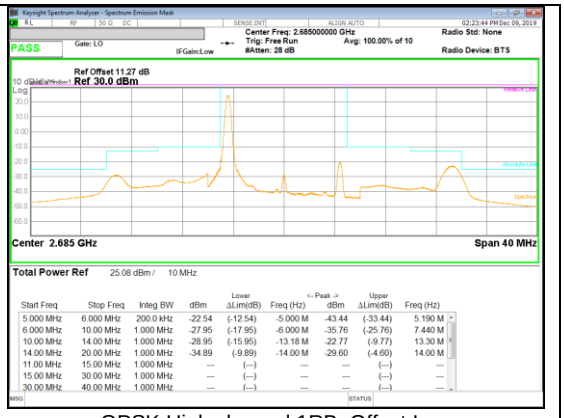
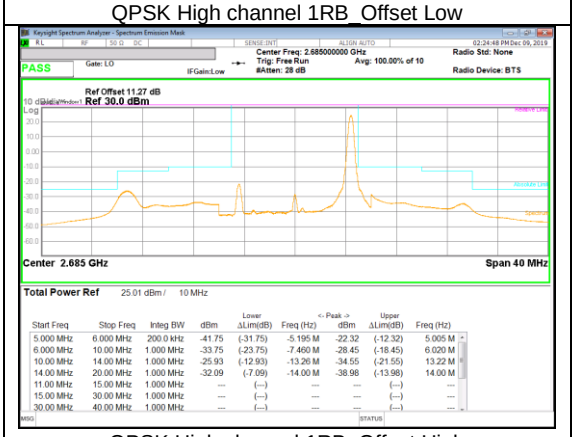
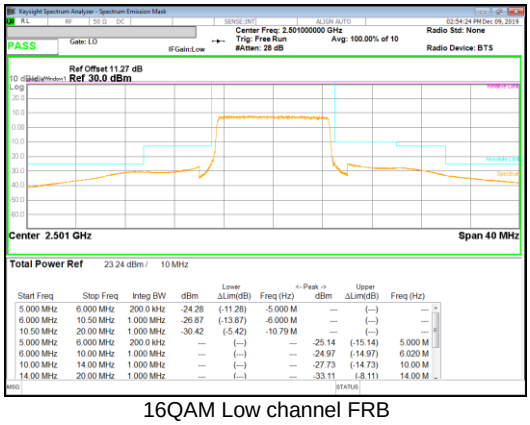
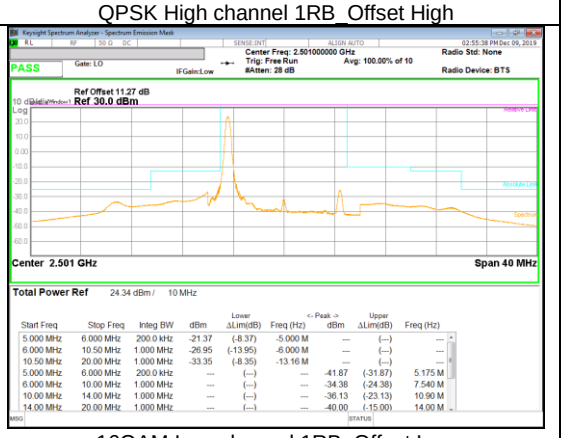
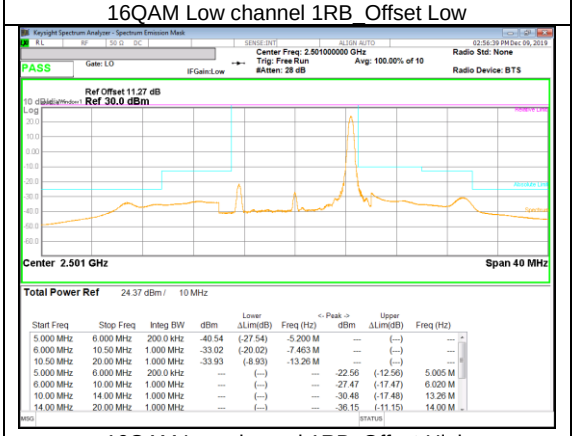
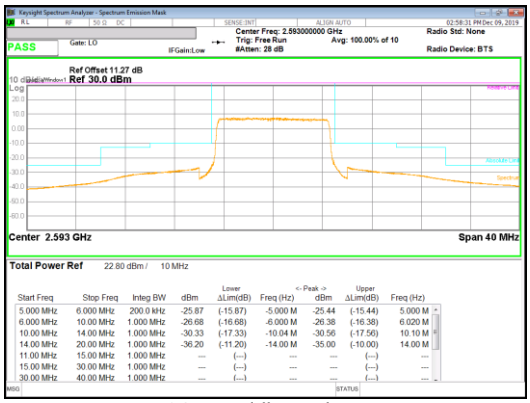
Band 41 10MHz QPSK	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low  QPSK High channel 1RB_Offset High
Band 41 10MHz 16QAM	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low  16QAM Low channel 1RB_Offset High

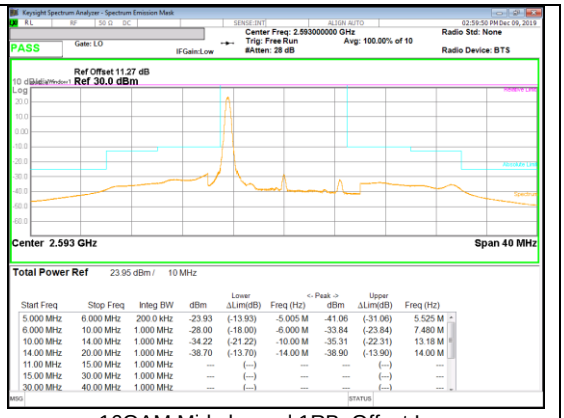
Band 41

10MHz

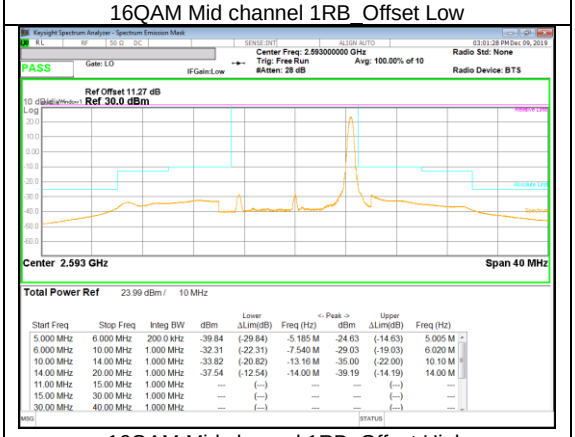
16QAM



16QAM Midhannel FRB

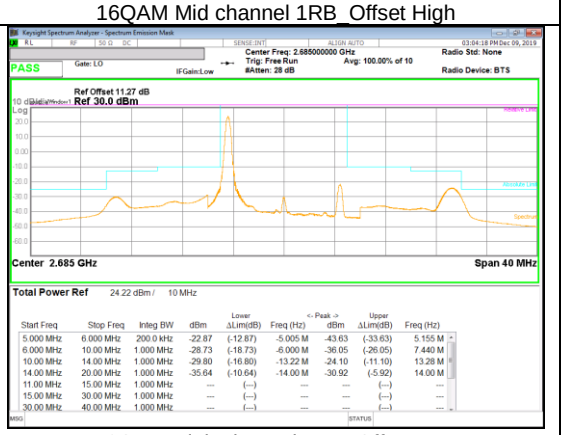


16QAM Mid channel 1RB_Offset Low

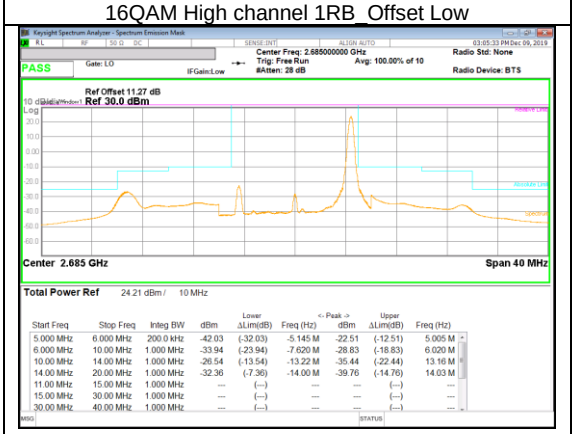


16QAM Mid channel 1RB_Offset High

16QAM High channel FRB



16QAM High channel 1RB_Offset Low

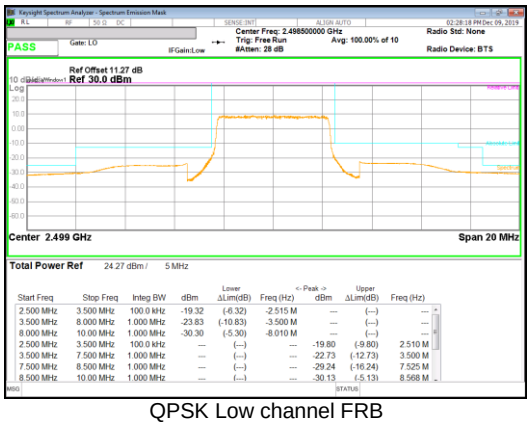


16QAM High channel 1RB_Offset High

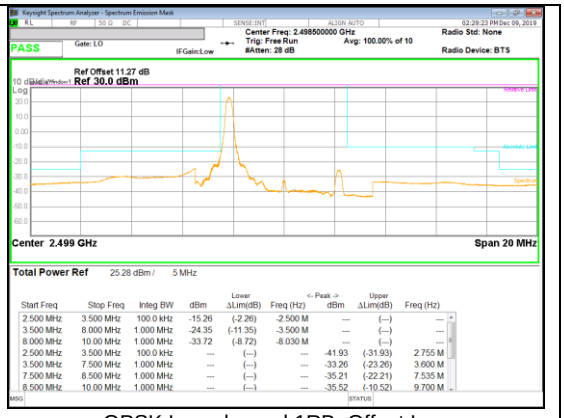
Band 41

5MHz

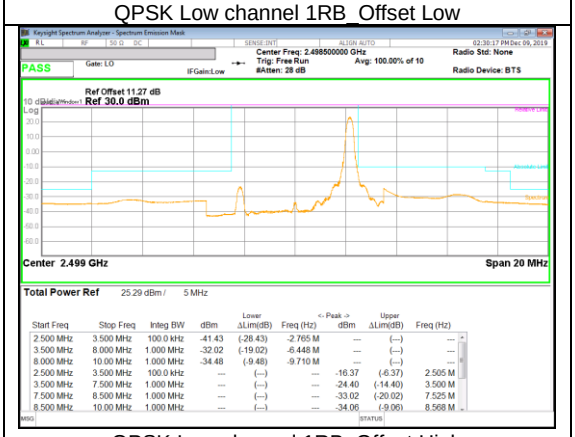
QPSK



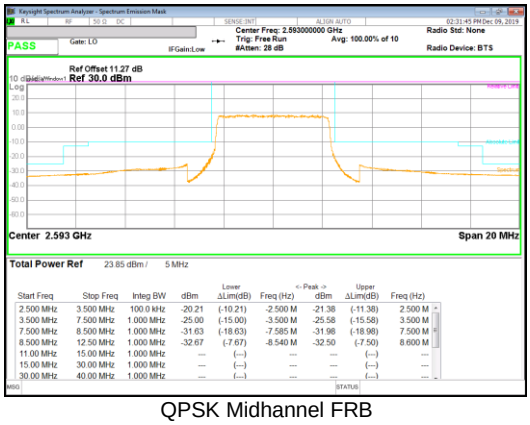
QPSK Low channel FRB



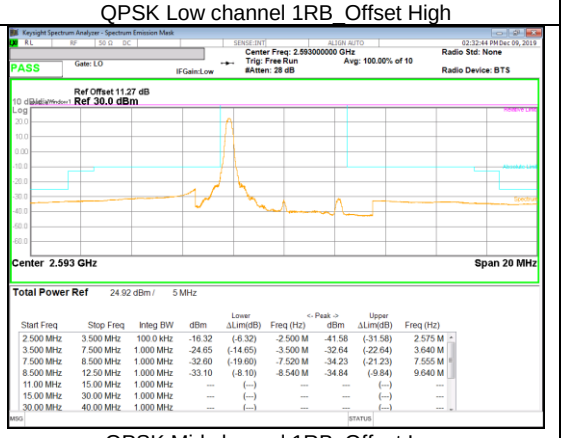
QPSK Low channel 1RB_Offset Low



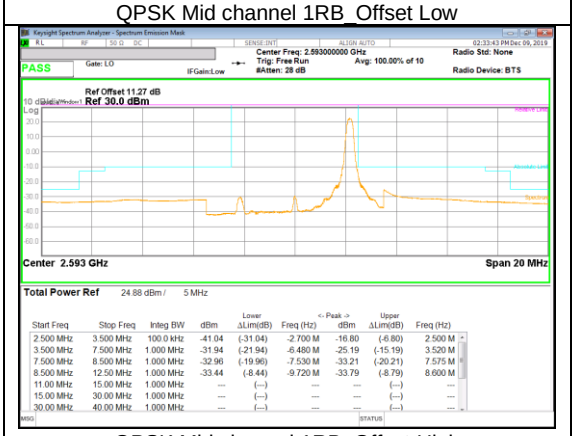
QPSK Low channel 1RB_Offset High



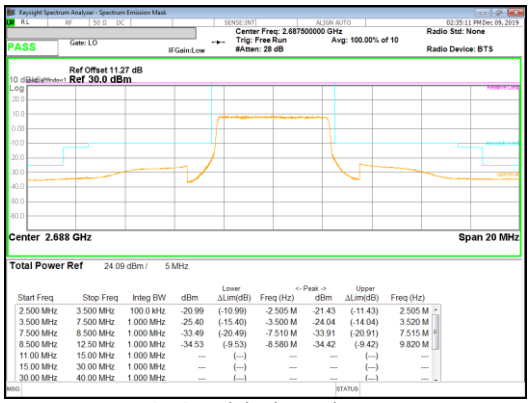
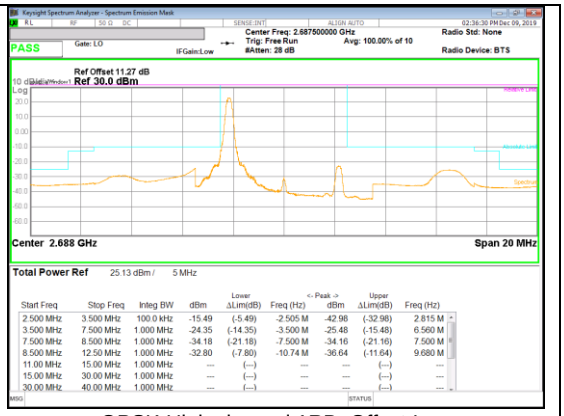
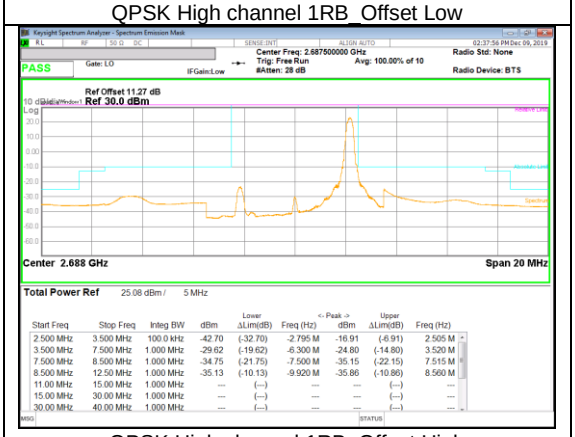
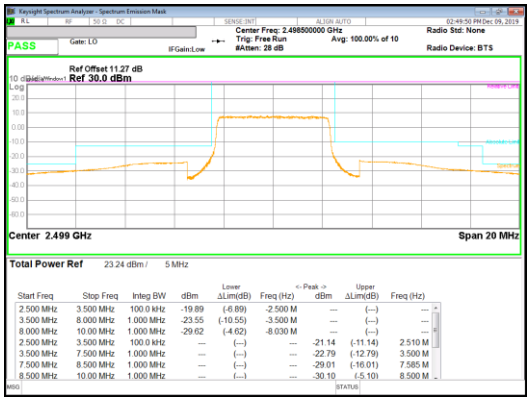
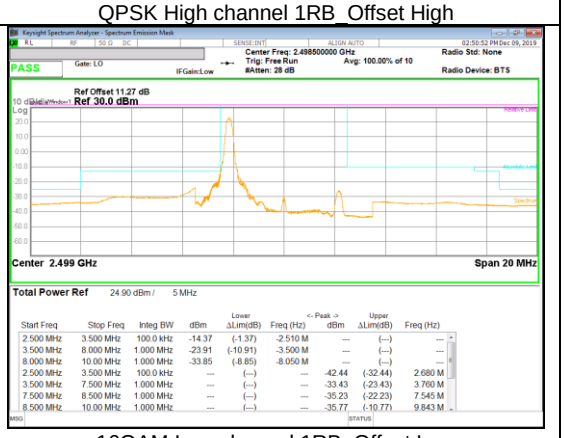
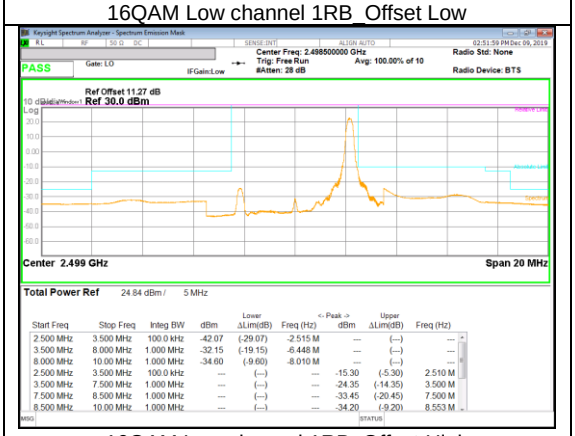
QPSK Midhannel FRB



