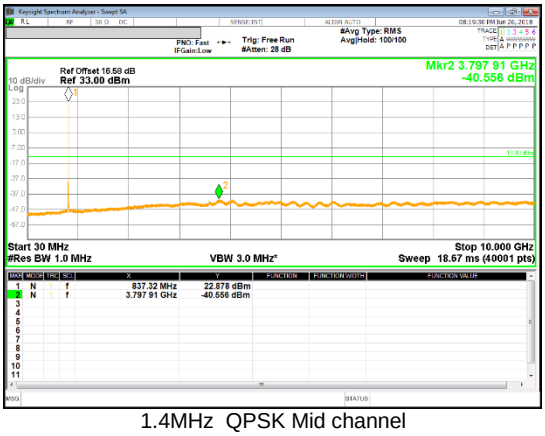
BAND 5

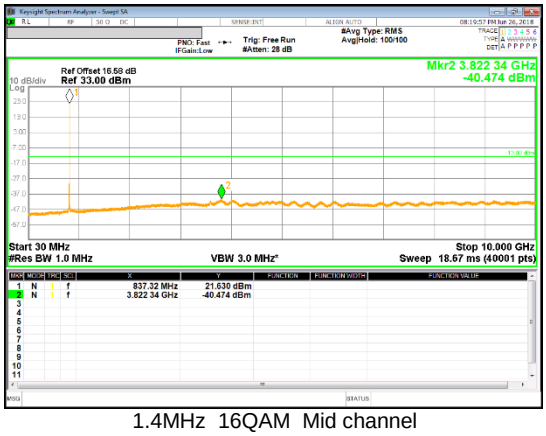
1.4MHz

1.4MHz QPSK Low channel

1.4MHz 16QAM Low channel



1.4MHz QPSK Mid channel



1.4MHz 16QAM Mid channel

1.4MHz QPSK High channel

1.4MHz 16QAM High channel

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9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355

LIMITS

§22.355- 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.

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9.4.1. FREQUENCY STABILITY RESULTS

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				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	826.39999068	-0.003	846.59998377	0.000	2.5
3.85	40	826.39998194	0.008	846.59998474	-0.001	2.5
3.85	30	826.39998789	0.000	846.59998663	-0.003	2.5
3.85	***20***	***826.39998823***	***0.000***	***846.59998385***	***0.000***	***2.5***
3.85	10	826.39999016	-0.002	846.59998505	-0.001	2.5
3.85	0	826.39999064	-0.003	846.59998771	-0.005	2.5
3.85	-10	826.39998609	0.003	846.59998575	-0.002	2.5
3.85	-20	826.39998490	0.004	846.59998254	0.002	2.5
3.85	-30	826.39998395	0.005	846.59998516	-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				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	**826.39998823**	***0***	**846.59998385**	***0***	***2.5***
4.40	20	826.39998632	0.002	846.59998961	-0.007	2.5
3.60	20	826.39999002	-0.002	846.59999072	-0.008	2.5

LTE BAND 5

Reference Frequency : LTE Band 5 Low Channel 824.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2061.750	Hz	High Channel	2120.750	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	824.69998746	-0.001	848.29999038	-0.003	2.5
3.85	40	824.69998453	0.003	848.29998053	0.008	2.5
3.85	30	824.69998830	-0.002	848.29998059	0.008	2.5
3.85	***20***	***824.69998682***	***0.000***	***848.29998753***	***0.000***	***2.5***
3.85	10	824.69998999	-0.004	848.29998730	0.000	2.5
3.85	0	824.69998278	0.005	848.29998182	0.007	2.5
3.85	-10	824.69998576	0.001	848.29998346	0.005	2.5
3.85	-20	824.69998295	0.005	848.29998357	0.005	2.5
3.85	-30	824.69998294	0.005	848.29999064	-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***	**824.69998682**	***0***	**848.29998753**	***0***	***2.5***
4.40	20	824.69998901	-0.003	848.29998382	0.004	2.5
3.60	20	824.69998858	-0.002	848.29998847	-0.001	2.5

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10. RADIATED TEST RESULTS

10.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913

LIMITS

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

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(WCDMA), average(LTE);

