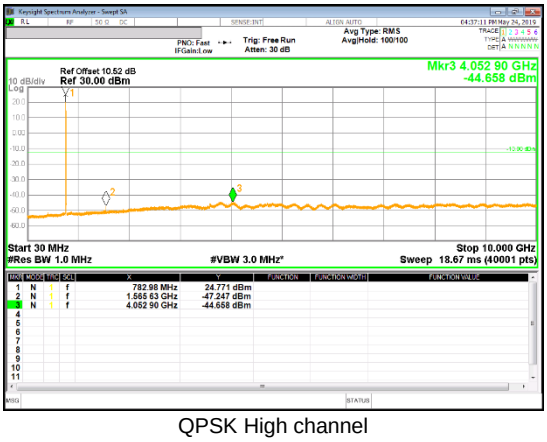
10MHz</td><td> 

QPSK Mid channel</td></tr>
<tr><td rowspan="2">Band 13
5MHz</td><td> 

QPSK Low channel</td><td> 

QPSK Mid channel</td></tr>
<tr><td colspan="2"> 

QPSK High channel</td></tr>
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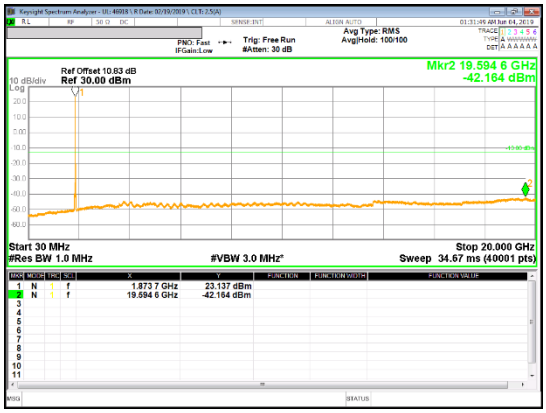
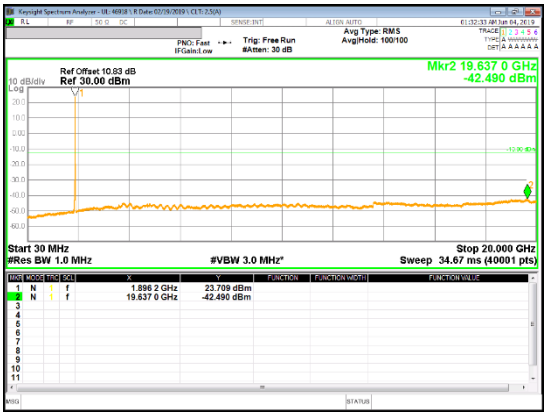
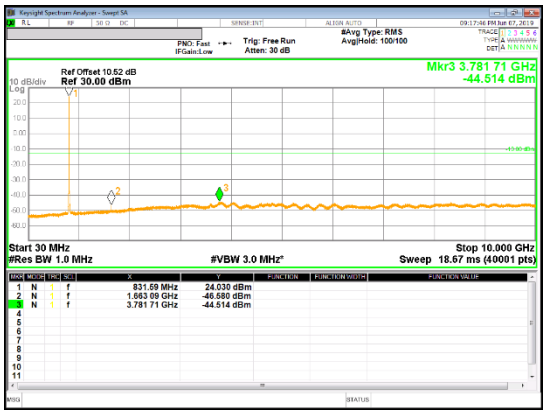
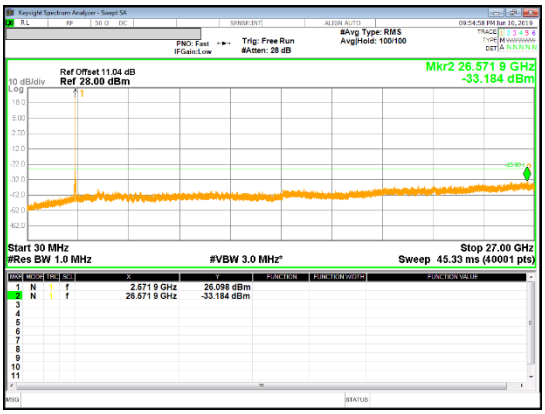
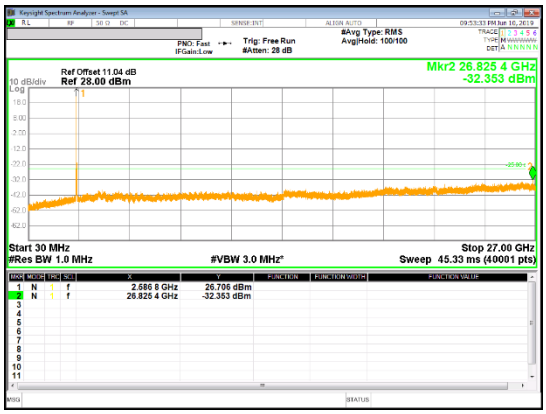
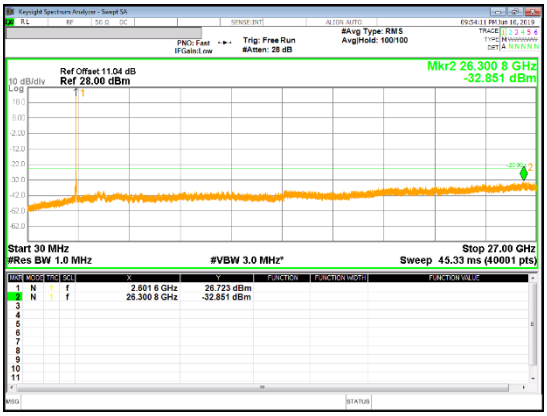
LTE Band 25

Band 26 20MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 26

Band 26 15MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 38

Band 38 20MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 41(PC2)

<table>
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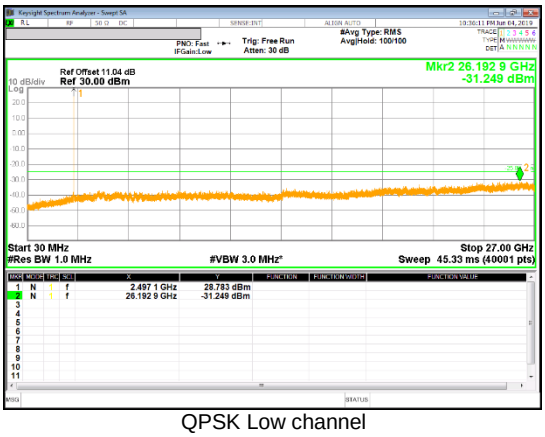
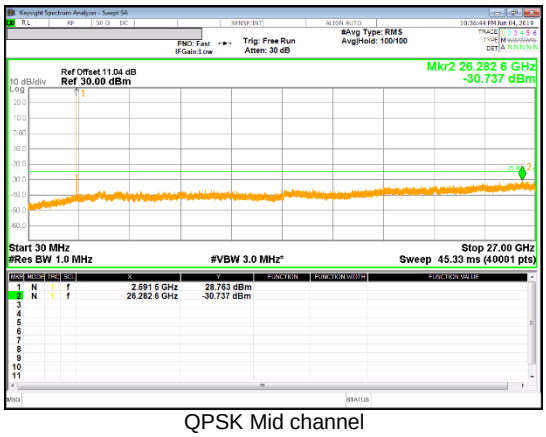
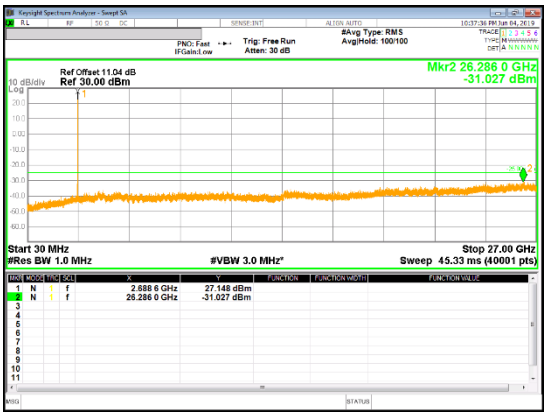
5MHz</td><td> 

QPSK Low channel</td><td> 

QPSK Mid channel</td></tr>
<tr><td colspan="2"> 

QPSK High channel</td></tr>
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LTE Band 41(PC3)

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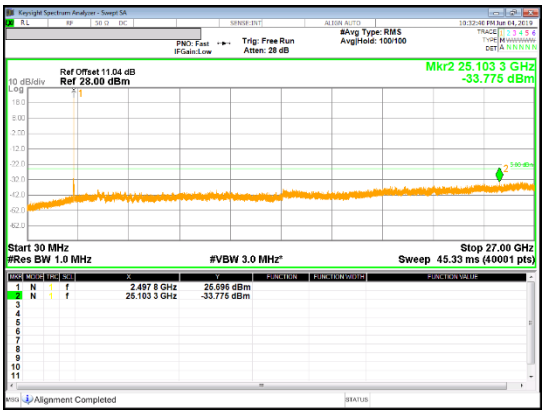
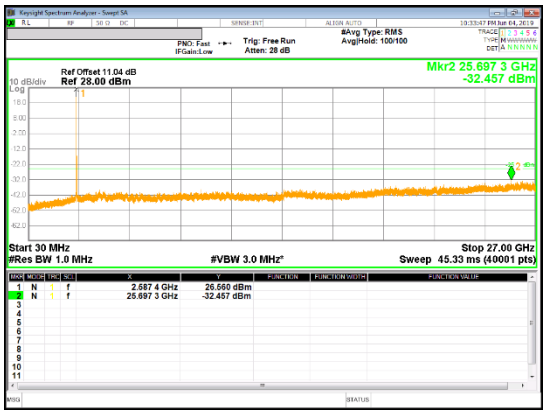
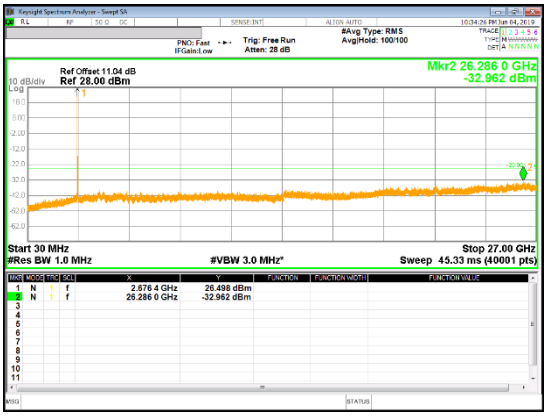
15MHz</td><td> 

