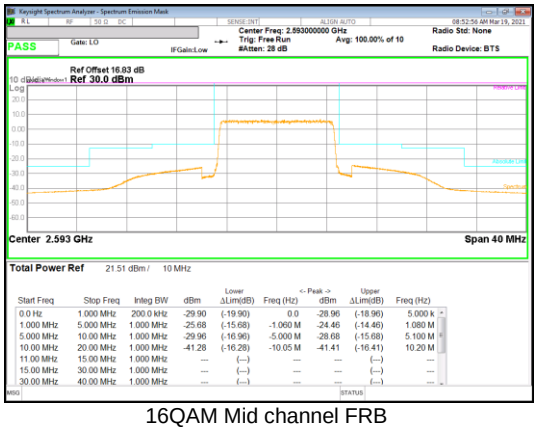
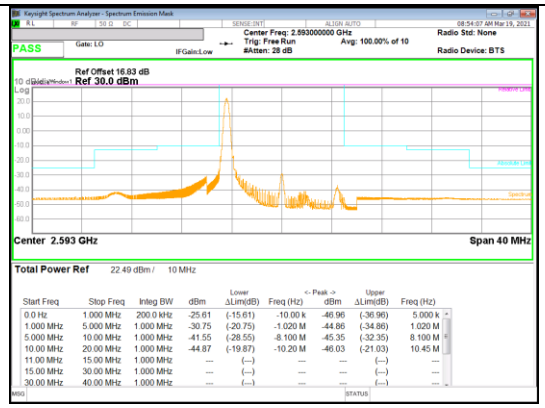
10MHz



16QAM Mid channel FRB



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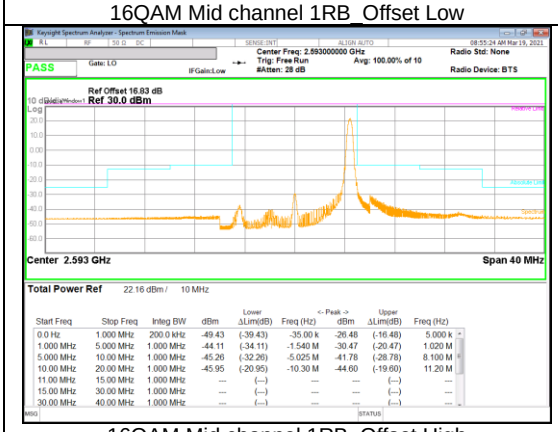

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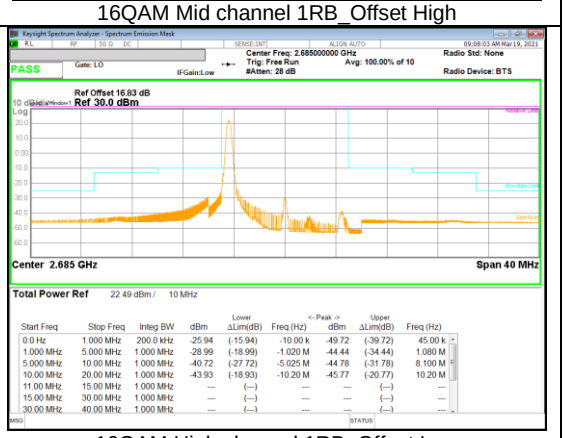
16QAM High channel FRB



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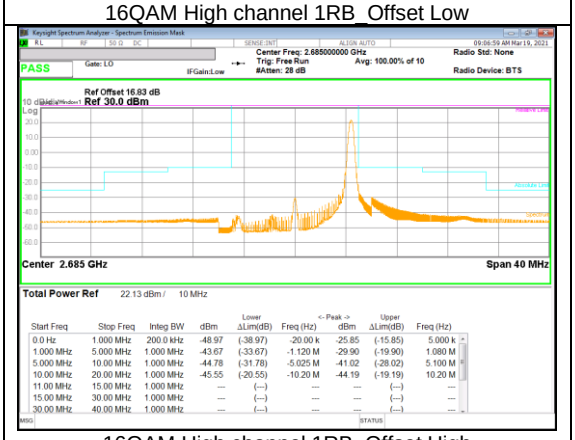

16QAM High channel 1RB_Offset High

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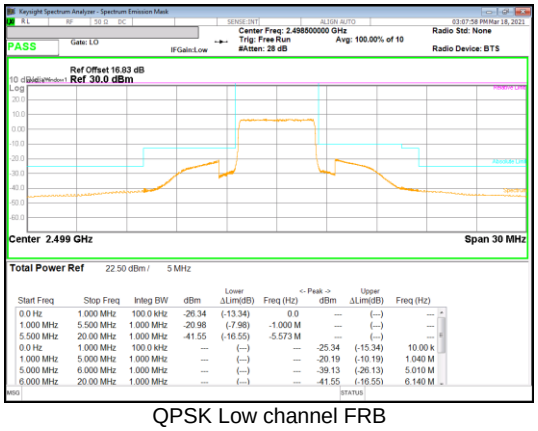
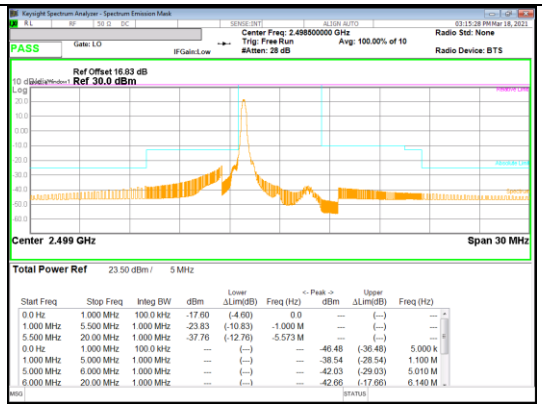
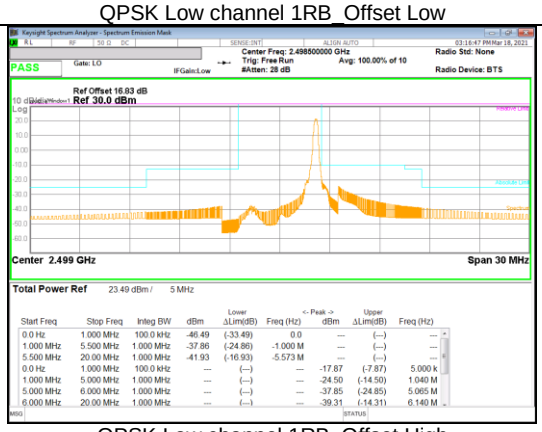
5MHz



QPSK Low channel FRB



QPSK Low channel 1RB_Offset Low



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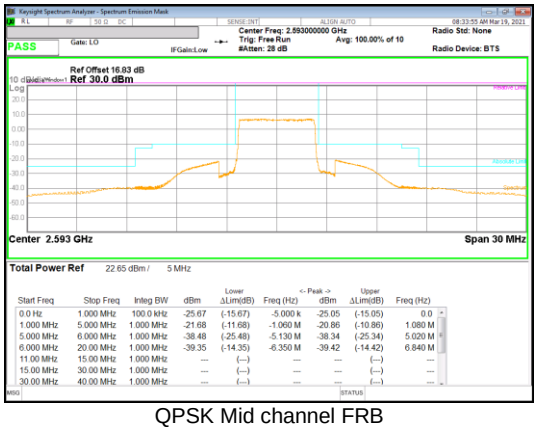
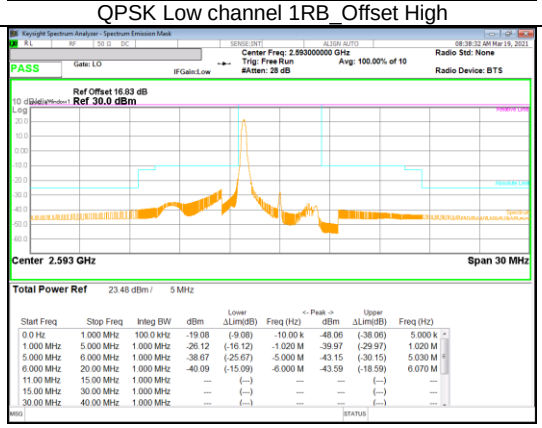


QPSK Mid channel FRB



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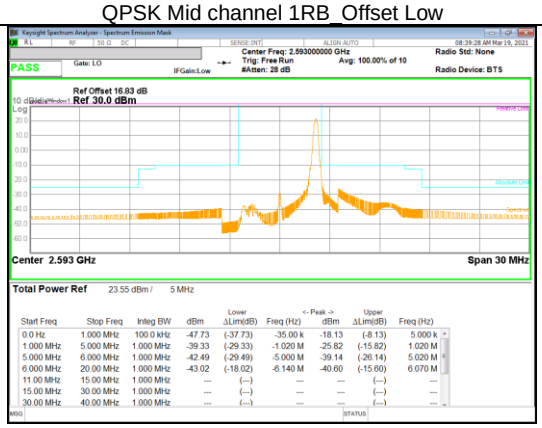

QPSK Mid channel 1RB_Offset High

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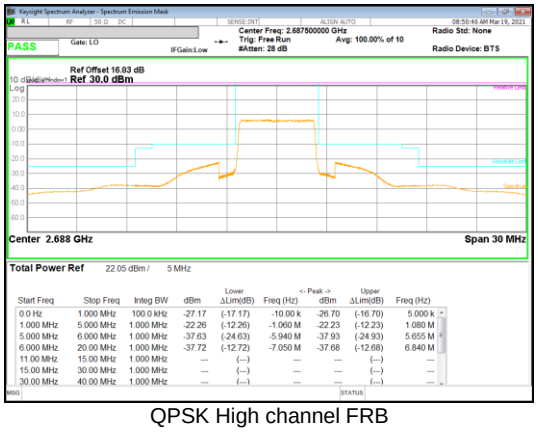
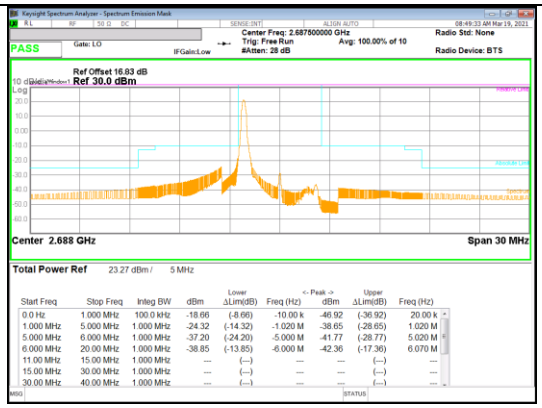
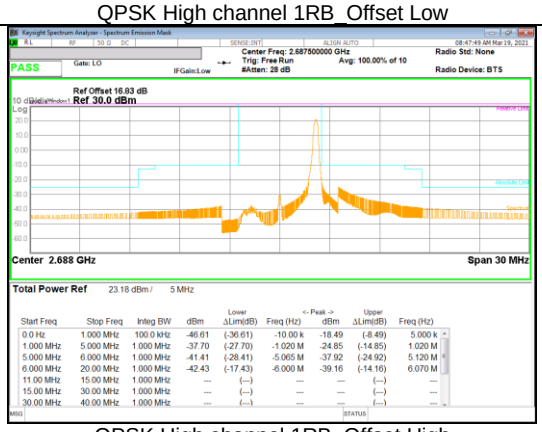
5MHz



QPSK High channel FRB

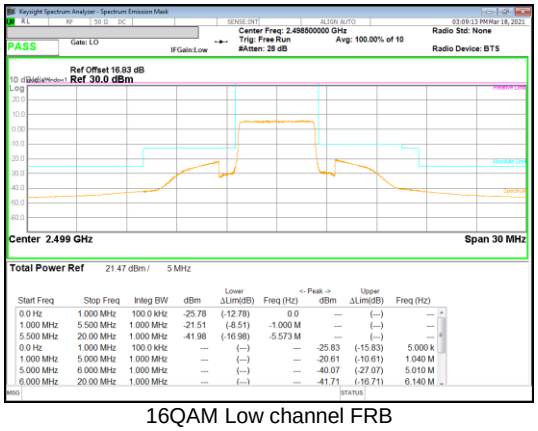


QPSK High channel 1RB_Offset Low

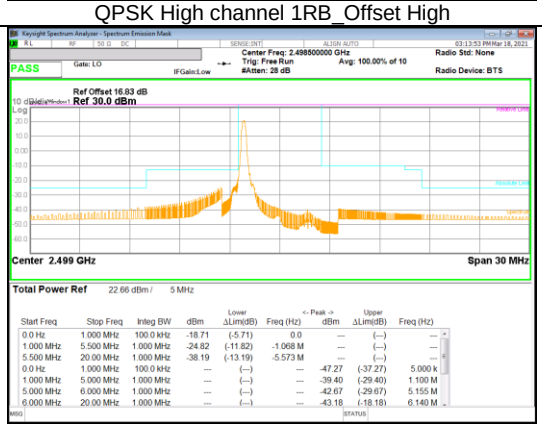


QPSK High channel 1RB_Offset High

5MHz



16QAM Low channel FRB



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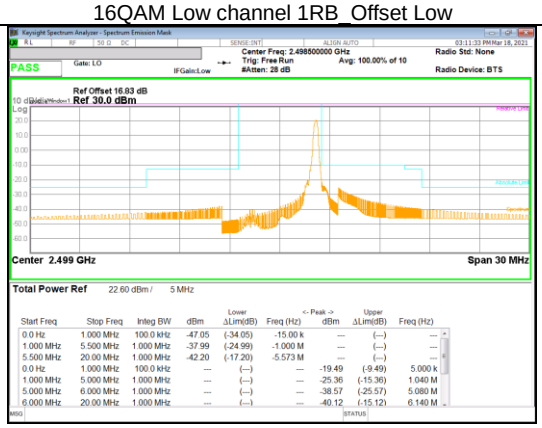

16QAM Low channel 1RB_Offset High

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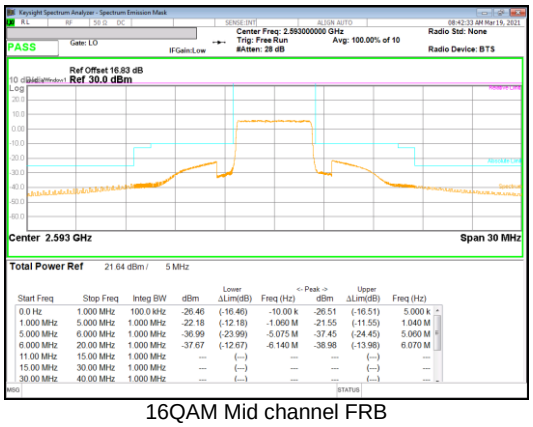
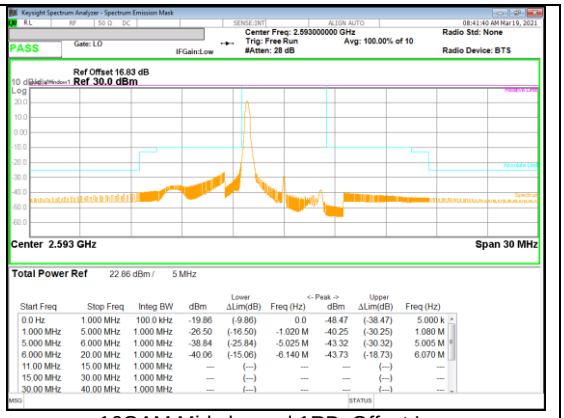
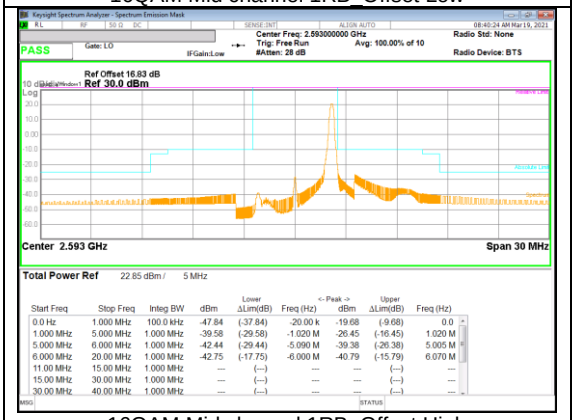
5MHz



16QAM Mid channel FRB



16QAM Mid channel 1RB_Offset Low



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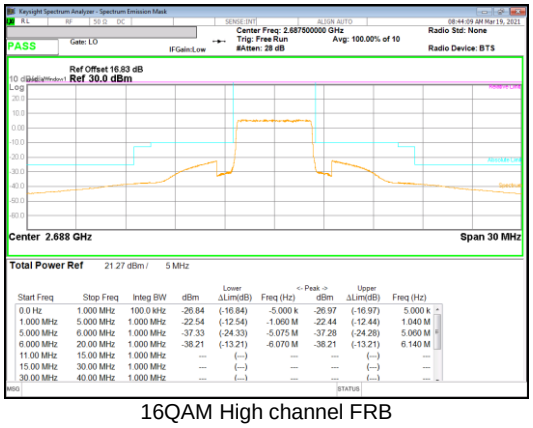
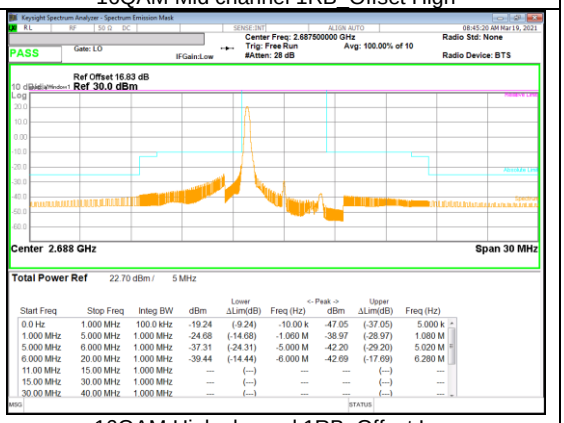
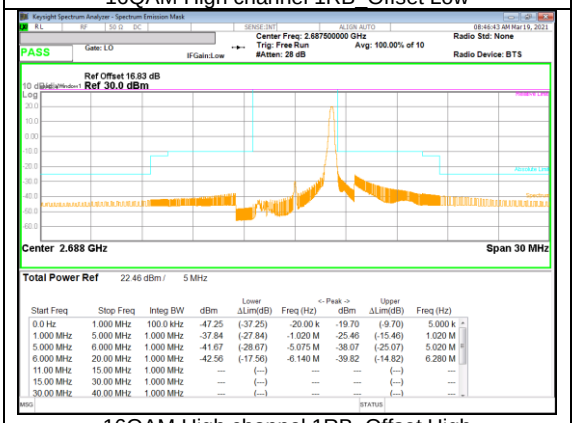


16QAM High channel FRB



16QAM High channel 1RB_Offset Low



16QAM High channel 1RB_Offset High

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LTE Band 2

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

LTE Band 4

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

LTE Band 5

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

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

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9.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §27.53 and §90.691

LIMITS

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

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

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

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

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

Part 90.691(a):

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

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

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

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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) Sweep time = auto couple;

d) Detector = RMS;

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

f) Trace mode = Average(FDD), Max hold(TDD);

NOTE

5GNR: All waveforms(CP-OFDM vs DFT-OFDM) were investigated to determine the worst case configuration. All mode of operation were investigated and the worst case configuration results are reported in tis section

RESULTS

See the following pages.