TEST RESULTS

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10.1.1. ERP/EIRP Results

WCDMA

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
Band 5	REL99	4132	826.4	0.82	1.21
		4183	836.6	1.24	1.33
		4233	846.6	2.50	1.78
	HSDPA	4132	826.4	0.79	1.20
		4183	836.6	1.34	1.36
		4233	846.6	2.37	1.73

LTE BAND 5

Band	BW [MHz]	Mode	RB size / RB Offset	f [MHz]	ERP / EIRP	
					[dBm]	[mW]
BAND 5	10	QPSK	1 / 0	829.0	5.77	3.78
			1 / 49	836.5	6.70	4.68
			1 / 25	844.0	6.10	4.07
		16QAM	1 / 0	829.0	5.04	3.19
			1 / 49	836.5	5.71	3.72
			1 / 25	844.0	5.46	3.52
	5	QPSK	1 / 12	826.5	4.35	2.72
			1 / 12	836.5	5.99	3.97
			1 / 12	846.5	5.28	3.37
		16QAM	1 / 0	826.5	3.25	2.11
			1 / 0	836.5	3.60	2.29
			1 / 0	846.5	4.55	2.85
	3	QPSK	1 / 8	825.5	5.73	3.74
			1 / 14	836.5	4.89	3.08
			1 / 0	847.5	7.08	5.11
		16QAM	1 / 8	825.5	4.92	3.10
			1 / 14	836.5	3.89	2.45
			1 / 14	847.5	4.81	3.03
	1.4	QPSK	1 / 5	824.7	5.61	3.64
			1 / 5	836.5	6.66	4.63
			1 / 5	848.3	4.79	3.01
		16QAM	1 / 3	824.7	2.86	1.93
			1 / 3	836.5	3.57	2.28
			1 / 0	848.3	4.51	2.82

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10.1.2.ERP/EIRP DATA

WCDMA Band 5

WCDMA

Band 5
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788494709
Date: 2018-06-28
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	3.24	V	1.0	-1.5	0.82	38.5	-37.7	
826.40	-1.35	H	1.0	-1.5	-3.77	38.5	-42.3	
Mid Ch								
836.60	3.62	V	1.0	-1.4	1.24	38.5	-37.3	
836.60	-1.03	H	1.0	-1.4	-3.41	38.5	-41.9	
High Ch								
846.60	4.85	V	1.0	-1.4	2.50	38.5	-36.0	
846.60	-0.83	H	1.0	-1.4	-3.18	38.5	-41.7	

WCDMA

Band 5
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788494709
Date: 2018-06-28
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	3.21	V	1.0	-1.5	0.79	38.5	-37.7	
826.40	-1.27	H	1.0	-1.5	-3.69	38.5	-42.2	
Mid Ch								
836.60	3.72	V	1.0	-1.4	1.34	38.5	-37.2	
836.60	-0.96	H	1.0	-1.4	-3.34	38.5	-41.8	
High Ch								
846.60	4.72	V	1.0	-1.4	2.37	38.5	-36.1	
846.60	-1.02	H	1.0	-1.4	-3.37	38.5	-41.9	

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LTE BAND 5

LTE BAND 5 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788494709
Date: 2018-07-16
Test Engineer: 47989
Configuration: EUT, Cradle, Adapter / 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	8.18	V	1.0	-1.5	5.77	38.5	-32.7	
829.00	8.02	H	1.0	-1.5	5.61	38.5	-32.9	
Mid Ch								
836.50	8.36	V	1.0	-1.4	5.98	38.5	-32.5	
836.50	9.08	H	1.0	-1.4	6.70	38.5	-31.8	
High Ch								
844.00	7.79	V	1.0	-1.4	5.43	38.5	-33.1	
844.00	8.46	H	1.0	-1.4	6.10	38.5	-32.4	

LTE BAND 5 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788494709
Date: 2018-07-16
Test Engineer: 47989
Configuration: EUT, Cradle, Adapter / 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	7.33	V	1.0	-1.5	4.92	38.5	-33.6	
829.00	7.45	H	1.0	-1.5	5.04	38.5	-33.5	
Mid Ch								
836.50	7.50	V	1.0	-1.4	5.12	38.5	-33.4	
836.50	8.09	H	1.0	-1.4	5.71	38.5	-32.8	
High Ch								
844.00	6.72	V	1.0	-1.4	4.36	38.5	-34.1	
844.00	7.82	H	1.0	-1.4	5.46	38.5	-33.0	