QPSK Low channel</td><td> 

QPSK Mid channel</td></tr>
<tr><td colspan="2"> 

QPSK High channel</td></tr>
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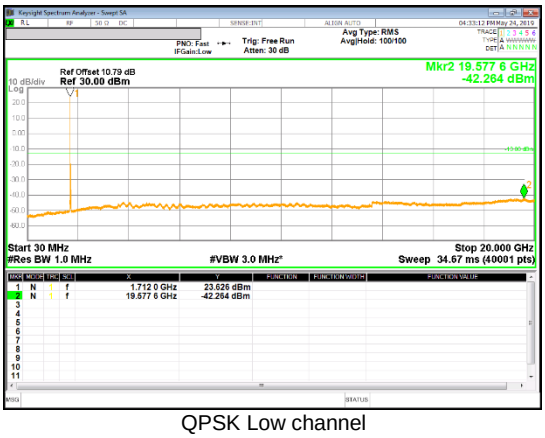
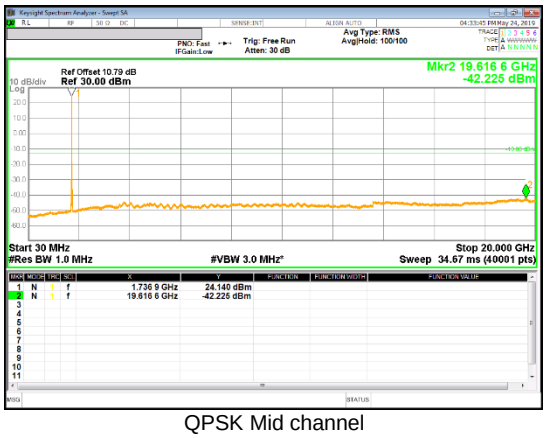
LTE Band 66

Band 66 20MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

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.

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 2

LTE Band 2 (Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, maximum tune-up limit of LTE Band 25 is higher than LTE Band 2 and both LTE Band 25 and LTE Band 2 channel bandwidth are same.

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)

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

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 [ºC]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.80	50	824.19998525	0.001	848.79998713	0.004	2.5
3.80	40	824.19998932	-0.004	848.79998609	0.005	2.5
3.80	30	824.19999100	-0.006	848.79998656	0.004	2.5
3.80	***20***	***824.19998594***	***0.000***	***848.79999021***	***0.000***	***2.5***
3.80	10	824.19998279	0.004	848.79998187	0.010	2.5
3.80	0	824.19998012	0.007	848.79998332	0.008	2.5
3.80	-10	824.19998981	-0.005	848.79998097	0.011	2.5
3.80	-20	824.19998467	0.002	848.79998150	0.010	2.5
3.80	-30	824.19998761	-0.002	848.79998543	0.006	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				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.80	***20***	***824.19998594***	***0***	***848.79999021***	***0***	***2.5***
4.30	20	824.19998299	0.004	848.79998809	0.002	2.5
3.60	20	824.19998866	-0.003	848.79999071	-0.001	2.5

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

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	1850.0805	1909.9209		
Extreme (50C)		1850.0805	1909.9209	-28.6	-0.015
Extreme (40C)		1850.0805	1909.9209	-26.5	-0.014
Extreme (30C)		1850.0805	1909.9209	-21.7	-0.012
Extreme (10C)		1850.0805	1909.9209	-28.8	-0.015
Extreme (0C)		1850.0805	1909.9209	-22.1	-0.012
Extreme (-10C)		1850.0805	1909.9209	-19.6	-0.010
Extreme (-20C)		1850.0805	1909.9209	-19.3	-0.010
Extreme (-30C)		1850.0805	1909.9209	-27.2	-0.014
20C	15%	1850.0805	1909.9209	-28.6	-0.015
	-15%	1850.0805	1909.9209	-28.2	-0.015
	End Point	1850.0805	1909.9209	-23.6	-0.013

WCDMA Band 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]	
3.80	50	826.39998962	-0.007	846.59998999	-0.008	2.5
3.80	40	826.39998256	0.002	846.59998498	-0.002	2.5
3.80	30	826.39998747	-0.004	846.59998559	-0.003	2.5
3.80	***20***	***826.39998399***	***0.000***	***846.59998287***	***0.000***	***2.5***
3.80	10	826.39998853	-0.005	846.59998544	-0.003	2.5
3.80	0	826.39998361	0.000	846.59998366	-0.001	2.5
3.80	-10	826.39998119	0.003	846.59998544	-0.003	2.5
3.80	-20	826.39999058	-0.008	846.59998808	-0.006	2.5
3.80	-30	826.39998425	0.000	846.59998545	-0.003	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]	
3.80	***20***	**826.39998399**	***0***	**846.59998287**	***0***	***2.5***
4.30	20	826.39999018	-0.007	846.59999034	-0.009	2.5
3.60	20	826.39998441	-0.001	846.59998601	-0.004	2.5

WCDMA Band 2 (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	1850.3177	1909.6874		
Extreme (50C)		1850.3177	1909.6874	-24.1	-0.013
Extreme (40C)		1850.3177	1909.6874	-19.1	-0.010
Extreme (30C)		1850.3177	1909.6874	-24.3	-0.013
Extreme (10C)		1850.3177	1909.6874	-21.0	-0.011
Extreme (0C)		1850.3177	1909.6874	-23.0	-0.012
Extreme (-10C)		1850.3177	1909.6874	-24.5	-0.013
Extreme (-20C)		1850.3177	1909.6874	-23.8	-0.013
Extreme (-30C)		1850.3177	1909.6874	-24.6	-0.013
20C	15%	1850.3177	1909.6874	-20.2	-0.011
	-15%	1850.3177	1909.6874	-25.0	-0.013
	End Point	1850.3177	1909.6874	-27.0	-0.014

WCDMA Band 4 (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	1710.3113	1754.6881		
Extreme (50C)		1710.3113	1754.6880	-26.9	-0.016
Extreme (40C)		1710.3113	1754.6880	-28.4	-0.016
Extreme (30C)		1710.3113	1754.6880	-21.1	-0.012
Extreme (10C)		1710.3113	1754.6880	-26.4	-0.015
Extreme (0C)		1710.3113	1754.6880	-23.2	-0.013
Extreme (-10C)		1710.3113	1754.6880	-22.1	-0.013
Extreme (-20C)		1710.3113	1754.6880	-25.4	-0.015
Extreme (-30C)		1710.3113	1754.6880	-25.6	-0.015
20C	15%	1710.3113	1754.6880	-29.6	-0.017
	-15%	1710.3113	1754.6880	-29.9	-0.017
	End Point	1710.3113	1754.6880	-21.8	-0.013

LTE Band 5 (QPSK)

Reference Frequency : LTE Band 5 Low Channel 824.7 MHz / High Channel 848.3 MHz @ 20°C						
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]	
3.80	50	824.69998661	-0.006	848.29998331	-0.004	2.5
3.80	40	824.69998300	-0.001	848.29999083	-0.013	2.5
3.80	30	824.69998544	-0.004	848.29998678	-0.008	2.5
3.80	***20***	***824.69998185***	***0.000***	***848.29998020***	***0.000***	***2.5***
3.80	10	824.69998693	-0.006	848.29998479	-0.005	2.5
3.80	0	824.69998029	0.002	848.29998003	0.000	2.5
3.80	-10	824.69998387	-0.002	848.29999048	-0.012	2.5
3.80	-20	824.69998977	-0.010	848.29998886	-0.010	2.5
3.80	-30	824.69998937	-0.009	848.29998548	-0.006	2.5

Reference Frequency : LTE Band 5 Low Channel 824.7 MHz / High Channel 848.3 MHz @ 20°C						
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]	
3.80	***20***	**824.69998185**	***0***	**848.29998020**	***0***	***2.5***
4.30	20	824.69998073	0.001	848.29998711	-0.008	2.5
3.60	20	824.69998776	-0.007	848.29998057	0.000	2.5

LTE Band 7 (16QAM)

Limit		2500	2570	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2500.2504	2569.7523		
Extreme (50C)		2500.2504	2569.7523	-32.5	-0.013
Extreme (40C)		2500.2504	2569.7523	-28.4	-0.011
Extreme (30C)		2500.2504	2569.7523	-24.9	-0.010
Extreme (10C)		2500.2504	2569.7523	-25.0	-0.010
Extreme (0C)		2500.2504	2569.7523	-34.3	-0.014
Extreme (-10C)		2500.2504	2569.7523	-28.5	-0.011
Extreme (-20C)		2500.2504	2569.7523	-32.1	-0.013
Extreme (-30C)		2500.2504	2569.7523	-32.3	-0.013
20C	15%	2500.2504	2569.7523	-32.1	-0.013
	-15%	2500.2504	2569.7523	-31.4	-0.012
	End Point	2500.2504	2569.7523	-27.1	-0.011

