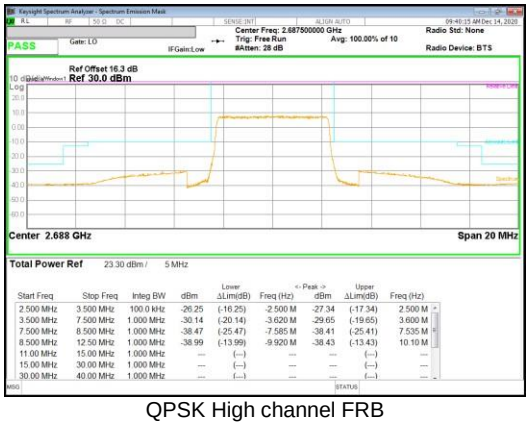
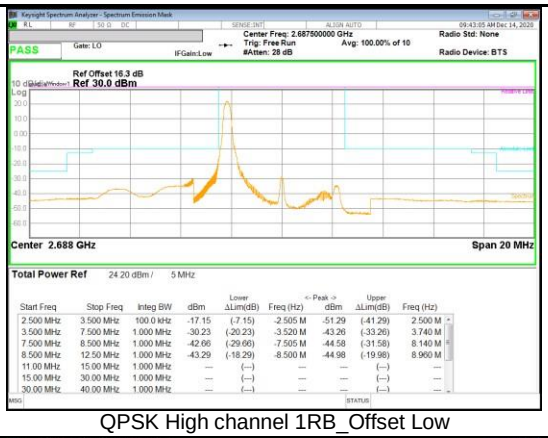
Band 41

5MHz

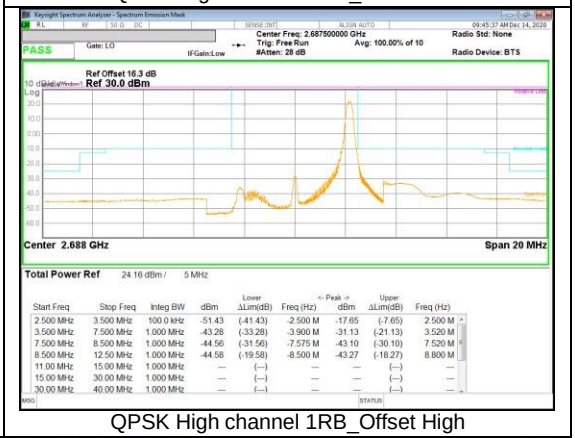
QPSK



QPSK High channel FRB



QPSK High channel 1RB_Offset Low

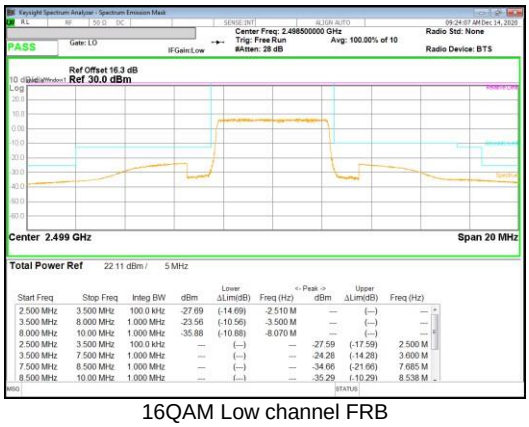


QPSK High channel 1RB_Offset High

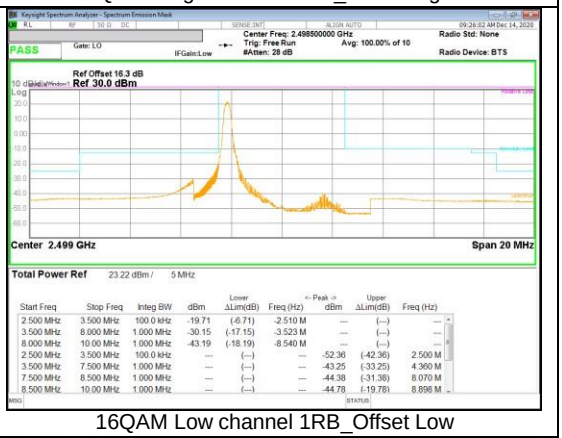
Band 41

5MHz

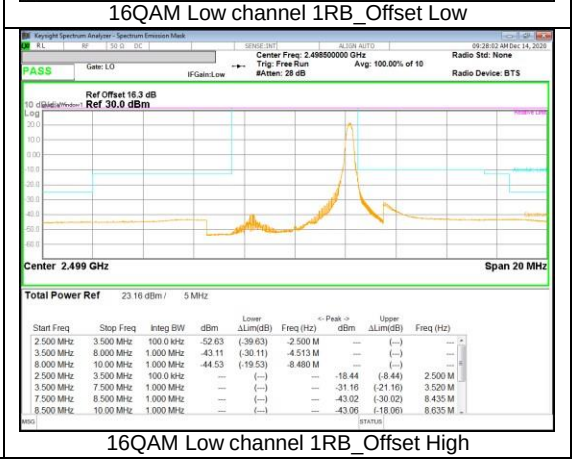
16QAM



16QAM Low channel FRB



16QAM Low channel 1RB_Offset Low



16QAM Low channel 1RB_Offset High

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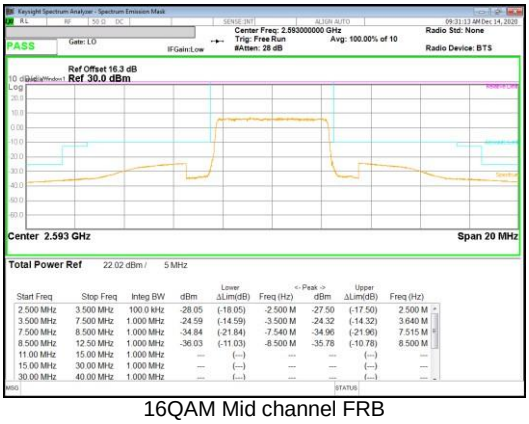
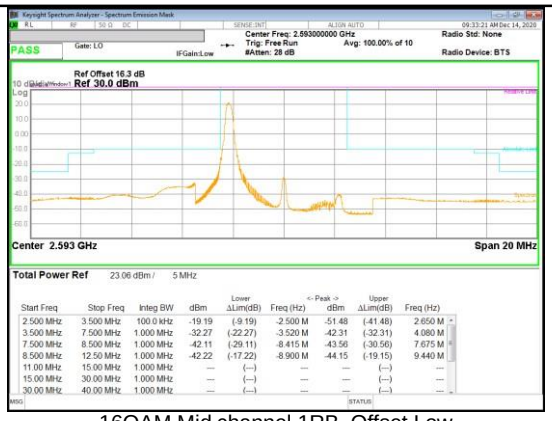
Band 41

5MHz

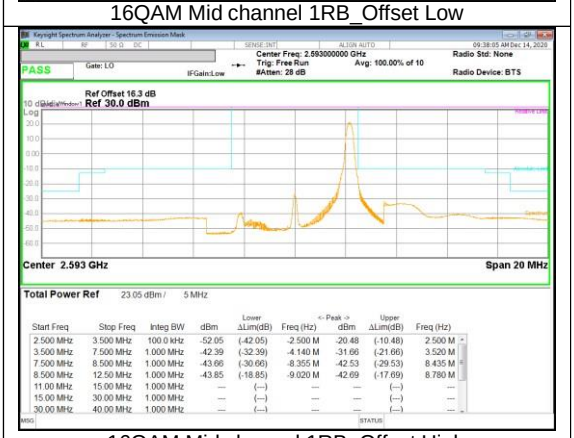
16QAM



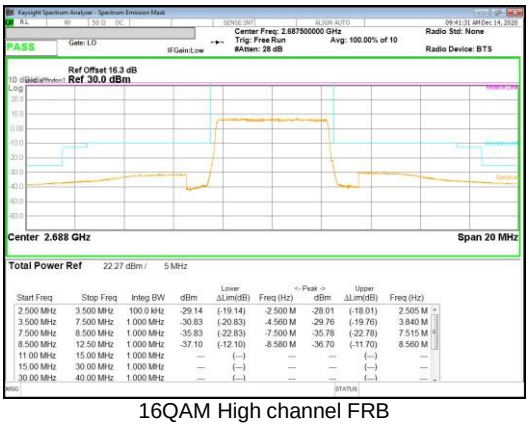
16QAM Mid channel FRB



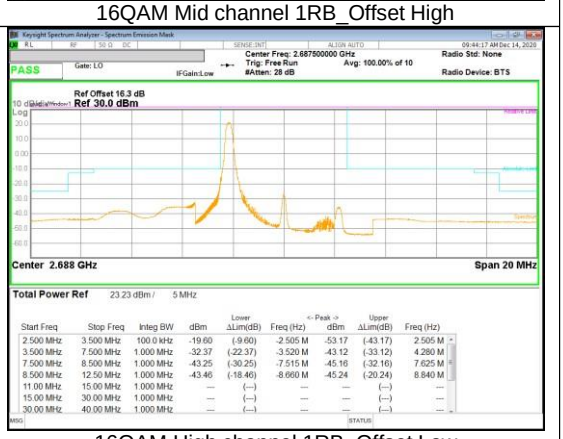
16QAM Mid channel 1RB_Offset Low



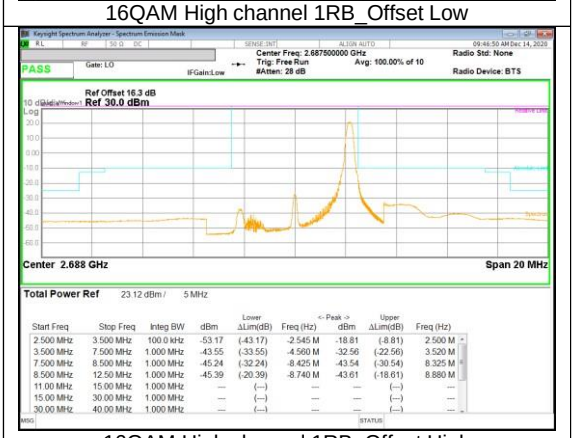
16QAM Mid channel 1RB_Offset High



16QAM High channel FRB



16QAM High channel 1RB_Offset Low



16QAM High channel 1RB_Offset High

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9.3. OUT OF BAND EMISSIONS

RULE PART(S)