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LTE
BAND 5
5MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788494709
Date: 2018-07-16
Test Engineer: 47989
Configuration: EUT, Cradle, Adapter / 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	6.53	V	1.0	-1.5	4.11	38.5	-34.4	
826.50	6.77	H	1.0	-1.5	4.35	38.5	-34.1	
Mid Ch								
836.50	6.70	V	1.0	-1.4	4.32	38.5	-34.2	
836.50	8.37	H	1.0	-1.4	5.99	38.5	-32.5	
High Ch								
846.50	5.16	V	1.0	-1.4	2.81	38.5	-35.7	
846.50	7.63	H	1.0	-1.4	5.28	38.5	-33.2	

LTE
BAND 5
5MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788494709
Date: 2018-07-16
Test Engineer: 47989
Configuration: EUT, Cradle, Adapter / 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	5.67	V	1.0	-1.5	3.25	38.5	-35.3	
826.50	5.55	H	1.0	-1.5	3.13	38.5	-35.4	
Mid Ch								
836.50	5.24	V	1.0	-1.4	2.86	38.5	-35.6	
836.50	5.98	H	1.0	-1.4	3.60	38.5	-34.9	
High Ch								
846.50	5.58	V	1.0	-1.4	3.23	38.5	-35.3	
846.50	6.90	H	1.0	-1.4	4.55	38.5	-33.9	

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LTE
BAND 5
3MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788494709
Date: 2018-07-16
Test Engineer: 47989
Configuration: EUT, Cradle, Adapter / 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	6.20	V	1.0	-1.5	3.78	38.5	-34.7	
825.50	8.15	H	1.0	-1.5	5.73	38.5	-32.8	
Mid Ch								
836.50	6.51	V	1.0	-1.4	4.13	38.5	-34.4	
836.50	7.27	H	1.0	-1.4	4.89	38.5	-33.6	
High Ch								
847.50	6.80	V	1.0	-1.4	4.45	38.5	-34.0	
847.50	9.43	H	1.0	-1.4	7.08	38.5	-31.4	

LTE
BAND 5
3MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788494709
Date: 2018-07-16
Test Engineer: 47989
Configuration: EUT, Cradle, Adapter / 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	4.64	V	1.0	-1.5	2.22	38.5	-36.3	
825.50	7.34	H	1.0	-1.5	4.92	38.5	-33.6	
Mid Ch								
836.50	5.12	V	1.0	-1.4	2.74	38.5	-35.8	
836.50	6.27	H	1.0	-1.4	3.89	38.5	-34.6	
High Ch								
847.50	4.12	V	1.0	-1.4	1.77	38.5	-36.7	
847.50	7.16	H	1.0	-1.4	4.81	38.5	-33.7	

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LTE
BAND 5
1.4MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788494709
Date: 2018-07-16
Test Engineer: 47989
Configuration: EUT, Cradle, Adapter / 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	6.64	V	1.0	-1.5	4.21	38.5	-34.3	
824.70	8.04	H	1.0	-1.5	5.61	38.5	-32.9	
Mid Ch								
836.50	7.41	V	1.0	-1.4	5.03	38.5	-33.5	
836.50	9.04	H	1.0	-1.4	6.66	38.5	-31.8	
High Ch								
848.30	6.09	V	1.0	-1.4	3.75	38.5	-34.8	
848.30	7.14	H	1.0	-1.4	4.79	38.5	-33.7	

LTE
BAND 5
1.4MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4788494709
Date: 2018-07-16
Test Engineer: 47989
Configuration: EUT, Cradle, Adapter / 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	4.57	V	1.0	-1.5	2.14	38.5	-36.4	
824.70	5.29	H	1.0	-1.5	2.86	38.5	-35.6	
Mid Ch								
836.50	5.79	V	1.0	-1.4	3.41	38.5	-35.1	
836.50	5.95	H	1.0	-1.4	3.57	38.5	-34.9	
High Ch								
848.30	5.07	V	1.0	-1.4	2.73	38.5	-35.8	
848.30	6.86	H	1.0	-1.4	4.51	38.5	-34.0	

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10.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917

LIMIT

Part 22.917(a)

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

ANSI / TIA / EIA 603 E Clause 2.2.12; ESU40 setting reference to 971168 D01 v03

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);