QPSK Mid channel 1RB_Offset Low



QPSK Mid channel 1RB_Offset High

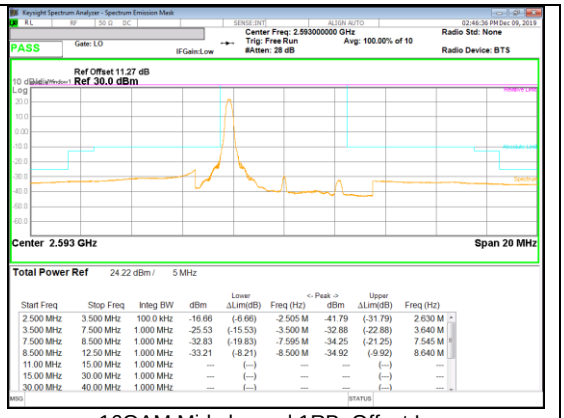
Band 41 5MHz QPSK	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low  QPSK High channel 1RB_Offset High
Band 41 5MHz 16QAM	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low  16QAM Low channel 1RB_Offset High

Band 41

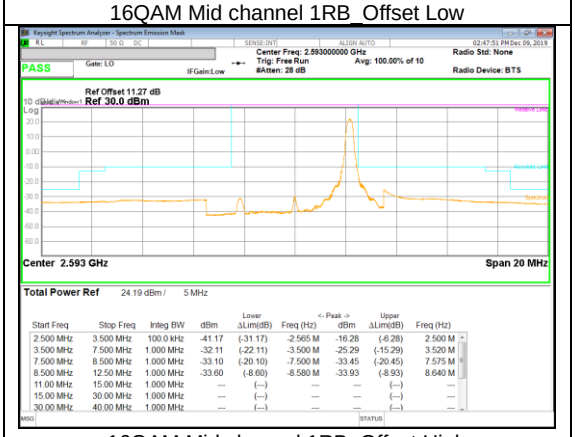
5MHz

16QAM

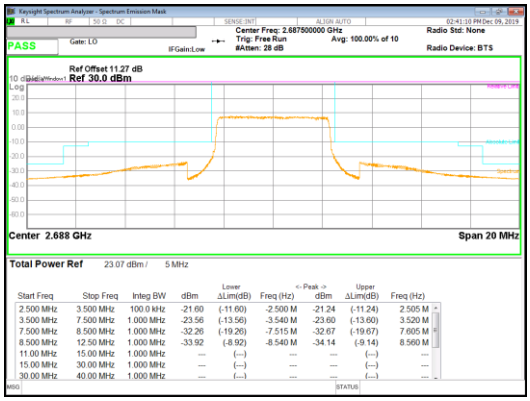
16QAM Midhannel FRB



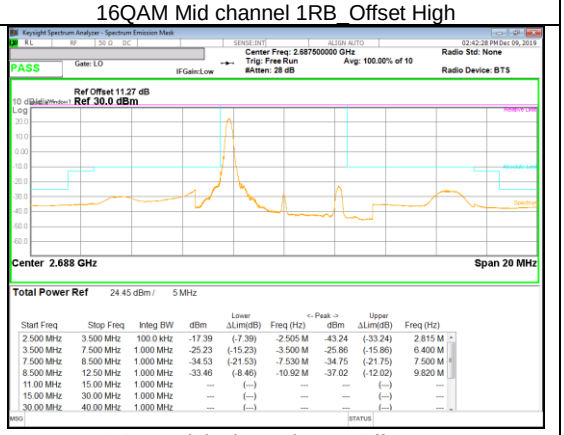
16QAM Mid channel 1RB_Offset Low



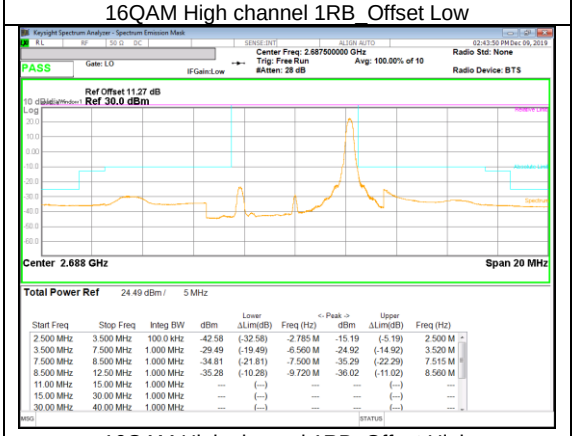
16QAM Mid channel 1RB_Offset High



16QAM High channel FRB



16QAM High channel 1RB_Offset Low



16QAM High channel 1RB_Offset High

LTE Band 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.

LTE Band41(PC3)

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

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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) Set span ≥ 1.5 times the OBW;

d) Sweep time = auto couple;

e) Detector = rms;

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

g) Trace mode = average(WCDMA, LTE), Maxhold(GSM, LTE Band41);

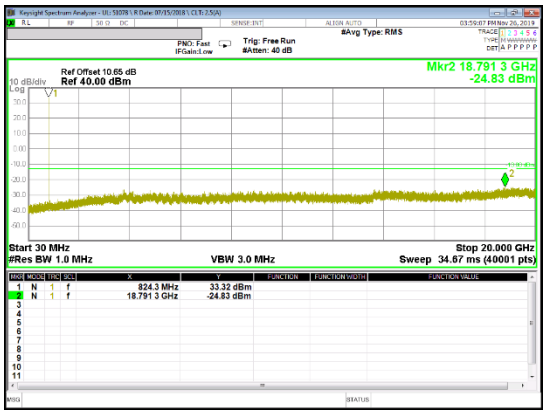
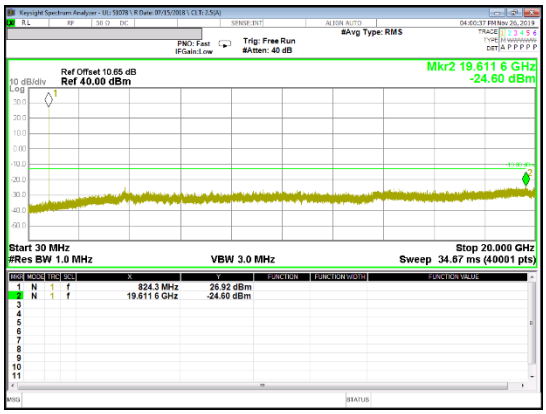
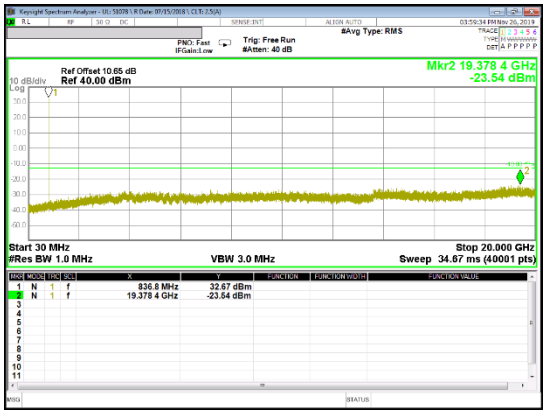
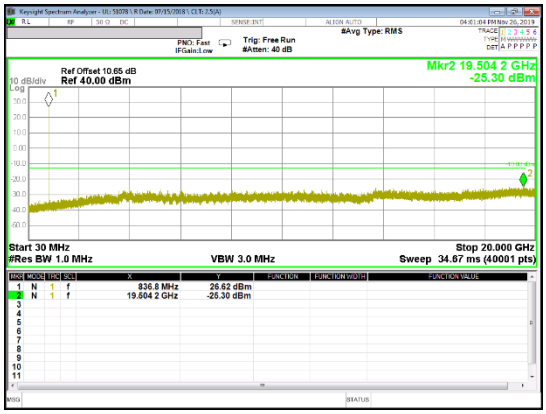
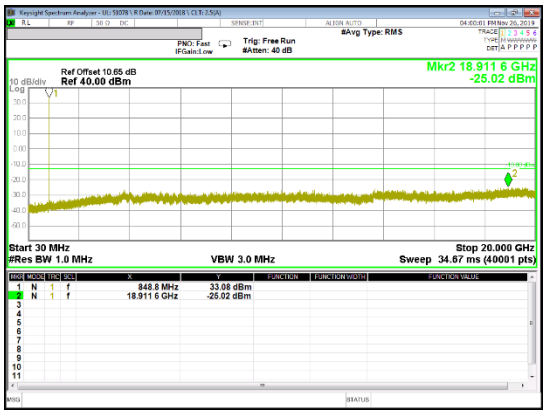
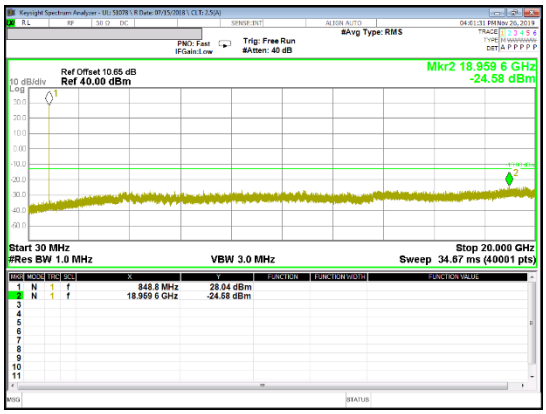
RESULTS

See the following pages.

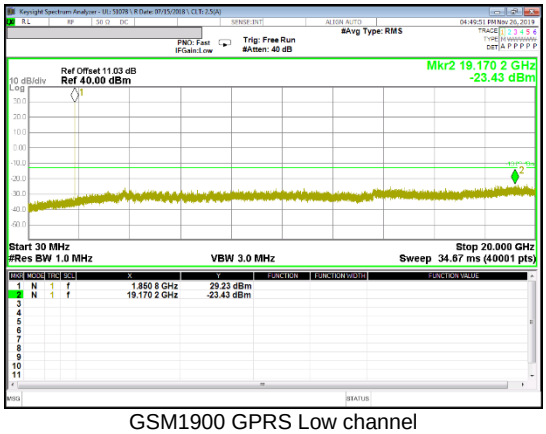
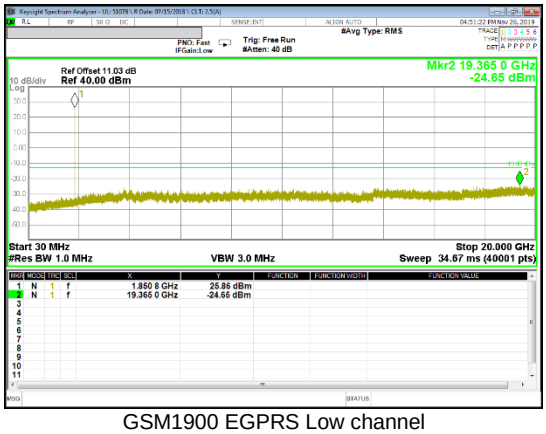
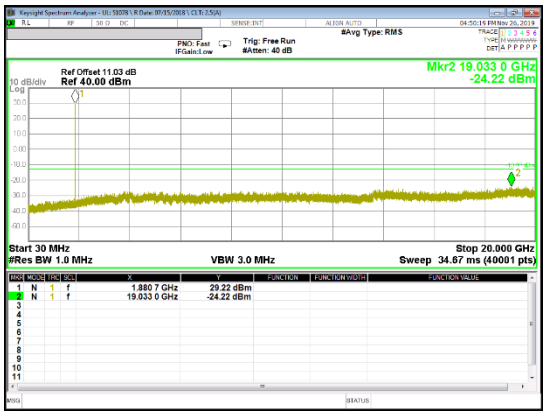
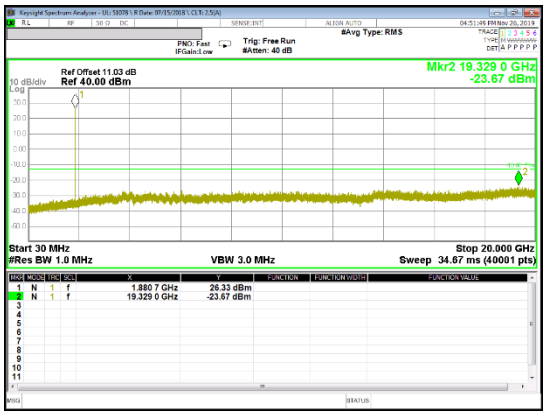
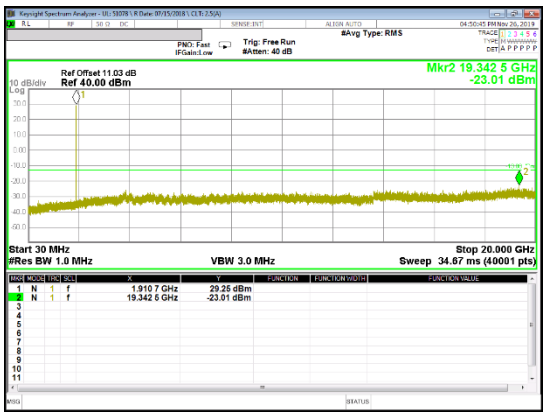
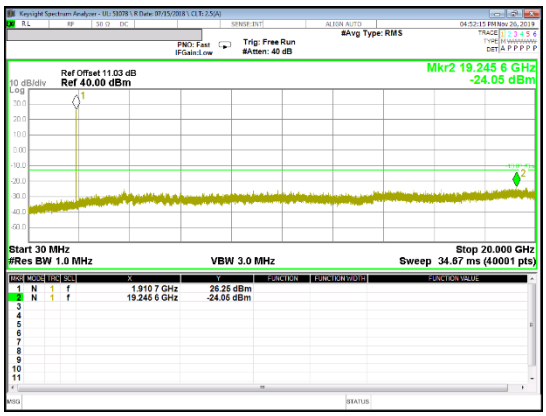
NOTE : Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

9.3.1. OUT OF BAND EMISSIONS RESULT

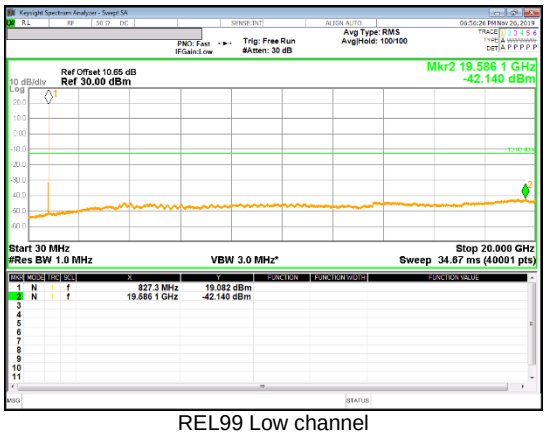
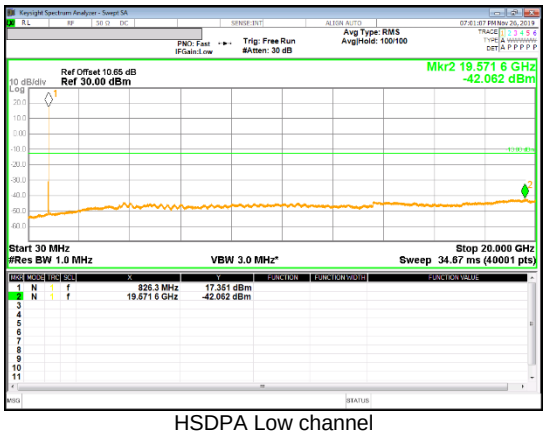
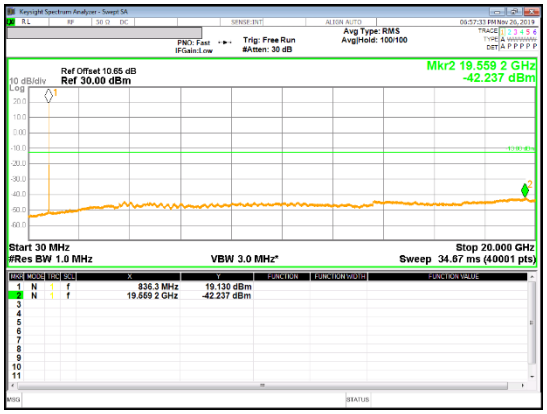
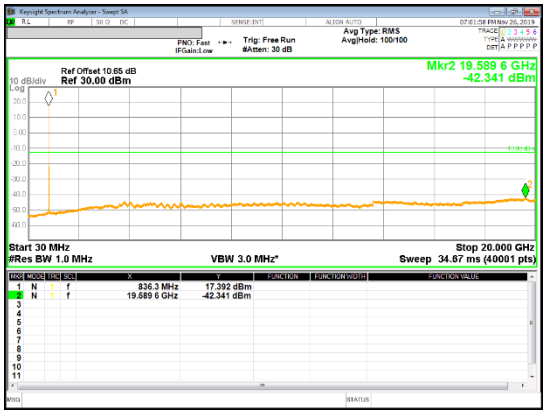
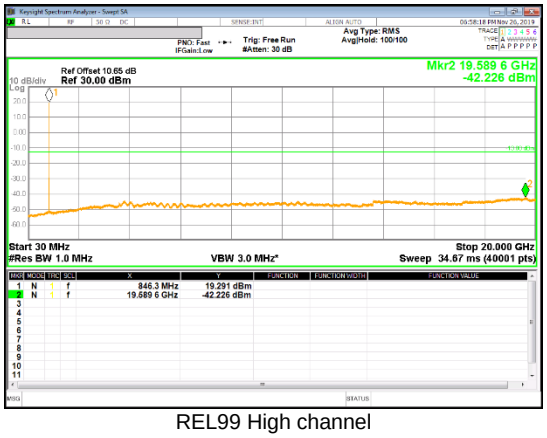
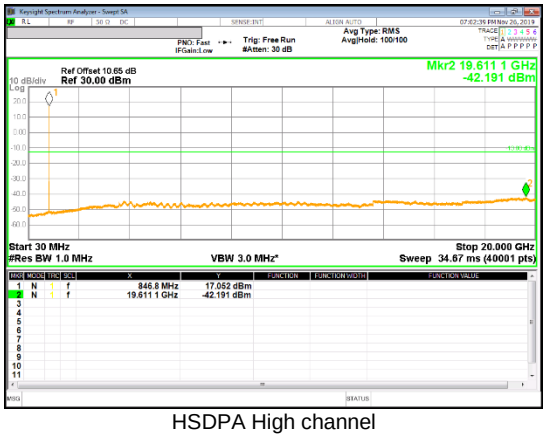
GSM 850