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

LIMITS

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

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

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

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

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

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TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01
The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

a) Set the RBW = 100kHz for emission below 1GHz and 1MHz for emissions above 1GHz (Tests were performed 1MHz [Worst case], to sweep 1 time for all frequency range)

b) Set VBW ≥ 3 × RBW;

c) Set span ≥ 1.5 times the OBW;

d) Sweep time = auto couple;

e) Detector = RMS;

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

g) Trace mode = Average(WCDMA, LTE FDD), Max hold(GSM, LTE TDD);

RESULTS

See the following pages.

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

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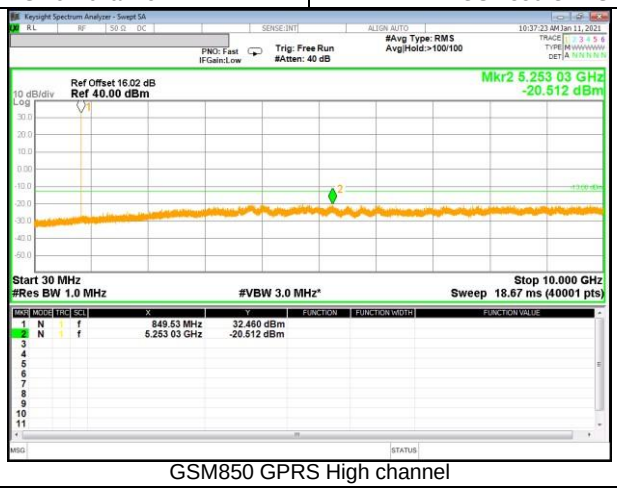
9.3.1. OUT OF BAND EMISSIONS RESULT

GSM 850

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

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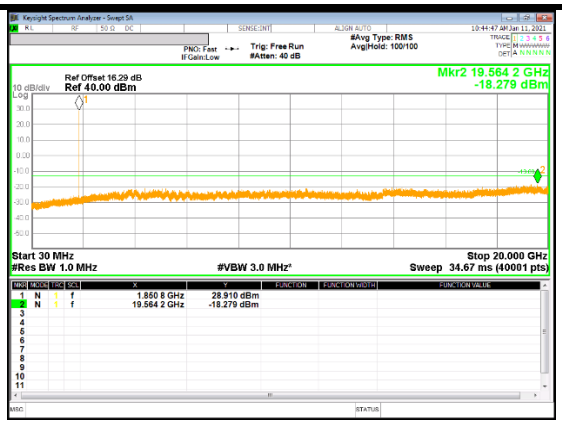
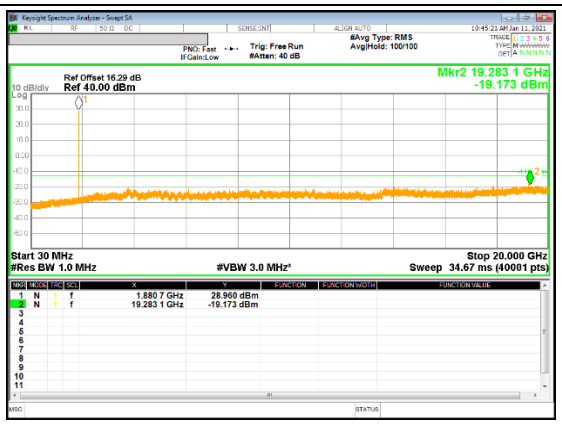
GSM 1900

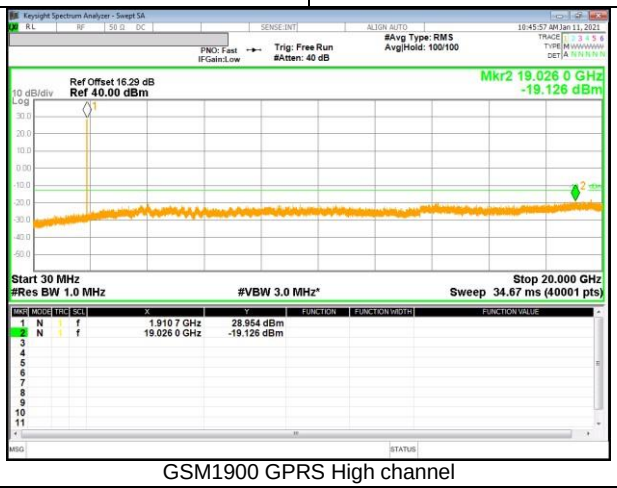
GSM 1900



GSM1900 GPRS Low channel



GSM1900 GPRS Mid channel



GSM1900 GPRS High channel

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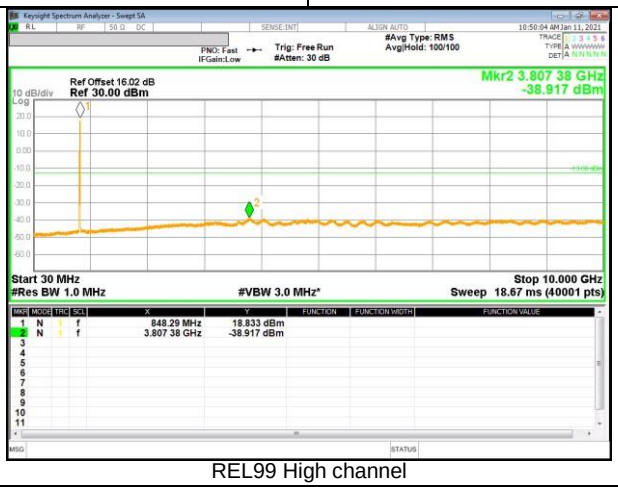
WCDMA Band 5

Band 5

REL99 Low channel

REL99 Mid channel



REL99 High channel

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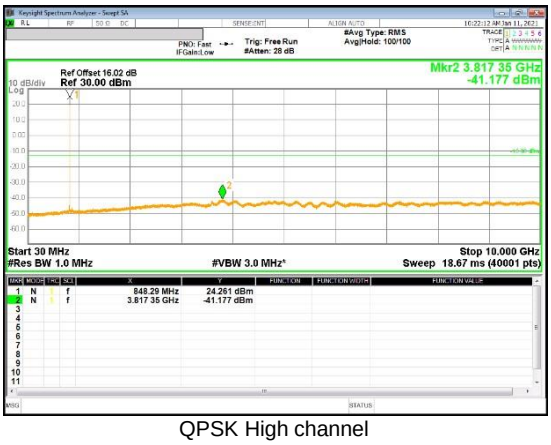
LTE Band 5

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

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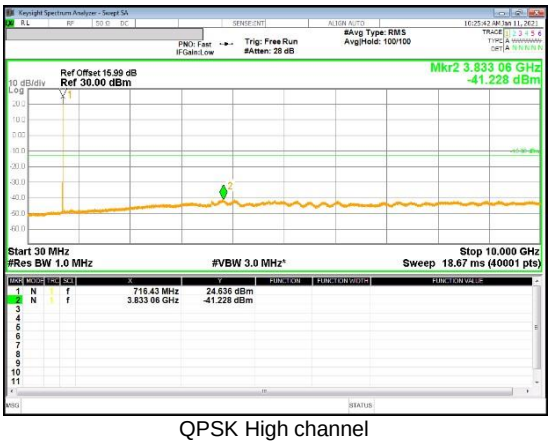
LTE Band 12