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

RESULTS

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10.2.1. SPURIOUS RADIATION PLOTS

WCDMA Band 5

WCDMA

Band 5
REL99

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

Company: Samsung
Project #: 4788494709
Date: 2018-07-03
Test Engineer: 45585
Configuration: EUT / Adapter / Earphone , Z-position
Location: Chamber 1
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	-24.8	V	3.0	43.6	1.0	-67.4	-13.0	-54.4	
2479.20	-22.8	V	3.0	43.4	1.0	-65.2	-13.0	-52.2	
3305.60	-21.6	V	3.0	43.6	1.0	-64.2	-13.0	-51.2	
1652.80	-24.7	H	3.0	43.6	1.0	-67.3	-13.0	-54.3	
2479.20	-22.9	H	3.0	43.4	1.0	-65.3	-13.0	-52.3	
3305.60	-21.2	H	3.0	43.6	1.0	-63.8	-13.0	-50.8	
Mid Ch, 836.6MHz									
1673.20	-24.9	V	3.0	43.6	1.0	-67.4	-13.0	-54.4	
2509.80	-22.8	V	3.0	43.4	1.0	-65.3	-13.0	-52.3	
3346.40	-21.6	V	3.0	43.6	1.0	-64.2	-13.0	-51.2	
1673.20	-24.8	H	3.0	43.6	1.0	-67.4	-13.0	-54.4	
2509.80	-22.9	H	3.0	43.4	1.0	-65.3	-13.0	-52.3	
3346.40	-21.1	H	3.0	43.6	1.0	-63.8	-13.0	-50.8	
High Ch, 846.6MHz									
1693.20	-24.6	V	3.0	43.6	1.0	-67.2	-13.0	-54.2	
2539.80	-22.8	V	3.0	43.4	1.0	-65.2	-13.0	-52.2	
3386.40	-22.1	V	3.0	43.7	1.0	-64.7	-13.0	-51.7	
1693.20	-23.9	H	3.0	43.6	1.0	-66.4	-13.0	-53.4	
2539.80	-22.8	H	3.0	43.4	1.0	-65.3	-13.0	-52.3	
3386.40	-21.7	H	3.0	43.7	1.0	-64.3	-13.0	-51.3	

WCDMA

Band 5
HSDPA

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

Company: Samsung
Project #: 4788494709
Date: 2018-07-03
Test Engineer: 45585
Configuration: EUT / Adapter / Earphone , Z-position
Location: Chamber 1
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	-24.9	V	3.0	43.6	1.0	-67.5	-13.0	-54.5	
2479.20	-22.8	V	3.0	43.4	1.0	-65.2	-13.0	-52.2	
3305.60	-21.7	V	3.0	43.6	1.0	-64.3	-13.0	-51.3	
1652.80	-24.8	H	3.0	43.6	1.0	-67.4	-13.0	-54.4	
2479.20	-22.8	H	3.0	43.4	1.0	-65.3	-13.0	-52.3	
3305.60	-21.2	H	3.0	43.6	1.0	-63.8	-13.0	-50.8	
Mid Ch, 836.6MHz									
1673.20	-24.9	V	3.0	43.6	1.0	-67.5	-13.0	-54.5	
2509.80	-22.9	V	3.0	43.4	1.0	-65.3	-13.0	-52.3	
3346.40	-21.6	V	3.0	43.6	1.0	-64.3	-13.0	-51.3	
1673.20	-24.8	H	3.0	43.6	1.0	-67.4	-13.0	-54.4	
2509.80	-23.0	H	3.0	43.4	1.0	-65.4	-13.0	-52.4	
3346.40	-21.2	H	3.0	43.6	1.0	-63.9	-13.0	-50.9	
High Ch, 846.6MHz									
1693.20	-24.6	V	3.0	43.6	1.0	-67.2	-13.0	-54.2	
2539.80	-22.8	V	3.0	43.4	1.0	-65.2	-13.0	-52.2	
3386.40	-22.0	V	3.0	43.7	1.0	-64.7	-13.0	-51.7	
1693.20	-23.8	H	3.0	43.6	1.0	-66.4	-13.0	-53.4	
2539.80	-22.7	H	3.0	43.4	1.0	-65.2	-13.0	-52.2	
3386.40	-21.6	H	3.0	43.7	1.0	-64.3	-13.0	-51.3	

