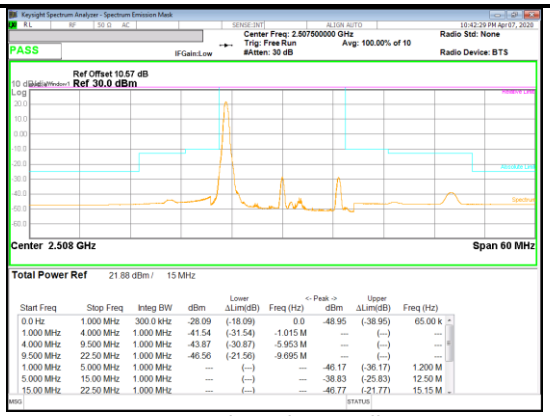
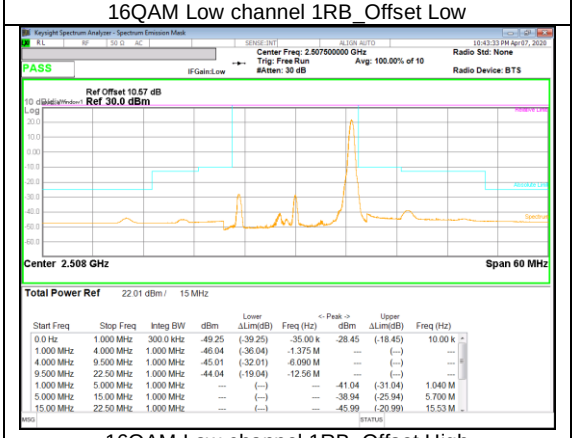
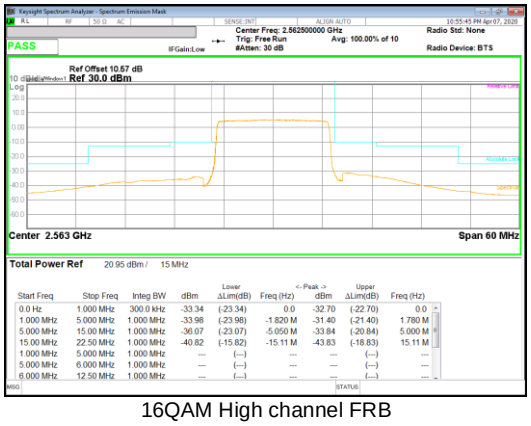
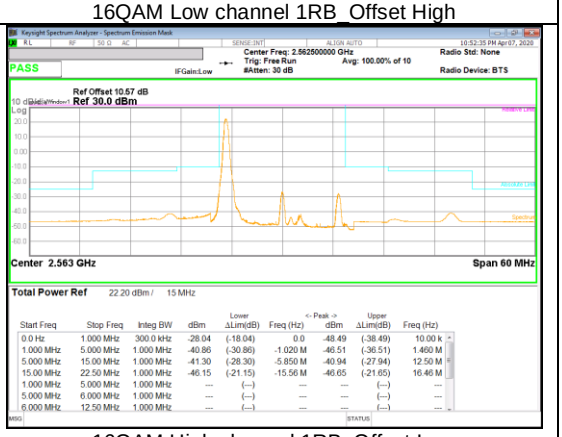
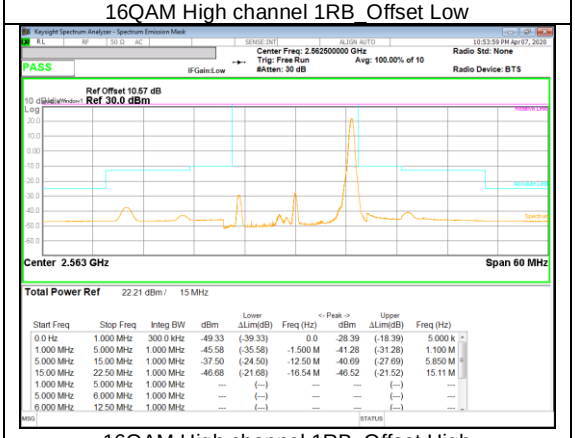
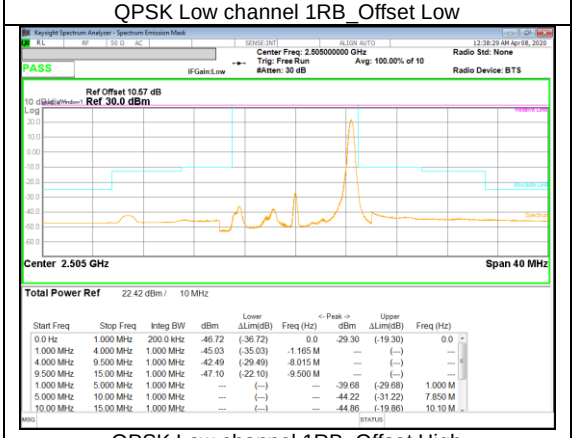
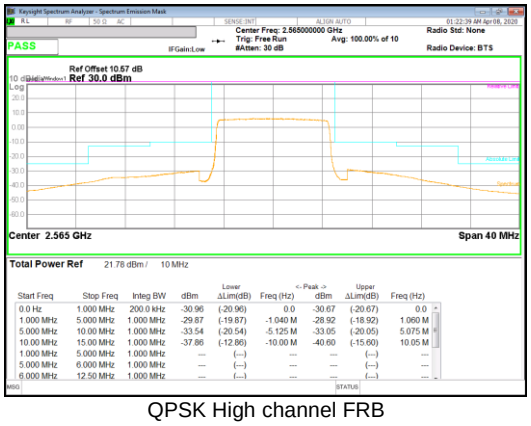
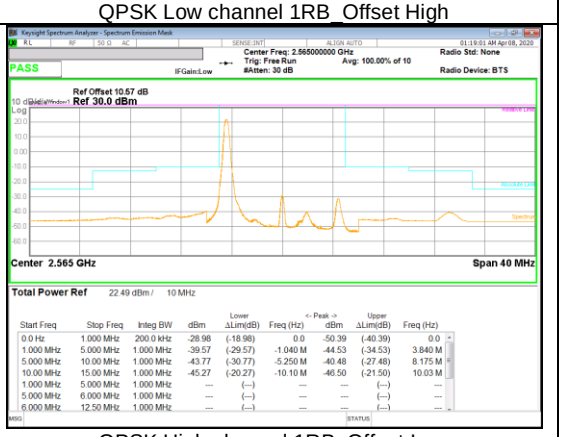
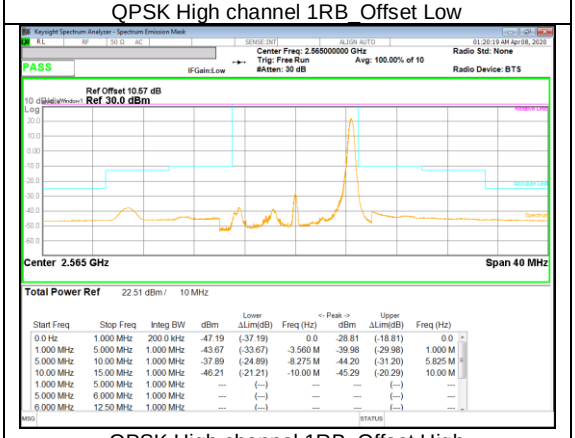
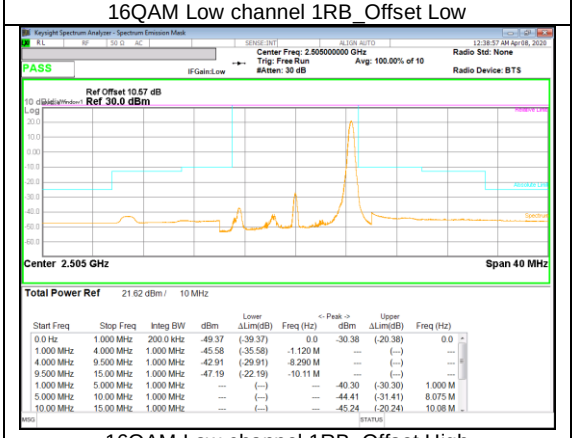
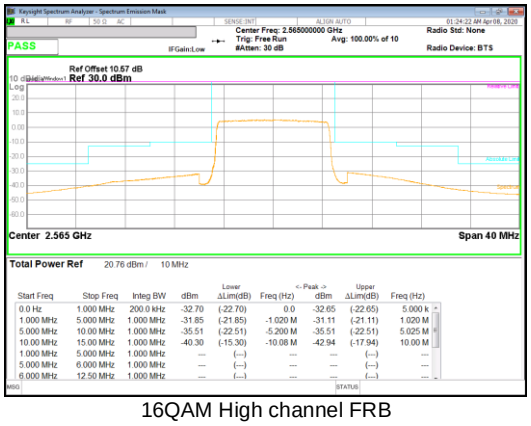
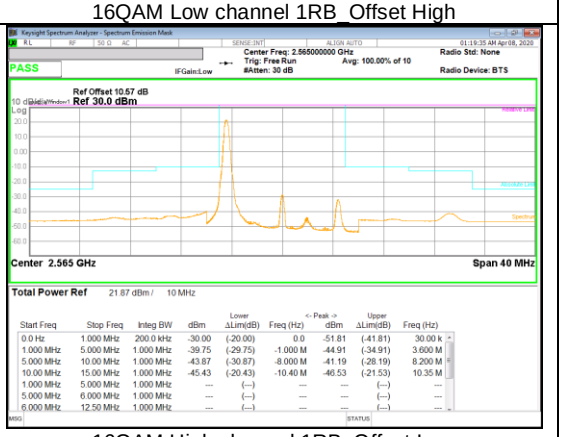
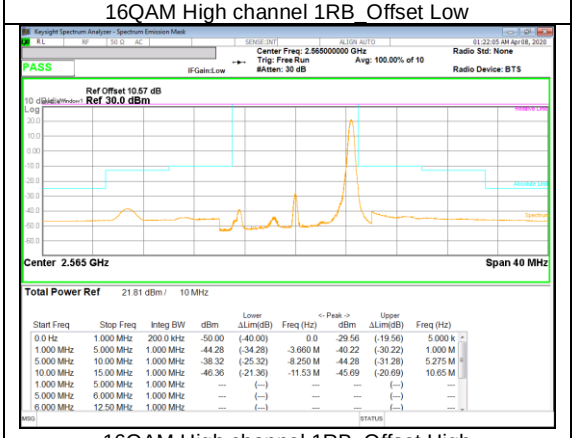
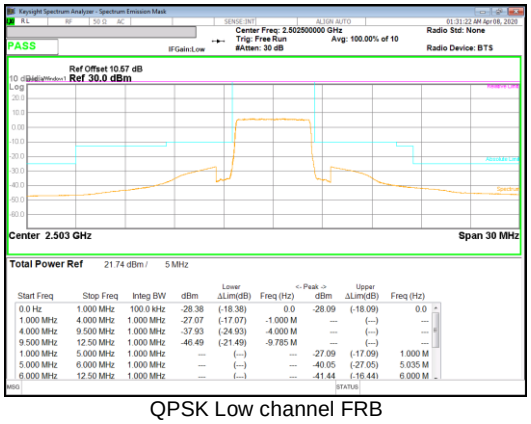
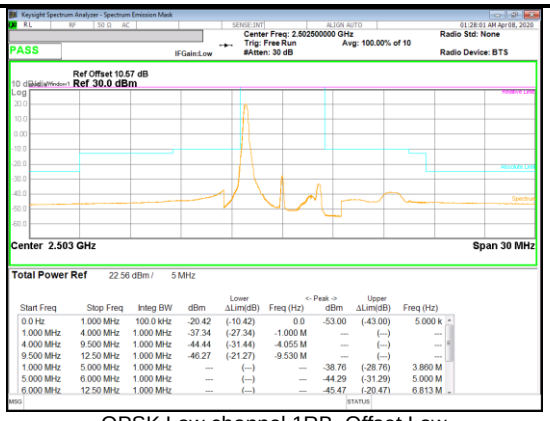
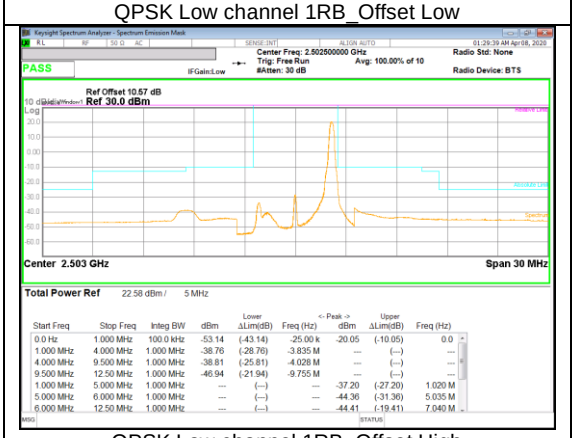
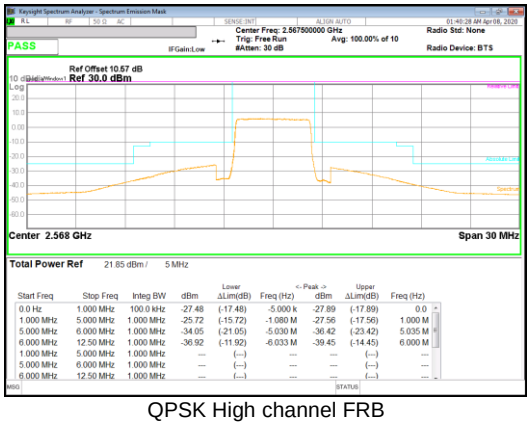
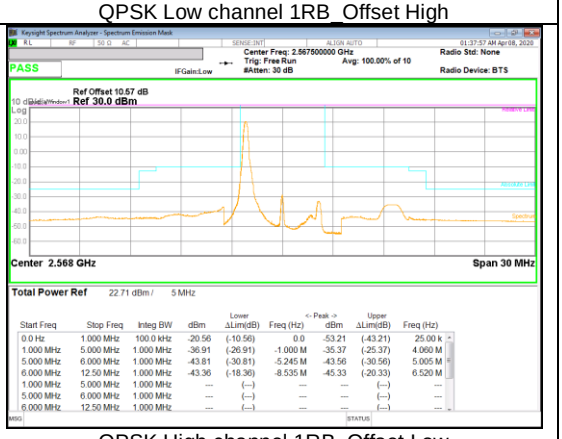
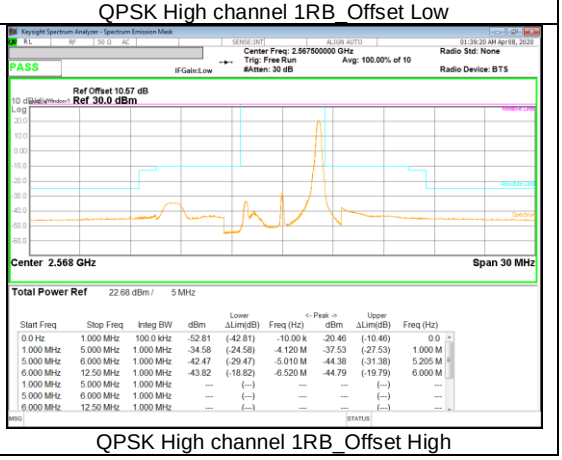
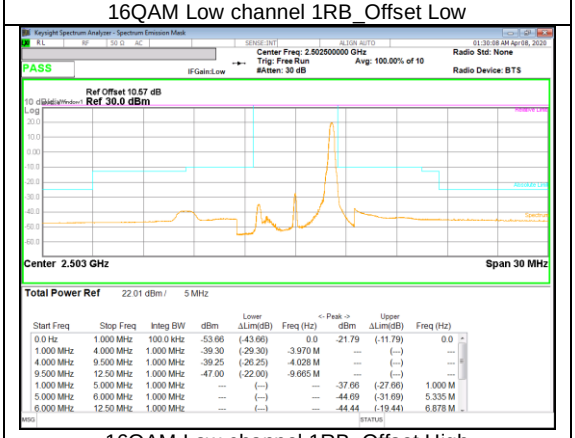
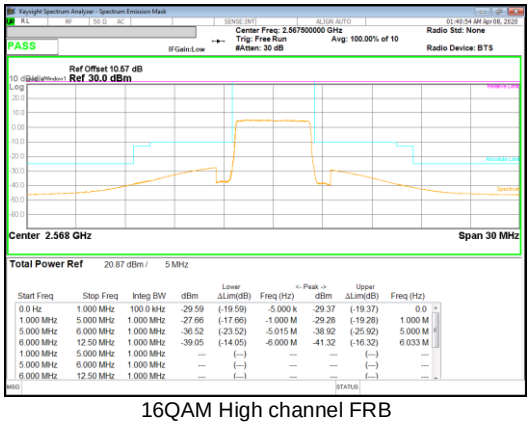
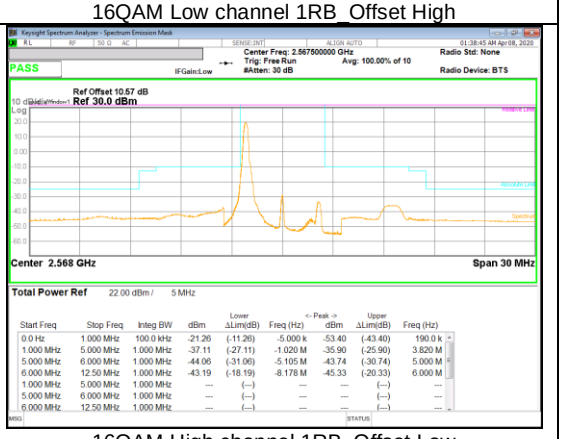
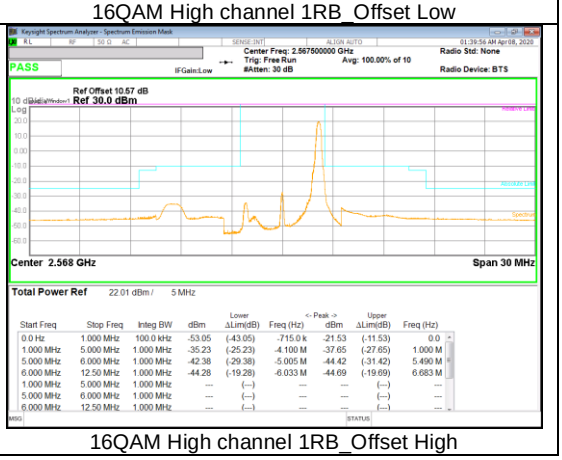
Band 7 15MHz 16QAM	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low
		 16QAM Low channel 1RB_Offset High
	 16QAM High channel FRB	 16QAM High channel 1RB_Offset Low
		 16QAM High channel 1RB_Offset High

Band 7 10MHz QPSK	 QPSK Low channel FRB	 QPSK Low channel 1RB_Offset Low  QPSK Low channel 1RB_Offset High
	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low  QPSK High channel 1RB_Offset High

Band 7 10MHz 16QAM	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low
		 16QAM Low channel 1RB_Offset High
	 16QAM High channel FRB	 16QAM High channel 1RB_Offset Low
		 16QAM High channel 1RB_Offset High

Band 7 5MHz QPSK	 QPSK Low channel FRB	 QPSK Low channel 1RB_Offset Low
		 QPSK Low channel 1RB_Offset High
	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low
		 QPSK High channel 1RB_Offset High

Band 7 5MHz 16QAM	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low
		 16QAM Low 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.

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9.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §27.53

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.