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

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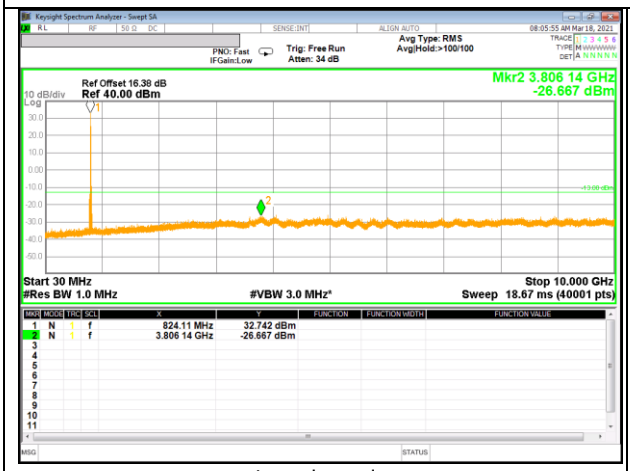
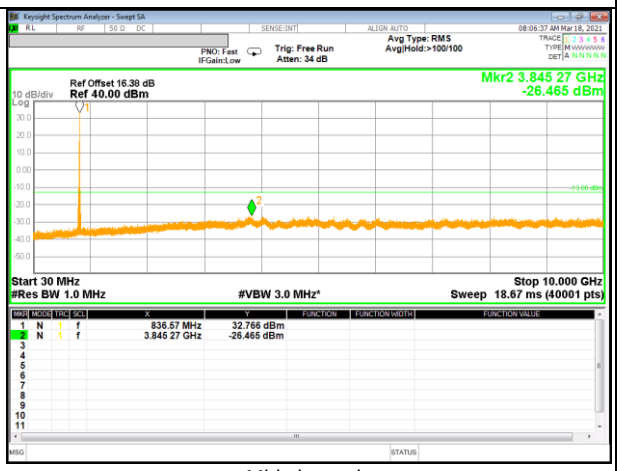
9.3.1. OUT OF BAND EMISSIONS RESULT

GSM

850 GPRS



Low channel



Mid channel

High channel

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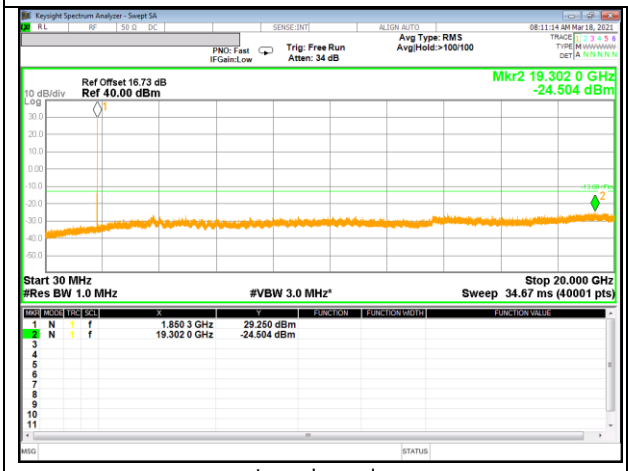
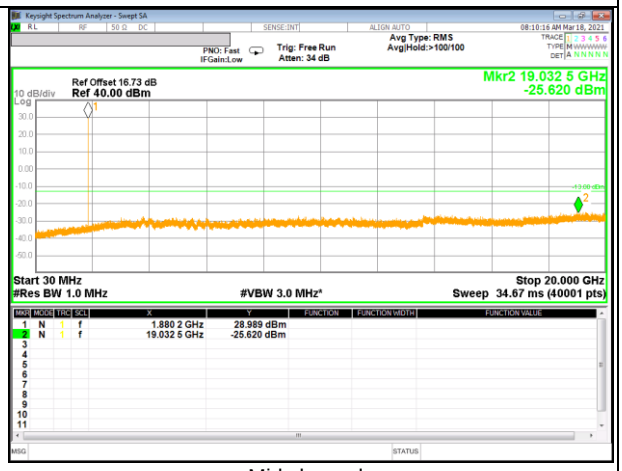
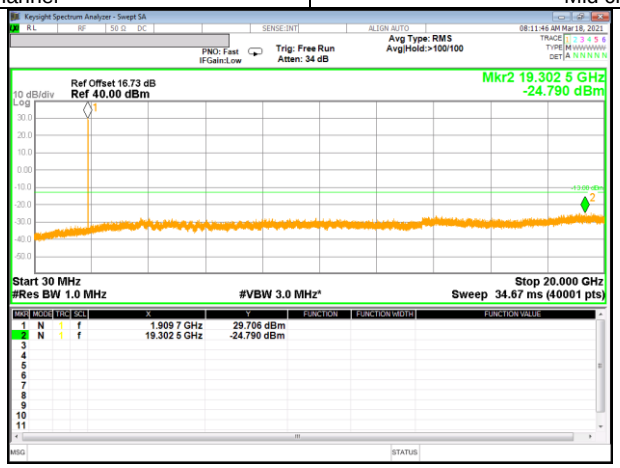
1900 GPRS



Low channel



Mid channel



High channel

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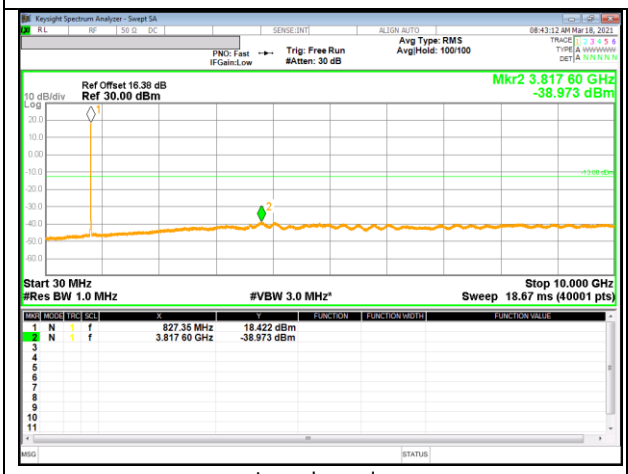
WCDMA

B5 REL99



Low channel

Mid channel

High channel

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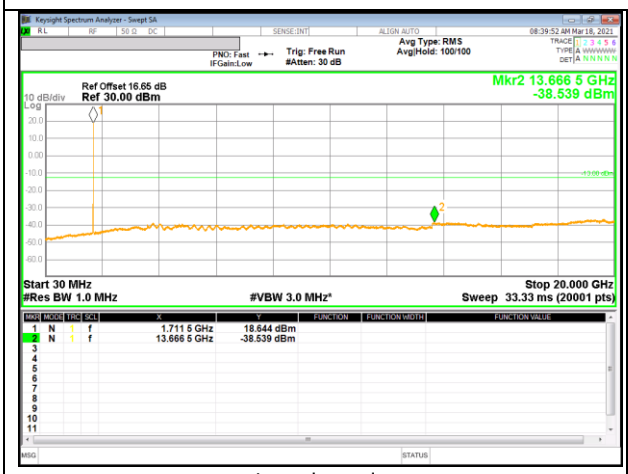
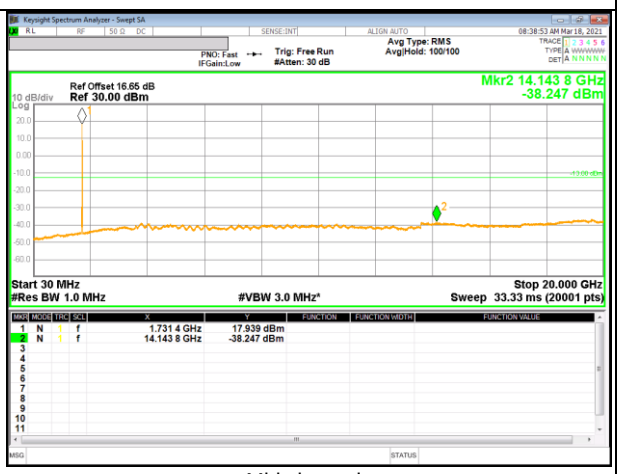
B4 REL99



Low channel



Mid channel

High channel

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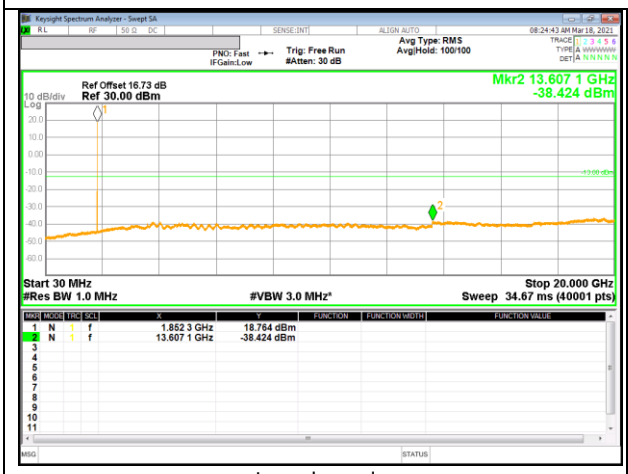
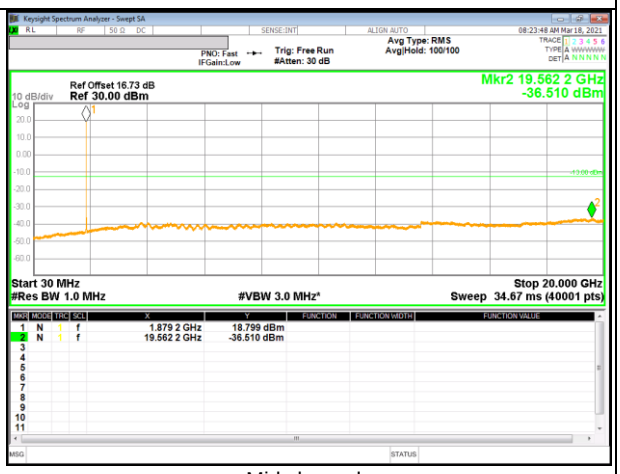
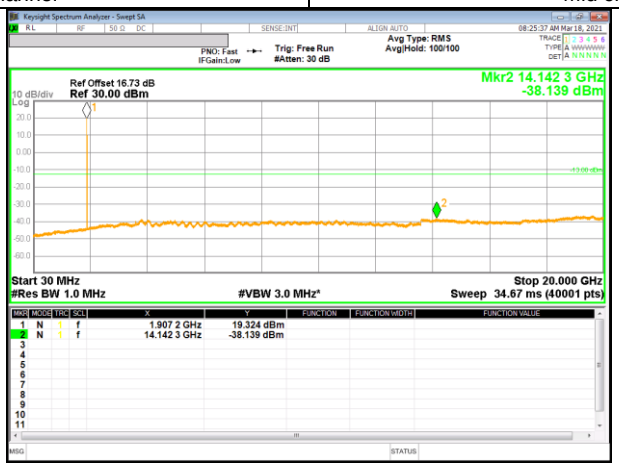
B2 REL99



Low channel



Mid channel



High channel

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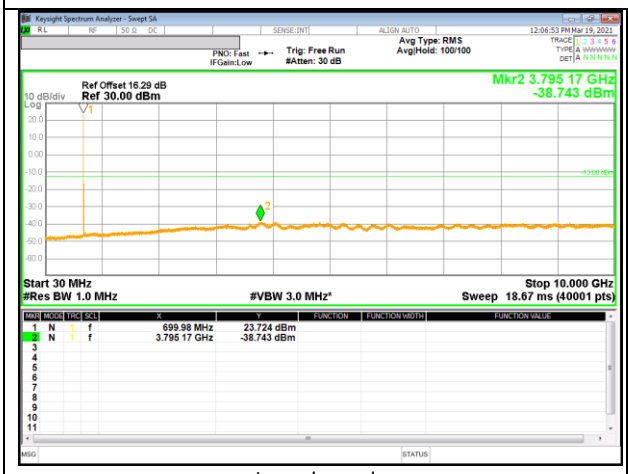
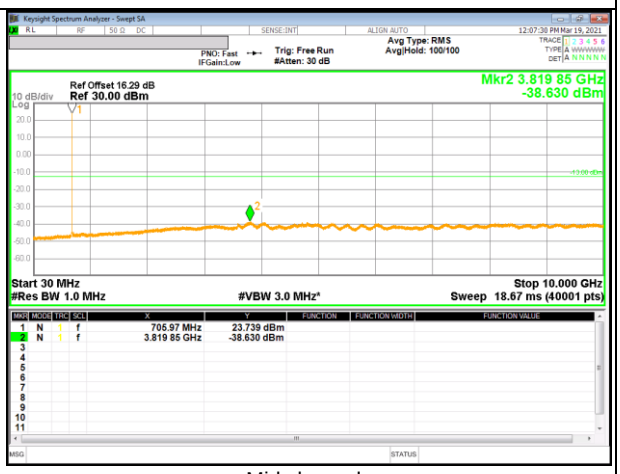
LTE Band 12

5 MHz QPSK



Low channel



Mid channel

High channel

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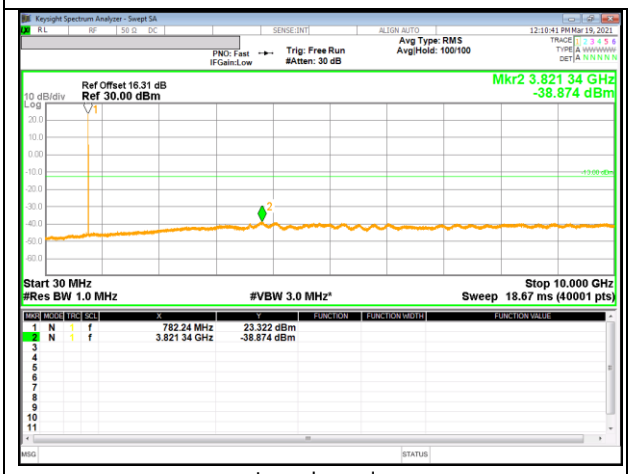
LTE Band 13

5 MHz QPSK



Low channel

Mid channel

High channel

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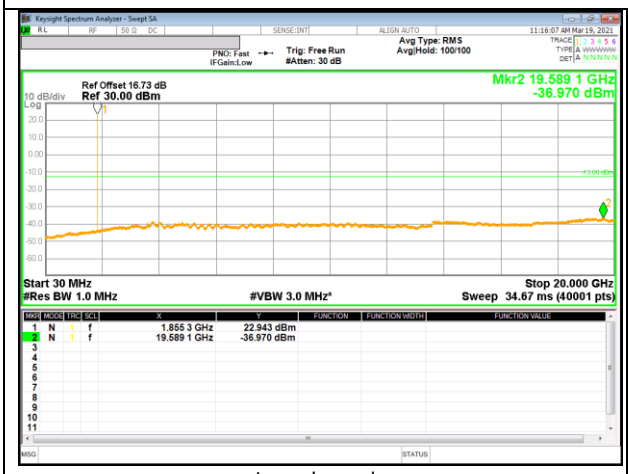
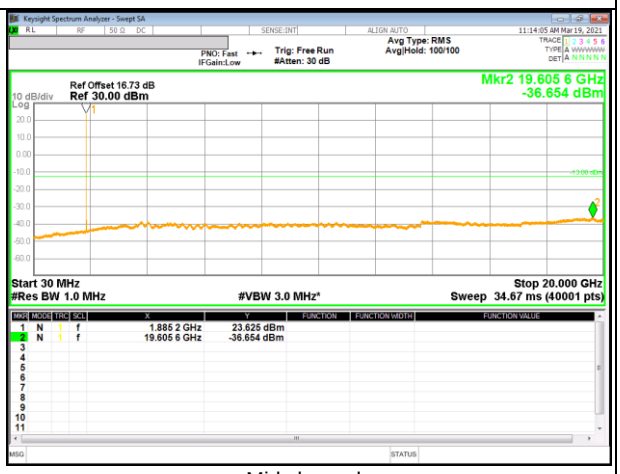
LTE Band 25

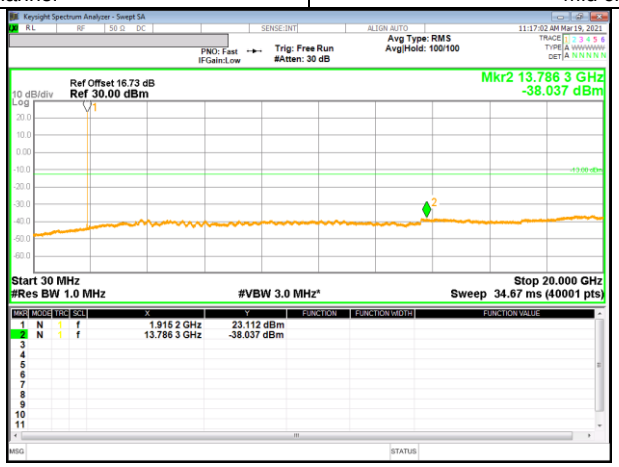
5 MHz QPSK



Low channel



Mid channel



High channel

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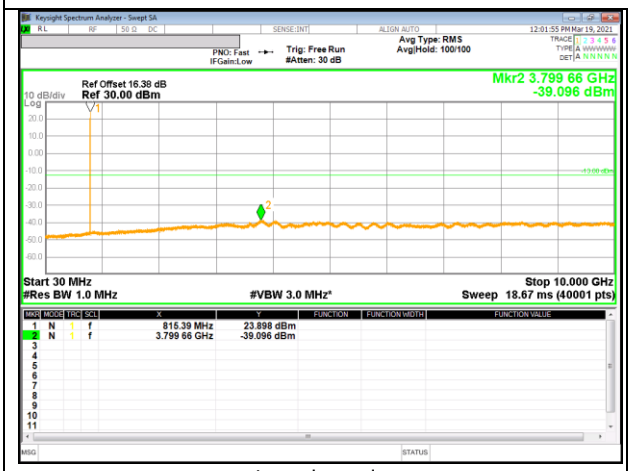
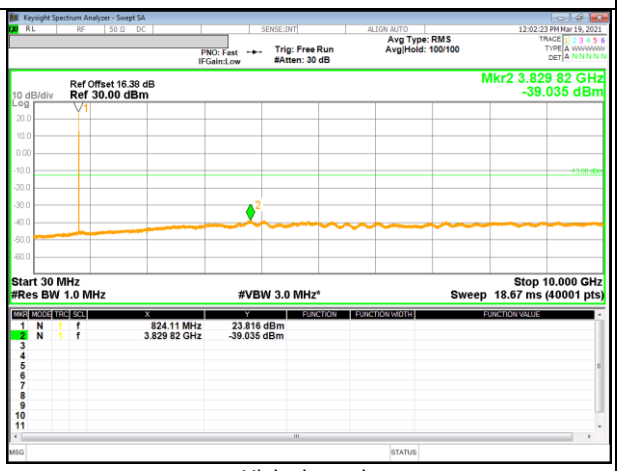
LTE Band 26 (Part 90)

1.4 MHz QPSK



Low channel



High channel

LTE Band 26 (Straddle)

5 MHz QPSK

Mid channel

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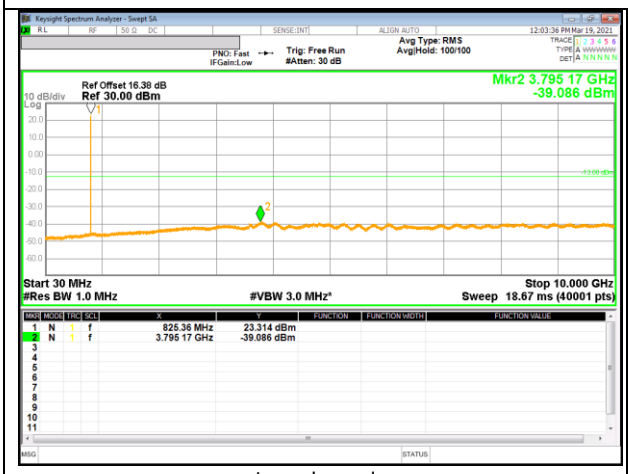
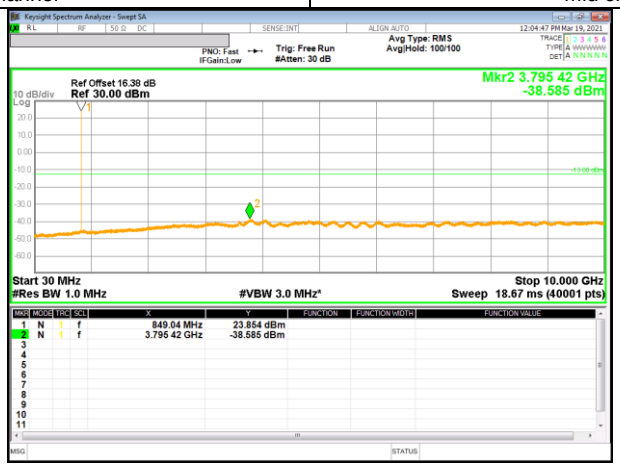
LTE Band 26 (Part 22)