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LTE BAND 5

LTE

BAND 5

10MHz

QPSK

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

Company: Samsung
Project #: 4788494709
Date: 2018-07-03
Test Engineer: 51072
Configuration: EUT / Adapter / Cradle , Z-position
Location: Chamber 1
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	-23.6	V	3.0	43.6	1.0	-66.2	-13.0	-53.2	
2487.00	-22.8	V	3.0	43.4	1.0	-65.2	-13.0	-52.2	
3316.00	-21.4	V	3.0	43.6	1.0	-64.1	-13.0	-51.1	
1658.00	-22.2	H	3.0	43.6	1.0	-64.8	-13.0	-51.8	
2487.00	-22.8	H	3.0	43.4	1.0	-65.2	-13.0	-52.2	
3316.00	-21.1	H	3.0	43.6	1.0	-63.8	-13.0	-50.8	
Mid Ch, 836.5MHz									
1673.00	-22.9	V	3.0	43.6	1.0	-65.5	-13.0	-52.5	
2509.50	-22.3	V	3.0	43.4	1.0	-64.8	-13.0	-51.8	
3346.00	-21.4	V	3.0	43.6	1.0	-64.1	-13.0	-51.1	
1673.00	-22.1	H	3.0	43.6	1.0	-64.7	-13.0	-51.7	
2509.50	-22.3	H	3.0	43.4	1.0	-64.7	-13.0	-51.7	
3346.00	-21.0	H	3.0	43.6	1.0	-63.6	-13.0	-50.6	
High Ch, 844MHz									
1688.00	-22.5	V	3.0	43.6	1.0	-65.1	-13.0	-52.1	
2532.00	-22.6	V	3.0	43.4	1.0	-65.0	-13.0	-52.0	
3376.00	-21.6	V	3.0	43.7	1.0	-64.2	-13.0	-51.2	
1688.00	-21.7	H	3.0	43.6	1.0	-64.3	-13.0	-51.3	
2532.00	-22.3	H	3.0	43.4	1.0	-64.7	-13.0	-51.7	
3376.00	-21.1	H	3.0	43.7	1.0	-63.8	-13.0	-50.8	

LTE

BAND 5

10MHz

16QAM

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

Company: Samsung
Project #: 4788494709
Date: 2018-07-03
Test Engineer: 51072
Configuration: EUT / Adapter / Cradle , Z-position
Location: Chamber 1
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	-23.7	V	3.0	43.6	1.0	-66.3	-13.0	-53.3	
2487.00	-22.8	V	3.0	43.4	1.0	-65.2	-13.0	-52.2	
3316.00	-21.6	V	3.0	43.6	1.0	-64.2	-13.0	-51.2	
1658.00	-22.3	H	3.0	43.6	1.0	-64.9	-13.0	-51.9	
2487.00	-22.9	H	3.0	43.4	1.0	-65.3	-13.0	-52.3	
3316.00	-21.1	H	3.0	43.6	1.0	-63.7	-13.0	-50.7	
Mid Ch, 836.5MHz									
1673.00	-23.0	V	3.0	43.6	1.0	-65.6	-13.0	-52.6	
2509.50	-22.3	V	3.0	43.4	1.0	-64.7	-13.0	-51.7	
3346.00	-21.5	V	3.0	43.6	1.0	-64.1	-13.0	-51.1	
1673.00	-22.0	H	3.0	43.6	1.0	-64.5	-13.0	-51.5	
2509.50	-22.4	H	3.0	43.4	1.0	-64.8	-13.0	-51.8	
3346.00	-20.9	H	3.0	43.6	1.0	-63.5	-13.0	-50.5	
High Ch, 844MHz									
1688.00	-22.9	V	3.0	43.6	1.0	-65.5	-13.0	-52.5	
2532.00	-22.7	V	3.0	43.4	1.0	-65.1	-13.0	-52.1	
3376.00	-21.5	V	3.0	43.7	1.0	-64.2	-13.0	-51.2	
1688.00	-22.3	H	3.0	43.6	1.0	-64.8	-13.0	-51.8	
2532.00	-22.5	H	3.0	43.4	1.0	-65.0	-13.0	-52.0	
3376.00	-21.1	H	3.0	43.7	1.0	-63.8	-13.0	-50.8	