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);

Note

5G NR: All Waveforms (CP-OFDM vs DFT-s OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

RESULTS

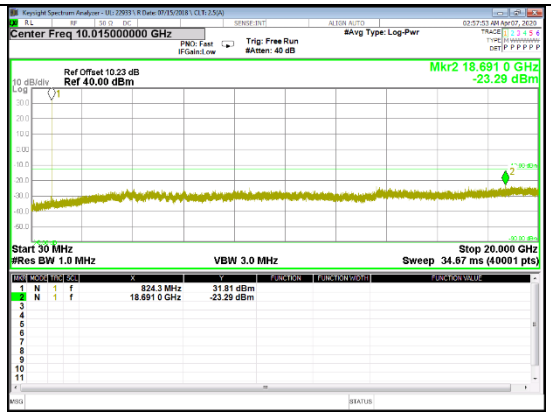
See the following pages.

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

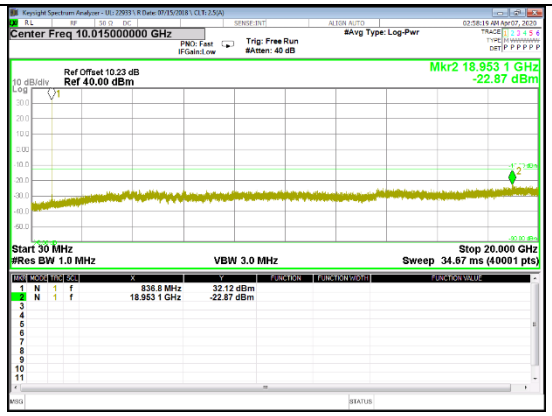
9.3.1. OUT OF BAND EMISSIONS RESULT

GSM 850

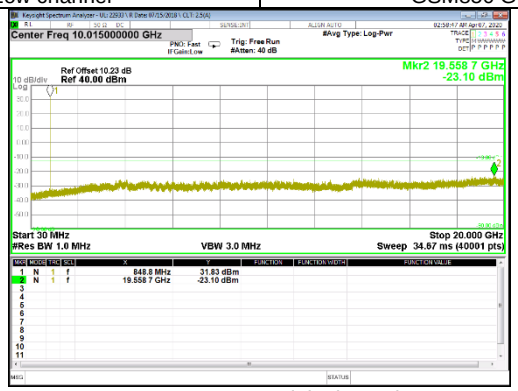
GSM 850



GSM850 GPRS Low channel

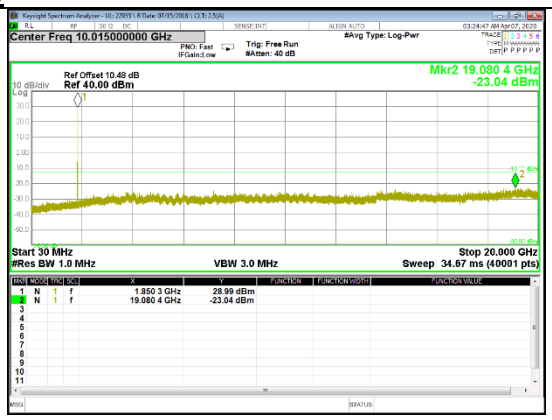
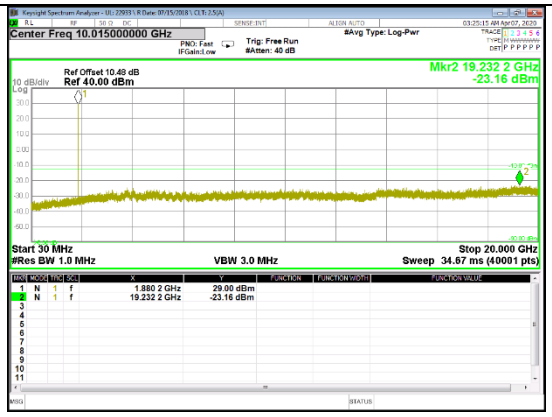
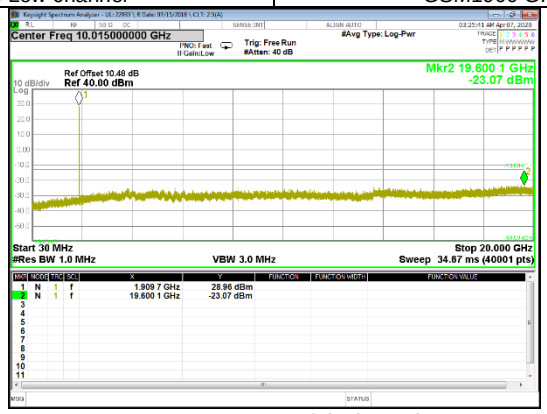


GSM850 GPRS Mid channel

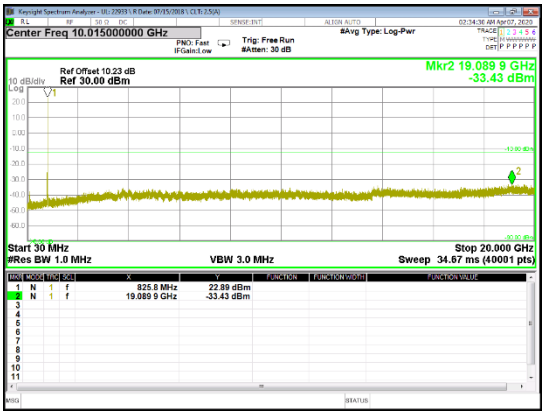
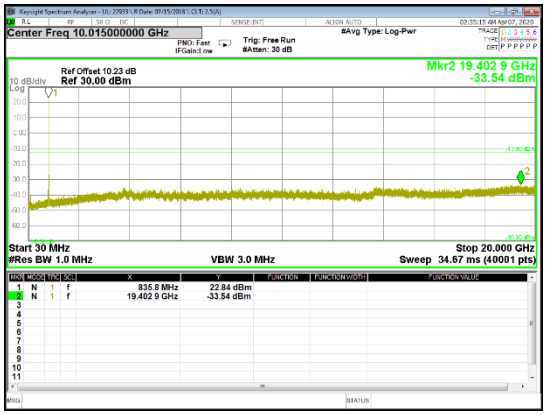
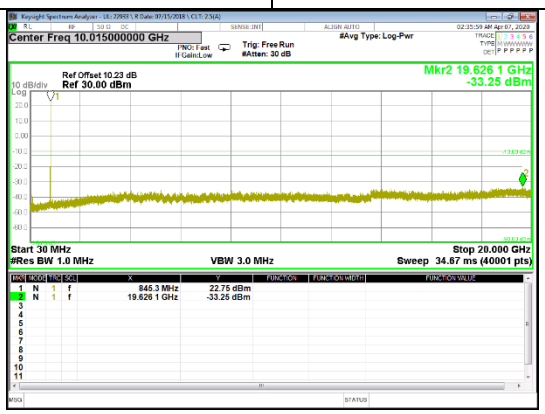


GSM850 GPRS High channel

GSM 1900

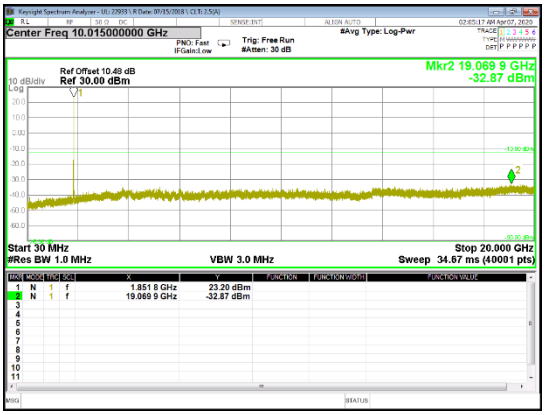
GSM 1900	 GSM1900 GPRS Low channel	 GSM1900 GPRS Mid channel
	 GSM1900 GPRS High channel	

WCDMA Band 5

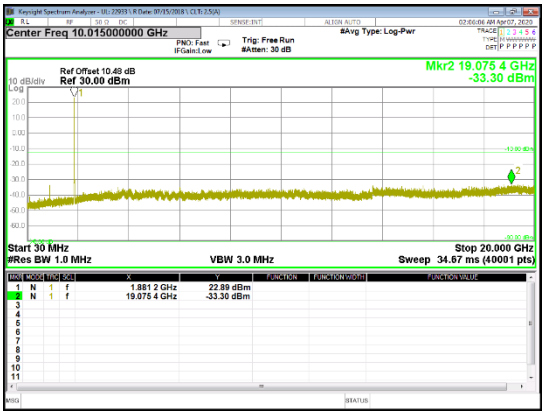
Band 5	 REL99 Low channel	 REL99 Mid channel
	 REL99 High channel	

WCDMA Band 2

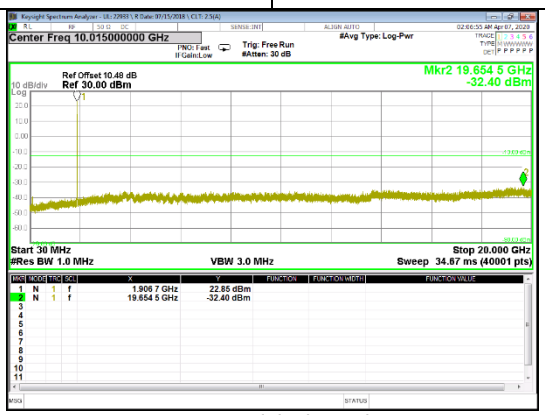
Band 2



REL99 Low channel

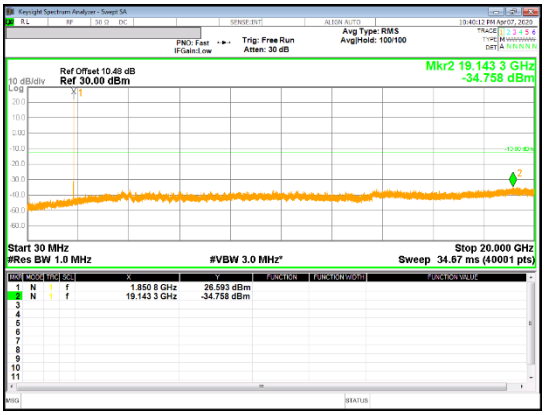
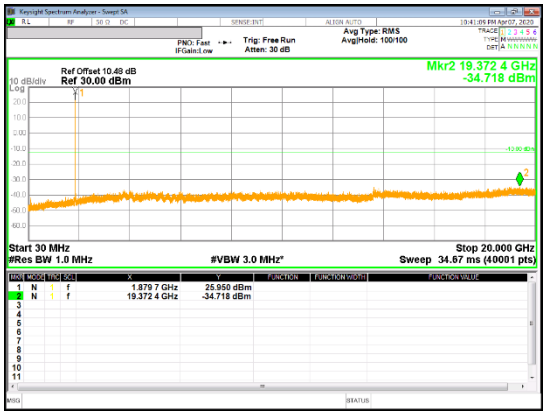
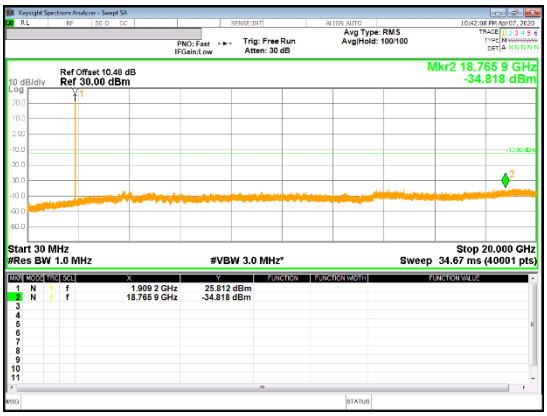


REL99 Mid channel

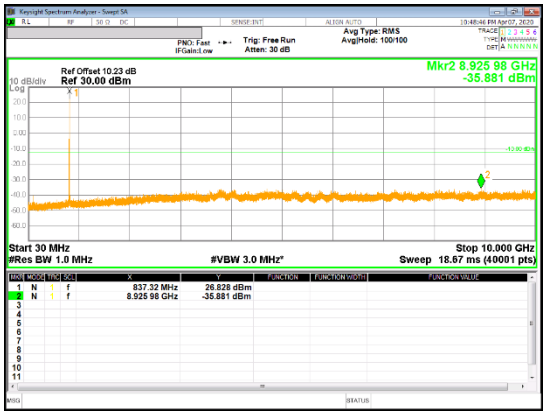
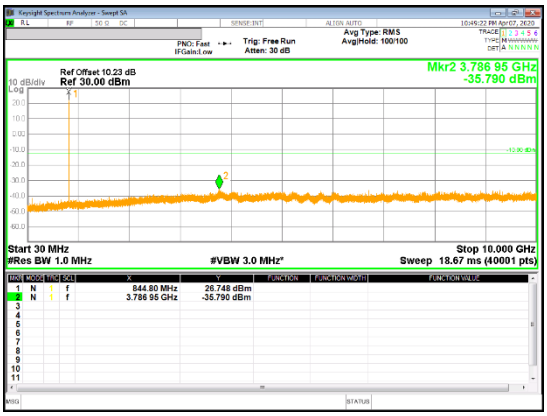


REL99 High channel

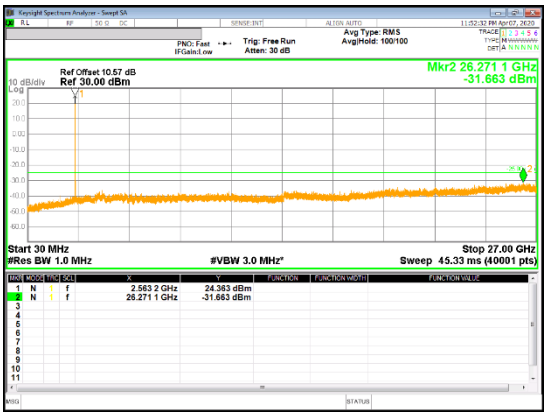
LTE Band 2

Band 2 3MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

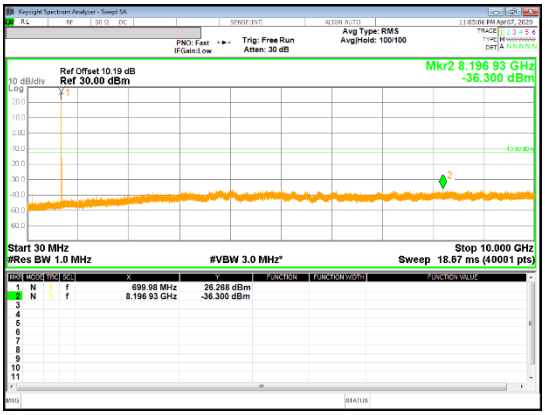
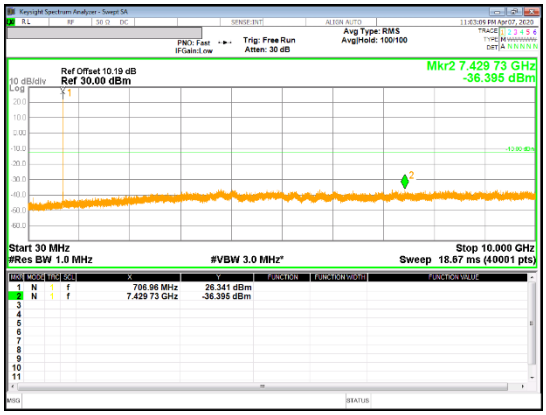
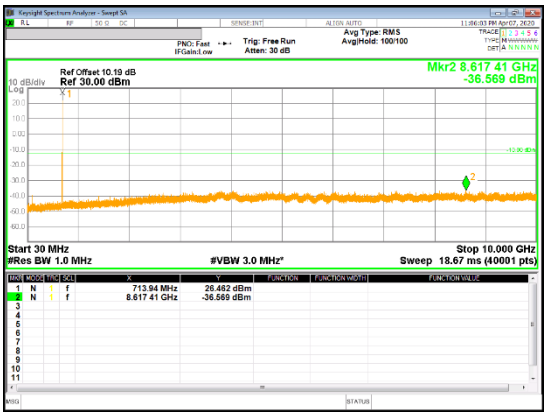
LTE Band 5

Band 5 3MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

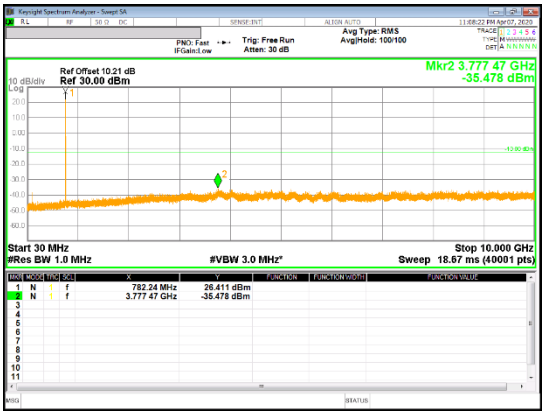
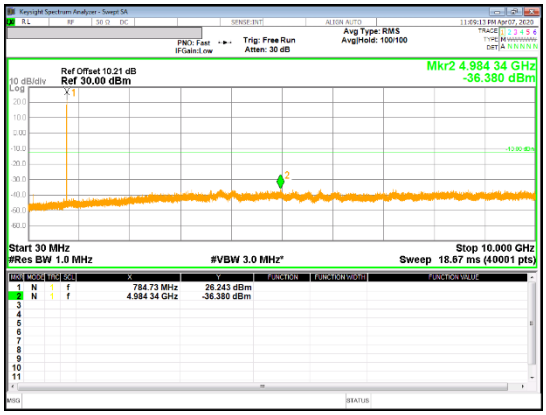
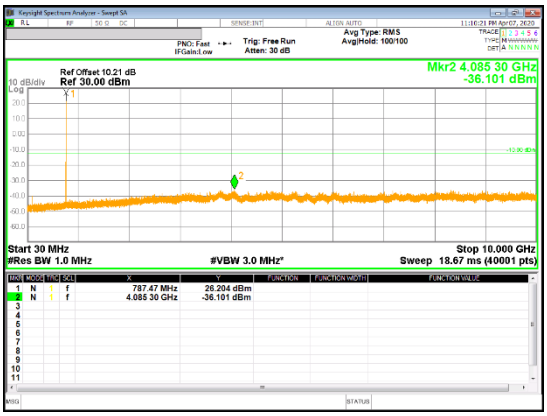
LTE Band 7

Band 7 15MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

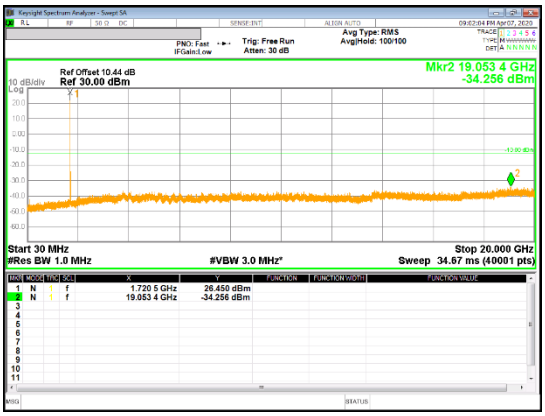
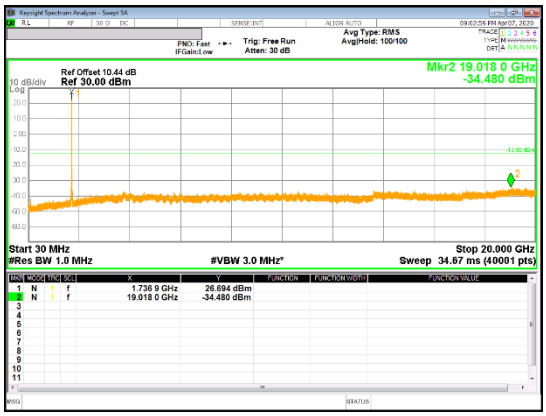
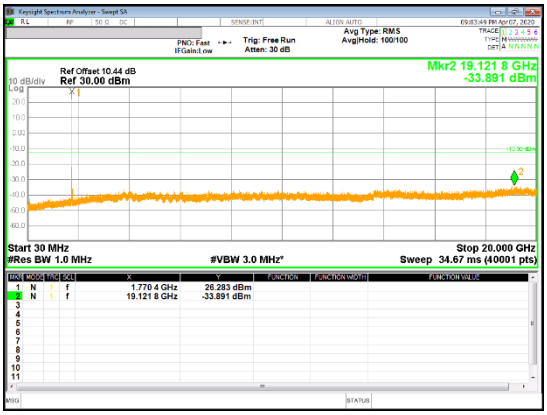
LTE Band 12