Band 12 5MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

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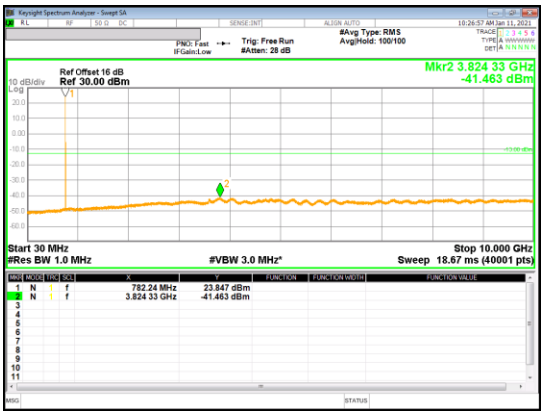
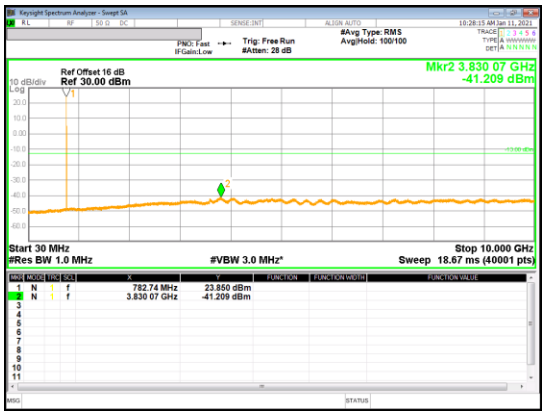
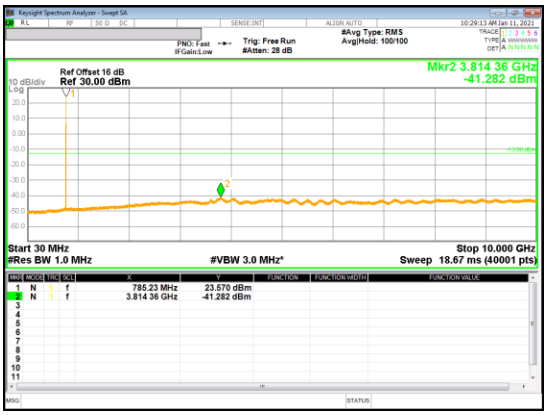
LTE Band 13

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

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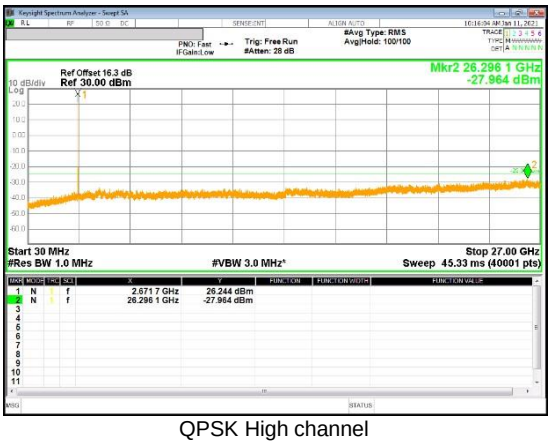
LTE Band 41

Band 41 20MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

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9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235,§27.54

LIMITS

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

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

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

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

RESULTS

See the following pages.

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

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9.4.1. FREQUENCY STABILITY RESULTS

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

Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2060.500	Hz	High Channel	2122.000	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	50	824.20003913	0.011	848.80003755	0.002	2.5
3.88	40	824.20003548	0.015	848.80003332	0.007	2.5
3.88	30	824.20003513	0.016	848.80003451	0.005	2.5
3.88	***20***	***824.20004798***	***0.000***	***848.80003887***	***0.000***	***2.5***
3.88	10	824.20004759	0.000	848.80004326	-0.005	2.5
3.88	0	824.20004333	0.006	848.80003516	0.004	2.5
3.88	-10	824.20004284	0.006	848.80003661	0.003	2.5
3.88	-20	824.20004339	0.006	848.80003861	0.000	2.5
3.88	-30	824.20005606	-0.010	848.80005560	-0.020	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]	
3.88	***20***	***824.20004798***	***0***	***848.80003887***	***0***	***2.5***
4.40	20	824.20003468	0.016	848.80003629	0.003	2.5
3.65	20	824.20003426	0.017	848.80003577	0.004	2.5

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

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.0759	1909.9262		
Extreme (50C)		1850.0760	1909.9262	62.9	0.033
Extreme (40C)		1850.0760	1909.9262	48.1	0.026
Extreme (30C)		1850.0760	1909.9262	46.9	0.025
Extreme (10C)		1850.0760	1909.9262	60.4	0.032
Extreme (0C)		1850.0760	1909.9262	53.0	0.028
Extreme (-10C)		1850.0760	1909.9262	53.6	0.028
Extreme (-20C)		1850.0760	1909.9262	56.7	0.030
Extreme (-30C)		1850.0760	1909.9262	80.9	0.043
20C	15%	1850.0760	1909.9262	38.2	0.020
	-15%	1850.0760	1909.9262	36.8	0.020
	End Point	1850.0760	1909.9262	35.9	0.019

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WCDMA Band 5

Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2066.000	Hz	High Channel	2116.500	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	50	826.40003035	-0.027	846.60002162	-0.019	2.5
3.88	40	826.40000668	0.001	846.60000570	-0.001	2.5
3.88	30	826.40000268	0.006	846.60000472	0.001	2.5
3.88	***20***	***826.40000781***	***0.000***	***846.60000518***	***0.000***	***2.5***
3.88	10	826.40000851	-0.001	846.60000739	-0.003	2.5
3.88	0	826.40000888	-0.001	846.60001104	-0.007	2.5
3.88	-10	826.40001174	-0.005	846.60001040	-0.006	2.5
3.88	-20	826.40003237	-0.030	846.60000844	-0.004	2.5
3.88	-30	826.40003560	-0.034	846.60000946	-0.005	2.5

Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2066.000	Hz	High Channel	2116.500	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	***20***	**826.40000781**	***0***	**846.60000518**	***0***	***2.5***
4.40	20	826.40000369	0.005	846.60000311	0.002	2.5
3.65	20	826.40000230	0.007	846.60000339	0.002	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				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	50	824.70004459	-0.041	848.30003287	-0.008	2.5
3.85	40	824.70003563	-0.030	848.30002257	0.004	2.5
3.85	30	824.70002714	-0.019	848.30002096	0.006	2.5
3.85	***20***	***824.70001109***	***0.000***	***848.30002568***	***0.000***	***2.5***
3.85	10	824.70001250	-0.002	848.30002159	0.005	2.5
3.85	0	824.70001459	-0.004	848.30002260	0.004	2.5
3.85	-10	824.70002511	-0.017	848.30002458	0.001	2.5
3.85	-20	824.70004239	-0.038	848.30004034	-0.017	2.5
3.85	-30	824.70004090	-0.036	848.30004353	-0.021	2.5

Reference Frequency : LTE Band 5 Low Channel 824.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2061.750	Hz	High Channel	2120.750	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	***20***	**824.70001109**	***0***	**848.30002568**	***0***	***2.5***
4.40	20	824.70003207	-0.025	848.30002435	0.002	2.5
3.65	20	824.70002237	-0.014	848.30003171	-0.007	2.5

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

Limit		699	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	699.1556	715.8447		
Extreme (50C)		699.1556	715.8447	9.8	0.014
Extreme (40C)		699.1556	715.8447	7.2	0.010
Extreme (30C)		699.1556	715.8447	8.3	0.012
Extreme (10C)		699.1556	715.8447	11.9	0.017
Extreme (0C)		699.1556	715.8447	18.4	0.026
Extreme (-10C)		699.1556	715.8447	27.4	0.039
Extreme (-20C)		699.1556	715.8447	22.3	0.031
Extreme (-30C)		699.1556	715.8447	41.7	0.059
20C	15%	699.1556	715.8447	24.3	0.034
	-15%	699.1556	715.8447	25.4	0.036
	End Point	699.1556	715.8447	24.5	0.035

LTE Band 13 (Lowest Frequency:16QAM / Highest Frequency: QPSK)

Limit		777	787	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	777.2614	786.7495		
Extreme (50C)		777.2614	786.7495	20.4	0.026
Extreme (40C)		777.2614	786.7495	10.0	0.013
Extreme (30C)		777.2614	786.7495	6.6	0.008
Extreme (10C)		777.2614	786.7495	9.7	0.012
Extreme (0C)		777.2614	786.7495	12.6	0.016
Extreme (-10C)		777.2614	786.7495	14.5	0.019
Extreme (-20C)		777.2614	786.7495	11.1	0.014
Extreme (-30C)		777.2614	786.7495	24.0	0.031
20C	15%	777.2614	786.7495	7.8	0.010
	-15%	777.2614	786.7495	8.8	0.011
	End Point	777.2614	786.7495	8.9	0.011

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LTE Band 41 (Lowest Frequency:QPSK / Highest Frequency: QPSK)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2494.0082	2691.9911		
Extreme (50C)		2494.0083	2691.9912	57.5	0.022
Extreme (40C)		2494.0082	2691.9911	20.3	0.008
Extreme (30C)		2494.0082	2691.9911	21.6	0.008
Extreme (10C)		2494.0082	2691.9911	48.7	0.019
Extreme (0C)		2494.0083	2691.9912	51.1	0.020
Extreme (-10C)		2494.0082	2691.9911	36.4	0.014
Extreme (-20C)		2494.0082	2691.9911	32.5	0.013
Extreme (-30C)		2494.0082	2691.9911	34.4	0.013
20C	15%	2494.0083	2691.9912	78.5	0.030
	-15%	2494.0082	2691.9912	80.1	0.031
	End Point	2494.0082	2691.9912	79.8	0.031