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LTE
BAND 5
5MHz
QPSK

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

Company: Samsung
Project #: 4788494709
Date: 2018-07-03
Test Engineer: 51072
Configuration: EUT / Adapter / Cradle , Z-position
Location: Chamber 1
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	-23.8	V	3.0	43.6	1.0	-66.4	-13.0	-53.4	
2479.50	-20.7	V	3.0	43.4	1.0	-63.1	-13.0	-50.1	
3306.00	-21.3	V	3.0	43.6	1.0	-63.9	-13.0	-50.9	
1653.00	-21.1	H	3.0	43.6	1.0	-63.7	-13.0	-50.7	
2479.50	-22.4	H	3.0	43.4	1.0	-64.8	-13.0	-51.8	
3306.00	-20.9	H	3.0	43.6	1.0	-63.6	-13.0	-50.6	
Mid Ch, 836.5MHz									
1673.00	-22.8	V	3.0	43.6	1.0	-65.4	-13.0	-52.4	
2509.50	-22.1	V	3.0	43.4	1.0	-64.5	-13.0	-51.5	
3346.00	-21.3	V	3.0	43.6	1.0	-63.9	-13.0	-50.9	
1673.00	-21.8	H	3.0	43.6	1.0	-64.3	-13.0	-51.3	
2509.50	-22.6	H	3.0	43.4	1.0	-65.0	-13.0	-52.0	
3346.00	-20.8	H	3.0	43.6	1.0	-63.4	-13.0	-50.4	
High Ch, 846.5MHz									
1693.00	-23.7	V	3.0	43.6	1.0	-66.3	-13.0	-53.3	
2539.50	-22.6	V	3.0	43.4	1.0	-65.1	-13.0	-52.1	
3386.00	-21.7	V	3.0	43.7	1.0	-64.4	-13.0	-51.4	
1693.00	-22.7	H	3.0	43.6	1.0	-65.2	-13.0	-52.2	
2539.50	-22.2	H	3.0	43.4	1.0	-64.6	-13.0	-51.6	
3386.00	-21.3	H	3.0	43.7	1.0	-64.0	-13.0	-51.0	

LTE
BAND 5
5MHz
16QAM

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

Company: Samsung
Project #: 4788494709
Date: 2018-07-03
Test Engineer: 51072
Configuration: EUT / Adapter / Charger , Z-position
Location: Chamber 1
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	-21.8	V	3.0	43.6	1.0	-64.4	-13.0	-51.4	
2479.50	-22.5	V	3.0	43.4	1.0	-64.9	-13.0	-51.9	
3306.00	-21.2	V	3.0	43.6	1.0	-63.8	-13.0	-50.8	
1653.00	-22.5	H	3.0	43.6	1.0	-65.1	-13.0	-52.1	
2479.50	-22.5	H	3.0	43.4	1.0	-64.9	-13.0	-51.9	
3306.00	-20.6	H	3.0	43.6	1.0	-63.3	-13.0	-50.3	
Mid Ch, 836.5MHz									
1673.00	-25.9	V	3.0	43.6	1.0	-68.4	-13.0	-55.4	
2509.50	-22.6	V	3.0	43.4	1.0	-65.1	-13.0	-52.1	
3346.00	-21.4	V	3.0	43.6	1.0	-64.0	-13.0	-51.0	
1673.00	-22.4	H	3.0	43.6	1.0	-65.0	-13.0	-52.0	
2509.50	-22.5	H	3.0	43.4	1.0	-65.0	-13.0	-52.0	
3346.00	-20.9	H	3.0	43.6	1.0	-63.5	-13.0	-50.5	
High Ch, 846.5MHz									
1693.00	-23.3	V	3.0	43.6	1.0	-65.9	-13.0	-52.9	
2539.50	-22.5	V	3.0	43.4	1.0	-65.0	-13.0	-52.0	
3386.00	-21.8	V	3.0	43.7	1.0	-64.4	-13.0	-51.4	
1693.00	-21.8	H	3.0	43.6	1.0	-64.4	-13.0	-51.4	
2539.50	-22.6	H	3.0	43.4	1.0	-65.0	-13.0	-52.0	
3386.00	-21.4	H	3.0	43.7	1.0	-64.0	-13.0	-51.0	

