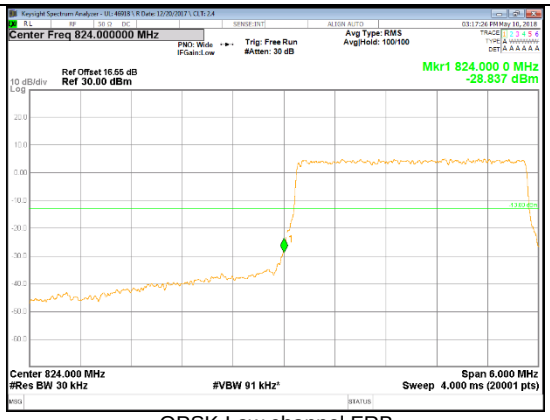
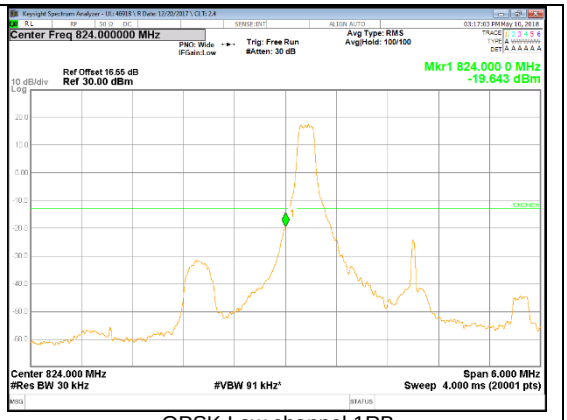
Band 5

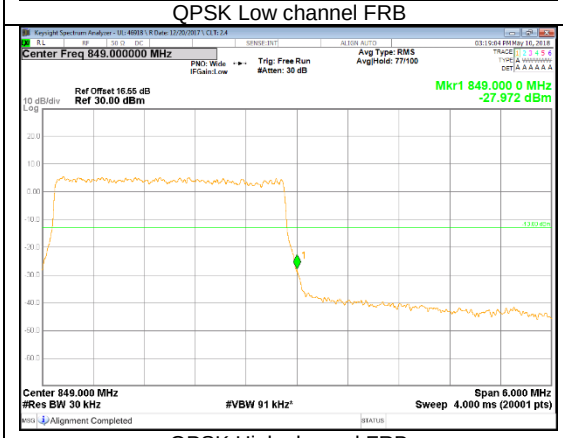
3MHz



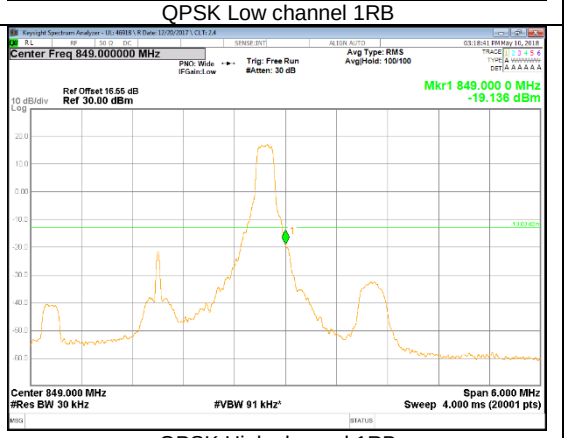
QPSK Low channel FRB



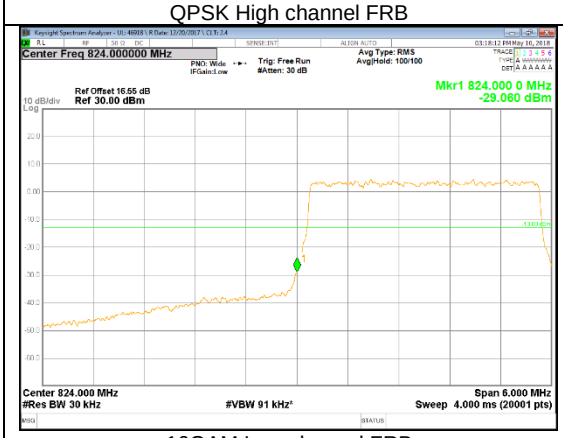
QPSK Low channel 1RB



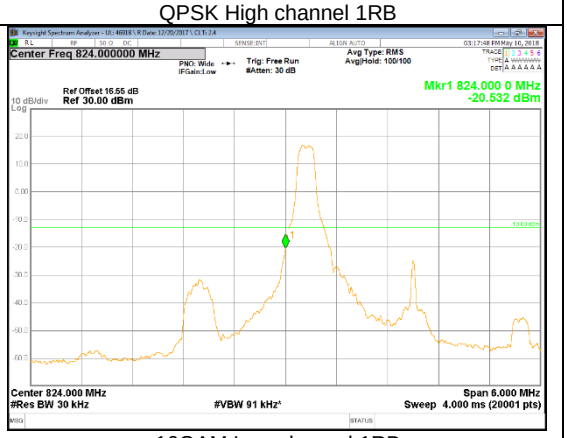
QPSK High channel FRB



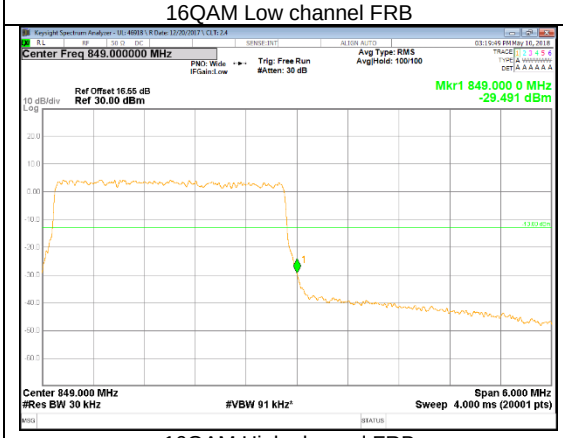
QPSK High channel 1RB



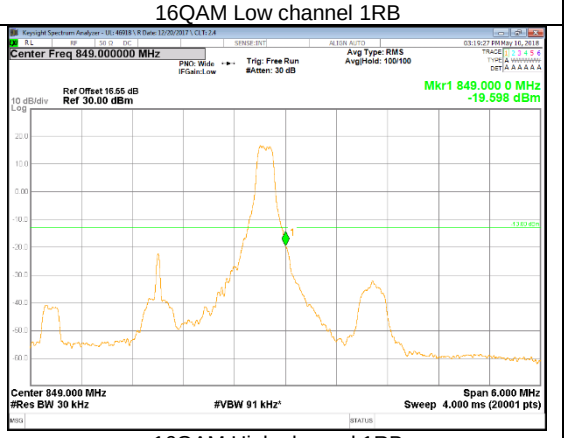
16QAM Low channel FRB



16QAM Low channel 1RB



16QAM High channel FRB



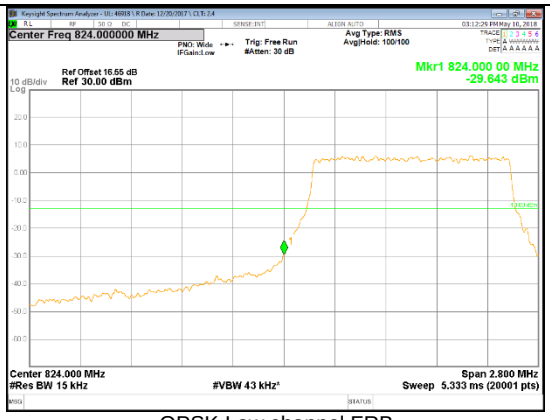
16QAM High channel 1RB

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

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

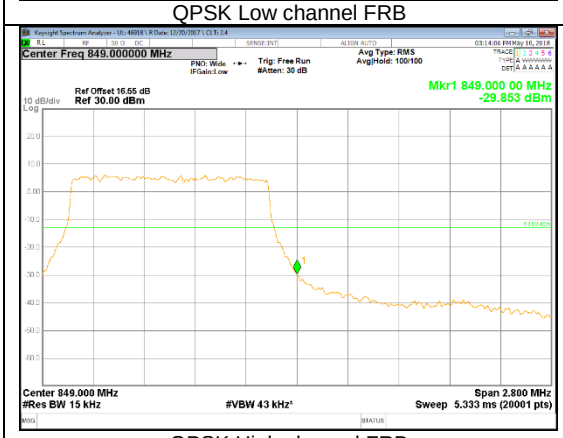
Band 5

1.4MHz

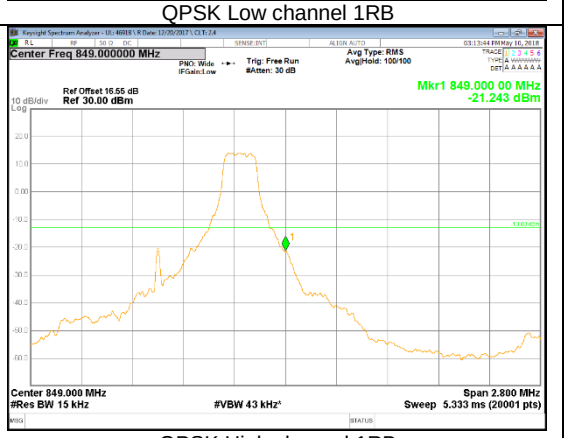


QPSK Low channel FRB

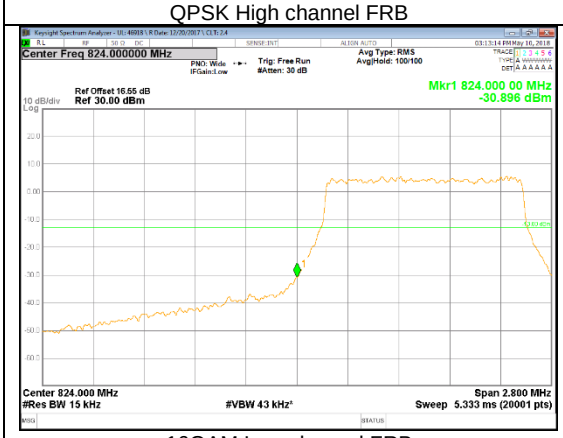
QPSK Low channel 1RB



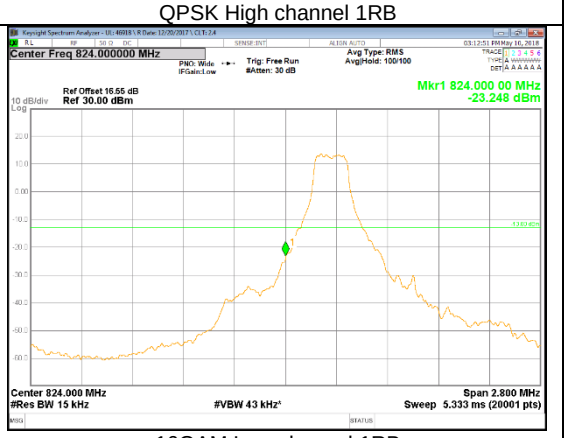
QPSK High channel FRB



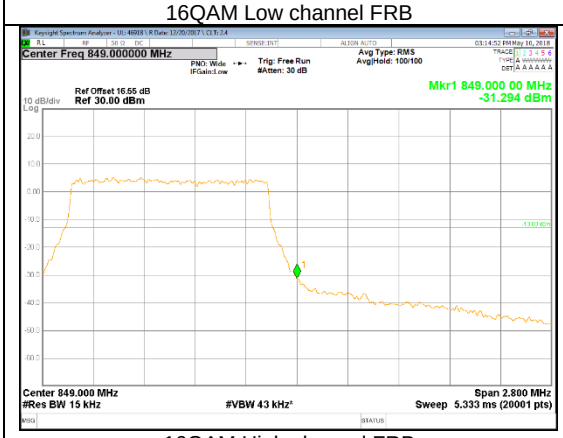
QPSK High channel 1RB



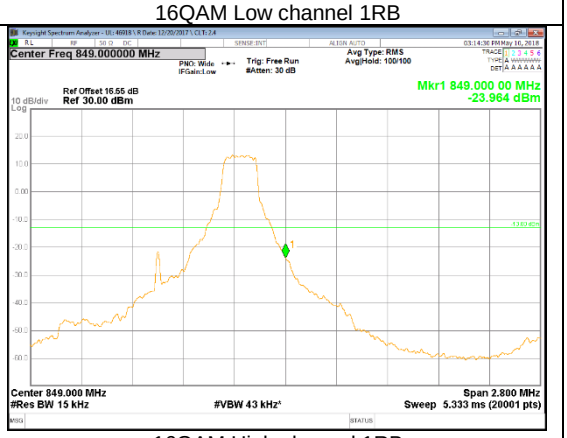
16QAM Low channel FRB



16QAM Low channel 1RB



16QAM High channel FRB



16QAM High channel 1RB

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

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

9.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238

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.

