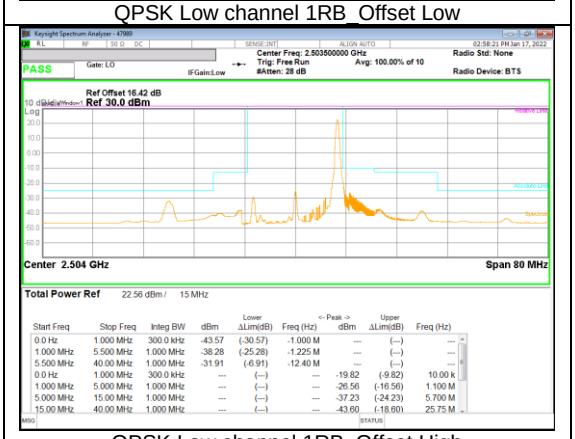
LTE Band 41

15MHz

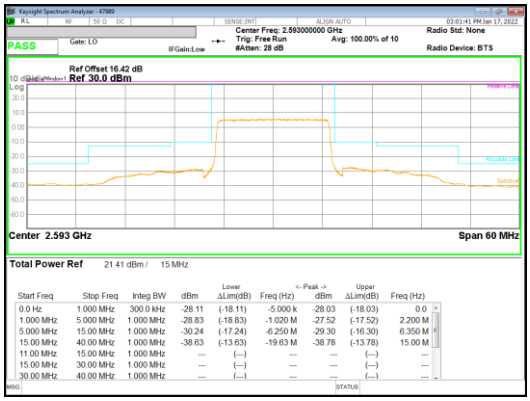
QPSK

QPSK Low channel FRB

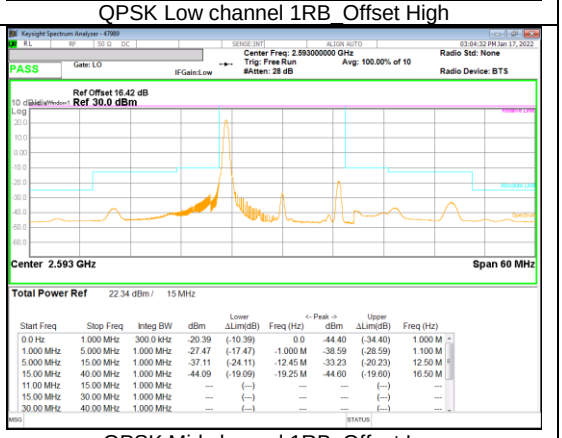
QPSK Low channel 1RB_Offset Low



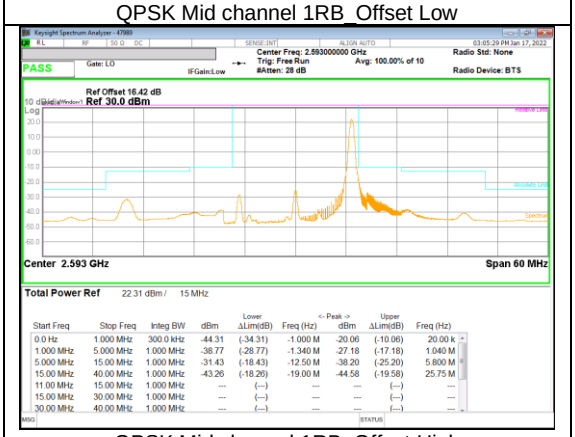
QPSK Low channel 1RB_Offset High



QPSK Mid channel FRB



QPSK Mid channel 1RB_Offset Low



QPSK Mid channel 1RB_Offset High

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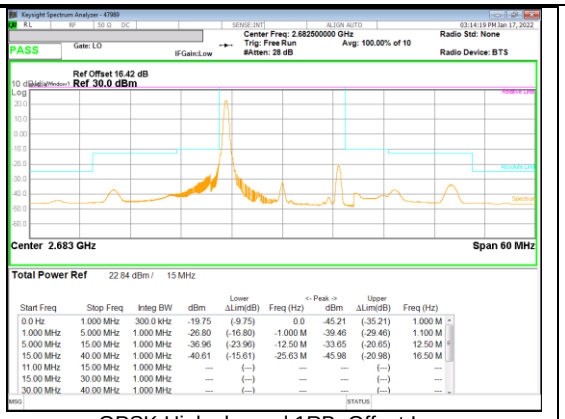
LTE Band 41