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

LTE Band 13

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

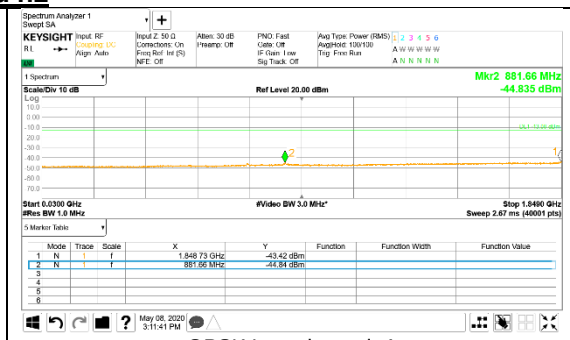
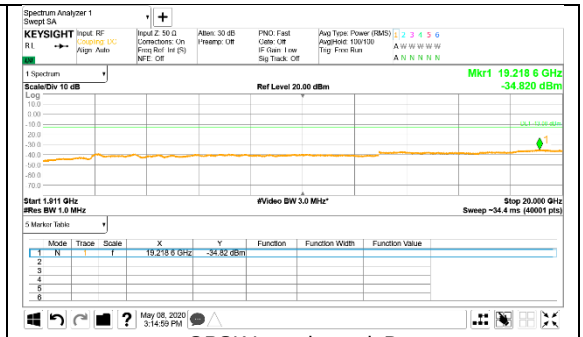
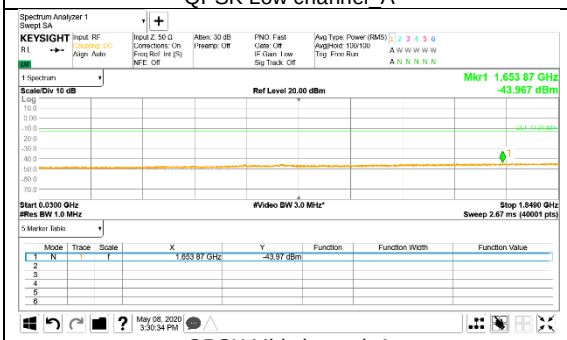
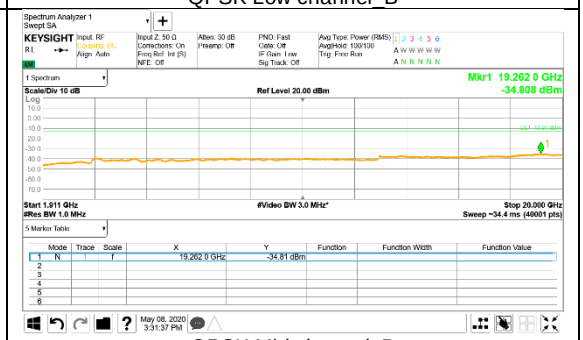
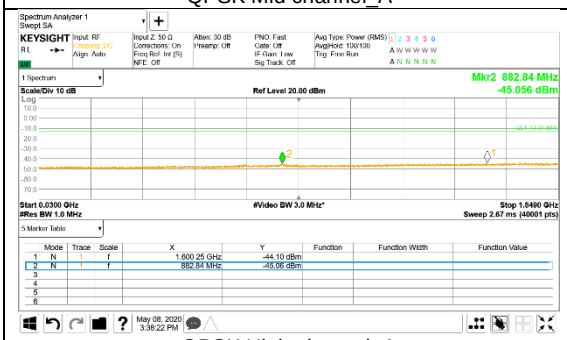
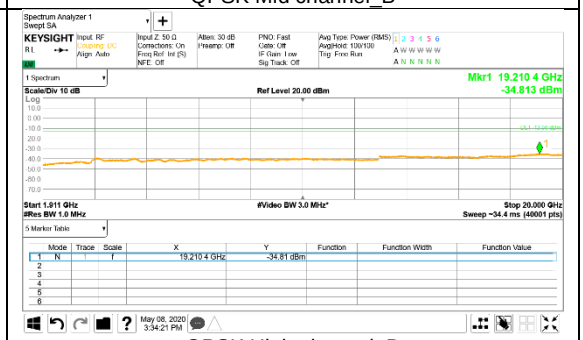
LTE Band 66

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

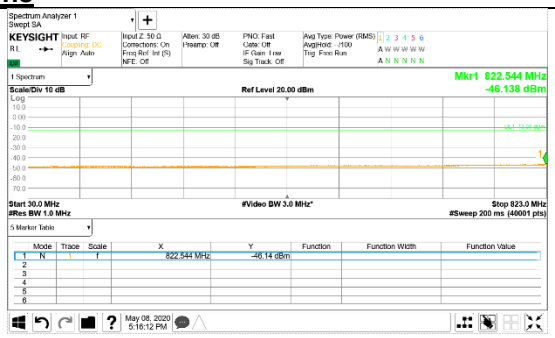
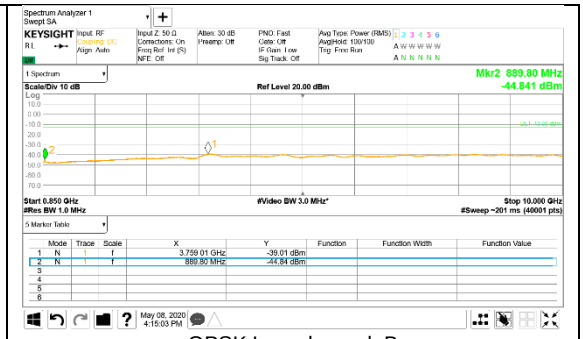
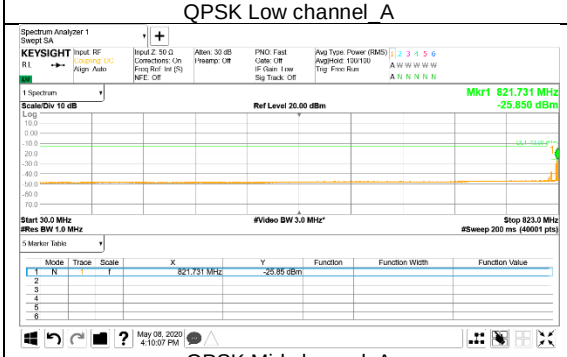
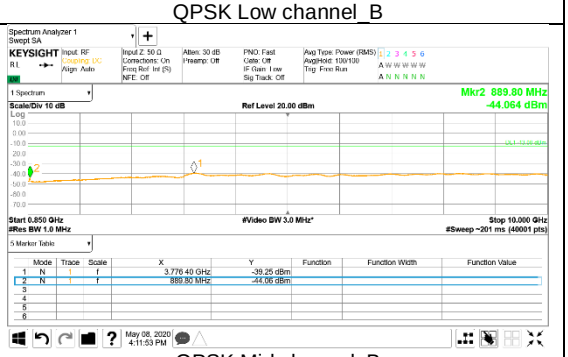
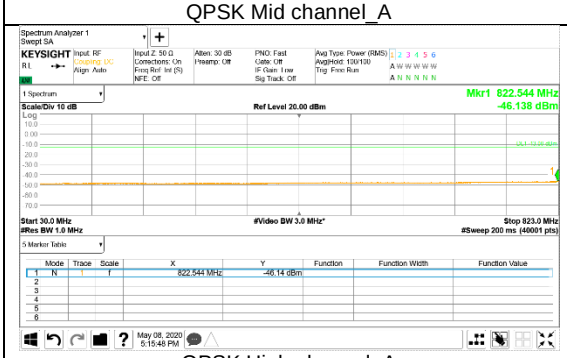
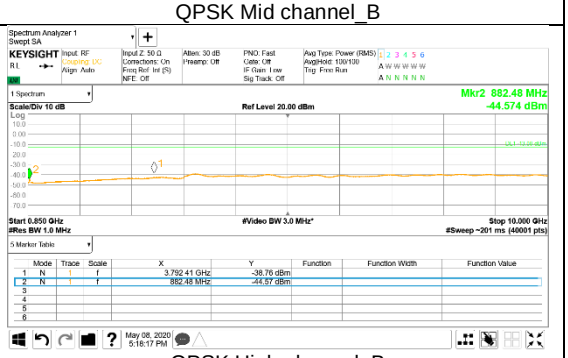
LTE Band 4

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.

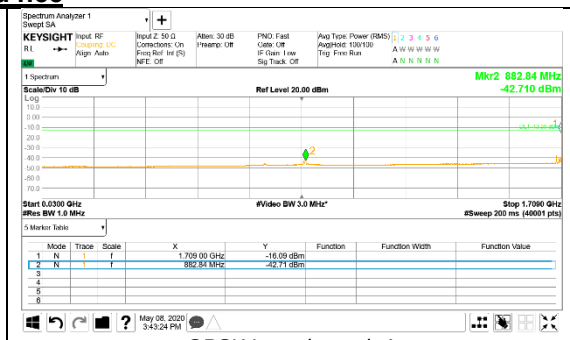
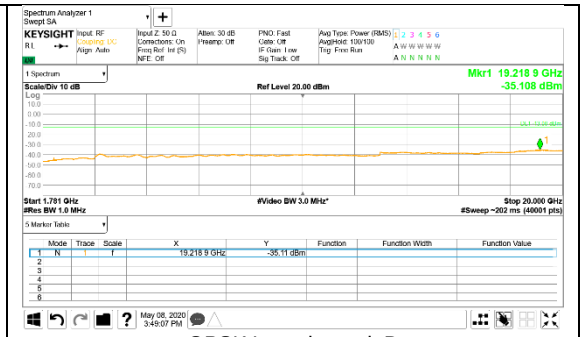
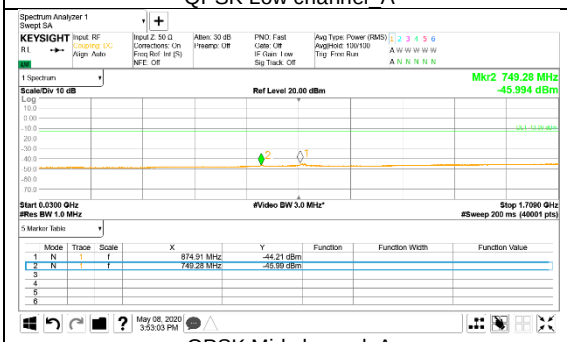
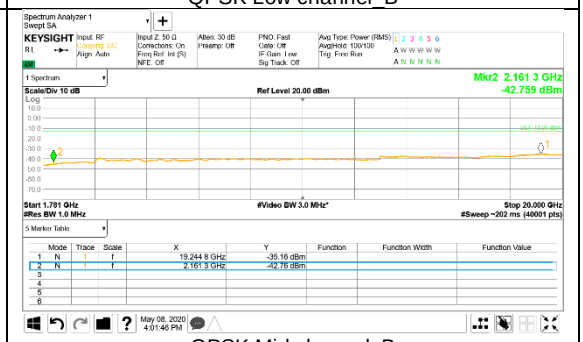
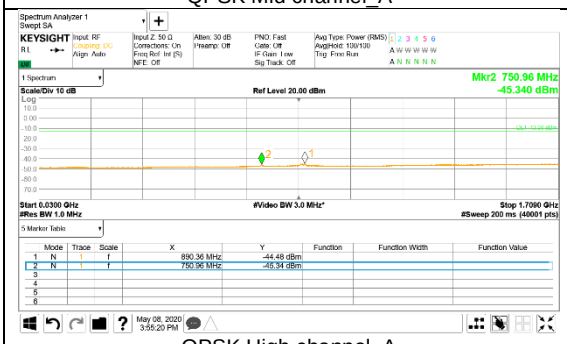
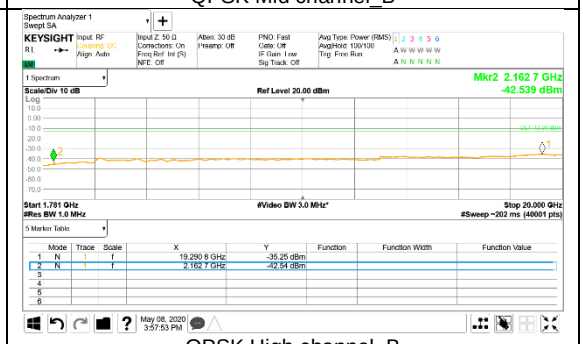
NR Band n2

NR Band n2 10 MHz DFT-s OFDM	 QPSK Low channel_A	 QPSK Low channel_B
	 QPSK Mid channel_A	 QPSK Mid channel_B
	 QPSK High channel_A	 QPSK High channel_B

NR Band n5

NR Band n5 20 MHz DFT-s OFDM	 QPSK Low channel_A	 QPSK Low channel_B
	 QPSK Mid channel_A	 QPSK Mid channel_B
	 QPSK High channel_A	 QPSK High channel_B

NR Band n66

NR Band n66 20 MHz DFT-s OFDM	 QPSK Low channel_A	 QPSK Low channel_B
	 QPSK Mid channel_A	 QPSK Mid channel_B
	 QPSK High channel_A	 QPSK High channel_B

9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235,§27.54

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.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

Note

5G NR: All Waveforms (CP-OFDM vs DFT-s OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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)

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]	
3.85	50	824.20000658	-0.013	848.80000842	-0.003	2.5
3.85	40	824.19999511	0.001	848.79999369	0.014	2.5
3.85	30	824.19998837	0.009	848.79999370	0.014	2.5
3.85	***20***	***824.19999572***	***0.000***	***848.80000582***	***0.000***	***2.5***
3.85	10	824.20000715	-0.014	848.80000638	-0.001	2.5
3.85	0	824.20000934	-0.017	848.80001036	-0.005	2.5
3.85	-10	824.20000625	-0.013	848.80000791	-0.002	2.5
3.85	-20	824.19999409	0.002	848.79999228	0.016	2.5
3.85	-30	824.20000849	-0.015	848.80001240	-0.008	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]	
3.85	***20***	**824.19999572**	***0***	**848.80000582**	***0***	***2.5***
4.35	20	824.20000536	-0.012	848.79999342	0.015	2.5
3.75	20	824.20000780	-0.015	848.79999258	0.016	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	1850.0797	1909.9203		
Extreme (50C)		1850.0797	1909.9204	13.6	0.007
Extreme (40C)		1850.0797	1909.9203	-8.2	-0.004
Extreme (30C)		1850.0797	1909.9203	-9.1	-0.005
Extreme (10C)		1850.0797	1909.9204	10.5	0.006
Extreme (0C)		1850.0797	1909.9204	14.2	0.008
Extreme (-10C)		1850.0797	1909.9204	12.7	0.007
Extreme (-20C)		1850.0797	1909.9203	-9.5	-0.005
Extreme (-30C)		1850.0797	1909.9203	-11.0	-0.006
20C	15%	1850.0797	1909.9203	-15.7	-0.008
	-15%	1850.0797	1909.9204	10.3	0.005
	End Point	1850.0797	1909.9203	9.0	0.005

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 [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	826.39999285	0.017	846.59999101	0.002	2.5
3.85	40	826.40000591	0.001	846.60000671	-0.017	2.5
3.85	30	826.40000834	-0.002	846.60000716	-0.017	2.5
3.85	***20***	***826.40000692***	***0.000***	***846.59999265***	***0.000***	***2.5***
3.85	10	826.40001148	-0.006	846.60000812	-0.018	2.5
3.85	0	826.39999275	0.017	846.59998658	0.007	2.5
3.85	-10	826.40000917	-0.003	846.60000840	-0.019	2.5
3.85	-20	826.39998953	0.021	846.59998734	0.006	2.5
3.85	-30	826.40000863	-0.002	846.60000948	-0.020	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 [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	**826.40000692**	***0***	**846.59999265**	***0***	***2.5***
4.35	20	826.40000831	-0.002	846.59999539	-0.003	2.5
3.75	20	826.40000769	-0.001	846.60000933	-0.020	2.5

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

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	1850.3316	1909.6639		
Extreme (50C)		1850.3316	1909.6639	14.1	0.008
Extreme (40C)		1850.3316	1909.6639	-8.5	-0.005
Extreme (30C)		1850.3316	1909.6639	9.7	0.005
Extreme (10C)		1850.3316	1909.6639	13.6	0.007
Extreme (0C)		1850.3316	1909.6639	12.9	0.007
Extreme (-10C)		1850.3316	1909.6639	-7.5	-0.004
Extreme (-20C)		1850.3316	1909.6639	12.8	0.007
Extreme (-30C)		1850.3316	1909.6639	7.9	0.004
20C	15%	1850.3316	1909.6639	-8.4	-0.004
	-15%	1850.3316	1909.6639	7.0	0.004
	End Point	1850.3316	1909.6639	11.4	0.006

LTE Band 2 (Lowest Frequency:QPSK / 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	1850.1538	1909.8434		
Extreme (50C)		1850.1538	1909.8433	-6.4	-0.003
Extreme (40C)		1850.1538	1909.8433	-10.2	-0.005
Extreme (30C)		1850.1538	1909.8433	-6.6	-0.004
Extreme (10C)		1850.1538	1909.8433	-10.7	-0.006
Extreme (0C)		1850.1538	1909.8434	8.9	0.005
Extreme (-10C)		1850.1538	1909.8434	9.8	0.005
Extreme (-20C)		1850.1538	1909.8433	-10.2	-0.005
Extreme (-30C)		1850.1538	1909.8433	-12.1	-0.006
20C	15%	1850.1538	1909.8433	-7.5	-0.004
	-15%	1850.1538	1909.8434	8.8	0.005
	End Point	1850.1538	1909.8434	8.9	0.005

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]	
3.80	50	824.69999189	0.000	848.29999358	0.013	2.5
3.80	40	824.70000634	-0.017	848.29999104	0.016	2.5
3.80	30	824.69999746	-0.007	848.30000741	-0.003	2.5
3.80	***20***	***824.69999207***	***0.000***	***848.30000465***	***0.000***	***2.5***
3.80	10	824.69999433	-0.003	848.29999290	0.014	2.5
3.80	0	824.70000425	-0.015	848.30000626	-0.002	2.5
3.80	-10	824.70000777	-0.019	848.30000813	-0.004	2.5
3.80	-20	824.69999619	-0.005	848.29999518	0.011	2.5
3.80	-30	824.69999304	-0.001	848.29999511	0.011	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]	
3.80	***20***	***824.69999207***	***0***	***848.30000465***	***0***	***2.5***
4.30	20	824.69998846	0.004	848.29999542	0.011	2.5
3.60	20	824.69999252	-0.001	848.29999231	0.015	2.5

LTE Band 7 (QPSK)

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	2500.2513	2569.7433		
Extreme (50C)		2500.2513	2569.7433	-14.9	-0.006
Extreme (40C)		2500.2513	2569.7433	7.8	0.003
Extreme (30C)		2500.2513	2569.7433	11.7	0.005
Extreme (10C)		2500.2513	2569.7433	-15.7	-0.006
Extreme (0C)		2500.2513	2569.7433	-13.6	-0.005
Extreme (-10C)		2500.2513	2569.7433	9.8	0.004
Extreme (-20C)		2500.2513	2569.7433	16.5	0.007
Extreme (-30C)		2500.2513	2569.7433	12.5	0.005
20C	15%	2500.2513	2569.7433	14.2	0.006
	-15%	2500.2513	2569.7433	12.8	0.005
	End Point	2500.2513	2569.7433	-8.6	-0.003

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	715.8455		
Extreme (50C)		699.1545	715.8455	7.6	0.011
Extreme (40C)		699.1544	715.8454	-8.4	-0.012
Extreme (30C)		699.1545	715.8455	11.1	0.016
Extreme (10C)		699.1545	715.8455	4.5	0.006
Extreme (0C)		699.1545	715.8455	6.7	0.009
Extreme (-10C)		699.1545	715.8455	4.9	0.007
Extreme (-20C)		699.1544	715.8454	-4.8	-0.007
Extreme (-30C)		699.1544	715.8454	-10.3	-0.015
20C	15%	699.1545	715.8455	4.9	0.007
	-15%	699.1544	715.8454	-5.9	-0.008
	End Point	699.1545	715.8454	-7.8	-0.011

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	777.2582	786.7402		
Extreme (50C)		777.2581	786.7401	-4.5	-0.006
Extreme (40C)		777.2582	786.7402	5.7	0.007
Extreme (30C)		777.2582	786.7402	3.9	0.005
Extreme (10C)		777.2581	786.7401	-6.9	-0.009
Extreme (0C)		777.2581	786.7401	-8.9	-0.011
Extreme (-10C)		777.2582	786.7402	7.3	0.009
Extreme (-20C)		777.2581	786.7401	-10.5	-0.013
Extreme (-30C)		777.2582	786.7402	6.7	0.009
20C	15%	777.2581	786.7402	8.4	0.011
	-15%	777.2582	786.7402	9.2	0.012
	End Point	777.2582	786.7402	6.4	0.008

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

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	1710.1544	1779.8432		
Extreme (50C)		1710.1544	1779.8432	8.9	0.005
Extreme (40C)		1710.1544	1779.8432	12.6	0.007
Extreme (30C)		1710.1544	1779.8431	-7.3	-0.004
Extreme (10C)		1710.1544	1779.8431	-8.6	-0.005
Extreme (0C)		1710.1544	1779.8432	10.1	0.006
Extreme (-10C)		1710.1544	1779.8432	13.4	0.008
Extreme (-20C)		1710.1544	1779.8431	-8.8	-0.005
Extreme (-30C)		1710.1544	1779.8431	-7.8	-0.004
20C	15%	1710.1544	1779.8431	-8.9	-0.005
	-15%	1710.1544	1779.8432	10.3	0.006
	End Point	1710.1544	1779.8431	-11.5	-0.007

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.