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);

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

RESULTS

GSM

Band	Mode	f [MHz]	Spurious [dBm]	Limit [dBm]
GSM850	GPRS	824.2	-24.85	-13.00
		836.6	-24.78	
		848.8	-24.72	
	EGPRS	824.2	-24.16	
		836.6	-24.62	
		848.8	-25.08	
GSM1900	GPRS	1850.2	-24.13	
		1880.0	-24.43	
		1909.8	-24.65	
	EGPRS	1850.2	-24.07	
		1880.0	-24.71	
		1909.8	-23.28	

WCDMA

Band	Mode	f [MHz]	Spurious [dBm]	Limit [dBm]
Band 5	REL99	826.4	-42.629	-13.00
		836.6	-42.531	
		846.6	-42.694	
	HSDPA	826.4	-42.629	
		836.6	-42.621	
		846.6	-42.648	
Band 2	REL99	1852.4	-42.131	
		1880.0	-42.055	
		1907.6	-42.295	
	HSDPA	1852.4	-42.235	
		1880.0	-42.205	
		1907.6	-42.287	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

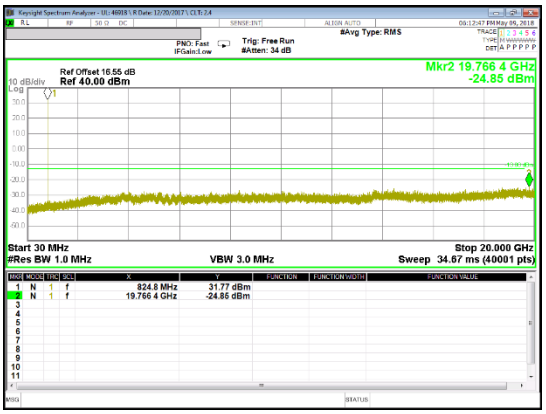
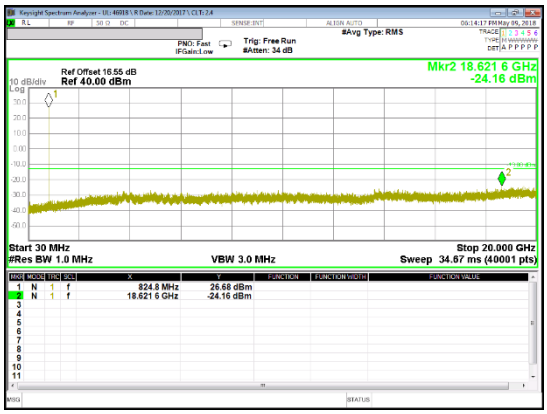
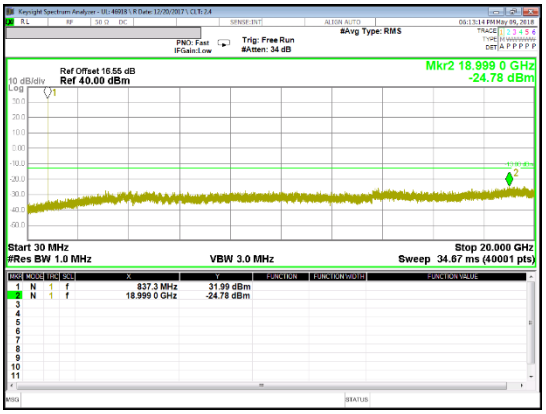
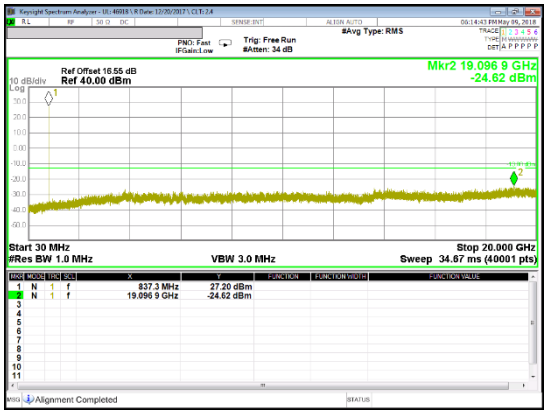
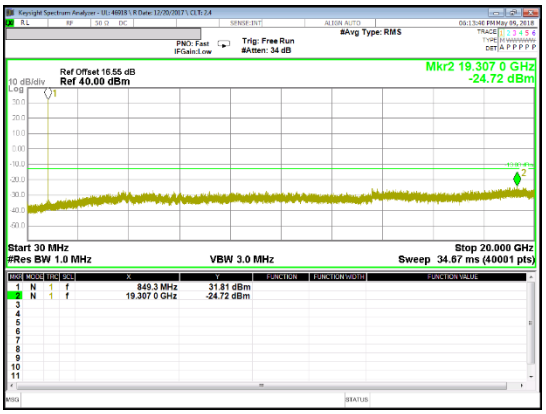
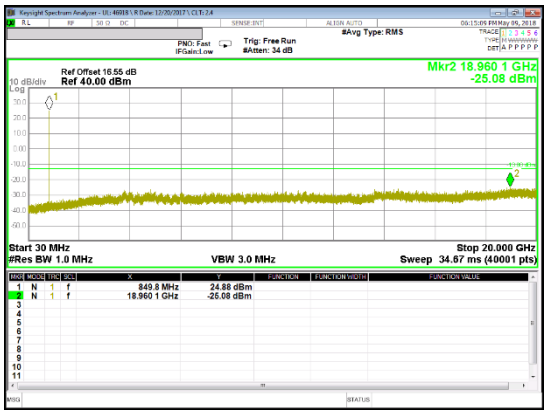
LTE 5

Bandwidth	Mode	f [MHz]	Spurious [dBm]	Limit [dBm]
10 MHz	QPSK	829.0	-44.858	-13.00
		836.5	-44.879	
		844.0	-44.773	
	16QAM	829.0	-44.678	
		836.5	-44.678	
		844.0	-44.757	
5 MHz	QPSK	826.5	-44.790	
		836.5	-44.944	
		846.5	-44.988	
	16QAM	826.5	-44.911	
		836.5	-44.911	
		846.5	-44.718	
3 MHz	QPSK	825.5	-44.800	
		836.5	-44.690	
		847.5	-44.747	
	16QAM	825.5	-44.529	
		836.5	-44.746	
		847.5	-44.965	
1.4 MHz	QPSK	824.7	-44.666	
		836.5	-44.779	
		848.3	-44.511	
	16QAM	824.7	-44.845	
		836.5	-44.771	
		848.3	-44.632	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

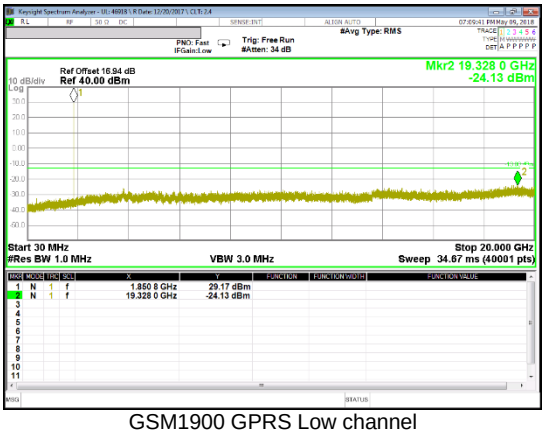
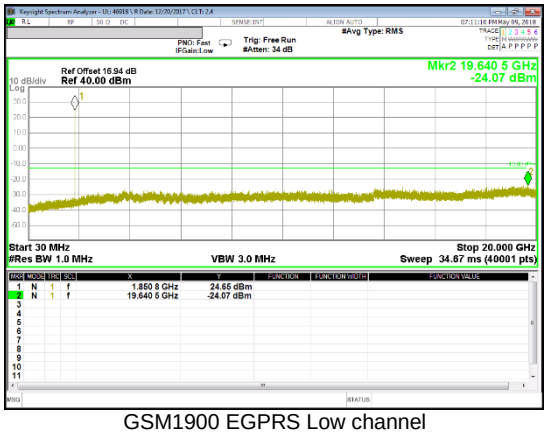
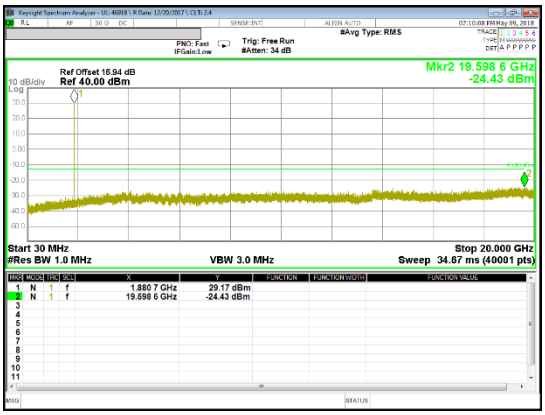
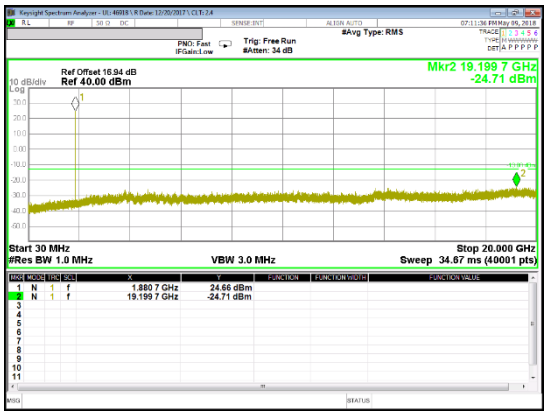
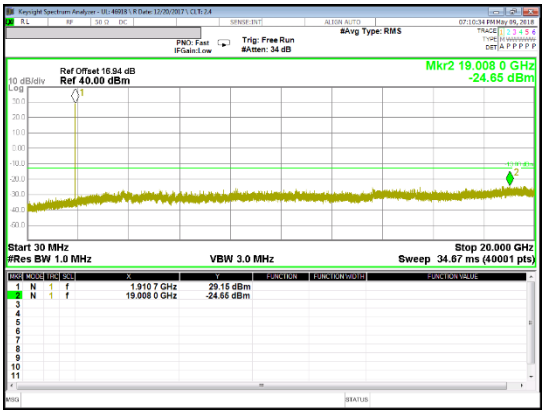
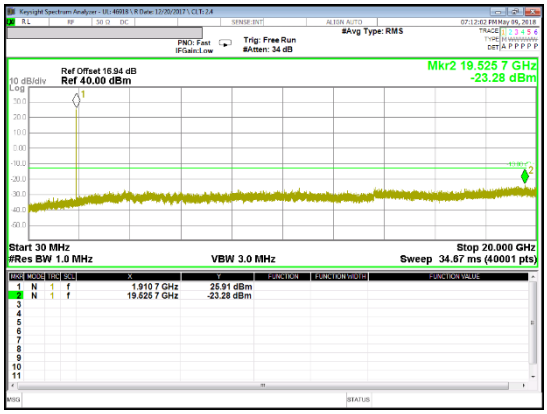
9.3.1. OUT OF BAND EMISSIONS PLOTS

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

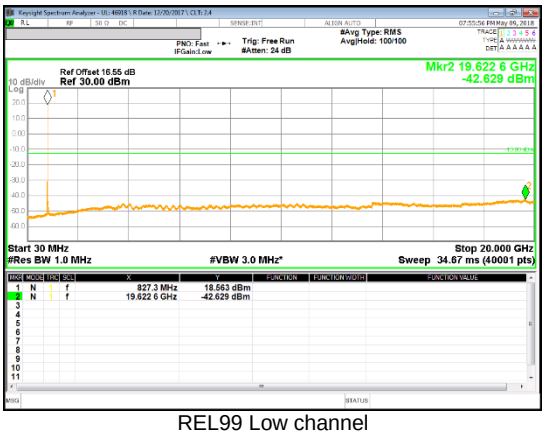
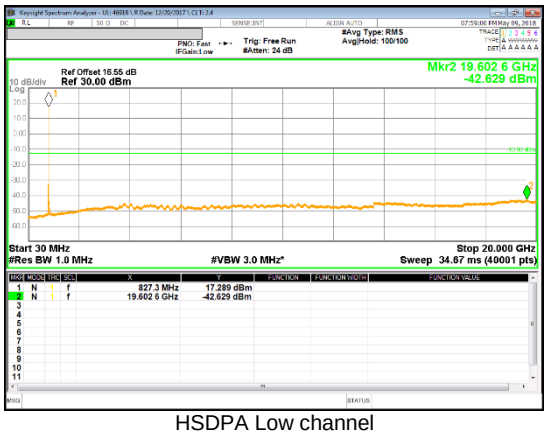
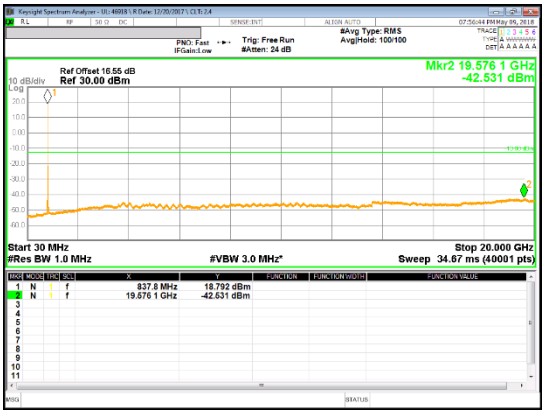
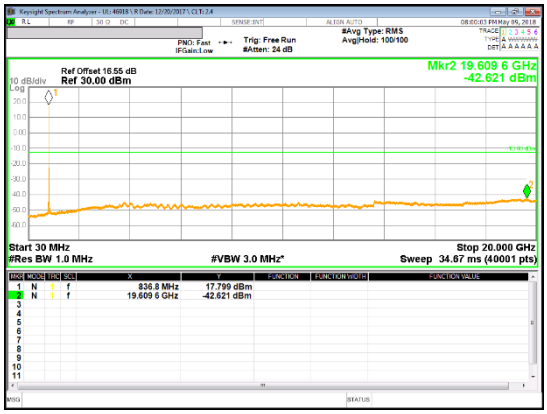
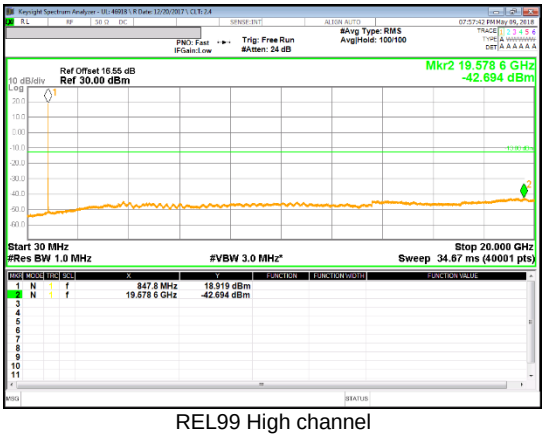
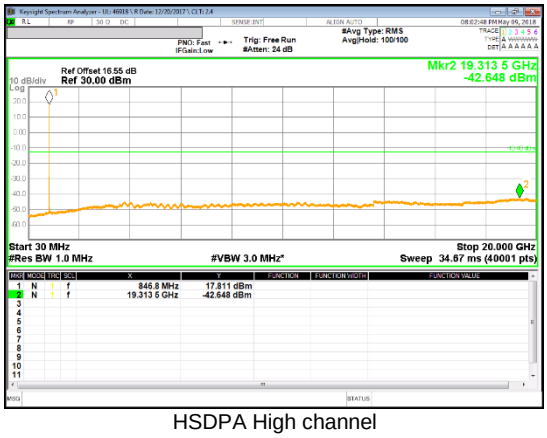
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