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LTE
BAND 5
3MHz
QPSK

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

Company: Samsung
Project #: 4788494709
Date: 2018-07-03
Test Engineer: 45585
Configuration: EUT / Adapter / Cradle, Z-Position
Location: Chamber 1
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	-23.1	V	3.0	43.6	1.0	-65.7	-13.0	-52.7	
2476.50	-22.5	V	3.0	43.4	1.0	-64.9	-13.0	-51.9	
3302.00	-21.4	V	3.0	43.6	1.0	-64.1	-13.0	-51.1	
1651.00	-18.3	H	3.0	43.6	1.0	-60.9	-13.0	-47.9	
2476.50	-22.8	H	3.0	43.4	1.0	-65.2	-13.0	-52.2	
3302.00	-21.0	H	3.0	43.6	1.0	-63.6	-13.0	-50.6	
Mid Ch, 836.5MHz									
1673.00	-25.0	V	3.0	43.6	1.0	-67.6	-13.0	-54.6	
2509.50	-16.3	V	3.0	43.4	1.0	-58.7	-13.0	-45.7	
3346.00	-21.9	V	3.0	43.6	1.0	-64.6	-13.0	-51.6	
1673.00	-22.6	H	3.0	43.6	1.0	-65.1	-13.0	-52.1	
2509.50	-20.7	H	3.0	43.4	1.0	-63.1	-13.0	-50.1	
3346.00	-21.4	H	3.0	43.6	1.0	-64.1	-13.0	-51.1	
High Ch, 847.5MHz									
1695.00	-22.5	V	3.0	43.6	1.0	-65.1	-13.0	-52.1	
2542.50	-22.7	V	3.0	43.4	1.0	-65.1	-13.0	-52.1	
3390.00	-21.4	V	3.0	43.7	1.0	-64.0	-13.0	-51.0	
1695.00	-21.4	H	3.0	43.6	1.0	-63.9	-13.0	-50.9	
2542.50	-22.0	H	3.0	43.4	1.0	-64.4	-13.0	-51.4	
3390.00	-21.1	H	3.0	43.7	1.0	-63.7	-13.0	-50.7	

LTE
BAND 5
3MHz
16QAM

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

Company: Samsung
Project #: 4788494709
Date: 2018-07-03
Test Engineer: 45585
Configuration: EUT / Adapter / Cradle, Z-Position
Location: Chamber 1
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	-24.6	V	3.0	43.6	1.0	-67.2	-13.0	-54.2	
2476.50	-22.7	V	3.0	43.4	1.0	-65.1	-13.0	-52.1	
3302.00	-21.5	V	3.0	43.6	1.0	-64.2	-13.0	-51.2	
1651.00	-19.2	H	3.0	43.6	1.0	-61.8	-13.0	-48.8	
2476.50	-22.9	H	3.0	43.4	1.0	-65.4	-13.0	-52.4	
3302.00	-20.9	H	3.0	43.6	1.0	-63.5	-13.0	-50.5	
Mid Ch, 836.5MHz									
1673.00	-25.0	V	3.0	43.6	1.0	-67.6	-13.0	-54.6	
2509.50	-15.9	V	3.0	43.4	1.0	-58.3	-13.0	-45.3	
3346.00	-21.7	V	3.0	43.6	1.0	-64.3	-13.0	-51.3	
1673.00	-23.1	H	3.0	43.6	1.0	-65.6	-13.0	-52.6	
2509.50	-21.3	H	3.0	43.4	1.0	-63.7	-13.0	-50.7	
3346.00	-21.3	H	3.0	43.6	1.0	-63.9	-13.0	-50.9	
High Ch, 847.5MHz									
1695.00	-23.1	V	3.0	43.6	1.0	-65.7	-13.0	-52.7	
2542.50	-22.2	V	3.0	43.4	1.0	-64.7	-13.0	-51.7	
3390.00	-21.2	V	3.0	43.7	1.0	-63.9	-13.0	-50.9	
1695.00	-22.0	H	3.0	43.6	1.0	-64.5	-13.0	-51.5	
2542.50	-21.6	H	3.0	43.4	1.0	-64.0	-13.0	-51.0	
3390.00	-20.6	H	3.0	43.7	1.0	-63.3	-13.0	-50.3	