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9.5. RADIATED POWER (ERP & EIRP)

RULE PART(S)

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

LIMITS

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

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

27.50:

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

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

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

TEST PROCEDURE

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

For radiated output power measurement with a ESU40:

a) Set the RBW ≥ OBW;

b) Set VBW ≥ 3 × RBW;

c) Set span ≥ 2 x RBW;

d) Sweep time = auto couple;

e) Detector = rms;

f) Ensure that the number of measurement points ≥ span/RBW;

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

TEST RESULTS

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9.5.1. ERP/EIRP Results

GSM

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
GSM850	GPRS	128	824.2	28.88	772.68
		190	836.6	**29.51**	**893.31**
		251	848.8	28.64	731.14
	EGPRS	128	824.2	23.56	226.99
		190	836.6	**24.02**	252.35
		251	848.8	23.62	230.14
GSM1900	GPRS	512	1850.2	**30.26**	**1061.70**
		661	1880	30.02	1004.62
		810	1909.8	28.98	790.68
	EGPRS	512	1850.2	**26.91**	490.91
		661	1880	26.09	406.44
		810	1909.8	25.89	388.15

WCDMA

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
Band 5	REL99	4132	826.4	20.33	107.89
		4183	836.6	**20.93**	**123.88**
		4233	846.6	20.31	107.40
	HSDPA	4132	826.4	17.94	62.23
		4183	836.6	**18.51**	70.96
		4233	846.6	17.95	62.37

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LTE_Band 5

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 5	10	QPSK	1/49	829.0	21.83	152.41
			1/49	836.5	**21.97**	157.40
			1/49	844.0	21.70	147.91
		16QAM	1/49	829.0	**20.90**	123.03
			1/49	836.5	20.79	119.95
			1/49	844.0	20.33	107.89
	5	QPSK	1/24	826.5	21.57	143.55
			1/12	836.5	**22.12**	162.93
			1/12	846.5	21.02	126.47
		16QAM	1/24	826.5	20.46	111.17
			1/24	836.5	**21.25**	133.35
			1/12	846.5	20.09	102.09
	3	QPSK	1/0	825.5	21.35	136.46
			1/14	836.5	**22.27**	168.66
			1/8	847.5	21.10	128.82
		16QAM	1/0	825.5	20.25	105.93
			1/14	836.5	**21.24**	133.05
			1/8	847.5	20.07	101.62
	1.4	QPSK	1/5	824.7	21.33	135.83
			1/5	836.5	**22.31**	**170.22**
			1/5	848.3	21.27	133.97
		16QAM	1/5	824.7	20.24	105.71
			1/5	836.5	**21.12**	129.42
			1/5	848.3	20.08	101.86

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LTE_Band 12

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 12	10	QPSK	1/49	704.0	17.67	58.48
			1/49	707.5	**18.16**	65.46
			1/49	711.0	17.98	62.81
		16QAM	1/49	704.0	16.63	46.03
			1/49	707.5	16.90	48.98
			1/0	711.0	**16.92**	49.20
	5	QPSK	1/24	701.5	16.99	50.00
			1/12	707.5	18.71	74.30
			1/24	713.5	**19.18**	**82.79**
		16QAM	1/24	701.5	16.08	40.55
			1/24	707.5	17.06	50.82
			1/12	713.5	**17.56**	57.02
	3	QPSK	1/0	700.5	17.42	55.21
			1/14	707.5	18.03	63.53
			1/14	714.5	**18.21**	66.22
		16QAM	1/0	700.5	16.21	41.78
			1/14	707.5	16.78	47.64
			1/0	714.5	**17.18**	52.24
	1.4	QPSK	1/3	699.7	17.27	53.33
			1/5	707.5	18.05	63.83
			1/3	715.3	**18.37**	68.71
		16QAM	1/3	699.7	16.06	40.36
			1/5	707.5	16.95	49.55
			1/3	715.3	**17.52**	56.49

LTE_Band 13

Band	BW [MHz]	Mode	RB size / RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 13	10	QPSK	1/0	782.0	**20.71**	117.76
		16QAM	1/0	782.0	19.58	90.78
	5	QPSK	1/24	779.5	20.43	110.41
			1/12	782.0	20.52	112.72
			1/12	784.5	**20.82**	**120.78**
		16QAM	1/12	779.5	19.53	89.74
			1/0	782.0	19.51	89.33
			1/24	784.5	**19.87**	97.05

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LTE Band 41

Band	BW [MHz]	Mode	RB Size/ RB Offset	f [MHz]	ERP / EIRP [dBm]	ERP / EIRP [mW]
Band 41	20	QPSK	1/0	2506.0	21.72	148.59
			1/0	2593.0	22.45	175.79
			1/0	2680.0	**22.80**	**190.55**
		16QAM	1/49	2506.0	20.35	108.39
			1/49	2593.0	21.65	146.22
			1/49	2680.0	**22.71**	**186.64**
	15	QPSK	1/0	2503.5	21.32	135.52
			1/37	2593.0	22.18	165.20
			1/37	2682.5	**23.66**	**232.27**
		16QAM	1/0	2503.5	21.06	127.64
			1/37	2593.0	21.82	152.05
			1/37	2682.5	**23.58**	**228.03**
	10	QPSK	1/25	2501.0	21.31	135.21
			1/25	2593.0	22.36	172.19
			1/25	2685.0	**23.52**	**224.91**
		16QAM	1/0	2501.0	21.19	131.52
			1/25	2593.0	21.95	156.68
			1/25	2685.0	**23.10**	**204.17**
	5	QPSK	1/0	2498.5	21.46	139.96
			1/24	2593.0	22.42	174.58
			1/12	2687.5	**23.62**	**230.14**
		16QAM	1/0	2498.5	21.25	133.35
			1/0	2593.0	22.21	166.34
			1/12	2687.5	**23.11**	**204.64**

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9.5.2. ERP/EIRP DATA

GSM850

GSM850

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20896
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: GPRS 850 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.20	32.87	V	3.0	-1.0	28.88	38.5	-9.6	
824.20	21.86	H	3.0	-1.0	17.86	38.5	-20.6	
Mid Ch								
836.60	33.48	V	3.1	-0.9	29.51	38.5	-9.0	
836.60	22.73	H	3.1	-0.9	18.77	38.5	-19.7	
High Ch								
848.80	32.58	V	3.1	-0.9	28.64	38.5	-9.9	
848.80	22.38	H	3.1	-0.9	18.44	38.5	-20.1	

GSM850

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20896
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: EGPRS 850 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.20	27.55	V	3.0	-1.0	23.56	38.5	-14.9	
824.20	15.74	H	3.0	-1.0	11.74	38.5	-26.8	
Mid Ch								
836.60	27.99	V	3.1	-0.9	24.02	38.5	-14.5	
836.60	17.59	H	3.1	-0.9	13.63	38.5	-24.9	
High Ch								
848.80	27.56	V	3.1	-0.9	23.62	38.5	-14.9	
848.80	17.68	H	3.1	-0.9	13.74	38.5	-24.8	

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GSM1900

GSM1900

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: GPRS 1900 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	21.35	V	4.5	9.6	26.42	33.0	-6.6	
1850.20	25.19	H	4.5	9.6	30.26	33.0	-2.7	
Mid Ch								
1880.00	21.66	V	4.6	9.4	26.47	33.0	-6.5	
1880.00	25.21	H	4.6	9.4	30.02	33.0	-3.0	
High Ch								
1909.80	22.19	V	4.6	9.1	26.71	33.0	-6.3	
1909.80	24.46	H	4.6	9.1	28.98	33.0	-4.0	

GSM1900

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: EGPRS 1900 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	18.83	V	4.5	9.6	23.90	33.0	-9.1	
1850.20	21.84	H	4.5	9.6	26.91	33.0	-6.1	
Mid Ch								
1880.00	18.80	V	4.6	9.4	23.61	33.0	-9.4	
1880.00	21.28	H	4.6	9.4	26.09	33.0	-6.9	
High Ch								
1909.80	19.45	V	4.6	9.1	23.97	33.0	-9.0	
1909.80	21.37	H	4.6	9.1	25.89	33.0	-7.1	

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WCDMA Band 5

WCDMA

Band 5
REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: Rel99 Band 5 Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.40	24.32	V	3.0	-0.9	20.33	38.5	-18.2	
826.40	13.17	H	3.0	-0.9	9.18	38.5	-29.3	
Mid Ch								
836.60	24.90	V	3.1	-0.9	20.93	38.5	-17.6	
836.60	13.93	H	3.1	-0.9	9.97	38.5	-28.5	
High Ch								
846.60	24.26	V	3.1	-0.9	20.31	38.5	-18.2	
846.60	13.69	H	3.1	-0.9	9.74	38.5	-28.8	

WCDMA

Band 5
HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: HSDPA Band 5 Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.40	21.93	V	3.0	-0.9	17.94	38.5	-20.6	
826.40	11.33	H	3.0	-0.9	7.34	38.5	-31.2	
Mid Ch								
836.60	22.48	V	3.1	-0.9	18.51	38.5	-20.0	
836.60	9.78	H	3.1	-0.9	5.82	38.5	-32.7	
High Ch								
846.60	21.90	V	3.1	-0.9	17.95	38.5	-20.6	
846.60	8.73	H	3.1	-0.9	4.78	38.5	-33.7	