GSM 850	 GSM850 GPRS Low channel	 GSM850 EGPRS Low channel
	 GSM850 GPRS Mid channel	 GSM850 EGPRS Mid channel
	 GSM850 GPRS High channel	 GSM850 EGPRS High channel

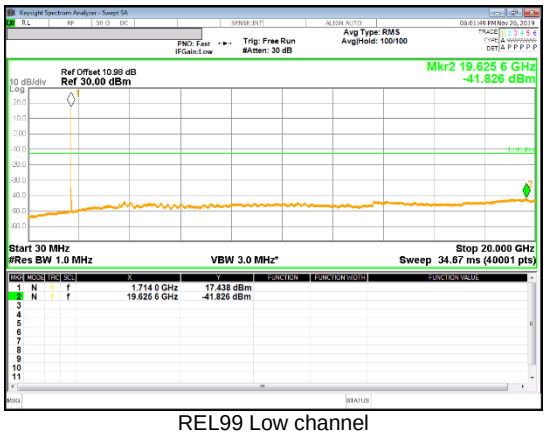
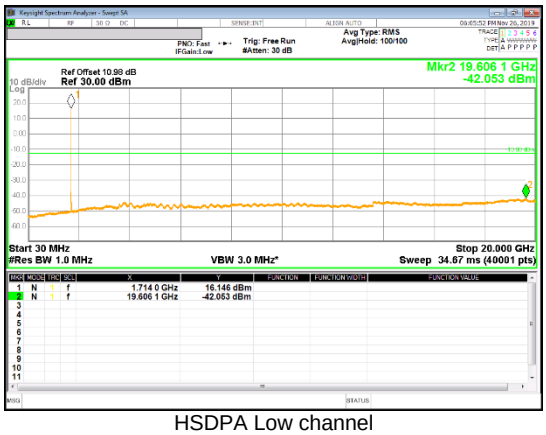
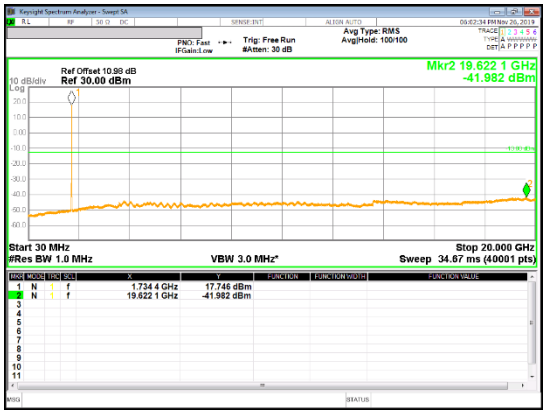
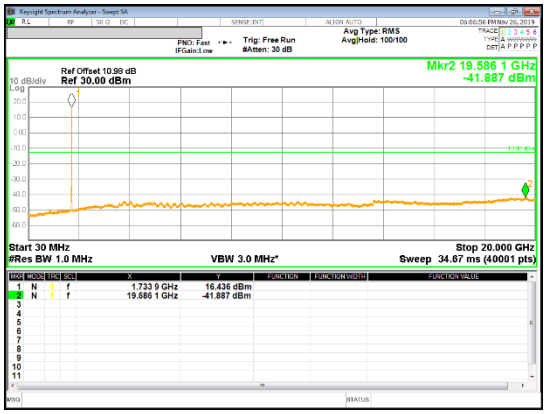
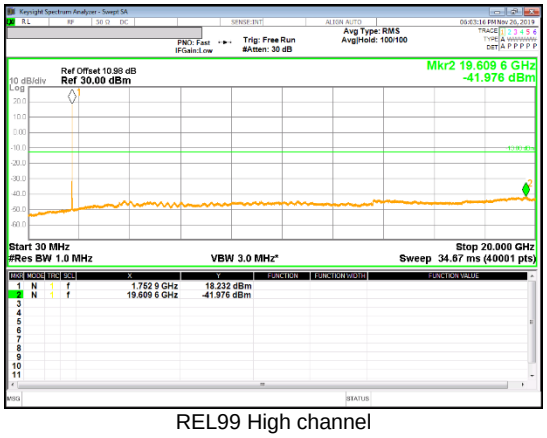
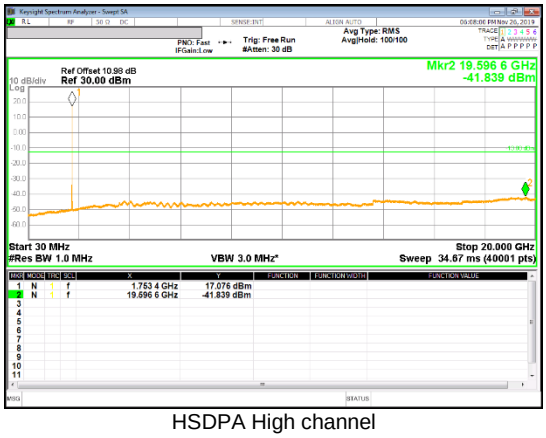
GSM 1900

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

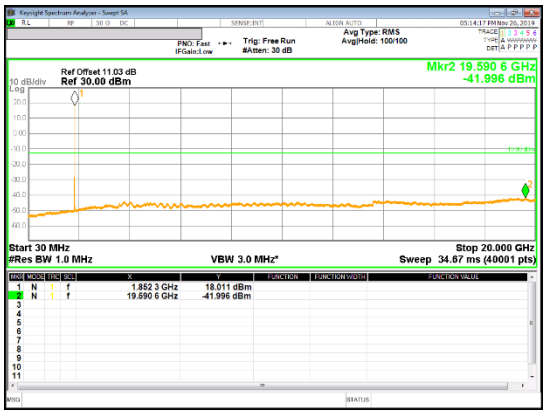
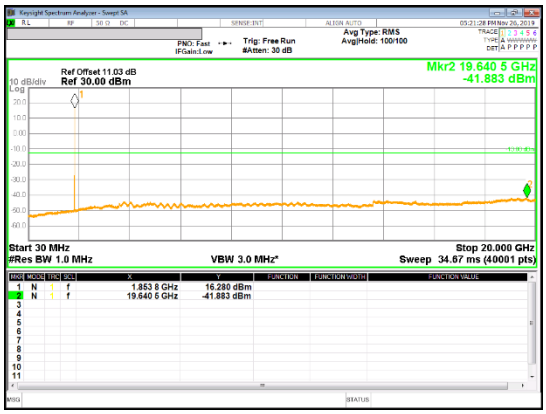
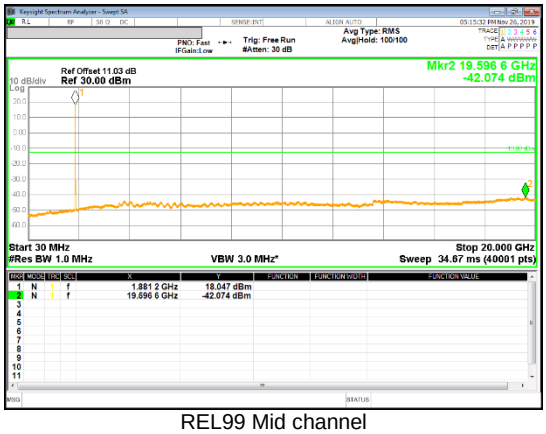
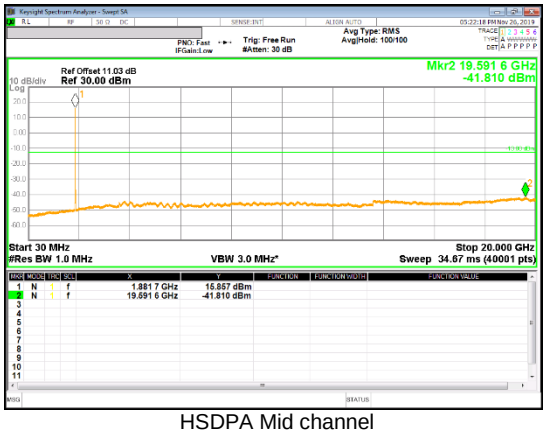
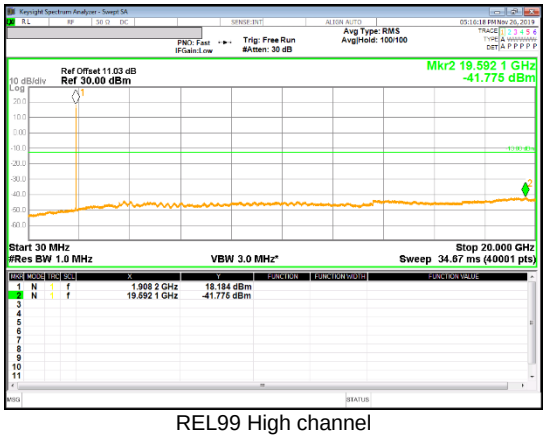
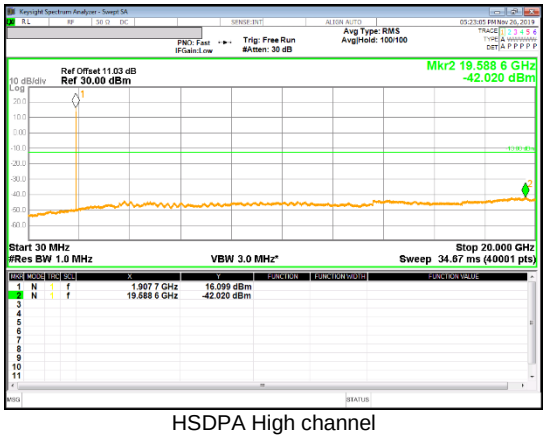
WCDMA Band 5

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

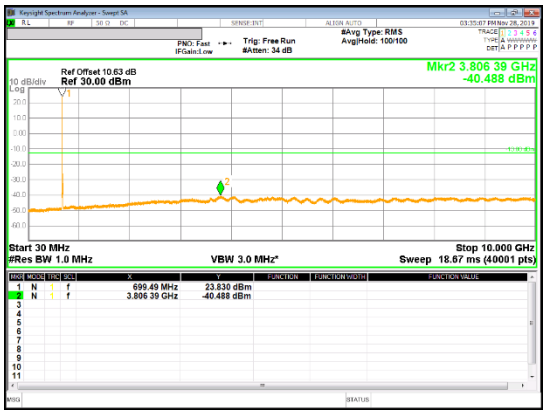
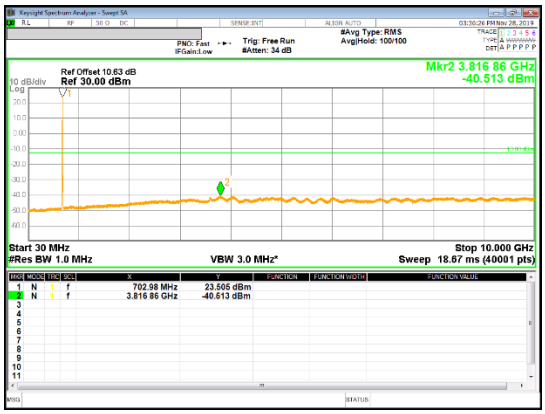
WCDMA Band 4

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

WCDMA Band 2

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

LTE Band 12

Band 12 10MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 13

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10MHz</td><td> 

QPSK Mid channel</td></tr>
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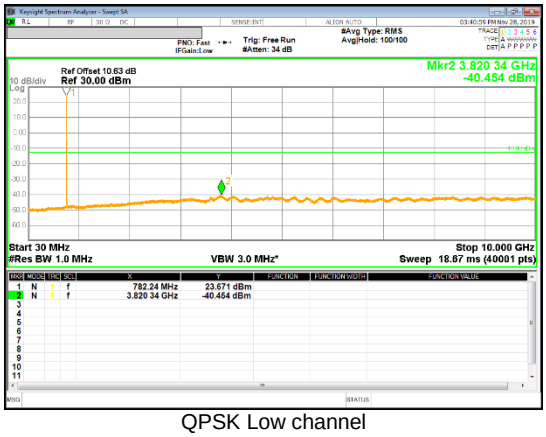
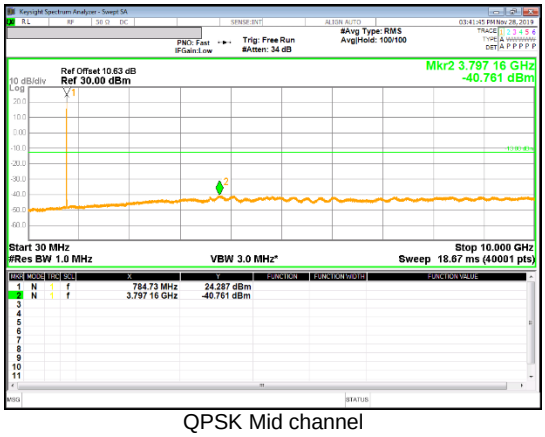
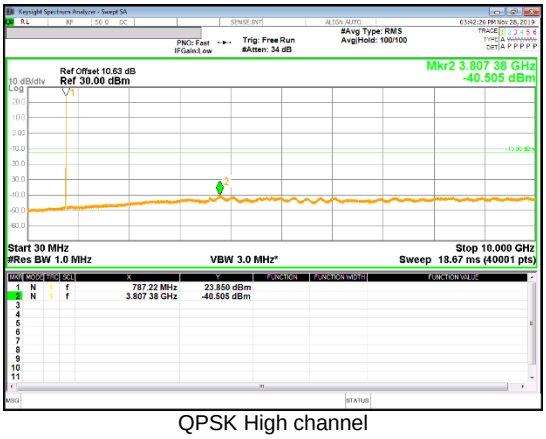
5MHz</td><td> 

QPSK Low channel</td><td> 

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

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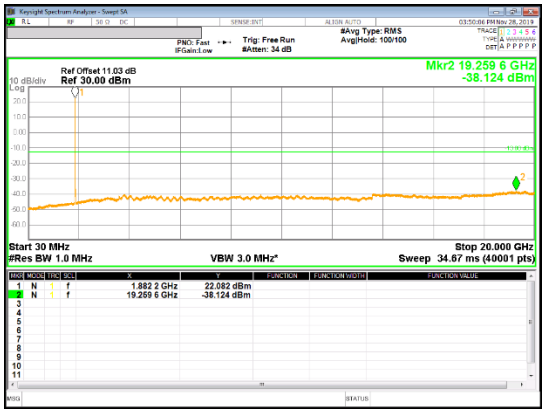
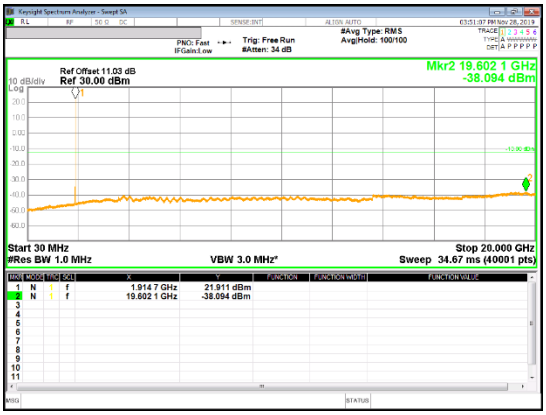
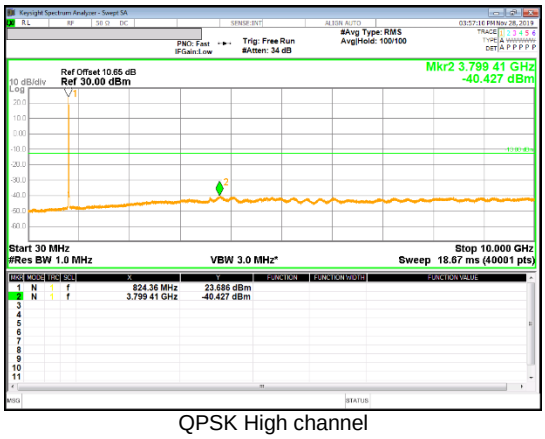
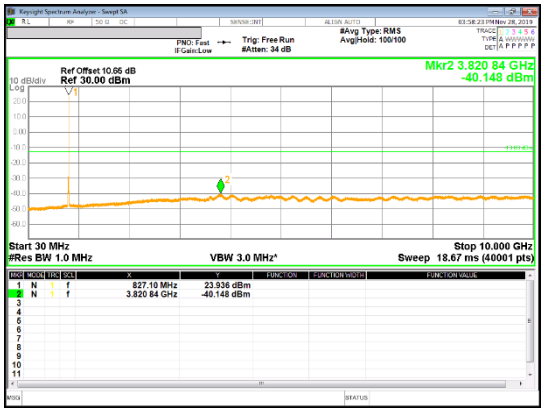
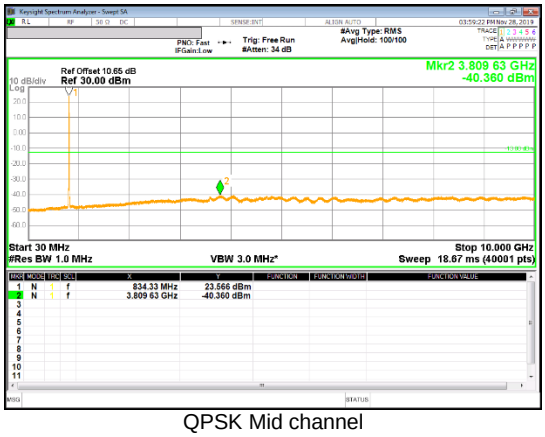
LTE Band 25