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

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	715.8442		
Extreme (50C)		699.1545	715.8441	-13.5	-0.019
Extreme (40C)		699.1545	715.8441	-11.1	-0.016
Extreme (30C)		699.1545	715.8441	-11.9	-0.017
Extreme (10C)		699.1545	715.8441	-18.8	-0.027
Extreme (0C)		699.1545	715.8441	-16.1	-0.023
Extreme (-10C)		699.1545	715.8441	-16.9	-0.024
Extreme (-20C)		699.1545	715.8441	-16.3	-0.023
Extreme (-30C)		699.1545	715.8441	-17.9	-0.025
20C	15%	699.1545	715.8441	-14.0	-0.020
	-15%	699.1545	715.8441	-16.0	-0.023
	End Point	699.1545	715.8441	-9.5	-0.013

LTE Band 13 (Lowest Frequency:QPSK / Highest Frequency: 16QAM)

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	777.2486	786.7534		
Extreme (50C)		777.2485	786.7533	-9.3	-0.012
Extreme (40C)		777.2485	786.7533	-14.8	-0.019
Extreme (30C)		777.2485	786.7533	-13.0	-0.017
Extreme (10C)		777.2485	786.7533	-16.6	-0.021
Extreme (0C)		777.2485	786.7533	-17.4	-0.022
Extreme (-10C)		777.2485	786.7533	-19.1	-0.024
Extreme (-20C)		777.2485	786.7533	-15.8	-0.020
Extreme (-30C)		777.2485	786.7533	-18.5	-0.024
20C	15%	777.2485	786.7533	-19.9	-0.025
	-15%	777.2485	786.7533	-19.7	-0.025
	End Point	777.2485	786.7533	-10.5	-0.013

LTE Band 25 (16QAM)

Limit		1850	1915	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.1535	1914.8436		
Extreme (50C)		1850.1534	1914.8435	-20.5	-0.011
Extreme (40C)		1850.1534	1914.8435	-19.6	-0.010
Extreme (30C)		1850.1534	1914.8435	-20.1	-0.011
Extreme (10C)		1850.1534	1914.8435	-25.8	-0.014
Extreme (0C)		1850.1534	1914.8435	-26.9	-0.014
Extreme (-10C)		1850.1534	1914.8435	-19.1	-0.010
Extreme (-20C)		1850.1534	1914.8435	-22.5	-0.012
Extreme (-30C)		1850.1534	1914.8435	-25.1	-0.013
20C	15%	1850.1534	1914.8435	-28.9	-0.015
	-15%	1850.1534	1914.8435	-25.0	-0.013
	End Point	1850.1534	1914.8435	-25.1	-0.013

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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 [ºC]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.80	50	814.69998257	0.007	848.29998762	-0.004	2.5
3.80	40	814.69998235	0.007	848.29999072	-0.008	2.5
3.80	30	814.69999027	-0.003	848.29998530	-0.002	2.5
3.80	***20***	***814.69998804***	***0.000***	***848.29998387***	***0.000***	***2.5***
3.80	10	814.69998513	0.004	848.29998998	-0.007	2.5
3.80	0	814.69998109	0.009	848.29998757	-0.004	2.5
3.80	-10	814.69998159	0.008	848.29998868	-0.006	2.5
3.80	-20	814.69998315	0.006	848.29998601	-0.003	2.5
3.80	-30	814.69998489	0.004	848.29998049	0.004	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 [ºC]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.80	***20***	***814.69998804***	***0***	***848.29998387***	***0***	***2.5***
4.30	20	814.69998084	0.009	848.29999063	-0.008	2.5
3.60	20	814.69998113	0.008	848.29998162	0.003	2.5

LTE Band 38(Lowest Frequency:16QAM / Highest Frequency: QPSK)

Limit		2570	2620	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2570.2466	2619.7471		
Extreme (50C)		2570.2466	2619.7471	-25.5	-0.010
Extreme (40C)		2570.2466	2619.7471	-27.5	-0.011
Extreme (30C)		2570.2466	2619.7471	-34.7	-0.013
Extreme (10C)		2570.2466	2619.7471	-28.4	-0.011
Extreme (0C)		2570.2466	2619.7471	-33.3	-0.013
Extreme (-10C)		2570.2466	2619.7471	-30.4	-0.012
Extreme (-20C)		2570.2466	2619.7471	-33.4	-0.013
Extreme (-30C)		2570.2466	2619.7471	-29.3	-0.011
20C	15%	2570.2466	2619.7471	-25.6	-0.010
	-15%	2570.2466	2619.7471	-28.1	-0.011
	End Point	2570.2466	2619.7471	-28.7	-0.011

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LTE Band 41 PC2 (16QAM)

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	2496.2524	2689.7491		
Extreme (50C)		2496.2523	2689.7490	-28.6	-0.011
Extreme (40C)		2496.2523	2689.7490	-32.1	-0.012
Extreme (30C)		2496.2523	2689.7490	-29.2	-0.011
Extreme (10C)		2496.2523	2689.7490	-32.2	-0.012
Extreme (0C)		2496.2523	2689.7490	-31.1	-0.012
Extreme (-10C)		2496.2523	2689.7490	-25.1	-0.010
Extreme (-20C)		2496.2523	2689.7490	-26.6	-0.010
Extreme (-30C)		2496.2523	2689.7490	-33.8	-0.013
20C	15%	2496.2523	2689.7490	-29.1	-0.011
	-15%	2496.2523	2689.7490	-31.4	-0.012
	End Point	2496.2523	2689.7490	-34.5	-0.013

LTE Band 41 PC3 (Lowest Frequency:16QAM / Highest Frequency: 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	2496.2509	2689.7489		
Extreme (50C)		2496.2509	2689.7488	-32.3	-0.012
Extreme (40C)		2496.2509	2689.7488	-27.2	-0.010
Extreme (30C)		2496.2509	2689.7488	-29.6	-0.011
Extreme (10C)		2496.2509	2689.7488	-26.1	-0.010
Extreme (0C)		2496.2509	2689.7488	-24.2	-0.009
Extreme (-10C)		2496.2509	2689.7488	-28.0	-0.011
Extreme (-20C)		2496.2509	2689.7488	-26.3	-0.010
Extreme (-30C)		2496.2509	2689.7488	-30.5	-0.012
20C	15%	2496.2509	2689.7488	-33.7	-0.013
	-15%	2496.2509	2689.7488	-25.6	-0.010
	End Point	2496.2509	2689.7488	-30.0	-0.012

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	1710.1551	1779.8444		
Extreme (50C)		1710.1550	1779.8443	-23.6	-0.014
Extreme (40C)		1710.1550	1779.8443	-25.5	-0.015
Extreme (30C)		1710.1550	1779.8443	-29.0	-0.017
Extreme (10C)		1710.1550	1779.8443	-23.4	-0.013
Extreme (0C)		1710.1550	1779.8443	-27.3	-0.016
Extreme (-10C)		1710.1550	1779.8443	-24.8	-0.014
Extreme (-20C)		1710.1550	1779.8443	-28.8	-0.016
Extreme (-30C)		1710.1550	1779.8443	-23.9	-0.014
20C	15%	1710.1550	1779.8443	-26.3	-0.015
	-15%	1710.1550	1779.8443	-23.4	-0.013
	End Point	1710.1550	1779.8443	-25.7	-0.015

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.

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 2

LTE Band 2 (Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, maximum tune-up limit of LTE Band 25 is higher than LTE Band 2 and both LTE Band 25 and LTE Band 2 channel bandwidth are same.

10. RADIATED TEST RESULTS

10.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

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

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.

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

10.1.1. ERP/EIRP Results

GSM

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
GSM850	GPRS	512	824.2	26.50	446.68
		661	836.6	27.18	522.40
		810	848.8	28.20	660.69
	EGPRS	512	824.2	19.47	88.51
		661	836.6	20.49	111.94
		810	848.8	21.53	142.23
GSM1900	GPRS	512	1850.2	28.32	679.20
		661	1880	31.88	1541.70
		810	1909.8	29.30	851.14
	EGPRS	512	1850.2	23.54	225.94
		661	1880	27.70	588.84
		810	1909.8	25.13	325.84

WCDMA

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
Band 5	REL99	4132	826.4	**17.88**	61.38
		4183	836.6	17.74	**59.43**
		4233	846.6	17.46	55.72
	HSDPA	4132	826.4	15.25	33.50
		4183	836.6	15.37	**34.43**
		4233	846.6	**15.41**	34.75
Band 4	REL99	1312	1712.4	**23.54**	225.94
		1413	1732.6	22.03	159.59
		1513	1752.6	22.15	164.06
	HSDPA	1312	1712.4	**23.57**	**227.51**
		1413	1732.6	22.25	167.88
		1513	1752.6	22.31	170.22
Band 2	REL99	9262	1852.4	20.15	103.51
		9400	1880.0	**21.61**	**144.88**
		9538	1907.6	20.51	112.46
	HSDPA	9262	1852.4	19.45	88.10
		9400	1880.0	**21.05**	**127.35**
		9538	1907.6	19.93	98.40