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LTE Band 5

LTE Band 5 10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	25.81	V	3.1	-0.9	21.83	38.5	-16.7	
829.00	14.69	H	3.1	-0.9	10.70	38.5	-27.8	
Mid Ch								
836.50	25.94	V	3.1	-0.9	21.97	38.5	-16.5	
836.50	14.85	H	3.1	-0.9	10.88	38.5	-27.6	
High Ch								
844.00	25.65	V	3.1	-0.9	21.70	38.5	-16.8	
844.00	13.82	H	3.1	-0.9	9.87	38.5	-28.6	

LTE Band 5 10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	24.88	V	3.1	-0.9	20.90	38.5	-17.6	
829.00	13.81	H	3.1	-0.9	9.82	38.5	-28.7	
Mid Ch								
836.50	24.76	V	3.1	-0.9	20.79	38.5	-17.7	
836.50	13.82	H	3.1	-0.9	9.85	38.5	-28.7	
High Ch								
844.00	24.28	V	3.1	-0.9	20.33	38.5	-18.2	
844.00	12.74	H	3.1	-0.9	8.79	38.5	-29.7	

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LTE
Band 5
5MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	25.56	V	3.0	-0.9	21.57	38.5	-16.9	
826.50	14.73	H	3.0	-0.9	10.73	38.5	-27.8	
Mid Ch								
836.50	26.09	V	3.1	-0.9	22.12	38.5	-16.4	
836.50	15.36	H	3.1	-0.9	11.39	38.5	-27.1	
High Ch								
846.50	24.96	V	3.1	-0.9	21.02	38.5	-17.5	
846.50	14.47	H	3.1	-0.9	10.52	38.5	-28.0	

LTE
Band 5
5MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	24.45	V	3.0	-0.9	20.46	38.5	-18.0	
826.50	13.77	H	3.0	-0.9	9.77	38.5	-28.7	
Mid Ch								
836.50	25.22	V	3.1	-0.9	21.25	38.5	-17.2	
836.50	14.33	H	3.1	-0.9	10.36	38.5	-28.1	
High Ch								
846.50	24.03	V	3.1	-0.9	20.09	38.5	-18.4	
846.50	13.85	H	3.1	-0.9	9.90	38.5	-28.6	

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LTE
Band 5
3MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
825.50	25.34	V	3.0	-0.9	21.35	38.5	-17.1	
825.50	14.43	H	3.0	-0.9	10.44	38.5	-28.1	
Mid Ch								
836.50	26.24	V	3.1	-0.9	22.27	38.5	-16.2	
836.50	15.09	H	3.1	-0.9	11.12	38.5	-27.4	
High Ch								
847.50	25.04	V	3.1	-0.9	21.10	38.5	-17.4	
847.50	13.71	H	3.1	-0.9	9.77	38.5	-28.7	

LTE
Band 5
3MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
825.50	24.24	V	3.0	-0.9	20.25	38.5	-18.2	
825.50	13.44	H	3.0	-0.9	9.45	38.5	-29.0	
Mid Ch								
836.50	25.21	V	3.1	-0.9	21.24	38.5	-17.3	
836.50	14.42	H	3.1	-0.9	10.45	38.5	-28.1	
High Ch								
847.50	24.01	V	3.1	-0.9	20.07	38.5	-18.4	
847.50	12.56	H	3.1	-0.9	8.62	38.5	-29.9	

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LTE
Band 5
1.4MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.70	25.32	V	3.0	-1.0	21.33	38.5	-17.2	
824.70	14.52	H	3.0	-1.0	10.52	38.5	-28.0	
Mid Ch								
836.50	26.28	V	3.1	-0.9	22.31	38.5	-16.2	
836.50	15.35	H	3.1	-0.9	11.38	38.5	-27.1	
High Ch								
848.30	25.21	V	3.1	-0.9	21.27	38.5	-17.2	
848.30	13.69	H	3.1	-0.9	9.75	38.5	-28.8	

LTE
Band 5
1.4MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2020-01-08
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.70	24.23	V	3.0	-1.0	20.24	38.5	-18.3	
824.70	13.35	H	3.0	-1.0	9.35	38.5	-29.1	
Mid Ch								
836.50	25.09	V	3.1	-0.9	21.12	38.5	-17.4	
836.50	14.12	H	3.1	-0.9	10.15	38.5	-28.4	
High Ch								
848.30	24.02	V	3.1	-0.9	20.08	38.5	-18.4	
848.30	12.29	H	3.1	-0.9	8.35	38.5	-30.2	

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LTE Band 12

LTE

Band 12

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
704.00	21.54	V	2.8	-1.1	17.67	34.8	-17.1	
704.00	4.40	H	2.8	-1.1	0.53	34.8	-34.2	
Mid Ch								
707.50	22.03	V	2.8	-1.1	18.16	34.8	-16.6	
707.50	4.69	H	2.8	-1.1	0.82	34.8	-34.0	
High Ch								
711.00	21.86	V	2.8	-1.1	17.98	34.8	-16.8	
711.00	6.29	H	2.8	-1.1	2.41	34.8	-32.4	

LTE

Band 12

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
704.00	20.50	V	2.8	-1.1	16.63	34.8	-18.1	
704.00	3.43	H	2.8	-1.1	-0.44	34.8	-35.2	
Mid Ch								
707.50	20.77	V	2.8	-1.1	16.90	34.8	-17.9	
707.50	3.58	H	2.8	-1.1	-0.29	34.8	-35.1	
High Ch								
711.00	20.80	V	2.8	-1.1	16.92	34.8	-17.9	
711.00	5.50	H	2.8	-1.1	1.62	34.8	-33.1	

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LTE
Band 12
5MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
701.50	20.85	V	2.8	-1.1	16.99	34.8	-17.8	
701.50	2.95	H	2.8	-1.1	-0.91	34.8	-35.7	
Mid Ch								
707.50	22.58	V	2.8	-1.1	18.71	34.8	-16.1	
707.50	4.96	H	2.8	-1.1	1.09	34.8	-33.7	
High Ch								
713.50	23.06	V	2.8	-1.1	19.18	34.8	-15.6	
713.50	6.70	H	2.8	-1.1	2.81	34.8	-32.0	

LTE
Band 12
5MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20882
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
701.50	19.94	V	2.8	-1.1	16.08	34.8	-18.7	
701.50	2.10	H	2.8	-1.1	-1.76	34.8	-36.5	
Mid Ch								
707.50	20.93	V	2.8	-1.1	17.06	34.8	-17.7	
707.50	4.80	H	2.8	-1.1	0.93	34.8	-33.8	
High Ch								
713.50	21.44	V	2.8	-1.1	17.56	34.8	-17.2	
713.50	4.15	H	2.8	-1.1	0.26	34.8	-34.5	

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LTE
Band 12
3MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
700.50	21.27	V	2.8	-1.1	17.42	34.8	-17.4	
700.50	3.36	H	2.8	-1.1	-0.49	34.8	-35.3	
Mid Ch								
707.50	21.90	V	2.8	-1.1	18.03	34.8	-16.7	
707.50	4.42	H	2.8	-1.1	0.55	34.8	-34.2	
High Ch								
714.50	22.10	V	2.8	-1.1	18.21	34.8	-16.6	
714.50	4.13	H	2.8	-1.1	0.24	34.8	-34.5	

LTE
Band 12
3MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 3MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
700.50	20.06	V	2.8	-1.1	16.21	34.8	-18.6	
700.50	2.15	H	2.8	-1.1	-1.70	34.8	-36.5	
Mid Ch								
707.50	20.65	V	2.8	-1.1	16.78	34.8	-18.0	
707.50	3.19	H	2.8	-1.1	-0.68	34.8	-35.5	
High Ch								
714.50	21.07	V	2.8	-1.1	17.18	34.8	-17.6	
714.50	3.50	H	2.8	-1.1	-0.39	34.8	-35.2	

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LTE
Band 12
1.4MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 12 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
699.70	21.13	V	2.8	-1.1	17.27	34.8	-17.5	
699.70	2.91	H	2.8	-1.1	-0.95	34.8	-35.7	
Mid Ch								
707.50	21.92	V	2.8	-1.1	18.05	34.8	-16.7	
707.50	6.56	H	2.8	-1.1	2.69	34.8	-32.1	
High Ch								
715.30	22.26	V	2.8	-1.1	18.37	34.8	-16.4	
715.30	6.05	H	2.8	-1.1	2.16	34.8	-32.6	

LTE
Band 12
1.4MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20890
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 12 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
699.70	19.92	V	2.8	-1.1	16.06	34.8	-18.7	
699.70	1.76	H	2.8	-1.1	-2.10	34.8	-36.9	
Mid Ch								
707.50	20.82	V	2.8	-1.1	16.95	34.8	-17.8	
707.50	5.50	H	2.8	-1.1	1.63	34.8	-33.1	
High Ch								
715.30	21.41	V	2.8	-1.1	17.52	34.8	-17.3	
715.30	4.88	H	2.8	-1.1	0.99	34.8	-33.8	