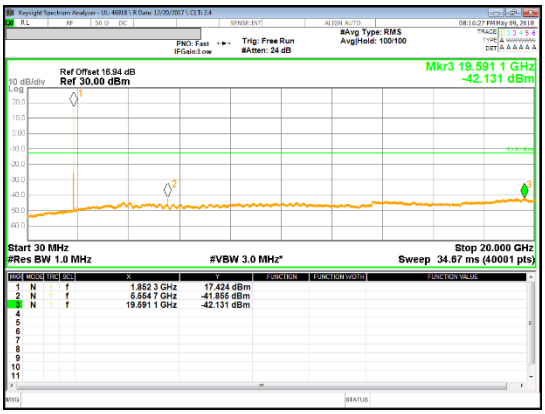
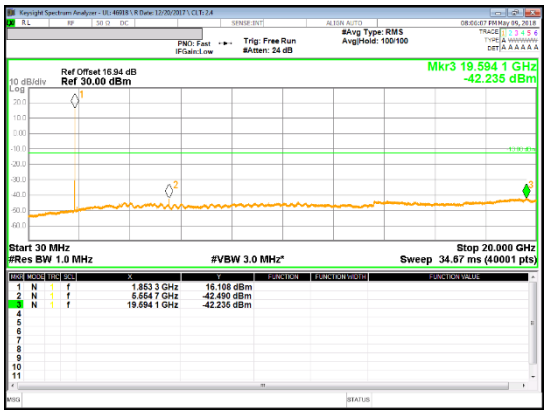
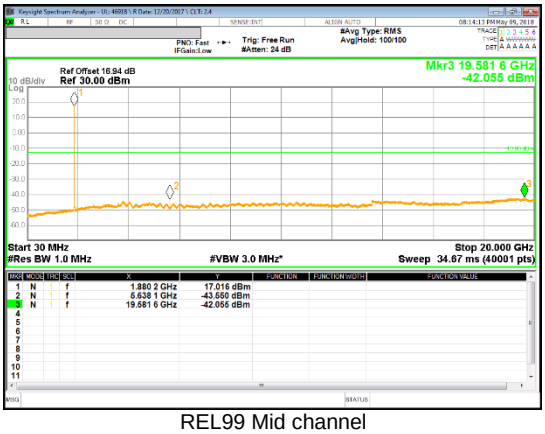
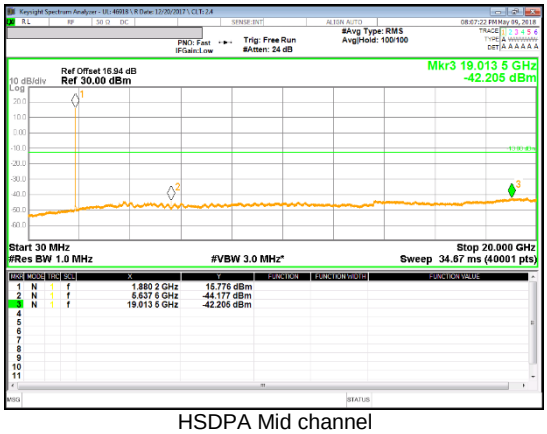
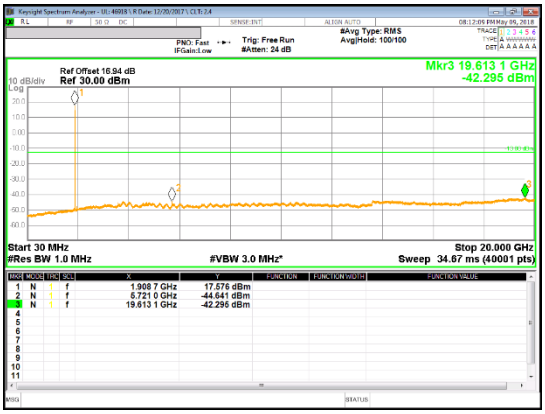
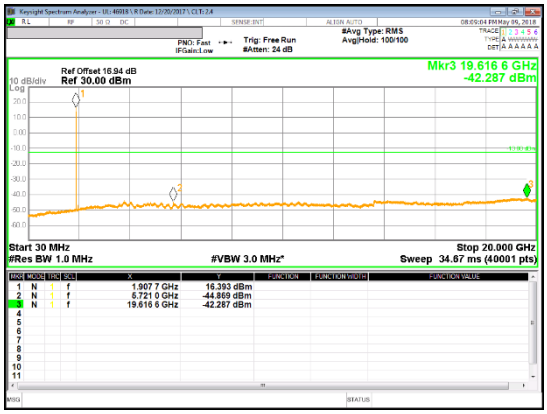
UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA Band 5

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

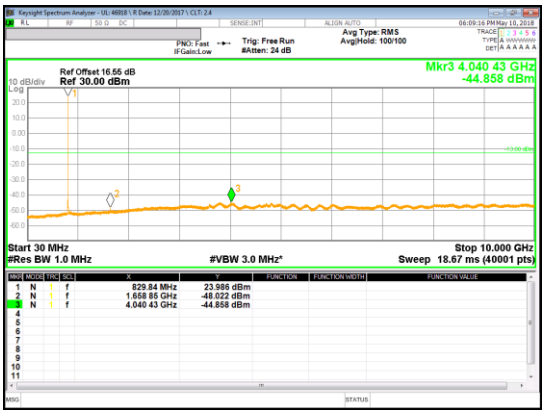
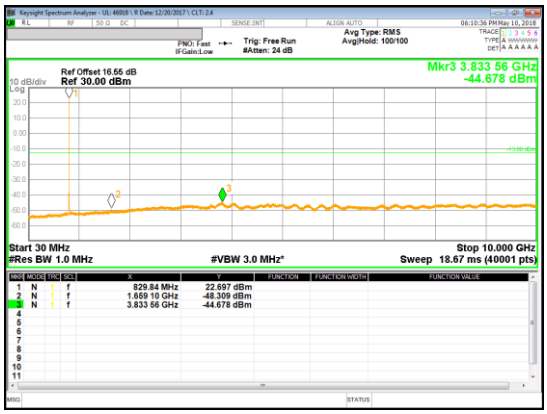
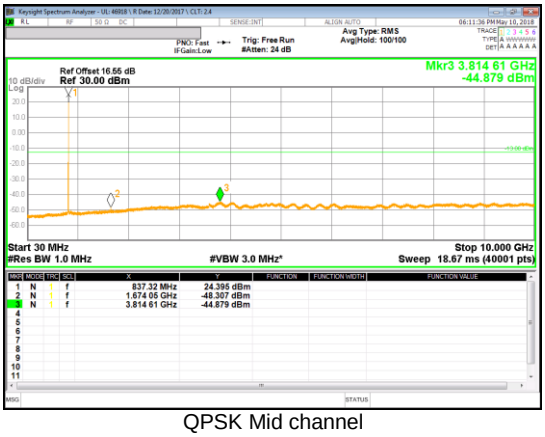
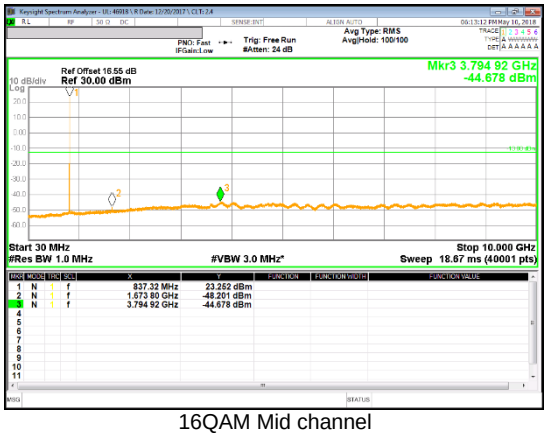
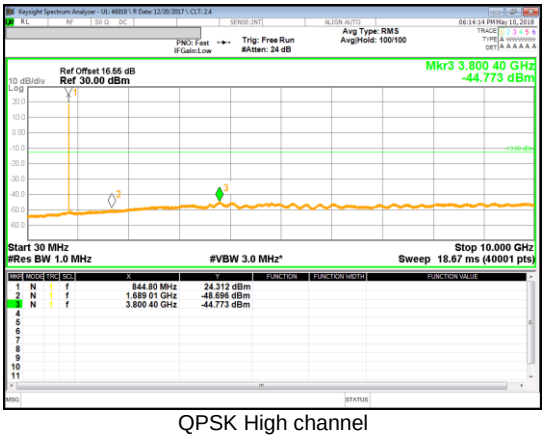
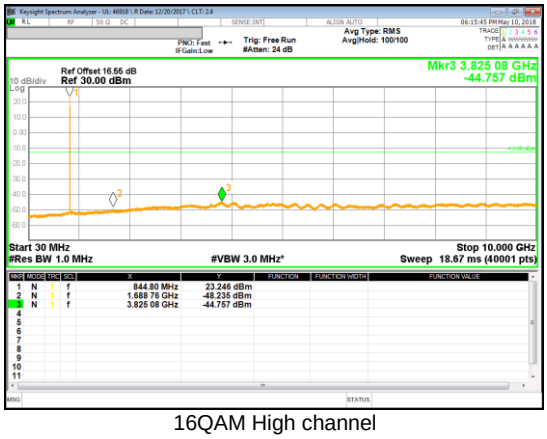
UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA Band 2

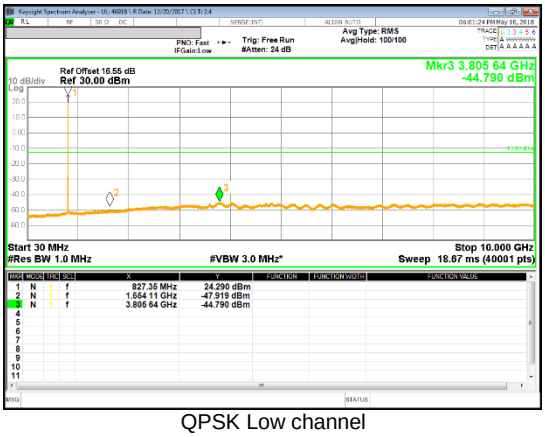
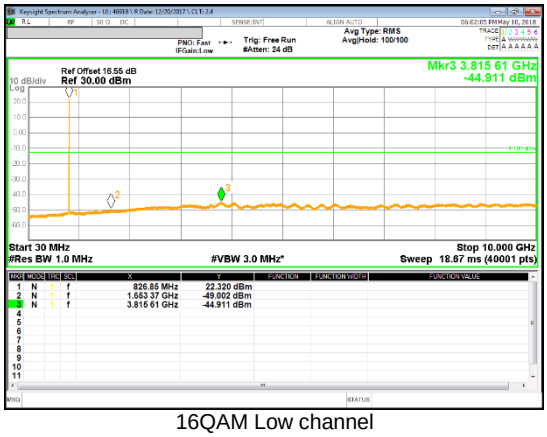
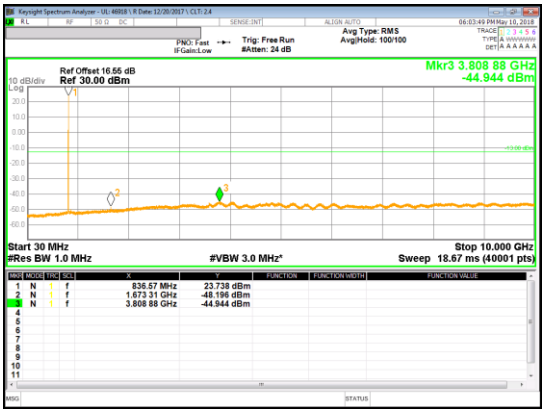
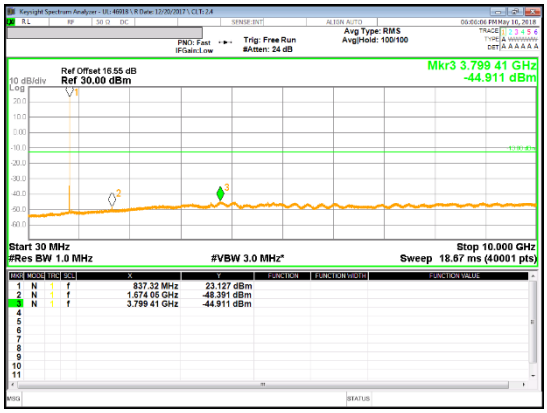
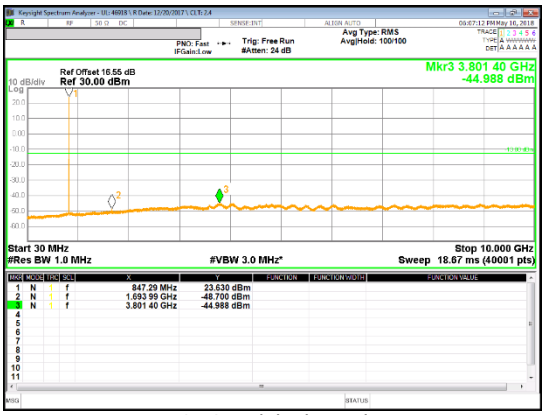
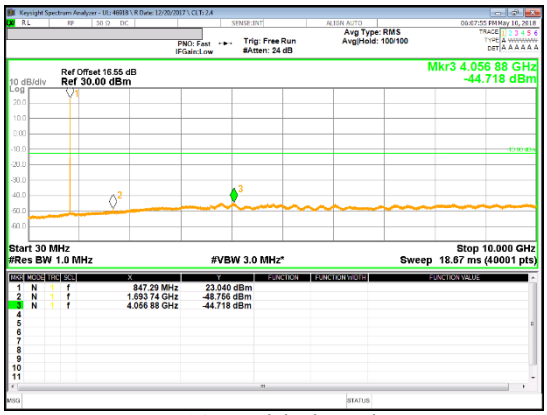
Band 2	 REL99 Low channel	 HSDPA Low channel
	 REL99 Mid channel	 HSDPA Mid channel
	 REL99 High channel	 HSDPA High channel