Band 25 3MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 26(Part 90)

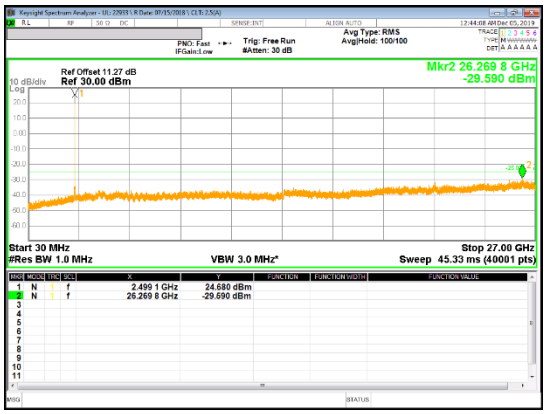
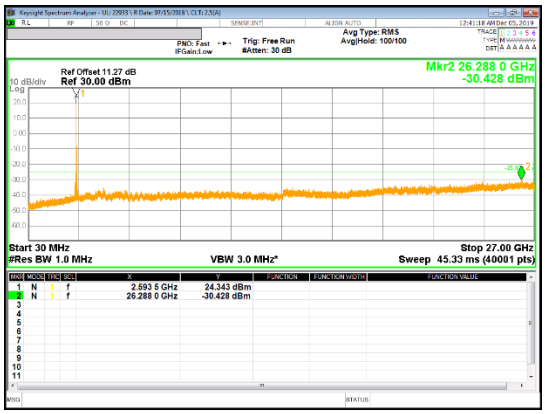
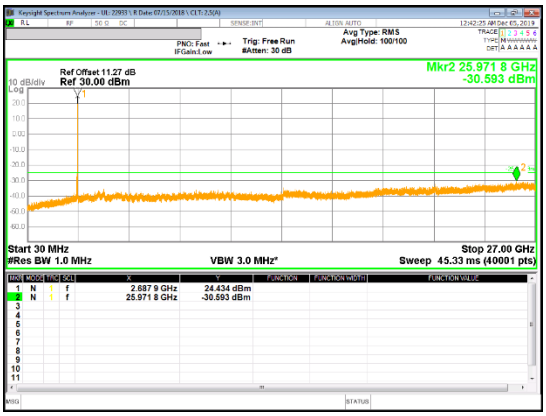
Band 26 3MHz	 QPSK Low channel	 QPSK High channel

LTE Band 26(Part 22)

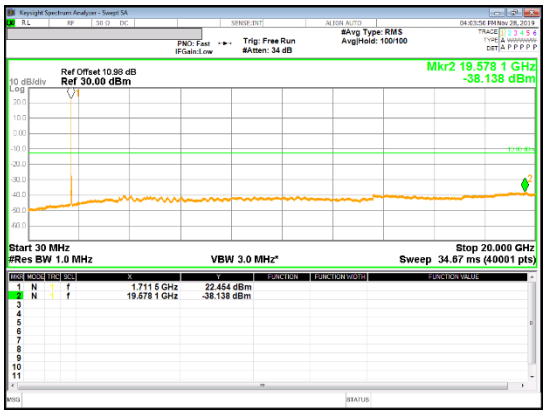
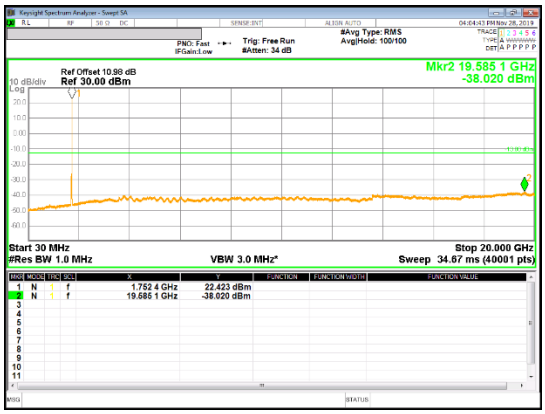
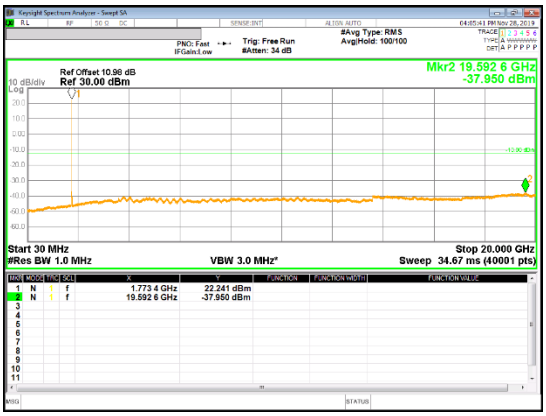
Band 26 5MHz	 QPSK Low channel	 QPSK Mid channel

QPSK High channel

LTE Band 41(PC2)

Band 41 5MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

LTE Band 66

Band 66 15MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

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.

LTE Band41(PC3)

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

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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				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	50	824.19998693	0.007	848.79998746	0.005	2.5
3.86	40	824.19998983	0.004	848.79998815	0.004	2.5
3.86	30	824.19999037	0.003	848.79999160	0.000	2.5
3.86	***20***	***824.19999309***	***0.000***	***848.79999157***	***0.000***	***2.5***
3.86	10	824.19999306	0.000	848.79999289	-0.002	2.5
3.86	0	824.19999699	-0.005	848.79999522	-0.004	2.5
3.86	-10	824.19999466	-0.002	848.79999388	-0.003	2.5
3.86	-20	824.19999285	0.000	848.79999202	-0.001	2.5
3.86	-30	824.19999036	0.003	848.79999088	0.001	2.5

Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2060.500	Hz	High Channel	2122.000	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	***20***	***824.19999309***	***0***	***848.79999157***	***0***	***2.5***
4.43	20	824.19999116	0.002	848.79999069	0.001	2.5
3.60	20	824.19999156	0.002	848.79999215	-0.001	2.5

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

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.0760	1909.9233		
Extreme (50C)		1850.0761	1909.9233	20.6	0.011
Extreme (40C)		1850.0761	1909.9233	23.7	0.013
Extreme (30C)		1850.0761	1909.9233	24.6	0.013
Extreme (10C)		1850.0761	1909.9233	23.5	0.012
Extreme (0C)		1850.0760	1909.9233	19.9	0.011
Extreme (-10C)		1850.0760	1909.9233	18.8	0.010
Extreme (-20C)		1850.0761	1909.9233	21.4	0.011
Extreme (-30C)		1850.0760	1909.9233	19.9	0.011
20C	15%	1850.0761	1909.9233	26.4	0.014
	-15%	1850.0761	1909.9233	28.1	0.015
	End Point	1850.0761	1909.9233	24.4	0.013

WCDMA Band 5

Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2066.000	Hz	High Channel	2116.500	Hz

Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	50	826.39998637	0.006	846.59998615	0.002	2.5
3.86	40	826.39998548	0.007	846.59998412	0.004	2.5
3.86	30	826.39998933	0.002	846.59998795	-0.001	2.5
3.86	***20***	***826.39999107***	***0.000***	***846.59998746***	***0.000***	***2.5***
3.86	10	826.39999216	-0.001	846.59999104	-0.004	2.5
3.86	0	826.39998931	0.002	846.59998857	-0.001	2.5
3.86	-10	826.39999141	0.000	846.59998742	0.000	2.5
3.86	-20	826.39998843	0.003	846.59999001	-0.003	2.5
3.86	-30	826.39998943	0.002	846.59998609	0.002	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]	
3.86	***20***	**826.39999107**	***0***	**846.59998746**	***0***	***2.5***
4.43	20	826.39999096	0.000	846.59998643	0.001	2.5
3.60	20	826.39998320	0.010	846.59998548	0.002	2.5

WCDMA Band 4 (Lowest Frequency:HSDPA / 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	1710.3139	1754.6865		
Extreme (50C)		1710.3139	1754.6865	21.5	0.012
Extreme (40C)		1710.3139	1754.6865	20.0	0.012
Extreme (30C)		1710.3139	1754.6865	19.3	0.011
Extreme (10C)		1710.3139	1754.6865	19.8	0.011
Extreme (0C)		1710.3139	1754.6865	23.5	0.014
Extreme (-10C)		1710.3139	1754.6865	22.2	0.013
Extreme (-20C)		1710.3139	1754.6865	19.6	0.011
Extreme (-30C)		1710.3139	1754.6865	20.5	0.012
20C	15%	1710.3139	1754.6865	24.4	0.014
	-15%	1710.3139	1754.6865	21.2	0.012
	End Point	1710.3139	1754.6865	21.6	0.012

WCDMA Band 2 (HSDPA)

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.3111	1909.6840		
Extreme (50C)		1850.3111	1909.6840	22.5	0.012
Extreme (40C)		1850.3111	1909.6840	21.7	0.012
Extreme (30C)		1850.3111	1909.6840	17.9	0.010
Extreme (10C)		1850.3111	1909.6840	19.0	0.010
Extreme (0C)		1850.3111	1909.6840	17.7	0.009
Extreme (-10C)		1850.3111	1909.6840	20.6	0.011
Extreme (-20C)		1850.3111	1909.6840	23.7	0.013
Extreme (-30C)		1850.3111	1909.6840	24.8	0.013
20C	15%	1850.3111	1909.6840	24.9	0.013
	-15%	1850.3111	1909.6840	25.3	0.013
	End Point	1850.3111	1909.6840	20.7	0.011

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

Limit		699	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	699.1565	715.8441		
Extreme (50C)		699.1565	715.8441	0.6	0.001
Extreme (40C)		699.1565	715.8441	0.7	0.001
Extreme (30C)		699.1565	715.8441	0.7	0.001
Extreme (10C)		699.1565	715.8441	0.9	0.001
Extreme (0C)		699.1564	715.8441	-0.4	-0.001
Extreme (-10C)		699.1565	715.8441	0.2	0.000
Extreme (-20C)		699.1565	715.8441	1.0	0.001
Extreme (-30C)		699.1565	715.8441	0.8	0.001
20C	15%	699.1565	715.8441	0.5	0.001
	-15%	699.1565	715.8441	0.6	0.001
	End Point	699.1565	715.8441	-0.2	0.000

LTE Band 13 (QPSK)

Limit		777	787	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	777.2556	786.7486		
Extreme (50C)		777.2556	786.7486	1.0	0.001
Extreme (40C)		777.2556	786.7486	1.2	0.002
Extreme (30C)		777.2556	786.7486	0.8	0.001
Extreme (10C)		777.2556	786.7486	1.1	0.001
Extreme (0C)		777.2555	786.7486	-0.2	0.000
Extreme (-10C)		777.2556	786.7486	0.5	0.001
Extreme (-20C)		777.2556	786.7486	1.4	0.002
Extreme (-30C)		777.2556	786.7486	0.9	0.001
20C	15%	777.2556	786.7486	1.0	0.001
	-15%	777.2556	786.7486	0.7	0.001
	End Point	777.2556	786.7486	1.3	0.002

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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	1850.1554	1914.8478		
Extreme (50C)		1850.1554	1914.8478	3.3	0.002
Extreme (40C)		1850.1554	1914.8478	2.6	0.001
Extreme (30C)		1850.1554	1914.8478	2.2	0.001
Extreme (10C)		1850.1554	1914.8478	1.1	0.001
Extreme (0C)		1850.1554	1914.8478	1.4	0.001
Extreme (-10C)		1850.1554	1914.8478	1.1	0.001
Extreme (-20C)		1850.1554	1914.8478	1.6	0.001
Extreme (-30C)		1850.1554	1914.8478	2.2	0.001
20C	15%	1850.1554	1914.8478	3.5	0.002
	-15%	1850.1554	1914.8478	2.5	0.001
	End Point	1850.1554	1914.8478	1.1	0.001

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	814.70000449	-0.002	848.30000506	-0.003	2.5
3.86	40	814.70000369	-0.001	848.30000157	0.002	2.5
3.86	30	814.70000342	-0.001	848.30000228	0.001	2.5
3.86	***20***	***814.70000290***	***0.000***	***848.30000292***	***0.000***	***2.5***
3.86	10	814.70000411	-0.001	848.30000435	-0.002	2.5
3.86	0	814.70000336	-0.001	848.30000194	0.001	2.5
3.86	-10	814.70000215	0.001	848.30000173	0.001	2.5
3.86	-20	814.70000369	-0.001	848.30000419	-0.001	2.5
3.86	-30	814.70000319	0.000	848.30000322	0.000	2.5

Reference Frequency : LTE Band 26 Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2036.750 Hz		High Channel	2120.750 Hz	
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	***20***	**814.70000290**	***0***	**848.30000292**	***0***	***2.5***
4.43	20	814.70000410	-0.001	848.30000159	0.002	2.5
3.60	20	814.70000254	0.000	848.30000396	-0.001	2.5

LTE Band 41 PC2 (QPSK)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2496.2520	2689.7480		
Extreme (50C)		2496.2520	2689.7480	21.0	0.008
Extreme (40C)		2496.2520	2689.7480	25.6	0.010
Extreme (30C)		2496.2520	2689.7480	19.9	0.008
Extreme (10C)		2496.2520	2689.7480	21.1	0.008
Extreme (0C)		2496.2520	2689.7480	17.5	0.007
Extreme (-10C)		2496.2520	2689.7480	19.9	0.008
Extreme (-20C)		2496.2520	2689.7480	18.5	0.007
Extreme (-30C)		2496.2520	2689.7480	20.7	0.008
20C	15%	2496.2520	2689.7480	21.4	0.008
	-15%	2496.2520	2689.7480	19.5	0.008
	End Point	2496.2520	2689.7480	18.8	0.007

LTE Band 66 (QPSK)

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.1546	1779.8450		
Extreme (50C)		1710.1546	1779.8450	2.7	0.002
Extreme (40C)		1710.1546	1779.8450	2.4	0.001
Extreme (30C)		1710.1546	1779.8450	1.7	0.001
Extreme (10C)		1710.1546	1779.8450	2.1	0.001
Extreme (0C)		1710.1546	1779.8450	1.7	0.001
Extreme (-10C)		1710.1546	1779.8450	2.2	0.001
Extreme (-20C)		1710.1546	1779.8450	1.7	0.001
Extreme (-30C)		1710.1546	1779.8450	1.9	0.001
20C	15%	1710.1546	1779.8450	2.5	0.001
	-15%	1710.1546	1779.8450	3.0	0.002
	End Point	1710.1546	1779.8450	1.2	0.001

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.