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LTE Band 13

LTE

Band 13

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 22943
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 13 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Mid Ch								
782.00	24.73	V	3.0	-1.1	20.71	34.8	-14.1	
782.00	13.11	H	3.0	-1.1	9.09	34.8	-25.7	

LTE

Band 13

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 22943
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 13 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Mid Ch								
782.00	23.60	V	3.0	-1.1	19.58	34.8	-15.2	
782.00	12.18	H	3.0	-1.1	8.16	34.8	-26.6	

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LTE
Band 13
5MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 22943
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 13 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
779.50	24.44	V	3.0	-1.1	20.43	34.8	-14.3	
779.50	12.66	H	3.0	-1.1	8.65	34.8	-26.1	
Mid Ch								
782.00	24.54	V	3.0	-1.1	20.52	34.8	-14.2	
782.00	12.94	H	3.0	-1.1	8.92	34.8	-25.8	
High Ch								
784.50	24.83	V	3.0	-1.1	20.82	34.8	-14.0	
784.50	12.29	H	3.0	-1.1	8.27	34.8	-26.5	

LTE
Band 13
5MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 22943
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 13 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
779.50	23.54	V	3.0	-1.1	19.53	34.8	-15.2	
779.50	12.35	H	3.0	-1.1	8.34	34.8	-26.4	
Mid Ch								
782.00	23.53	V	3.0	-1.1	19.51	34.8	-15.3	
782.00	11.84	H	3.0	-1.1	7.82	34.8	-26.9	
High Ch								
784.50	23.88	V	3.0	-1.1	19.87	34.8	-14.9	
784.50	11.56	H	3.0	-1.1	7.54	34.8	-27.2	

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LTE Band 41

LTE

Band 41

20MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20882
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 41 Fundamentals, 20MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2506.00	13.51	V	5.3	10.2	18.38	33.0	-14.6	
2506.00	16.84	H	5.3	10.2	21.72	33.0	-11.3	
Mid Ch								
2593.00	13.42	V	5.4	10.0	18.08	33.0	-14.9	
2593.00	17.80	H	5.4	10.0	22.45	33.0	-10.5	
High Ch								
2680.00	16.78	V	5.5	10.1	21.35	33.0	-11.6	
2680.00	18.23	H	5.5	10.1	22.80	33.0	-10.2	

LTE

Band 41

20MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20882
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 41 Fundamentals, 20MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2506.00	12.36	V	5.3	10.2	17.23	33.0	-15.8	
2506.00	15.47	H	5.3	10.2	20.35	33.0	-12.7	
Mid Ch								
2593.00	13.15	V	5.4	10.0	17.81	33.0	-15.2	
2593.00	17.00	H	5.4	10.0	21.65	33.0	-11.3	
High Ch								
2680.00	17.48	V	5.5	10.1	22.05	33.0	-10.9	
2680.00	18.14	H	5.5	10.1	22.71	33.0	-10.3	

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LTE

Band 41

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 41 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2503.50	13.44	V	5.3	10.2	18.33	33.0	-14.7	
2503.50	16.44	H	5.3	10.2	21.32	33.0	-11.7	
Mid Ch								
2593.00	13.46	V	5.4	10.0	18.12	33.0	-14.9	
2593.00	17.53	H	5.4	10.0	22.18	33.0	-10.8	
High Ch								
2682.50	18.14	V	5.5	10.1	22.70	33.0	-10.3	
2682.50	19.09	H	5.5	10.1	23.66	33.0	-9.3	

LTE

Band 41

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 41 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2503.50	12.80	V	5.3	10.2	17.69	33.0	-15.3	
2503.50	16.18	H	5.3	10.2	21.06	33.0	-11.9	
Mid Ch								
2593.00	13.24	V	5.4	10.0	17.90	33.0	-15.1	
2593.00	17.17	H	5.4	10.0	21.82	33.0	-11.2	
High Ch								
2682.50	18.13	V	5.5	10.1	22.69	33.0	-10.3	
2682.50	19.01	H	5.5	10.1	23.58	33.0	-9.4	

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LTE

Band 41

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 41 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2501.00	13.04	V	5.3	10.2	17.93	33.0	-15.1	
2501.00	16.43	H	5.3	10.2	21.31	33.0	-11.7	
Mid Ch								
2593.00	13.87	V	5.4	10.0	18.53	33.0	-14.5	
2593.00	17.71	H	5.4	10.0	22.36	33.0	-10.6	
High Ch								
2685.00	18.43	V	5.5	10.1	22.99	33.0	-10.0	
2685.00	18.96	H	5.5	10.1	23.52	33.0	-9.5	

LTE

Band 41

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 41 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2501.00	12.88	V	5.3	10.2	17.77	33.0	-15.2	
2501.00	16.31	H	5.3	10.2	21.19	33.0	-11.8	
Mid Ch								
2593.00	13.43	V	5.4	10.0	18.09	33.0	-14.9	
2593.00	17.30	H	5.4	10.0	21.95	33.0	-11.0	
High Ch								
2685.00	18.03	V	5.5	10.1	22.59	33.0	-10.4	
2685.00	18.54	H	5.5	10.1	23.10	33.0	-9.9	

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LTE
Band 41
5MHz
QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 41 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2498.50	14.11	V	5.3	10.2	19.01	33.0	-14.0	
2498.50	16.56	H	5.3	10.2	21.46	33.0	-11.5	
Mid Ch								
2593.00	13.90	V	5.4	10.0	18.56	33.0	-14.4	
2593.00	17.77	H	5.4	10.0	22.42	33.0	-10.6	
High Ch								
2687.50	18.24	V	5.5	10.1	22.80	33.0	-10.2	
2687.50	19.06	H	5.5	10.1	23.62	33.0	-9.4	

LTE
Band 41
5MHz
16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20881
Configuration: EUT, X-Position
Location: Chamber 1
Mode: LTE_16QAM Band 41 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2498.50	13.59	V	5.3	10.2	18.49	33.0	-14.5	
2498.50	16.35	H	5.3	10.2	21.25	33.0	-11.8	
Mid Ch								
2593.00	13.63	V	5.4	10.0	18.29	33.0	-14.7	
2593.00	17.56	H	5.4	10.0	22.21	33.0	-10.8	
High Ch								
2687.50	0.00	V	5.5	10.1	0.00	33.0	0.0	
2687.50	18.55	H	5.5	10.1	23.11	33.0	-9.9	

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9.6. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

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

LIMIT

Part 22.917(a) & Part 24.238(a) & Part 27.53(h) The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

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

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

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

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

TEST PROCEDURE

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

RESULTS

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

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9.6.1. SPURIOUS RADIATION PLOTS

GSM850

GSM850

GPRS

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

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20896
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: GPRS 850 MHz Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1648.40	-8.4	V	3.0	45.3	1.0	-52.6	-13.0	-39.6	
2472.60	-1.4	V	3.0	45.1	1.0	-45.5	-13.0	-32.5	
3296.80	-4.6	V	3.0	45.3	1.0	-48.9	-13.0	-35.9	
1648.40	-8.6	H	3.0	45.3	1.0	-52.9	-13.0	-39.9	
2472.60	-0.5	H	3.0	45.1	1.0	-44.6	-13.0	-31.6	
3296.80	-4.5	H	3.0	45.3	1.0	-48.8	-13.0	-35.8	
Mid Ch, 836.6MHz									
1673.20	-8.2	V	3.0	45.3	1.0	-52.5	-13.0	-39.5	
2509.80	-0.1	V	3.0	45.1	1.0	-44.2	-13.0	-31.2	
3346.40	-4.3	V	3.0	45.3	1.0	-48.6	-13.0	-35.6	
1673.20	-9.7	H	3.0	45.3	1.0	-53.9	-13.0	-40.9	
2509.80	1.5	H	3.0	45.1	1.0	-42.6	-13.0	-29.6	
3346.40	-4.1	H	3.0	45.3	1.0	-48.4	-13.0	-35.4	
High Ch, 848.8MHz									
1697.60	-8.4	V	3.0	45.2	1.0	-52.7	-13.0	-39.7	
2546.40	-1.1	V	3.0	45.1	1.0	-45.2	-13.0	-32.2	
3395.20	-3.9	V	3.0	45.3	1.0	-48.3	-13.0	-35.3	
1697.60	-8.3	H	3.0	45.2	1.0	-52.6	-13.0	-39.6	
2546.40	-0.4	H	3.0	45.1	1.0	-44.5	-13.0	-31.5	
3395.20	-3.8	H	3.0	45.3	1.0	-48.1	-13.0	-35.1	