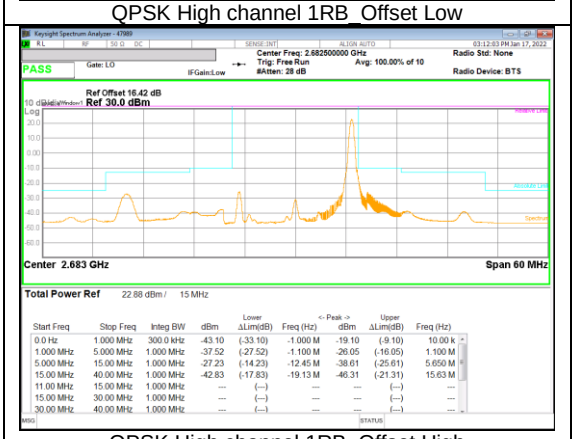
15MHz

QPSK

QPSK High channel FRB



QPSK High channel 1RB_Offset Low



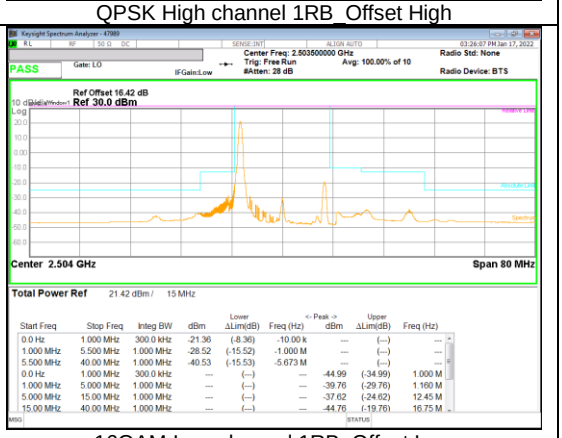
QPSK High channel 1RB_Offset High

LTE Band 41

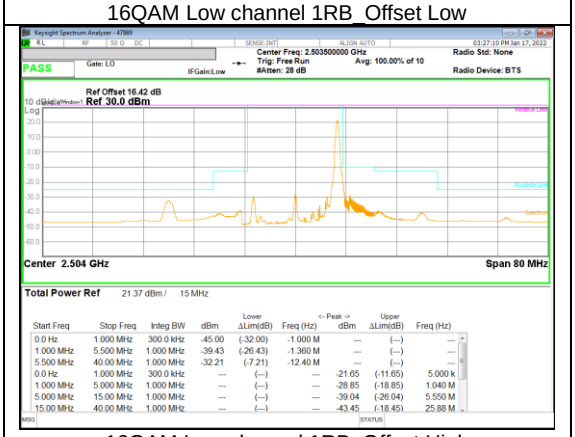
15MHz

16QAM

16QAM Low channel FRB



16QAM Low channel 1RB_Offset Low



16QAM Low channel 1RB_Offset High

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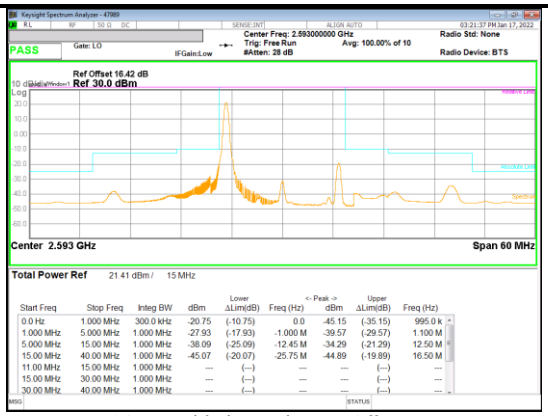
LTE Band 41