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

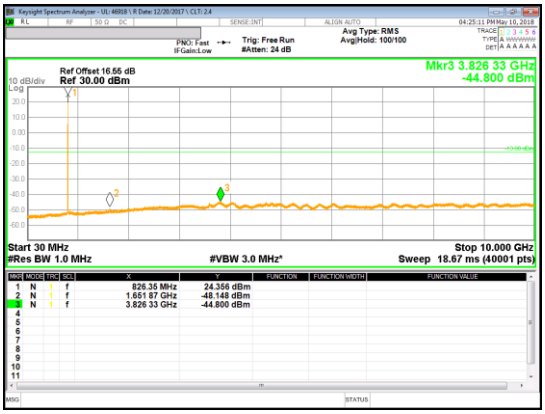
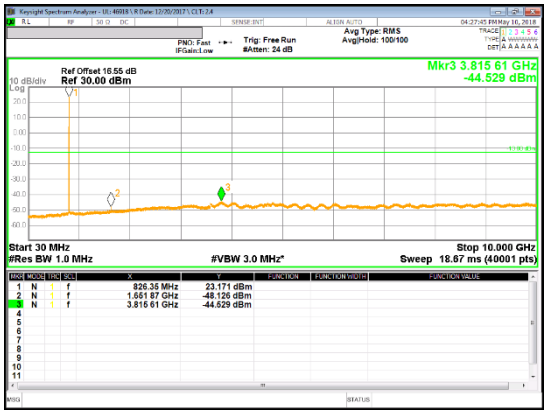
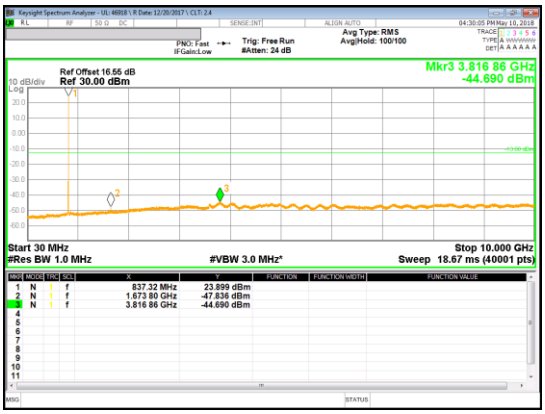
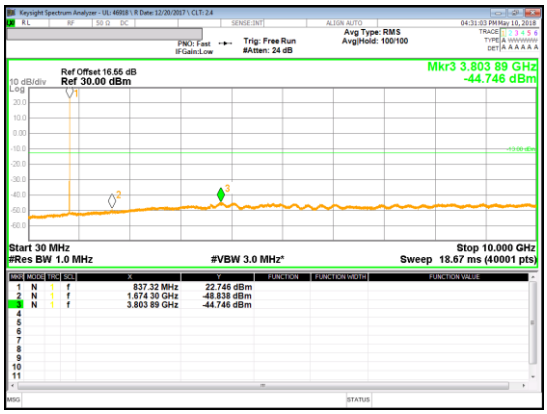
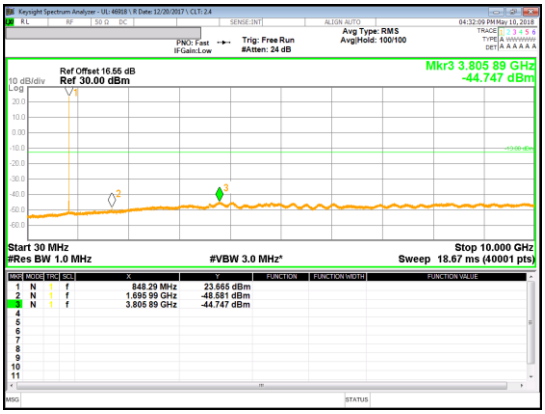
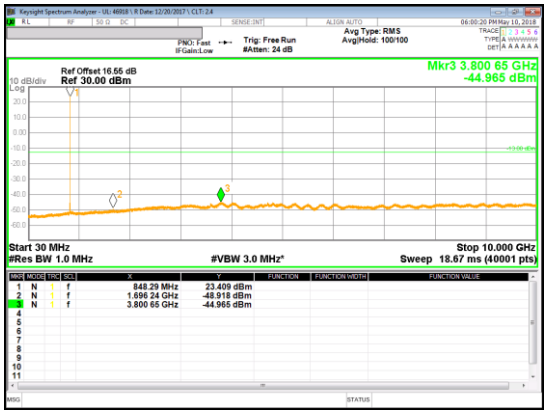
LTE Band 5

Band 5 10MHz	 QPSK Low channel	 16QAM Low channel
	 QPSK Mid channel	 16QAM Mid channel
	 QPSK High channel	 16QAM High channel

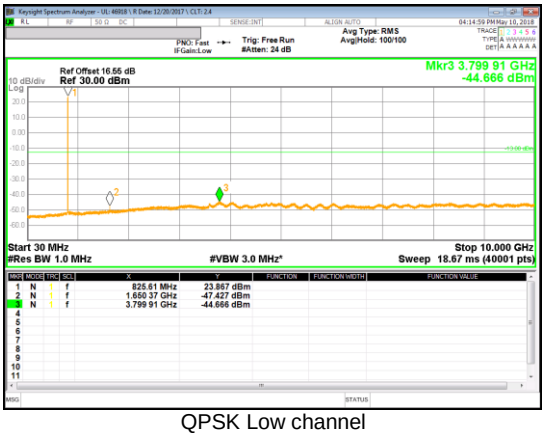
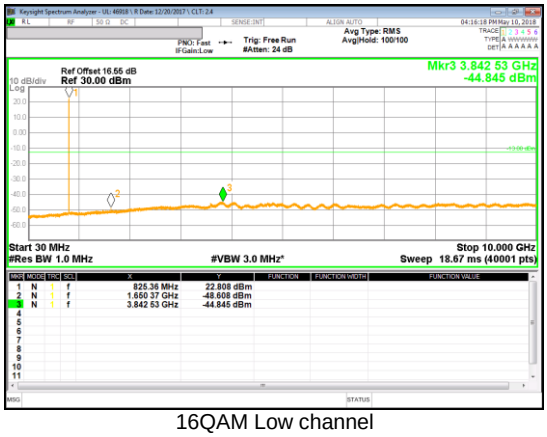
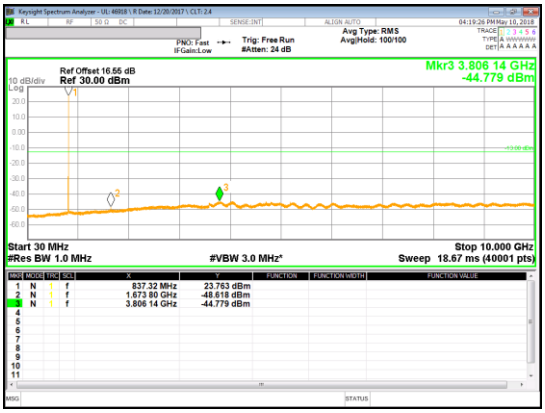
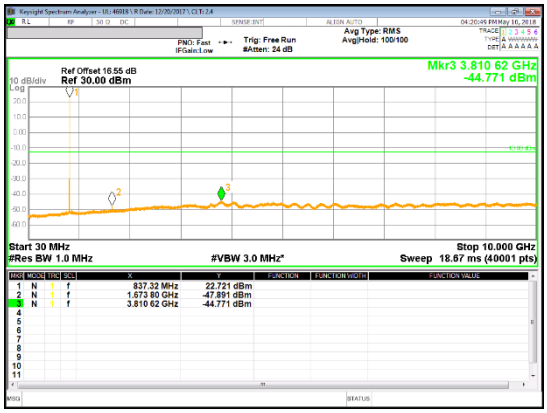
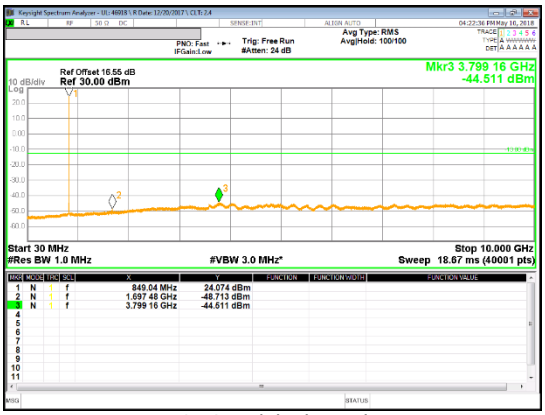
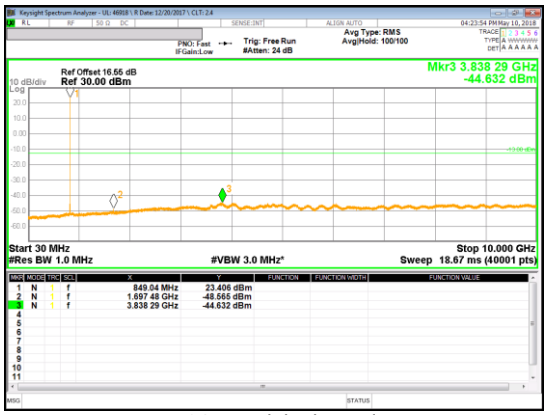
UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Band 5 5MHz	 QPSK Low channel	 16QAM Low channel
	 QPSK Mid channel	 16QAM Mid channel
	 QPSK High channel	 16QAM High channel

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Band 5 3MHz	 QPSK Low channel	 16QAM Low channel
	 QPSK Mid channel	 16QAM Mid channel
	 QPSK High channel	 16QAM High channel

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Band 5 1.4MHz	 QPSK Low channel	 16QAM Low channel
	 QPSK Mid channel	 16QAM Mid channel
	 QPSK High channel	 16QAM High channel

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235

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.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

RESULTS

See the following pages.