GSM850

EGPRS

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

Company: Samsung
Project #: 4789754188
Date: 2021-01-08
Test Engineer: 20896
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: EGPRS 850 MHz Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1648.40	-13.0	V	3.0	45.3	1.0	-57.3	-13.0	-44.3	
2472.60	-7.7	V	3.0	45.1	1.0	-51.8	-13.0	-38.8	
3296.80	-9.4	V	3.0	45.3	1.0	-53.8	-13.0	-40.8	
1648.40	-14.5	H	3.0	45.3	1.0	-58.8	-13.0	-45.8	
2472.60	-6.2	H	3.0	45.1	1.0	-50.3	-13.0	-37.3	
3296.80	-9.3	H	3.0	45.3	1.0	-53.6	-13.0	-40.6	
Mid Ch, 836.6MHz									
1673.20	-13.1	V	3.0	45.3	1.0	-57.3	-13.0	-44.3	
2509.80	-7.7	V	3.0	45.1	1.0	-51.8	-13.0	-38.8	
3346.40	-9.0	V	3.0	45.3	1.0	-53.3	-13.0	-40.3	
1673.20	-14.6	H	3.0	45.3	1.0	-58.9	-13.0	-45.9	
2509.80	-6.2	H	3.0	45.1	1.0	-50.3	-13.0	-37.3	
3346.40	-8.8	H	3.0	45.3	1.0	-53.2	-13.0	-40.2	
High Ch, 848.8MHz									
1697.60	-9.4	V	3.0	45.2	1.0	-53.6	-13.0	-40.6	
2546.40	-8.0	V	3.0	45.1	1.0	-52.1	-13.0	-39.1	
3395.20	-8.4	V	3.0	45.3	1.0	-52.8	-13.0	-39.8	
1697.60	-13.2	H	3.0	45.2	1.0	-57.5	-13.0	-44.5	
2546.40	-7.0	H	3.0	45.1	1.0	-51.2	-13.0	-38.2	
3395.20	-9.2	H	3.0	45.3	1.0	-53.5	-13.0	-40.5	

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GSM1900

GSM1900

GPRS

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

Company: Samsung
Project #: 4789754188
Date: 2021-01-12
Test Engineer: 20890
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 1
Mode: GPRS 1900 MHz Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-10.1	V	3.0	45.5	1.0	-54.6	-13.0	-41.6	
5550.60	-7.8	V	3.0	45.4	1.0	-52.2	-13.0	-39.2	
7400.80	-5.0	V	3.0	44.2	1.0	-48.2	-13.0	-35.2	
3700.40	-10.1	H	3.0	45.5	1.0	-54.5	-13.0	-41.5	
5550.60	-7.7	H	3.0	45.4	1.0	-52.1	-13.0	-39.1	
7400.80	-4.8	H	3.0	44.2	1.0	-48.0	-13.0	-35.0	
Mid Ch, 1880MHz									
3760.00	-10.1	V	3.0	45.5	1.0	-54.6	-13.0	-41.6	
5640.00	-7.4	V	3.0	45.4	1.0	-51.8	-13.0	-38.8	
7520.00	-4.9	V	3.0	44.1	1.0	-48.1	-13.0	-35.1	
3760.00	-10.0	H	3.0	45.5	1.0	-54.5	-13.0	-41.5	
5640.00	-7.2	H	3.0	45.4	1.0	-51.6	-13.0	-38.6	
7520.00	-4.8	H	3.0	44.1	1.0	-47.9	-13.0	-34.9	
High Ch, 1909.8MHz									
3819.60	-10.2	V	3.0	45.5	1.0	-54.7	-13.0	-41.7	
5729.40	-7.6	V	3.0	45.4	1.0	-51.9	-13.0	-38.9	
7639.20	-4.5	V	3.0	44.1	1.0	-47.6	-13.0	-34.6	
3819.60	-10.0	H	3.0	45.5	1.0	-54.5	-13.0	-41.5	
5729.40	-7.5	H	3.0	45.4	1.0	-51.9	-13.0	-38.9	
7639.20	-4.7	H	3.0	44.1	1.0	-47.7	-13.0	-34.7	

GSM1900

EGPRS

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

Company: Samsung
Project #: 4789754188
Date: 2021-01-12
Test Engineer: 20890
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 1
Mode: EGPRS 1900 MHz Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-10.3	V	3.0	45.5	1.0	-54.8	-13.0	-41.8	
5550.60	-7.7	V	3.0	45.4	1.0	-52.1	-13.0	-39.1	
7400.80	-4.9	V	3.0	44.2	1.0	-48.1	-13.0	-35.1	
3700.40	-9.9	H	3.0	45.5	1.0	-54.3	-13.0	-41.3	
5550.60	-7.4	H	3.0	45.4	1.0	-51.8	-13.0	-38.8	
7400.80	-4.7	H	3.0	44.2	1.0	-47.9	-13.0	-34.9	
Mid Ch, 1880MHz									
3760.00	-10.2	V	3.0	45.5	1.0	-54.7	-13.0	-41.7	
5640.00	-7.4	V	3.0	45.4	1.0	-51.7	-13.0	-38.7	
7520.00	-4.9	V	3.0	44.1	1.0	-48.0	-13.0	-35.0	
3760.00	-10.0	H	3.0	45.5	1.0	-54.5	-13.0	-41.5	
5640.00	-7.3	H	3.0	45.4	1.0	-51.7	-13.0	-38.7	
7520.00	-4.7	H	3.0	44.1	1.0	-47.8	-13.0	-34.8	
High Ch, 1909.8MHz									
3819.60	-10.4	V	3.0	45.5	1.0	-54.9	-13.0	-41.9	
5729.40	-7.2	V	3.0	45.4	1.0	-51.5	-13.0	-38.5	
7639.20	-4.7	V	3.0	44.1	1.0	-47.8	-13.0	-34.8	
3819.60	-10.1	H	3.0	45.5	1.0	-54.5	-13.0	-41.5	
5729.40	-7.5	H	3.0	45.4	1.0	-51.9	-13.0	-38.9	
7639.20	-4.6	H	3.0	44.1	1.0	-47.7	-13.0	-34.7	

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WCDMA Band 5

WCDMA

Band 5
REL99

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

Company: Samsung
Project #: 4789754188
Date: 2021-01-12
Test Engineer: 20890
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 1
Mode: Rel99 Band 5 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-13.8	V	3.0	45.3	1.0	-58.1	-13.0	-45.1	
2479.20	-11.0	V	3.0	45.1	1.0	-55.1	-13.0	-42.1	
3305.60	-10.3	V	3.0	45.3	1.0	-54.6	-13.0	-41.6	
1652.80	-15.3	H	3.0	45.3	1.0	-59.6	-13.0	-46.6	
2479.20	-11.9	H	3.0	45.1	1.0	-56.0	-13.0	-43.0	
3305.60	-10.1	H	3.0	45.3	1.0	-54.5	-13.0	-41.5	
Mid Ch, 836.6MHz									
1673.20	-13.9	V	3.0	45.3	1.0	-58.1	-13.0	-45.1	
2509.80	-11.2	V	3.0	45.1	1.0	-55.3	-13.0	-42.3	
3346.40	-9.8	V	3.0	45.3	1.0	-54.1	-13.0	-41.1	
1673.20	-15.4	H	3.0	45.3	1.0	-59.7	-13.0	-46.7	
2509.80	-11.9	H	3.0	45.1	1.0	-56.0	-13.0	-43.0	
3346.40	-9.5	H	3.0	45.3	1.0	-53.9	-13.0	-40.9	
High Ch, 846.6MHz									
1693.20	-13.7	V	3.0	45.2	1.0	-57.9	-13.0	-44.9	
2539.80	-11.1	V	3.0	45.1	1.0	-55.2	-13.0	-42.2	
3386.40	-9.5	V	3.0	45.3	1.0	-53.8	-13.0	-40.8	
1693.20	-15.2	H	3.0	45.2	1.0	-59.5	-13.0	-46.5	
2539.80	-11.9	H	3.0	45.1	1.0	-56.0	-13.0	-43.0	
3386.40	-9.5	H	3.0	45.3	1.0	-53.8	-13.0	-40.8	

WCDMA

Band 5
HSDPA

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

Company: Samsung
Project #: 4789754188
Date: 2021-01-12
Test Engineer: 20890
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 1
Mode: HSDPA Band 5 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-13.8	V	3.0	45.3	1.0	-58.1	-13.0	-45.1	
2479.20	-11.1	V	3.0	45.1	1.0	-55.2	-13.0	-42.2	
3305.60	-10.4	V	3.0	45.3	1.0	-54.7	-13.0	-41.7	
1652.80	-15.4	H	3.0	45.3	1.0	-59.7	-13.0	-46.7	
2479.20	-11.8	H	3.0	45.1	1.0	-55.9	-13.0	-42.9	
3305.60	-10.2	H	3.0	45.3	1.0	-54.5	-13.0	-41.5	
Mid Ch, 836.6MHz									
1673.20	-13.8	V	3.0	45.3	1.0	-58.1	-13.0	-45.1	
2509.80	-11.1	V	3.0	45.1	1.0	-55.2	-13.0	-42.2	
3346.40	-9.7	V	3.0	45.3	1.0	-54.1	-13.0	-41.1	
1673.20	-15.4	H	3.0	45.3	1.0	-59.6	-13.0	-46.6	
2509.80	-12.0	H	3.0	45.1	1.0	-56.1	-13.0	-43.1	
3346.40	-9.6	H	3.0	45.3	1.0	-53.9	-13.0	-40.9	
High Ch, 846.6MHz									
1693.20	-13.6	V	3.0	45.2	1.0	-57.9	-13.0	-44.9	
2539.80	-11.2	V	3.0	45.1	1.0	-55.3	-13.0	-42.3	
3386.40	-9.6	V	3.0	45.3	1.0	-54.0	-13.0	-41.0	
1693.20	-15.2	H	3.0	45.2	1.0	-59.4	-13.0	-46.4	
2539.80	-11.9	H	3.0	45.1	1.0	-56.0	-13.0	-43.0	
3386.40	-9.4	H	3.0	45.3	1.0	-53.8	-13.0	-40.8	