1.4 MHz QPSK



Low channel

Mid channel



High channel

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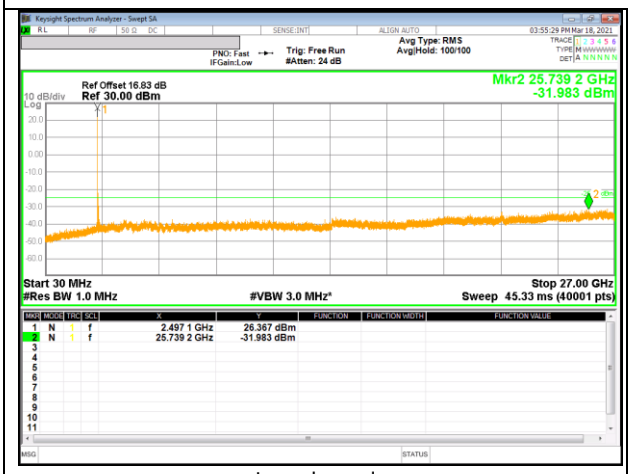
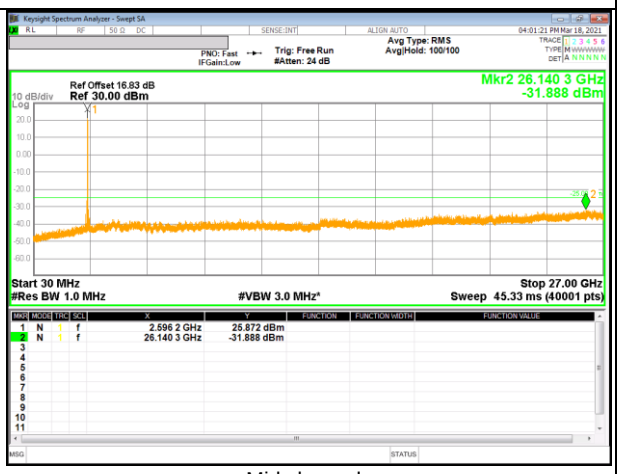
LTE Band 41

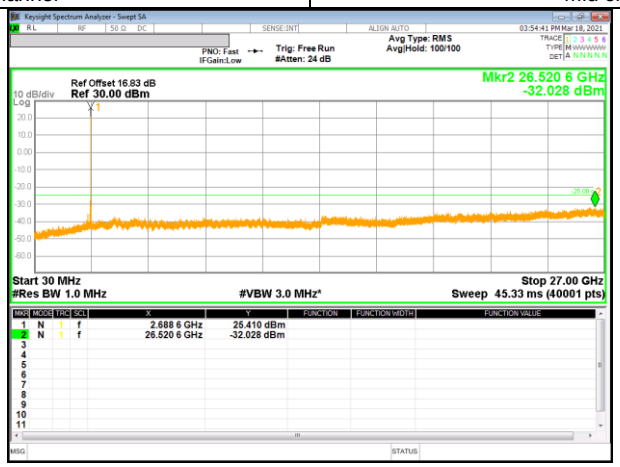
5 MHz QPSK5



Low channel



Mid channel



High channel

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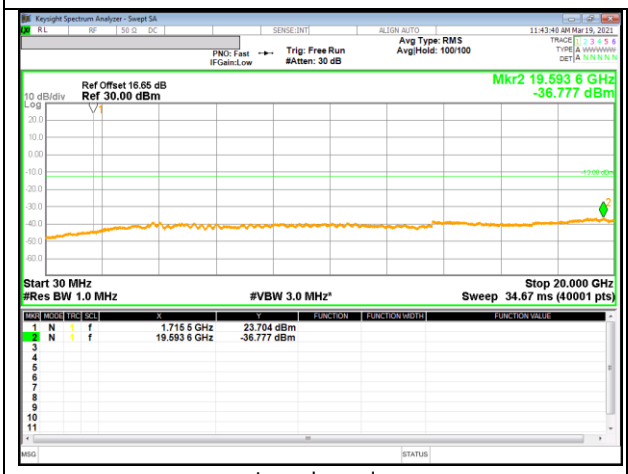
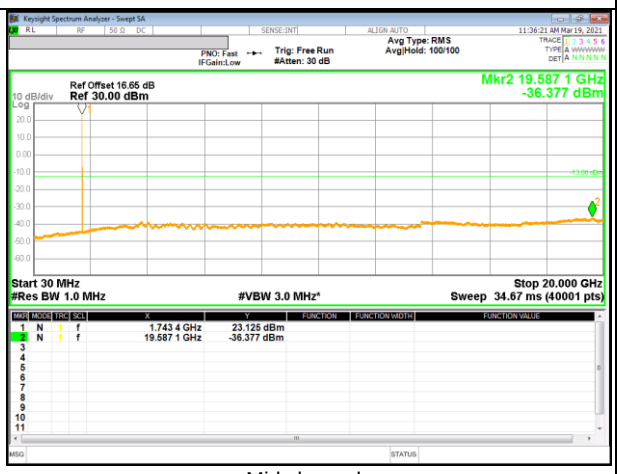
LTE Band 66

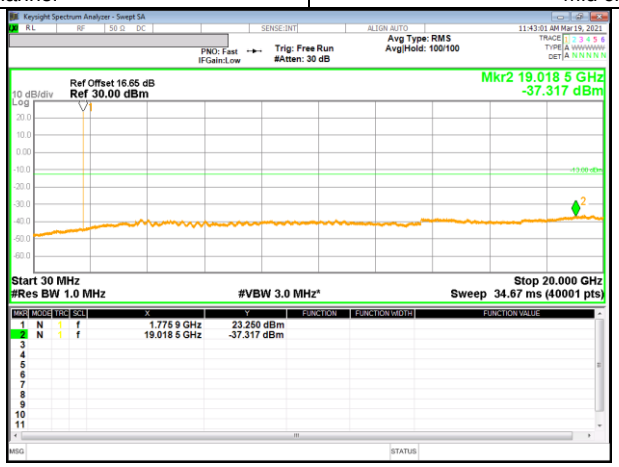
5 MHz QPSK



Low channel



Mid channel



High channel

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LTE Band 2

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

LTE Band 4

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

LTE Band 5

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

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

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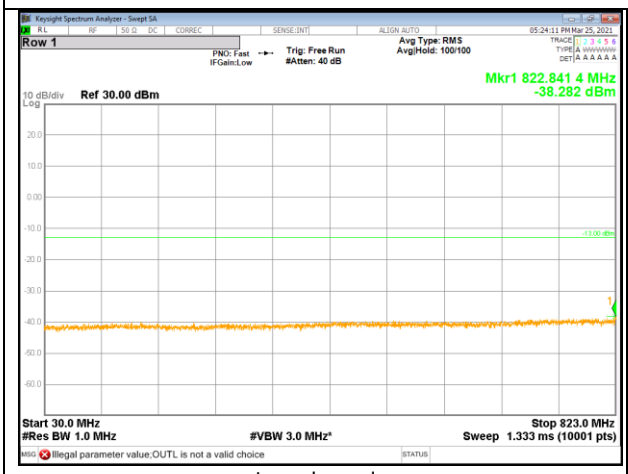
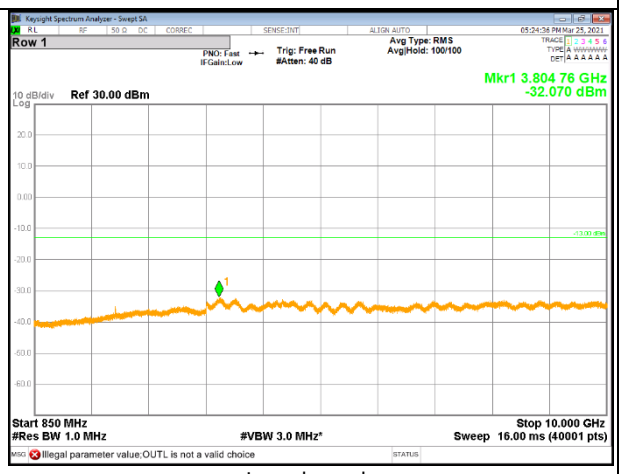
NR Band 5

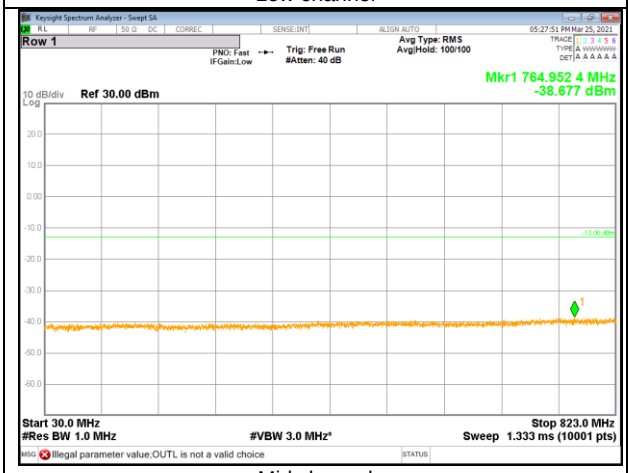
20 MHz QPSK



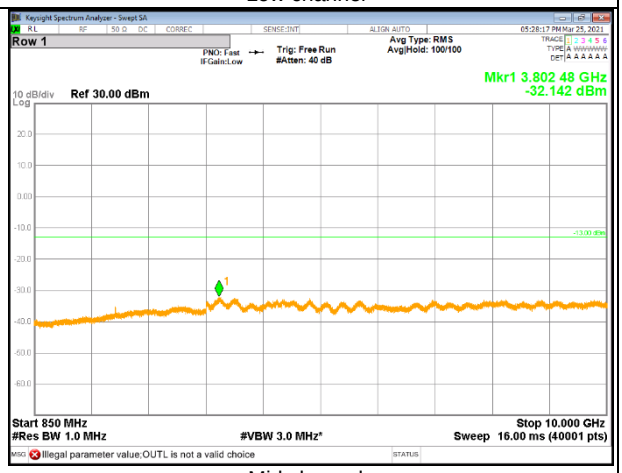
Low channel



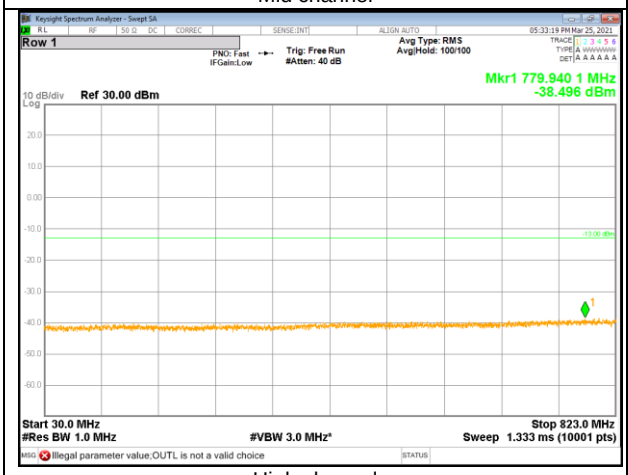
Low channel



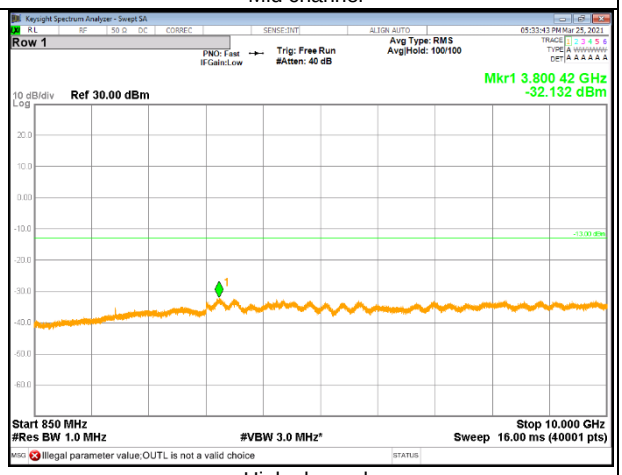
Mid channel



Mid channel



High channel



High channel

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9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235,§27.54 and §90.213

LIMITS

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

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

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

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

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

RESULTS

See the following pages.

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

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9.4.1. FREQUENCY STABILITY RESULTS

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

Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2060.500	Hz	High Channel	2122.000	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	50	824.20009027	-0.007	848.80010128	-0.004	2.5
3.86	40	824.20008850	-0.005	848.80009050	0.009	2.5
3.86	30	824.20008910	-0.005	848.80009480	0.004	2.5
3.86	***20***	***824.20008460***	***0.000***	***848.80009791***	***0.000***	***2.5***
3.86	10	824.20003805	0.056	848.80003587	0.073	2.5
3.86	0	824.20004201	0.052	848.80004412	0.063	2.5
3.86	-10	824.20007785	0.008	848.80011361	-0.018	2.5
3.86	-20	824.20009284	-0.010	848.80009438	0.004	2.5
3.86	-30	824.20009532	-0.013	848.80010196	-0.005	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				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.65	***20***		***0***	**848.80009791**	***0***	***2.5***
4.40	20	824.20000528	-1000000.006	848.80004292	0.065	2.5
3.65	20	824.20001375	-1000000.017	848.80001255	0.101	2.5

GSM 1900, Channel 512/810, Frequency 1850.0/1910.0 MHz (Lowest Frequency:EGPRS / 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	1850.0766	1909.9215		
Extreme (50C)		1850.0766	1909.9215	25.9	0.014
Extreme (40C)		1850.0766	1909.9215	26.1	0.014
Extreme (30C)		1850.0766	1909.9215	30.2	0.016
Extreme (10C)		1850.0766	1909.9215	27.3	0.015
Extreme (0C)		1850.0766	1909.9215	37.7	0.020
Extreme (-10C)		1850.0766	1909.9216	62.4	0.033
Extreme (-20C)		1850.0767	1909.9216	128.7	0.068
Extreme (-30C)		1850.0768	1909.9217	213.6	0.114
20C	15%	1850.0766	1909.9215	8.9	0.005
	-15%	1850.0766	1909.9215	8.4	0.004
	End Point	1850.0766	1909.9215	8.4	0.004

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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]	
3.86	50	826.40001858	0.002	846.60005469	-0.043	2.5
3.86	40	826.40002063	-0.001	846.60004820	-0.035	2.5
3.86	30	826.40002142	-0.002	846.60002480	-0.007	2.5
3.86	***20***	***826.40002000***	***0.000***	***846.60001848***	***0.000***	***2.5***
3.86	10	826.40002015	0.000	846.60002484	-0.008	2.5
3.86	0	826.40001812	0.002	846.60002135	-0.003	2.5
3.86	-10	826.40002236	-0.003	846.60007023	-0.061	2.5
3.86	-20	826.40002881	-0.011	846.60004881	-0.036	2.5
3.86	-30	826.40002091	-0.001	846.60005353	-0.041	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***	**826.40002000**	***0***	**846.60001848**	***0***	***2.5***
4.40	20	826.40000337	0.020	846.60000263	0.019	2.5
3.65	20	826.40000330	0.020	846.60000338	0.018	2.5

WCDMA Band 4(Lowest Frequency: Rel99 / Highest Frequency: Rel99)

Limit		1710	1755	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1712.4000	1754.6763		
Extreme (50C)		1712.4000	1754.6763	28.6	0.017
Extreme (40C)		1712.4000	1754.6763	29.2	0.017
Extreme (30C)		1712.4000	1754.6763	30.5	0.018
Extreme (10C)		1712.4000	1754.6763	31.9	0.018
Extreme (0C)		1712.4000	1754.6763	28.1	0.016
Extreme (-10C)		1712.4000	1754.6763	32.1	0.019
Extreme (-20C)		1712.4000	1754.6763	28.6	0.017
Extreme (-30C)		1712.4000	1754.6763	32.7	0.019
20C	15%	1712.4000	1754.6763	9.1	0.005
	-15%	1712.4000	1754.6763	10.1	0.006
	End Point	1712.4000	1754.6763	10.2	0.006

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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	1850.3179	1909.6771		
Extreme (50C)		1850.3179	1909.6771	35.0	0.019
Extreme (40C)		1850.3179	1909.6771	33.6	0.018
Extreme (30C)		1850.3179	1909.6771	25.8	0.014
Extreme (10C)		1850.3179	1909.6771	17.9	0.010
Extreme (0C)		1850.3179	1909.6771	26.6	0.014
Extreme (-10C)		1850.3179	1909.6771	31.3	0.017
Extreme (-20C)		1850.3179	1909.6771	31.0	0.016
Extreme (-30C)		1850.3179	1909.6771	33.7	0.018
20C	15%	1850.3179	1909.6771	8.8	0.005
	-15%	1850.3179	1909.6771	6.3	0.003
	End Point	1850.3179	1909.6771	7.8	0.004

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	699.1563	715.8418		
Extreme (50C)		699.1563	715.8418	11.5	0.016
Extreme (40C)		699.1563	715.8418	10.6	0.015
Extreme (30C)		699.1563	715.8418	8.9	0.013
Extreme (10C)		699.1563	715.8418	8.8	0.012
Extreme (0C)		699.1563	715.8418	25.0	0.035
Extreme (-10C)		699.1563	715.8418	17.9	0.025
Extreme (-20C)		699.1563	715.8418	7.7	0.011
Extreme (-30C)		699.1563	715.8418	11.8	0.017
20C	15%	699.1563	715.8418	4.9	0.007
	-15%	699.1563	715.8418	4.5	0.006
	End Point	699.1563	715.8418	27.5	0.039

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

Limit		777	787	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	777.2516	786.7468		
Extreme (50C)		777.2516	786.7468	21.6	0.028
Extreme (40C)		777.2516	786.7468	19.0	0.024
Extreme (30C)		777.2516	786.7468	18.3	0.023
Extreme (10C)		777.2516	786.7468	19.2	0.025
Extreme (0C)		777.2516	786.7468	24.1	0.031
Extreme (-10C)		777.2516	786.7468	21.2	0.027
Extreme (-20C)		777.2516	786.7468	16.8	0.021
Extreme (-30C)		777.2516	786.7468	15.4	0.020
20C	15%	777.2516	786.7468	14.0	0.018
	-15%	777.2516	786.7468	14.1	0.018
	End Point	777.2516	786.7468	13.1	0.017

LTE Band 25 (Lowest Frequency:16QAM / Highest Frequency: QPSK)

Limit		1850	1915	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.1593	1914.8439		
Extreme (50C)		1850.1593	1914.8439	54.6	0.029
Extreme (40C)		1850.1593	1914.8439	52.8	0.028
Extreme (30C)		1850.1593	1914.8439	53.1	0.028
Extreme (10C)		1850.1593	1914.8439	63.0	0.033
Extreme (0C)		1850.1593	1914.8439	23.1	0.012
Extreme (-10C)		1850.1593	1914.8439	13.7	0.007
Extreme (-20C)		1850.1593	1914.8439	49.0	0.026
Extreme (-30C)		1850.1593	1914.8439	55.8	0.030
20C	15%	1850.1593	1914.8439	29.0	0.015
	-15%	1850.1593	1914.8439	8.6	0.005
	End Point	1850.1593	1914.8439	7.7	0.004