LTE Band41(PC3)

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

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10. RADIATED TEST RESULTS

10.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

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

LIMITS

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

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

27.50:

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

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

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

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

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

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.17; ESU40 setting reference to 971168 D01 v03r01

For radiated output power measurement with a ESU40:

a) Set the RBW ≥ OBW; b) Set VBW ≥ 3 × RBW; c) Set span ≥ 2 x RBW; d) Sweep time = auto couple; e) Detector = rms; f) Ensure that the number of measurement points ≥ span/RBW; g) Trace mode = max hold(GSM, WCDMA), average(LTE);

TEST RESULTS

10.1.1. ERP/EIRP Results

GSM

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
GSM850	GPRS	512	824.2	30.72	1180.32
		661	836.6	30.83	1210.60
		810	848.8	**31.16**	**1306.17**
	EGPRS	512	824.2	23.35	216.27
		661	836.6	23.58	228.03
		810	848.8	**24.00**	**251.19**
GSM1900	GPRS	512	1850.2	28.48	704.69
		661	1880	**28.48**	**704.86**
		810	1909.8	27.78	599.79
	EGPRS	512	1850.2	**24.47**	**279.90**
		661	1880	23.25	211.35
		810	1909.8	24.18	261.82

WCDMA

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
Band 5	REL99	4132	826.4	19.73	93.97
		4183	836.6	19.90	97.72
		4233	846.6	**20.90**	**123.03**
	HSDPA	4132	826.4	18.07	64.12
		4183	836.6	17.76	59.70
		4233	846.6	**18.57**	**71.94**
Band 4	REL99	1312	1712.4	21.03	126.77
		1413	1732.6	22.35	171.79
		1513	1752.6	**23.29**	**213.30**
	HSDPA	1312	1712.4	19.29	84.92
		1413	1732.6	20.55	113.50
		1513	1752.6	**21.28**	**134.28**
Band 2	REL99	9262	1852.4	**20.72**	**118.03**
		9400	1880.0	19.81	95.72
		9538	1907.6	19.51	89.33
	HSDPA	9262	1852.4	**17.61**	**57.68**
		9400	1880.0	17.56	57.02
		9538	1907.6	16.88	48.75

LTE Band 12

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP	
					[dBm]	[mW]
Band 12	10	QPSK	1 / 0	704.0	16.76	47.42
			1 / 0	707.5	17.04	50.58
			1 / 0	711.0	**17.36**	**54.45**
		16QAM	1 / 0	704.0	15.82	38.19
			1 / 0	707.5	**16.38**	**43.45**
			1 / 0	711.0	16.30	42.66
	5	QPSK	1 / 12	701.5	16.93	49.32
			1 / 24	707.5	**17.40**	**54.95**
			1 / 24	713.5	17.36	54.45
		16QAM	1 / 24	701.5	15.62	36.48
			1 / 12	707.5	16.23	41.98
			1 / 12	713.5	**16.63**	**46.03**
	3	QPSK	1 / 8	700.5	16.80	47.86
			1 / 0	707.5	17.33	54.08
			1 / 8	714.5	**17.47**	**55.85**
		16QAM	1 / 8	700.5	15.95	39.36
			1 / 0	707.5	16.34	43.05
			1 / 8	714.5	**16.39**	**43.55**
	1.4	QPSK	1 / 5	699.7	16.84	48.31
			1 / 0	707.5	**17.35**	**54.33**
			1 / 3	715.3	17.18	52.24
		16QAM	1 / 5	699.7	15.82	38.19
			1 / 0	707.5	16.34	43.05
			1 / 0	715.3	**16.49**	**44.57**

LTE Band 13

Band	BW [MHz]	Mode	RB size / RB Offset	f [MHz]	ERP / EIRP	
					[dBm]	[mW]
Band 13	10	QPSK	1 / 0	782.0	**20.30**	**107.15**
		16QAM	1 / 49	782.0	18.93	78.16
	5	QPSK	1 / 12	779.5	19.99	99.77
			1 / 0	782.0	**20.06**	**101.39**
			1 / 12	784.5	19.77	94.84
		16QAM	1 / 24	779.5	**19.13**	**81.85**
			1 / 0	782.0	18.97	78.89
			1 / 0	784.5	18.73	74.64

LTE Band 25

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 25	20	QPSK	1 / 0	1860.0	21.27	133.97
			1 / 0	1882.5	21.44	139.32
			1 / 0	1905.0	**23.32**	**214.78**
		16QAM	1 / 0	1860.0	21.84	152.76
			1 / 0	1882.5	22.41	174.18
			1 / 0	1905.0	**23.28**	**212.81**
	15	QPSK	1 / 37	1857.5	23.11	204.64
			1 / 0	1882.5	22.72	187.07
			1 / 74	1907.5	**24.03**	**252.93**
		16QAM	1 / 0	1857.5	21.92	155.60
			1 / 37	1882.5	22.00	158.49
			1 / 0	1907.5	**23.65**	**231.74**
	10	QPSK	1 / 0	1855.0	22.94	196.79
			1 / 0	1882.5	22.97	198.15
			1 / 49	1910.0	**23.99**	**250.61**
		16QAM	1 / 0	1855.0	21.87	153.82
			1 / 0	1882.5	22.23	167.11
			1 / 0	1910.0	**23.25**	**211.35**
	5	QPSK	1 / 12	1852.5	22.87	193.64
			1 / 24	1882.5	22.95	197.24
			1 / 24	1912.5	**24.05**	**254.10**
		16QAM	1 / 24	1852.5	21.99	158.12
			1 / 24	1882.5	21.67	146.89
			1 / 12	1912.5	**22.68**	**185.35**
	3	QPSK	1 / 8	1851.5	22.67	184.93
			1 / 0	1882.5	23.06	202.30
			1 / 0	1913.5	**24.39**	**274.79**
		16QAM	1 / 8	1851.5	21.62	145.21
			1 / 8	1882.5	22.09	161.81
			1 / 8	1913.5	**23.17**	**207.49**
	1.4	QPSK	1 / 0	1850.7	22.61	182.39
			1 / 0	1882.5	22.92	195.88
			1 / 0	1914.3	**24.28**	**267.92**
		16QAM	1 / 3	1850.7	21.80	151.36
			1 / 0	1882.5	21.66	146.55
			1 / 0	1914.3	**23.18**	**207.97**

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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	19.39	86.90
			1 / 37	831.5	**18.82**	**76.21**
			1 / 37	841.5	18.67	73.62
		16QAM	1 / 0	821.5	18.16	65.46
			1 / 37	831.5	**18.46**	**70.15**
			1 / 37	841.5	17.54	56.75
	10	QPSK	1 / 0	819.0	19.39	86.90
			1 / 0	829.0	19.31	85.31
			1 / 0	831.5	**19.57**	**90.57**
			1 / 0	844.0	18.96	78.70
		16QAM	1 / 0	819.0	18.28	67.30
			1 / 25	829.0	18.41	69.34
			1 / 0	831.5	**18.57**	**71.94**
			1 / 0	844.0	18.01	63.24
	5	QPSK	1 / 12	816.5	19.02	79.80
			1 / 12	821.5	**19.49**	**88.92**
			1 / 12	826.5	19.34	85.90
			1 / 0	831.5	19.23	83.75
			1 / 0	846.5	18.64	73.11
		16QAM	1 / 12	816.5	18.12	64.86
			1 / 24	821.5	18.05	63.83
			1 / 24	826.5	**18.25**	**66.83**
			1 / 0	831.5	18.23	66.53
			1 / 12	846.5	17.28	53.46
	3	QPSK	1 / 14	815.5	18.96	78.70
			1 / 0	822.5	19.32	85.51
			1 / 0	825.5	**19.47**	**88.51**
			1 / 8	831.5	19.55	90.16
			1 / 8	847.5	18.28	67.30
		16QAM	1 / 14	815.5	17.85	60.95
			1 / 0	822.5	**18.57**	**71.94**
			1 / 14	825.5	18.46	70.15
			1 / 0	831.5	18.29	67.45
			1 / 8	847.5	17.25	53.09
	1.4	QPSK	1 / 0	814.7	18.56	71.78
			1 / 0	823.3	**19.42**	**87.50**
			1 / 0	824.7	19.26	84.33
			1 / 0	831.5	19.16	82.41
			1 / 0	848.3	18.37	68.71
		16QAM	1 / 0	814.7	17.65	58.21
			1 / 0	823.3	18.22	66.37
			1 / 0	824.7	**18.24**	**66.68**
			1 / 0	831.5	18.28	67.30
			1 / 0	848.3	17.47	55.85

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LTE Band 41(PC2)

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP	
					[dBm]	[mW]
Band 41	20	QPSK	1 / 99	2506.0	**27.45**	**555.90**
			1 / 0	2593.0	27.15	518.80
			1 / 0	2680.0	26.64	461.32
		16QAM	1 / 0	2506.0	26.34	430.53
			1 / 0	2593.0	**27.69**	**587.49**
			1 / 0	2680.0	26.08	405.51
	15	QPSK	1 / 37	2503.5	**28.42**	**695.02**
			1 / 37	2593.0	27.24	529.66
			1 / 0	2682.5	26.99	500.03
		16QAM	1 / 0	2503.5	26.89	488.65
			1 / 0	2593.0	**27.65**	**582.10**
			1 / 0	2682.5	25.94	392.64
	10	QPSK	1 / 25	2501.0	**28.32**	**679.20**
			1 / 0	2593.0	28.00	630.96
			1 / 25	2685.0	27.49	561.05
		16QAM	1 / 25	2501.0	27.60	575.44
			1 / 0	2593.0	**27.78**	**599.79**
			1 / 25	2685.0	27.07	509.33
	5	QPSK	1 / 0	2498.5	26.45	441.57
			1 / 12	2593.0	**27.02**	**503.50**
			1 / 0	2687.5	26.31	427.56
		16QAM	1 / 24	2498.5	26.57	453.94
			1 / 0	2593.0	**27.25**	**530.88**
			1 / 0	2687.5	26.84	483.06

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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 / 0	1720.0	23.14	206.06
			1 / 0	1745.0	**23.92**	**246.60**
			1 / 0	1770.0	23.29	213.30
		16QAM	1 / 0	1720.0	21.76	149.97
			1 / 0	1745.0	**22.75**	**188.36**
			1 / 0	1770.0	22.19	165.58
	15	QPSK	1 / 37	1717.5	23.25	211.35
			1 / 0	1747.5	**23.90**	**245.47**
			1 / 0	1772.5	22.88	194.09
		16QAM	1 / 37	1717.5	21.44	139.32
			1 / 37	1747.5	**22.49**	**177.42**
			1 / 37	1772.5	21.55	142.89
	10	QPSK	1 / 0	1715.0	22.98	198.61
			1 / 0	1745.0	**23.95**	**248.31**
			1 / 0	1775.0	22.97	198.15
		16QAM	1 / 0	1715.0	22.04	159.96
			1 / 0	1745.0	**22.49**	**177.42**
			1 / 0	1775.0	22.14	163.68
	5	QPSK	1 / 12	1712.5	23.09	203.70
			1 / 12	1745.0	**23.80**	**239.88**
			1 / 24	1777.5	23.60	229.09
		16QAM	1 / 24	1712.5	22.19	165.58
			1 / 12	1745.0	**22.55**	**179.89**
			1 / 12	1777.5	22.50	177.83
	3	QPSK	1 / 8	1711.5	22.66	184.50
			1 / 0	1745.0	23.27	212.32
			1 / 8	1778.5	**23.60**	**229.09**
		16QAM	1 / 8	1711.5	21.92	155.60
			1 / 0	1745.0	**22.74**	**187.93**
			1 / 8	1778.5	22.07	161.06
	1.4	QPSK	1 / 0	1710.7	22.84	192.31
			1 / 0	1745.0	23.22	209.89
			1 / 0	1779.3	**23.40**	**218.78**
		16QAM	1 / 0	1710.7	21.94	156.31
			1 / 5	1745.0	22.22	166.72
			1 / 0	1779.3	**22.36**	**172.19**

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.

LTE Band41(PC3)

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27(03)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

10.1.2. ERP/EIRP DATA

GSM850

GSM850

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: GPRS 850 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.20	34.68	V	3.0	-1.0	30.72	38.5	-7.8	
824.20	25.06	H	3.0	-1.0	21.10	38.5	-17.4	
Mid Ch								
836.60	34.77	V	3.0	-0.9	30.83	38.5	-7.7	
836.60	23.96	H	3.0	-0.9	20.02	38.5	-18.5	
High Ch								
848.80	35.07	V	3.1	-0.9	31.16	38.5	-7.3	
848.80	24.93	H	3.1	-0.9	21.02	38.5	-17.5	

GSM850

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: EGPRS 850 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.20	27.31	V	3.0	-1.0	23.35	38.5	-15.2	
824.20	17.96	H	3.0	-1.0	14.00	38.5	-24.5	
Mid Ch								
836.60	27.52	V	3.0	-0.9	23.58	38.5	-14.9	
836.60	17.66	H	3.0	-0.9	13.72	38.5	-24.8	
High Ch								
848.80	27.91	V	3.1	-0.9	24.00	38.5	-14.5	
848.80	17.77	H	3.1	-0.9	13.86	38.5	-24.6	

GSM1900

GSM1900

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, X-Position
Location: Chamber 2
Mode: GPRS 1900 MHz Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	15.45	V	4.5	9.4	20.37	33.0	-12.6	
1850.20	23.56	H	4.5	9.4	28.48	33.0	-4.5	
Mid Ch								
1880.00	19.09	V	4.5	9.2	23.75	33.0	-9.3	
1880.00	23.82	H	4.5	9.2	28.48	33.0	-4.5	
High Ch								
1909.80	19.75	V	4.6	8.9	24.11	33.0	-8.9	
1909.80	23.42	H	4.6	8.9	27.78	33.0	-5.2	

GSM1900

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, X-Position
Location: Chamber 2
Mode: EGPRS 1900 MHz Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	8.65	V	4.5	9.4	13.57	33.0	-19.4	
1850.20	19.55	H	4.5	9.4	24.47	33.0	-8.5	
Mid Ch								
1880.00	14.32	V	4.5	9.2	18.98	33.0	-14.0	
1880.00	18.59	H	4.5	9.2	23.25	33.0	-9.8	
High Ch								
1909.80	15.73	V	4.6	8.9	20.09	33.0	-12.9	
1909.80	19.82	H	4.6	8.9	24.18	33.0	-8.8	

WCDMA Band 5

WCDMA

Band 5
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-23
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: Rel99 Band 5 Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.40	23.69	V	3.0	-0.9	19.73	38.5	-18.8	
826.40	14.19	H	3.0	-0.9	10.23	38.5	-28.3	
Mid Ch								
836.60	23.84	V	3.0	-0.9	19.90	38.5	-18.6	
836.60	13.67	H	3.0	-0.9	9.73	38.5	-28.8	
High Ch								
846.60	24.81	V	3.1	-0.9	20.90	38.5	-17.6	
846.60	14.14	H	3.1	-0.9	10.23	38.5	-28.3	

WCDMA

Band 5
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-23
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: HSDPA Band 5 Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.40	22.03	V	3.0	-0.9	18.07	38.5	-20.4	
826.40	12.24	H	3.0	-0.9	8.28	38.5	-30.2	
Mid Ch								
836.60	21.70	V	3.0	-0.9	17.76	38.5	-20.7	
836.60	12.18	H	3.0	-0.9	8.24	38.5	-30.3	
High Ch								
846.60	22.48	V	3.1	-0.9	18.57	38.5	-19.9	
846.60	12.07	H	3.1	-0.9	8.16	38.5	-30.3	

WCDMA Band 4

WCDMA

Band 4
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-23
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: Rel99 Band 4 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.40	13.26	V	4.3	9.3	18.27	30.0	-11.7	
1712.40	16.02	H	4.3	9.3	21.03	30.0	-9.0	
Mid Ch								
1732.60	13.19	V	4.3	9.4	18.24	30.0	-11.8	
1732.60	17.30	H	4.3	9.4	22.35	30.0	-7.6	
High Ch								
1752.60	14.43	V	4.4	9.5	19.53	30.0	-10.5	
1752.60	18.18	H	4.4	9.5	23.29	30.0	-6.7	

WCDMA

Band 4
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-23
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: HSDPA Band 4 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.40	12.23	V	4.3	9.3	17.24	30.0	-12.8	
1712.40	14.28	H	4.3	9.3	19.29	30.0	-10.7	
Mid Ch								
1732.60	11.51	V	4.3	9.4	16.56	30.0	-13.4	
1732.60	15.50	H	4.3	9.4	20.55	30.0	-9.4	
High Ch								
1752.60	12.83	V	4.4	9.5	17.93	30.0	-12.1	
1752.60	16.17	H	4.4	9.5	21.28	30.0	-8.7	

WCDMA Band 2

WCDMA

Band 2
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: Rel99 Band 2 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.40	15.82	V	4.5	9.4	20.72	33.0	-12.3	
1852.40	10.16	H	4.5	9.4	15.06	33.0	-17.9	
Mid Ch								
1880.00	15.15	V	4.5	9.2	19.81	33.0	-13.2	
1880.00	8.72	H	4.5	9.2	13.38	33.0	-19.6	
High Ch								
1907.60	15.12	V	4.6	9.0	19.51	33.0	-13.5	
1907.60	10.21	H	4.6	9.0	14.60	33.0	-18.4	

WCDMA

Band 2
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: HSDPA Band 2 Fundamentals

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.40	12.71	V	4.5	9.4	17.61	33.0	-15.4	
1852.40	8.25	H	4.5	9.4	13.15	33.0	-19.9	
Mid Ch								
1880.00	12.90	V	4.5	9.2	17.56	33.0	-15.4	
1880.00	6.61	H	4.5	9.2	11.27	33.0	-21.7	
High Ch								
1907.60	12.49	V	4.6	9.0	16.88	33.0	-16.1	
1907.60	7.79	H	4.6	9.0	12.18	33.0	-20.8	

LTE Band 12

LTE Band 12 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Posiiton
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
704.00	20.60	V	2.8	-1.1	16.76	34.8	-18.0	
704.00	5.96	H	2.8	-1.1	2.12	34.8	-32.7	
Mid Ch								
707.50	20.88	V	2.8	-1.1	17.04	34.8	-17.8	
707.50	6.67	H	2.8	-1.1	2.82	34.8	-32.0	
High Ch								
711.00	21.22	V	2.8	-1.1	17.36	34.8	-17.4	
711.00	6.92	H	2.8	-1.1	3.06	34.8	-31.7	

LTE Band 12 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
704.00	19.66	V	2.8	-1.1	15.82	34.8	-19.0	
704.00	4.83	H	2.8	-1.1	0.99	34.8	-33.8	
Mid Ch								
707.50	20.22	V	2.8	-1.1	16.38	34.8	-18.4	
707.50	5.61	H	2.8	-1.1	1.76	34.8	-33.0	
High Ch								
711.00	20.16	V	2.8	-1.1	16.30	34.8	-18.5	
711.00	6.01	H	2.8	-1.1	2.15	34.8	-32.6	

LTE

Band 12

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
701.50	20.76	V	2.8	-1.1	16.93	34.8	-17.9	
701.50	6.02	H	2.8	-1.1	2.18	34.8	-32.6	
Mid Ch								
707.50	21.24	V	2.8	-1.1	17.40	34.8	-17.4	
707.50	6.78	H	2.8	-1.1	2.93	34.8	-31.9	
High Ch								
713.50	21.23	V	2.8	-1.1	17.36	34.8	-17.4	
713.50	6.88	H	2.8	-1.1	3.02	34.8	-31.8	

LTE

Band 12

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
701.50	19.45	V	2.8	-1.1	15.62	34.8	-19.2	
701.50	4.65	H	2.8	-1.1	0.81	34.8	-34.0	
Mid Ch								
707.50	20.07	V	2.8	-1.1	16.23	34.8	-18.6	
707.50	5.80	H	2.8	-1.1	1.95	34.8	-32.8	
High Ch								
713.50	20.50	V	2.8	-1.1	16.63	34.8	-18.2	
713.50	6.01	H	2.8	-1.1	2.15	34.8	-32.7	