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

9.4.1. FREQUENCY STABILITY RESULTS

GSM 850 (GPRS)

Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2060.500	Hz	High Channel	2122.000	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	824.19998388	0.004	848.79998065	0.009	2.5
3.85	40	824.19999089	-0.005	848.79998595	0.003	2.5
3.85	30	824.19998478	0.003	848.79998414	0.005	2.5
3.85	***20***	***824.19998696***	***0.000***	***848.79998811***	***0.000***	***2.5***
3.85	10	824.19998542	0.002	848.79998201	0.007	2.5
3.85	0	824.19998038	0.008	848.79998595	0.003	2.5
3.85	-10	824.19998936	-0.003	848.79998634	0.002	2.5
3.85	-20	824.19998389	0.004	848.79998769	0.000	2.5
3.85	-30	824.19998072	0.008	848.79998474	0.004	2.5

Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2060.500	Hz	High Channel	2122.000	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	***824.19998696***	***0***	***848.79998811***	***0***	***2.5***
4.40	20	824.19998514	0.002	848.79998091	0.008	2.5
3.60	20	824.19998137	0.007	848.79998884	-0.001	2.5

GSM 1900 (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	1850.0808	1909.9223		
Extreme (50C)		1850.0808	1909.9223	-17.2	-0.009
Extreme (40C)		1850.0808	1909.9223	-17.8	-0.009
Extreme (30C)		1850.0808	1909.9223	-18.9	-0.010
Extreme (10C)		1850.0808	1909.9223	-15.5	-0.008
Extreme (0C)		1850.0808	1909.9223	-22.2	-0.012
Extreme (-10C)		1850.0808	1909.9223	-16.2	-0.009
Extreme (-20C)		1850.0808	1909.9223	-16.6	-0.009
Extreme (-30C)		1850.0808	1909.9223	-16.6	-0.009
20C	15%	1850.0808	1909.9223	-23.3	-0.012
	-15%	1850.0808	1909.9223	-15.0	-0.008
	End Point	1850.0808	1909.9223	-18.9	-0.010

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA Band 5 (Rel 99)

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				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	826.39998038	0.010	846.59998794	0.003	2.5
3.85	40	826.39998210	0.008	846.59998787	0.003	2.5
3.85	30	826.39999088	-0.002	846.59998470	0.007	2.5
3.85	***20***	***826.39998890***	***0.000***	***846.59999055***	***0.000***	***2.5***
3.85	10	826.39999068	-0.002	846.59998543	0.006	2.5
3.85	0	826.39998648	0.003	846.59998835	0.003	2.5
3.85	-10	826.39998686	0.002	846.59998591	0.005	2.5
3.85	-20	826.39998842	0.001	846.59998860	0.002	2.5
3.85	-30	826.39998651	0.003	846.59998170	0.010	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				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	***826.39998890***	***0***	***846.59999055***	***0***	***2.5***
4.40	20	826.39998079	0.010	846.59998365	0.008	2.5
3.60	20	826.39998365	0.006	846.59998526	0.006	2.5

WCDMA Band 2 (Rel 99)

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	1852.3979	1907.6021		
Extreme (50C)		1852.3979	1907.6020	-20.1	-0.011
Extreme (40C)		1852.3979	1907.6020	-24.4	-0.013
Extreme (30C)		1852.3979	1907.6020	-22.2	-0.012
Extreme (10C)		1852.3979	1907.6021	-18.0	-0.010
Extreme (0C)		1852.3979	1907.6020	-23.5	-0.013
Extreme (-10C)		1852.3979	1907.6021	-16.7	-0.009
Extreme (-20C)		1852.3979	1907.6020	-24.4	-0.013
Extreme (-30C)		1852.3979	1907.6020	-22.8	-0.012
20C	15%	1852.3979	1907.6020	-20.5	-0.011
	-15%	1852.3979	1907.6020	-23.0	-0.012
	End Point	1852.3979	1907.6021	-18.7	-0.010

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5 (QPSK)

Reference Frequency : LTE Band 5 Low Channel 824.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2061.750	Hz	High Channel	2120.750	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	824.69998571	0.003	848.29998736	-0.001	2.5
3.85	40	824.69998088	0.009	848.29998034	0.007	2.5
3.85	30	824.69998600	0.003	848.29998235	0.005	2.5
3.85	***20***	***824.69998849***	***0.000***	***848.29998628***	***0.000***	***2.5***
3.85	10	824.69998864	0.000	848.29998217	0.005	2.5
3.85	0	824.69998337	0.006	848.29998098	0.006	2.5
3.85	-10	824.69998835	0.000	848.29998404	0.003	2.5
3.85	-20	824.69998517	0.004	848.29998349	0.003	2.5
3.85	-30	824.69998471	0.005	848.29998319	0.004	2.5

Reference Frequency : LTE Band 5 Low Channel 824.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2061.750	Hz	High Channel	2120.750	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	**824.69998849**	***0***	**848.29998628**	***0***	***2.5***
4.40	20	824.69998905	-0.001	848.29998025	0.007	2.5
3.60	20	824.69998212	0.008	848.29999099	-0.006	2.5

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10. RADIATED TEST RESULTS

10.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232

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(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.

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 power measurement with a ESU40:

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

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10.1.1. ERP/EIRP Results

GSM

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
GSM850	GPRS	512	824.2	26.15	412.10
		661	836.6	26.52	448.75
		810	848.8	27.48	559.76
	EGPRS	512	824.2	19.59	90.99
		661	836.6	19.71	93.54
		810	848.8	20.80	120.23
GSM1900	GPRS	512	1850.2	24.46	279.25
		661	1880.0	26.16	413.05
		810	1909.8	25.58	361.41
	EGPRS	512	1850.2	20.05	101.16
		661	1880.0	19.16	82.41
		810	1909.8	21.19	131.52

WCDMA

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
Band 5	REL99	4132	826.4	17.72	59.16
		4183	836.6	17.53	56.62
		4233	846.6	17.90	61.66
	HSDPA	4132	826.4	16.52	44.87
		4183	836.6	16.25	42.17
		4233	846.6	16.54	45.08
Band 2	REL99	9262	1852.4	19.36	86.30
		9400	1880.0	18.16	65.46
		9538	1907.6	17.85	60.95
	HSDPA	9262	1852.4	18.47	70.31
		9400	1880.0	17.35	54.33
		9538	1907.6	16.84	48.31

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5

Band	BW [MHz]	Mode	RB/RB Offset	f [MHz]	ERP / EIRP	
			1 RB		[dBm]	[mW]
Band 5	10	QPSK	1 / 49	829.0	18.02	63.39
			1 / 49	836.5	18.69	73.96
			1 / 49	844.0	19.12	81.66
		16QAM	1 / 0	829.0	17.30	53.70
			1 / 49	836.5	18.01	63.24
			1 / 49	844.0	17.99	62.95
	5	QPSK	1 / 0	826.5	18.19	65.92
			1 / 24	836.5	18.35	68.39
			1 / 24	846.5	18.07	64.12
		16QAM	1 / 24	826.5	17.91	61.80
			1 / 24	836.5	17.52	56.49
			1 / 24	846.5	17.50	56.23
	3	QPSK	1 / 0	825.5	18.33	68.08
			1 / 14	836.5	18.24	66.68
			1 / 8	847.5	18.40	69.18
		16QAM	1 / 8	825.5	17.71	59.02
			1 / 14	836.5	17.49	56.10
			1 / 8	847.5	17.53	56.62
	1.4	QPSK	1 / 0	824.7	18.43	69.66
			1 / 0	836.5	18.17	65.61
			1 / 0	848.3	18.19	65.92
		16QAM	1 / 0	824.7	17.56	57.02
			1 / 0	836.5	17.29	53.58
			1 / 0	848.3	17.38	54.70

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10.1.2. ERP/EIRP DATA

GSM 850

GSM

GSM850
GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: GPRS 850 MHz Fundamentals

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-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	28.58	V	1.0	-1.5	26.15	38.5	-12.3	
824.20	16.52	H	1.0	-1.5	14.09	38.5	-24.4	
Mid Ch								
836.60	28.90	V	1.0	-1.4	26.52	38.5	-12.0	
836.60	16.99	H	1.0	-1.4	14.61	38.5	-23.9	
High Ch								
848.80	29.83	V	1.0	-1.4	27.48	38.5	-11.0	
848.80	18.64	H	1.0	-1.4	16.29	38.5	-22.2	

GSM

GSM850
EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: EGPRS 850 MHz Fundamentals

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-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	22.02	V	1.0	-1.5	19.59	38.5	-18.9	
824.20	8.87	H	1.0	-1.5	6.44	38.5	-32.1	
Mid Ch								
836.60	22.09	V	1.0	-1.4	19.71	38.5	-18.8	
836.60	9.90	H	1.0	-1.4	7.52	38.5	-31.0	
High Ch								
848.80	23.15	V	1.0	-1.4	20.80	38.5	-17.7	
848.80	11.80	H	1.0	-1.4	9.45	38.5	-29.0	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

GSM 1900

GSM

GSM1900
GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsugn
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 51072
Configuration: EUT / X-Position
Location: Chamber 1
Mode: GPRS 1900 MHz Fundamentals

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00161451], 3m N-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	18.56	V	4.5	9.5	23.57	33.0	-9.4	
1850.20	19.45	H	4.5	9.5	24.46	33.0	-8.5	
Mid Ch								
1880.00	18.17	V	4.5	9.2	22.85	33.0	-10.2	
1880.00	21.48	H	4.5	9.2	26.16	33.0	-6.8	
High Ch								
1909.80	19.07	V	4.6	8.9	23.37	33.0	-9.6	
1909.80	21.28	H	4.6	8.9	25.58	33.0	-7.4	

GSM

GSM1900
EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsugn
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 51072
Configuration: EUT / X-Position
Location: Chamber 1
Mode: EGPRS 1900 MHz Fundamentals

Test Equpment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00161451], 3m N-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	14.12	V	4.5	9.5	19.13	33.0	-13.9	
1850.20	15.04	H	4.5	9.5	20.05	33.0	-12.9	
Mid Ch								
1880.00	13.66	V	4.5	9.2	18.34	33.0	-14.7	
1880.00	14.48	H	4.5	9.2	19.16	33.0	-13.8	
High Ch								
1909.80	14.70	V	4.6	8.9	19.00	33.0	-14.0	
1909.80	16.89	H	4.6	8.9	21.19	33.0	-11.8	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA

Band 5

WCDMA

Band 5
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: Rel99 Band 5 Fundamentals

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-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	20.14	V	1.0	-1.5	17.72	38.5	-20.8	
826.40	7.96	H	1.0	-1.5	5.54	38.5	-33.0	
Mid Ch								
836.60	19.91	V	1.0	-1.4	17.53	38.5	-21.0	
836.60	8.31	H	1.0	-1.4	5.93	38.5	-32.6	
High Ch								
846.60	20.25	V	1.0	-1.4	17.90	38.5	-20.6	
846.60	8.76	H	1.0	-1.4	6.41	38.5	-32.1	

WCDMA

Band 5
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: HSDPA Band 5 Fundamentals

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-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	18.94	V	1.0	-1.5	16.52	38.5	-22.0	
826.40	6.75	H	1.0	-1.5	4.33	38.5	-34.2	
Mid Ch								
836.60	18.63	V	1.0	-1.4	16.25	38.5	-22.2	
836.60	7.02	H	1.0	-1.4	4.64	38.5	-33.9	
High Ch								
846.60	18.89	V	1.0	-1.4	16.54	38.5	-22.0	
846.60	7.46	H	1.0	-1.4	5.11	38.5	-33.4	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Band 2

WCDMA

Band 2
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 51072
Configuration: EUT / X-Position
Location: Chamber 1
Mode: Rel99 Band 2 Fundamentals

Test Equipment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00161451], 3m N-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.40	11.72	V	4.5	9.5	16.71	33.0	-16.3	
1852.40	14.37	H	4.5	9.5	19.36	33.0	-13.6	
Mid Ch								
1880.00	10.67	V	4.5	9.2	15.35	33.0	-17.7	
1880.00	13.48	H	4.5	9.2	18.16	33.0	-14.8	
High Ch								
1907.60	11.21	V	4.6	8.9	15.55	33.0	-17.5	
1907.60	13.51	H	4.6	8.9	17.85	33.0	-15.1	

WCDMA

Band 2
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 51072
Configuration: EUT / X-Position
Location: Chamber 1
Mode: HSDPA Band 2 Fundamentals

Test Equipment:
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables
Substitution: Horn 3115[00161451], 3m N-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	10.75	V	4.5	9.5	15.74	33.0	-17.3	
1852.40	13.48	H	4.5	9.5	18.47	33.0	-14.5	
Mid Ch								
1880.00	9.84	V	4.5	9.2	14.52	33.0	-18.5	
1880.00	12.67	H	4.5	9.2	17.35	33.0	-15.7	
High Ch								
1907.60	10.13	V	4.6	8.9	14.47	33.0	-18.5	
1907.60	12.50	H	4.6	8.9	16.84	33.0	-16.2	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5

LTE
Band 5
10MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-03
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-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	20.43	V	1.0	-1.5	18.02	38.5	-20.5	
829.00	9.76	H	1.0	-1.5	7.35	38.5	-31.2	
Mid Ch								
836.50	21.07	V	1.0	-1.4	18.69	38.5	-19.8	
836.50	9.02	H	1.0	-1.4	6.64	38.5	-31.9	
High Ch								
844.00	21.47	V	1.0	-1.4	19.12	38.5	-19.4	
844.00	9.96	H	1.0	-1.4	7.60	38.5	-30.9	

LTE
Band 5
10MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-03
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-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	19.71	V	1.0	-1.5	17.30	38.5	-21.2	
829.00	8.69	H	1.0	-1.5	6.28	38.5	-32.2	
Mid Ch								
836.50	20.39	V	1.0	-1.4	18.01	38.5	-20.5	
836.50	8.12	H	1.0	-1.4	5.74	38.5	-32.8	
High Ch								
844.00	20.34	V	1.0	-1.4	17.99	38.5	-20.5	
844.00	8.72	H	1.0	-1.4	6.36	38.5	-32.1	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE

Band 5

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	20.61	V	1.0	-1.5	18.19	38.5	-20.3	
826.50	8.81	H	1.0	-1.5	6.39	38.5	-32.1	
Mid Ch								
836.50	20.73	V	1.0	-1.4	18.35	38.5	-20.2	
836.50	8.83	H	1.0	-1.4	6.45	38.5	-32.1	
High Ch								
846.50	20.42	V	1.0	-1.4	18.07	38.5	-20.4	
846.50	8.85	H	1.0	-1.4	6.50	38.5	-32.0	