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LTE Band 26

Reference Frequency : LTE Band 26 Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2036.750	Hz	High Channel	2120.750	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	50	814.70005620	0.000	848.30009050	-0.035	2.5
3.86	40	814.70005415	0.003	848.30005680	0.005	2.5
3.86	30	814.70003309	0.028	848.30006208	-0.001	2.5
3.86	***20***	***814.70005624***	***0.000***	***848.30006113***	***0.000***	***2.5***
3.86	10	814.70005817	-0.002	848.30008348	-0.026	2.5
3.86	0	814.70005408	0.003	848.30007312	-0.014	2.5
3.86	-10	814.70001978	0.045	848.30002124	0.047	2.5
3.86	-20	814.70003255	0.029	848.30009859	-0.044	2.5
3.86	-30	814.70001607	0.049	848.30009457	-0.039	2.5

Reference Frequency : LTE Band 26 Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2036.750	Hz	High Channel	2120.750	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	**814.70005624**	***0***	**848.30006113**	***0***	***2.5***
4.40	20	814.70001130	0.055	848.30001372	0.056	2.5
3.65	20	814.70001270	0.053	848.30001413	0.055	2.5

LTE Band 41 (Lowest Frequency: 16QAM / Highest Frequency: 16QAM)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2496.2512	2689.7440		
Extreme (50C)		2496.2512	2689.7440	20.5	0.008
Extreme (40C)		2496.2512	2689.7440	21.9	0.008
Extreme (30C)		2496.2512	2689.7440	18.7	0.007
Extreme (10C)		2496.2512	2689.7440	19.8	0.008
Extreme (0C)		2496.2512	2689.7440	22.4	0.009
Extreme (-10C)		2496.2512	2689.7440	10.8	0.004
Extreme (-20C)		2496.2512	2689.7440	18.6	0.007
Extreme (-30C)		2496.2512	2689.7440	21.9	0.008
20C	15%	2496.2512	2689.7440	10.9	0.004
	-15%	2496.2512	2689.7440	11.3	0.004
	End Point	2496.2512	2689.7440	13.8	0.005

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

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.1566	1779.8414		
Extreme (50C)		1710.1566	1779.8414	55.0	0.032
Extreme (40C)		1710.1566	1779.8414	64.9	0.037
Extreme (30C)		1710.1567	1779.8415	103.2	0.059
Extreme (10C)		1710.1566	1779.8414	66.9	0.038
Extreme (0C)		1710.1566	1779.8414	54.8	0.031
Extreme (-10C)		1710.1567	1779.8415	104.2	0.060
Extreme (-20C)		1710.1567	1779.8415	120.1	0.069
Extreme (-30C)		1710.1566	1779.8414	98.5	0.056
20C	15%	1710.1566	1779.8414	6.4	0.004
	-15%	1710.1566	1779.8414	6.5	0.004
	End Point	1710.1567	1779.8414	6.8	0.004

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LTE Band 2

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

LTE Band 4

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

LTE Band 5

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

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

NR Band 5 (SCS 15kHz)

NR Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 5 (Frequency range: 824-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

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9.5. RADIATED POWER (ERP & EIRP)

RULE PART(S)

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

LIMITS

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

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

27.50:

(a)(3) Mobile and portable stations. (i) For mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth. For mobile and portable stations using time division duplexing (TDD) technology, the duty cycle must not exceed 38 percent in the 2305-2315 MHz and 2350-2360 MHz bands. Mobile and portable stations using FDD technology are restricted to transmitting in the 2305-2315 MHz band. Power averaging shall not include intervals in which the transmitter is off.

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

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

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

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

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

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

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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 ≥ 2 x span/RBW;

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

NOTE

5GNR: All waveforms(CP-OFDM vs DFT-OFDM) were investigated to determine the worst case configuration. All mode of operation were investigated and the worst case configuration results are reported in tis section.

TEST RESULTS

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9.5.1. ERP/EIRP Results

GSM

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
GSM850	GPRS	128	824.2	**32.32**	**1706.08**
		190	836.6	31.57	1435.49
		251	848.8	30.80	1202.26
	EGPRS	128	824.2	**29.21**	**833.68**
		190	836.6	28.92	779.83
		251	848.8	27.76	597.04
GSM1900	GPRS	512	1850.2	30.63	1156.11
		661	1880.0	**31.70**	**1479.11**
		810	1909.8	30.57	1140.25
	EGPRS	512	1850.2	27.68	586.14
		661	1880.0	**28.81**	**760.33**
		810	1909.8	27.32	539.51

WCDMA

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
Band 5	REL99	4132	826.4	21.21	132.13
		4183	836.6	22.20	165.96
		4233	846.6	**22.57**	**180.72**
	HSDPA	4132	826.4	20.76	119.12
		4183	836.6	21.44	139.32
		4233	846.6	**21.48**	**140.60**
Band 4	REL99	1312	1712.4	22.59	181.55
		1413	1732.6	23.50	223.87
		1513	1752.6	**23.63**	**230.67**
	HSDPA	1312	1712.4	21.59	144.21
		1413	1732.6	22.24	167.49
		1513	1752.6	**22.67**	**184.93**
Band 2	REL99	9262	1852.4	22.06	160.69
		9400	1880.0	23.43	220.29
		9538	1907.6	**23.51**	**224.39**
	HSDPA	9262	1852.4	21.07	127.94
		9400	1880.0	22.41	174.18
		9538	1907.6	**22.63**	**183.23**

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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	1/0	704.0	**20.05**	**101.16**
			1/0	707.5	19.73	93.97
			1/0	711.0	20.00	100.00
		16QAM	1/0	704.0	**19.13**	**81.85**
			1/0	707.5	18.83	76.38
			1/0	711.0	18.83	76.38
	5	QPSK	1/0	701.5	**20.20**	**104.71**
			1/0	707.5	19.95	98.86
			1/0	713.5	19.75	94.41
		16QAM	1/0	701.5	**19.47**	**88.51**
			1/0	707.5	18.82	76.21
			1/0	713.5	18.82	76.21
	3	QPSK	1/8	700.5	**20.11**	**102.57**
			1/0	707.5	19.98	99.54
			1/0	714.5	20.01	100.23
		16QAM	1/0	700.5	18.77	75.34
			1/0	707.5	18.90	77.62
			1/0	714.5	**18.91**	**77.80**
	1.4	QPSK	1/3	699.7	**19.98**	**99.54**
			1/3	707.5	19.91	97.95
			1/3	715.3	18.64	73.11
		16QAM	1/3	699.7	**19.12**	**81.66**
			1/3	707.5	18.48	70.47
			1/3	715.3	17.63	57.94

LTE Band 13

Band	BW [MHz]	Mode	RB size / RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 13	10	QPSK	1/49	782.0	**21.96**	**157.04**
		16QAM	1/0	782.0	21.23	132.74
	5	QPSK	1/24	779.5	**22.08**	**161.44**
			1/24	782.0	21.90	154.88
			1/24	784.5	21.85	153.11
		16QAM	1/24	779.5	**21.08**	**128.23**
			1/24	782.0	21.06	127.64
			1/24	784.5	21.03	126.77

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LTE Band 25

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 25	20	QPSK	1/99	1860.0	**23.58**	**228.03**
			1/49	1882.5	23.10	204.17
			1/0	1905.0	23.42	219.79
		16QAM	1/0	1860.0	**23.33**	**215.28**
			1/49	1882.5	21.86	153.46
			1/0	1905.0	22.40	173.78
	15	QPSK	1/37	1857.5	23.48	222.84
			1/74	1882.5	23.09	203.70
			1/0	1907.5	**23.74**	**236.59**
		16QAM	1/37	1857.5	**22.71**	**186.64**
			1/37	1882.5	21.86	153.46
			1/0	1907.5	22.45	175.79
	10	QPSK	1/25	1855.0	**23.98**	**250.03**
			1/25	1882.5	23.04	201.37
			1/0	1910.0	23.24	210.86
		16QAM	1/25	1855.0	**22.83**	**191.87**
			1/25	1882.5	22.19	165.58
			1/0	1910.0	22.45	175.79
	5	QPSK	1/24	1852.5	**23.72**	**235.50**
			1/24	1882.5	23.22	209.89
			1/24	1912.5	23.19	208.45
		16QAM	1/24	1852.5	**22.95**	**197.24**
			1/24	1882.5	21.78	150.66
			1/24	1912.5	22.43	174.98
	3	QPSK	1/14	1851.5	**23.88**	**244.34**
			1/14	1882.5	22.98	198.61
			1/14	1913.5	23.23	210.38
		16QAM	1/14	1851.5	**22.93**	**196.34**
			1/14	1882.5	22.26	168.27
			1/14	1913.5	22.64	183.65
	1.4	QPSK	1/3	1850.7	**23.75**	**237.14**
			1/3	1882.5	23.23	210.38
			1/3	1914.3	23.20	208.93
		16QAM	1/3	1850.7	**22.53**	**179.06**
			1/3	1882.5	22.04	159.96
			1/3	1914.3	22.11	162.55

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LTE Band 26

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP/EIRP [dBm]	ERP/EIRP [mW]
Band 26	15	QPSK	1/0	821.5	22.63	183.23
			1/0	831.5	**23.89**	**244.91**
			1/0	841.5	23.82	240.99
		16QAM	1/0	821.5	21.72	148.59
			1/0	831.5	**23.40**	**218.78**
			1/0	841.5	22.77	189.23
	10	QPSK	1/0	819.0	22.44	175.39
			1/49	829.0	**23.53**	**225.42**
			1/0	831.5	23.42	219.79
			1/0	844.0	23.24	210.86
		16QAM	1/0	819.0	21.16	130.62
			1/49	829.0	**22.58**	**181.13**
			1/0	831.5	22.39	173.38
			1/0	844.0	22.59	181.55
	5	QPSK	1/12	816.5	21.81	151.71
			1/12	821.5	23.36	216.77
			1/12	826.5	**23.66**	**232.27**
			1/12	831.5	23.18	207.97
			1/0	846.5	22.48	177.01
		16QAM	1/24	816.5	20.95	124.45
			1/12	821.5	22.57	180.72
			1/12	826.5	**22.79**	**190.11**
			1/0	831.5	22.28	169.04
			1/0	846.5	21.62	145.21
	3	QPSK	1/14	815.5	21.65	146.22
			1/8	822.5	23.42	219.79
			1/8	825.5	**23.79**	**239.33**
			1/0	831.5	23.36	216.77
			1/0	847.5	22.19	165.58
		16QAM	1/0	815.5	20.67	116.68
			1/8	822.5	22.85	192.75
			1/8	825.5	**23.17**	**207.49**
			1/14	831.5	22.16	164.44
			1/0	847.5	21.63	145.55
	1.4	QPSK	1/3	814.7	21.49	140.93
			1/3	823.3	23.46	221.82
			1/3	824.7	**23.68**	**233.35**
			1/3	831.5	23.30	213.80
			1/3	848.3	22.34	171.40
		16QAM	1/3	814.7	20.52	112.72
			1/3	823.3	22.22	166.72
			1/3	824.7	**22.77**	**189.23**
			1/3	831.5	22.11	162.55
			1/3	848.3	21.33	135.83

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LTE Band 26 (Straddle)

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP/EIRP [dBm]	ERP/EIRP [mW]
Band 26 Straddle	15	QPSK	1/37	824	23.04	201.37
		16QAM	1/37		22.55	179.89
	10	QPSK	1/49	824	23.44	220.80
		16QAM	1/25		22.94	196.79
	5	QPSK	1/24	824	23.29	213.30
		16QAM	1/24		22.66	184.50
	3	QPSK	1/8	824	23.59	228.56
		16QAM	1/8		22.49	177.42
	1.4	QPSK	1/3	824	23.48	222.84
		16QAM	1/3		22.69	185.78

LTE Band 41

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 41	20	QPSK	1/0	2506.0	23.26	211.84
			1/49	2593.0	24.50	281.84
			1/0	2680.0	**24.99**	**315.50**
		16QAM	1/0	2506.0	22.61	182.39
			1/49	2593.0	24.10	257.04
			1/49	2680.0	**25.29**	**338.06**
	15	QPSK	1/37	2503.5	23.19	208.45
			1/37	2593.0	24.75	298.54
			1/37	2682.5	**25.48**	**353.18**
		16QAM	1/37	2503.5	23.12	205.12
			1/37	2593.0	**24.43**	**277.33**
			1/37	2682.5	23.50	223.87
	10	QPSK	1/25	2501.0	22.88	194.09
			1/25	2593.0	24.70	295.12
			1/25	2685.0	**25.47**	**352.37**
		16QAM	1/0	2501.0	23.16	207.01
			1/25	2593.0	24.24	265.46
			1/25	2685.0	**25.50**	**354.81**
	5	QPSK	1/0	2498.5	23.77	238.23
			1/24	2593.0	24.85	305.49
			1/24	2687.5	**25.69**	**370.68**
		16QAM	1/12	2498.5	23.90	245.47
			1/12	2593.0	24.44	277.97
			1/12	2687.5	**25.51**	**355.63**

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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	23.20	208.93
			1/49	1745.0	**23.97**	**249.46**
			1/0	1770.0	23.53	225.42
		16QAM	1/49	1720.0	21.85	153.11
			1/49	1745.0	**23.00**	**199.53**
			1/0	1770.0	22.43	174.98
	15	QPSK	1/37	1717.5	23.18	207.97
			1/37	1747.5	**24.07**	**255.27**
			1/0	1772.5	23.32	214.78
		16QAM	1/37	1717.5	22.21	166.34
			1/37	1747.5	**23.05**	**201.84**
			1/0	1772.5	22.40	173.78
	10	QPSK	1/25	1715.0	23.35	216.27
			1/25	1745.0	**24.02**	**252.35**
			1/25	1775.0	23.84	242.10
		16QAM	1/25	1715.0	22.18	165.20
			1/25	1745.0	**23.33**	**215.28**
			1/25	1775.0	22.64	183.65
	5	QPSK	1/24	1712.5	23.73	236.05
			1/12	1745.0	**24.71**	**295.80**
			1/0	1777.5	23.72	235.50
		16QAM	1/12	1712.5	22.78	189.67
			1/12	1745.0	**22.87**	**193.64**
			1/0	1777.5	22.69	185.78
	3	QPSK	1/14	1711.5	23.52	224.91
			1/0	1745.0	**24.29**	**268.53**
			1/0	1778.5	23.76	237.68
		16QAM	1/0	1711.5	22.32	170.61
			1/0	1745.0	**23.45**	**221.31**
			1/0	1778.5	22.84	192.31
	1.4	QPSK	1/3	1710.7	23.53	225.42
			1/3	1745.0	**24.34**	**271.64**
			1/3	1779.3	23.40	218.78
		16QAM	1/3	1710.7	22.56	180.30
			1/3	1745.0	**23.41**	**219.28**
			1/3	1779.3	22.32	170.61

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LTE Band 2

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

LTE Band 66

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

LTE Band 5

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

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

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NR Band 5

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	**20.42**	**110.15**
				1/1	836.5	19.78	95.06
				1/1	839.0	20.07	101.62
			16QAM	1/1	834.0	**19.23**	**83.75**
				1/1	836.5	18.46	70.15
				1/1	839.0	18.91	77.80
	15	DFT-s OFDM	QPSK	1/1	831.5	**21.09**	**128.53**
				1/39	836.5	19.84	96.38
				1/39	841.5	18.97	78.89
			16QAM	1/1	831.5	**19.85**	**96.61**
				1/39	836.5	18.51	70.96
				1/39	841.5	18.03	63.53
	10	DFT-s OFDM	QPSK	1/1	829.0	**20.21**	**104.95**
				1/26	836.5	19.49	**88.92**
				1/1	844.0	19.01	79.62
			16QAM	1/1	829.0	**19.21**	83.37
				1/26	836.5	18.30	**67.61**
				1/1	844.0	17.92	61.94
	5	DFT-s OFDM	QPSK	1/1	826.5	**19.76**	**94.62**
				1/1	836.5	19.65	92.26
				1/13	846.5	17.88	61.38
			16QAM	1/1	826.5	**18.61**	**72.61**
				1/1	836.5	18.32	67.92
				1/13	846.5	16.75	47.32

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9.5.2. ERP/EIRP DATA

GSM

GSM850

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841431
Date: 2021-03-09
Test Engineer: 20890
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: GPRS 850 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.20	36.31	V	3.0	-1.0	32.32	38.5	-6.2	
824.20	27.13	H	3.0	-1.0	23.13	38.5	-15.4	
Mid Ch								
836.60	35.54	V	3.1	-0.9	31.57	38.5	-6.9	
836.60	26.28	H	3.1	-0.9	22.32	38.5	-16.2	
High Ch								
848.80	34.74	V	3.1	-0.9	30.80	38.5	-7.7	
848.80	25.84	H	3.1	-0.9	21.90	38.5	-16.6	

GSM850

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841431
Date: 2021-03-09
Test Engineer: 20890
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: EGPRS 850 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.20	33.20	V	3.0	-1.0	29.21	38.5	-9.3	
824.20	23.34	H	3.0	-1.0	19.34	38.5	-19.2	
Mid Ch								
836.60	32.89	V	3.1	-0.9	28.92	38.5	-9.6	
836.60	24.23	H	3.1	-0.9	20.27	38.5	-18.2	
High Ch								
848.80	31.70	V	3.1	-0.9	27.76	38.5	-10.7	
848.80	22.78	H	3.1	-0.9	18.84	38.5	-19.7	

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GSM1900

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20881
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: GPRS 1900 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	22.99	V	4.5	9.6	28.06	33.0	-4.9	
1850.20	25.56	H	4.5	9.6	30.63	33.0	-2.4	
Mid Ch								
1880.00	23.92	V	4.6	9.4	28.73	33.0	-4.3	
1880.00	26.89	H	4.6	9.4	31.70	33.0	-1.3	
High Ch								
1909.80	24.03	V	4.6	9.1	28.55	33.0	-4.5	
1909.80	26.05	H	4.6	9.1	30.57	33.0	-2.4	

GSM1900

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20881
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: EGPRS 1900 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	20.47	V	4.5	9.6	25.54	33.0	-7.5	
1850.20	22.61	H	4.5	9.6	27.68	33.0	-5.3	
Mid Ch								
1880.00	20.89	V	4.6	9.4	25.70	33.0	-7.3	
1880.00	24.00	H	4.6	9.4	28.81	33.0	-4.2	
High Ch								
1909.80	21.02	V	4.6	9.1	25.54	33.0	-7.5	
1909.80	22.80	H	4.6	9.1	27.32	33.0	-5.7	

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WCDMA

Band 5

REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-10
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: Rel99 Band 5 Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.40	25.20	V	3.0	-0.9	21.21	38.5	-17.3	
826.40	15.95	H	3.0	-0.9	11.96	38.5	-26.5	
Mid Ch								
836.60	26.16	V	3.1	-0.9	22.20	38.5	-16.3	
836.60	15.98	H	3.1	-0.9	12.02	38.5	-26.5	
High Ch								
846.60	26.52	V	3.1	-0.9	22.57	38.5	-15.9	
846.60	15.54	H	3.1	-0.9	11.59	38.5	-26.9	