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5G NR Band 2

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	1850.2467	1909.7505		
Extreme (50C)		1850.2466	1909.7505	-8.6	-0.005
Extreme (40C)		1850.2466	1909.7505	-11.9	-0.006
Extreme (30C)		1850.2466	1909.7505	-10.6	-0.006
Extreme (10C)		1850.2466	1909.7505	-4.8	-0.003
Extreme (0C)		1850.2466	1909.7505	-6.8	-0.004
Extreme (-10C)		1850.2467	1909.7505	7.4	0.004
Extreme (-20C)		1850.2466	1909.7505	-6.3	-0.003
Extreme (-30C)		1850.2467	1909.7505	4.6	0.002
20C	15%	1850.2466	1909.7505	5.6	0.003
	-15%	1850.2466	1909.7505	-7.9	-0.004
	End Point	1850.2466	1909.7505	-12.5	-0.007

5G NR Band 5

Reference Frequency : 5G NR 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]	
3.80	50	824.69998816	-0.002	848.29998610	0.007	2.5
3.80	40	824.69999426	-0.009	848.29999682	-0.005	2.5
3.80	30	824.69999224	-0.007	848.29999009	0.002	2.5
3.80	***20***	***824.69998645***	***0.000***	***848.29999218***	***0.000***	***2.5***
3.80	10	824.69998317	0.004	848.29999288	-0.001	2.5
3.80	0	824.70000506	-0.023	848.30000836	-0.019	2.5
3.80	-10	824.69999525	-0.011	848.30000711	-0.018	2.5
3.80	-20	824.70001067	-0.029	848.30001325	-0.025	2.5
3.80	-30	824.69999422	-0.009	848.29999507	-0.003	2.5

Reference Frequency : 5G NR 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]	
3.80	***20***	**824.69998645**	***0***	**848.29999218**	***0***	***2.5***
4.30	20	824.70001142	-0.030	848.30001210	-0.023	2.5
3.60	20	824.69999037	-0.005	848.29999161	0.001	2.5

5G NR Band 66

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	1710.2454	1779.7520		
Extreme (50C)		1710.2454	1779.7520	8.9	0.005
Extreme (40C)		1710.2454	1779.7520	12.6	0.007
Extreme (30C)		1710.2453	1779.7520	-7.3	-0.004
Extreme (10C)		1710.2453	1779.7520	-8.6	-0.005
Extreme (0C)		1710.2454	1779.7520	10.1	0.006
Extreme (-10C)		1710.2454	1779.7520	13.4	0.008
Extreme (-20C)		1710.2453	1779.7520	-8.8	-0.005
Extreme (-30C)		1710.2453	1779.7520	-7.8	-0.004
20C	15%	1710.2454	1779.7520	-8.9	-0.005
	-15%	1710.2454	1779.7520	10.3	0.006
	End Point	1710.2453	1779.7520	-11.5	-0.007

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9.5. RADIATED POWER (ERP & EIRP)

RULE PART(S)

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

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);

Note

5G NR: All Waveforms (CP-OFDM vs DFT-s OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

TEST RESULTS

9.5.1. ERP/EIRP Results

GSM

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
GSM850	GPRS	128	824.2	28.65	732.82
		190	836.6	28.90	776.25
		251	848.8	**28.95**	**785.24**
	EGPRS	128	824.2	23.48	222.84
		190	836.6	23.57	227.51
		251	848.8	**23.74**	**236.59**
GSM1900	GPRS	512	1850.2	25.60	363.08
		661	1880	26.92	492.04
		810	1909.8	**26.95**	**495.45**
	EGPRS	512	1850.2	22.43	174.98
		661	1880	23.93	247.17
		810	1909.8	**24.20**	**263.03**

WCDMA

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
Band 5	REL99	4132	826.4	19.31	85.31
		4183	836.6	**20.11**	**102.57**
		4233	846.6	20.06	101.39
	HSDPA	4132	826.4	18.31	67.76
		4183	836.6	19.11	81.47
		4233	846.6	**19.12**	**81.66**
Band 2	REL99	9262	1852.4	19.13	81.85
		9400	1880.0	19.90	97.72
		9538	1907.6	**20.49**	**111.94**
	HSDPA	9262	1852.4	18.18	65.77
		9400	1880.0	18.47	70.31
		9538	1907.6	**19.61**	**91.41**

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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	1/0	1860.0	21.85	153.11
			1/49	1882.5	**21.91**	**155.24**
			1/49	1905.0	21.10	128.82
		16QAM	1/0	1860.0	**21.16**	**130.62**
			1/49	1882.5	20.79	119.95
			1/49	1905.0	20.34	108.14
	15	QPSK	1/0	1857.5	21.81	151.71
			1/37	1882.5	**22.00**	**158.49**
			1/74	1907.5	20.83	121.06
		16QAM	1/0	1857.5	20.76	119.12
			1/37	1882.5	**20.87**	**122.18**
			1/74	1907.5	19.97	99.31
	10	QPSK	1/25	1855.0	21.68	147.23
			1/25	1882.5	**21.82**	**152.05**
			1/25	1910.0	20.95	124.45
		16QAM	1/25	1855.0	20.30	107.15
			1/25	1882.5	**20.82**	**120.78**
			1/25	1910.0	19.75	94.41
	5	QPSK	1/0	1852.5	**22.00**	**158.49**
			1/12	1882.5	20.98	125.31
			1/24	1912.5	20.64	115.88
		16QAM	1/0	1852.5	**21.42**	**138.68**
			1/12	1882.5	20.22	105.20
			1/12	1912.5	20.13	103.04
	3	QPSK	1/0	1851.5	**21.91**	**155.24**
			1/0	1882.5	21.65	146.22
			1/8	1913.5	20.59	114.55
		16QAM	1/0	1851.5	**20.77**	**119.40**
			1/0	1882.5	20.42	110.15
			1/14	1913.5	19.36	86.30
	1.4	QPSK	1/3	1850.7	**21.49**	**140.93**
			1/3	1882.5	21.11	129.12
			1/3	1914.3	20.15	103.51
		16QAM	1/3	1850.7	**20.50**	**112.20**
			1/3	1882.5	20.07	101.62
			1/3	1914.3	19.30	85.11

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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	1/25	829.0	20.75	118.85
			1/25	836.5	21.00	125.89
			1/25	844.0	**21.24**	**133.05**
		16QAM	1/25	829.0	19.62	91.62
			1/25	836.5	20.18	104.23
			1/25	844.0	**20.39**	**109.40**
	5	QPSK	1/12	826.5	20.69	117.22
			1/0	836.5	**21.03**	**126.77**
			1/0	846.5	20.95	124.45
		16QAM	1/12	826.5	19.80	95.50
			1/0	836.5	**20.40**	**109.65**
			1/0	846.5	19.97	99.31
	3	QPSK	1/0	825.5	20.54	113.24
			1/14	836.5	**21.07**	**127.94**
			1/0	847.5	20.81	120.50
		16QAM	1/8	825.5	19.57	90.57
			1/0	836.5	19.79	95.28
			1/0	847.5	**19.80**	**95.50**
	1.4	QPSK	1/3	824.7	20.16	103.75
			1/3	836.5	**20.77**	**119.40**
			1/0	848.3	20.08	101.86
		16QAM	1/5	824.7	19.12	81.66
			1/3	836.5	**19.84**	**96.38**
			1/0	848.3	18.99	79.25

LTE Band 7

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 7	20	QPSK	1/49	2510.0	17.90	61.66
			1/49	2535.0	**18.36**	**68.55**
			1/49	2560.0	17.96	62.52
		16QAM	1/49	2510.0	16.71	46.88
			1/49	2535.0	**17.52**	**56.49**
			1/49	2560.0	17.09	51.17
	15	QPSK	1/37	2507.5	19.54	89.95
			1/37	2535.0	**20.66**	**116.41**
			1/37	2562.5	19.93	98.40
		16QAM	1/37	2507.5	18.62	72.78
			1/37	2535.0	**19.56**	**90.36**
			1/37	2562.5	19.16	82.41
	10	QPSK	1/25	2505.0	19.86	96.83
			1/25	2535.0	**20.74**	**118.58**
			1/25	2565.0	19.60	91.20
		16QAM	1/25	2505.0	18.91	77.80
			1/25	2535.0	**19.82**	**95.94**
			1/25	2565.0	18.45	69.98
	5	QPSK	1/12	2502.5	19.80	95.50
			1/12	2535.0	**20.87**	**122.18**
			1/0	2567.5	20.05	101.16
		16QAM	1/12	2502.5	18.85	76.74
			1/12	2535.0	**19.77**	**94.84**
			1/0	2567.5	18.83	76.38

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LTE Band 12

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 12	10	QPSK	1/25	704.0	17.40	54.95
			1/25	707.5	17.44	55.46
			1/25	711.0	**17.93**	**62.09**
		16QAM	1/25	704.0	16.11	40.83
			1/25	707.5	16.44	44.06
			1/25	711.0	**16.73**	**47.10**
	5	QPSK	1/12	701.5	17.30	53.70
			1/0	707.5	17.68	58.61
			1/0	713.5	**18.02**	**63.39**
		16QAM	1/0	701.5	16.51	44.77
			1/0	707.5	16.77	47.53
			1/0	713.5	**17.39**	**54.83**
	3	QPSK	1/0	700.5	17.74	59.43
			1/0	707.5	17.61	57.68
			1/0	714.5	**18.31**	**67.76**
		16QAM	1/0	700.5	16.64	46.13
			1/0	707.5	16.42	43.85
			1/0	714.5	**17.12**	**51.52**
	1.4	QPSK	1/3	699.7	17.39	54.83
			1/3	707.5	17.45	55.59
			1/0	715.3	**17.72**	**59.16**
		16QAM	1/3	699.7	16.20	41.69
			1/3	707.5	16.32	42.85
			1/0	715.3	**16.62**	**45.92**

LTE Band 13

Band	BW [MHz]	Mode	RB size / RB Offset	f [MHz]	ERP / EIRP	
					[dBm]	[mW]
Band 13	10	QPSK	1/25	782.0	**21.46**	**139.96**
		16QAM	1/25	782.0	20.84	121.34
	5	QPSK	1/24	779.5	**21.65**	**146.22**
			1/24	782.0	21.32	135.52
			1/24	784.5	21.25	133.35
		16QAM	1/24	779.5	**21.22**	**132.43**
			1/24	782.0	20.64	115.88
			1/12	784.5	20.72	118.03

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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	**24.39**	**274.79**
			1/0	1745.0	23.93	247.17
			1/49	1770.0	21.74	149.28
		16QAM	1/49	1720.0	**23.30**	**213.80**
			1/0	1745.0	22.94	196.79
			1/49	1770.0	20.78	119.67
	15	QPSK	1/74	1717.5	**24.04**	**253.51**
			1/0	1747.5	23.96	248.89
			1/0	1772.5	22.26	168.27
		16QAM	1/74	1717.5	23.06	202.30
			1/0	1747.5	**23.23**	**210.38**
			1/0	1772.5	21.49	140.93
	10	QPSK	1/25	1715.0	22.94	196.79
			1/25	1745.0	**23.09**	**203.70**
			1/25	1775.0	21.70	147.91
		16QAM	1/25	1715.0	21.92	155.60
			1/25	1745.0	**22.14**	**163.68**
			1/25	1775.0	20.49	111.94
	5	QPSK	1/0	1712.5	22.65	184.08
			1/0	1745.0	**23.01**	**199.99**
			1/12	1777.5	21.83	152.41
		16QAM	1/12	1712.5	22.03	159.59
			1/12	1745.0	**22.50**	**177.83**
			1/12	1777.5	20.78	119.67
	3	QPSK	1/0	1711.5	**23.16**	**207.01**
			1/0	1745.0	23.13	205.59
			1/14	1778.5	21.52	141.91
		16QAM	1/0	1711.5	22.23	167.11
			1/0	1745.0	**22.28**	**169.04**
			1/0	1778.5	20.76	119.12
	1.4	QPSK	1/3	1710.7	22.49	177.42
			1/3	1745.0	**22.77**	**189.23**
			1/3	1779.3	21.49	140.93
		16QAM	1/3	1710.7	21.51	141.58
			1/3	1745.0	**21.82**	**152.05**
			1/3	1779.3	20.35	108.39

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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.

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5G NR Band n2

Band	BW [MHz]	Modulation	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
n2	20	DFT-s OFDM	QPSK	1/1	1860.0	**18.62**	**72.78**
				1/104	1880.0	17.90	61.66
				1/1	1900.0	18.30	67.61
			16QAM	1/1	1860.0	**18.65**	**73.28**
				1/104	1880.0	18.14	65.16
				1/53	1900.0	18.24	66.68
	15	DFT-s OFDM	QPSK	1/1	1857.5	17.11	51.40
				1/77	1880.0	**19.60**	**91.20**
				1/1	1902.5	14.68	29.38
			16QAM	1/39	1857.5	15.32	34.04
				1/77	1880.0	**19.09**	**81.10**
				1/1	1902.5	13.93	24.72
	10	DFT-s OFDM	QPSK	1/26	1855.0	21.31	135.21
				1/26	1880.0	**22.05**	**160.32**
				1/1	1905.0	21.99	158.12
			16QAM	1/26	1855.0	20.35	108.39
				1/26	1880.0	20.32	107.65
				1/1	1905.0	**21.17**	**130.92**
	5	DFT-s OFDM	QPSK	1/23	1852.5	**20.13**	**103.04**
				1/23	1880.0	18.90	77.62
				1/23	1907.5	20.01	100.23
			16QAM	1/13	1852.5	18.09	64.42
				1/23	1880.0	18.55	71.61
				1/23	1907.5	**19.87**	**97.05**

5G NR Band n5

Band	BW [MHz]	Modulation	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
n5	20	DFT-s OFDM	QPSK	1/1	834.0	18.23	66.53
				1/1	836.5	18.38	68.87
				1/1	839.0	**18.77**	**75.34**
			16QAM	1/1	834.0	17.64	58.08
				1/1	836.5	**18.25**	**66.83**
				1/1	839.0	18.19	65.92
	15	DFT-s OFDM	QPSK	1/1	831.5	17.07	50.93
				1/1	836.5	18.46	70.15
				1/1	841.5	**18.80**	**75.86**
			16QAM	1/1	831.5	16.71	46.88
				1/1	836.5	17.86	61.09
				1/1	841.5	**17.93**	**62.09**
	10	DFT-s OFDM	QPSK	1/50	829.0	**18.06**	**63.97**
				1/1	836.5	17.04	50.58
				1/1	844.0	16.71	46.88
			16QAM	1/50	829.0	18.29	67.45
				1/26	836.5	**18.46**	**70.15**
				1/26	844.0	15.29	33.81
	5	DFT-s OFDM	QPSK	1/12	826.5	16.49	44.57
				1/23	836.5	**17.63**	**57.94**
				1/13	846.5	16.57	45.39
			16QAM	1/23	826.5	16.23	41.98
				1/1	836.5	**17.29**	**53.58**
				1/13	846.5	15.97	39.54

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5G NR Band n66

Band	BW [MHz]	Modulation	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
n66	20	DFT-s OFDM	QPSK	1/1	1720.0	21.38	137.40
				1/53	1745.0	**22.67**	**184.93**
				1/53	1770.0	19.56	90.36
			16QAM	1/1	1720.0	20.52	112.72
				1/1	1745.0	**21.08**	**128.23**
				1/1	1770.0	18.16	65.46
	15	DFT-s OFDM	QPSK	1/1	1717.5	**23.73**	**236.05**
				1/1	1745.0	20.35	108.39
				1/1	1772.5	19.19	82.99
			16QAM	1/39	1717.5	**21.57**	**143.55**
				1/1	1745.0	19.51	89.33
				1/1	1772.5	18.32	67.92
	10	DFT-s OFDM	QPSK	1/26	1715.0	**20.17**	**103.99**
				1/26	1745.0	19.69	93.11
				1/50	1775.0	16.98	49.89
			16QAM	1/26	1715.0	**19.32**	**85.51**
				1/26	1745.0	18.47	70.31
				1/26	1775.0	16.15	41.21
	5	DFT-s OFDM	QPSK	1/13	1712.5	**21.51**	**141.58**
				1/13	1745.0	21.27	133.97
				1/1	1777.5	19.88	97.27
			16QAM	1/23	1712.5	20.81	120.50
				1/23	1745.0	20.64	115.88
				1/13	1777.5	**21.44**	**139.32**

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9.5.2. ERP/EIRP DATA

GSM850

GSM850

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20882
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	32.61	V	3.0	-1.0	28.65	38.5	-9.9	
824.20	23.42	H	3.0	-1.0	19.46	38.5	-19.0	
Mid Ch								
836.60	32.84	V	3.0	-0.9	28.90	38.5	-9.6	
836.60	23.28	H	3.0	-0.9	19.34	38.5	-19.2	
High Ch								
848.80	32.86	V	3.1	-0.9	28.95	38.5	-9.5	
848.80	24.43	H	3.1	-0.9	20.52	38.5	-18.0	

GSM850

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20882
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	27.44	V	3.0	-1.0	23.48	38.5	-15.0	
824.20	17.69	H	3.0	-1.0	13.73	38.5	-24.8	
Mid Ch								
836.60	27.51	V	3.0	-0.9	23.57	38.5	-14.9	
836.60	17.46	H	3.0	-0.9	13.52	38.5	-25.0	
High Ch								
848.80	27.65	V	3.1	-0.9	23.74	38.5	-14.8	
848.80	17.83	H	3.1	-0.9	13.92	38.5	-24.6	