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	829.0	**17.42**	**55.21**
			1 / 0	836.5	17.13	51.64
			1 / 0	844.0	17.24	52.97
		16QAM	1 / 0	829.0	**14.79**	**30.13**
			1 / 0	836.5	14.42	27.67
			1 / 0	844.0	14.40	27.54
	5	QPSK	1 / 12	826.5	17.03	50.47
			1 / 12	836.5	16.94	49.43
			1 / 0	846.5	**17.26**	**53.21**
		16QAM	1 / 24	826.5	**14.57**	**28.64**
			1 / 12	836.5	14.22	26.42
			1 / 0	846.5	14.39	27.48
	3	QPSK	1 / 8	825.5	17.15	51.88
			1 / 0	836.5	**17.19**	**52.36**
			1 / 0	847.5	17.15	51.88
		16QAM	1 / 8	825.5	14.55	28.51
			1 / 0	836.5	14.68	29.38
			1 / 8	847.5	**14.74**	**29.79**
	1.4	QPSK	1 / 3	824.7	16.82	48.08
			1 / 0	836.5	**17.40**	**54.95**
			1 / 3	848.3	17.29	53.58
		16QAM	1 / 3	824.7	14.29	26.85
			1 / 0	836.5	**14.59**	**28.77**
			1 / 0	848.3	**14.59**	**28.77**

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LTE Band 7

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP	
					[dBm]	[mW]
Band 7	20	QPSK	1 / 0	2510.0	21.92	155.60
			1 / 0	2535.0	21.84	152.76
			1 / 99	2560.0	**22.09**	161.81
		16QAM	1 / 0	2510.0	19.30	85.11
			1 / 0	2535.0	19.28	84.72
			1 / 0	2560.0	**20.66**	116.41
	15	QPSK	1 / 0	2507.5	21.49	140.93
			1 / 0	2535.0	22.06	160.69
			1 / 0	2562.5	**22.16**	**164.44**
		16QAM	1 / 37	2507.5	19.08	80.91
			1 / 0	2535.0	19.71	93.54
			1 / 37	2562.5	**19.97**	99.31
	10	QPSK	1 / 0	2505.0	21.76	149.97
			1 / 0	2535.0	21.98	157.76
			1 / 49	2565.0	**22.09**	161.81
		16QAM	1 / 0	2505.0	19.13	81.85
			1 / 0	2535.0	19.52	89.54
			1 / 0	2565.0	**19.92**	98.17
	5	QPSK	1 / 12	2502.5	21.79	151.01
			1 / 24	2535.0	21.70	147.91
			1 / 24	2567.5	**21.92**	155.60
		16QAM	1 / 24	2502.5	19.04	80.17
			1 / 0	2535.0	19.39	86.90
			1 / 0	2567.5	**19.61**	91.41

LTE Band 12

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 12	10	QPSK	1 / 0	704.0	16.43	43.95
			1 / 0	707.5	**16.47**	44.36
			1 / 0	711.0	15.79	37.93
		16QAM	1 / 0	704.0	14.17	26.12
			1 / 0	707.5	**14.18**	26.18
			1 / 0	711.0	13.13	20.56
	5	QPSK	1 / 12	701.5	16.16	41.30
			1 / 24	707.5	**16.23**	41.98
			1 / 12	713.5	15.83	38.28
		16QAM	1 / 24	701.5	**13.90**	24.55
			1 / 0	707.5	13.89	24.49
			1 / 0	713.5	13.48	22.28
	3	QPSK	1 / 8	700.5	16.12	40.93
			1 / 0	707.5	**16.49**	**44.57**
			1 / 8	714.5	15.81	38.11
		16QAM	1 / 8	700.5	13.63	23.07
			1 / 8	707.5	**13.98**	25.00
			1 / 8	714.5	12.99	19.91
	1.4	QPSK	1 / 5	699.7	16.18	41.50
			1 / 3	707.5	**16.42**	43.85
			1 / 0	715.3	16.09	40.64
		16QAM	1 / 5	699.7	13.41	21.93
			1 / 5	707.5	**13.43**	22.03
			1 / 0	715.3	13.27	21.23

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	16.88	48.75
		16QAM	1 / 0	782.0	14.23	26.49
	5	QPSK	1 / 12	779.5	**17.15**	**51.88**
			1 / 24	782.0	16.84	48.31
			1 / 0	784.5	16.48	44.46
		16QAM	1 / 24	779.5	14.37	27.35
			1 / 12	782.0	**14.38**	27.42
			1 / 12	784.5	13.90	24.55

LTE Band 25

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 25	20	QPSK	1 / 0	1860.0	19.38	86.70
			1 / 0	1882.5	20.43	110.41
			1 / 0	1905.0	19.95	98.86
		16QAM	1 / 0	1860.0	17.70	58.88
			1 / 0	1882.5	19.06	80.54
			1 / 0	1905.0	18.79	75.68
	15	QPSK	1 / 37	1857.5	18.91	77.80
			1 / 0	1882.5	20.38	109.14
			1 / 0	1907.5	18.91	77.80
		16QAM	1 / 37	1857.5	17.53	56.62
			1 / 0	1882.5	19.22	83.56
			1 / 37	1907.5	17.31	53.83
	10	QPSK	1 / 0	1855.0	19.49	88.92
			1 / 0	1882.5	20.59	114.55
			1 / 0	1910.0	18.75	74.99
		16QAM	1 / 0	1855.0	18.06	63.97
			1 / 0	1882.5	19.03	79.98
			1 / 0	1910.0	17.19	52.36
	5	QPSK	1 / 12	1852.5	19.14	82.04
			1 / 24	1882.5	21.09	128.53
			1 / 24	1912.5	18.74	74.82
		16QAM	1 / 24	1852.5	17.63	57.94
			1 / 12	1882.5	19.05	80.35
			1 / 12	1912.5	16.83	48.19
	3	QPSK	1 / 8	1851.5	19.15	82.22
			1 / 0	1882.5	20.85	121.62
			1 / 8	1913.5	18.61	72.61
		16QAM	1 / 8	1851.5	17.76	59.70
			1 / 0	1882.5	19.13	81.85
			1 / 8	1913.5	17.19	52.36
	1.4	QPSK	1 / 0	1850.7	19.61	91.41
			1 / 0	1882.5	**21.14**	**130.02**
			1 / 0	1914.3	19.15	82.22
		16QAM	1 / 0	1850.7	17.90	61.66
			1 / 3	1882.5	**19.85**	96.61
			1 / 5	1914.3	17.38	54.70

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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 / 37	821.5	16.11	40.83
			1 / 37	831.5	**16.05**	40.27
			1 / 0	841.5	15.48	35.32
		16QAM	1 / 0	821.5	14.29	26.85
			1 / 37	831.5	13.68	23.33
			1 / 37	841.5	**13.88**	24.43
	10	QPSK	1 / 0	819.0	16.04	40.18
			1 / 25	829.0	**16.15**	41.21
			1 / 0	831.5	15.84	38.37
			1 / 0	844.0	15.57	36.06
		16QAM	1 / 0	819.0	14.09	25.64
			1 / 25	829.0	**14.22**	26.42
			1 / 0	831.5	13.54	22.59
			1 / 0	844.0	13.47	22.23
	5	QPSK	1 / 24	816.5	16.06	40.36
			1 / 12	821.5	**16.27**	42.36
			1 / 12	826.5	**15.44**	34.99
			1 / 24	831.5	15.24	33.42
			1 / 12	846.5	15.18	32.96
		16QAM	1 / 0	816.5	**13.96**	24.89
			1 / 12	821.5	13.86	24.32
			1 / 24	826.5	**13.51**	22.44
			1 / 0	831.5	13.04	20.14
			1 / 0	846.5	13.38	21.78
	3	QPSK	1 / 0	815.5	15.92	39.08
			1 / 0	822.5	**16.11**	40.83
			1 / 0	825.5	**15.66**	36.81
			1 / 0	831.5	15.44	34.99
			1 / 8	847.5	15.40	34.67
		16QAM	1 / 14	815.5	13.92	24.66
			1 / 0	822.5	**14.18**	26.18
			1 / 14	825.5	**13.52**	22.49
			1 / 14	831.5	13.24	21.09
			1 / 0	847.5	13.30	21.38
	1.4	QPSK	1 / 5	814.7	**16.19**	41.59
			1 / 3	823.3	16.18	41.50
			1 / 0	824.7	15.57	36.06
			1 / 0	831.5	**15.64**	36.64
			1 / 3	848.3	15.63	36.56
		16QAM	1 / 5	814.7	**14.29**	26.85
			1 / 3	823.3	13.98	25.00
			1 / 0	824.7	**13.98**	25.00
			1 / 3	831.5	13.44	22.08
			1 / 5	848.3	13.33	21.53

LTE Band 38

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 38	20	QPSK	1 / 0	2580.0	25.66	367.96
			1 / 0	2595.0	25.65	367.28
			1 / 0	2610.0	**25.77**	377.57
		16QAM	1 / 49	2580.0	24.69	294.44
			1 / 0	2595.0	**25.12**	325.09
			1 / 99	2610.0	24.83	304.09
	15	QPSK	1 / 0	2577.5	25.60	363.08
			1 / 0	2595.0	**26.23**	**419.76**
			1 / 0	2612.5	26.11	408.32
		16QAM	1 / 0	2577.5	24.59	287.74
			1 / 0	2595.0	**25.24**	334.20
			1 / 37	2612.5	25.15	327.34
	10	QPSK	1 / 0	2575.0	24.99	315.50
			1 / 0	2595.0	**25.32**	340.41
			1 / 0	2615.0	24.59	287.74
		16QAM	1 / 0	2575.0	23.96	248.89
			1 / 0	2595.0	**24.24**	265.46
			1 / 0	2615.0	23.58	228.03
	5	QPSK	1 / 0	2572.5	24.30	269.15
			1 / 0	2595.0	**25.59**	362.24
			1 / 0	2617.5	25.23	333.43
		16QAM	1 / 0	2572.5	23.38	217.77
			1 / 0	2595.0	**24.54**	284.45
			1 / 0	2617.5	24.53	283.79