LTE

Band 12

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
700.50	20.63	V	2.8	-1.1	16.80	34.8	-18.0	
700.50	6.04	H	2.8	-1.1	2.21	34.8	-32.6	
Mid Ch								
707.50	21.17	V	2.8	-1.1	17.33	34.8	-17.5	
707.50	6.74	H	2.8	-1.1	2.89	34.8	-31.9	
High Ch								
714.50	21.33	V	2.8	-1.1	17.47	34.8	-17.3	
714.50	6.91	H	2.8	-1.1	3.05	34.8	-31.7	

LTE

Band 12

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
700.50	19.78	V	2.8	-1.1	15.95	34.8	-18.9	
700.50	5.30	H	2.8	-1.1	1.47	34.8	-33.3	
Mid Ch								
707.50	20.18	V	2.8	-1.1	16.34	34.8	-18.5	
707.50	5.73	H	2.8	-1.1	1.88	34.8	-32.9	
High Ch								
714.50	20.25	V	2.8	-1.1	16.39	34.8	-18.4	
714.50	5.81	H	2.8	-1.1	1.95	34.8	-32.8	

LTE

Band 12

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
699.70	20.67	V	2.8	-1.1	16.84	34.8	-18.0	
699.70	6.01	H	2.8	-1.1	2.17	34.8	-32.6	
Mid Ch								
707.50	21.19	V	2.8	-1.1	17.35	34.8	-17.5	
707.50	6.87	H	2.8	-1.1	3.02	34.8	-31.8	
High Ch								
715.30	21.04	V	2.8	-1.1	17.18	34.8	-17.6	
715.30	6.41	H	2.8	-1.1	2.55	34.8	-32.3	

LTE

Band 12

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
699.70	19.65	V	2.8	-1.1	15.82	34.8	-19.0	
699.70	5.18	H	2.8	-1.1	1.34	34.8	-33.5	
Mid Ch								
707.50	20.18	V	2.8	-1.1	16.34	34.8	-18.5	
707.50	5.59	H	2.8	-1.1	1.74	34.8	-33.1	
High Ch								
715.30	20.35	V	2.8	-1.1	16.49	34.8	-18.3	
715.30	5.44	H	2.8	-1.1	1.58	34.8	-33.2	

LTE Band 13

LTE Band 13 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 13 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
Mid Ch								
782.00	24.29	V	2.9	-1.1	20.30	34.8	-14.5	
782.00	12.71	H	2.9	-1.1	8.72	34.8	-26.1	

LTE Band 13 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 13 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
Mid Ch								
782.00	22.92	V	2.9	-1.1	18.93	34.8	-15.8	
782.00	11.47	H	2.9	-1.1	7.48	34.8	-27.3	

LTE

Band 13

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 13 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								
779.50	23.97	V	2.9	-1.1	19.99	34.8	-14.8	
779.50	12.20	H	2.9	-1.1	8.22	34.8	-26.5	
Mid Ch								
782.00	24.05	V	2.9	-1.1	20.06	34.8	-14.7	
782.00	12.34	H	2.9	-1.1	8.35	34.8	-26.4	
High Ch								
784.50	23.76	V	2.9	-1.1	19.77	34.8	-15.0	
784.50	12.61	H	2.9	-1.1	8.62	34.8	-26.2	

LTE

Band 13

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 13 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								
779.50	23.11	V	2.9	-1.1	19.13	34.8	-15.6	
779.50	11.27	H	2.9	-1.1	7.29	34.8	-27.5	
Mid Ch								
782.00	22.96	V	2.9	-1.1	18.97	34.8	-15.8	
782.00	11.23	H	2.9	-1.1	7.24	34.8	-27.5	
High Ch								
784.50	22.72	V	2.9	-1.1	18.73	34.8	-16.0	
784.50	11.31	H	2.9	-1.1	7.32	34.8	-27.5	

LTE Band 25

LTE Band 25 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 25 Fundamentals, 20MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1860.00	13.76	V	4.5	9.4	18.69	33.0	-14.3	
1860.00	16.35	H	4.5	9.4	21.27	33.0	-11.7	
Mid Ch								
1882.50	11.33	V	4.5	9.3	16.08	33.0	-16.9	
1882.50	16.69	H	4.5	9.3	21.44	33.0	-11.6	
High Ch								
1905.00	16.09	V	4.6	9.1	20.64	33.0	-12.4	
1905.00	18.77	H	4.6	9.1	23.32	33.0	-9.7	

LTE Band 25 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 25 Fundamentals, 20MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1860.00	12.54	V	4.5	9.4	17.47	33.0	-15.5	
1860.00	16.92	H	4.5	9.4	21.84	33.0	-11.2	
Mid Ch								
1882.50	13.46	V	4.5	9.3	18.21	33.0	-14.8	
1882.50	17.66	H	4.5	9.3	22.41	33.0	-10.6	
High Ch								
1905.00	15.01	V	4.6	9.1	19.56	33.0	-13.4	
1905.00	18.73	H	4.6	9.1	23.28	33.0	-9.7	

LTE

Band 25

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 25 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1857.50	14.05	V	4.5	9.5	19.00	33.0	-14.0	
1857.50	18.16	H	4.5	9.5	23.11	33.0	-9.9	
Mid Ch								
1882.50	14.41	V	4.5	9.3	19.16	33.0	-13.8	
1882.50	17.97	H	4.5	9.3	22.72	33.0	-10.3	
High Ch								
1907.50	15.82	V	4.6	9.1	20.34	33.0	-12.7	
1907.50	19.51	H	4.6	9.1	24.03	33.0	-9.0	

LTE

Band 25

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 25 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1857.50	12.59	V	4.5	9.5	17.54	33.0	-15.5	
1857.50	16.97	H	4.5	9.5	21.92	33.0	-11.1	
Mid Ch								
1882.50	13.46	V	4.5	9.3	18.21	33.0	-14.8	
1882.50	17.25	H	4.5	9.3	22.00	33.0	-11.0	
High Ch								
1907.50	15.38	V	4.6	9.1	19.90	33.0	-13.1	
1907.50	19.13	H	4.6	9.1	23.65	33.0	-9.4	

LTE

Band 25

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 25 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1855.00	13.75	V	4.5	9.5	18.72	33.0	-14.3	
1855.00	17.97	H	4.5	9.5	22.94	33.0	-10.1	
Mid Ch								
1882.50	13.78	V	4.5	9.3	18.53	33.0	-14.5	
1882.50	18.22	H	4.5	9.3	22.97	33.0	-10.0	
High Ch								
1910.00	15.75	V	4.6	9.1	20.23	33.0	-12.8	
1910.00	19.50	H	4.6	9.1	23.99	33.0	-9.0	

LTE

Band 25

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 25 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1855.00	12.70	V	4.5	9.5	17.67	33.0	-15.3	
1855.00	16.90	H	4.5	9.5	21.87	33.0	-11.1	
Mid Ch								
1882.50	12.68	V	4.5	9.3	17.43	33.0	-15.6	
1882.50	17.48	H	4.5	9.3	22.23	33.0	-10.8	
High Ch								
1910.00	14.81	V	4.6	9.1	19.29	33.0	-13.7	
1910.00	18.76	H	4.6	9.1	23.25	33.0	-9.8	

LTE

Band 25

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 25 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.50	13.66	V	4.5	9.5	18.65	33.0	-14.4	
1852.50	17.88	H	4.5	9.5	22.87	33.0	-10.1	
Mid Ch								
1882.50	13.53	V	4.5	9.3	18.28	33.0	-14.7	
1882.50	18.20	H	4.5	9.3	22.95	33.0	-10.1	
High Ch								
1912.50	15.81	V	4.6	9.0	20.27	33.0	-12.7	
1912.50	19.59	H	4.6	9.0	24.05	33.0	-9.0	

LTE

Band 25

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 25 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.50	12.85	V	4.5	9.5	17.84	33.0	-15.2	
1852.50	17.00	H	4.5	9.5	21.99	33.0	-11.0	
Mid Ch								
1882.50	12.46	V	4.5	9.3	17.21	33.0	-15.8	
1882.50	16.92	H	4.5	9.3	21.67	33.0	-11.3	
High Ch								
1912.50	14.64	V	4.6	9.0	19.10	33.0	-13.9	
1912.50	18.22	H	4.6	9.0	22.68	33.0	-10.3	

LTE

Band 25

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 25 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1851.50	13.96	V	4.5	9.5	18.96	33.0	-14.0	
1851.50	17.67	H	4.5	9.5	22.67	33.0	-10.3	
Mid Ch								
1882.50	13.86	V	4.5	9.3	18.61	33.0	-14.4	
1882.50	18.31	H	4.5	9.3	23.06	33.0	-9.9	
High Ch								
1913.50	16.03	V	4.6	9.0	20.47	33.0	-12.5	
1913.50	19.95	H	4.6	9.0	24.39	33.0	-8.6	

LTE

Band 25

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 25 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1851.50	12.56	V	4.5	9.5	17.56	33.0	-15.4	
1851.50	16.62	H	4.5	9.5	21.62	33.0	-11.4	
Mid Ch								
1882.50	12.77	V	4.5	9.3	17.52	33.0	-15.5	
1882.50	17.34	H	4.5	9.3	22.09	33.0	-10.9	
High Ch								
1913.50	14.98	V	4.6	9.0	19.42	33.0	-13.6	
1913.50	18.73	H	4.6	9.0	23.17	33.0	-9.8	

LTE

Band 25

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 25 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.70	13.70	V	4.5	9.5	18.70	33.0	-14.3	
1850.70	17.60	H	4.5	9.5	22.61	33.0	-10.4	
Mid Ch								
1882.50	13.18	V	4.5	9.3	17.93	33.0	-15.1	
1882.50	18.17	H	4.5	9.3	22.92	33.0	-10.1	
High Ch								
1914.30	15.91	V	4.6	9.0	20.34	33.0	-12.7	
1914.30	19.85	H	4.6	9.0	24.28	33.0	-8.7	

LTE

Band 25

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 25 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.70	12.57	V	4.5	9.5	17.57	33.0	-15.4	
1850.70	16.79	H	4.5	9.5	21.80	33.0	-11.2	
Mid Ch								
1882.50	12.12	V	4.5	9.3	16.87	33.0	-16.1	
1882.50	16.91	H	4.5	9.3	21.66	33.0	-11.3	
High Ch								
1914.30	14.77	V	4.6	9.0	19.20	33.0	-13.8	
1914.30	18.75	H	4.6	9.0	23.18	33.0	-9.8	

LTE Band 26

LTE

Band 26

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
821.50	15.02	V	3.0	-1.0	11.05	50.0	-38.9	Part 90
821.50	23.36	H	3.0	-1.0	19.39	50.0	-30.6	Part 90

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Mid Ch								
831.50	15.68	V	3.0	-0.9	11.74	38.5	-26.8	
831.50	22.77	H	3.0	-0.9	18.82	38.5	-19.7	
High Ch								
841.50	16.06	V	3.0	-0.9	12.14	38.5	-26.4	
841.50	22.59	H	3.0	-0.9	18.67	38.5	-19.8	

LTE

Band 26

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
821.50	13.45	V	3.0	-1.0	9.48	50.0	-40.5	Part 90
821.50	22.13	H	3.0	-1.0	18.16	50.0	-31.8	Part 90

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 26 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Mid Ch								
831.50	14.65	V	3.0	-0.9	10.71	38.5	-27.8	
831.50	22.41	H	3.0	-0.9	18.46	38.5	-20.0	
High Ch								
841.50	13.88	V	3.0	-0.9	9.96	38.5	-28.5	
841.50	21.46	H	3.0	-0.9	17.54	38.5	-21.0	

LTE

Band 26

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
819.00	15.09	V	3.0	-1.0	11.11	50.0	-38.9	Part 90
819.00	23.37	H	3.0	-1.0	19.39	50.0	-30.6	Part 90

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 26 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	15.59	V	3.0	-0.9	11.63	38.5	-26.9	
829.00	23.26	H	3.0	-0.9	19.31	38.5	-19.2	
Mid Ch								
831.50	15.74	V	3.0	-0.9	11.80	38.5	-26.7	
831.50	23.52	H	3.0	-0.9	19.57	38.5	-18.9	
High Ch								
844.00	14.08	V	3.0	-0.9	10.16	38.5	-28.3	
844.00	22.88	H	3.0	-0.9	18.96	38.5	-19.5	

LTE

Band 26

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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
Low Ch								
819.00	14.17	V	3.0	-1.0	10.19	50.0	-39.8	Part 90
819.00	22.26	H	3.0	-1.0	18.28	50.0	-31.7	Part 90

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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
Low Ch								
829.00	14.46	V	3.0	-0.9	10.50	38.5	-28.0	
829.00	22.36	H	3.0	-0.9	18.41	38.5	-20.1	
Mid Ch								
831.50	14.63	V	3.0	-0.9	10.69	38.5	-27.8	
831.50	22.52	H	3.0	-0.9	18.57	38.5	-19.9	
High Ch								
844.00	13.05	V	3.0	-0.9	9.13	38.5	-29.4	
844.00	21.93	H	3.0	-0.9	18.01	38.5	-20.5	

LTE

Band 26

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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	14.59	V	3.0	-1.0	10.61	50.0	-39.4	Part 90
816.50	23.00	H	3.0	-1.0	19.02	50.0	-31.0	Part 90
Mid Ch								
821.50	15.18	V	3.0	-1.0	11.21	50.0	-38.8	Part 90
821.50	23.46	H	3.0	-1.0	19.49	50.0	-30.5	Part 90

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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								
826.50	15.16	V	3.0	-0.9	11.20	38.5	-27.3	
826.50	23.30	H	3.0	-0.9	19.34	38.5	-19.2	
Mid Ch								
831.50	14.64	V	3.0	-0.9	10.70	38.5	-27.8	
831.50	23.18	H	3.0	-0.9	19.23	38.5	-19.3	
High Ch								
846.50	15.77	V	3.0	-0.9	11.85	38.5	-26.6	
846.50	22.56	H	3.0	-0.9	18.64	38.5	-19.9	

LTE

Band 26

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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	13.77	V	3.0	-1.0	9.79	50.0	-40.2	Part 90
816.50	22.10	H	3.0	-1.0	18.12	50.0	-31.9	Part 90
Mid Ch								
821.50	13.65	V	3.0	-1.0	9.68	50.0	-40.3	Part 90
821.50	22.02	H	3.0	-1.0	18.05	50.0	-32.0	Part 90

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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								
826.50	14.36	V	3.0	-0.9	10.40	38.5	-28.1	
826.50	22.21	H	3.0	-0.9	18.25	38.5	-20.3	
Mid Ch								
831.50	14.64	V	3.0	-0.9	10.70	38.5	-27.8	
831.50	22.18	H	3.0	-0.9	18.23	38.5	-20.3	
High Ch								
846.50	14.67	V	3.0	-0.9	10.75	38.5	-27.7	
846.50	21.20	H	3.0	-0.9	17.28	38.5	-21.2	

LTE

Band 26

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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	14.23	V	3.0	-1.0	10.24	50.0	-39.8	Part 90
815.50	22.94	H	3.0	-1.0	18.96	50.0	-31.0	Part 90
Mid Ch								
822.50	15.15	V	3.0	-1.0	11.18	50.0	-38.8	Part 90
822.50	23.28	H	3.0	-1.0	19.32	50.0	-30.7	Part 90

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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								
825.50	15.28	V	3.0	-0.9	11.32	38.5	-27.2	
825.50	23.43	H	3.0	-0.9	19.47	38.5	-19.0	
Mid Ch								
831.50	15.83	V	3.0	-0.9	11.89	38.5	-26.6	
831.50	23.50	H	3.0	-0.9	19.55	38.5	-19.0	
High Ch								
847.50	13.92	V	3.1	-0.9	10.01	38.5	-28.5	
847.50	22.19	H	3.1	-0.9	18.28	38.5	-20.2	

LTE

Band 26

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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	13.35	V	3.0	-1.0	9.36	50.0	-40.6	Part 90
815.50	21.83	H	3.0	-1.0	17.85	50.0	-32.2	Part 90
Mid Ch								
822.50	14.18	V	3.0	-1.0	10.21	50.0	-39.8	Part 90
822.50	22.53	H	3.0	-1.0	18.57	50.0	-31.4	Part 90

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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								
825.50	14.21	V	3.0	-0.9	10.25	38.5	-28.3	
825.50	22.42	H	3.0	-0.9	18.46	38.5	-20.0	
Mid Ch								
831.50	14.76	V	3.0	-0.9	10.82	38.5	-27.7	
831.50	22.24	H	3.0	-0.9	18.29	38.5	-20.2	
High Ch								
847.50	13.12	V	3.1	-0.9	9.21	38.5	-29.3	
847.50	21.16	H	3.1	-0.9	17.25	38.5	-21.3	

LTE

Band 26

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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
Low Ch								
814.70	14.34	V	3.0	-1.0	10.36	50.0	-39.6	Part 90
814.70	22.55	H	3.0	-1.0	18.56	50.0	-31.4	Part 90
Mid Ch								
823.30	15.08	V	3.0	-1.0	11.11	50.0	-38.9	Part 90
823.30	23.39	H	3.0	-1.0	19.42	50.0	-30.6	Part 90

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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
Low Ch								
824.70	15.12	V	3.0	-1.0	11.15	38.5	-27.3	
824.70	23.22	H	3.0	-1.0	19.26	38.5	-19.2	
Mid Ch								
831.50	15.82	V	3.0	-0.9	11.88	38.5	-26.6	
831.50	23.11	H	3.0	-0.9	19.16	38.5	-19.3	
High Ch								
848.30	15.43	V	3.0	-0.9	11.52	38.5	-27.0	
848.30	22.28	H	3.0	-0.9	18.37	38.5	-20.1	