GSM1900

GSM1900

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20882
Configuration: EUT, X-Position
Location: Chamber 2
Mode: GPRS 1900 MHz 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								
1850.20	14.84	V	4.5	9.4	19.76	33.0	-13.2	
1850.20	20.68	H	4.5	9.4	25.60	33.0	-7.4	
Mid Ch								
1880.00	17.08	V	4.5	9.2	21.74	33.0	-11.3	
1880.00	22.26	H	4.5	9.2	26.92	33.0	-6.1	
High Ch								
1909.80	18.67	V	4.6	8.9	23.03	33.0	-10.0	
1909.80	22.59	H	4.6	8.9	26.95	33.0	-6.0	

GSM1900

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20882
Configuration: EUT, X-Position
Location: Chamber 2
Mode: EGPRS 1900 MHz 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								
1850.20	12.22	V	4.5	9.4	17.14	33.0	-15.9	
1850.20	17.51	H	4.5	9.4	22.43	33.0	-10.6	
Mid Ch								
1880.00	14.96	V	4.5	9.2	19.62	33.0	-13.4	
1880.00	19.27	H	4.5	9.2	23.93	33.0	-9.1	
High Ch								
1909.80	15.95	V	4.6	8.9	20.31	33.0	-12.7	
1909.80	19.84	H	4.6	8.9	24.20	33.0	-8.8	

WCDMA Band 5

WCDMA

Band 5
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20882
Configuration: EUT, Z-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	23.27	V	3.0	-0.9	19.31	38.5	-19.2	
826.40	13.26	H	3.0	-0.9	9.30	38.5	-29.2	
Mid Ch								
836.60	24.05	V	3.0	-0.9	20.11	38.5	-18.4	
836.60	14.78	H	3.0	-0.9	10.84	38.5	-27.7	
High Ch								
846.60	23.98	V	3.1	-0.9	20.06	38.5	-18.4	
846.60	14.57	H	3.1	-0.9	10.66	38.5	-27.8	

WCDMA

Band 5
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20882
Configuration: EUT, Z-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	22.27	V	3.0	-0.9	18.31	38.5	-20.2	
826.40	12.22	H	3.0	-0.9	8.26	38.5	-30.2	
Mid Ch								
836.60	23.05	V	3.0	-0.9	19.11	38.5	-19.4	
836.60	13.76	H	3.0	-0.9	9.82	38.5	-28.7	
High Ch								
846.60	23.04	V	3.1	-0.9	19.12	38.5	-19.4	
846.60	13.56	H	3.1	-0.9	9.65	38.5	-28.9	

WCDMA Band 2

WCDMA

Band 2
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20882
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	14.05	V	4.5	9.5	19.04	33.0	-14.0	
1852.40	14.15	H	4.5	9.5	19.13	33.0	-13.9	
Mid Ch								
1880.00	15.12	V	4.5	9.3	19.89	33.0	-13.1	
1880.00	15.13	H	4.5	9.3	19.90	33.0	-13.1	
High Ch								
1907.60	15.43	V	4.6	9.1	19.95	33.0	-13.1	
1907.60	15.97	H	4.6	9.1	20.49	33.0	-12.5	

WCDMA

Band 2
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20882
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	13.08	V	4.5	9.5	18.07	33.0	-14.9	
1852.40	13.20	H	4.5	9.5	18.18	33.0	-14.8	
Mid Ch								
1880.00	13.63	V	4.5	9.3	18.40	33.0	-14.6	
1880.00	13.70	H	4.5	9.3	18.47	33.0	-14.5	
High Ch								
1907.60	14.57	V	4.6	9.1	19.09	33.0	-13.9	
1907.60	15.09	H	4.6	9.1	19.61	33.0	-13.4	

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LTE Band 2

LTE Band 2 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20896
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 2 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	11.85	V	4.5	9.3	16.68	33.0	-16.3	
1860.00	17.02	H	4.5	9.3	21.85	33.0	-11.2	
Mid Ch								
1880.00	11.90	V	4.5	9.2	16.56	33.0	-16.4	
1880.00	17.25	H	4.5	9.2	21.91	33.0	-11.1	
High Ch								
1900.00	14.07	V	4.6	9.0	18.56	33.0	-14.4	
1900.00	16.61	H	4.6	9.0	21.10	33.0	-11.9	

LTE Band 2 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20896
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_16QAM Band 2 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	11.05	V	4.5	9.3	15.88	33.0	-17.1	
1860.00	16.33	H	4.5	9.3	21.16	33.0	-11.8	
Mid Ch								
1880.00	10.74	V	4.5	9.2	15.40	33.0	-17.6	
1880.00	16.13	H	4.5	9.2	20.79	33.0	-12.2	
High Ch								
1900.00	13.28	V	4.6	9.0	17.77	33.0	-15.2	
1900.00	15.85	H	4.6	9.0	20.34	33.0	-12.7	

LTE
Band 2
15MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 2 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	12.14	V	4.5	9.4	16.99	33.0	-16.0	
1857.50	16.96	H	4.5	9.4	21.81	33.0	-11.2	
Mid Ch								
1880.00	11.58	V	4.5	9.2	16.24	33.0	-16.8	
1880.00	17.34	H	4.5	9.2	22.00	33.0	-11.0	
High Ch								
1902.50	12.94	V	4.6	9.0	17.40	33.0	-15.6	
1902.50	16.37	H	4.6	9.0	20.83	33.0	-12.2	

LTE
Band 2
15MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 2
Mode: LTE_16QAM Band 2 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	11.11	V	4.5	9.4	15.96	33.0	-17.0	
1857.50	15.91	H	4.5	9.4	20.76	33.0	-12.2	
Mid Ch								
1880.00	10.57	V	4.5	9.2	15.23	33.0	-17.8	
1880.00	16.21	H	4.5	9.2	20.87	33.0	-12.1	
High Ch								
1902.50	12.35	V	4.6	9.0	16.81	33.0	-16.2	
1902.50	15.51	H	4.6	9.0	19.97	33.0	-13.0	

LTE Band 2 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20896
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 2 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	12.16	V	4.5	9.4	17.03	33.0	-16.0	
1855.00	16.80	H	4.5	9.4	21.68	33.0	-11.3	
Mid Ch								
1880.00	11.41	V	4.5	9.2	16.07	33.0	-16.9	
1880.00	17.16	H	4.5	9.2	21.82	33.0	-11.2	
High Ch								
1905.00	13.11	V	4.6	9.0	17.54	33.0	-15.5	
1905.00	16.52	H	4.6	9.0	20.95	33.0	-12.1	

LTE Band 2 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20896
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_16QAM Band 2 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	10.72	V	4.5	9.4	15.59	33.0	-17.4	
1855.00	15.42	H	4.5	9.4	20.30	33.0	-12.7	
Mid Ch								
1880.00	10.50	V	4.5	9.2	15.16	33.0	-17.8	
1880.00	16.16	H	4.5	9.2	20.82	33.0	-12.2	
High Ch								
1905.00	12.10	V	4.6	9.0	16.53	33.0	-16.5	
1905.00	15.32	H	4.6	9.0	19.75	33.0	-13.3	

LTE Band 2 5MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 2 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	11.77	V	4.5	9.4	16.67	33.0	-16.3	
1852.50	17.10	H	4.5	9.4	22.00	33.0	-11.0	
Mid Ch								
1880.00	11.77	V	4.5	9.2	16.43	33.0	-16.6	
1880.00	16.32	H	4.5	9.2	20.98	33.0	-12.0	
High Ch								
1907.50	12.73	V	4.6	9.0	17.12	33.0	-15.9	
1907.50	16.25	H	4.6	9.0	20.64	33.0	-12.4	

LTE Band 2 5MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 2
Mode: LTE_16QAM Band 2 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	11.05	V	4.5	9.4	15.95	33.0	-17.1	
1852.50	16.52	H	4.5	9.4	21.42	33.0	-11.6	
Mid Ch								
1880.00	10.78	V	4.5	9.2	15.44	33.0	-17.6	
1880.00	15.56	H	4.5	9.2	20.22	33.0	-12.8	
High Ch								
1907.50	12.50	V	4.6	9.0	16.89	33.0	-16.1	
1907.50	15.74	H	4.6	9.0	20.13	33.0	-12.9	

LTE Band 2 3MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 2 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	11.34	V	4.5	9.4	16.25	33.0	-16.8	
1851.50	17.01	H	4.5	9.4	21.91	33.0	-11.1	
Mid Ch								
1880.00	12.38	V	4.5	9.2	17.04	33.0	-16.0	
1880.00	16.99	H	4.5	9.2	21.65	33.0	-11.4	
High Ch								
1908.50	13.13	V	4.6	8.9	17.50	33.0	-15.5	
1908.50	16.22	H	4.6	8.9	20.59	33.0	-12.4	

LTE Band 2 3MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 2
Mode: LTE_16QAM Band 2 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	10.23	V	4.5	9.4	15.14	33.0	-17.9	
1851.50	15.87	H	4.5	9.4	20.77	33.0	-12.2	
Mid Ch								
1880.00	11.46	V	4.5	9.2	16.12	33.0	-16.9	
1880.00	15.76	H	4.5	9.2	20.42	33.0	-12.6	
High Ch								
1908.50	11.72	V	4.6	8.9	16.09	33.0	-16.9	
1908.50	14.99	H	4.6	8.9	19.36	33.0	-13.6	

LTE Band 2 1.4MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 2 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	10.76	V	4.5	9.4	15.68	33.0	-17.3	
1850.70	16.57	H	4.5	9.4	21.49	33.0	-11.5	
Mid Ch								
1880.00	11.78	V	4.5	9.2	16.44	33.0	-16.6	
1880.00	16.45	H	4.5	9.2	21.11	33.0	-11.9	
High Ch								
1909.30	12.76	V	4.6	8.9	17.13	33.0	-15.9	
1909.30	15.78	H	4.6	8.9	20.15	33.0	-12.9	

LTE Band 2 1.4MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 2
Mode: LTE_16QAM Band 2 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	9.65	V	4.5	9.4	14.57	33.0	-18.4	
1850.70	15.58	H	4.5	9.4	20.50	33.0	-12.5	
Mid Ch								
1880.00	10.75	V	4.5	9.2	15.41	33.0	-17.6	
1880.00	15.41	H	4.5	9.2	20.07	33.0	-12.9	
High Ch								
1909.30	11.82	V	4.6	8.9	16.19	33.0	-16.8	
1909.30	14.93	H	4.6	8.9	19.30	33.0	-13.7	

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 5

LTE Band 5 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 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
Low Ch								
829.00	24.71	V	3.0	-0.9	20.75	38.5	-17.7	
829.00	15.32	H	3.0	-0.9	11.37	38.5	-27.1	
Mid Ch								
836.50	24.93	V	3.0	-0.9	21.00	38.5	-17.5	
836.50	15.65	H	3.0	-0.9	11.71	38.5	-26.8	
High Ch								
844.00	25.16	V	3.0	-0.9	21.24	38.5	-17.3	
844.00	15.65	H	3.0	-0.9	11.73	38.5	-26.8	

LTE Band 5 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 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
Low Ch								
829.00	23.58	V	3.0	-0.9	19.62	38.5	-18.9	
829.00	14.20	H	3.0	-0.9	10.25	38.5	-28.3	
Mid Ch								
836.50	24.11	V	3.0	-0.9	20.18	38.5	-18.3	
836.50	14.68	H	3.0	-0.9	10.74	38.5	-27.8	
High Ch								
844.00	24.31	V	3.0	-0.9	20.39	38.5	-18.1	
844.00	14.81	H	3.0	-0.9	10.89	38.5	-27.6	

LTE Band 5 5MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 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								
826.50	24.65	V	3.0	-0.9	20.69	38.5	-17.8	
826.50	15.29	H	3.0	-0.9	11.33	38.5	-27.2	
Mid Ch								
836.50	24.96	V	3.0	-0.9	21.03	38.5	-17.5	
836.50	15.41	H	3.0	-0.9	11.47	38.5	-27.0	
High Ch								
846.50	24.86	V	3.0	-0.9	20.95	38.5	-17.6	
846.50	15.68	H	3.0	-0.9	11.76	38.5	-26.7	

LTE Band 5 5MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 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								
826.50	23.76	V	3.0	-0.9	19.80	38.5	-18.7	
826.50	14.46	H	3.0	-0.9	10.50	38.5	-28.0	
Mid Ch								
836.50	24.33	V	3.0	-0.9	20.40	38.5	-18.1	
836.50	14.58	H	3.0	-0.9	10.64	38.5	-27.9	
High Ch								
846.50	23.88	V	3.0	-0.9	19.97	38.5	-18.5	
846.50	14.54	H	3.0	-0.9	10.62	38.5	-27.9	

LTE Band 5 3MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Fundamentals, 3MHz 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								
825.50	24.50	V	3.0	-0.9	20.54	38.5	-18.0	
825.50	15.10	H	3.0	-0.9	11.14	38.5	-27.4	
Mid Ch								
836.50	25.00	V	3.0	-0.9	21.07	38.5	-17.4	
836.50	15.60	H	3.0	-0.9	11.66	38.5	-26.8	
High Ch								
847.50	24.73	V	3.1	-0.9	20.81	38.5	-17.7	
847.50	15.61	H	3.1	-0.9	11.69	38.5	-26.8	

LTE Band 5 3MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Fundamentals, 3MHz 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								
825.50	23.53	V	3.0	-0.9	19.57	38.5	-18.9	
825.50	14.26	H	3.0	-0.9	10.30	38.5	-28.2	
Mid Ch								
836.50	23.72	V	3.0	-0.9	19.79	38.5	-18.7	
836.50	14.47	H	3.0	-0.9	10.53	38.5	-28.0	
High Ch								
847.50	23.72	V	3.1	-0.9	19.80	38.5	-18.7	
847.50	14.58	H	3.1	-0.9	10.66	38.5	-27.8	

LTE Band 5 1.4MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Fundamentals, 1.4MHz 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								
824.70	24.12	V	3.0	-1.0	20.16	38.5	-18.3	
824.70	14.60	H	3.0	-1.0	10.63	38.5	-27.9	
Mid Ch								
836.50	24.70	V	3.0	-0.9	20.77	38.5	-17.7	
836.50	15.47	H	3.0	-0.9	11.53	38.5	-27.0	
High Ch								
848.30	23.99	V	3.0	-0.9	20.08	38.5	-18.4	
848.30	14.80	H	3.0	-0.9	10.89	38.5	-27.6	

LTE Band 5 1.4MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Fundamentals, 1.4MHz 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								
824.70	23.08	V	3.0	-1.0	19.12	38.5	-19.4	
824.70	13.62	H	3.0	-1.0	9.65	38.5	-28.8	
Mid Ch								
836.50	23.77	V	3.0	-0.9	19.84	38.5	-18.7	
836.50	14.38	H	3.0	-0.9	10.44	38.5	-28.1	
High Ch								
848.30	22.90	V	3.0	-0.9	18.99	38.5	-19.5	
848.30	13.74	H	3.0	-0.9	9.83	38.5	-28.7	

LTE Band 7

LTE Band 7 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-23
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 7 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								
2510.00	13.24	V	5.3	9.9	17.90	33.0	-15.1	
2510.00	11.48	H	5.3	9.9	16.14	33.0	-16.9	
Mid Ch								
2535.00	13.76	V	5.3	9.9	18.36	33.0	-14.6	
2535.00	11.58	H	5.3	9.9	16.18	33.0	-16.8	
High Ch								
2560.00	13.42	V	5.3	9.9	17.96	33.0	-15.0	
2560.00	12.08	H	5.3	9.9	16.62	33.0	-16.4	

LTE Band 7 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-23
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 7 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								
2510.00	12.05	V	5.3	9.9	16.71	33.0	-16.3	
2510.00	10.67	H	5.3	9.9	15.33	33.0	-17.7	
Mid Ch								
2535.00	12.92	V	5.3	9.9	17.52	33.0	-15.5	
2535.00	10.66	H	5.3	9.9	15.26	33.0	-17.7	
High Ch								
2560.00	12.55	V	5.3	9.9	17.09	33.0	-15.9	
2560.00	11.33	H	5.3	9.9	15.87	33.0	-17.1	

LTE
Band 7
15MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-23
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 7 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								
2507.50	14.88	V	5.3	9.9	19.54	33.0	-13.5	
2507.50	11.40	H	5.3	9.9	16.07	33.0	-16.9	
Mid Ch								
2535.00	16.06	V	5.3	9.9	20.66	33.0	-12.3	
2535.00	11.32	H	5.3	9.9	15.92	33.0	-17.1	
High Ch								
2562.50	15.40	V	5.3	9.9	19.93	33.0	-13.1	
2562.50	11.66	H	5.3	9.9	16.20	33.0	-16.8	

LTE
Band 7
15MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-23
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 7 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								
2507.50	13.96	V	5.3	9.9	18.62	33.0	-14.4	
2507.50	10.20	H	5.3	9.9	14.87	33.0	-18.1	
Mid Ch								
2535.00	14.96	V	5.3	9.9	19.56	33.0	-13.4	
2535.00	10.17	H	5.3	9.9	14.77	33.0	-18.2	
High Ch								
2562.50	14.63	V	5.3	9.9	19.16	33.0	-13.8	
2562.50	10.64	H	5.3	9.9	15.18	33.0	-17.8	

LTE

Band 7

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-23
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 7 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								
2505.00	15.19	V	5.2	9.9	19.86	33.0	-13.1	
2505.00	10.94	H	5.2	9.9	15.61	33.0	-17.4	
Mid Ch								
2535.00	16.14	V	5.3	9.9	20.74	33.0	-12.3	
2535.00	11.09	H	5.3	9.9	15.69	33.0	-17.3	
High Ch								
2565.00	15.07	V	5.3	9.8	19.60	33.0	-13.4	
2565.00	11.76	H	5.3	9.8	16.29	33.0	-16.7	

LTE

Band 7

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-23
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 7 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								
2505.00	14.24	V	5.2	9.9	18.91	33.0	-14.1	
2505.00	9.69	H	5.2	9.9	14.36	33.0	-18.6	
Mid Ch								
2535.00	15.22	V	5.3	9.9	19.82	33.0	-13.2	
2535.00	10.28	H	5.3	9.9	14.88	33.0	-18.1	
High Ch								
2565.00	13.92	V	5.3	9.8	18.45	33.0	-14.6	
2565.00	10.75	H	5.3	9.8	15.28	33.0	-17.7	

LTE

Band 7

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-23
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 7 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								
2502.50	15.12	V	5.2	9.9	19.80	33.0	-13.2	
2502.50	10.87	H	5.2	9.9	15.54	33.0	-17.5	
Mid Ch								
2535.00	16.27	V	5.3	9.9	20.87	33.0	-12.1	
2535.00	11.16	H	5.3	9.9	15.76	33.0	-17.2	
High Ch								
2567.50	15.54	V	5.3	9.8	20.05	33.0	-12.9	
2567.50	11.86	H	5.3	9.8	16.38	33.0	-16.6	

LTE

Band 7

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-23
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 7 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								
2502.50	14.17	V	5.2	9.9	18.85	33.0	-14.2	
2502.50	9.60	H	5.2	9.9	14.27	33.0	-18.7	
Mid Ch								
2535.00	15.17	V	5.3	9.9	19.77	33.0	-13.2	
2535.00	10.27	H	5.3	9.9	14.87	33.0	-18.1	
High Ch								
2567.50	14.32	V	5.3	9.8	18.83	33.0	-14.2	
2567.50	10.37	H	5.3	9.8	14.89	33.0	-18.1	