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LTE Band 41(PC2)

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 41	20	QPSK	1 / 99	2506.0	23.94	247.74
			1 / 0	2593.0	**26.39**	435.51
			1 / 0	2680.0	26.27	423.64
		16QAM	1 / 0	2506.0	23.73	236.05
			1 / 0	2593.0	**26.91**	490.91
			1 / 0	2680.0	25.94	392.64
	15	QPSK	1 / 0	2503.5	24.13	258.82
			1 / 0	2593.0	**27.16**	**520.00**
			1 / 37	2682.5	25.73	374.11
		16QAM	1 / 0	2503.5	23.97	249.46
			1 / 0	2593.0	**26.68**	465.59
			1 / 37	2682.5	25.61	363.92
	10	QPSK	1 / 25	2501.0	24.59	287.74
			1 / 0	2593.0	**26.59**	456.04
			1 / 0	2685.0	24.87	306.90
		16QAM	1 / 25	2501.0	24.82	303.39
			1 / 0	2593.0	**26.76**	474.24
			1 / 0	2685.0	24.79	301.30
	5	QPSK	1 / 0	2498.5	25.04	319.15
			1 / 0	2593.0	**27.01**	502.34
			1 / 12	2687.5	25.90	389.05
		16QAM	1 / 0	2498.5	24.04	253.51
			1 / 0	2593.0	**25.70**	371.54
			1 / 24	2687.5	24.75	298.54

LTE Band 41(PC3)

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP	
					[dBm]	[mW]
Band 41	20	QPSK	1 / 99	2506.0	22.69	185.78
			1 / 0	2593.0	**24.85**	305.49
			1 / 0	2680.0	23.84	242.10
		16QAM	1 / 0	2506.0	22.10	162.18
			1 / 49	2593.0	**25.04**	319.15
			1 / 0	2680.0	24.54	284.45
	15	QPSK	1 / 0	2503.5	21.71	148.25
			1 / 0	2593.0	**24.83**	304.09
			1 / 0	2682.5	22.34	171.40
		16QAM	1 / 74	2503.5	21.59	144.21
			1 / 0	2593.0	**24.80**	302.00
			1 / 0	2682.5	22.34	171.40
	10	QPSK	1 / 0	2501.0	21.88	154.17
			1 / 0	2593.0	**25.25**	**334.97**
			1 / 0	2685.0	23.47	222.33
		16QAM	1 / 0	2501.0	21.97	157.40
			1 / 0	2593.0	**25.14**	326.59
			1 / 0	2685.0	23.50	223.87
	5	QPSK	1 / 0	2498.5	22.09	161.81
			1 / 0	2593.0	**25.05**	319.89
			1 / 0	2687.5	23.43	220.29
		16QAM	1 / 24	2498.5	21.87	153.82
			1 / 0	2593.0	**24.98**	314.77
			1 / 0	2687.5	23.40	218.78

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.

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 2

LTE Band 2 (Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, maximum tune-up limit of LTE Band 25 is higher than LTE Band 2 and both LTE Band 25 and LTE Band 2 channel bandwidth are same.

LTE Band 66

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 66	20	QPSK	1 / 0	1720.0	22.02	159.22
			1 / 0	1745.0	**22.92**	**195.88**
			1 / 0	1770.0	21.63	145.55
		16QAM	1 / 0	1720.0	19.48	88.72
			1 / 0	1745.0	**20.52**	112.72
			1 / 0	1770.0	19.62	91.62
	15	QPSK	1 / 37	1717.5	21.72	148.59
			1 / 0	1747.5	**22.42**	174.58
			1 / 37	1772.5	21.46	139.96
		16QAM	1 / 0	1717.5	19.59	90.99
			1 / 37	1747.5	**20.52**	112.72
			1 / 37	1772.5	19.03	79.98
	10	QPSK	1 / 0	1715.0	21.93	155.96
			1 / 0	1745.0	**22.23**	167.11
			1 / 0	1775.0	21.50	141.25
		16QAM	1 / 25	1715.0	19.91	97.95
			1 / 25	1745.0	**20.24**	105.68
			1 / 25	1775.0	19.56	90.36
	5	QPSK	1 / 12	1712.5	21.38	137.40
			1 / 24	1745.0	**22.16**	164.44
			1 / 12	1777.5	21.48	140.60
		16QAM	1 / 0	1712.5	19.68	92.90
			1 / 24	1745.0	**20.13**	103.04
			1 / 24	1777.5	19.61	91.41
	3	QPSK	1 / 8	1711.5	21.83	152.41
			1 / 0	1745.0	**22.52**	178.65
			1 / 8	1778.5	21.84	152.76
		16QAM	1 / 8	1711.5	19.71	93.54
			1 / 0	1745.0	**20.40**	109.65
			1 / 8	1778.5	19.84	96.38
	1.4	QPSK	1 / 0	1710.7	21.89	154.53
			1 / 0	1745.0	**22.54**	179.47
			1 / 0	1779.3	21.94	156.31
		16QAM	1 / 5	1710.7	19.71	93.54
			1 / 0	1745.0	**20.23**	105.44
			1 / 0	1779.3	19.81	95.72

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10.1.2. ERP/EIRP DATA

GSM850

GSM850

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-31
Test Engineer: 45585
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: GPRS 850 MHz Fundamentals

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								
824.20	30.99	V	3.0	-1.5	26.50	38.5	-12.0	
824.20	23.79	H	3.0	-1.5	19.30	38.5	-19.2	
Mid Ch								
836.60	31.64	V	3.0	-1.4	27.18	38.5	-11.3	
836.60	23.47	H	3.0	-1.4	19.00	38.5	-19.5	
High Ch								
848.80	32.64	V	3.1	-1.4	28.20	38.5	-10.3	
848.80	24.01	H	3.1	-1.4	19.57	38.5	-18.9	

GSM850

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-31
Test Engineer: 45585
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: EGPRS 850 MHz Fundamentals

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								
824.20	23.96	V	3.0	-1.5	19.47	38.5	-19.0	
824.20	16.86	H	3.0	-1.5	12.37	38.5	-26.1	
Mid Ch								
836.60	24.95	V	3.0	-1.4	20.49	38.5	-18.0	
836.60	17.65	H	3.0	-1.4	13.18	38.5	-25.3	
High Ch								
848.80	25.97	V	3.1	-1.4	21.53	38.5	-17.0	
848.80	17.39	H	3.1	-1.4	12.95	38.5	-25.6	

GSM1900

GSM1900

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT / X-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	19.60	V	4.5	9.5	24.62	33.0	-8.4	
1850.20	23.30	H	4.5	9.5	28.32	33.0	-4.7	
Mid Ch								
1880.00	21.79	V	4.5	9.3	26.57	33.0	-6.4	
1880.00	27.11	H	4.5	9.3	31.88	33.0	-1.1	
High Ch								
1909.80	21.72	V	4.6	9.1	26.21	33.0	-6.8	
1909.80	24.81	H	4.6	9.1	29.30	33.0	-3.7	

GSM1900

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT / X-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	14.88	V	4.5	9.5	19.90	33.0	-13.1	
1850.20	18.52	H	4.5	9.5	23.54	33.0	-9.5	
Mid Ch								
1880.00	17.26	V	4.5	9.3	22.04	33.0	-11.0	
1880.00	22.93	H	4.5	9.3	27.70	33.0	-5.3	
High Ch								
1909.80	17.36	V	4.6	9.1	21.85	33.0	-11.2	
1909.80	20.64	H	4.6	9.1	25.13	33.0	-7.9	

WCDMA Band 5

WCDMA

Band 5
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-31
Test Engineer: 45585
Configuration: EUT, X-Position
Location: Chamber 1
Mode: Rel99 Band 5 Fundamentals

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								
826.40	13.83	V	3.0	-1.5	9.35	38.5	-29.1	
826.40	22.36	H	3.0	-1.5	17.88	38.5	-20.6	
Mid Ch								
836.60	13.92	V	3.0	-1.4	9.46	38.5	-29.0	
836.60	22.21	H	3.0	-1.4	17.74	38.5	-20.8	
High Ch								
846.60	13.85	V	3.1	-1.4	9.40	38.5	-29.1	
846.60	21.91	H	3.1	-1.4	17.46	38.5	-21.0	

WCDMA

Band 5
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-31
Test Engineer: 45585
Configuration: EUT, X-Position
Location: Chamber 1
Mode: HSDPA Band 5 Fundamentals

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								
826.40	11.74	V	3.0	-1.5	7.26	38.5	-31.2	
826.40	19.73	H	3.0	-1.5	15.25	38.5	-23.3	
Mid Ch								
836.60	11.84	V	3.0	-1.4	7.38	38.5	-31.1	
836.60	19.84	H	3.0	-1.4	15.37	38.5	-23.1	
High Ch								
846.60	11.85	V	3.1	-1.4	7.40	38.5	-31.1	
846.60	19.86	H	3.1	-1.4	15.41	38.5	-23.1	

WCDMA Band 4

WCDMA

Band 4
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-03
Test Engineer:	45585
Configuration:	EUT, Z-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	14.68	V	4.3	9.4	19.77	30.0	-10.2	
1712.40	18.46	H	4.3	9.4	23.54	30.0	-6.5	
Mid Ch								
1732.60	14.41	V	4.3	9.5	19.55	30.0	-10.5	
1732.60	16.90	H	4.3	9.5	22.03	30.0	-8.0	
High Ch								
1752.60	14.36	V	4.4	9.5	19.53	30.0	-10.5	
1752.60	16.98	H	4.4	9.5	22.15	30.0	-7.8	