Band 5

HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-10
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: HSDPA Band 5 Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.40	24.75	V	3.0	-0.9	20.76	38.5	-17.7	
826.40	14.84	H	3.0	-0.9	10.85	38.5	-27.6	
Mid Ch								
836.60	25.40	V	3.1	-0.9	21.44	38.5	-17.1	
836.60	14.51	H	3.1	-0.9	10.55	38.5	-28.0	
High Ch								
846.60	25.43	V	3.1	-0.9	21.48	38.5	-17.0	
846.60	14.45	H	3.1	-0.9	10.50	38.5	-28.0	

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Band 4

REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, X-Position
Location: Chamber 2
Mode: Rel99 Band 4 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.40	15.23	V	4.4	9.6	20.45	30.0	-9.5	
1712.40	17.37	H	4.4	9.6	22.59	30.0	-7.4	
Mid Ch								
1732.60	16.59	V	4.4	9.6	21.84	30.0	-8.2	
1732.60	18.25	H	4.4	9.6	23.50	30.0	-6.5	
High Ch								
1752.60	17.27	V	4.4	9.7	22.56	30.0	-7.4	
1752.60	18.34	H	4.4	9.7	23.63	30.0	-6.4	

Band 4

HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, X-Position
Location: Chamber 2
Mode: HSDPA Band 4 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.40	14.25	V	4.4	9.6	19.47	30.0	-10.5	
1712.40	16.37	H	4.4	9.6	21.59	30.0	-8.4	
Mid Ch								
1732.60	15.15	V	4.4	9.6	20.40	30.0	-9.6	
1732.60	16.99	H	4.4	9.6	22.24	30.0	-7.8	
High Ch								
1752.60	16.23	V	4.4	9.7	21.52	30.0	-8.5	
1752.60	17.38	H	4.4	9.7	22.67	30.0	-7.3	

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Band 2

REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT / X-Position
Location: Chamber 2
Mode: Rel99 Band 2 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	16.72	V	4.5	9.6	21.80	33.0	-11.2	
1852.40	16.98	H	4.5	9.6	22.06	33.0	-10.9	
Mid Ch								
1880.00	14.75	V	4.6	9.4	19.54	33.0	-13.5	
1880.00	18.64	H	4.6	9.4	23.43	33.0	-9.6	
High Ch								
1907.60	16.92	V	4.6	9.1	21.41	33.0	-11.6	
1907.60	19.02	H	4.6	9.1	23.51	33.0	-9.5	

Band 2

HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT, X-Position
Location: Chamber 2
Mode: HSDPA Band 2 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.71	V	4.5	9.6	20.79	33.0	-12.2	
1852.40	15.99	H	4.5	9.6	21.07	33.0	-11.9	
Mid Ch								
1880.00	14.07	V	4.6	9.4	18.86	33.0	-14.1	
1880.00	17.62	H	4.6	9.4	22.41	33.0	-10.6	
High Ch								
1907.60	15.77	V	4.6	9.1	20.26	33.0	-12.7	
1907.60	18.14	H	4.6	9.1	22.63	33.0	-10.4	

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LTE Band 12

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samusng
Project #: 4789841420
Date: 2021-03-10
Test Engineer: 20882
Configuration: EUT, Y-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	23.92	V	2.8	-1.1	20.05	34.8	-14.7	
704.00	17.57	H	2.8	-1.1	13.70	34.8	-21.1	
Mid Ch								
707.50	23.60	V	2.8	-1.1	19.73	34.8	-15.0	
707.50	17.40	H	2.8	-1.1	13.53	34.8	-21.2	
High Ch								
711.00	23.88	V	2.8	-1.1	20.00	34.8	-14.8	
711.00	17.91	H	2.8	-1.1	14.03	34.8	-20.7	

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-10
Test Engineer: 20882
Configuration: EUT, Y-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	23.00	V	2.8	-1.1	19.13	34.8	-15.6	
704.00	16.50	H	2.8	-1.1	12.63	34.8	-22.1	
Mid Ch								
707.50	22.70	V	2.8	-1.1	18.83	34.8	-15.9	
707.50	16.46	H	2.8	-1.1	12.59	34.8	-22.2	
High Ch								
711.00	22.71	V	2.8	-1.1	18.83	34.8	-15.9	
711.00	16.93	H	2.8	-1.1	13.05	34.8	-21.7	

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5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samusng
Project #: 4789841420
Date: 2021-03-10
Test Engineer: 20882
Configuration: EUT, Y-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	24.06	V	2.8	-1.1	20.20	34.8	-14.6	
701.50	17.57	H	2.8	-1.1	13.71	34.8	-21.1	
Mid Ch								
707.50	23.82	V	2.8	-1.1	19.95	34.8	-14.8	
707.50	17.28	H	2.8	-1.1	13.41	34.8	-21.4	
High Ch								
713.50	23.63	V	2.8	-1.1	19.75	34.8	-15.0	
713.50	17.97	H	2.8	-1.1	14.08	34.8	-20.7	

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-10
Test Engineer: 20882
Configuration: EUT, Y-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	23.33	V	2.8	-1.1	19.47	34.8	-15.3	
701.50	16.57	H	2.8	-1.1	12.71	34.8	-22.1	
Mid Ch								
707.50	22.69	V	2.8	-1.1	18.82	34.8	-16.0	
707.50	16.20	H	2.8	-1.1	12.33	34.8	-22.4	
High Ch								
713.50	22.70	V	2.8	-1.1	18.82	34.8	-16.0	
713.50	16.95	H	2.8	-1.1	13.06	34.8	-21.7	

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3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20881
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 12 Fundamentals, 3MHz Bandwidth

Test Equipment:
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	23.96	V	2.8	-1.1	20.11	34.8	-14.7	
700.50	17.59	H	2.8	-1.1	13.73	34.8	-21.0	
Mid Ch								
707.50	23.85	V	2.8	-1.1	19.98	34.8	-14.8	
707.50	17.71	H	2.8	-1.1	13.84	34.8	-20.9	
High Ch								
714.50	23.89	V	2.8	-1.1	20.01	34.8	-14.8	
714.50	19.28	H	2.8	-1.1	15.39	34.8	-19.4	

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20881
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 12 Fundamentals, 3MHz Bandwidth

Test Equipment:
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	22.62	V	2.8	-1.1	18.77	34.8	-16.0	
700.50	16.51	H	2.8	-1.1	12.65	34.8	-22.1	
Mid Ch								
707.50	22.77	V	2.8	-1.1	18.90	34.8	-15.9	
707.50	16.49	H	2.8	-1.1	12.62	34.8	-22.1	
High Ch								
714.50	22.79	V	2.8	-1.1	18.91	34.8	-15.9	
714.50	18.40	H	2.8	-1.1	14.51	34.8	-20.3	

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1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20881
Configuration: EUT, Y-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	23.84	V	2.8	-1.1	19.98	34.8	-14.8	
699.70	17.31	H	2.8	-1.1	13.45	34.8	-21.3	
Mid Ch								
707.50	23.78	V	2.8	-1.1	19.91	34.8	-14.9	
707.50	17.49	H	2.8	-1.1	13.62	34.8	-21.1	
High Ch								
715.30	22.53	V	2.8	-1.1	18.64	34.8	-16.1	
715.30	19.24	H	2.8	-1.1	15.35	34.8	-19.4	

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20881
Configuration: EUT, Y-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	22.98	V	2.8	-1.1	19.12	34.8	-15.6	
699.70	16.33	H	2.8	-1.1	12.47	34.8	-22.3	
Mid Ch								
707.50	22.35	V	2.8	-1.1	18.48	34.8	-16.3	
707.50	16.37	H	2.8	-1.1	12.50	34.8	-22.3	
High Ch								
715.30	21.52	V	2.8	-1.1	17.63	34.8	-17.1	
715.30	18.21	H	2.8	-1.1	14.32	34.8	-20.4	

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LTE Band 13

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-09
Test Engineer: 22943
Configuration: EUT, Y-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	25.98	V	3.0	-1.1	21.96	34.8	-12.8	
782.00	18.09	H	3.0	-1.1	14.07	34.8	-20.7	

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-09
Test Engineer: 22943
Configuration: EUT, Y-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	25.25	V	3.0	-1.1	21.23	34.8	-13.5	
782.00	17.60	H	3.0	-1.1	13.58	34.8	-21.2	

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5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-09
Test Engineer: 22943
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 13 Fundamentals, 5MHz Bandwidth

Test Equipment:
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	26.09	V	3.0	-1.1	22.08	34.8	-12.7	
779.50	18.22	H	3.0	-1.1	14.21	34.8	-20.6	
Mid Ch								
782.00	25.92	V	3.0	-1.1	21.90	34.8	-12.9	
782.00	18.12	H	3.0	-1.1	14.10	34.8	-20.7	
High Ch								
784.50	25.87	V	3.0	-1.1	21.85	34.8	-12.9	
784.50	18.20	H	3.0	-1.1	14.19	34.8	-20.6	

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-09
Test Engineer: 22943
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 13 Fundamentals, 5MHz Bandwidth

Test Equipment:
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	25.09	V	3.0	-1.1	21.08	34.8	-13.7	
779.50	17.18	H	3.0	-1.1	13.17	34.8	-21.6	
Mid Ch								
782.00	25.08	V	3.0	-1.1	21.06	34.8	-13.7	
782.00	17.56	H	3.0	-1.1	13.54	34.8	-21.2	
High Ch								
784.50	25.05	V	3.0	-1.1	21.03	34.8	-13.7	
784.50	17.43	H	3.0	-1.1	13.42	34.8	-21.4	

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LTE Band 25

20MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.39	V	4.6	9.6	20.39	33.0	-12.6	
1860.00	18.58	H	4.6	9.6	23.58	33.0	-9.4	
Mid Ch								
1882.50	15.42	V	4.6	9.3	20.19	33.0	-12.8	
1882.50	18.33	H	4.6	9.3	23.10	33.0	-9.9	
High Ch								
1905.00	15.36	V	4.6	9.1	19.88	33.0	-13.1	
1905.00	18.89	H	4.6	9.1	23.42	33.0	-9.6	

20MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 25 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	14.69	V	4.6	9.6	19.69	33.0	-13.3	
1860.00	18.33	H	4.6	9.6	23.33	33.0	-9.7	
Mid Ch								
1882.50	14.37	V	4.6	9.3	19.14	33.0	-13.9	
1882.50	17.09	H	4.6	9.3	21.86	33.0	-11.1	
High Ch								
1905.00	14.16	V	4.6	9.1	18.68	33.0	-14.3	
1905.00	17.87	H	4.6	9.1	22.40	33.0	-10.6	

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15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Fundamentals, 15MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.79	V	4.5	9.6	20.82	33.0	-12.2	
1857.50	18.45	H	4.5	9.6	23.48	33.0	-9.5	
Mid Ch								
1882.50	15.25	V	4.6	9.3	20.02	33.0	-13.0	
1882.50	18.32	H	4.6	9.3	23.09	33.0	-9.9	
High Ch								
1907.50	15.30	V	4.6	9.1	19.79	33.0	-13.2	
1907.50	19.25	H	4.6	9.1	23.74	33.0	-9.3	

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 25 Fundamentals, 15MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	14.78	V	4.5	9.6	19.81	33.0	-13.2	
1857.50	17.68	H	4.5	9.6	22.71	33.0	-10.3	
Mid Ch								
1882.50	14.07	V	4.6	9.3	18.84	33.0	-14.2	
1882.50	17.09	H	4.6	9.3	21.86	33.0	-11.1	
High Ch								
1907.50	14.05	V	4.6	9.1	18.54	33.0	-14.5	
1907.50	17.96	H	4.6	9.1	22.45	33.0	-10.6	

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10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.54	V	4.5	9.6	20.59	33.0	-12.4	
1855.00	18.93	H	4.5	9.6	23.98	33.0	-9.0	
Mid Ch								
1882.50	15.39	V	4.6	9.3	20.16	33.0	-12.8	
1882.50	18.27	H	4.6	9.3	23.04	33.0	-10.0	
High Ch								
1910.00	15.70	V	4.6	9.1	20.15	33.0	-12.8	
1910.00	18.79	H	4.6	9.1	23.24	33.0	-9.8	

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 25 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	14.50	V	4.5	9.6	19.55	33.0	-13.5	
1855.00	17.78	H	4.5	9.6	22.83	33.0	-10.2	
Mid Ch								
1882.50	14.18	V	4.6	9.3	18.95	33.0	-14.0	
1882.50	17.42	H	4.6	9.3	22.19	33.0	-10.8	
High Ch								
1910.00	14.71	V	4.6	9.1	19.16	33.0	-13.8	
1910.00	18.00	H	4.6	9.1	22.45	33.0	-10.5	

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5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.67	V	4.5	9.6	20.75	33.0	-12.2	
1852.50	18.64	H	4.5	9.6	23.72	33.0	-9.3	
Mid Ch								
1882.50	15.35	V	4.6	9.3	20.12	33.0	-12.9	
1882.50	18.45	H	4.6	9.3	23.22	33.0	-9.8	
High Ch								
1912.50	16.08	V	4.6	9.0	20.50	33.0	-12.5	
1912.50	18.76	H	4.6	9.0	23.19	33.0	-9.8	

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 25 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	14.72	V	4.5	9.6	19.80	33.0	-13.2	
1852.50	17.87	H	4.5	9.6	22.95	33.0	-10.0	
Mid Ch								
1882.50	13.59	V	4.6	9.3	18.36	33.0	-14.6	
1882.50	17.01	H	4.6	9.3	21.78	33.0	-11.2	
High Ch								
1912.50	15.30	V	4.6	9.0	19.72	33.0	-13.3	
1912.50	18.00	H	4.6	9.0	22.43	33.0	-10.6	

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3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 22890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.91	V	4.5	9.6	21.01	33.0	-12.0	
1851.50	18.78	H	4.5	9.6	23.88	33.0	-9.1	
Mid Ch								
1882.50	15.66	V	4.6	9.3	20.43	33.0	-12.6	
1882.50	18.21	H	4.6	9.3	22.98	33.0	-10.0	
High Ch								
1913.50	16.46	V	4.6	9.0	20.86	33.0	-12.1	
1913.50	18.83	H	4.6	9.0	23.23	33.0	-9.8	

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 25 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	14.86	V	4.5	9.6	19.96	33.0	-13.0	
1851.50	17.83	H	4.5	9.6	22.93	33.0	-10.1	
Mid Ch								
1882.50	14.48	V	4.6	9.3	19.25	33.0	-13.7	
1882.50	17.49	H	4.6	9.3	22.26	33.0	-10.7	
High Ch								
1913.50	15.49	V	4.6	9.0	19.89	33.0	-13.1	
1913.50	18.24	H	4.6	9.0	22.64	33.0	-10.4	

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1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.78	V	4.5	9.6	20.88	33.0	-12.1	
1850.70	18.64	H	4.5	9.6	23.75	33.0	-9.3	
Mid Ch								
1882.50	15.54	V	4.6	9.3	20.31	33.0	-12.7	
1882.50	18.46	H	4.6	9.3	23.23	33.0	-9.8	
High Ch								
1914.30	16.26	V	4.6	9.0	20.66	33.0	-12.3	
1914.30	18.80	H	4.6	9.0	23.20	33.0	-9.8	

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20890
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	14.48	V	4.5	9.6	19.58	33.0	-13.4	
1850.70	17.42	H	4.5	9.6	22.53	33.0	-10.5	
Mid Ch								
1882.50	14.47	V	4.6	9.3	19.24	33.0	-13.8	
1882.50	17.27	H	4.6	9.3	22.04	33.0	-11.0	
High Ch								
1914.30	15.11	V	4.6	9.0	19.51	33.0	-13.5	
1914.30	17.71	H	4.6	9.0	22.11	33.0	-10.9	

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LTE Band 26 (Part 90)

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
821.50	26.64	V	3.0	-1.0	22.63	50.0	-27.4	Part 90
821.50	17.58	H	3.0	-1.0	13.57	50.0	-36.4	Part 90

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
821.50	25.73	V	3.0	-1.0	21.72	50.0	-28.3	Part 90
821.50	16.80	H	3.0	-1.0	12.79	50.0	-37.2	Part 90

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10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
819.00	26.44	V	3.0	-1.0	22.44	50.0	-27.6	Part 90
819.00	18.01	H	3.0	-1.0	14.01	50.0	-36.0	Part 90

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
819.00	25.16	V	3.0	-1.0	21.16	50.0	-28.8	Part 90
819.00	16.71	H	3.0	-1.0	12.71	50.0	-37.3	Part 90

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5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 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								
816.50	25.82	V	3.0	-1.0	21.81	50.0	-28.2	Part 90
816.50	17.57	H	3.0	-1.0	13.56	50.0	-36.4	Part 90
Mid Ch								
821.50	27.37	V	3.0	-1.0	23.36	50.0	-26.6	Part 90
821.50	18.06	H	3.0	-1.0	14.05	50.0	-35.9	Part 90

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 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								
816.50	24.96	V	3.0	-1.0	20.95	50.0	-29.1	Part 90
816.50	16.68	H	3.0	-1.0	12.67	50.0	-37.3	Part 90
Mid Ch								
821.50	26.58	V	3.0	-1.0	22.57	50.0	-27.4	Part 90
821.50	17.22	H	3.0	-1.0	13.21	50.0	-36.8	Part 90

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3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
815.50	25.67	V	3.0	-1.0	21.65	50.0	-28.3	Part 90
815.50	17.85	H	3.0	-1.0	13.84	50.0	-36.2	Part 90
Mid Ch								
822.50	27.42	V	3.0	-1.0	23.42	50.0	-26.6	Part 90
822.50	17.90	H	3.0	-1.0	13.89	50.0	-36.1	Part 90

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
815.50	24.69	V	3.0	-1.0	20.67	50.0	-29.3	Part 90
815.50	16.81	H	3.0	-1.0	12.80	50.0	-37.2	Part 90
Mid Ch								
822.50	26.85	V	3.0	-1.0	22.85	50.0	-27.1	Part 90
822.50	17.16	H	3.0	-1.0	13.15	50.0	-36.8	Part 90

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1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
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								
814.70	25.51	V	3.0	-1.0	21.49	50.0	-28.5	Part 90
814.70	17.27	H	3.0	-1.0	13.25	50.0	-36.8	Part 90
Mid Ch								
823.30	27.46	V	3.0	-1.0	23.46	50.0	-26.5	Part 90
823.30	17.73	H	3.0	-1.0	13.73	50.0	-36.3	Part 90

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
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								
814.70	24.54	V	3.0	-1.0	20.52	50.0	-29.5	Part 90
814.70	16.27	H	3.0	-1.0	12.25	50.0	-37.8	Part 90
Mid Ch								
823.30	26.22	V	3.0	-1.0	22.22	50.0	-27.8	Part 90
823.30	16.54	H	3.0	-1.0	12.54	50.0	-37.5	Part 90

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LTE Band 26 (Straddle & Part 22)

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 15MHz Bandwidth

Test Equipment:
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
Straddle Ch								
824.00	27.04	V	3.0	-1.0	23.04	38.5	-15.5	
824.00	17.03	H	3.0	-1.0	13.04	38.5	-25.5	
Mid Ch								
831.50	27.87	V	3.1	-0.9	23.89	38.5	-14.6	
831.50	17.07	H	3.1	-0.9	13.09	38.5	-25.4	
High Ch								
841.50	27.78	V	3.1	-0.9	23.82	38.5	-14.7	
841.50	18.28	H	3.1	-0.9	14.32	38.5	-24.2	

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 15MHz Bandwidth

Test Equipment:
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
Straddle Ch								
824.00	26.55	V	3.0	-1.0	22.55	38.5	-15.9	
824.00	16.52	H	3.0	-1.0	12.53	38.5	-26.0	
Mid Ch								
831.50	27.38	V	3.1	-0.9	23.40	38.5	-15.1	
831.50	16.63	H	3.1	-0.9	12.65	38.5	-25.8	
High Ch								
841.50	26.73	V	3.1	-0.9	22.77	38.5	-15.7	
841.50	16.93	H	3.1	-0.9	12.97	38.5	-25.5	