LTE Band 12

LTE Band 12 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-03
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 12 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
Low Ch								
704.00	21.24	V	2.8	-1.1	17.40	34.8	-17.4	
704.00	8.10	H	2.8	-1.1	4.26	34.8	-30.5	
Mid Ch								
707.50	21.28	V	2.8	-1.1	17.44	34.8	-17.4	
707.50	8.45	H	2.8	-1.1	4.61	34.8	-30.2	
High Ch								
711.00	21.78	V	2.8	-1.1	17.93	34.8	-16.9	
711.00	10.63	H	2.8	-1.1	6.78	34.8	-28.0	

LTE Band 12 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-03
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 12 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
Low Ch								
704.00	19.95	V	2.8	-1.1	16.11	34.8	-18.7	
704.00	7.06	H	2.8	-1.1	3.22	34.8	-31.6	
Mid Ch								
707.50	20.28	V	2.8	-1.1	16.44	34.8	-18.4	
707.50	7.54	H	2.8	-1.1	3.70	34.8	-31.1	
High Ch								
711.00	20.58	V	2.8	-1.1	16.73	34.8	-18.1	
711.00	9.27	H	2.8	-1.1	5.42	34.8	-29.4	

LTE

Band 12

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-03
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 12 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								
701.50	21.14	V	2.8	-1.1	17.30	34.8	-17.5	
701.50	7.60	H	2.8	-1.1	3.77	34.8	-31.0	
Mid Ch								
707.50	21.52	V	2.8	-1.1	17.68	34.8	-17.1	
707.50	7.95	H	2.8	-1.1	4.11	34.8	-30.7	
High Ch								
713.50	21.88	V	2.8	-1.1	18.02	34.8	-16.8	
713.50	9.00	H	2.8	-1.1	5.14	34.8	-29.7	

LTE

Band 12

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-03
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 12 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								
701.50	20.35	V	2.8	-1.1	16.51	34.8	-18.3	
701.50	7.66	H	2.8	-1.1	3.83	34.8	-31.0	
Mid Ch								
707.50	20.61	V	2.8	-1.1	16.77	34.8	-18.0	
707.50	7.21	H	2.8	-1.1	3.37	34.8	-31.4	
High Ch								
713.50	21.25	V	2.8	-1.1	17.39	34.8	-17.4	
713.50	8.21	H	2.8	-1.1	4.35	34.8	-30.4	

LTE

Band 12

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-03
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 12 Fundamentals, 3MHz 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								
700.50	21.57	V	2.8	-1.1	17.74	34.8	-17.1	
700.50	9.02	H	2.8	-1.1	5.19	34.8	-29.6	
Mid Ch								
707.50	21.45	V	2.8	-1.1	17.61	34.8	-17.2	
707.50	8.32	H	2.8	-1.1	4.48	34.8	-30.3	
High Ch								
714.50	22.17	V	2.8	-1.1	18.31	34.8	-16.5	
714.50	10.63	H	2.8	-1.1	6.77	34.8	-28.0	

LTE

Band 12

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-03
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 12 Fundamentals, 3MHz 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								
700.50	20.47	V	2.8	-1.1	16.64	34.8	-18.2	
700.50	8.01	H	2.8	-1.1	4.18	34.8	-30.6	
Mid Ch								
707.50	20.26	V	2.8	-1.1	16.42	34.8	-18.4	
707.50	7.26	H	2.8	-1.1	3.42	34.8	-31.4	
High Ch								
714.50	20.98	V	2.8	-1.1	17.12	34.8	-17.7	
714.50	9.51	H	2.8	-1.1	5.65	34.8	-29.1	

LTE

Band 12

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-03
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 12 Fundamentals, 1.4MHz 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								
699.70	21.23	V	2.8	-1.1	17.39	34.8	-17.4	
699.70	7.42	H	2.8	-1.1	3.59	34.8	-31.2	
Mid Ch								
707.50	21.29	V	2.8	-1.1	17.45	34.8	-17.4	
707.50	8.66	H	2.8	-1.1	4.82	34.8	-30.0	
High Ch								
715.30	21.59	V	2.8	-1.1	17.72	34.8	-17.1	
715.30	9.95	H	2.8	-1.1	6.08	34.8	-28.7	

LTE

Band 12

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-03
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 12 Fundamentals, 1.4MHz 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								
699.70	20.04	V	2.8	-1.1	16.20	34.8	-18.6	
699.70	6.45	H	2.8	-1.1	2.62	34.8	-32.2	
Mid Ch								
707.50	20.16	V	2.8	-1.1	16.32	34.8	-18.5	
707.50	7.70	H	2.8	-1.1	3.86	34.8	-30.9	
High Ch								
715.30	20.49	V	2.8	-1.1	16.62	34.8	-18.2	
715.30	9.04	H	2.8	-1.1	5.17	34.8	-29.6	

LTE Band 13

LTE Band 13 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20896
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	25.45	V	2.9	-1.1	21.46	34.8	-13.3	
782.00	14.53	H	2.9	-1.1	10.54	34.8	-24.2	

LTE Band 13 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20896
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	24.83	V	2.9	-1.1	20.84	34.8	-13.9	
782.00	13.97	H	2.9	-1.1	9.98	34.8	-24.8	

LTE

Band 13

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20896
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	25.63	V	2.9	-1.1	21.65	34.8	-13.1	
779.50	14.75	H	2.9	-1.1	10.77	34.8	-24.0	
Mid Ch								
782.00	25.31	V	2.9	-1.1	21.32	34.8	-13.4	
782.00	14.70	H	2.9	-1.1	10.71	34.8	-24.1	
High Ch								
784.50	25.24	V	2.9	-1.1	21.25	34.8	-13.5	
784.50	15.00	H	2.9	-1.1	11.01	34.8	-23.8	

LTE

Band 13

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20896
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	25.20	V	2.9	-1.1	21.22	34.8	-13.6	
779.50	13.96	H	2.9	-1.1	9.98	34.8	-24.8	
Mid Ch								
782.00	24.63	V	2.9	-1.1	20.64	34.8	-14.1	
782.00	14.06	H	2.9	-1.1	10.07	34.8	-24.7	
High Ch								
784.50	24.71	V	2.9	-1.1	20.72	34.8	-14.0	
784.50	14.25	H	2.9	-1.1	10.26	34.8	-24.5	

LTE Band 66

LTE Band 66 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 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								
1720.00	16.02	V	4.3	9.4	21.04	30.0	-9.0	
1720.00	19.37	H	4.3	9.4	24.39	30.0	-5.6	
Mid Ch								
1745.00	15.87	V	4.4	9.4	20.96	30.0	-9.0	
1745.00	18.84	H	4.4	9.4	23.93	30.0	-6.1	
High Ch								
1770.00	14.87	V	4.4	9.5	19.97	30.0	-10.0	
1770.00	16.64	H	4.4	9.5	21.74	30.0	-8.3	

LTE Band 66 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 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								
1720.00	15.00	V	4.3	9.4	20.02	30.0	-10.0	
1720.00	18.28	H	4.3	9.4	23.30	30.0	-6.7	
Mid Ch								
1745.00	15.25	V	4.4	9.4	20.34	30.0	-9.7	
1745.00	17.85	H	4.4	9.4	22.94	30.0	-7.1	
High Ch								
1770.00	13.78	V	4.4	9.5	18.88	30.0	-11.1	
1770.00	15.68	H	4.4	9.5	20.78	30.0	-9.2	

LTE

Band 66

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 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								
1717.50	15.69	V	4.3	9.3	20.71	30.0	-9.3	
1717.50	19.02	H	4.3	9.3	24.04	30.0	-6.0	
Mid Ch								
1745.00	16.23	V	4.4	9.4	21.32	30.0	-8.7	
1745.00	18.87	H	4.4	9.4	23.96	30.0	-6.0	
High Ch								
1772.50	15.47	V	4.4	9.5	20.56	30.0	-9.4	
1772.50	17.17	H	4.4	9.5	22.26	30.0	-7.7	

LTE

Band 66

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 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								
1717.50	14.56	V	4.3	9.3	19.58	30.0	-10.4	
1717.50	18.04	H	4.3	9.3	23.06	30.0	-6.9	
Mid Ch								
1745.00	15.22	V	4.4	9.4	20.31	30.0	-9.7	
1745.00	18.14	H	4.4	9.4	23.23	30.0	-6.8	
High Ch								
1772.50	14.38	V	4.4	9.5	19.47	30.0	-10.5	
1772.50	16.40	H	4.4	9.5	21.49	30.0	-8.5	

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LTE

Band 66

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 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								
1715.00	15.00	V	4.3	9.3	20.01	30.0	-10.0	
1715.00	17.93	H	4.3	9.3	22.94	30.0	-7.1	
Mid Ch								
1745.00	15.60	V	4.4	9.4	20.69	30.0	-9.3	
1745.00	18.00	H	4.4	9.4	23.09	30.0	-6.9	
High Ch								
1775.00	14.98	V	4.4	9.5	20.08	30.0	-9.9	
1775.00	16.60	H	4.4	9.5	21.70	30.0	-8.3	

LTE

Band 66

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 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								
1715.00	14.09	V	4.3	9.3	19.10	30.0	-10.9	
1715.00	16.91	H	4.3	9.3	21.92	30.0	-8.1	
Mid Ch								
1745.00	14.73	V	4.4	9.4	19.82	30.0	-10.2	
1745.00	17.05	H	4.4	9.4	22.14	30.0	-7.9	
High Ch								
1775.00	13.88	V	4.4	9.5	18.98	30.0	-11.0	
1775.00	15.39	H	4.4	9.5	20.49	30.0	-9.5	

LTE

Band 66

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 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								
1712.50	14.92	V	4.3	9.3	19.92	30.0	-10.1	
1712.50	17.65	H	4.3	9.3	22.65	30.0	-7.3	
Mid Ch								
1745.00	15.48	V	4.4	9.4	20.57	30.0	-9.4	
1745.00	17.92	H	4.4	9.4	23.01	30.0	-7.0	
High Ch								
1777.50	15.12	V	4.4	9.5	20.22	30.0	-9.8	
1777.50	16.73	H	4.4	9.5	21.83	30.0	-8.2	

LTE

Band 66

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 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								
1712.50	13.95	V	4.3	9.3	18.95	30.0	-11.0	
1712.50	17.03	H	4.3	9.3	22.03	30.0	-8.0	
Mid Ch								
1745.00	14.83	V	4.4	9.4	19.92	30.0	-10.1	
1745.00	17.41	H	4.4	9.4	22.50	30.0	-7.5	
High Ch								
1777.50	14.21	V	4.4	9.5	19.31	30.0	-10.7	
1777.50	15.68	H	4.4	9.5	20.78	30.0	-9.2	

LTE

Band 66

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20896
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 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								
1711.50	15.25	V	4.3	9.3	20.26	30.0	-9.7	
1711.50	18.15	H	4.3	9.3	23.16	30.0	-6.8	
Mid Ch								
1745.00	15.44	V	4.4	9.4	20.53	30.0	-9.5	
1745.00	18.04	H	4.4	9.4	23.13	30.0	-6.9	
High Ch								
1778.50	14.98	V	4.4	9.5	20.08	30.0	-9.9	
1778.50	16.42	H	4.4	9.5	21.52	30.0	-8.5	

LTE

Band 66

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20896
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 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								
1711.50	14.40	V	4.3	9.3	19.41	30.0	-10.6	
1711.50	17.22	H	4.3	9.3	22.23	30.0	-7.8	
Mid Ch								
1745.00	14.58	V	4.4	9.4	19.67	30.0	-10.3	
1745.00	17.19	H	4.4	9.4	22.28	30.0	-7.7	
High Ch								
1778.50	14.16	V	4.4	9.5	19.26	30.0	-10.7	
1778.50	15.66	H	4.4	9.5	20.76	30.0	-9.2	

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

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20896
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 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								
1710.70	15.08	V	4.3	9.3	20.08	30.0	-9.9	
1710.70	17.49	H	4.3	9.3	22.49	30.0	-7.5	
Mid Ch								
1745.00	15.20	V	4.4	9.4	20.29	30.0	-9.7	
1745.00	17.68	H	4.4	9.4	22.77	30.0	-7.2	
High Ch								
1779.30	15.03	V	4.4	9.5	20.13	30.0	-9.9	
1779.30	16.39	H	4.4	9.5	21.49	30.0	-8.5	

LTE

Band 66

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20896
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 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								
1710.70	14.19	V	4.3	9.3	19.19	30.0	-10.8	
1710.70	16.51	H	4.3	9.3	21.51	30.0	-8.5	
Mid Ch								
1745.00	14.34	V	4.4	9.4	19.43	30.0	-10.6	
1745.00	16.73	H	4.4	9.4	21.82	30.0	-8.2	
High Ch								
1779.30	13.81	V	4.4	9.5	18.91	30.0	-11.1	
1779.30	15.25	H	4.4	9.5	20.35	30.0	-9.6	

NR Band n2

NR Band n2 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-06-02
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK NR n2 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	13.69	V	4.5	9.4	18.62	33.0	-14.4	
1860.00	10.10	H	4.5	9.4	15.02	33.0	-18.0	
Mid Ch								
1880.00	13.13	V	4.5	9.3	17.90	33.0	-15.1	
1880.00	9.93	H	4.5	9.3	14.70	33.0	-18.3	
High Ch								
1900.00	13.68	V	4.6	9.2	18.30	33.0	-14.7	
1900.00	10.91	H	4.6	9.2	15.53	33.0	-17.5	

NR Band n2 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-06-02
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM NR n2 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	13.72	V	4.5	9.4	18.65	33.0	-14.4	
1860.00	10.33	H	4.5	9.4	15.25	33.0	-17.7	
Mid Ch								
1880.00	13.37	V	4.5	9.3	18.14	33.0	-14.9	
1880.00	9.71	H	4.5	9.3	14.48	33.0	-18.5	
High Ch								
1900.00	13.62	V	4.6	9.2	18.24	33.0	-14.8	
1900.00	10.70	H	4.6	9.2	15.32	33.0	-17.7	

NR
Band n2
15MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-28
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK NR n2 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	12.16	V	4.5	9.5	17.11	33.0	-15.9	
1857.50	7.17	H	4.5	9.5	12.12	33.0	-20.9	
Mid Ch								
1880.00	14.83	V	4.5	9.3	19.60	33.0	-13.4	
1880.00	8.64	H	4.5	9.3	13.41	33.0	-19.6	
High Ch								
1902.50	10.10	V	4.6	9.1	14.68	33.0	-18.3	
1902.50	8.22	H	4.6	9.1	12.81	33.0	-20.2	

NR
Band n2
15MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-28
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM NR n2 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	10.37	V	4.5	9.5	15.32	33.0	-17.7	
1857.50	8.41	H	4.5	9.5	13.36	33.0	-19.6	
Mid Ch								
1880.00	14.32	V	4.5	9.3	19.09	33.0	-13.9	
1880.00	8.25	H	4.5	9.3	13.02	33.0	-20.0	
High Ch								
1902.50	9.35	V	4.6	9.1	13.93	33.0	-19.1	
1902.50	7.91	H	4.6	9.1	12.50	33.0	-20.5	

NR
Band n2
10MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-27
Test Engineer: 20896
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK NR n2 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	16.34	V	4.5	9.5	21.31	33.0	-11.7	
1855.00	12.03	H	4.5	9.5	17.00	33.0	-16.0	
Mid Ch								
1880.00	17.28	V	4.5	9.3	22.05	33.0	-10.9	
1880.00	11.41	H	4.5	9.3	16.18	33.0	-16.8	
High Ch								
1905.00	17.44	V	4.6	9.1	21.99	33.0	-11.0	
1905.00	14.03	H	4.6	9.1	18.58	33.0	-14.4	

NR
Band n2
10MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-27
Test Engineer: 20896
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM NR n2 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	15.38	V	4.5	9.5	20.35	33.0	-12.7	
1855.00	11.11	H	4.5	9.5	16.08	33.0	-16.9	
Mid Ch								
1880.00	15.55	V	4.5	9.3	20.32	33.0	-12.7	
1880.00	9.87	H	4.5	9.3	14.64	33.0	-18.4	
High Ch								
1905.00	16.62	V	4.6	9.1	21.17	33.0	-11.8	
1905.00	13.43	H	4.6	9.1	17.98	33.0	-15.0	

NR Band n2 5MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-05-12
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK NR n2 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	15.14	V	4.5	9.5	20.13	33.0	-12.9	
1852.50	9.69	H	4.5	9.5	14.68	33.0	-18.3	
Mid Ch								
1880.00	14.13	V	4.5	9.3	18.90	33.0	-14.1	
1880.00	8.43	H	4.5	9.3	13.20	33.0	-19.8	
High Ch								
1907.50	15.49	V	4.6	9.1	20.01	33.0	-13.0	
1907.50	6.67	H	4.6	9.1	11.19	33.0	-21.8	

NR Band n2 5MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-05-12
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM NR n2 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	13.10	V	4.5	9.5	18.09	33.0	-14.9	
1852.50	7.17	H	4.5	9.5	12.16	33.0	-20.8	
Mid Ch								
1880.00	13.78	V	4.5	9.3	18.55	33.0	-14.4	
1880.00	7.95	H	4.5	9.3	12.72	33.0	-20.3	
High Ch								
1907.50	15.35	V	4.6	9.1	19.87	33.0	-13.1	
1907.50	6.29	H	4.6	9.1	10.81	33.0	-22.2	

NR Band n5

NR Band n5 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-29
Test Engineer: 20882
Configuration: EUT
Location: Chamber 1
Mode: LTE_QPSK NR n5 Fundamentals, 20MHz 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								
834.00	22.17	V	3.0	-0.9	18.23	38.5	-20.3	
834.00	13.12	H	3.0	-0.9	9.18	38.5	-29.3	
Mid Ch								
836.50	22.32	V	3.0	-0.9	18.38	38.5	-20.1	
836.50	13.16	H	3.0	-0.9	9.22	38.5	-29.3	
High Ch								
839.00	22.70	V	3.0	-0.9	18.77	38.5	-19.7	
839.00	13.47	H	3.0	-0.9	9.54	38.5	-29.0	

NR Band n5 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-29
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM NR n5 Fundamentals, 20MHz 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								
834.00	21.58	V	3.0	-0.9	17.64	38.5	-20.9	
834.00	12.80	H	3.0	-0.9	8.86	38.5	-29.6	
Mid Ch								
836.50	22.19	V	3.0	-0.9	18.25	38.5	-20.2	
836.50	12.82	H	3.0	-0.9	8.88	38.5	-29.6	
High Ch								
839.00	22.12	V	3.0	-0.9	18.19	38.5	-20.3	
839.00	13.18	H	3.0	-0.9	9.25	38.5	-29.3	

NR
Band n5
15MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-29
Test Engineer: 20882
Configuration: EUT
Location: Chamber 1
Mode: LTE_QPSK NR n5 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								
831.50	21.01	V	3.0	-0.9	17.07	38.5	-21.4	
831.50	13.02	H	3.0	-0.9	9.07	38.5	-29.4	
Mid Ch								
836.50	22.40	V	3.0	-0.9	18.46	38.5	-20.0	
836.50	13.53	H	3.0	-0.9	9.59	38.5	-28.9	
High Ch								
841.50	22.72	V	3.0	-0.9	18.80	38.5	-19.7	
841.50	13.76	H	3.0	-0.9	9.84	38.5	-28.7	

NR
Band n5
15MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-29
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM NR n5 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								
831.50	20.65	V	3.0	-0.9	16.71	38.5	-21.8	
831.50	12.75	H	3.0	-0.9	8.80	38.5	-29.7	
Mid Ch								
836.50	21.80	V	3.0	-0.9	17.86	38.5	-20.6	
836.50	13.18	H	3.0	-0.9	9.24	38.5	-29.3	
High Ch								
841.50	21.85	V	3.0	-0.9	17.93	38.5	-20.6	
841.50	13.58	H	3.0	-0.9	9.66	38.5	-28.8	