LTE

Band 5

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-type Cable

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	20.33	V	1.0	-1.5	17.91	38.5	-20.6	
826.50	8.67	H	1.0	-1.5	6.25	38.5	-32.2	
Mid Ch								
836.50	19.90	V	1.0	-1.4	17.52	38.5	-21.0	
836.50	8.00	H	1.0	-1.4	5.62	38.5	-32.9	
High Ch								
846.50	19.85	V	1.0	-1.4	17.50	38.5	-21.0	
846.50	8.56	H	1.0	-1.4	6.21	38.5	-32.3	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE

Band 5

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-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	20.75	V	1.0	-1.5	18.33	38.5	-20.2	
825.50	8.93	H	1.0	-1.5	6.51	38.5	-32.0	
Mid Ch								
836.50	20.62	V	1.0	-1.4	18.24	38.5	-20.3	
836.50	8.77	H	1.0	-1.4	6.39	38.5	-32.1	
High Ch								
847.50	20.74	V	1.0	-1.4	18.40	38.5	-20.1	
847.50	9.17	H	1.0	-1.4	6.82	38.5	-31.7	

LTE

Band 5

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-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	20.13	V	1.0	-1.5	17.71	38.5	-20.8	
825.50	8.36	H	1.0	-1.5	5.94	38.5	-32.6	
Mid Ch								
836.50	19.87	V	1.0	-1.4	17.49	38.5	-21.0	
836.50	8.11	H	1.0	-1.4	5.73	38.5	-32.8	
High Ch								
847.50	19.87	V	1.0	-1.4	17.53	38.5	-21.0	
847.50	8.39	H	1.0	-1.4	6.04	38.5	-32.5	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE

Band 5

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-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	20.86	V	1.0	-1.5	18.43	38.5	-20.1	
824.70	8.95	H	1.0	-1.5	6.52	38.5	-32.0	
Mid Ch								
836.50	20.55	V	1.0	-1.4	18.17	38.5	-20.3	
836.50	9.01	H	1.0	-1.4	6.63	38.5	-31.9	
High Ch								
848.30	20.54	V	1.0	-1.4	18.19	38.5	-20.3	
848.30	8.46	H	1.0	-1.4	6.11	38.5	-32.4	

LTE

Band 5

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788458975
Date: 2018-05-01
Test Engineer: 47989
Configuration: EUT / Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: VULB9163-749, and Chamber 2 SMA Cables
Substitution: Dipole 3121_DB4, 3m N-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	19.99	V	1.0	-1.5	17.56	38.5	-20.9	
824.70	8.23	H	1.0	-1.5	5.80	38.5	-32.7	
Mid Ch								
836.50	19.67	V	1.0	-1.4	17.29	38.5	-21.2	
836.50	8.18	H	1.0	-1.4	5.80	38.5	-32.7	
High Ch								
848.30	19.73	V	1.0	-1.4	17.38	38.5	-21.1	
848.30	7.68	H	1.0	-1.4	5.33	38.5	-33.2	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238

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: (m)(4) For mobile station, the attenuation factor shall be not less than 43 + 10 log (P) dB at the channel edge and (55 + 10 log (P)dB) at the 5.5 MHz from the channel edges.

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 = max hold(GSM, LTE B41), average(WCDMA, LTE);

NOTE : Radiated spurious emissions were investigated below 30MHz, 30MHz – 1GHz and above 1GHz. There were no emissions found on below 30MHz and 30MHz – 1GHz.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field based on KDB 414788.

RESULTS

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10.2.1. SPURIOUS RADIATION PLOTS

GSM 850

GSM

GSM850
GPRS

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-02
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-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	-14.1	V	3.0	38.2	1.0	-51.4	-13.0	-38.4	
2472.60	-13.1	V	3.0	38.8	1.0	-50.9	-13.0	-37.9	
3296.80	-25.2	V	3.0	39.4	1.0	-63.6	-13.0	-50.6	
4121.00	-11.0	V	3.0	39.8	1.0	-49.8	-13.0	-36.8	
1648.40	-20.0	H	3.0	38.2	1.0	-57.3	-13.0	-44.3	
2472.60	-10.2	H	3.0	38.8	1.0	-48.0	-13.0	-35.0	
3296.80	-25.8	H	3.0	39.4	1.0	-64.2	-13.0	-51.2	
4121.00	-13.0	H	3.0	39.8	1.0	-51.8	-13.0	-38.8	
Mid Ch, 836.6MHz									
1673.20	-13.4	V	3.0	38.2	1.0	-50.7	-13.0	-37.7	
2509.80	-9.1	V	3.0	38.8	1.0	-46.9	-13.0	-33.9	
3346.40	-25.7	V	3.0	39.5	1.0	-64.2	-13.0	-51.2	
4183.00	-9.9	V	3.0	39.8	1.0	-48.7	-13.0	-35.7	
1673.20	-19.0	H	3.0	38.2	1.0	-56.2	-13.0	-43.2	
2509.80	-4.6	H	3.0	38.8	1.0	-42.5	-13.0	-29.5	
3346.40	-26.1	H	3.0	39.5	1.0	-64.6	-13.0	-51.6	
4183.00	-4.5	H	3.0	39.8	1.0	-43.3	-13.0	-30.3	
High Ch, 848.8MHz									
1697.60	-14.3	V	3.0	38.2	1.0	-51.5	-13.0	-38.5	
2546.40	-8.8	V	3.0	38.9	1.0	-46.7	-13.0	-33.7	
3395.20	-25.5	V	3.0	39.5	1.0	-64.0	-13.0	-51.0	
4244.00	-6.8	V	3.0	39.8	1.0	-45.6	-13.0	-32.6	
1697.60	-20.8	H	3.0	38.2	1.0	-58.1	-13.0	-45.1	
2546.40	-2.8	H	3.0	38.9	1.0	-40.7	-13.0	-27.7	
3395.20	-25.0	H	3.0	39.5	1.0	-63.4	-13.0	-50.4	
4244.00	-3.6	H	3.0	39.8	1.0	-42.4	-13.0	-29.4	

GSM

GSM850
EGPRS

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-02
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-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	-20.2	V	3.0	38.2	1.0	-57.4	-13.0	-44.4	
2472.60	-20.7	V	3.0	38.8	1.0	-58.5	-13.0	-45.5	
3296.80	-26.5	V	3.0	39.4	1.0	-65.0	-13.0	-52.0	
4121.00	-21.3	V	3.0	39.8	1.0	-60.2	-13.0	-47.2	
1648.40	-23.7	H	3.0	38.2	1.0	-60.9	-13.0	-47.9	
2472.60	-18.2	H	3.0	38.8	1.0	-56.0	-13.0	-43.0	
3296.80	-26.5	H	3.0	39.4	1.0	-65.0	-13.0	-52.0	
4121.00	-16.5	H	3.0	39.8	1.0	-55.3	-13.0	-42.3	
Mid Ch, 836.6MHz									
1673.20	-20.0	V	3.0	38.2	1.0	-57.3	-13.0	-44.3	
2509.80	-21.9	V	3.0	38.8	1.0	-59.8	-13.0	-46.8	
3346.40	-25.2	V	3.0	39.5	1.0	-63.7	-13.0	-50.7	
4183.00	-22.1	V	3.0	39.8	1.0	-60.9	-13.0	-47.9	
1673.20	-23.7	H	3.0	38.2	1.0	-60.9	-13.0	-47.9	
2509.80	-18.5	H	3.0	38.8	1.0	-56.4	-13.0	-43.4	
3346.40	-26.3	H	3.0	39.5	1.0	-64.7	-13.0	-51.7	
4183.00	-17.2	H	3.0	39.8	1.0	-56.0	-13.0	-43.0	
High Ch, 848.8MHz									
1697.60	-16.5	V	3.0	38.2	1.0	-53.7	-13.0	-40.7	
2546.40	-18.5	V	3.0	38.9	1.0	-56.4	-13.0	-43.4	
3395.20	-25.9	V	3.0	39.5	1.0	-64.4	-13.0	-51.4	
4244.00	-17.2	V	3.0	39.8	1.0	-56.0	-13.0	-43.0	
1697.60	-24.2	H	3.0	38.2	1.0	-61.4	-13.0	-48.4	
2546.40	-14.0	H	3.0	38.9	1.0	-51.8	-13.0	-38.8	
3395.20	-25.7	H	3.0	39.5	1.0	-64.1	-13.0	-51.1	
4244.00	-13.5	H	3.0	39.8	1.0	-52.3	-13.0	-39.3	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

GSM 1900

GSM

GSM1900
GPRS

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-03
Test Engineer: 51072
Configuration: EUT / Adapter / Earphone . X-Position
Location: Chamber 1
Mode: GPRS 1900 MHz Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-9.3	V	3.0	43.8	1.0	-52.1	-13.0	-39.1	
5550.60	-0.3	V	3.0	43.7	1.0	-43.0	-13.0	-30.0	
7400.80	-8.9	V	3.0	42.5	1.0	-50.4	-13.0	-37.4	
9251.00	-18.4	V	3.0	41.3	1.0	-58.7	-13.0	-45.7	
11101.20	-13.2	V	3.0	40.9	1.0	-53.1	-13.0	-40.1	
12951.40	-12.5	V	3.0	42.0	1.0	-53.5	-13.0	-40.5	
14801.60	-10.0	V	3.0	43.5	1.0	-52.6	-13.0	-39.6	
3700.40	-7.7	H	3.0	43.8	1.0	-50.5	-13.0	-37.5	
5550.60	-3.3	H	3.0	43.7	1.0	-46.0	-13.0	-33.0	
7400.80	-12.4	H	3.0	42.5	1.0	-53.9	-13.0	-40.9	
9251.00	-17.9	H	3.0	41.3	1.0	-58.2	-13.0	-45.2	
11101.20	-16.2	H	3.0	40.9	1.0	-56.1	-13.0	-43.1	
12951.40	-12.4	H	3.0	42.0	1.0	-53.4	-13.0	-40.4	
14801.60	-9.0	H	3.0	43.5	1.0	-51.5	-13.0	-38.5	
Mid Ch, 1880MHz									
3760.00	-7.8	V	3.0	43.8	1.0	-50.6	-13.0	-37.6	
5640.00	-1.8	V	3.0	43.7	1.0	-44.5	-13.0	-31.5	
7520.00	-8.5	V	3.0	42.5	1.0	-49.9	-13.0	-36.9	
9400.00	-17.3	V	3.0	41.1	1.0	-57.4	-13.0	-44.4	
11280.00	-10.9	V	3.0	41.0	1.0	-50.8	-13.0	-37.8	
15040.00	-8.5	V	3.0	43.7	1.0	-51.2	-13.0	-38.2	
3760.00	-6.1	H	3.0	43.8	1.0	-48.9	-13.0	-35.9	
5640.00	-4.9	H	3.0	43.7	1.0	-47.6	-13.0	-34.6	
7520.00	-12.6	H	3.0	42.5	1.0	-54.0	-13.0	-41.0	
9400.00	-16.5	H	3.0	41.1	1.0	-56.7	-13.0	-43.7	
11280.00	-12.7	H	3.0	41.0	1.0	-52.7	-13.0	-39.7	
15040.00	-8.5	H	3.0	43.7	1.0	-51.1	-13.0	-38.1	
High Ch, 1909.8MHz									
3819.60	-7.9	V	3.0	43.8	1.0	-50.7	-13.0	-37.7	
5729.40	-2.7	V	3.0	43.7	1.0	-45.4	-13.0	-32.4	
7639.20	-8.5	V	3.0	42.4	1.0	-49.9	-13.0	-36.9	
9549.00	-17.1	V	3.0	41.0	1.0	-57.0	-13.0	-44.0	
11458.80	-6.2	V	3.0	41.0	1.0	-46.2	-13.0	-33.2	
13368.60	-12.0	V	3.0	42.3	1.0	-53.4	-13.0	-40.4	
15278.40	-8.5	V	3.0	43.4	1.0	-50.9	-13.0	-37.9	
3819.60	-6.1	H	3.0	43.8	1.0	-48.9	-13.0	-35.9	
5729.40	-7.8	H	3.0	43.7	1.0	-50.5	-13.0	-37.5	
7639.20	-14.0	H	3.0	42.4	1.0	-55.4	-13.0	-42.4	
9549.00	-17.1	H	3.0	41.0	1.0	-57.0	-13.0	-44.0	
11458.80	-12.1	H	3.0	41.0	1.0	-52.1	-13.0	-39.1	
13368.60	-11.4	H	3.0	42.3	1.0	-52.7	-13.0	-39.7	
15278.40	-9.5	H	3.0	43.4	1.0	-51.8	-13.0	-38.8	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