LTE

Band 26

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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
Low Ch								
814.70	13.22	V	3.0	-1.0	9.24	50.0	-40.8	Part 90
814.70	21.64	H	3.0	-1.0	17.65	50.0	-32.3	Part 90
Mid Ch								
823.30	13.93	V	3.0	-1.0	9.96	50.0	-40.0	Part 90
823.30	22.19	H	3.0	-1.0	18.22	50.0	-31.8	Part 90

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20881
Configuration: EUT, X-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
Low Ch								
824.70	14.21	V	3.0	-1.0	10.24	38.5	-28.3	
824.70	22.20	H	3.0	-1.0	18.24	38.5	-20.3	
Mid Ch								
831.50	14.57	V	3.0	-0.9	10.63	38.5	-27.9	
831.50	22.23	H	3.0	-0.9	18.28	38.5	-20.2	
High Ch								
848.30	14.47	V	3.0	-0.9	10.56	38.5	-27.9	
848.30	21.38	H	3.0	-0.9	17.47	38.5	-21.0	

LTE Band 41(PC2)

LTE Band 41 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-29
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 41 Fundamentals, 20MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2506.00	17.84	V	5.2	9.9	22.51	33.0	-10.5	
2506.00	22.78	H	5.2	9.9	27.45	33.0	-5.6	
Mid Ch								
2593.00	18.14	V	5.3	9.8	22.60	33.0	-10.4	
2593.00	22.68	H	5.3	9.8	27.15	33.0	-5.9	
High Ch								
2680.00	19.24	V	5.4	9.8	23.60	33.0	-9.4	
2680.00	22.28	H	5.4	9.8	26.64	33.0	-6.4	

LTE Band 41 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-29
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 41 Fundamentals, 20MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2506.00	18.64	V	5.2	9.9	23.31	33.0	-9.7	
2506.00	21.67	H	5.2	9.9	26.34	33.0	-6.7	
Mid Ch								
2593.00	18.90	V	5.3	9.8	23.36	33.0	-9.6	
2593.00	23.22	H	5.3	9.8	27.69	33.0	-5.3	
High Ch								
2680.00	18.56	V	5.4	9.8	22.92	33.0	-10.1	
2680.00	21.72	H	5.4	9.8	26.08	33.0	-6.9	

LTE

Band 41

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-29
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 41 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2503.50	17.38	V	5.2	9.9	22.05	33.0	-11.0	
2503.50	23.74	H	5.2	9.9	28.42	33.0	-4.6	
Mid Ch								
2593.00	19.78	V	5.3	9.8	24.24	33.0	-8.8	
2593.00	22.77	H	5.3	9.8	27.24	33.0	-5.8	
High Ch								
2682.50	19.56	V	5.4	9.8	23.92	33.0	-9.1	
2682.50	22.63	H	5.4	9.8	26.99	33.0	-6.0	

LTE

Band 41

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-29
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 41 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2503.50	17.81	V	5.2	9.9	22.48	33.0	-10.5	
2503.50	22.21	H	5.2	9.9	26.89	33.0	-6.1	
Mid Ch								
2593.00	19.13	V	5.3	9.8	23.59	33.0	-9.4	
2593.00	23.18	H	5.3	9.8	27.65	33.0	-5.4	
High Ch								
2682.50	19.27	V	5.4	9.8	23.63	33.0	-9.4	
2682.50	21.58	H	5.4	9.8	25.94	33.0	-7.1	

LTE

Band 41

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-29
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 41 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2501.00	16.43	V	5.2	9.9	21.11	33.0	-11.9	
2501.00	23.64	H	5.2	9.9	28.32	33.0	-4.7	
Mid Ch								
2593.00	19.79	V	5.3	9.8	24.25	33.0	-8.7	
2593.00	23.53	H	5.3	9.8	28.00	33.0	-5.0	
High Ch								
2685.00	21.20	V	5.5	9.8	25.56	33.0	-7.4	
2685.00	23.13	H	5.5	9.8	27.49	33.0	-5.5	

LTE

Band 41

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-29
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 41 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2501.00	17.82	V	5.2	9.9	22.50	33.0	-10.5	
2501.00	22.92	H	5.2	9.9	27.60	33.0	-5.4	
Mid Ch								
2593.00	18.26	V	5.3	9.8	22.72	33.0	-10.3	
2593.00	23.31	H	5.3	9.8	27.78	33.0	-5.2	
High Ch								
2685.00	19.74	V	5.5	9.8	24.10	33.0	-8.9	
2685.00	22.71	H	5.5	9.8	27.07	33.0	-5.9	

LTE

Band 41

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-29
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 41 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2498.50	19.69	V	5.2	9.9	24.38	33.0	-8.6	
2498.50	21.77	H	5.2	9.9	26.45	33.0	-6.5	
Mid Ch								
2593.00	18.94	V	5.3	9.8	23.40	33.0	-9.6	
2593.00	22.55	H	5.3	9.8	27.02	33.0	-6.0	
High Ch								
2687.50	19.95	V	5.5	9.8	24.31	33.0	-8.7	
2687.50	21.95	H	5.5	9.8	26.31	33.0	-6.7	

LTE

Band 41

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-29
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 41 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2498.50	19.28	V	5.2	9.9	23.97	33.0	-9.0	
2498.50	21.89	H	5.2	9.9	26.57	33.0	-6.4	
Mid Ch								
2593.00	20.18	V	5.3	9.8	24.64	33.0	-8.4	
2593.00	22.78	H	5.3	9.8	27.25	33.0	-5.8	
High Ch								
2687.50	20.44	V	5.5	9.8	24.80	33.0	-8.2	
2687.50	22.48	H	5.5	9.8	26.84	33.0	-6.2	

LTE Band 66

LTE Band 66 20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20890
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1720.00	18.04	V	4.3	9.4	23.14	30.0	-6.9	
1720.00	12.45	H	4.3	9.4	17.55	30.0	-12.5	
Mid Ch								
1745.00	18.76	V	4.4	9.5	23.92	30.0	-6.1	
1745.00	13.13	H	4.4	9.5	18.29	30.0	-11.7	
High Ch								
1770.00	18.12	V	4.4	9.6	23.29	30.0	-6.7	
1770.00	10.97	H	4.4	9.6	16.14	30.0	-13.9	

LTE Band 66 20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20890
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 20MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1720.00	16.66	V	4.3	9.4	21.76	30.0	-8.2	
1720.00	9.46	H	4.3	9.4	14.56	30.0	-15.4	
Mid Ch								
1745.00	17.59	V	4.4	9.5	22.75	30.0	-7.3	
1745.00	11.90	H	4.4	9.5	17.06	30.0	-12.9	
High Ch								
1770.00	17.02	V	4.4	9.6	22.19	30.0	-7.8	
1770.00	10.01	H	4.4	9.6	15.18	30.0	-14.8	

LTE

Band 66

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20890
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 15MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1717.50	18.16	V	4.3	9.4	23.25	30.0	-6.7	
1717.50	12.50	H	4.3	9.4	17.59	30.0	-12.4	
Mid Ch								
1745.00	18.74	V	4.4	9.5	23.90	30.0	-6.1	
1745.00	10.05	H	4.4	9.5	15.21	30.0	-14.8	
High Ch								
1772.50	17.71	V	4.4	9.6	22.88	30.0	-7.1	
1772.50	12.34	H	4.4	9.6	17.51	30.0	-12.5	

LTE

Band 66

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20890
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 15MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1717.50	16.35	V	4.3	9.4	21.44	30.0	-8.6	
1717.50	10.69	H	4.3	9.4	15.78	30.0	-14.2	
Mid Ch								
1745.00	17.33	V	4.4	9.5	22.49	30.0	-7.5	
1745.00	9.39	H	4.4	9.5	14.55	30.0	-15.5	
High Ch								
1772.50	16.38	V	4.4	9.6	21.55	30.0	-8.5	
1772.50	10.85	H	4.4	9.6	16.02	30.0	-14.0	

LTE

Band 66

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20890
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1715.00	17.89	V	4.3	9.4	22.98	30.0	-7.0	
1715.00	7.75	H	4.3	9.4	12.84	30.0	-17.2	
Mid Ch								
1745.00	18.79	V	4.4	9.5	23.95	30.0	-6.1	
1745.00	12.71	H	4.4	9.5	17.87	30.0	-12.1	
High Ch								
1775.00	17.80	V	4.4	9.6	22.97	30.0	-7.0	
1775.00	12.20	H	4.4	9.6	17.37	30.0	-12.6	

LTE

Band 66

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20890
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1715.00	16.95	V	4.3	9.4	22.04	30.0	-8.0	
1715.00	6.64	H	4.3	9.4	11.73	30.0	-18.3	
Mid Ch								
1745.00	17.33	V	4.4	9.5	22.49	30.0	-7.5	
1745.00	11.70	H	4.4	9.5	16.86	30.0	-13.1	
High Ch								
1775.00	16.97	V	4.4	9.6	22.14	30.0	-7.9	
1775.00	10.88	H	4.4	9.6	16.05	30.0	-13.9	

LTE

Band 66

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-26
Test Engineer: 20896
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.50	18.09	V	4.3	9.3	23.09	30.0	-6.9	
1712.50	11.82	H	4.3	9.3	16.82	30.0	-13.2	
Mid Ch								
1745.00	18.71	V	4.4	9.4	23.80	30.0	-6.2	
1745.00	12.75	H	4.4	9.4	17.84	30.0	-12.2	
High Ch								
1777.50	18.50	V	4.4	9.5	23.60	30.0	-6.4	
1777.50	12.20	H	4.4	9.5	17.30	30.0	-12.7	

LTE

Band 66

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-26
Test Engineer: 20896
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.50	17.11	V	4.3	9.4	22.19	30.0	-7.8	
1712.50	11.30	H	4.3	9.4	16.38	30.0	-13.6	
Mid Ch								
1745.00	17.39	V	4.4	9.5	22.55	30.0	-7.5	
1745.00	12.01	H	4.4	9.5	17.17	30.0	-12.8	
High Ch								
1777.50	17.33	V	4.4	9.6	22.50	30.0	-7.5	
1777.50	11.13	H	4.4	9.6	16.30	30.0	-13.7	

LTE

Band 66

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-26
Test Engineer: 20896
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1711.50	17.65	V	4.3	9.3	22.66	30.0	-7.3	
1711.50	12.23	H	4.3	9.3	17.24	30.0	-12.8	
Mid Ch								
1745.00	18.18	V	4.4	9.4	23.27	30.0	-6.7	
1745.00	13.02	H	4.4	9.4	18.11	30.0	-11.9	
High Ch								
1778.50	18.50	V	4.4	9.5	23.60	30.0	-6.4	
1778.50	12.43	H	4.4	9.5	17.53	30.0	-12.5	

LTE

Band 66

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-26
Test Engineer: 20896
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[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								
1711.50	16.84	V	4.3	9.4	21.92	30.0	-8.1	
1711.50	10.33	H	4.3	9.4	15.41	30.0	-14.6	
Mid Ch								
1745.00	17.58	V	4.4	9.5	22.74	30.0	-7.3	
1745.00	11.51	H	4.4	9.5	16.67	30.0	-13.3	
High Ch								
1778.50	16.90	V	4.4	9.6	22.07	30.0	-7.9	
1778.50	11.11	H	4.4	9.6	16.28	30.0	-13.7	

LTE

Band 66

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-26
Test Engineer: 20896
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 66 Fundamentals, 1.4MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1710.70	17.84	V	4.3	9.3	22.84	30.0	-7.2	
1710.70	11.49	H	4.3	9.3	16.49	30.0	-13.5	
Mid Ch								
1745.00	18.13	V	4.4	9.4	23.22	30.0	-6.8	
1745.00	12.63	H	4.4	9.4	17.72	30.0	-12.3	
High Ch								
1779.30	18.30	V	4.4	9.5	23.40	30.0	-6.6	
1779.30	11.99	H	4.4	9.5	17.09	30.0	-12.9	

LTE

Band 66

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789219881
Date: 2019-11-26
Test Engineer: 20896
Configuration: EUT / Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 66 Fundamentals, 1.4MHz Bandwidth

Test Equpment:
Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables
Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1710.70	16.94	V	4.3	9.3	21.94	30.0	-8.1	
1710.70	9.41	H	4.3	9.3	14.41	30.0	-15.6	
Mid Ch								
1745.00	17.13	V	4.4	9.4	22.22	30.0	-7.8	
1745.00	11.37	H	4.4	9.4	16.46	30.0	-13.5	
High Ch								
1779.30	17.26	V	4.4	9.5	22.36	30.0	-7.6	
1779.30	10.80	H	4.4	9.5	15.90	30.0	-14.1	

10.2. 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):
(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

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

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

TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.12; ESU40 setting reference to 971168 D01 v03r01

For peak power measurement with a ESU40:
a) Set the RBW = 100 KHz for emission below 1GHz and 1MHz for emissions above 1GHz
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 1.5 times the OBW;
d) Sweep time = auto couple;
e) Detector = rms;
f) Ensure that the number of measurement points ≥ span/RBW;
g) Trace mode = average(WCDMA, LTE), Maxhold(GSM, LTE Band41);;

RESULTS

See the following pages.

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

10.2.1. SPURIOUS RADIATION PLOTS

GSM850

GSM850

GPRS

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

Company:	Samsung
Project #:	4789219881
Date:	2019-11-25
Test Engineer:	20882
Configuration:	EUT / AC Adapter, X-Position
Location:	Chamber 2
Mode:	GPRS 850 MHz Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1648.40	-14.3	V	3.0	40.7	1.0	-54.0	-13.0	-41.0	
2472.60	-11.3	V	3.0	41.3	1.0	-51.6	-13.0	-38.6	
3296.80	-9.3	V	3.0	42.0	1.0	-50.4	-13.0	-37.4	
4121.00	-8.9	V	3.0	42.1	1.0	-50.1	-13.0	-37.1	
4945.20	-7.8	V	3.0	42.7	1.0	-49.5	-13.0	-36.5	
1648.40	-13.9	H	3.0	40.7	1.0	-53.6	-13.0	-40.6	
2472.60	-11.0	H	3.0	41.3	1.0	-51.2	-13.0	-38.2	
3296.80	-8.8	H	3.0	42.0	1.0	-49.9	-13.0	-36.9	
4121.00	-9.7	H	3.0	42.1	1.0	-50.8	-13.0	-37.8	
4945.20	-7.7	H	3.0	42.7	1.0	-49.4	-13.0	-36.4	
Mid Ch, 836.6MHz									
1673.20	-14.1	V	3.0	40.7	1.0	-53.7	-13.0	-40.7	
2509.80	-11.4	V	3.0	41.3	1.0	-51.8	-13.0	-38.8	
3346.40	-9.0	V	3.0	42.0	1.0	-50.1	-13.0	-37.1	
4183.00	-8.4	V	3.0	42.2	1.0	-49.6	-13.0	-36.6	
5019.60	-7.3	V	3.0	42.8	1.0	-49.0	-13.0	-36.0	
1673.20	-12.6	H	3.0	40.7	1.0	-52.2	-13.0	-39.2	
2509.80	-11.5	H	3.0	41.3	1.0	-51.8	-13.0	-38.8	
3346.40	-8.8	H	3.0	42.0	1.0	-49.8	-13.0	-36.8	
4183.00	-9.3	H	3.0	42.2	1.0	-50.5	-13.0	-37.5	
5019.60	-7.4	H	3.0	42.8	1.0	-49.1	-13.0	-36.1	
High Ch, 848.8MHz									
1697.60	-13.8	V	3.0	40.7	1.0	-53.4	-13.0	-40.4	
2546.40	-10.5	V	3.0	41.4	1.0	-50.9	-13.0	-37.9	
3395.20	-8.8	V	3.0	42.0	1.0	-49.8	-13.0	-36.8	
4244.00	-9.3	V	3.0	42.2	1.0	-50.6	-13.0	-37.6	
5092.80	-7.4	V	3.0	42.8	1.0	-49.2	-13.0	-36.2	
1697.60	-13.4	H	3.0	40.7	1.0	-53.1	-13.0	-40.1	
2546.40	-11.0	H	3.0	41.4	1.0	-51.4	-13.0	-38.4	
3395.20	-8.5	H	3.0	42.0	1.0	-49.5	-13.0	-36.5	
4244.00	-9.5	H	3.0	42.2	1.0	-50.7	-13.0	-37.7	
5092.80	-7.7	H	3.0	42.8	1.0	-49.4	-13.0	-36.4	