NR
Band n5
10MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-29
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK NR n5 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	22.02	V	3.0	-0.9	18.06	38.5	-20.4	
829.00	13.65	H	3.0	-0.9	9.70	38.5	-28.8	
Mid Ch								
836.50	20.98	V	3.0	-0.9	17.04	38.5	-21.5	
836.50	12.41	H	3.0	-0.9	8.47	38.5	-30.0	
High Ch								
844.00	20.63	V	3.0	-0.9	16.71	38.5	-21.8	
844.00	12.97	H	3.0	-0.9	9.05	38.5	-29.5	

NR
Band n5
10MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-29
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM NR n5 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	22.25	V	3.0	-0.9	18.29	38.5	-20.2	
829.00	14.05	H	3.0	-0.9	10.10	38.5	-28.4	
Mid Ch								
836.50	22.40	V	3.0	-0.9	18.46	38.5	-20.0	
836.50	13.29	H	3.0	-0.9	9.35	38.5	-29.2	
High Ch								
844.00	19.21	V	3.0	-0.9	15.29	38.5	-23.2	
844.00	10.85	H	3.0	-0.9	6.93	38.5	-31.6	

NR
Band n5
5MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-05-12
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK NR n5 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	20.45	V	3.0	-0.9	16.49	38.5	-22.0	
826.50	14.05	H	3.0	-0.9	10.09	38.5	-28.4	
Mid Ch								
836.50	21.57	V	3.0	-0.9	17.63	38.5	-20.9	
836.50	15.72	H	3.0	-0.9	11.78	38.5	-26.7	
High Ch								
846.50	20.49	V	3.0	-0.9	16.57	38.5	-21.9	
846.50	15.60	H	3.0	-0.9	11.68	38.5	-26.8	

NR
Band n5
5MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-05-12
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM NR n5 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	20.19	V	3.0	-0.9	16.23	38.5	-22.3	
826.50	14.14	H	3.0	-0.9	10.18	38.5	-28.3	
Mid Ch								
836.50	21.23	V	3.0	-0.9	17.29	38.5	-21.2	
836.50	14.66	H	3.0	-0.9	10.72	38.5	-27.8	
High Ch								
846.50	19.89	V	3.0	-0.9	15.97	38.5	-22.5	
846.50	14.28	H	3.0	-0.9	10.36	38.5	-28.1	

NR Band n66

NR Band n66 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-24
Test Engineer: 20896
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK NR n66 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								
1720.00	9.48	V	4.3	9.4	14.57	30.0	-15.4	
1720.00	16.28	H	4.3	9.4	21.38	30.0	-8.6	
Mid Ch								
1745.00	12.37	V	4.4	9.5	17.54	30.0	-12.5	
1745.00	17.51	H	4.4	9.5	22.67	30.0	-7.3	
High Ch								
1770.00	11.05	V	4.4	9.6	16.22	30.0	-13.8	
1770.00	14.39	H	4.4	9.6	19.56	30.0	-10.4	

NR Band n66 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-24
Test Engineer: 20896
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM NR n66 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								
1720.00	8.24	V	4.3	9.4	13.33	30.0	-16.7	
1720.00	15.42	H	4.3	9.4	20.52	30.0	-9.5	
Mid Ch								
1745.00	13.39	V	4.4	9.5	18.56	30.0	-11.4	
1745.00	15.92	H	4.4	9.5	21.08	30.0	-8.9	
High Ch								
1770.00	11.29	V	4.4	9.6	16.46	30.0	-13.5	
1770.00	12.99	H	4.4	9.6	18.16	30.0	-11.8	

NR
Band n66
15MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-28
Test Engineer: 20896
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK NR n66 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								
1717.50	10.90	V	4.3	9.4	16.00	30.0	-14.0	
1717.50	18.64	H	4.3	9.4	23.73	30.0	-6.3	
Mid Ch								
1745.00	10.10	V	4.4	9.5	15.27	30.0	-14.7	
1745.00	15.19	H	4.4	9.5	20.35	30.0	-9.6	
High Ch								
1772.50	11.63	V	4.4	9.6	16.81	30.0	-13.2	
1772.50	14.02	H	4.4	9.6	19.19	30.0	-10.8	

NR
Band n66
15MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-28
Test Engineer: 20896
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM NR n66 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								
1717.50	11.23	V	4.3	9.4	16.33	30.0	-13.7	
1717.50	16.48	H	4.3	9.4	21.57	30.0	-8.4	
Mid Ch								
1745.00	9.14	V	4.4	9.5	14.31	30.0	-15.7	
1745.00	14.35	H	4.4	9.5	19.51	30.0	-10.5	
High Ch								
1772.50	10.36	V	4.4	9.6	15.54	30.0	-14.5	
1772.50	13.15	H	4.4	9.6	18.32	30.0	-11.7	

NR
Band n66
10MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-28
Test Engineer: 20896
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK NR n66 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								
1715.00	8.95	V	4.3	9.4	14.04	30.0	-16.0	
1715.00	15.08	H	4.3	9.4	20.17	30.0	-9.8	
Mid Ch								
1745.00	9.81	V	4.4	9.5	14.98	30.0	-15.0	
1745.00	14.53	H	4.4	9.5	19.69	30.0	-10.3	
High Ch								
1775.00	8.58	V	4.4	9.6	13.76	30.0	-16.2	
1775.00	11.80	H	4.4	9.6	16.98	30.0	-13.0	

NR
Band n66
10MHz
16QAM

RB 1/26

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-04-28
Test Engineer: 20896
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM NR n66 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								
1715.00	7.99	V	4.3	9.4	13.08	30.0	-16.9	
1715.00	14.23	H	4.3	9.4	19.32	30.0	-10.7	
Mid Ch								
1745.00	9.67	V	4.4	9.5	14.84	30.0	-15.2	
1745.00	13.31	H	4.4	9.5	18.47	30.0	-11.5	
High Ch								
1775.00	7.52	V	4.4	9.6	12.70	30.0	-17.3	
1775.00	10.97	H	4.4	9.6	16.15	30.0	-13.9	

NR Band n66 5MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-05-12
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK NR n66 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								
1712.50	11.54	V	4.3	9.4	16.62	30.0	-13.4	
1712.50	16.43	H	4.3	9.4	21.51	30.0	-8.5	
Mid Ch								
1745.00	10.92	V	4.4	9.5	16.09	30.0	-13.9	
1745.00	16.11	H	4.4	9.5	21.27	30.0	-8.7	
High Ch								
1777.50	12.47	V	4.4	9.6	17.64	30.0	-12.4	
1777.50	14.71	H	4.4	9.6	19.88	30.0	-10.1	

NR Band n66 5MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789424849
Date: 2020-05-12
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM NR n66 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								
1712.50	10.30	V	4.3	9.4	15.38	30.0	-14.6	
1712.50	15.73	H	4.3	9.4	20.81	30.0	-9.2	
Mid Ch								
1745.00	10.40	V	4.4	9.5	15.57	30.0	-14.4	
1745.00	15.48	H	4.4	9.5	20.64	30.0	-9.4	
High Ch								
1777.50	12.59	V	4.4	9.6	17.76	30.0	-12.2	
1777.50	16.27	H	4.4	9.6	21.44	30.0	-8.6	

9.6. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238, §27. 53

LIMIT

Part 22.917(a) & Part 24.238(a) & Part 27.53(h) 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.

(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

(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.

TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.12; ESU40 setting reference to 971168 D01 v03r01
For peak power measurement with a ESU40:
a) Set the RBW = 100 kHz for emission below 1GHz and 1MHz for emissions above 1GHz
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 1.5 times the OBW;
d) Sweep time = auto couple;
e) Detector = rms;
f) Ensure that the number of measurement points ≥ span/RBW;
g) Trace mode = average(WCDMA, LTE, 5G NR), Max hold(GSM, LTE Band41);;

Note

5G NR: All Waveforms (CP-OFDM vs DFT-s OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

RESULTS

See the following pages.
NOTE : Please refer to section 5.4 for bandwidth and RB setting about LTE / 5G NR bands.

9.6.1. SPURIOUS RADIATION PLOTS

GSM850

GSM850

GPRS

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

Company: Samsung
Project #: 4789424849
Date: 2020-03-31
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, X-Position
Location: Chamber 1
Mode: GPRS 850 MHz Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1648.40	-10.0	V	3.0	45.2	1.0	-54.2	-13.0	-41.2	
2472.60	-10.7	V	3.0	45.0	1.0	-54.7	-13.0	-41.7	
3296.80	-8.6	V	3.0	45.3	1.0	-52.9	-13.0	-39.9	
1648.40	-5.1	H	3.0	45.2	1.0	-49.3	-13.0	-36.3	
2472.60	-10.4	H	3.0	45.0	1.0	-54.4	-13.0	-41.4	
3296.80	-8.6	H	3.0	45.3	1.0	-52.9	-13.0	-39.9	
Mid Ch, 836.6MHz									
1673.20	-9.8	V	3.0	45.2	1.0	-54.0	-13.0	-41.0	
2509.80	-10.5	V	3.0	45.0	1.0	-54.6	-13.0	-41.6	
3346.40	-8.0	V	3.0	45.3	1.0	-52.2	-13.0	-39.2	
1673.20	-4.7	H	3.0	45.2	1.0	-48.9	-13.0	-35.9	
2509.80	-10.1	H	3.0	45.0	1.0	-54.2	-13.0	-41.2	
3346.40	-8.2	H	3.0	45.3	1.0	-52.5	-13.0	-39.5	
High Ch, 848.8MHz									
1697.60	-5.2	V	3.0	45.2	1.0	-49.4	-13.0	-36.4	
2546.40	-10.7	V	3.0	45.1	1.0	-54.8	-13.0	-41.8	
3395.20	-7.9	V	3.0	45.3	1.0	-52.2	-13.0	-39.2	
1697.60	-4.1	H	3.0	45.2	1.0	-48.3	-13.0	-35.3	
2546.40	-10.2	H	3.0	45.1	1.0	-54.2	-13.0	-41.2	
3395.20	-7.8	H	3.0	45.3	1.0	-52.1	-13.0	-39.1	

GSM850

EGPRS

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

Company: Samsung
Project #: 4789424849
Date: 2020-03-31
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, X-Position
Location: Chamber 1
Mode: EGPRS 850 MHz Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1648.40	-13.6	V	3.0	45.2	1.0	-57.8	-13.0	-44.8	
2472.60	-10.7	V	3.0	45.0	1.0	-54.7	-13.0	-41.7	
3296.80	-8.3	V	3.0	45.3	1.0	-52.6	-13.0	-39.6	
1648.40	-11.3	H	3.0	45.2	1.0	-55.5	-13.0	-42.5	
2472.60	-10.1	H	3.0	45.0	1.0	-54.1	-13.0	-41.1	
3296.80	-8.7	H	3.0	45.3	1.0	-53.0	-13.0	-40.0	
Mid Ch, 836.6MHz									
1673.20	-13.7	V	3.0	45.2	1.0	-57.8	-13.0	-44.8	
2509.80	-10.7	V	3.0	45.0	1.0	-54.7	-13.0	-41.7	
3346.40	-7.8	V	3.0	45.3	1.0	-52.0	-13.0	-39.0	
1673.20	-11.7	H	3.0	45.2	1.0	-55.8	-13.0	-42.8	
2509.80	-10.1	H	3.0	45.0	1.0	-54.1	-13.0	-41.1	
3346.40	-8.2	H	3.0	45.3	1.0	-52.4	-13.0	-39.4	
High Ch, 848.8MHz									
1697.60	-13.2	V	3.0	45.2	1.0	-57.4	-13.0	-44.4	
2546.40	-10.6	V	3.0	45.1	1.0	-54.6	-13.0	-41.6	
3395.20	-7.7	V	3.0	45.3	1.0	-52.0	-13.0	-39.0	
1697.60	-10.9	H	3.0	45.2	1.0	-55.1	-13.0	-42.1	
2546.40	-10.3	H	3.0	45.1	1.0	-54.4	-13.0	-41.4	
3395.20	-8.1	H	3.0	45.3	1.0	-52.4	-13.0	-39.4	

GSM1900

GSM1900

GPRS

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

Company: Samsung
Project #: 4789424849
Date: 2020-03-31
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 1
Mode: GPRS 1900 MHz Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-2.3	V	3.0	45.4	1.0	-46.7	-13.0	-33.7	
5550.60	-6.5	V	3.0	45.3	1.0	-50.8	-13.0	-37.8	
7400.80	-4.1	V	3.0	44.1	1.0	-47.2	-13.0	-34.2	
9251.00	-1.8	V	3.0	42.9	1.0	-43.7	-13.0	-30.7	
3700.40	-0.3	H	3.0	45.4	1.0	-44.7	-13.0	-31.7	
5550.60	-6.6	H	3.0	45.3	1.0	-50.9	-13.0	-37.9	
7400.80	-4.0	H	3.0	44.1	1.0	-47.2	-13.0	-34.2	
9251.00	-1.8	H	3.0	42.9	1.0	-43.7	-13.0	-30.7	
Mid Ch, 1880MHz									
3760.00	-1.7	V	3.0	45.4	1.0	-46.1	-13.0	-33.1	
5640.00	-0.2	V	3.0	45.3	1.0	-44.5	-13.0	-31.5	
7520.00	-4.1	V	3.0	44.1	1.0	-47.1	-13.0	-34.1	
9400.00	1.3	V	3.0	42.8	1.0	-40.5	-13.0	-27.5	
3760.00	1.0	H	3.0	45.4	1.0	-43.4	-13.0	-30.4	
5640.00	1.6	H	3.0	45.3	1.0	-42.7	-13.0	-29.7	
7520.00	-4.0	H	3.0	44.1	1.0	-47.1	-13.0	-34.1	
9400.00	-0.3	H	3.0	42.8	1.0	-42.1	-13.0	-29.1	
High Ch, 1909.8MHz									
3819.60	-3.4	V	3.0	45.4	1.0	-47.8	-13.0	-34.8	
5729.40	-1.8	V	3.0	45.3	1.0	-46.1	-13.0	-33.1	
7639.20	-4.0	V	3.0	44.0	1.0	-47.0	-13.0	-34.0	
9549.00	2.0	V	3.0	42.6	1.0	-39.6	-13.0	-26.6	
3819.60	-2.4	H	3.0	45.4	1.0	-46.8	-13.0	-33.8	
5729.40	1.5	H	3.0	45.3	1.0	-42.8	-13.0	-29.8	
7639.20	-3.7	H	3.0	44.0	1.0	-46.7	-13.0	-33.7	
9549.00	-0.1	H	3.0	42.6	1.0	-41.8	-13.0	-28.8	

GSM1900

EGPRS

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

Company: Samsung
Project #: 4789424849
Date: 2020-03-31
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 1
Mode: EGPRS 1900 MHz Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-7.6	V	3.0	45.4	1.0	-52.0	-13.0	-39.0	
5550.60	-6.4	V	3.0	45.3	1.0	-50.7	-13.0	-37.7	
7400.80	-4.0	V	3.0	44.1	1.0	-47.2	-13.0	-34.2	
9251.00	-1.7	V	3.0	42.9	1.0	-43.6	-13.0	-30.6	
3700.40	-6.9	H	3.0	45.4	1.0	-51.3	-13.0	-38.3	
5550.60	-6.9	H	3.0	45.3	1.0	-51.2	-13.0	-38.2	
7400.80	-3.9	H	3.0	44.1	1.0	-47.1	-13.0	-34.1	
9251.00	-1.8	H	3.0	42.9	1.0	-43.7	-13.0	-30.7	
Mid Ch, 1880MHz									
3760.00	-2.2	V	3.0	45.4	1.0	-46.6	-13.0	-33.6	
5640.00	-5.1	V	3.0	45.3	1.0	-49.3	-13.0	-36.3	
7520.00	-4.1	V	3.0	44.1	1.0	-47.2	-13.0	-34.2	
9400.00	-1.6	V	3.0	42.8	1.0	-43.4	-13.0	-30.4	
3760.00	-4.0	H	3.0	45.4	1.0	-48.4	-13.0	-35.4	
5640.00	-4.4	H	3.0	45.3	1.0	-48.6	-13.0	-35.6	
7520.00	-3.9	H	3.0	44.1	1.0	-47.0	-13.0	-34.0	
9400.00	-0.8	H	3.0	42.8	1.0	-42.5	-13.0	-29.5	
High Ch, 1909.8MHz									
3819.60	-5.3	V	3.0	45.4	1.0	-49.7	-13.0	-36.7	
5729.40	-5.9	V	3.0	45.3	1.0	-50.1	-13.0	-37.1	
7639.20	-3.8	V	3.0	44.0	1.0	-46.9	-13.0	-33.9	
9549.00	-1.6	V	3.0	42.6	1.0	-43.2	-13.0	-30.2	
3819.60	-3.8	H	3.0	45.4	1.0	-48.3	-13.0	-35.3	
5729.40	-4.1	H	3.0	45.3	1.0	-48.3	-13.0	-35.3	
7639.20	-3.7	H	3.0	44.0	1.0	-46.7	-13.0	-33.7	
9549.00	-1.2	H	3.0	42.6	1.0	-42.8	-13.0	-29.8	

WCDMA Band 5

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

Company: Samsung
Project #: 4789424849
Date: 2020-03-31
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 1
Mode: Rel99 Band 5 Harmonics

WCDMA

Band 5
REL99

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-15.3	V	3.0	45.2	1.0	-59.5	-13.0	-46.5	
2479.20	-11.7	V	3.0	45.0	1.0	-55.8	-13.0	-42.8	
3305.60	-9.1	V	3.0	45.3	1.0	-53.3	-13.0	-40.3	
1652.80	-14.5	H	3.0	45.2	1.0	-58.7	-13.0	-45.7	
2479.20	-11.3	H	3.0	45.0	1.0	-55.3	-13.0	-42.3	
3305.60	-9.6	H	3.0	45.3	1.0	-53.9	-13.0	-40.9	
Mid Ch, 836.6MHz									
1673.20	-15.2	V	3.0	45.2	1.0	-59.4	-13.0	-46.4	
2509.80	-12.0	V	3.0	45.0	1.0	-56.1	-13.0	-43.1	
3346.40	-9.1	V	3.0	45.3	1.0	-53.4	-13.0	-40.4	
1673.20	-14.2	H	3.0	45.2	1.0	-58.4	-13.0	-45.4	
2509.80	-11.3	H	3.0	45.0	1.0	-55.3	-13.0	-42.3	
3346.40	-9.2	H	3.0	45.3	1.0	-53.5	-13.0	-40.5	
High Ch, 846.6MHz									
1693.20	-15.2	V	3.0	45.2	1.0	-59.3	-13.0	-46.3	
2539.80	-11.9	V	3.0	45.0	1.0	-55.9	-13.0	-42.9	
3386.40	-9.1	V	3.0	45.3	1.0	-53.4	-13.0	-40.4	
1693.20	-14.3	H	3.0	45.2	1.0	-58.4	-13.0	-45.4	
2539.80	-11.2	H	3.0	45.0	1.0	-55.2	-13.0	-42.2	
3386.40	-9.2	H	3.0	45.3	1.0	-53.5	-13.0	-40.5	

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

Company: Samsung
Project #: 4789424849
Date: 2020-03-31
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 1
Mode: HSDPA Band 5 Harmonics