WCDMA

Band 4
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-03
Test Engineer:	45585
Configuration:	EUT, Z-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	14.76	V	4.3	9.4	19.85	30.0	-10.2	
1712.40	18.49	H	4.3	9.4	23.57	30.0	-6.4	
Mid Ch								
1732.60	14.61	V	4.3	9.5	19.75	30.0	-10.3	
1732.60	17.12	H	4.3	9.5	22.25	30.0	-7.7	
High Ch								
1752.60	14.42	V	4.4	9.5	19.59	30.0	-10.4	
1752.60	17.14	H	4.4	9.5	22.31	30.0	-7.7	

WCDMA Band 2

WCDMA

Band 2
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT, Z-Position
Location:	Chamber 2
Mode:	Rel99 Band 2 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	12.63	V	4.5	9.4	17.53	33.0	-15.5	
1852.40	15.25	H	4.5	9.4	20.15	33.0	-12.8	
Mid Ch								
1880.00	14.93	V	4.5	9.2	19.59	33.0	-13.4	
1880.00	16.94	H	4.5	9.2	21.61	33.0	-11.4	
High Ch								
1907.60	13.94	V	4.6	9.0	18.33	33.0	-14.7	
1907.60	16.12	H	4.6	9.0	20.51	33.0	-12.5	

WCDMA

Band 2
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT, Z-Position
Location:	Chamber 2
Mode:	HSDPA Band 2 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	11.93	V	4.5	9.4	16.83	33.0	-16.2	
1852.40	14.55	H	4.5	9.4	19.45	33.0	-13.5	
Mid Ch								
1880.00	13.57	V	4.5	9.2	18.23	33.0	-14.8	
1880.00	16.38	H	4.5	9.2	21.05	33.0	-12.0	
High Ch								
1907.60	13.41	V	4.6	9.0	17.80	33.0	-15.2	
1907.60	15.54	H	4.6	9.0	19.93	33.0	-13.1	

LTE Band 5

LTE Band 5 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-06-14
Test Engineer: 45585
Configuration: EUT / X-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	14.09	V	3.0	-1.5	9.61	38.5	-28.9	
829.00	21.90	H	3.0	-1.5	17.42	38.5	-21.1	
Mid Ch								
836.50	14.05	V	3.0	-1.4	9.59	38.5	-28.9	
836.50	21.59	H	3.0	-1.4	17.13	38.5	-21.4	
High Ch								
844.00	14.35	V	3.1	-1.4	9.90	38.5	-28.6	
844.00	21.69	H	3.1	-1.4	17.24	38.5	-21.3	

LTE Band 5 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-06-14
Test Engineer: 45585
Configuration: EUT / X-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	11.25	V	3.0	-1.5	6.77	38.5	-31.7	
829.00	19.27	H	3.0	-1.5	14.79	38.5	-23.7	
Mid Ch								
836.50	11.32	V	3.0	-1.4	6.86	38.5	-31.6	
836.50	18.88	H	3.0	-1.4	14.42	38.5	-24.1	
High Ch								
844.00	11.86	V	3.1	-1.4	7.41	38.5	-31.1	
844.00	18.85	H	3.1	-1.4	14.40	38.5	-24.1	

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LTE

Band 5

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT / X-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	13.46	V	3.0	-1.5	8.98	38.5	-29.5	
826.50	21.51	H	3.0	-1.5	17.03	38.5	-21.5	
Mid Ch								
836.50	14.05	V	3.0	-1.4	9.59	38.5	-28.9	
836.50	21.40	H	3.0	-1.4	16.94	38.5	-21.6	
High Ch								
846.50	14.20	V	3.1	-1.4	9.75	38.5	-28.7	
846.50	21.71	H	3.1	-1.4	17.26	38.5	-21.2	

LTE

Band 5

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT / X-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	10.97	V	3.0	-1.5	6.49	38.5	-32.0	
826.50	19.05	H	3.0	-1.5	14.57	38.5	-23.9	
Mid Ch								
836.50	11.55	V	3.0	-1.4	7.09	38.5	-31.4	
836.50	18.68	H	3.0	-1.4	14.22	38.5	-24.3	
High Ch								
846.50	11.49	V	3.1	-1.4	7.04	38.5	-31.5	
846.50	18.84	H	3.1	-1.4	14.39	38.5	-24.1	

LTE

Band 5

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT / X-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	13.38	V	3.0	-1.5	8.90	38.5	-29.6	
825.50	21.63	H	3.0	-1.5	17.15	38.5	-21.4	
Mid Ch								
836.50	14.19	V	3.0	-1.4	9.73	38.5	-28.8	
836.50	21.65	H	3.0	-1.4	17.19	38.5	-21.3	
High Ch								
847.50	14.19	V	3.1	-1.4	9.75	38.5	-28.8	
847.50	21.60	H	3.1	-1.4	17.15	38.5	-21.3	

LTE

Band 5

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT / X-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	10.80	V	3.0	-1.5	6.32	38.5	-32.2	
825.50	19.03	H	3.0	-1.5	14.55	38.5	-24.0	
Mid Ch								
836.50	11.53	V	3.0	-1.4	7.07	38.5	-31.4	
836.50	19.14	H	3.0	-1.4	14.68	38.5	-23.8	
High Ch								
847.50	11.82	V	3.1	-1.4	7.38	38.5	-31.1	
847.50	19.19	H	3.1	-1.4	14.74	38.5	-23.8	

LTE Band 5 1.4MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-06-14
Test Engineer: 45585
Configuration: EUT / X-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	13.35	V	3.0	-1.5	8.86	38.5	-29.6	
824.70	21.31	H	3.0	-1.5	16.82	38.5	-21.7	
Mid Ch								
836.50	14.32	V	3.0	-1.4	9.86	38.5	-28.6	
836.50	21.86	H	3.0	-1.4	17.40	38.5	-21.1	
High Ch								
848.30	14.48	V	3.1	-1.4	10.04	38.5	-28.5	
848.30	21.73	H	3.1	-1.4	17.29	38.5	-21.2	

LTE Band 5 1.4MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-06-14
Test Engineer: 45585
Configuration: EUT / X-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	10.83	V	3.0	-1.5	6.34	38.5	-32.2	
824.70	18.78	H	3.0	-1.5	14.29	38.5	-24.2	
Mid Ch								
836.50	11.76	V	3.0	-1.4	7.30	38.5	-31.2	
836.50	19.05	H	3.0	-1.4	14.59	38.5	-23.9	
High Ch								
848.30	11.87	V	3.1	-1.4	7.43	38.5	-31.1	
848.30	19.03	H	3.1	-1.4	14.59	38.5	-23.9	

LTE Band 7

LTE Band 7 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-06-14
Test Engineer: 45585
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 7 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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								
2510.00	12.41	V	5.3	10.1	17.23	33.0	-15.8	
2510.00	17.10	H	5.3	10.1	21.92	33.0	-11.1	
Mid Ch								
2535.00	14.13	V	5.3	10.0	18.89	33.0	-14.1	
2535.00	17.07	H	5.3	10.0	21.84	33.0	-11.2	
High Ch								
2560.00	14.48	V	5.3	10.0	19.19	33.0	-13.8	
2560.00	17.39	H	5.3	10.0	22.09	33.0	-10.9	

LTE Band 7 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-06-14
Test Engineer: 45585
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_16QAM Band 7 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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								
2510.00	9.76	V	5.3	10.1	14.58	33.0	-18.4	
2510.00	14.48	H	5.3	10.1	19.30	33.0	-13.7	
Mid Ch								
2535.00	11.66	V	5.3	10.0	16.42	33.0	-16.6	
2535.00	14.51	H	5.3	10.0	19.28	33.0	-13.7	
High Ch								
2560.00	12.57	V	5.3	10.0	17.28	33.0	-15.7	
2560.00	15.96	H	5.3	10.0	20.66	33.0	-12.3	

LTE

Band 7

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT, X-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 7 Fundamentals, 15MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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								
2507.50	12.37	V	5.3	10.1	17.20	33.0	-15.8	
2507.50	16.66	H	5.3	10.1	21.49	33.0	-11.5	
Mid Ch								
2535.00	14.54	V	5.3	10.0	19.30	33.0	-13.7	
2535.00	17.29	H	5.3	10.0	22.06	33.0	-10.9	
High Ch								
2562.50	14.93	V	5.3	10.0	19.63	33.0	-13.4	
2562.50	17.45	H	5.3	10.0	22.16	33.0	-10.8	

LTE

Band 7

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT, X-Position
Location:	Chamber 2
Mode:	LTE_16QAM Band 7 Fundamentals, 15MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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								
2507.50	10.03	V	5.3	10.1	14.86	33.0	-18.1	
2507.50	14.25	H	5.3	10.1	19.08	33.0	-13.9	
Mid Ch								
2535.00	12.12	V	5.3	10.0	16.88	33.0	-16.1	
2535.00	14.94	H	5.3	10.0	19.71	33.0	-13.3	
High Ch								
2562.50	12.52	V	5.3	10.0	17.22	33.0	-15.8	
2562.50	15.26	H	5.3	10.0	19.97	33.0	-13.0	