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10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Straddle Ch								
824.00	27.44	V	3.0	-1.0	23.44	38.5	-15.1	
824.00	17.07	H	3.0	-1.0	13.08	38.5	-25.4	
Low Ch								
829.00	27.51	V	3.1	-0.9	23.53	38.5	-15.0	
829.00	16.49	H	3.1	-0.9	12.50	38.5	-26.0	
Mid Ch								
831.50	27.40	V	3.1	-0.9	23.42	38.5	-15.1	
831.50	17.22	H	3.1	-0.9	13.24	38.5	-25.3	
High Ch								
844.00	27.19	V	3.1	-0.9	23.24	38.5	-15.3	
844.00	17.53	H	3.1	-0.9	13.58	38.5	-24.9	

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Straddle Ch								
824.00	26.94	V	3.0	-1.0	22.94	38.5	-15.6	
824.00	17.15	H	3.0	-1.0	13.16	38.5	-25.3	
Low Ch								
829.00	26.56	V	3.1	-0.9	22.58	38.5	-15.9	
829.00	15.38	H	3.1	-0.9	11.39	38.5	-27.1	
Mid Ch								
831.50	26.37	V	3.1	-0.9	22.39	38.5	-16.1	
831.50	16.18	H	3.1	-0.9	12.20	38.5	-26.3	
High Ch								
844.00	26.54	V	3.1	-0.9	22.59	38.5	-15.9	
844.00	16.86	H	3.1	-0.9	12.91	38.5	-25.6	

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5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 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
Straddle Ch								
824.00	27.29	V	3.0	-1.0	23.29	38.5	-15.2	
824.00	17.00	H	3.0	-1.0	13.01	38.5	-25.5	
Low Ch								
826.50	27.65	V	3.0	-0.9	23.66	38.5	-14.8	
826.50	17.05	H	3.0	-0.9	13.05	38.5	-25.4	
Mid Ch								
831.50	27.16	V	3.1	-0.9	23.18	38.5	-15.3	
831.50	16.55	H	3.1	-0.9	12.57	38.5	-25.9	
High Ch								
846.50	26.42	V	3.1	-0.9	22.48	38.5	-16.0	
846.50	17.37	H	3.1	-0.9	13.42	38.5	-25.1	

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 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
Straddle Ch								
824.00	26.66	V	3.0	-1.0	22.66	38.5	-15.8	
824.00	16.14	H	3.0	-1.0	12.15	38.5	-26.4	
Low Ch								
826.50	26.78	V	3.0	-0.9	22.79	38.5	-15.7	
826.50	16.26	H	3.0	-0.9	12.26	38.5	-26.2	
Mid Ch								
831.50	26.26	V	3.1	-0.9	22.28	38.5	-16.2	
831.50	15.82	H	3.1	-0.9	11.84	38.5	-26.7	
High Ch								
846.50	25.56	V	3.1	-0.9	21.62	38.5	-16.9	
846.50	16.32	H	3.1	-0.9	12.37	38.5	-26.1	

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3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Straddle Ch								
824.00	27.59	V	3.0	-1.0	23.59	38.5	-14.9	
824.00	17.53	H	3.0	-1.0	13.54	38.5	-25.0	
Low Ch								
825.50	27.78	V	3.0	-0.9	23.79	38.5	-14.7	
825.50	17.52	H	3.0	-0.9	13.53	38.5	-25.0	
Mid Ch								
831.50	27.34	V	3.1	-0.9	23.36	38.5	-15.1	
831.50	16.46	H	3.1	-0.9	12.48	38.5	-26.0	
High Ch								
847.50	26.13	V	3.1	-0.9	22.19	38.5	-16.3	
847.50	17.10	H	3.1	-0.9	13.16	38.5	-25.3	

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Straddle Ch								
824.00	26.49	V	3.0	-1.0	22.49	38.5	-16.0	
824.00	16.52	H	3.0	-1.0	12.53	38.5	-26.0	
Low Ch								
825.50	27.16	V	3.0	-0.9	23.17	38.5	-15.3	
825.50	16.98	H	3.0	-0.9	12.99	38.5	-25.5	
Mid Ch								
831.50	26.14	V	3.1	-0.9	22.16	38.5	-16.3	
831.50	15.28	H	3.1	-0.9	11.30	38.5	-27.2	
High Ch								
847.50	25.57	V	3.1	-0.9	21.63	38.5	-16.9	
847.50	16.44	H	3.1	-0.9	12.50	38.5	-26.0	

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1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Straddle Ch								
824.00	27.48	V	3.0	-1.0	23.48	38.5	-15.0	
824.00	17.70	H	3.0	-1.0	13.71	38.5	-24.8	
Low Ch								
824.70	27.67	V	3.0	-1.0	23.68	38.5	-14.8	
824.70	17.46	H	3.0	-1.0	13.46	38.5	-25.0	
Mid Ch								
831.50	27.28	V	3.1	-0.9	23.30	38.5	-15.2	
831.50	17.09	H	3.1	-0.9	13.11	38.5	-25.4	
High Ch								
848.30	26.28	V	3.1	-0.9	22.34	38.5	-16.2	
848.30	16.52	H	3.1	-0.9	12.58	38.5	-25.9	

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Straddle Ch								
824.00	26.69	V	3.0	-1.0	22.69	38.5	-15.8	
824.00	16.75	H	3.0	-1.0	12.76	38.5	-25.7	
Low Ch								
824.70	26.76	V	3.0	-1.0	22.77	38.5	-15.7	
824.70	16.36	H	3.0	-1.0	12.36	38.5	-26.1	
Mid Ch								
831.50	26.09	V	3.1	-0.9	22.11	38.5	-16.4	
831.50	15.28	H	3.1	-0.9	11.30	38.5	-27.2	
High Ch								
848.30	25.27	V	3.1	-0.9	21.33	38.5	-17.2	
848.30	15.57	H	3.1	-0.9	11.63	38.5	-26.9	

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LTE Band 41

20MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-23
Test Engineer: 22943
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 41 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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								
2506.00	18.02	V	5.3	10.2	22.92	33.0	-10.1	
2506.00	18.35	H	5.3	10.2	23.26	33.0	-9.7	
Mid Ch								
2593.00	17.56	V	5.4	10.1	22.30	33.0	-10.7	
2593.00	19.76	H	5.4	10.1	24.50	33.0	-8.5	
High Ch								
2680.00	20.29	V	5.5	10.2	24.99	33.0	-8.0	
2680.00	19.00	H	5.5	10.2	23.71	33.0	-9.3	

20MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-23
Test Engineer: 22943
Configuration: EUT, X- Position
Location: Chamber 2
Mode: LTE_16QAM Band 41 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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								
2506.00	17.20	V	5.3	10.2	22.10	33.0	-10.9	
2506.00	17.70	H	5.3	10.2	22.61	33.0	-10.4	
Mid Ch								
2593.00	17.28	V	5.4	10.1	22.02	33.0	-11.0	
2593.00	19.36	H	5.4	10.1	24.10	33.0	-8.9	
High Ch								
2680.00	20.59	V	5.5	10.2	25.29	33.0	-7.7	
2680.00	18.78	H	5.5	10.2	23.49	33.0	-9.5	

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15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-23
Test Engineer: 22943
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 41 Fundamentals, 15MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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								
2503.50	18.14	V	5.3	10.2	23.05	33.0	-9.9	
2503.50	18.27	H	5.3	10.2	23.19	33.0	-9.8	
Mid Ch								
2593.00	17.45	V	5.4	10.1	22.19	33.0	-10.8	
2593.00	20.01	H	5.4	10.1	24.75	33.0	-8.3	
High Ch								
2682.50	20.78	V	5.5	10.2	25.48	33.0	-7.5	
2682.50	19.36	H	5.5	10.2	24.07	33.0	-8.9	

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-23
Test Engineer: 22943
Configuration: EUT
Location: Chamber 2
Mode: LTE_QPSK Band 41 Fundamentals, 20MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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								
2503.50	18.15	V	5.3	10.2	23.06	33.0	-9.9	
2503.50	18.20	H	5.3	10.2	23.12	33.0	-9.9	
Mid Ch								
2593.00	17.13	V	5.4	10.1	21.87	33.0	-11.1	
2593.00	19.69	H	5.4	10.1	24.43	33.0	-8.6	
High Ch								
2682.50	17.41	V	5.5	10.2	22.11	33.0	-10.9	
2682.50	18.79	H	5.5	10.2	23.50	33.0	-9.5	

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10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-23
Test Engineer: 22943
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 41 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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								
2501.00	17.96	V	5.3	10.2	22.88	33.0	-10.1	
2501.00	17.66	H	5.3	10.2	22.58	33.0	-10.4	
Mid Ch								
2593.00	17.47	V	5.4	10.1	22.21	33.0	-10.8	
2593.00	19.96	H	5.4	10.1	24.70	33.0	-8.3	
High Ch								
2685.00	20.76	V	5.5	10.2	25.47	33.0	-7.5	
2685.00	19.49	H	5.5	10.2	24.19	33.0	-8.8	

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-23
Test Engineer: 22943
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_16QAM Band 41 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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								
2501.00	17.46	V	5.3	10.2	22.38	33.0	-10.6	
2501.00	18.24	H	5.3	10.2	23.16	33.0	-9.8	
Mid Ch								
2593.00	17.19	V	5.4	10.1	21.93	33.0	-11.1	
2593.00	19.50	H	5.4	10.1	24.24	33.0	-8.8	
High Ch								
2685.00	20.79	V	5.5	10.2	25.50	33.0	-7.5	
2685.00	19.51	H	5.5	10.2	24.21	33.0	-8.8	

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5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-23
Test Engineer: 22943
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 41 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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								
2498.50	17.91	V	5.3	10.2	22.85	33.0	-10.2	
2498.50	18.84	H	5.3	10.2	23.77	33.0	-9.2	
Mid Ch								
2593.00	17.87	V	5.4	10.1	22.61	33.0	-10.4	
2593.00	20.11	H	5.4	10.1	24.85	33.0	-8.2	
High Ch								
2687.50	20.97	V	5.5	10.2	25.69	33.0	-7.3	
2687.50	19.52	H	5.5	10.2	24.24	33.0	-8.8	

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-23
Test Engineer: 22943
Configuration: EUT, X-Position
Location: Chamber 2
Mode: LTE_16QAM Band 41 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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								
2498.50	18.28	V	5.3	10.2	23.22	33.0	-9.8	
2498.50	18.97	H	5.3	10.2	23.90	33.0	-9.1	
Mid Ch								
2593.00	17.30	V	5.4	10.1	22.04	33.0	-11.0	
2593.00	19.70	H	5.4	10.1	24.44	33.0	-8.6	
High Ch								
2687.50	20.79	V	5.5	10.2	25.51	33.0	-7.5	
2687.50	19.37	H	5.5	10.2	24.09	33.0	-8.9	

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LTE Band 66

20MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20882
Configuration: EUT/ Keyboard, covered X
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[00161451], 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	16.61	V	4.4	9.6	21.85	30.0	-8.2	
1720.00	17.97	H	4.4	9.6	23.20	30.0	-6.8	
Mid Ch								
1745.00	17.87	V	4.4	9.7	23.15	30.0	-6.9	
1745.00	18.69	H	4.4	9.7	23.97	30.0	-6.0	
High Ch								
1770.00	17.70	V	4.4	9.7	22.97	30.0	-7.0	
1770.00	18.25	H	4.4	9.7	23.53	30.0	-6.5	

20MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20882
Configuration: EUT/ Keyboard, covered X
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[00161451], 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	15.49	V	4.4	9.6	20.73	30.0	-9.3	
1720.00	16.62	H	4.4	9.6	21.85	30.0	-8.1	
Mid Ch								
1745.00	16.67	V	4.4	9.7	21.95	30.0	-8.1	
1745.00	17.72	H	4.4	9.7	23.00	30.0	-7.0	
High Ch								
1770.00	16.72	V	4.4	9.7	21.99	30.0	-8.0	
1770.00	17.15	H	4.4	9.7	22.43	30.0	-7.6	

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15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20882
Configuration: EUT/ Keyboard, covered X
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 15MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	16.46	V	4.4	9.6	21.69	30.0	-8.3	
1717.50	17.95	H	4.4	9.6	23.18	30.0	-6.8	
Mid Ch								
1745.00	17.78	V	4.4	9.7	23.06	30.0	-6.9	
1745.00	18.79	H	4.4	9.7	24.07	30.0	-5.9	
High Ch								
1772.50	17.48	V	4.4	9.7	22.75	30.0	-7.2	
1772.50	18.05	H	4.4	9.7	23.32	30.0	-6.7	

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20882
Configuration: EUT/ Keyboard, covered X
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 15MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.52	V	4.4	9.6	20.75	30.0	-9.2	
1717.50	16.98	H	4.4	9.6	22.21	30.0	-7.8	
Mid Ch								
1745.00	16.79	V	4.4	9.7	22.07	30.0	-7.9	
1745.00	17.77	H	4.4	9.7	23.05	30.0	-6.9	
High Ch								
1772.50	16.39	V	4.4	9.7	21.66	30.0	-8.3	
1772.50	17.13	H	4.4	9.7	22.40	30.0	-7.6	

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10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT/ Keyboard, covered X
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	16.93	V	4.4	9.6	22.16	30.0	-7.8	
1715.00	18.13	H	4.4	9.6	23.35	30.0	-6.6	
Mid Ch								
1745.00	18.32	V	4.4	9.7	23.60	30.0	-6.4	
1745.00	18.74	H	4.4	9.7	24.02	30.0	-6.0	
High Ch								
1775.00	17.17	V	4.4	9.7	22.44	30.0	-7.6	
1775.00	18.57	H	4.4	9.7	23.84	30.0	-6.2	

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT/ Keyboard, covered X
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.68	V	4.4	9.6	20.91	30.0	-9.1	
1715.00	16.96	H	4.4	9.6	22.18	30.0	-7.8	
Mid Ch								
1745.00	17.50	V	4.4	9.7	22.78	30.0	-7.2	
1745.00	18.05	H	4.4	9.7	23.33	30.0	-6.7	
High Ch								
1775.00	15.96	V	4.4	9.7	21.23	30.0	-8.8	
1775.00	17.37	H	4.4	9.7	22.64	30.0	-7.4	

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5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT/ Keyboard, covered X
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	16.64	V	4.4	9.6	21.86	30.0	-8.1	
1712.50	18.51	H	4.4	9.6	23.73	30.0	-6.3	
Mid Ch								
1745.00	18.37	V	4.4	9.7	23.65	30.0	-6.4	
1745.00	19.43	H	4.4	9.7	24.71	30.0	-5.3	
High Ch								
1777.50	12.95	V	4.4	9.7	18.22	30.0	-11.8	
1777.50	18.46	H	4.4	9.7	23.72	30.0	-6.3	

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT/ Keyboard, covered X
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.49	V	4.4	9.6	20.71	30.0	-9.3	
1712.50	17.56	H	4.4	9.6	22.78	30.0	-7.2	
Mid Ch								
1745.00	16.98	V	4.4	9.7	22.26	30.0	-7.7	
1745.00	17.59	H	4.4	9.7	22.87	30.0	-7.1	
High Ch								
1777.50	12.21	V	4.4	9.7	17.48	30.0	-12.5	
1777.50	17.43	H	4.4	9.7	22.69	30.0	-7.3	

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3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT/ Keyboard, covered X
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	16.54	V	4.4	9.6	21.75	30.0	-8.2	
1711.50	18.30	H	4.4	9.6	23.52	30.0	-6.5	
Mid Ch								
1745.00	18.10	V	4.4	9.7	23.38	30.0	-6.6	
1745.00	19.01	H	4.4	9.7	24.29	30.0	-5.7	
High Ch								
1778.50	17.26	V	4.4	9.7	22.52	30.0	-7.5	
1778.50	18.50	H	4.4	9.7	23.76	30.0	-6.2	

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT/ Keyboard, covered X
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.13	V	4.4	9.6	20.34	30.0	-9.7	
1711.50	17.10	H	4.4	9.6	22.32	30.0	-7.7	
Mid Ch								
1745.00	17.17	V	4.4	9.7	22.45	30.0	-7.6	
1745.00	18.17	H	4.4	9.7	23.45	30.0	-6.5	
High Ch								
1778.50	16.15	V	4.4	9.7	21.41	30.0	-8.6	
1778.50	17.58	H	4.4	9.7	22.84	30.0	-7.2	

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1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT/ Keyboard, covered X
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	16.42	V	4.4	9.6	21.63	30.0	-8.4	
1710.70	18.31	H	4.4	9.6	23.53	30.0	-6.5	
Mid Ch								
1745.00	18.09	V	4.4	9.7	23.37	30.0	-6.6	
1745.00	19.06	H	4.4	9.7	24.34	30.0	-5.7	
High Ch								
1779.30	17.11	V	4.4	9.7	22.37	30.0	-7.6	
1779.30	18.13	H	4.4	9.7	23.40	30.0	-6.6	

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT/ Keyboard, covered X
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00161451], 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	15.45	V	4.4	9.6	20.66	30.0	-9.3	
1710.70	17.34	H	4.4	9.6	22.56	30.0	-7.4	
Mid Ch								
1745.00	16.93	V	4.4	9.7	22.21	30.0	-7.8	
1745.00	18.13	H	4.4	9.7	23.41	30.0	-6.6	
High Ch								
1779.30	16.39	V	4.4	9.7	21.65	30.0	-8.3	
1779.30	17.05	H	4.4	9.7	22.32	30.0	-7.7	

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NR Band 5

20MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-24
Test Engineer: 20890
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK NR n5 Fundamentals, 20MHz Bandwidth

Test Equipment:
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	24.39	V	3.1	-0.9	20.42	38.5	-18.1	
834.00	13.21	H	3.1	-0.9	9.24	38.5	-29.3	
Mid Ch								
836.50	23.75	V	3.1	-0.9	19.78	38.5	-18.7	
836.50	12.35	H	3.1	-0.9	8.38	38.5	-30.1	
High Ch								
839.00	24.03	V	3.1	-0.9	20.07	38.5	-18.4	
839.00	12.47	H	3.1	-0.9	8.51	38.5	-30.0	

20MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-24
Test Engineer: 20890
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM NR n5 Fundamentals, 20MHz Bandwidth

Test Equipment:
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	23.20	V	3.1	-0.9	19.23	38.5	-19.3	
834.00	12.32	H	3.1	-0.9	8.35	38.5	-30.2	
Mid Ch								
836.50	22.43	V	3.1	-0.9	18.46	38.5	-20.0	
836.50	11.11	H	3.1	-0.9	7.14	38.5	-31.4	
High Ch								
839.00	22.87	V	3.1	-0.9	18.91	38.5	-19.6	
839.00	11.35	H	3.1	-0.9	7.39	38.5	-31.1	

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15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-24
Test Engineer: 22943
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK NR n5 Fundamentals, 15MHz Bandwidth

Test Equipment:
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	25.07	V	3.1	-0.9	21.09	38.5	-17.4	
831.50	13.24	H	3.1	-0.9	9.26	38.5	-29.2	
Mid Ch								
836.50	23.81	V	3.1	-0.9	19.84	38.5	-18.7	
836.50	12.55	H	3.1	-0.9	8.58	38.5	-29.9	
High Ch								
841.50	22.93	V	3.1	-0.9	18.97	38.5	-19.5	
841.50	12.09	H	3.1	-0.9	8.13	38.5	-30.4	

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-24
Test Engineer: 22943
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM NR n5 Fundamentals, 15MHz Bandwidth