GSM

GSM1900
EGPRS

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-03
Test Engineer: 51072
Configuration: EUT / Adapter / Earphone . X-Position
Location: Chamber 1
Mode: EGPRS 1900 MHz Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-15.1	V	3.0	43.8	1.0	-57.9	-13.0	-44.9	
5550.60	-11.6	V	3.0	43.7	1.0	-54.3	-13.0	-41.3	
7400.80	-15.8	V	3.0	42.5	1.0	-57.4	-13.0	-44.4	
9251.00	-18.6	V	3.0	41.3	1.0	-58.9	-13.0	-45.9	
11101.20	-17.0	V	3.0	40.9	1.0	-56.9	-13.0	-43.9	
12951.40	-12.6	V	3.0	42.0	1.0	-53.6	-13.0	-40.6	
14801.60	-10.3	V	3.0	43.5	1.0	-52.8	-13.0	-39.8	
3700.40	-14.1	H	3.0	43.8	1.0	-56.9	-13.0	-43.9	
5550.60	-14.5	H	3.0	43.7	1.0	-57.2	-13.0	-44.2	
7400.80	-16.4	H	3.0	42.5	1.0	-57.9	-13.0	-44.9	
9251.00	-18.2	H	3.0	41.3	1.0	-58.4	-13.0	-45.4	
11101.20	-16.6	H	3.0	40.9	1.0	-56.5	-13.0	-43.5	
12951.40	-12.2	H	3.0	42.0	1.0	-53.2	-13.0	-40.2	
14801.60	-9.1	H	3.0	43.5	1.0	-51.7	-13.0	-38.7	
Mid Ch, 1880MHz									
3760.00	-14.9	V	3.0	43.8	1.0	-57.7	-13.0	-44.7	
5640.00	-11.1	V	3.0	43.7	1.0	-53.8	-13.0	-40.8	
7520.00	-14.5	V	3.0	42.5	1.0	-56.0	-13.0	-43.0	
9400.00	-17.5	V	3.0	41.1	1.0	-57.6	-13.0	-44.6	
11280.00	-15.2	V	3.0	41.0	1.0	-55.2	-13.0	-42.2	
15040.00	-10.4	V	3.0	43.7	1.0	-53.0	-13.0	-40.0	
3760.00	-13.0	H	3.0	43.8	1.0	-55.8	-13.0	-42.8	
5640.00	-13.8	H	3.0	43.7	1.0	-56.5	-13.0	-43.5	
7520.00	-16.0	H	3.0	42.5	1.0	-57.5	-13.0	-44.5	
9400.00	-16.8	H	3.0	41.1	1.0	-57.0	-13.0	-44.0	
11280.00	-13.2	H	3.0	41.0	1.0	-53.1	-13.0	-40.1	
15040.00	-7.8	H	3.0	43.7	1.0	-50.4	-13.0	-37.4	
High Ch, 1909.8MHz									
3819.60	-15.3	V	3.0	43.8	1.0	-58.1	-13.0	-45.1	
5729.40	-11.7	V	3.0	43.7	1.0	-54.4	-13.0	-41.4	
7639.20	-15.1	V	3.0	42.4	1.0	-56.5	-13.0	-43.5	
9549.00	-17.5	V	3.0	41.0	1.0	-57.5	-13.0	-44.5	
11458.80	-14.2	V	3.0	41.0	1.0	-54.2	-13.0	-41.2	
13368.60	-12.4	V	3.0	42.3	1.0	-53.7	-13.0	-40.7	
15278.40	-11.5	V	3.0	43.4	1.0	-53.9	-13.0	-40.9	
3819.60	-13.8	H	3.0	43.8	1.0	-56.6	-13.0	-43.6	
5729.40	-14.9	H	3.0	43.7	1.0	-57.5	-13.0	-44.5	
7639.20	-16.5	H	3.0	42.4	1.0	-57.8	-13.0	-44.8	
9549.00	-17.5	H	3.0	41.0	1.0	-57.5	-13.0	-44.5	
11458.80	-14.2	H	3.0	41.0	1.0	-54.2	-13.0	-41.2	
13368.60	-11.5	H	3.0	42.3	1.0	-52.9	-13.0	-39.9	
15278.40	-9.6	H	3.0	43.4	1.0	-52.0	-13.0	-39.0	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA Band 5

WCDMA

Band 5
REL99

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-02
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: Rel99 Band 5 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, 826.4MHz									
1652.80	-24.7	V	3.0	38.2	1.0	-61.9	-13.0	-48.9	
2479.20	-28.9	V	3.0	38.8	1.0	-66.7	-13.0	-53.7	
3305.60	-27.6	V	3.0	39.4	1.0	-66.0	-13.0	-53.0	
1652.80	-24.9	H	3.0	38.2	1.0	-62.1	-13.0	-49.1	
2479.20	-29.3	H	3.0	38.8	1.0	-67.1	-13.0	-54.1	
3305.60	-27.6	H	3.0	39.4	1.0	-66.0	-13.0	-53.0	
Mid Ch, 836.6MHz									
1673.20	-24.7	V	3.0	38.2	1.0	-61.9	-13.0	-48.9	
2509.80	-28.6	V	3.0	38.8	1.0	-66.5	-13.0	-53.5	
3346.40	-27.3	V	3.0	39.5	1.0	-65.8	-13.0	-52.8	
1673.20	-24.7	H	3.0	38.2	1.0	-61.9	-13.0	-48.9	
2509.80	-29.2	H	3.0	38.8	1.0	-67.0	-13.0	-54.0	
3346.40	-27.3	H	3.0	39.5	1.0	-65.8	-13.0	-52.8	
High Ch, 846.6MHz									
1693.20	-24.2	V	3.0	38.2	1.0	-61.4	-13.0	-48.4	
2539.80	-28.6	V	3.0	38.9	1.0	-66.5	-13.0	-53.5	
3386.40	-27.3	V	3.0	39.5	1.0	-65.8	-13.0	-52.8	
1693.20	-23.6	H	3.0	38.2	1.0	-60.9	-13.0	-47.9	
2539.80	-29.1	H	3.0	38.9	1.0	-67.0	-13.0	-54.0	
3386.40	-27.4	H	3.0	39.5	1.0	-65.9	-13.0	-52.9	

WCDMA

Band 5
HSDPA

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-02
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: HSDPA Band 5 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, 826.4MHz									
1652.80	-26.9	V	3.0	38.2	1.0	-64.1	-13.0	-51.1	
2479.20	-28.7	V	3.0	38.8	1.0	-66.5	-13.0	-53.5	
3305.60	-27.5	V	3.0	39.4	1.0	-65.9	-13.0	-52.9	
1652.80	-27.1	H	3.0	38.2	1.0	-64.3	-13.0	-51.3	
2479.20	-29.4	H	3.0	38.8	1.0	-67.2	-13.0	-54.2	
3305.60	-27.6	H	3.0	39.4	1.0	-66.1	-13.0	-53.1	
Mid Ch, 836.6MHz									
1673.20	-25.7	V	3.0	38.2	1.0	-62.9	-13.0	-49.9	
2509.80	-28.7	V	3.0	38.8	1.0	-66.6	-13.0	-53.6	
3346.40	-27.3	V	3.0	39.5	1.0	-65.8	-13.0	-52.8	
1673.20	-25.7	H	3.0	38.2	1.0	-62.9	-13.0	-49.9	
2509.80	-29.1	H	3.0	38.8	1.0	-67.0	-13.0	-54.0	
3346.40	-27.3	H	3.0	39.5	1.0	-65.8	-13.0	-52.8	
High Ch, 846.6MHz									
1693.20	-25.9	V	3.0	38.2	1.0	-63.2	-13.0	-50.2	
2539.80	-28.6	V	3.0	38.9	1.0	-66.4	-13.0	-53.4	
3386.40	-27.4	V	3.0	39.5	1.0	-65.9	-13.0	-52.9	
1693.20	-25.1	H	3.0	38.2	1.0	-62.3	-13.0	-49.3	
2539.80	-29.0	H	3.0	38.9	1.0	-66.9	-13.0	-53.9	
3386.40	-27.5	H	3.0	39.5	1.0	-66.0	-13.0	-53.0	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA Band 2

WCDMA

Band 2
REL99

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-02
Test Engineer: 51072
Configuration: EUT / Adapter / Earphone , X-Position
Location: Chamber 1
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	-13.2	V	3.0	43.8	1.0	-56.0	-13.0	-43.0	
5557.20	-11.8	V	3.0	43.7	1.0	-54.5	-13.0	-41.5	
7409.60	-17.0	V	3.0	42.5	1.0	-58.5	-13.0	-45.5	
3704.80	-8.3	H	3.0	43.8	1.0	-51.0	-13.0	-38.0	
5557.20	-14.7	H	3.0	43.7	1.0	-57.4	-13.0	-44.4	
7409.60	-15.1	H	3.0	42.5	1.0	-56.6	-13.0	-43.6	
Mid Ch, 1880MHz									
3760.00	-17.6	V	3.0	43.8	1.0	-60.4	-13.0	-47.4	
5640.00	-12.3	V	3.0	43.7	1.0	-55.0	-13.0	-42.0	
7520.00	-17.3	V	3.0	42.5	1.0	-58.8	-13.0	-45.8	
3760.00	-12.9	H	3.0	43.8	1.0	-55.7	-13.0	-42.7	
5640.00	-14.4	H	3.0	43.7	1.0	-57.1	-13.0	-44.1	
7520.00	-17.0	H	3.0	42.5	1.0	-58.4	-13.0	-45.4	
High Ch, 1907.6MHz									
3815.20	-17.0	V	3.0	43.8	1.0	-59.8	-13.0	-46.8	
5722.80	-13.7	V	3.0	43.7	1.0	-56.3	-13.0	-43.3	
7630.40	-17.5	V	3.0	42.4	1.0	-58.9	-13.0	-45.9	
3815.20	-10.6	H	3.0	43.8	1.0	-53.4	-13.0	-40.4	
5722.80	-11.9	H	3.0	43.7	1.0	-54.6	-13.0	-41.6	
7630.40	-17.6	H	3.0	42.4	1.0	-59.0	-13.0	-46.0	

WCDMA

Band 2
HSDPA

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-02
Test Engineer: 51072
Configuration: EUT / Adapter / Earphone , X-Position
Location: Chamber 1
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	-14.2	V	3.0	43.8	1.0	-57.0	-13.0	-44.0	
5557.20	-13.1	V	3.0	43.7	1.0	-55.8	-13.0	-42.8	
7409.60	-17.1	V	3.0	42.5	1.0	-58.6	-13.0	-45.6	
3704.80	-9.4	H	3.0	43.8	1.0	-52.2	-13.0	-39.2	
5557.20	-15.5	H	3.0	43.7	1.0	-58.2	-13.0	-45.2	
7409.60	-16.2	H	3.0	42.5	1.0	-57.7	-13.0	-44.7	
Mid Ch, 1880MHz									
3760.00	-18.2	V	3.0	43.8	1.0	-61.0	-13.0	-48.0	
5640.00	-13.2	V	3.0	43.7	1.0	-55.9	-13.0	-42.9	
7520.00	-17.4	V	3.0	42.5	1.0	-58.8	-13.0	-45.8	
3760.00	-13.0	H	3.0	43.8	1.0	-55.8	-13.0	-42.8	
5640.00	-14.9	H	3.0	43.7	1.0	-57.6	-13.0	-44.6	
7520.00	-17.0	H	3.0	42.5	1.0	-58.4	-13.0	-45.4	
High Ch, 1907.6MHz									
3815.20	-17.1	V	3.0	43.8	1.0	-59.9	-13.0	-46.9	
5722.80	-14.6	V	3.0	43.7	1.0	-57.3	-13.0	-44.3	
7630.40	-18.1	V	3.0	42.4	1.0	-59.5	-13.0	-46.5	
3815.20	-10.8	H	3.0	43.8	1.0	-53.6	-13.0	-40.6	
5722.80	-13.0	H	3.0	43.7	1.0	-55.7	-13.0	-42.7	
7630.40	-17.7	H	3.0	42.4	1.0	-59.1	-13.0	-46.1	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5

LTE Band 5 10MHz QPSK

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-03
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Harmonics, 10MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 829MHz									
1658.00	-18.5	V	3.0	38.2	1.0	-55.7	-13.0	-42.7	
2487.00	-27.7	V	3.0	38.8	1.0	-65.6	-13.0	-52.6	
3316.00	-26.6	V	3.0	39.4	1.0	-65.0	-13.0	-52.0	
1658.00	-19.1	H	3.0	38.2	1.0	-56.3	-13.0	-43.3	
2487.00	-28.1	H	3.0	38.8	1.0	-65.9	-13.0	-52.9	
3316.00	-26.6	H	3.0	39.4	1.0	-65.0	-13.0	-52.0	
Mid Ch, 836.5MHz									
1673.00	-17.2	V	3.0	38.2	1.0	-54.4	-13.0	-41.4	
2509.50	-27.6	V	3.0	38.8	1.0	-65.5	-13.0	-52.5	
3346.00	-27.3	V	3.0	39.5	1.0	-65.7	-13.0	-52.7	
1673.00	-16.9	H	3.0	38.2	1.0	-54.1	-13.0	-41.1	
2509.50	-28.5	H	3.0	38.8	1.0	-66.3	-13.0	-53.3	
3346.00	-27.1	H	3.0	39.5	1.0	-65.6	-13.0	-52.6	
High Ch, 844MHz									
1688.00	-18.0	V	3.0	38.2	1.0	-55.3	-13.0	-42.3	
2532.00	-28.0	V	3.0	38.9	1.0	-65.8	-13.0	-52.8	
3376.00	-27.5	V	3.0	39.5	1.0	-66.0	-13.0	-53.0	
1688.00	-15.3	H	3.0	38.2	1.0	-52.5	-13.0	-39.5	
2532.00	-29.1	H	3.0	38.9	1.0	-66.9	-13.0	-53.9	
3376.00	-27.6	H	3.0	39.5	1.0	-66.1	-13.0	-53.1	