LTE

Band 7

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT, X-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 7 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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								
2505.00	12.42	V	5.2	10.1	17.25	33.0	-15.7	
2505.00	16.93	H	5.2	10.1	21.76	33.0	-11.2	
Mid Ch								
2535.00	15.06	V	5.3	10.0	19.82	33.0	-13.2	
2535.00	17.21	H	5.3	10.0	21.98	33.0	-11.0	
High Ch								
2565.00	14.52	V	5.3	10.0	19.22	33.0	-13.8	
2565.00	17.39	H	5.3	10.0	22.09	33.0	-10.9	

LTE

Band 7

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT, X-Position
Location:	Chamber 2
Mode:	LTE_16QAM Band 7 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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								
2505.00	9.90	V	5.2	10.1	14.73	33.0	-18.3	
2505.00	14.30	H	5.2	10.1	19.13	33.0	-13.9	
Mid Ch								
2535.00	12.53	V	5.3	10.0	17.29	33.0	-15.7	
2535.00	14.75	H	5.3	10.0	19.52	33.0	-13.5	
High Ch								
2565.00	11.78	V	5.3	10.0	16.48	33.0	-16.5	
2565.00	15.22	H	5.3	10.0	19.92	33.0	-13.1	

LTE
Band 7
5MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT, X-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 7 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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								
2502.50	12.72	V	5.2	10.1	17.56	33.0	-15.4	
2502.50	16.95	H	5.2	10.1	21.79	33.0	-11.2	
Mid Ch								
2535.00	14.75	V	5.3	10.0	19.51	33.0	-13.5	
2535.00	16.93	H	5.3	10.0	21.70	33.0	-11.3	
High Ch								
2567.50	14.74	V	5.3	10.0	19.43	33.0	-13.6	
2567.50	17.23	H	5.3	10.0	21.92	33.0	-11.1	

LTE
Band 7
5MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-14
Test Engineer:	45585
Configuration:	EUT, X-Position
Location:	Chamber 2
Mode:	LTE_16QAM Band 7 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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								
2502.50	10.55	V	5.2	10.1	15.39	33.0	-17.6	
2502.50	14.20	H	5.2	10.1	19.04	33.0	-14.0	
Mid Ch								
2535.00	12.95	V	5.3	10.0	17.71	33.0	-15.3	
2535.00	14.62	H	5.3	10.0	19.39	33.0	-13.6	
High Ch								
2567.50	12.53	V	5.3	10.0	17.22	33.0	-15.8	
2567.50	14.92	H	5.3	10.0	19.61	33.0	-13.4	

LTE Band 12

LTE Band 12 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-21
Test Engineer:	45585
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	13.95	V	2.8	-1.6	9.57	34.8	-25.2	
704.00	20.81	H	2.8	-1.6	16.43	34.8	-18.4	
Mid Ch								
707.50	13.77	V	2.8	-1.6	9.38	34.8	-25.4	
707.50	20.85	H	2.8	-1.6	16.47	34.8	-18.3	
High Ch								
711.00	12.72	V	2.8	-1.6	8.32	34.8	-26.5	
711.00	20.18	H	2.8	-1.6	15.79	34.8	-19.0	

LTE Band 12 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-21
Test Engineer:	45585
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	11.76	V	2.8	-1.6	7.38	34.8	-27.4	
704.00	18.55	H	2.8	-1.6	14.17	34.8	-20.6	
Mid Ch								
707.50	11.03	V	2.8	-1.6	6.64	34.8	-28.2	
707.50	18.56	H	2.8	-1.6	14.18	34.8	-20.6	
High Ch								
711.00	10.04	V	2.8	-1.6	5.64	34.8	-29.2	
711.00	17.52	H	2.8	-1.6	13.13	34.8	-21.7	

LTE

Band 12

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-21
Test Engineer:	45585
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	13.90	V	2.8	-1.6	9.52	34.8	-25.3	
701.50	20.54	H	2.8	-1.6	16.16	34.8	-18.6	
Mid Ch								
707.50	13.09	V	2.8	-1.6	8.70	34.8	-26.1	
707.50	20.61	H	2.8	-1.6	16.23	34.8	-18.6	
High Ch								
713.50	12.04	V	2.8	-1.6	7.64	34.8	-27.2	
713.50	20.23	H	2.8	-1.6	15.83	34.8	-19.0	

LTE

Band 12

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-21
Test Engineer:	45585
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	11.28	V	2.8	-1.6	6.90	34.8	-27.9	
701.50	18.28	H	2.8	-1.6	13.90	34.8	-20.9	
Mid Ch								
707.50	11.17	V	2.8	-1.6	6.78	34.8	-28.0	
707.50	18.27	H	2.8	-1.6	13.89	34.8	-20.9	
High Ch								
713.50	9.79	V	2.8	-1.6	5.39	34.8	-29.4	
713.50	17.88	H	2.8	-1.6	13.48	34.8	-21.3	

LTE

Band 12

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-21
Test Engineer:	45585
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	14.02	V	2.8	-1.6	9.64	34.8	-25.2	
700.50	20.50	H	2.8	-1.6	16.12	34.8	-18.7	
Mid Ch								
707.50	13.46	V	2.8	-1.6	9.07	34.8	-25.7	
707.50	20.87	H	2.8	-1.6	16.49	34.8	-18.3	
High Ch								
714.50	11.99	V	2.8	-1.6	7.60	34.8	-27.2	
714.50	20.21	H	2.8	-1.6	15.81	34.8	-19.0	

LTE

Band 12

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-21
Test Engineer:	45585
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	11.56	V	2.8	-1.6	7.18	34.8	-27.6	
700.50	18.01	H	2.8	-1.6	13.63	34.8	-21.2	
Mid Ch								
707.50	10.75	V	2.8	-1.6	6.36	34.8	-28.4	
707.50	18.36	H	2.8	-1.6	13.98	34.8	-20.8	
High Ch								
714.50	9.75	V	2.8	-1.6	5.36	34.8	-29.4	
714.50	17.39	H	2.8	-1.6	12.99	34.8	-21.8	

LTE

Band 12

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-21
Test Engineer:	45585
Configuration:	EUT / X-Position
Location:	Chamber 1
Mode:	LTE_QPSK Band 12 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								
699.70	14.35	V	2.8	-1.6	9.97	34.8	-24.8	
699.70	20.56	H	2.8	-1.6	16.18	34.8	-18.6	
Mid Ch								
707.50	13.68	V	2.8	-1.6	9.29	34.8	-25.5	
707.50	20.80	H	2.8	-1.6	16.42	34.8	-18.4	
High Ch								
715.30	12.28	V	2.8	-1.6	7.88	34.8	-26.9	
715.30	20.49	H	2.8	-1.6	16.09	34.8	-18.7	

LTE

Band 12

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-21
Test Engineer:	45585
Configuration:	EUT / X-Position
Location:	Chamber 1
Mode:	LTE_16QAM Band 12 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								
699.70	11.73	V	2.8	-1.6	7.35	34.8	-27.4	
699.70	17.79	H	2.8	-1.6	13.41	34.8	-21.4	
Mid Ch								
707.50	10.46	V	2.8	-1.6	6.07	34.8	-28.7	
707.50	17.81	H	2.8	-1.6	13.43	34.8	-21.4	
High Ch								
715.30	9.71	V	2.8	-1.6	5.31	34.8	-29.5	
715.30	17.67	H	2.8	-1.6	13.27	34.8	-21.5	

LTE Band 13

LTE Band 13 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-06
Test Engineer:	45585
Configuration:	EUT, Z-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 13 Fundamentals, 10MHz Bandwidth

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
Mid Ch								
782.00	21.38	V	2.9	-1.6	16.88	34.8	-17.9	
782.00	7.90	H	2.9	-1.6	3.40	34.8	-31.4	

LTE Band 13 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-06
Test Engineer:	45585
Configuration:	EUT, Z-Position
Location:	Chamber 2
Mode:	LTE_16QAM Band 13 Fundamentals, 10MHz Bandwidth

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
Mid Ch								
782.00	18.73	V	2.9	-1.6	14.23	34.8	-20.5	
782.00	5.72	H	2.9	-1.6	1.22	34.8	-33.6	

LTE

Band 13

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-06
Test Engineer:	45585
Configuration:	EUT, Z-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 13 Fundamentals, 5MHz Bandwidth

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								
779.50	21.65	V	2.9	-1.6	17.15	34.8	-17.6	
779.50	7.96	H	2.9	-1.6	3.46	34.8	-31.3	
Mid Ch								
782.00	21.34	V	2.9	-1.6	16.84	34.8	-17.9	
782.00	8.36	H	2.9	-1.6	3.86	34.8	-30.9	
High Ch								
784.50	20.98	V	2.9	-1.6	16.48	34.8	-18.3	
784.50	8.37	H	2.9	-1.6	3.86	34.8	-30.9	

LTE

Band 13

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-06-06
Test Engineer:	45585
Configuration:	EUT, Z-Position
Location:	Chamber 2
Mode:	LTE_16QAM Band 13 Fundamentals, 5MHz Bandwidth

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								
779.50	18.87	V	2.9	-1.6	14.37	34.8	-20.4	
779.50	5.55	H	2.9	-1.6	1.05	34.8	-33.7	
Mid Ch								
782.00	18.88	V	2.9	-1.6	14.38	34.8	-20.4	
782.00	5.61	H	2.9	-1.6	1.11	34.8	-33.7	
High Ch								
784.50	18.40	V	2.9	-1.6	13.90	34.8	-20.9	
784.50	5.60	H	2.9	-1.6	1.09	34.8	-33.7	