Test Equipment:
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	23.83	V	3.1	-0.9	19.85	38.5	-18.6	
831.50	12.12	H	3.1	-0.9	8.14	38.5	-30.4	
Mid Ch								
836.50	22.48	V	3.1	-0.9	18.51	38.5	-20.0	
836.50	11.55	H	3.1	-0.9	7.58	38.5	-30.9	
High Ch								
841.50	21.99	V	3.1	-0.9	18.03	38.5	-20.5	
841.50	11.27	H	3.1	-0.9	7.31	38.5	-31.2	

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10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-24
Test Engineer: 22943
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK NR n5 Fundamentals, 10MHz Bandwidth

Test Equipment:
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	24.19	V	3.1	-0.9	20.21	38.5	-18.3	
829.00	13.81	H	3.1	-0.9	9.82	38.5	-28.7	
Mid Ch								
836.50	23.46	V	3.1	-0.9	19.49	38.5	-19.0	
836.50	11.36	H	3.1	-0.9	7.39	38.5	-31.1	
High Ch								
844.00	22.96	V	3.1	-0.9	19.01	38.5	-19.5	
844.00	11.95	H	3.1	-0.9	8.00	38.5	-30.5	

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-24
Test Engineer: 22943
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM NR n5 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	23.19	V	3.1	-0.9	19.21	38.5	-19.3	
829.00	12.98	H	3.1	-0.9	8.99	38.5	-29.5	
Mid Ch								
836.50	22.27	V	3.1	-0.9	18.30	38.5	-20.2	
836.50	10.24	H	3.1	-0.9	6.27	38.5	-32.2	
High Ch								
844.00	21.87	V	3.1	-0.9	17.92	38.5	-20.6	
844.00	11.88	H	3.1	-0.9	7.93	38.5	-30.6	

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5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-24
Test Engineer: 22943
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_QPSK NR n5 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	23.75	V	3.0	-0.9	19.76	38.5	-18.7	
826.50	12.85	H	3.0	-0.9	8.85	38.5	-29.6	
Mid Ch								
836.50	23.62	V	3.1	-0.9	19.65	38.5	-18.8	
836.50	12.30	H	3.1	-0.9	8.33	38.5	-30.2	
High Ch								
846.50	21.82	V	3.1	-0.9	17.88	38.5	-20.6	
846.50	10.98	H	3.1	-0.9	7.03	38.5	-31.5	

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789841420
Date: 2021-03-24
Test Engineer: 22943
Configuration: EUT, Y-Position
Location: Chamber 1
Mode: LTE_16QAM NR n5 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	23.19	V	3.1	-0.9	19.21	38.5	-19.3	
829.00	12.98	H	3.1	-0.9	8.99	38.5	-29.5	
Mid Ch								
836.50	22.27	V	3.1	-0.9	18.30	38.5	-20.2	
836.50	10.24	H	3.1	-0.9	6.27	38.5	-32.2	
High Ch								
844.00	21.87	V	3.1	-0.9	17.92	38.5	-20.6	
844.00	11.88	H	3.1	-0.9	7.93	38.5	-30.6	

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9.6. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238, §27. 53 and §90.691

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.

Part 90.691:
(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

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

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

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TEST PROCEDURE

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

NOTE

5GNR: All waveforms(CP-OFDM vs DFT-OFDM) were investigated to determine the worst case configuration. All mode of operation were investigated and the worst case configuration results are reported in tis section.

RESULTS

See the following pages.
NOTE : Please refer to section 5.4 for bandwidth and RB setting about LTE.

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9.6.1. SPURIOUS RADIATION PLOTS

GSM

850

GPRS

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

Company:	Samsung
Project #:	4789841420
Date:	2021-03-16
Test Engineer:	20881
Configuration:	EUT / AC Adapter / Keyboard, laptop mode
Location:	Chamber 1
Mode:	GPRS 850 MHz Harmonics
Test Votage:	AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1648.40	-5.5	V	3.0	45.3	1.0	-49.8	-13.0	-36.8	
2472.60	4.5	V	3.0	45.1	1.0	-39.6	-13.0	-26.6	
3296.80	-7.4	V	3.0	45.3	1.0	-51.7	-13.0	-38.7	
1648.40	-9.7	H	3.0	45.3	1.0	-54.0	-13.0	-41.0	
2472.60	3.0	H	3.0	45.1	1.0	-41.0	-13.0	-28.0	
3296.80	-7.4	H	3.0	45.3	1.0	-51.7	-13.0	-38.7	
Mid Ch, 836.6MHz									
1673.20	-4.8	V	3.0	45.3	1.0	-49.1	-13.0	-36.1	
2509.80	4.8	V	3.0	45.1	1.0	-39.3	-13.0	-26.3	
3346.40	-8.4	V	3.0	45.3	1.0	-52.7	-13.0	-39.7	
1673.20	-8.9	H	3.0	45.3	1.0	-53.1	-13.0	-40.1	
2509.80	3.0	H	3.0	45.1	1.0	-41.1	-13.0	-28.1	
3346.40	-8.3	H	3.0	45.3	1.0	-52.7	-13.0	-39.7	
High Ch, 848.8MHz									
1697.60	-4.5	V	3.0	45.2	1.0	-48.8	-13.0	-35.8	
2546.40	4.3	V	3.0	45.1	1.0	-39.8	-13.0	-26.8	
3395.20	-8.2	V	3.0	45.3	1.0	-52.6	-13.0	-39.6	
1697.60	-7.8	H	3.0	45.2	1.0	-52.0	-13.0	-39.0	
2546.40	3.8	H	3.0	45.1	1.0	-40.3	-13.0	-27.3	
3395.20	-7.8	H	3.0	45.3	1.0	-52.2	-13.0	-39.2	

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850

EGPRS

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20881
Configuration: EUT / AC Adapter / Keyboard, laptop mode
Location: Chamber 1
Mode: EGPRS 850 MHz Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1648.40	-8.7	V	3.0	45.3	1.0	-53.0	-13.0	-40.0	
2472.60	-2.1	V	3.0	45.1	1.0	-46.2	-13.0	-33.2	
3296.80	-8.6	V	3.0	45.3	1.0	-53.0	-13.0	-40.0	
1648.40	-12.8	H	3.0	45.3	1.0	-57.1	-13.0	-44.1	
2472.60	-2.3	H	3.0	45.1	1.0	-46.4	-13.0	-33.4	
3296.80	-8.3	H	3.0	45.3	1.0	-52.6	-13.0	-39.6	
Mid Ch, 836.6MHz									
1673.20	-8.6	V	3.0	45.3	1.0	-52.9	-13.0	-39.9	
2509.80	-4.3	V	3.0	45.1	1.0	-48.4	-13.0	-35.4	
3346.40	-8.4	V	3.0	45.3	1.0	-52.8	-13.0	-39.8	
1673.20	-11.3	H	3.0	45.3	1.0	-55.5	-13.0	-42.5	
2509.80	-4.2	H	3.0	45.1	1.0	-48.3	-13.0	-35.3	
3346.40	-8.3	H	3.0	45.3	1.0	-52.7	-13.0	-39.7	
High Ch, 848.8MHz									
1697.60	-7.9	V	3.0	45.2	1.0	-52.1	-13.0	-39.1	
2546.40	-4.8	V	3.0	45.1	1.0	-48.9	-13.0	-35.9	
3395.20	-8.2	V	3.0	45.3	1.0	-52.5	-13.0	-39.5	
1697.60	-10.9	H	3.0	45.2	1.0	-55.1	-13.0	-42.1	
2546.40	-4.1	H	3.0	45.1	1.0	-48.2	-13.0	-35.2	
3395.20	-8.0	H	3.0	45.3	1.0	-52.3	-13.0	-39.3	

1900

GPRS

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20881
Configuration: EUT / AC Adapter / Keyboard, covered X
Location: Chamber 1
Mode: GPRS 1900 MHz Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-10.6	V	3.0	45.5	1.0	-55.0	-13.0	-42.0	
5550.60	5.0	V	3.0	45.4	1.0	-39.4	-13.0	-26.4	
7400.80	-5.2	V	3.0	44.2	1.0	-48.4	-13.0	-35.4	
3700.40	-10.2	H	3.0	45.5	1.0	-54.6	-13.0	-41.6	
5550.60	4.8	H	3.0	45.4	1.0	-39.6	-13.0	-26.6	
7400.80	-5.1	H	3.0	44.2	1.0	-48.3	-13.0	-35.3	
Mid Ch, 1880MHz									
3760.00	-10.2	V	3.0	45.5	1.0	-54.6	-13.0	-41.6	
5640.00	19.5	V	3.0	45.4	1.0	-24.9	-13.0	-11.9	
7520.00	-5.3	V	3.0	44.1	1.0	-48.4	-13.0	-35.4	
3760.00	-9.9	H	3.0	45.5	1.0	-54.4	-13.0	-41.4	
5640.00	14.1	H	3.0	45.4	1.0	-30.3	-13.0	-17.3	
7520.00	-5.1	H	3.0	44.1	1.0	-48.2	-13.0	-35.2	
High Ch, 1909.8MHz									
3819.60	-7.8	V	3.0	45.5	1.0	-52.3	-13.0	-39.3	
5729.40	6.8	V	3.0	45.4	1.0	-37.5	-13.0	-24.5	
7639.20	-5.2	V	3.0	44.1	1.0	-48.3	-13.0	-35.3	
3819.60	-10.0	H	3.0	45.5	1.0	-54.5	-13.0	-41.5	
5729.40	9.4	H	3.0	45.4	1.0	-35.0	-13.0	-22.0	
7639.20	-5.0	H	3.0	44.1	1.0	-48.1	-13.0	-35.1	

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1900

EGPRS

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20881
Configuration: EUT / AC Adapter / Keyboard, covered X
Location: Chamber 1
Mode: EGPRS 1900 MHz Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-10.5	V	3.0	45.5	1.0	-54.9	-13.0	-41.9	
5550.60	-2.1	V	3.0	45.4	1.0	-46.5	-13.0	-33.5	
7400.80	-5.2	V	3.0	44.2	1.0	-48.4	-13.0	-35.4	
3700.40	-10.3	H	3.0	45.5	1.0	-54.8	-13.0	-41.8	
5550.60	-4.2	H	3.0	45.4	1.0	-48.6	-13.0	-35.6	
7400.80	-5.0	H	3.0	44.2	1.0	-48.2	-13.0	-35.2	
Mid Ch, 1880MHz									
3760.00	-10.2	V	3.0	45.5	1.0	-54.7	-13.0	-41.7	
5640.00	-3.0	V	3.0	45.4	1.0	-47.4	-13.0	-34.4	
7520.00	-5.4	V	3.0	44.1	1.0	-48.6	-13.0	-35.6	
3760.00	-9.9	H	3.0	45.5	1.0	-54.4	-13.0	-41.4	
5640.00	-7.3	H	3.0	45.4	1.0	-51.7	-13.0	-38.7	
7520.00	-5.0	H	3.0	44.1	1.0	-48.2	-13.0	-35.2	
High Ch, 1909.8MHz									
3819.60	-10.3	V	3.0	45.5	1.0	-54.8	-13.0	-41.8	
5729.40	-3.2	V	3.0	45.4	1.0	-47.6	-13.0	-34.6	
7639.20	-5.1	V	3.0	44.1	1.0	-48.1	-13.0	-35.1	
3819.60	-9.9	H	3.0	45.5	1.0	-54.4	-13.0	-41.4	
5729.40	-7.2	H	3.0	45.4	1.0	-51.6	-13.0	-38.6	
7639.20	-4.9	H	3.0	44.1	1.0	-48.0	-13.0	-35.0	

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WCDMA

Band 5

REL99

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 2
Mode: Rel99 Band 5 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-14.9	V	3.0	40.7	1.0	-54.6	-13.0	-41.6	
2479.20	-12.7	V	3.0	41.3	1.0	-53.0	-13.0	-40.0	
3305.60	-9.3	V	3.0	42.1	1.0	-50.4	-13.0	-37.4	
1652.80	-15.0	H	3.0	40.7	1.0	-54.7	-13.0	-41.7	
2479.20	-11.8	H	3.0	41.3	1.0	-52.2	-13.0	-39.2	
3305.60	-9.4	H	3.0	42.1	1.0	-50.5	-13.0	-37.5	
Mid Ch, 836.6MHz									
1673.20	-14.9	V	3.0	40.7	1.0	-54.6	-13.0	-41.6	
2509.80	-12.6	V	3.0	41.4	1.0	-52.9	-13.0	-39.9	
3346.40	-9.3	V	3.0	42.1	1.0	-50.3	-13.0	-37.3	
1673.20	-15.6	H	3.0	40.7	1.0	-55.3	-13.0	-42.3	
2509.80	-12.2	H	3.0	41.4	1.0	-52.6	-13.0	-39.6	
3346.40	-9.6	H	3.0	42.1	1.0	-50.7	-13.0	-37.7	
High Ch, 846.6MHz									
1693.20	-15.3	V	3.0	40.7	1.0	-55.0	-13.0	-42.0	
2539.80	-12.8	V	3.0	41.4	1.0	-53.2	-13.0	-40.2	
3386.40	-10.7	V	3.0	42.1	1.0	-51.8	-13.0	-38.8	
1693.20	-15.4	H	3.0	40.7	1.0	-55.1	-13.0	-42.1	
2539.80	-11.7	H	3.0	41.4	1.0	-52.1	-13.0	-39.1	
3386.40	-9.1	H	3.0	42.1	1.0	-50.1	-13.0	-37.1	

Band 5

HSDPA

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 2
Mode: HSDPA Band 5 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-14.6	V	3.0	40.7	1.0	-54.3	-13.0	-41.3	
2479.20	-12.5	V	3.0	41.3	1.0	-52.8	-13.0	-39.8	
3305.60	-10.1	V	3.0	42.1	1.0	-51.2	-13.0	-38.2	
1652.80	-15.6	H	3.0	40.7	1.0	-55.3	-13.0	-42.3	
2479.20	-12.4	H	3.0	41.3	1.0	-52.7	-13.0	-39.7	
3305.60	-9.5	H	3.0	42.1	1.0	-50.5	-13.0	-37.5	
Mid Ch, 836.6MHz									
1673.20	-15.6	V	3.0	40.7	1.0	-55.3	-13.0	-42.3	
2509.80	-12.7	V	3.0	41.4	1.0	-53.0	-13.0	-40.0	
3346.40	-9.9	V	3.0	42.1	1.0	-50.9	-13.0	-37.9	
1673.20	-15.6	H	3.0	40.7	1.0	-55.3	-13.0	-42.3	
2509.80	-12.5	H	3.0	41.4	1.0	-52.9	-13.0	-39.9	
3346.40	-9.8	H	3.0	42.1	1.0	-50.9	-13.0	-37.9	
High Ch, 846.6MHz									
1693.20	-15.7	V	3.0	40.7	1.0	-55.3	-13.0	-42.3	
2539.80	-12.4	V	3.0	41.4	1.0	-52.8	-13.0	-39.8	
3386.40	-9.7	V	3.0	42.1	1.0	-50.7	-13.0	-37.7	
1693.20	-14.9	H	3.0	40.7	1.0	-54.6	-13.0	-41.6	
2539.80	-12.3	H	3.0	41.4	1.0	-52.7	-13.0	-39.7	
3386.40	-9.5	H	3.0	42.1	1.0	-50.6	-13.0	-37.6	

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Band 4

REL99

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: Rel99 Band 4 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1712.4MHz									
3424.80	-9.4	V	3.0	42.1	1.0	-50.5	-13.0	-37.5	
5137.20	-9.0	V	3.0	42.8	1.0	-50.9	-13.0	-37.9	
6849.60	-6.3	V	3.0	42.7	1.0	-48.1	-13.0	-35.1	
3424.80	-9.5	H	3.0	42.1	1.0	-50.6	-13.0	-37.6	
5137.20	-8.7	H	3.0	42.8	1.0	-50.5	-13.0	-37.5	
6849.60	-6.6	H	3.0	42.7	1.0	-48.3	-13.0	-35.3	
Mid Ch, 1732.6MHz									
3465.20	-9.1	V	3.0	42.1	1.0	-50.2	-13.0	-37.2	
5197.80	-8.9	V	3.0	42.8	1.0	-50.7	-13.0	-37.7	
6930.40	-6.5	V	3.0	42.7	1.0	-48.2	-13.0	-35.2	
3465.20	-8.8	H	3.0	42.1	1.0	-49.9	-13.0	-36.9	
5197.80	-8.1	H	3.0	42.8	1.0	-49.9	-13.0	-36.9	
6930.40	-6.2	H	3.0	42.7	1.0	-47.9	-13.0	-34.9	
High Ch, 1752.6MHz									
3505.20	-8.7	V	3.0	42.1	1.0	-49.8	-13.0	-36.8	
5257.80	-8.8	V	3.0	42.8	1.0	-50.6	-13.0	-37.6	
7010.40	-6.2	V	3.0	42.7	1.0	-47.9	-13.0	-34.9	
3505.20	-8.4	H	3.0	42.1	1.0	-49.5	-13.0	-36.5	
5257.80	-8.1	H	3.0	42.8	1.0	-50.0	-13.0	-37.0	
7010.40	-5.9	H	3.0	42.7	1.0	-47.6	-13.0	-34.6	

Band 4

HSDPA

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20882
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: HSDPA Band 4 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1712.4MHz									
3424.80	-9.3	V	3.0	42.1	1.0	-50.4	-13.0	-37.4	
5137.20	-8.8	V	3.0	42.8	1.0	-50.6	-13.0	-37.6	
6849.60	-6.1	V	3.0	42.7	1.0	-47.8	-13.0	-34.8	
3424.80	-9.2	H	3.0	42.1	1.0	-50.3	-13.0	-37.3	
5137.20	-8.4	H	3.0	42.8	1.0	-50.2	-13.0	-37.2	
6849.60	-6.1	H	3.0	42.7	1.0	-47.9	-13.0	-34.9	
Mid Ch, 1732.6MHz									
3465.20	-9.0	V	3.0	42.1	1.0	-50.0	-13.0	-37.0	
5197.80	-8.3	V	3.0	42.8	1.0	-50.1	-13.0	-37.1	
6930.40	-6.0	V	3.0	42.7	1.0	-47.7	-13.0	-34.7	
3465.20	-8.8	H	3.0	42.1	1.0	-49.9	-13.0	-36.9	
5197.80	-8.2	H	3.0	42.8	1.0	-50.1	-13.0	-37.1	
6930.40	-6.2	H	3.0	42.7	1.0	-47.9	-13.0	-34.9	
High Ch, 1752.6MHz									
3505.20	-8.0	V	3.0	42.1	1.0	-49.1	-13.0	-36.1	
5257.80	-8.7	V	3.0	42.8	1.0	-50.5	-13.0	-37.5	
7010.40	-6.0	V	3.0	42.7	1.0	-47.7	-13.0	-34.7	
3505.20	-8.7	H	3.0	42.1	1.0	-49.7	-13.0	-36.7	
5257.80	-8.0	H	3.0	42.8	1.0	-49.9	-13.0	-36.9	
7010.40	-6.3	H	3.0	42.7	1.0	-48.0	-13.0	-35.0	