GSM850

EGPRS

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

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: EGPRS 850 MHz Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1648.40	-14.5	V	3.0	40.7	1.0	-54.2	-13.0	-41.2	
2472.60	-11.6	V	3.0	41.3	1.0	-51.8	-13.0	-38.8	
3296.80	-9.2	V	3.0	42.0	1.0	-50.3	-13.0	-37.3	
4121.00	-9.9	V	3.0	42.1	1.0	-51.1	-13.0	-38.1	
4945.20	-7.8	V	3.0	42.7	1.0	-49.6	-13.0	-36.6	
1648.40	-15.1	H	3.0	40.7	1.0	-54.8	-13.0	-41.8	
2472.60	-11.7	H	3.0	41.3	1.0	-52.0	-13.0	-39.0	
3296.80	-9.0	H	3.0	42.0	1.0	-50.1	-13.0	-37.1	
4121.00	-10.0	H	3.0	42.1	1.0	-51.2	-13.0	-38.2	
4945.20	-7.9	H	3.0	42.7	1.0	-49.6	-13.0	-36.6	
Mid Ch, 836.6MHz									
1673.20	-14.2	V	3.0	40.7	1.0	-53.9	-13.0	-40.9	
2509.80	-11.9	V	3.0	41.3	1.0	-52.2	-13.0	-39.2	
3346.40	-9.0	V	3.0	42.0	1.0	-50.0	-13.0	-37.0	
4183.00	-9.2	V	3.0	42.2	1.0	-50.4	-13.0	-37.4	
5019.60	-7.8	V	3.0	42.8	1.0	-49.6	-13.0	-36.6	
1673.20	-15.1	H	3.0	40.7	1.0	-54.8	-13.0	-41.8	
2509.80	-11.6	H	3.0	41.3	1.0	-52.0	-13.0	-39.0	
3346.40	-9.0	H	3.0	42.0	1.0	-50.0	-13.0	-37.0	
4183.00	-9.5	H	3.0	42.2	1.0	-50.7	-13.0	-37.7	
5019.60	-7.5	H	3.0	42.8	1.0	-49.3	-13.0	-36.3	
High Ch, 848.8MHz									
1697.60	-14.1	V	3.0	40.7	1.0	-53.7	-13.0	-40.7	
2546.40	-11.5	V	3.0	41.4	1.0	-51.8	-13.0	-38.8	
3395.20	-8.6	V	3.0	42.0	1.0	-49.6	-13.0	-36.6	
4244.00	-9.1	V	3.0	42.2	1.0	-50.3	-13.0	-37.3	
5092.80	-7.7	V	3.0	42.8	1.0	-49.4	-13.0	-36.4	
1697.60	-14.8	H	3.0	40.7	1.0	-54.5	-13.0	-41.5	
2546.40	-11.1	H	3.0	41.4	1.0	-51.5	-13.0	-38.5	
3395.20	-8.6	H	3.0	42.0	1.0	-49.6	-13.0	-36.6	
4244.00	-9.6	H	3.0	42.2	1.0	-50.9	-13.0	-37.9	
5092.80	-7.7	H	3.0	42.8	1.0	-49.4	-13.0	-36.4	

GSM1900

GSM1900
GPRS

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

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20882
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 2
Mode: GPRS 1900 MHz Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-10.6	V	3.0	42.0	1.0	-51.6	-13.0	-38.6	
5550.60	-6.8	V	3.0	42.9	1.0	-48.7	-13.0	-35.7	
7400.80	-5.3	V	3.0	42.5	1.0	-46.8	-13.0	-33.8	
3700.40	-9.4	H	3.0	42.0	1.0	-50.4	-13.0	-37.4	
5550.60	-4.0	H	3.0	42.9	1.0	-45.9	-13.0	-32.9	
7400.80	-5.4	H	3.0	42.5	1.0	-46.8	-13.0	-33.8	
Mid Ch, 1880MHz									
3760.00	-9.9	V	3.0	42.1	1.0	-51.0	-13.0	-38.0	
5640.00	-6.9	V	3.0	42.9	1.0	-48.8	-13.0	-35.8	
7520.00	-5.4	V	3.0	42.4	1.0	-46.8	-13.0	-33.8	
3760.00	-9.1	H	3.0	42.1	1.0	-50.2	-13.0	-37.2	
5640.00	-3.9	H	3.0	42.9	1.0	-45.8	-13.0	-32.8	
7520.00	-5.6	H	3.0	42.4	1.0	-47.0	-13.0	-34.0	
High Ch, 1909.8MHz									
3819.60	-10.3	V	3.0	42.1	1.0	-51.4	-13.0	-38.4	
5729.40	-6.3	V	3.0	42.9	1.0	-48.3	-13.0	-35.3	
7639.20	-5.5	V	3.0	42.3	1.0	-46.8	-13.0	-33.8	
3819.60	-9.9	H	3.0	42.1	1.0	-50.9	-13.0	-37.9	
5729.40	-5.4	H	3.0	42.9	1.0	-47.3	-13.0	-34.3	
7639.20	-5.6	H	3.0	42.3	1.0	-46.9	-13.0	-33.9	

GSM1900
EGPRS

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

Company: Samsung
Project #: 4789219881
Date: 2019-11-25
Test Engineer: 20896
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 2
Mode: EGPRS 1900 MHz Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-10.8	V	3.0	42.0	1.0	-51.9	-13.0	-38.9	
5550.60	-7.0	V	3.0	42.9	1.0	-48.9	-13.0	-35.9	
7400.80	-5.4	V	3.0	42.5	1.0	-46.9	-13.0	-33.9	
3700.40	-10.8	H	3.0	42.0	1.0	-51.8	-13.0	-38.8	
5550.60	-6.9	H	3.0	42.9	1.0	-48.8	-13.0	-35.8	
7400.80	-5.5	H	3.0	42.5	1.0	-46.9	-13.0	-33.9	
Mid Ch, 1880MHz									
3760.00	-10.2	V	3.0	42.1	1.0	-51.3	-13.0	-38.3	
5640.00	-6.9	V	3.0	42.9	1.0	-48.8	-13.0	-35.8	
7520.00	-5.4	V	3.0	42.4	1.0	-46.8	-13.0	-33.8	
3760.00	-10.3	H	3.0	42.1	1.0	-51.4	-13.0	-38.4	
5640.00	-6.2	H	3.0	42.9	1.0	-48.1	-13.0	-35.1	
7520.00	-5.5	H	3.0	42.4	1.0	-46.9	-13.0	-33.9	
High Ch, 1909.8MHz									
3819.60	-10.4	V	3.0	42.1	1.0	-51.5	-13.0	-38.5	
5729.40	-7.0	V	3.0	42.9	1.0	-48.9	-13.0	-35.9	
7639.20	-5.3	V	3.0	42.3	1.0	-46.7	-13.0	-33.7	
3819.60	-10.5	H	3.0	42.1	1.0	-51.6	-13.0	-38.6	
5729.40	-6.7	H	3.0	42.9	1.0	-48.6	-13.0	-35.6	
7639.20	-5.4	H	3.0	42.3	1.0	-46.7	-13.0	-33.7	

WCDMA Band 5

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

Company: Samsung
Project #: 4789219881
Date: 2019-11-23
Test Engineer: 20882
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 2
Mode: Rel99 Band 5 Harmonics

WCDMA Band 5 REL99

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-14.3	V	3.0	40.7	1.0	-54.0	-13.0	-41.0	
2479.20	-11.9	V	3.0	41.3	1.0	-52.2	-13.0	-39.2	
3305.60	-10.1	V	3.0	42.0	1.0	-51.2	-13.0	-38.2	
1652.80	-16.1	H	3.0	40.7	1.0	-55.8	-13.0	-42.8	
2479.20	-11.9	H	3.0	41.3	1.0	-52.2	-13.0	-39.2	
3305.60	-9.7	H	3.0	42.0	1.0	-50.7	-13.0	-37.7	
Mid Ch, 836.6MHz									
1673.20	-14.5	V	3.0	40.7	1.0	-54.1	-13.0	-41.1	
2509.80	-12.3	V	3.0	41.3	1.0	-52.6	-13.0	-39.6	
3346.40	-10.0	V	3.0	42.0	1.0	-51.1	-13.0	-38.1	
1673.20	-15.1	H	3.0	40.7	1.0	-54.8	-13.0	-41.8	
2509.80	-12.3	H	3.0	41.3	1.0	-52.6	-13.0	-39.6	
3346.40	-9.5	H	3.0	42.0	1.0	-50.6	-13.0	-37.6	
High Ch, 846.6MHz									
1693.20	-14.3	V	3.0	40.7	1.0	-54.0	-13.0	-41.0	
2539.80	-12.5	V	3.0	41.4	1.0	-52.9	-13.0	-39.9	
3386.40	-9.8	V	3.0	42.0	1.0	-50.8	-13.0	-37.8	
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	-52.6	-13.0	-39.6	
3386.40	-9.5	H	3.0	42.0	1.0	-50.6	-13.0	-37.6	

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

Company: Samsung
Project #: 4789219881
Date: 2019-11-23
Test Engineer: 20882
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 2
Mode: HSDPA Band 5 Harmonics

WCDMA Band 5 HSDPA

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-14.9	V	3.0	40.7	1.0	-54.5	-13.0	-41.5	
2479.20	-12.4	V	3.0	41.3	1.0	-52.7	-13.0	-39.7	
3305.60	-10.1	V	3.0	42.0	1.0	-51.1	-13.0	-38.1	
1652.80	-15.2	H	3.0	40.7	1.0	-54.8	-13.0	-41.8	
2479.20	-12.1	H	3.0	41.3	1.0	-52.4	-13.0	-39.4	
3305.60	-9.7	H	3.0	42.0	1.0	-50.7	-13.0	-37.7	
Mid Ch, 836.6MHz									
1673.20	-14.3	V	3.0	40.7	1.0	-54.0	-13.0	-41.0	
2509.80	-12.8	V	3.0	41.3	1.0	-53.1	-13.0	-40.1	
3346.40	-10.1	V	3.0	42.0	1.0	-51.1	-13.0	-38.1	
1673.20	-15.7	H	3.0	40.7	1.0	-55.3	-13.0	-42.3	
2509.80	-12.1	H	3.0	41.3	1.0	-52.4	-13.0	-39.4	
3346.40	-9.4	H	3.0	42.0	1.0	-50.5	-13.0	-37.5	
High Ch, 846.6MHz									
1693.20	-15.2	V	3.0	40.7	1.0	-54.8	-13.0	-41.8	
2539.80	-12.0	V	3.0	41.4	1.0	-52.4	-13.0	-39.4	
3386.40	-9.8	V	3.0	42.0	1.0	-50.8	-13.0	-37.8	
1693.20	-15.9	H	3.0	40.7	1.0	-55.5	-13.0	-42.5	
2539.80	-12.2	H	3.0	41.4	1.0	-52.6	-13.0	-39.6	
3386.40	-9.3	H	3.0	42.0	1.0	-50.3	-13.0	-37.3	

WCDMA Band 4

WCDMA

Band 4
REL99

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

Company: Samsung
Project #: 4789219881
Date: 2019-11-23
Test Engineer: 20882
Configuration: EUT/ AC Adapter, Z-Position
Location: Chamber 2
Mode: Rel99 Band 4 Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1712.4MHz									
3424.80	-8.8	V	3.0	42.0	1.0	-49.9	-13.0	-36.9	
5137.20	-8.3	V	3.0	42.8	1.0	-50.1	-13.0	-37.1	
6849.60	-5.7	V	3.0	42.7	1.0	-47.4	-13.0	-34.4	
3424.80	-8.7	H	3.0	42.0	1.0	-49.7	-13.0	-36.7	
5137.20	-8.0	H	3.0	42.8	1.0	-49.7	-13.0	-36.7	
6849.60	-5.5	H	3.0	42.7	1.0	-47.2	-13.0	-34.2	
Mid Ch, 1732.6MHz									
3465.20	-8.7	V	3.0	42.0	1.0	-49.8	-13.0	-36.8	
5197.80	-7.9	V	3.0	42.8	1.0	-49.7	-13.0	-36.7	
6930.40	-6.2	V	3.0	42.7	1.0	-47.8	-13.0	-34.8	
3465.20	-8.7	H	3.0	42.0	1.0	-49.8	-13.0	-36.8	
5197.80	-7.9	H	3.0	42.8	1.0	-49.7	-13.0	-36.7	
6930.40	-5.6	H	3.0	42.7	1.0	-47.2	-13.0	-34.2	
High Ch, 1752.6MHz									
3505.20	-7.5	V	3.0	42.0	1.0	-48.5	-13.0	-35.5	
5257.80	-7.9	V	3.0	42.8	1.0	-49.7	-13.0	-36.7	
7010.40	-6.3	V	3.0	42.7	1.0	-47.9	-13.0	-34.9	
3505.20	-8.0	H	3.0	42.0	1.0	-49.1	-13.0	-36.1	
5257.80	-8.1	H	3.0	42.8	1.0	-49.9	-13.0	-36.9	
7010.40	-5.4	H	3.0	42.7	1.0	-47.1	-13.0	-34.1	

WCDMA

Band 4
HSDPA

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

Company: Samsung
Project #: 4789219881
Date: 2019-11-23
Test Engineer: 20882
Configuration: EUT/ AC Adapter, Z-Position
Location: Chamber 2
Mode: HSDPA Band 4 Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1712.4MHz									
3424.80	-9.0	V	3.0	42.0	1.0	-50.0	-13.0	-37.0	
5137.20	-8.4	V	3.0	42.8	1.0	-50.2	-13.0	-37.2	
6849.60	-6.1	V	3.0	42.7	1.0	-47.8	-13.0	-34.8	
3424.80	-8.5	H	3.0	42.0	1.0	-49.5	-13.0	-36.5	
5137.20	-8.2	H	3.0	42.8	1.0	-50.0	-13.0	-37.0	
6849.60	-5.6	H	3.0	42.7	1.0	-47.3	-13.0	-34.3	
Mid Ch, 1732.6MHz									
3465.20	-8.6	V	3.0	42.0	1.0	-49.7	-13.0	-36.7	
5197.80	-7.7	V	3.0	42.8	1.0	-49.5	-13.0	-36.5	
6930.40	-5.8	V	3.0	42.7	1.0	-47.4	-13.0	-34.4	
3465.20	-8.8	H	3.0	42.0	1.0	-49.8	-13.0	-36.8	
5197.80	-7.6	H	3.0	42.8	1.0	-49.4	-13.0	-36.4	
6930.40	-5.7	H	3.0	42.7	1.0	-47.4	-13.0	-34.4	
High Ch, 1752.6MHz									
3505.20	-7.5	V	3.0	42.0	1.0	-48.6	-13.0	-35.6	
5257.80	-8.2	V	3.0	42.8	1.0	-50.0	-13.0	-37.0	
7010.40	-5.7	V	3.0	42.7	1.0	-47.3	-13.0	-34.3	
3505.20	-7.4	H	3.0	42.0	1.0	-48.4	-13.0	-35.4	
5257.80	-7.9	H	3.0	42.8	1.0	-49.7	-13.0	-36.7	
7010.40	-5.3	H	3.0	42.7	1.0	-46.9	-13.0	-33.9	

WCDMA Band 2

WCDMA

Band 2
REL99

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

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 2
Mode: Rel99 Band 2 Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4MHz									
3704.80	-10.0	V	3.0	42.0	1.0	-51.1	-13.0	-38.1	
5557.20	-7.2	V	3.0	42.9	1.0	-49.1	-13.0	-36.1	
7409.60	-5.3	V	3.0	42.5	1.0	-46.7	-13.0	-33.7	
3704.80	-10.3	H	3.0	42.0	1.0	-51.3	-13.0	-38.3	
5557.20	-7.4	H	3.0	42.9	1.0	-49.2	-13.0	-36.2	
7409.60	-6.2	H	3.0	42.5	1.0	-47.7	-13.0	-34.7	
Mid Ch, 1880MHz									
3760.00	-9.6	V	3.0	42.1	1.0	-50.7	-13.0	-37.7	
5640.00	-7.0	V	3.0	42.9	1.0	-48.9	-13.0	-35.9	
7520.00	-6.5	V	3.0	42.4	1.0	-47.9	-13.0	-34.9	
3760.00	-11.3	H	3.0	42.1	1.0	-52.4	-13.0	-39.4	
5640.00	-7.0	H	3.0	42.9	1.0	-48.9	-13.0	-35.9	
7520.00	-6.1	H	3.0	42.4	1.0	-47.5	-13.0	-34.5	
High Ch, 1907.6MHz									
3815.20	-10.8	V	3.0	42.1	1.0	-51.9	-13.0	-38.9	
5722.80	-6.8	V	3.0	42.9	1.0	-48.8	-13.0	-35.8	
7630.40	-5.7	V	3.0	42.4	1.0	-47.1	-13.0	-34.1	
3815.20	-10.5	H	3.0	42.1	1.0	-51.5	-13.0	-38.5	
5722.80	-7.3	H	3.0	42.9	1.0	-49.2	-13.0	-36.2	
7630.40	-6.1	H	3.0	42.4	1.0	-47.4	-13.0	-34.4	

WCDMA

Band 2
HSDPA

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

Company: Samsung
Project #: 4789219881
Date: 2019-11-22
Test Engineer: 20882
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 2
Mode: HSDPA Band 2 Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4MHz									
3704.80	-11.4	V	3.0	42.0	1.0	-52.5	-13.0	-39.5	
5557.20	-7.7	V	3.0	42.9	1.0	-49.6	-13.0	-36.6	
7409.60	-5.6	V	3.0	42.5	1.0	-47.1	-13.0	-34.1	
3704.80	-11.0	H	3.0	42.0	1.0	-52.1	-13.0	-39.1	
5557.20	-7.2	H	3.0	42.9	1.0	-49.1	-13.0	-36.1	
7409.60	-5.7	H	3.0	42.5	1.0	-47.2	-13.0	-34.2	
Mid Ch, 1880MHz									
3760.00	-10.6	V	3.0	42.1	1.0	-51.7	-13.0	-38.7	
5640.00	-7.0	V	3.0	42.9	1.0	-48.9	-13.0	-35.9	
7520.00	-5.7	V	3.0	42.4	1.0	-47.2	-13.0	-34.2	
3760.00	-11.6	H	3.0	42.1	1.0	-52.6	-13.0	-39.6	
5640.00	-7.2	H	3.0	42.9	1.0	-49.1	-13.0	-36.1	
7520.00	-5.8	H	3.0	42.4	1.0	-47.2	-13.0	-34.2	
High Ch, 1907.6MHz									
3815.20	-10.6	V	3.0	42.1	1.0	-51.6	-13.0	-38.6	
5722.80	-7.7	V	3.0	42.9	1.0	-49.7	-13.0	-36.7	
7630.40	-6.0	V	3.0	42.4	1.0	-47.3	-13.0	-34.3	
3815.20	-10.9	H	3.0	42.1	1.0	-52.0	-13.0	-39.0	
5722.80	-7.3	H	3.0	42.9	1.0	-49.2	-13.0	-36.2	
7630.40	-6.2	H	3.0	42.4	1.0	-47.5	-13.0	-34.5	