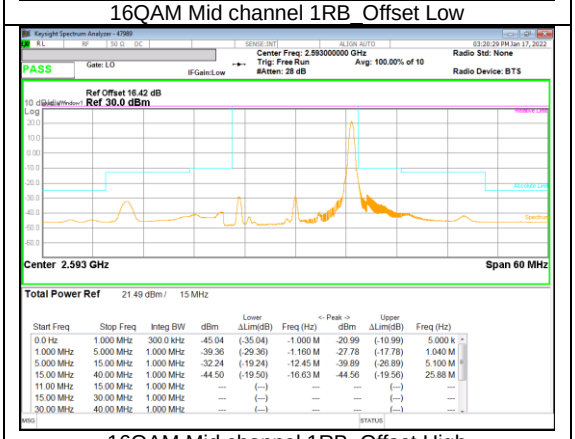
15MHz

16QAM

16QAM Mid channel FRB

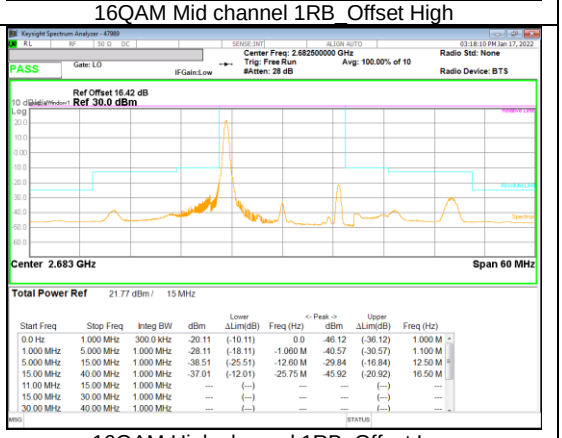


16QAM Mid channel 1RB_Offset Low

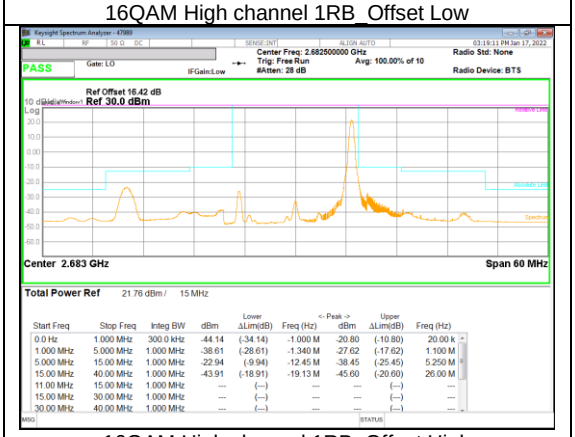


16QAM Mid channel 1RB_Offset High

16QAM High channel FRB



16QAM High channel 1RB_Offset Low



16QAM High channel 1RB_Offset High

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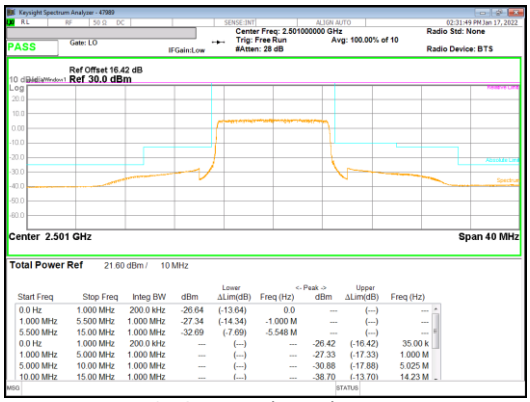
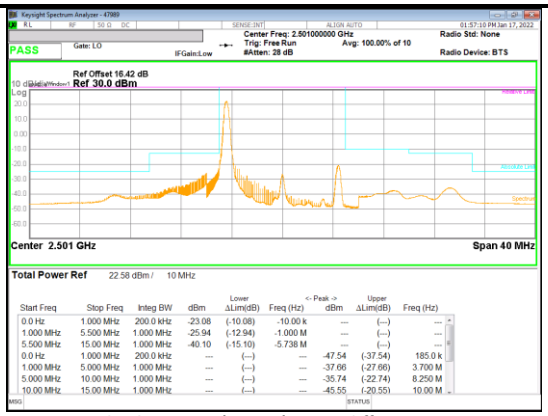
LTE Band 41