LTE Band 5 10MHz 16QAM

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-03
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Harmonics, 10MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 829MHz									
1658.00	-17.6	V	3.0	38.2	1.0	-54.9	-13.0	-41.9	
2487.00	-27.5	V	3.0	38.8	1.0	-65.3	-13.0	-52.3	
3316.00	-26.8	V	3.0	39.4	1.0	-65.2	-13.0	-52.2	
1658.00	-19.2	H	3.0	38.2	1.0	-56.4	-13.0	-43.4	
2487.00	-28.6	H	3.0	38.8	1.0	-66.4	-13.0	-53.4	
3316.00	-27.3	H	3.0	39.4	1.0	-65.7	-13.0	-52.7	
Mid Ch, 836.5MHz									
1673.00	-18.8	V	3.0	38.2	1.0	-56.0	-13.0	-43.0	
2509.50	-27.7	V	3.0	38.8	1.0	-65.6	-13.0	-52.6	
3346.00	-27.4	V	3.0	39.5	1.0	-65.8	-13.0	-52.8	
1673.00	-18.4	H	3.0	38.2	1.0	-55.6	-13.0	-42.6	
2509.50	-28.8	H	3.0	38.8	1.0	-66.7	-13.0	-53.7	
3346.00	-27.3	H	3.0	39.5	1.0	-65.8	-13.0	-52.8	
High Ch, 844MHz									
1688.00	-18.6	V	3.0	38.2	1.0	-55.9	-13.0	-42.9	
2532.00	-28.1	V	3.0	38.9	1.0	-66.0	-13.0	-53.0	
3376.00	-27.4	V	3.0	39.5	1.0	-65.9	-13.0	-52.9	
1688.00	-17.3	H	3.0	38.2	1.0	-54.5	-13.0	-41.5	
2532.00	-29.0	H	3.0	38.9	1.0	-66.8	-13.0	-53.8	
3376.00	-27.5	H	3.0	39.5	1.0	-66.0	-13.0	-53.0	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE
Band 5
5MHz
QPSK

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-03
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Harmonics, 5MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5MHz									
1653.00	-19.3	V	3.0	38.2	1.0	-56.6	-13.0	-43.6	
2479.50	-27.5	V	3.0	38.8	1.0	-65.3	-13.0	-52.3	
3306.00	-27.4	V	3.0	39.4	1.0	-65.8	-13.0	-52.8	
1653.00	-17.6	H	3.0	38.2	1.0	-54.8	-13.0	-41.8	
2479.50	-28.5	H	3.0	38.8	1.0	-66.3	-13.0	-53.3	
3306.00	-27.4	H	3.0	39.4	1.0	-65.9	-13.0	-52.9	
Mid Ch, 836.5MHz									
1673.00	-19.6	V	3.0	38.2	1.0	-56.8	-13.0	-43.8	
2509.50	-27.9	V	3.0	38.8	1.0	-65.8	-13.0	-52.8	
3346.00	-27.2	V	3.0	39.5	1.0	-65.7	-13.0	-52.7	
1673.00	-18.4	H	3.0	38.2	1.0	-55.6	-13.0	-42.6	
2509.50	-28.0	H	3.0	38.8	1.0	-65.8	-13.0	-52.8	
3346.00	-27.3	H	3.0	39.5	1.0	-65.8	-13.0	-52.8	
High Ch, 846.5MHz									
1693.00	-16.4	V	3.0	38.2	1.0	-53.6	-13.0	-40.6	
2539.50	-28.2	V	3.0	38.9	1.0	-66.0	-13.0	-53.0	
3386.00	-27.3	V	3.0	39.5	1.0	-65.7	-13.0	-52.7	
1693.00	-18.4	H	3.0	38.2	1.0	-55.7	-13.0	-42.7	
2539.50	-27.9	H	3.0	38.9	1.0	-65.8	-13.0	-52.8	
3386.00	-27.2	H	3.0	39.5	1.0	-65.7	-13.0	-52.7	

LTE
Band 5
5MHz
16QAM

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-03
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Harmonics, 5MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5MHz									
1653.00	-17.4	V	3.0	38.2	1.0	-54.6	-13.0	-41.6	
2479.50	-27.4	V	3.0	38.8	1.0	-65.2	-13.0	-52.2	
3306.00	-27.3	V	3.0	39.4	1.0	-65.7	-13.0	-52.7	
1653.00	-18.6	H	3.0	38.2	1.0	-55.8	-13.0	-42.8	
2479.50	-28.2	H	3.0	38.8	1.0	-66.0	-13.0	-53.0	
3306.00	-27.5	H	3.0	39.4	1.0	-65.9	-13.0	-52.9	
Mid Ch, 836.5MHz									
1673.00	-18.6	V	3.0	38.2	1.0	-55.8	-13.0	-42.8	
2509.50	-28.1	V	3.0	38.8	1.0	-66.0	-13.0	-53.0	
3346.00	-27.3	V	3.0	39.5	1.0	-65.7	-13.0	-52.7	
1673.00	-20.2	H	3.0	38.2	1.0	-57.5	-13.0	-44.5	
2509.50	-28.2	H	3.0	38.8	1.0	-66.0	-13.0	-53.0	
3346.00	-27.3	H	3.0	39.5	1.0	-65.7	-13.0	-52.7	
High Ch, 846.5MHz									
1693.00	-18.9	V	3.0	38.2	1.0	-56.2	-13.0	-43.2	
2539.50	-28.4	V	3.0	38.9	1.0	-66.2	-13.0	-53.2	
3386.00	-27.1	V	3.0	39.5	1.0	-65.6	-13.0	-52.6	
1693.00	-17.4	H	3.0	38.2	1.0	-54.7	-13.0	-41.7	
2539.50	-27.7	H	3.0	38.9	1.0	-65.5	-13.0	-52.5	
3386.00	-27.4	H	3.0	39.5	1.0	-65.9	-13.0	-52.9	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5 3MHz QPSK

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-03
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Harmonics, 3MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 825.5MHz									
1651.00	-18.3	V	3.0	38.2	1.0	-55.6	-13.0	-42.6	
2476.50	-26.7	V	3.0	38.8	1.0	-64.5	-13.0	-51.5	
3302.00	-27.3	V	3.0	39.4	1.0	-65.8	-13.0	-52.8	
1651.00	-18.5	H	3.0	38.2	1.0	-55.7	-13.0	-42.7	
2476.50	-28.1	H	3.0	38.8	1.0	-65.9	-13.0	-52.9	
3302.00	-27.4	H	3.0	39.4	1.0	-65.9	-13.0	-52.9	
Mid Ch, 836.5MHz									
1673.00	-20.3	V	3.0	38.2	1.0	-57.5	-13.0	-44.5	
2509.50	-27.0	V	3.0	38.8	1.0	-64.8	-13.0	-51.8	
3346.00	-26.7	V	3.0	39.5	1.0	-65.1	-13.0	-52.1	
1673.00	-17.8	H	3.0	38.2	1.0	-55.0	-13.0	-42.0	
2509.50	-28.3	H	3.0	38.8	1.0	-66.1	-13.0	-53.1	
3346.00	-26.7	H	3.0	39.5	1.0	-65.1	-13.0	-52.1	
High Ch, 847.5MHz									
1695.00	-17.6	V	3.0	38.2	1.0	-54.9	-13.0	-41.9	
2542.50	-26.5	V	3.0	38.9	1.0	-64.4	-13.0	-51.4	
3390.00	-26.7	V	3.0	39.5	1.0	-65.2	-13.0	-52.2	
1695.00	-18.4	H	3.0	38.2	1.0	-55.6	-13.0	-42.6	
2542.50	-28.3	H	3.0	38.9	1.0	-66.1	-13.0	-53.1	
3390.00	-27.0	H	3.0	39.5	1.0	-65.5	-13.0	-52.5	

LTE Band 5 3MHz 16QAM

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-03
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Harmonics, 3MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 825.5MHz									
1651.00	-18.4	V	3.0	38.2	1.0	-55.7	-13.0	-42.7	
2476.50	-27.0	V	3.0	38.8	1.0	-64.8	-13.0	-51.8	
3302.00	-27.0	V	3.0	39.4	1.0	-65.5	-13.0	-52.5	
1651.00	-19.5	H	3.0	38.2	1.0	-56.7	-13.0	-43.7	
2476.50	-28.7	H	3.0	38.8	1.0	-66.5	-13.0	-53.5	
3302.00	-27.4	H	3.0	39.4	1.0	-65.9	-13.0	-52.9	
Mid Ch, 836.5MHz									
1673.00	-20.6	V	3.0	38.2	1.0	-57.9	-13.0	-44.9	
2509.50	-27.4	V	3.0	38.8	1.0	-65.2	-13.0	-52.2	
3346.00	-26.7	V	3.0	39.5	1.0	-65.1	-13.0	-52.1	
1673.00	-18.6	H	3.0	38.2	1.0	-55.8	-13.0	-42.8	
2509.50	-28.6	H	3.0	38.8	1.0	-66.5	-13.0	-53.5	
3346.00	-26.6	H	3.0	39.5	1.0	-65.0	-13.0	-52.0	
High Ch, 847.5MHz									
1695.00	-18.3	V	3.0	38.2	1.0	-55.6	-13.0	-42.6	
2542.50	-26.9	V	3.0	38.9	1.0	-64.7	-13.0	-51.7	
3390.00	-27.0	V	3.0	39.5	1.0	-65.4	-13.0	-52.4	
1695.00	-17.9	H	3.0	38.2	1.0	-55.1	-13.0	-42.1	
2542.50	-28.5	H	3.0	38.9	1.0	-66.3	-13.0	-53.3	
3390.00	-26.9	H	3.0	39.5	1.0	-65.3	-13.0	-52.3	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5 1.4MHz QPSK

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-02
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Harmonics, 1.4MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.7MHz									
1649.40	-20.1	V	3.0	38.2	1.0	-57.3	-13.0	-44.3	
2474.10	-28.5	V	3.0	38.8	1.0	-66.3	-13.0	-53.3	
3298.80	-27.8	V	3.0	39.4	1.0	-66.2	-13.0	-53.2	
1649.40	-18.2	H	3.0	38.2	1.0	-55.4	-13.0	-42.4	
2474.10	-28.2	H	3.0	38.8	1.0	-66.1	-13.0	-53.1	
3298.80	-27.7	H	3.0	39.4	1.0	-66.1	-13.0	-53.1	
Mid Ch, 836.5MHz									
1673.00	-17.8	V	3.0	38.2	1.0	-55.1	-13.0	-42.1	
2509.50	-27.9	V	3.0	38.8	1.0	-65.7	-13.0	-52.7	
3346.00	-27.5	V	3.0	39.5	1.0	-66.0	-13.0	-53.0	
1673.00	-18.6	H	3.0	38.2	1.0	-55.8	-13.0	-42.8	
2509.50	-27.4	H	3.0	38.8	1.0	-65.2	-13.0	-52.2	
3346.00	-27.3	H	3.0	39.5	1.0	-65.8	-13.0	-52.8	
High Ch, 848.3MHz									
1696.60	-17.1	V	3.0	38.2	1.0	-54.4	-13.0	-41.4	
2544.90	-27.4	V	3.0	38.9	1.0	-65.3	-13.0	-52.3	
3393.20	-27.2	V	3.0	39.5	1.0	-65.7	-13.0	-52.7	
1696.60	-18.0	H	3.0	38.2	1.0	-55.3	-13.0	-42.3	
2544.90	-24.2	H	3.0	38.9	1.0	-62.0	-13.0	-49.0	
3393.20	-27.2	H	3.0	39.5	1.0	-65.7	-13.0	-52.7	

LTE Band 5 1.4MHz 16QAM

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

Company: Samsung
Project #: 4788458975
Date: 2018-05-02
Test Engineer: 47989
Configuration: EUT / AC Adapter / Earphone, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Harmonics, 1.4MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.7MHz									
1649.40	-20.7	V	3.0	38.2	1.0	-58.0	-13.0	-45.0	
2474.10	-28.7	V	3.0	38.8	1.0	-66.5	-13.0	-53.5	
3298.80	-27.6	V	3.0	39.4	1.0	-66.0	-13.0	-53.0	
1649.40	-20.1	H	3.0	38.2	1.0	-57.3	-13.0	-44.3	
2474.10	-28.2	H	3.0	38.8	1.0	-66.1	-13.0	-53.1	
3298.80	-27.7	H	3.0	39.4	1.0	-66.1	-13.0	-53.1	
Mid Ch, 836.5MHz									
1673.00	-19.0	V	3.0	38.2	1.0	-56.2	-13.0	-43.2	
2509.50	-27.9	V	3.0	38.8	1.0	-65.8	-13.0	-52.8	
3346.00	-27.4	V	3.0	39.5	1.0	-65.8	-13.0	-52.8	
1673.00	-20.2	H	3.0	38.2	1.0	-57.4	-13.0	-44.4	
2509.50	-28.1	H	3.0	38.8	1.0	-65.9	-13.0	-52.9	
3346.00	-27.8	H	3.0	39.5	1.0	-66.2	-13.0	-53.2	
High Ch, 848.3MHz									
1696.60	-19.0	V	3.0	38.2	1.0	-56.3	-13.0	-43.3	
2544.90	-27.6	V	3.0	38.9	1.0	-65.4	-13.0	-52.4	
3393.20	-27.2	V	3.0	39.5	1.0	-65.7	-13.0	-52.7	
1696.60	-19.7	H	3.0	38.2	1.0	-56.9	-13.0	-43.9	
2544.90	-24.7	H	3.0	38.9	1.0	-62.6	-13.0	-49.6	
3393.20	-27.1	H	3.0	39.5	1.0	-65.5	-13.0	-52.5	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.