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LTE Band 5

LTE
Band 5
3MHz
QPSK

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

Company:	Samsung
Project #:	4789754188
Date:	2021-01-11
Test Engineer:	20890
Configuration:	EUT / AC Adapter, Z-Position
Location:	Chamber 1
Mode:	LTE_QPSK Band 5 Harmonics, 3MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 825.5MHz									
1651.00	-13.3	V	3.0	45.3	1.0	-57.6	-13.0	-44.6	
2476.50	-10.2	V	3.0	45.1	1.0	-54.3	-13.0	-41.3	
3302.00	-9.7	V	3.0	45.3	1.0	-54.0	-13.0	-41.0	
1651.00	-14.9	H	3.0	45.3	1.0	-59.1	-13.0	-46.1	
2476.50	-11.1	H	3.0	45.1	1.0	-55.2	-13.0	-42.2	
3302.00	-9.5	H	3.0	45.3	1.0	-53.8	-13.0	-40.8	
Mid Ch, 836.5MHz									
1673.00	-13.0	V	3.0	45.3	1.0	-57.3	-13.0	-44.3	
2509.50	-10.7	V	3.0	45.1	1.0	-54.8	-13.0	-41.8	
3346.00	-9.0	V	3.0	45.3	1.0	-53.3	-13.0	-40.3	
1673.00	-15.0	H	3.0	45.3	1.0	-59.2	-13.0	-46.2	
2509.50	-11.2	H	3.0	45.1	1.0	-55.3	-13.0	-42.3	
3346.00	-9.2	H	3.0	45.3	1.0	-53.5	-13.0	-40.5	
High Ch, 847.5MHz									
1695.00	-12.9	V	3.0	45.2	1.0	-57.1	-13.0	-44.1	
2542.50	-10.3	V	3.0	45.1	1.0	-54.4	-13.0	-41.4	
3390.00	-8.9	V	3.0	45.3	1.0	-53.2	-13.0	-40.2	
1695.00	-14.6	H	3.0	45.2	1.0	-58.9	-13.0	-45.9	
2542.50	-11.1	H	3.0	45.1	1.0	-55.2	-13.0	-42.2	
3390.00	-8.6	H	3.0	45.3	1.0	-53.0	-13.0	-40.0	

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LTE Band 99

LTE

Band 12

5MHz

QPSK

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

Company:	Samsung
Project #:	4789754188
Date:	2021-01-11
Test Engineer:	20890
Configuration:	EUT / AC Adapter, Z-Position
Location:	Chamber 1
Mode:	LTE_QPSK Band 12 Harmonics, 5MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 701.5MHz									
1403.00	-14.7	V	3.0	45.5	1.0	-59.2	-13.0	-46.2	
2104.50	-10.9	V	3.0	45.0	1.0	-54.9	-13.0	-41.9	
2806.00	-10.3	V	3.0	45.2	1.0	-54.5	-13.0	-41.5	
1403.00	-16.5	H	3.0	45.5	1.0	-61.0	-13.0	-48.0	
2104.50	-12.6	H	3.0	45.0	1.0	-56.6	-13.0	-43.6	
2806.00	-10.4	H	3.0	45.2	1.0	-54.6	-13.0	-41.6	
Mid Ch, 707.5MHz									
1415.00	-14.6	V	3.0	45.5	1.0	-59.0	-13.0	-46.0	
2122.50	-10.8	V	3.0	45.0	1.0	-54.8	-13.0	-41.8	
2830.00	-10.1	V	3.0	45.2	1.0	-54.2	-13.0	-41.2	
1415.00	-16.0	H	3.0	45.5	1.0	-60.4	-13.0	-47.4	
2122.50	-12.5	H	3.0	45.0	1.0	-56.5	-13.0	-43.5	
2830.00	-10.3	H	3.0	45.2	1.0	-54.5	-13.0	-41.5	
High Ch, 713.5MHz									
1427.00	-14.4	V	3.0	45.4	1.0	-58.9	-13.0	-45.9	
2140.50	-11.0	V	3.0	45.0	1.0	-55.1	-13.0	-42.1	
2854.00	-10.0	V	3.0	45.2	1.0	-54.2	-13.0	-41.2	
1427.00	-15.9	H	3.0	45.4	1.0	-60.4	-13.0	-47.4	
2140.50	-12.6	H	3.0	45.0	1.0	-56.6	-13.0	-43.6	
2854.00	-10.1	H	3.0	45.2	1.0	-54.3	-13.0	-41.3	

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LTE Band 100

LTE

Band 13

5MHz

QPSK

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

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 20890
Configuration: EUT / AC Adapter
Location: Chamber 1
Mode: LTE_QPSK Band 13 Harmonics, 5MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 779.5MHz									
1559.00	-23.6	V	3.0	45.3	1.0	-68.0	-40.0	-28.0	
2338.50	-11.5	V	3.0	45.1	1.0	-55.5	-13.0	-42.5	
3118.00	-10.4	V	3.0	45.3	1.0	-54.6	-13.0	-41.6	
1559.00	-25.2	H	3.0	45.3	1.0	-69.6	-40.0	-29.6	
2338.50	-12.5	H	3.0	45.1	1.0	-56.5	-13.0	-43.5	
3118.00	-10.3	H	3.0	45.3	1.0	-54.5	-13.0	-41.5	
Mid Ch, 782MHz									
1564.00	-14.2	V	3.0	45.3	1.0	-58.5	-40.0	-18.5	
2346.00	-11.4	V	3.0	45.1	1.0	-55.5	-13.0	-42.5	
3128.00	-10.3	V	3.0	45.3	1.0	-54.6	-13.0	-41.6	
1564.00	-25.3	H	3.0	45.3	1.0	-69.6	-40.0	-29.6	
2346.00	-12.4	H	3.0	45.1	1.0	-56.5	-13.0	-43.5	
3128.00	-10.1	H	3.0	45.3	1.0	-54.4	-13.0	-41.4	
High Ch, 784.5MHz									
1569.00	-23.7	V	3.0	45.3	1.0	-68.1	-40.0	-28.1	
2353.50	-11.5	V	3.0	45.1	1.0	-55.5	-13.0	-42.5	
3138.00	-10.2	V	3.0	45.3	1.0	-54.4	-13.0	-41.4	
1569.00	-25.3	H	3.0	45.3	1.0	-69.7	-40.0	-29.7	
2353.50	-12.5	H	3.0	45.1	1.0	-56.6	-13.0	-43.6	
3138.00	-10.1	H	3.0	45.3	1.0	-54.3	-13.0	-41.3	

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

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LTE Band 41

LTE

Band 41

5MHz

QPSK

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

Company: Samsung
Project #: 4789754188
Date: 2021-01-11
Test Engineer: 22943
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 41 Harmonics, 20MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2506MHz									
5012.00	-15.2	V	3.0	45.5	1.0	-59.7	-25.0	-34.7	
7518.00	-15.2	V	3.0	44.1	1.0	-58.3	-25.0	-33.3	
10024.00	-12.6	V	3.0	42.2	1.0	-53.8	-25.0	-28.8	
5012.00	-15.1	H	3.0	45.5	1.0	-59.6	-25.0	-34.6	
7518.00	-15.3	H	3.0	44.1	1.0	-58.4	-25.0	-33.4	
10024.00	-12.5	H	3.0	42.2	1.0	-53.7	-25.0	-28.7	
Mid Ch, 2593MHz									
5186.00	-14.5	V	3.0	45.4	1.0	-59.0	-25.0	-34.0	
7779.00	-15.1	V	3.0	44.0	1.0	-58.1	-25.0	-33.1	
10372.00	-12.2	V	3.0	42.4	1.0	-53.5	-25.0	-28.5	
5186.00	-15.1	H	3.0	45.4	1.0	-59.6	-25.0	-34.6	
7779.00	-15.2	H	3.0	44.0	1.0	-58.3	-25.0	-33.3	
10372.00	-12.0	H	3.0	42.4	1.0	-53.4	-25.0	-28.4	
High Ch, 2680MHz									
5360.00	-13.4	V	3.0	45.4	1.0	-57.8	-25.0	-32.8	
8040.00	-15.5	V	3.0	43.9	1.0	-58.4	-25.0	-33.4	
10720.00	-12.3	V	3.0	42.5	1.0	-53.8	-25.0	-28.8	
5360.00	-15.4	H	3.0	45.4	1.0	-59.8	-25.0	-34.8	
8040.00	-15.5	H	3.0	43.9	1.0	-58.4	-25.0	-33.4	
10720.00	-11.9	H	3.0	42.5	1.0	-53.3	-25.0	-28.3	

END OF TEST REPORT

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