10MHz

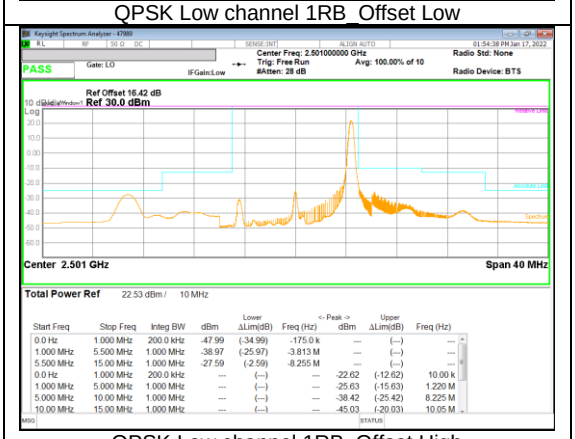
QPSK



QPSK Low channel FRB

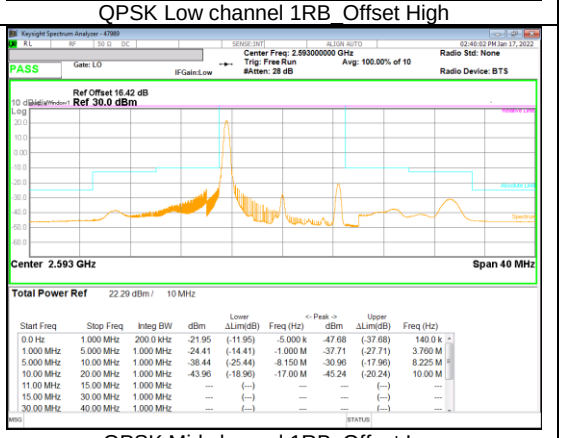


QPSK Low channel 1RB_Offset Low

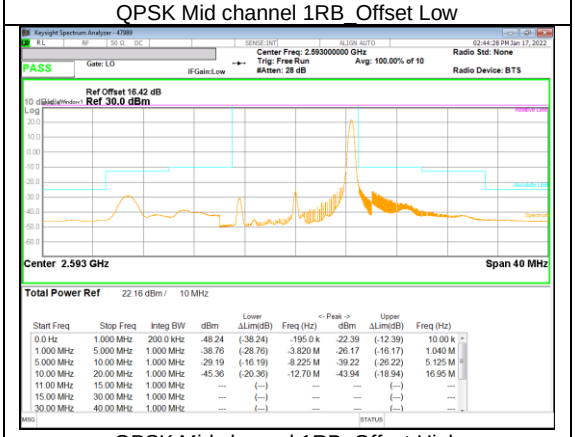


QPSK Low channel 1RB_Offset High

QPSK Mid channel FRB



QPSK Mid channel 1RB_Offset Low



QPSK Mid channel 1RB_Offset High

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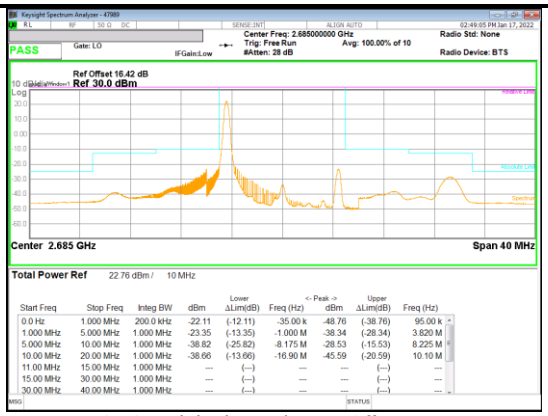
LTE Band 41