LTE Band 25

LTE Band 25 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-31
Test Engineer: 45585
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	11.48	V	4.5	9.3	16.32	33.0	-16.7	
1860.00	14.54	H	4.5	9.3	19.38	33.0	-13.6	
Mid Ch								
1882.50	12.45	V	4.5	9.2	17.10	33.0	-15.9	
1882.50	15.79	H	4.5	9.2	20.43	33.0	-12.6	
High Ch								
1905.00	11.69	V	4.6	9.0	16.11	33.0	-16.9	
1905.00	15.52	H	4.6	9.0	19.95	33.0	-13.1	

LTE Band 25 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-31
Test Engineer: 45585
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 25 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	9.89	V	4.5	9.3	14.73	33.0	-18.3	
1860.00	12.86	H	4.5	9.3	17.70	33.0	-15.3	
Mid Ch								
1882.50	10.73	V	4.5	9.2	15.38	33.0	-17.6	
1882.50	14.42	H	4.5	9.2	19.06	33.0	-13.9	
High Ch								
1905.00	9.95	V	4.6	9.0	14.37	33.0	-18.6	
1905.00	14.36	H	4.6	9.0	18.79	33.0	-14.2	

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LTE

Band 25

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-31
Test Engineer:	45585
Configuration:	EUT / Z-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 25 Fundamentals, 15MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	10.61	V	4.5	9.4	15.47	33.0	-17.5	
1857.50	14.05	H	4.5	9.4	18.91	33.0	-14.1	
Mid Ch								
1882.50	12.12	V	4.5	9.2	16.77	33.0	-16.2	
1882.50	15.74	H	4.5	9.2	20.38	33.0	-12.6	
High Ch								
1907.50	12.30	V	4.6	9.0	16.69	33.0	-16.3	
1907.50	14.52	H	4.6	9.0	18.91	33.0	-14.1	

LTE

Band 25

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-31
Test Engineer:	45585
Configuration:	EUT / Z-Position
Location:	Chamber 2
Mode:	LTE_16QAM Band 25 Fundamentals, 15MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	8.92	V	4.5	9.4	13.78	33.0	-19.2	
1857.50	12.67	H	4.5	9.4	17.53	33.0	-15.5	
Mid Ch								
1882.50	10.70	V	4.5	9.2	15.35	33.0	-17.7	
1882.50	14.58	H	4.5	9.2	19.22	33.0	-13.8	
High Ch								
1907.50	10.73	V	4.6	9.0	15.12	33.0	-17.9	
1907.50	12.92	H	4.6	9.0	17.31	33.0	-15.7	

LTE Band 25 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-31
Test Engineer: 45585
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	8.62	V	4.5	9.4	13.50	33.0	-19.5	
1855.00	14.61	H	4.5	9.4	19.49	33.0	-13.5	
Mid Ch								
1882.50	12.77	V	4.5	9.2	17.42	33.0	-15.6	
1882.50	15.95	H	4.5	9.2	20.59	33.0	-12.4	
High Ch								
1910.00	12.17	V	4.6	8.9	16.52	33.0	-16.5	
1910.00	14.40	H	4.6	8.9	18.75	33.0	-14.2	

LTE Band 25 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-31
Test Engineer: 45585
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 25 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	7.08	V	4.5	9.4	11.96	33.0	-21.0	
1855.00	13.18	H	4.5	9.4	18.06	33.0	-14.9	
Mid Ch								
1882.50	11.04	V	4.5	9.2	15.69	33.0	-17.3	
1882.50	14.39	H	4.5	9.2	19.03	33.0	-14.0	
High Ch								
1910.00	10.56	V	4.6	8.9	14.91	33.0	-18.1	
1910.00	12.84	H	4.6	8.9	17.19	33.0	-15.8	

LTE Band 25 5MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-31
Test Engineer: 45585
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	8.86	V	4.5	9.4	13.76	33.0	-19.2	
1852.50	14.24	H	4.5	9.4	19.14	33.0	-13.9	
Mid Ch								
1882.50	11.30	V	4.5	9.2	15.95	33.0	-17.1	
1882.50	16.45	H	4.5	9.2	21.09	33.0	-11.9	
High Ch								
1912.50	10.80	V	4.6	8.9	15.12	33.0	-17.9	
1912.50	14.42	H	4.6	8.9	18.74	33.0	-14.3	

LTE Band 25 5MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-31
Test Engineer: 45585
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 25 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	7.20	V	4.5	9.4	12.10	33.0	-20.9	
1852.50	12.73	H	4.5	9.4	17.63	33.0	-15.4	
Mid Ch								
1882.50	9.52	V	4.5	9.2	14.17	33.0	-18.8	
1882.50	14.41	H	4.5	9.2	19.05	33.0	-13.9	
High Ch								
1912.50	9.26	V	4.6	8.9	13.58	33.0	-19.4	
1912.50	12.51	H	4.6	8.9	16.83	33.0	-16.2	

LTE

Band 25

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-31
Test Engineer:	45585
Configuration:	EUT / Z-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 25 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	8.26	V	4.5	9.4	13.17	33.0	-19.8	
1851.50	14.24	H	4.5	9.4	19.15	33.0	-13.8	
Mid Ch								
1882.50	11.32	V	4.5	9.2	15.97	33.0	-17.0	
1882.50	16.21	H	4.5	9.2	20.85	33.0	-12.1	
High Ch								
1913.50	12.34	V	4.6	8.9	16.65	33.0	-16.3	
1913.50	14.30	H	4.6	8.9	18.61	33.0	-14.4	

LTE

Band 25

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-31
Test Engineer:	45585
Configuration:	EUT / Z-Position
Location:	Chamber 2
Mode:	LTE_16QAM Band 25 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	6.95	V	4.5	9.4	11.86	33.0	-21.1	
1851.50	12.85	H	4.5	9.4	17.76	33.0	-15.2	
Mid Ch								
1882.50	9.89	V	4.5	9.2	14.54	33.0	-18.5	
1882.50	14.49	H	4.5	9.2	19.13	33.0	-13.9	
High Ch								
1913.50	10.93	V	4.6	8.9	15.24	33.0	-17.8	
1913.50	12.88	H	4.6	8.9	17.19	33.0	-15.8	

LTE

Band 25

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-31
Test Engineer:	45585
Configuration:	EUT / Z-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 25 Fundamentals, 1.4MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	9.04	V	4.5	9.4	13.96	33.0	-19.0	
1850.70	14.69	H	4.5	9.4	19.61	33.0	-13.4	
Mid Ch								
1882.50	11.25	V	4.5	9.2	15.90	33.0	-17.1	
1882.50	16.50	H	4.5	9.2	21.14	33.0	-11.9	
High Ch								
1914.30	10.79	V	4.6	8.9	15.09	33.0	-17.9	
1914.30	14.85	H	4.6	8.9	19.15	33.0	-13.9	

LTE

Band 25

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company:	Samsung
Project #:	4789009800
Date:	2019-05-31
Test Engineer:	45585
Configuration:	EUT / Z-Position
Location:	Chamber 2
Mode:	LTE_16QAM Band 25 Fundamentals, 1.4MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 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	7.69	V	4.5	9.4	12.61	33.0	-20.4	
1850.70	12.98	H	4.5	9.4	17.90	33.0	-15.1	
Mid Ch								
1882.50	9.37	V	4.5	9.2	14.02	33.0	-19.0	
1882.50	15.21	H	4.5	9.2	19.85	33.0	-13.1	
High Ch								
1914.30	9.27	V	4.6	8.9	13.57	33.0	-19.4	
1914.30	13.08	H	4.6	8.9	17.38	33.0	-15.6	

LTE Band 26

LTE

Band 26

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-21
Test Engineer: 45585
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 15MHz 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
Mid Ch								
831.50	13.79	V	3.0	-1.4	9.32	38.5	-29.2	
831.50	20.52	H	3.0	-1.4	16.05	38.5	-22.5	
High Ch								
841.50	13.73	V	3.0	-1.4	9.27	38.5	-29.2	
841.50	19.93	H	3.0	-1.4	15.48	38.5	-23.0	

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-22
Test Engineer: 45585
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 15MHz 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								
821.50	13.35	V	3.0	-1.5	8.85	50.0	-41.1	Part 90
821.50	20.60	H	3.0	-1.5	16.11	50.0	-33.9	Part 90

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LTE

Band 26

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-21
Test Engineer: 45585
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 15MHz 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
Mid Ch								
831.50	11.52	V	3.0	-1.4	7.05	38.5	-31.5	
831.50	18.15	H	3.0	-1.4	13.68	38.5	-24.8	
High Ch								
841.50	11.54	V	3.0	-1.4	7.08	38.5	-31.4	
841.50	18.33	H	3.0	-1.4	13.88	38.5	-24.6	

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-22
Test Engineer: 45585
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 15MHz 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								
821.50	11.28	V	3.0	-1.5	6.78	50.0	-43.2	Part 90
821.50	18.78	H	3.0	-1.5	14.29	50.0	-35.7	Part 90

LTE

Band 26

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-21
Test Engineer: 45585
Configuration: EUT / X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 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	12.49	V	3.0	-1.5	8.01	38.5	-30.5	
829.00	20.63	H	3.0	-1.5	16.15	38.5	-22.4	
Mid Ch								
831.50	13.95	V	3.0	-1.4	9.48	38.5	-29.0	
831.50	20.31	H	3.0	-1.4	15.84	38.5	-22.7	
High Ch								
844.00	13.99	V	3.1	-1.4	9.54	38.5	-29.0	
844.00	20.02	H	3.1	-1.4	15.57	38.5	-22.9	

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789009800
Date: 2019-05-22
Test Engineer: 45585
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 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								
819.00	13.27	V	3.0	-1.5	8.77	50.0	-41.2	Part 90
819.00	20.54	H	3.0	-1.5	16.04	50.0	-34.0	Part 90