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Band 2

REL99

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: Rel99 Band 2 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4MHz									
3704.80	-11.8	V	3.0	42.1	1.0	-52.9	-13.0	-39.9	
5557.20	-8.4	V	3.0	42.9	1.0	-50.3	-13.0	-37.3	
7409.60	-6.5	V	3.0	42.5	1.0	-47.9	-13.0	-34.9	
3704.80	-11.8	H	3.0	42.1	1.0	-52.9	-13.0	-39.9	
5557.20	-8.1	H	3.0	42.9	1.0	-50.0	-13.0	-37.0	
7409.60	-6.6	H	3.0	42.5	1.0	-48.1	-13.0	-35.1	
Mid Ch, 1880MHz									
3760.00	-11.6	V	3.0	42.1	1.0	-52.7	-13.0	-39.7	
5640.00	-8.0	V	3.0	42.9	1.0	-49.9	-13.0	-36.9	
7520.00	-6.6	V	3.0	42.4	1.0	-48.0	-13.0	-35.0	
3760.00	-11.7	H	3.0	42.1	1.0	-52.7	-13.0	-39.7	
5640.00	-7.8	H	3.0	42.9	1.0	-49.8	-13.0	-36.8	
7520.00	-6.7	H	3.0	42.4	1.0	-48.2	-13.0	-35.2	
High Ch, 1907.6MHz									
3815.20	-11.7	V	3.0	42.1	1.0	-52.8	-13.0	-39.8	
5722.80	-8.2	V	3.0	42.9	1.0	-50.2	-13.0	-37.2	
7630.40	-6.3	V	3.0	42.4	1.0	-47.7	-13.0	-34.7	
3815.20	-11.6	H	3.0	42.1	1.0	-52.7	-13.0	-39.7	
5722.80	-8.1	H	3.0	42.9	1.0	-50.0	-13.0	-37.0	
7630.40	-6.5	H	3.0	42.4	1.0	-47.9	-13.0	-34.9	

Band 2

HSDPA

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-15
Test Engineer: 20890
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: HSDPA Band 2 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4MHz									
3704.80	-11.8	V	3.0	42.1	1.0	-52.8	-13.0	-39.8	
5557.20	-8.3	V	3.0	42.9	1.0	-50.2	-13.0	-37.2	
7409.60	-6.4	V	3.0	42.5	1.0	-47.9	-13.0	-34.9	
3704.80	-11.8	H	3.0	42.1	1.0	-52.9	-13.0	-39.9	
5557.20	-8.0	H	3.0	42.9	1.0	-49.9	-13.0	-36.9	
7409.60	-6.5	H	3.0	42.5	1.0	-48.0	-13.0	-35.0	
Mid Ch, 1880MHz									
3760.00	-11.6	V	3.0	42.1	1.0	-52.7	-13.0	-39.7	
5640.00	-7.9	V	3.0	42.9	1.0	-49.9	-13.0	-36.9	
7520.00	-6.6	V	3.0	42.4	1.0	-48.0	-13.0	-35.0	
3760.00	-11.6	H	3.0	42.1	1.0	-52.7	-13.0	-39.7	
5640.00	-7.8	H	3.0	42.9	1.0	-49.7	-13.0	-36.7	
7520.00	-6.6	H	3.0	42.4	1.0	-48.1	-13.0	-35.1	
High Ch, 1907.6MHz									
3815.20	-11.7	V	3.0	42.1	1.0	-52.8	-13.0	-39.8	
5722.80	-8.2	V	3.0	42.9	1.0	-50.2	-13.0	-37.2	
7630.40	-6.4	V	3.0	42.4	1.0	-47.8	-13.0	-34.8	
3815.20	-11.7	H	3.0	42.1	1.0	-52.7	-13.0	-39.7	
5722.80	-8.0	H	3.0	42.9	1.0	-49.9	-13.0	-36.9	
7630.40	-6.6	H	3.0	42.4	1.0	-48.0	-13.0	-35.0	

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LTE Band 12

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-11
Test Engineer: 20882
Configuration: EUT/ AC Adapter, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 12 Harmonics, 5MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

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, 701.5MHz									
1403.00	-16.9	V	3.0	40.7	1.0	-56.6	-13.0	-43.6	
2104.50	-14.3	V	3.0	40.8	1.0	-54.1	-13.0	-41.1	
2806.00	-11.7	V	3.0	41.8	1.0	-52.5	-13.0	-39.5	
1403.00	-17.0	H	3.0	40.7	1.0	-56.8	-13.0	-43.8	
2104.50	-13.9	H	3.0	40.8	1.0	-53.6	-13.0	-40.6	
2806.00	-11.6	H	3.0	41.8	1.0	-52.4	-13.0	-39.4	
Mid Ch, 707.5MHz									
1415.00	-16.7	V	3.0	40.7	1.0	-56.5	-13.0	-43.5	
2122.50	-14.3	V	3.0	40.8	1.0	-54.1	-13.0	-41.1	
2830.00	-11.7	V	3.0	41.8	1.0	-52.5	-13.0	-39.5	
1415.00	-16.9	H	3.0	40.7	1.0	-56.6	-13.0	-43.6	
2122.50	-13.8	H	3.0	40.8	1.0	-53.6	-13.0	-40.6	
2830.00	-11.5	H	3.0	41.8	1.0	-52.3	-13.0	-39.3	
High Ch, 713.5MHz									
1427.00	-16.8	V	3.0	40.7	1.0	-56.5	-13.0	-43.5	
2140.50	-14.2	V	3.0	40.8	1.0	-54.0	-13.0	-41.0	
2854.00	-11.5	V	3.0	41.8	1.0	-52.3	-13.0	-39.3	
1427.00	-17.0	H	3.0	40.7	1.0	-56.8	-13.0	-43.8	
2140.50	-13.9	H	3.0	40.8	1.0	-53.7	-13.0	-40.7	
2854.00	-11.9	H	3.0	41.8	1.0	-52.7	-13.0	-39.7	

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LTE Band 13

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-10
Test Engineer: 22943
Configuration: EUT / AC Adapter / Keyboard, covered X
Location: Chamber 2
Mode: LTE_QPSK Band 13 Harmonics, 5MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

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	-24.3	V	3.0	40.7	1.0	-64.0	-40.0	-24.0	
2338.50	-13.4	V	3.0	41.1	1.0	-53.5	-13.0	-40.5	
3118.00	-10.4	V	3.0	42.1	1.0	-51.5	-13.0	-38.5	
1559.00	-26.2	H	3.0	40.7	1.0	-65.9	-40.0	-25.9	
2338.50	-13.0	H	3.0	41.1	1.0	-53.1	-13.0	-40.1	
3118.00	-10.2	H	3.0	42.1	1.0	-51.3	-13.0	-38.3	
Mid Ch, 782MHz									
1564.00	-29.0	V	3.0	40.7	1.0	-68.7	-40.0	-28.7	
2346.00	-13.3	V	3.0	41.1	1.0	-53.4	-13.0	-40.4	
3128.00	-10.3	V	3.0	42.1	1.0	-51.3	-13.0	-38.3	
1564.00	-30.2	H	3.0	40.7	1.0	-69.9	-40.0	-29.9	
2346.00	-12.9	H	3.0	41.1	1.0	-53.0	-13.0	-40.0	
3128.00	-10.3	H	3.0	42.1	1.0	-51.3	-13.0	-38.3	
High Ch, 784.5MHz									
1569.00	-30.6	V	3.0	40.7	1.0	-70.3	-40.0	-30.3	
2353.50	-13.3	V	3.0	41.1	1.0	-53.4	-13.0	-40.4	
3138.00	-11.1	V	3.0	42.1	1.0	-52.1	-13.0	-39.1	
1569.00	-30.6	H	3.0	40.7	1.0	-70.3	-40.0	-30.3	
2353.50	-13.0	H	3.0	41.1	1.0	-53.1	-13.0	-40.1	
3138.00	-10.3	H	3.0	42.1	1.0	-51.3	-13.0	-38.3	

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

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LTE Band 25

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-17
Test Engineer: 20882
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 25 Harmonics, 5MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

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, 1852.5MHz									
3705.00	-10.8	V	3.0	42.1	1.0	-51.8	-13.0	-38.8	
5557.50	-7.3	V	3.0	42.9	1.0	-49.2	-13.0	-36.2	
7410.00	-5.7	V	3.0	42.5	1.0	-47.2	-13.0	-34.2	
3705.00	-11.0	H	3.0	42.1	1.0	-52.1	-13.0	-39.1	
5557.50	-6.9	H	3.0	42.9	1.0	-48.8	-13.0	-35.8	
7410.00	-5.9	H	3.0	42.5	1.0	-47.4	-13.0	-34.4	
Mid Ch, 1882.5MHz									
3765.00	-10.7	V	3.0	42.1	1.0	-51.8	-13.0	-38.8	
5647.50	-5.2	V	3.0	42.9	1.0	-47.1	-13.0	-34.1	
7530.00	-5.8	V	3.0	42.4	1.0	-47.3	-13.0	-34.3	
3765.00	-10.7	H	3.0	42.1	1.0	-51.8	-13.0	-38.8	
5647.50	-7.1	H	3.0	42.9	1.0	-49.0	-13.0	-36.0	
7530.00	-5.9	H	3.0	42.4	1.0	-47.3	-13.0	-34.3	
High Ch, 1912.5MHz									
3825.00	-10.6	V	3.0	42.1	1.0	-51.7	-13.0	-38.7	
5737.50	-7.3	V	3.0	43.0	1.0	-49.3	-13.0	-36.3	
7650.00	-5.8	V	3.0	42.4	1.0	-47.2	-13.0	-34.2	
3825.00	-10.6	H	3.0	42.1	1.0	-51.7	-13.0	-38.7	
5737.50	-7.2	H	3.0	43.0	1.0	-49.1	-13.0	-36.1	
7650.00	-5.8	H	3.0	42.4	1.0	-47.2	-13.0	-34.2	

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LTE Band 26 (Part 90)

1.4MHz

QPSK

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 22943
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 26 Harmonics, 1.4MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 814.7MHz									
1629.40	-15.8	V	3.0	40.7	1.0	-55.5	-13.0	-42.5	
2444.10	-12.9	V	3.0	41.3	1.0	-53.2	-13.0	-40.2	
3258.80	-10.4	V	3.0	42.1	1.0	-51.5	-13.0	-38.5	
1629.40	-15.8	H	3.0	40.7	1.0	-55.5	-13.0	-42.5	
2444.10	-12.7	H	3.0	41.3	1.0	-52.9	-13.0	-39.9	
3258.80	-10.2	H	3.0	42.1	1.0	-51.2	-13.0	-38.2	
Mid Ch, 823.3MHz									
1646.60	-15.7	V	3.0	40.7	1.0	-55.4	-13.0	-42.4	
2469.90	-13.0	V	3.0	41.3	1.0	-53.2	-13.0	-40.2	
3293.20	-10.3	V	3.0	42.1	1.0	-51.4	-13.0	-38.4	
1646.60	-15.7	H	3.0	40.7	1.0	-55.4	-13.0	-42.4	
2469.90	-12.7	H	3.0	41.3	1.0	-53.0	-13.0	-40.0	
3293.20	-10.1	H	3.0	42.1	1.0	-51.2	-13.0	-38.2	

LTE Band 26 (Straddle)

5MHz

QPSK

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 22943
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 26 Harmonics, 5MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Straddle Ch, 824MHz									
1648.00	-15.7	V	3.0	40.7	1.0	-55.4	-13.0	-42.4	
2472.00	-12.9	V	3.0	41.3	1.0	-53.2	-13.0	-40.2	
3296.00	-10.2	V	3.0	42.1	1.0	-51.3	-13.0	-38.3	
1648.00	-15.8	H	3.0	40.7	1.0	-55.5	-13.0	-42.5	
2472.00	-12.7	H	3.0	41.3	1.0	-53.0	-13.0	-40.0	
3296.00	-10.2	H	3.0	42.1	1.0	-51.2	-13.0	-38.2	

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LTE Band 26 (Part 22)

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-16
Test Engineer: 20882
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 26 Harmonics, 1.4MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

1.4MHz 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, 824.7MHz									
1649.40	-15.8	V	3.0	40.7	1.0	-55.4	-13.0	-42.4	
2474.10	-12.9	V	3.0	41.3	1.0	-53.2	-13.0	-40.2	
3298.80	-10.1	V	3.0	42.1	1.0	-51.2	-13.0	-38.2	
1649.40	-15.7	H	3.0	40.7	1.0	-55.4	-13.0	-42.4	
2474.10	-12.6	H	3.0	41.3	1.0	-52.9	-13.0	-39.9	
3298.80	-10.1	H	3.0	42.1	1.0	-51.2	-13.0	-38.2	
Mid Ch, 831.5MHz									
1663.00	-15.5	V	3.0	40.7	1.0	-55.2	-13.0	-42.2	
2494.50	-12.8	V	3.0	41.3	1.0	-53.1	-13.0	-40.1	
3326.00	-10.1	V	3.0	42.1	1.0	-51.1	-13.0	-38.1	
1663.00	-15.7	H	3.0	40.7	1.0	-55.4	-13.0	-42.4	
2494.50	-12.5	H	3.0	41.3	1.0	-52.8	-13.0	-39.8	
3326.00	-10.1	H	3.0	42.1	1.0	-51.1	-13.0	-38.1	
High Ch, 848.3MHz									
1696.60	-15.6	V	3.0	40.7	1.0	-55.3	-13.0	-42.3	
2544.90	-12.6	V	3.0	41.4	1.0	-53.0	-13.0	-40.0	
3393.20	-9.9	V	3.0	42.1	1.0	-51.0	-13.0	-38.0	
1696.60	-15.6	H	3.0	40.7	1.0	-55.3	-13.0	-42.3	
2544.90	-12.3	H	3.0	41.4	1.0	-52.7	-13.0	-39.7	
3393.20	-9.8	H	3.0	42.1	1.0	-50.8	-13.0	-37.8	

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LTE Band 41

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

Company: Samsung
Project #: 4789841420
Date: 2021-03-23
Test Engineer: 22943
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: LTE_QPSK Band 41 Harmonics, 5MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

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, 2498.5MHz									
4997.00	-16.8	V	3.0	42.8	1.0	-58.6	-25.0	-33.6	
7495.50	-15.0	V	3.0	42.5	1.0	-56.4	-25.0	-31.4	
9994.00	-11.8	V	3.0	40.9	1.0	-51.7	-25.0	-26.7	
4997.00	-16.3	H	3.0	42.8	1.0	-58.1	-25.0	-33.1	
7495.50	-15.0	H	3.0	42.5	1.0	-56.5	-25.0	-31.5	
9994.00	-11.7	H	3.0	40.9	1.0	-51.6	-25.0	-26.6	
Mid Ch, 2593MHz									
5186.00	-16.6	V	3.0	42.8	1.0	-58.4	-25.0	-33.4	
7779.00	-15.1	V	3.0	42.3	1.0	-56.4	-25.0	-31.4	
10372.00	-11.5	V	3.0	41.0	1.0	-51.5	-25.0	-26.5	
5186.00	-16.1	H	3.0	42.8	1.0	-57.9	-25.0	-32.9	
7779.00	-15.2	H	3.0	42.3	1.0	-56.5	-25.0	-31.5	
10372.00	-11.4	H	3.0	41.0	1.0	-51.4	-25.0	-26.4	
High Ch, 2687.5MHz									
5375.00	-16.0	V	3.0	42.9	1.0	-57.8	-25.0	-32.8	
8062.50	-14.9	V	3.0	42.2	1.0	-56.1	-25.0	-31.1	
10750.00	-10.5	V	3.0	41.2	1.0	-50.7	-25.0	-25.7	
5375.00	-15.6	H	3.0	42.9	1.0	-57.5	-25.0	-32.5	
8062.50	-15.1	H	3.0	42.2	1.0	-56.3	-25.0	-31.3	
10750.00	-10.4	H	3.0	41.2	1.0	-50.6	-25.0	-25.6	

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LTE Band 66

1.4MHz

QPSK

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

Company:	Samsung
Project #:	4789841420
Date:	2021-03-16
Test Engineer:	20881
Configuration:	EUT / AC Adapter / Keyboard, covered X
Location:	Chamber 2
Mode:	LTE_QPSK Band 66 Harmonics, 5MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1712.5MHz									
3425.00	-9.7	V	3.0	42.1	1.0	-50.8	-13.0	-37.8	
5137.50	-9.0	V	3.0	42.8	1.0	-50.9	-13.0	-37.9	
6850.00	-6.4	V	3.0	42.7	1.0	-48.1	-13.0	-35.1	
3425.00	-9.6	H	3.0	42.1	1.0	-50.6	-13.0	-37.6	
5137.50	-8.7	H	3.0	42.8	1.0	-50.5	-13.0	-37.5	
6850.00	-6.5	H	3.0	42.7	1.0	-48.2	-13.0	-35.2	
Mid Ch, 1745MHz									
3490.00	-9.1	V	3.0	42.1	1.0	-50.1	-13.0	-37.1	
5235.00	-8.9	V	3.0	42.8	1.0	-50.8	-13.0	-37.8	
6980.00	-6.3	V	3.0	42.7	1.0	-48.0	-13.0	-35.0	
3490.00	-9.1	H	3.0	42.1	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	-6.3	H	3.0	42.7	1.0	-48.0	-13.0	-35.0	
High Ch, 1777.5MHz									
3555.00	-8.4	V	3.0	42.1	1.0	-49.5	-13.0	-36.5	
5332.50	-8.4	V	3.0	42.9	1.0	-50.2	-13.0	-37.2	
7110.00	-6.1	V	3.0	42.6	1.0	-47.7	-13.0	-34.7	
3555.00	-8.3	H	3.0	42.1	1.0	-49.4	-13.0	-36.4	
5332.50	-8.0	H	3.0	42.9	1.0	-49.9	-13.0	-36.9	
7110.00	-6.3	H	3.0	42.6	1.0	-48.0	-13.0	-35.0	

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LTE Band 2

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

LTE Band 4

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

LTE Band 5

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

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

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NR Band 5

20MHz

QPSK

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

Company:	Samsung
Project #:	4789841420
Date:	2021-03-24
Test Engineer:	22943
Configuration:	EUT / AC Adapter, Y-Position
Location:	Chamber 1
Mode:	LTE_QPSK NR n5 Harmonics, 20MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 834MHz									
1668.00	-13.7	V	3.0	45.3	1.0	-57.9	-13.0	-44.9	
2502.00	-11.0	V	3.0	45.1	1.0	-55.1	-13.0	-42.1	
3336.00	-9.5	V	3.0	45.3	1.0	-53.8	-13.0	-40.8	
1668.00	-15.2	H	3.0	45.3	1.0	-59.5	-13.0	-46.5	
2502.00	-11.6	H	3.0	45.1	1.0	-55.7	-13.0	-42.7	
3336.00	-9.3	H	3.0	45.3	1.0	-53.6	-13.0	-40.6	
Mid Ch, 836.5MHz									
1673.00	-13.6	V	3.0	45.3	1.0	-57.9	-13.0	-44.9	
2509.50	-10.8	V	3.0	45.1	1.0	-54.9	-13.0	-41.9	
3346.00	-9.3	V	3.0	45.3	1.0	-53.7	-13.0	-40.7	
1673.00	-15.2	H	3.0	45.3	1.0	-59.5	-13.0	-46.5	
2509.50	-11.6	H	3.0	45.1	1.0	-55.7	-13.0	-42.7	
3346.00	-9.1	H	3.0	45.3	1.0	-53.4	-13.0	-40.4	
High Ch, 839MHz									
1678.00	-13.7	V	3.0	45.2	1.0	-58.0	-13.0	-45.0	
2517.00	-10.9	V	3.0	45.1	1.0	-55.0	-13.0	-42.0	
3356.00	-9.4	V	3.0	45.3	1.0	-53.7	-13.0	-40.7	
1678.00	-15.2	H	3.0	45.2	1.0	-59.4	-13.0	-46.4	
2517.00	-11.6	H	3.0	45.1	1.0	-55.7	-13.0	-42.7	
3356.00	-9.2	H	3.0	45.3	1.0	-53.5	-13.0	-40.5	

END OF TEST REPORT

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