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LTE

BAND 5

1.4MHz

QPSK

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

Company: Samsung
Project #: 4788494709
Date: 2018-07-03
Test Engineer: 45585
Configuration: EUT / Adapter / Cradle, Z-Position
Location: Chamber 1
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	-16.7	V	3.0	43.6	1.0	-59.3	-13.0	-46.3	
2474.10	-22.1	V	3.0	43.4	1.0	-64.5	-13.0	-51.5	
3298.80	-20.9	V	3.0	43.6	1.0	-63.5	-13.0	-50.5	
1649.40	-15.0	H	3.0	43.6	1.0	-57.6	-13.0	-44.6	
2474.10	-22.3	H	3.0	43.4	1.0	-64.7	-13.0	-51.7	
3298.80	-20.6	H	3.0	43.6	1.0	-63.2	-13.0	-50.2	
Mid Ch, 836.5MHz									
1673.00	-23.3	V	3.0	43.6	1.0	-65.9	-13.0	-52.9	
2509.50	-22.5	V	3.0	43.4	1.0	-64.9	-13.0	-51.9	
3346.00	-21.2	V	3.0	43.6	1.0	-63.9	-13.0	-50.9	
1673.00	-22.4	H	3.0	43.6	1.0	-65.0	-13.0	-52.0	
2509.50	-22.1	H	3.0	43.4	1.0	-64.6	-13.0	-51.6	
3346.00	-20.8	H	3.0	43.6	1.0	-63.5	-13.0	-50.5	
High Ch, 848.3MHz									
1696.60	-22.7	V	3.0	43.6	1.0	-65.3	-13.0	-52.3	
2544.90	-22.4	V	3.0	43.4	1.0	-64.8	-13.0	-51.8	
3393.20	-21.5	V	3.0	43.7	1.0	-64.2	-13.0	-51.2	
1696.60	-17.2	H	3.0	43.6	1.0	-59.7	-13.0	-46.7	
2544.90	-22.5	H	3.0	43.4	1.0	-64.9	-13.0	-51.9	
3393.20	-21.3	H	3.0	43.7	1.0	-64.0	-13.0	-51.0	

LTE

BAND 5

1.4MHz

16QAM

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

Company: Samsung
Project #: 4788494709
Date: 2018-07-03
Test Engineer: 45585
Configuration: EUT / Adapter / Cradle, Z-Position
Location: Chamber 1
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	-22.2	V	3.0	43.6	1.0	-64.8	-13.0	-51.8	
2474.10	-22.6	V	3.0	43.4	1.0	-65.0	-13.0	-52.0	
3298.80	-21.1	V	3.0	43.6	1.0	-63.7	-13.0	-50.7	
1649.40	-19.9	H	3.0	43.6	1.0	-62.5	-13.0	-49.5	
2474.10	-22.4	H	3.0	43.4	1.0	-64.8	-13.0	-51.8	
3298.80	-20.5	H	3.0	43.6	1.0	-63.2	-13.0	-50.2	
Mid Ch, 836.5MHz									
1673.00	-24.1	V	3.0	43.6	1.0	-66.7	-13.0	-53.7	
2509.50	-22.7	V	3.0	43.4	1.0	-65.1	-13.0	-52.1	
3346.00	-21.4	V	3.0	43.6	1.0	-64.1	-13.0	-51.1	
1673.00	-21.9	H	3.0	43.6	1.0	-64.5	-13.0	-51.5	
2509.50	-22.6	H	3.0	43.4	1.0	-65.1	-13.0	-52.1	
3346.00	-20.9	H	3.0	43.6	1.0	-63.5	-13.0	-50.5	
High Ch, 848.3MHz									
1696.60	-21.6	V	3.0	43.6	1.0	-64.2	-13.0	-51.2	
2544.90	-22.6	V	3.0	43.4	1.0	-65.0	-13.0	-52.0	
3393.20	-21.7	V	3.0	43.7	1.0	-64.4	-13.0	-51.4	
1696.60	-20.6	H	3.0	43.6	1.0	-63.2	-13.0	-50.2	
2544.90	-22.5	H	3.0	43.4	1.0	-64.9	-13.0	-51.9	
3393.20	-21.3	H	3.0	43.7	1.0	-63.9	-13.0	-50.9	

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