WCDMA

Band 5
HSDPA

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-15.4	V	3.0	45.2	1.0	-59.6	-13.0	-46.6	
2479.20	-11.6	V	3.0	45.0	1.0	-55.7	-13.0	-42.7	
3305.60	-9.4	V	3.0	45.3	1.0	-53.6	-13.0	-40.6	
1652.80	-14.5	H	3.0	45.2	1.0	-58.7	-13.0	-45.7	
2479.20	-11.3	H	3.0	45.0	1.0	-55.3	-13.0	-42.3	
3305.60	-9.7	H	3.0	45.3	1.0	-54.0	-13.0	-41.0	
Mid Ch, 836.6MHz									
1673.20	-15.2	V	3.0	45.2	1.0	-59.4	-13.0	-46.4	
2509.80	-11.9	V	3.0	45.0	1.0	-56.0	-13.0	-43.0	
3346.40	-8.9	V	3.0	45.3	1.0	-53.2	-13.0	-40.2	
1673.20	-14.4	H	3.0	45.2	1.0	-58.6	-13.0	-45.6	
2509.80	-11.4	H	3.0	45.0	1.0	-55.4	-13.0	-42.4	
3346.40	-9.1	H	3.0	45.3	1.0	-53.4	-13.0	-40.4	
High Ch, 846.6MHz									
1693.20	-15.2	V	3.0	45.2	1.0	-59.4	-13.0	-46.4	
2539.80	-11.8	V	3.0	45.0	1.0	-55.9	-13.0	-42.9	
3386.40	-9.0	V	3.0	45.3	1.0	-53.3	-13.0	-40.3	
1693.20	-14.2	H	3.0	45.2	1.0	-58.4	-13.0	-45.4	
2539.80	-11.1	H	3.0	45.0	1.0	-55.1	-13.0	-42.1	
3386.40	-9.2	H	3.0	45.3	1.0	-53.5	-13.0	-40.5	

WCDMA Band 2

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

Company: Samsung
Project #: 4789424849
Date: 2020-03-31
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, X-Position
Location: Chamber 1
Mode: Rel99 Band 2 Harmonics

WCDMA Band 2 REL99

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4MHz									
3704.80	-10.0	V	3.0	45.4	1.0	-54.4	-13.0	-41.4	
5557.20	-7.4	V	3.0	45.3	1.0	-51.7	-13.0	-38.7	
7409.60	-5.1	V	3.0	44.1	1.0	-48.2	-13.0	-35.2	
3704.80	-10.3	H	3.0	45.4	1.0	-54.7	-13.0	-41.7	
5557.20	-7.8	H	3.0	45.3	1.0	-52.1	-13.0	-39.1	
7409.60	-4.9	H	3.0	44.1	1.0	-48.1	-13.0	-35.1	
Mid Ch, 1880MHz									
3760.00	-10.0	V	3.0	45.4	1.0	-54.4	-13.0	-41.4	
5640.00	-7.0	V	3.0	45.3	1.0	-51.3	-13.0	-38.3	
7520.00	-4.4	V	3.0	44.1	1.0	-47.4	-13.0	-34.4	
3760.00	-10.7	H	3.0	45.4	1.0	-55.1	-13.0	-42.1	
5640.00	-7.6	H	3.0	45.3	1.0	-51.9	-13.0	-38.9	
7520.00	-4.9	H	3.0	44.1	1.0	-48.0	-13.0	-35.0	
High Ch, 1907.6MHz									
3815.20	-10.3	V	3.0	45.4	1.0	-54.7	-13.0	-41.7	
5722.80	-7.1	V	3.0	45.3	1.0	-51.4	-13.0	-38.4	
7630.40	-4.6	V	3.0	44.0	1.0	-47.6	-13.0	-34.6	
3815.20	-10.7	H	3.0	45.4	1.0	-55.1	-13.0	-42.1	
5722.80	-7.7	H	3.0	45.3	1.0	-52.0	-13.0	-39.0	
7630.40	-4.7	H	3.0	44.0	1.0	-47.7	-13.0	-34.7	

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

Company: Samsung
Project #: 4789424849
Date: 2020-03-31
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, X-Position
Location: Chamber 1
Mode: HSDPA Band 2 Harmonics

WCDMA Band 2 HSDPA

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4MHz									
3704.80	-10.1	V	3.0	45.4	1.0	-54.5	-13.0	-41.5	
5557.20	-7.6	V	3.0	45.3	1.0	-51.9	-13.0	-38.9	
7409.60	-5.3	V	3.0	44.1	1.0	-48.4	-13.0	-35.4	
3704.80	-10.3	H	3.0	45.4	1.0	-54.7	-13.0	-41.7	
5557.20	-7.6	H	3.0	45.3	1.0	-51.9	-13.0	-38.9	
7409.60	-5.1	H	3.0	44.1	1.0	-48.3	-13.0	-35.3	
Mid Ch, 1880MHz									
3760.00	-10.1	V	3.0	45.4	1.0	-54.6	-13.0	-41.6	
5640.00	-7.2	V	3.0	45.3	1.0	-51.5	-13.0	-38.5	
7520.00	-5.1	V	3.0	44.1	1.0	-48.2	-13.0	-35.2	
3760.00	-10.7	H	3.0	45.4	1.0	-55.1	-13.0	-42.1	
5640.00	-7.3	H	3.0	45.3	1.0	-51.6	-13.0	-38.6	
7520.00	-5.2	H	3.0	44.1	1.0	-48.2	-13.0	-35.2	
High Ch, 1907.6MHz									
3815.20	-10.3	V	3.0	45.4	1.0	-54.7	-13.0	-41.7	
5722.80	-7.1	V	3.0	45.3	1.0	-51.4	-13.0	-38.4	
7630.40	-5.1	V	3.0	44.0	1.0	-48.2	-13.0	-35.2	
3815.20	-10.8	H	3.0	45.4	1.0	-55.2	-13.0	-42.2	
5722.80	-7.7	H	3.0	45.3	1.0	-52.0	-13.0	-39.0	
7630.40	-5.1	H	3.0	44.0	1.0	-48.1	-13.0	-35.1	

LTE Band 2

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

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20881
Configuration: EUT / AC Adapter / Earphone, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 2 Harmonics, 3MHz Bandwidth

LTE Band 2 3MHz QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1851.5MHz									
3703.00	-10.6	V	3.0	45.4	1.0	-55.0	-13.0	-42.0	
5554.50	-7.6	V	3.0	45.3	1.0	-51.9	-13.0	-38.9	
7406.00	-5.2	V	3.0	44.1	1.0	-48.4	-13.0	-35.4	
3703.00	-10.8	H	3.0	45.4	1.0	-55.2	-13.0	-42.2	
5554.50	-7.8	H	3.0	45.3	1.0	-52.1	-13.0	-39.1	
7406.00	-5.1	H	3.0	44.1	1.0	-48.3	-13.0	-35.3	
Mid Ch, 1880MHz									
3760.00	-10.7	V	3.0	45.4	1.0	-55.1	-13.0	-42.1	
5640.00	-7.4	V	3.0	45.3	1.0	-51.7	-13.0	-38.7	
7520.00	-5.2	V	3.0	44.1	1.0	-48.3	-13.0	-35.3	
3760.00	-10.8	H	3.0	45.4	1.0	-55.2	-13.0	-42.2	
5640.00	-7.5	H	3.0	45.3	1.0	-51.8	-13.0	-38.8	
7520.00	-5.1	H	3.0	44.1	1.0	-48.2	-13.0	-35.2	
High Ch, 1908.5MHz									
3817.00	-10.5	V	3.0	45.4	1.0	-54.9	-13.0	-41.9	
5725.50	-7.6	V	3.0	45.3	1.0	-51.9	-13.0	-38.9	
7634.00	-5.1	V	3.0	44.0	1.0	-48.1	-13.0	-35.1	
3817.00	-10.9	H	3.0	45.4	1.0	-55.3	-13.0	-42.3	
5725.50	-7.7	H	3.0	45.3	1.0	-52.0	-13.0	-39.0	
7634.00	-4.9	H	3.0	44.0	1.0	-47.9	-13.0	-34.9	

LTE Band 5

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

Company: Samsung
Project #: 4789424849
Date: 2020-04-01
Test Engineer: 20881
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Harmonics, 10MHz Bandwidth

LTE Band 5 10MHz QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 829MHz									
1658.00	-15.0	V	3.0	45.2	1.0	-59.2	-13.0	-46.2	
2487.00	-11.7	V	3.0	45.0	1.0	-55.7	-13.0	-42.7	
3316.00	-9.4	V	3.0	45.3	1.0	-53.6	-13.0	-40.6	
1658.00	-14.1	H	3.0	45.2	1.0	-58.3	-13.0	-45.3	
2487.00	-11.2	H	3.0	45.0	1.0	-55.2	-13.0	-42.2	
3316.00	-9.4	H	3.0	45.3	1.0	-53.6	-13.0	-40.6	
Mid Ch, 836.5MHz									
1673.00	-14.9	V	3.0	45.2	1.0	-59.1	-13.0	-46.1	
2509.50	-11.7	V	3.0	45.0	1.0	-55.8	-13.0	-42.8	
3346.00	-8.9	V	3.0	45.3	1.0	-53.1	-13.0	-40.1	
1673.00	-13.9	H	3.0	45.2	1.0	-58.1	-13.0	-45.1	
2509.50	-11.0	H	3.0	45.0	1.0	-55.0	-13.0	-42.0	
3346.00	-9.1	H	3.0	45.3	1.0	-53.4	-13.0	-40.4	
High Ch, 844MHz									
1688.00	-14.8	V	3.0	45.2	1.0	-59.0	-13.0	-46.0	
2532.00	-11.7	V	3.0	45.0	1.0	-55.7	-13.0	-42.7	
3376.00	-8.9	V	3.0	45.3	1.0	-53.2	-13.0	-40.2	
1688.00	-14.0	H	3.0	45.2	1.0	-58.2	-13.0	-45.2	
2532.00	-11.0	H	3.0	45.0	1.0	-55.1	-13.0	-42.1	
3376.00	-9.1	H	3.0	45.3	1.0	-53.4	-13.0	-40.4	

LTE Band 7

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

Company: Samsung
Project #: 4789424849
Date: 2020-04-23
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 7 Harmonics, 20MHz Bandwidth

LTE

Band 7

20MHz

QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2510MHz									
5020.00	-17.1	V	3.0	45.3	1.0	-61.4	-25.0	-36.4	
7530.00	-17.4	V	3.0	44.1	1.0	-60.5	-25.0	-35.5	
10040.00	-14.1	V	3.0	42.2	1.0	-55.3	-25.0	-30.3	
5020.00	-16.8	H	3.0	45.3	1.0	-61.0	-25.0	-36.0	
7530.00	-17.4	H	3.0	44.1	1.0	-60.5	-25.0	-35.5	
10040.00	-13.9	H	3.0	42.2	1.0	-55.0	-25.0	-30.0	
Mid Ch, 2535MHz									
5070.00	-18.2	V	3.0	45.3	1.0	-62.4	-25.0	-37.4	
7605.00	-17.1	V	3.0	44.0	1.0	-60.2	-25.0	-35.2	
10140.00	-14.2	V	3.0	42.2	1.0	-55.5	-25.0	-30.5	
5070.00	-18.5	H	3.0	45.3	1.0	-62.8	-25.0	-37.8	
7605.00	-17.1	H	3.0	44.0	1.0	-60.1	-25.0	-35.1	
10140.00	-12.9	H	3.0	42.2	1.0	-54.1	-25.0	-29.1	
High Ch, 2560MHz									
5120.00	-17.6	V	3.0	45.3	1.0	-61.9	-25.0	-36.9	
7680.00	-17.4	V	3.0	44.0	1.0	-60.4	-25.0	-35.4	
10240.00	-14.7	V	3.0	42.3	1.0	-56.0	-25.0	-31.0	
5120.00	-17.7	H	3.0	45.3	1.0	-62.0	-25.0	-37.0	
7680.00	-17.2	H	3.0	44.0	1.0	-60.2	-25.0	-35.2	
10240.00	-13.5	H	3.0	42.3	1.0	-54.7	-25.0	-29.7	

LTE Band 12

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

Company: Samsung
Project #: 4789424849
Date: 2020-04-03
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Harmonics, 3MHz Bandwidth

LTE
Band 12
3MHz
QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 700.5MHz									
1401.00	-16.3	V	3.0	45.4	1.0	-60.7	-13.0	-47.7	
2101.50	-7.0	V	3.0	45.0	1.0	-50.9	-13.0	-37.9	
2802.00	-10.9	V	3.0	45.1	1.0	-55.0	-13.0	-42.0	
1401.00	-15.7	H	3.0	45.4	1.0	-60.1	-13.0	-47.1	
2101.50	-6.1	H	3.0	45.0	1.0	-50.1	-13.0	-37.1	
2802.00	-10.7	H	3.0	45.1	1.0	-54.8	-13.0	-41.8	
Mid Ch, 707.5MHz									
1415.00	-16.6	V	3.0	45.4	1.0	-61.0	-13.0	-48.0	
2122.50	-9.9	V	3.0	45.0	1.0	-53.8	-13.0	-40.8	
2830.00	-10.6	V	3.0	45.1	1.0	-54.7	-13.0	-41.7	
1415.00	-15.1	H	3.0	45.4	1.0	-59.5	-13.0	-46.5	
2122.50	-8.1	H	3.0	45.0	1.0	-52.1	-13.0	-39.1	
2830.00	-10.5	H	3.0	45.1	1.0	-54.6	-13.0	-41.6	
High Ch, 714.5MHz									
1429.00	-15.8	V	3.0	45.4	1.0	-60.2	-13.0	-47.2	
2143.50	-8.5	V	3.0	45.0	1.0	-52.4	-13.0	-39.4	
2858.00	-10.3	V	3.0	45.1	1.0	-54.4	-13.0	-41.4	
1429.00	-15.2	H	3.0	45.4	1.0	-59.6	-13.0	-46.6	
2143.50	-6.6	H	3.0	45.0	1.0	-50.6	-13.0	-37.6	
2858.00	-10.2	H	3.0	45.1	1.0	-54.3	-13.0	-41.3	

LTE Band 13

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

Company: Samsung
Project #: 4789424849
Date: 2020-03-30
Test Engineer: 20896
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 13 Harmonics, 5MHz Bandwidth

LTE
Band 13
5MHz
QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 779.5MHz									
1559.00	-23.8	V	3.0	40.7	1.0	-63.5	-40.0	-23.5	
2338.50	-12.8	V	3.0	41.1	1.0	-52.9	-13.0	-39.9	
3118.00	-10.2	V	3.0	42.0	1.0	-51.2	-13.0	-38.2	
1559.00	-24.3	H	3.0	40.7	1.0	-64.0	-40.0	-24.0	
2338.50	-12.8	H	3.0	41.1	1.0	-52.9	-13.0	-39.9	
3118.00	-9.7	H	3.0	42.0	1.0	-50.7	-13.0	-37.7	
Mid Ch, 782MHz									
1564.00	-26.0	V	3.0	40.7	1.0	-65.6	-40.0	-25.6	
2346.00	-13.0	V	3.0	41.1	1.0	-53.1	-13.0	-40.1	
3128.00	-10.6	V	3.0	42.0	1.0	-51.6	-13.0	-38.6	
1564.00	-24.6	H	3.0	40.7	1.0	-64.3	-40.0	-24.3	
2346.00	-13.1	H	3.0	41.1	1.0	-53.2	-13.0	-40.2	
3128.00	-10.1	H	3.0	42.0	1.0	-51.2	-13.0	-38.2	
High Ch, 784.5MHz									
1569.00	-28.0	V	3.0	40.7	1.0	-67.7	-40.0	-27.7	
2353.50	-12.4	V	3.0	41.1	1.0	-52.5	-13.0	-39.5	
3138.00	-9.8	V	3.0	42.0	1.0	-50.8	-13.0	-37.8	
1569.00	-28.8	H	3.0	40.7	1.0	-68.4	-40.0	-28.4	
2353.50	-11.8	H	3.0	41.1	1.0	-51.9	-13.0	-38.9	
3138.00	-9.5	H	3.0	42.0	1.0	-50.6	-13.0	-37.6	

Note : No narrowband emissions so only applied the -70dBW/MHz (-40dBm/MHz) wideband emission limit for the 1559-1610 MHz band

LTE Band 66

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

Company: Samsung
Project #: 4789424849
Date: 2020-03-31
Test Engineer: 20890
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 Harmonics, 20MHz Bandwidth

LTE

Band 66

20MHz
QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1720MHz									
3440.00	-9.4	V	3.0	42.0	1.0	-50.4	-13.0	-37.4	
5160.00	-8.5	V	3.0	42.8	1.0	-50.3	-13.0	-37.3	
6880.00	-6.5	V	3.0	42.7	1.0	-48.2	-13.0	-35.2	
3440.00	-9.2	H	3.0	42.0	1.0	-50.2	-13.0	-37.2	
5160.00	-8.4	H	3.0	42.8	1.0	-50.2	-13.0	-37.2	
6880.00	-6.4	H	3.0	42.7	1.0	-48.1	-13.0	-35.1	
Mid Ch, 1745MHz									
3490.00	-9.1	V	3.0	42.0	1.0	-50.2	-13.0	-37.2	
5235.00	-8.5	V	3.0	42.8	1.0	-50.3	-13.0	-37.3	
6980.00	-6.2	V	3.0	42.7	1.0	-47.8	-13.0	-34.8	
3490.00	-9.0	H	3.0	42.0	1.0	-50.1	-13.0	-37.1	
5235.00	-8.4	H	3.0	42.8	1.0	-50.2	-13.0	-37.2	
6980.00	-6.1	H	3.0	42.7	1.0	-47.7	-13.0	-34.7	
High Ch, 1770MHz									
3540.00	-8.1	V	3.0	42.0	1.0	-49.2	-13.0	-36.2	
5310.00	-8.1	V	3.0	42.8	1.0	-49.9	-13.0	-36.9	
7080.00	-6.2	V	3.0	42.6	1.0	-47.8	-13.0	-34.8	
3540.00	-8.0	H	3.0	42.0	1.0	-49.0	-13.0	-36.0	
5310.00	-8.0	H	3.0	42.8	1.0	-49.9	-13.0	-36.9	
7080.00	-6.1	H	3.0	42.6	1.0	-47.7	-13.0	-34.7	

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.

NR Band n2

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

Company: Samsung
Project #: 4789424849
Date: 2020-04-28
Test Engineer: 20882
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 1
Mode: LTE_QPSK NR n2 Harmonics, 10MHz Bandwidth

NR

Band n2

10MHz
QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1855MHz									
3710.00	4.9	V	3.0	45.4	1.0	-39.5	-13.0	-26.5	
5565.00	-2.3	V	3.0	45.3	1.0	-46.6	-13.0	-33.6	
7420.00	-3.1	V	3.0	44.1	1.0	-46.2	-13.0	-33.2	
3710.00	7.9	H	3.0	45.4	1.0	-36.5	-13.0	-23.5	
5565.00	-2.6	H	3.0	45.3	1.0	-46.9	-13.0	-33.9	
7420.00	-2.2	H	3.0	44.1	1.0	-45.3	-13.0	-32.3	
Mid Ch, 1880MHz									
3760.00	3.3	V	3.0	45.4	1.0	-41.2	-13.0	-28.2	
5640.00	-3.1	V	3.0	45.3	1.0	-47.4	-13.0	-34.4	
7520.00	-3.3	V	3.0	44.1	1.0	-46.4	-13.0	-33.4	
3760.00	5.8	H	3.0	45.4	1.0	-38.6	-13.0	-25.6	
5640.00	-3.0	H	3.0	45.3	1.0	-47.3	-13.0	-34.3	
7520.00	-2.5	H	3.0	44.1	1.0	-45.6	-13.0	-32.6	
High Ch, 1905MHz									
3810.00	3.8	V	3.0	45.4	1.0	-40.6	-13.0	-27.6	
5715.00	5.8	V	3.0	45.3	1.0	-38.5	-13.0	-25.5	
7620.00	-0.1	V	3.0	44.0	1.0	-43.1	-13.0	-30.1	
3810.00	6.2	H	3.0	45.4	1.0	-38.2	-13.0	-25.2	
5715.00	4.8	H	3.0	45.3	1.0	-39.5	-13.0	-26.5	
7620.00	1.3	H	3.0	44.0	1.0	-41.7	-13.0	-28.7	