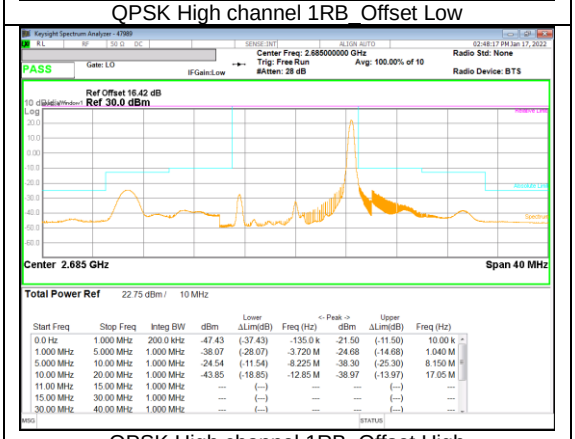
10MHz

QPSK

QPSK High channel FRB



QPSK High channel 1RB_Offset Low

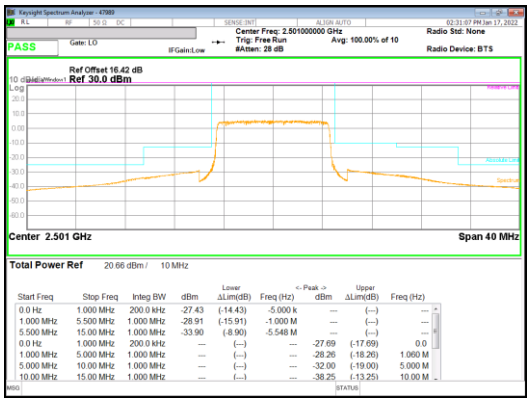


QPSK High channel 1RB_Offset High

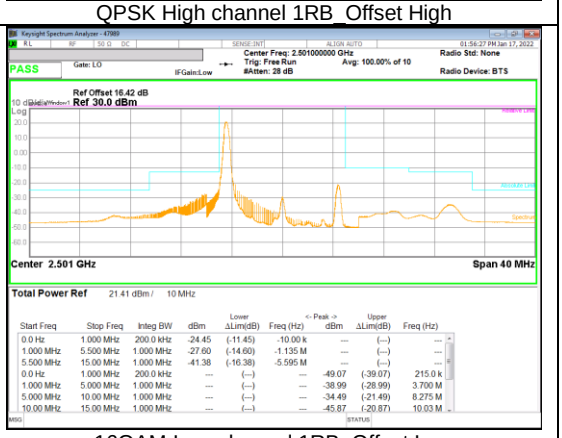
LTE Band 41

10MHz

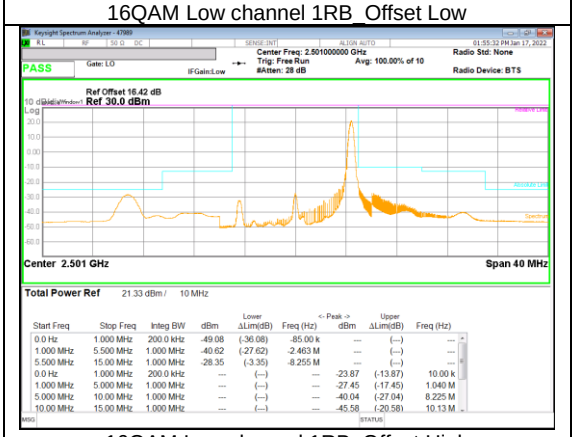
16QAM



16QAM Low channel FRB



16QAM Low channel 1RB_Offset Low



16QAM Low channel 1RB_Offset High

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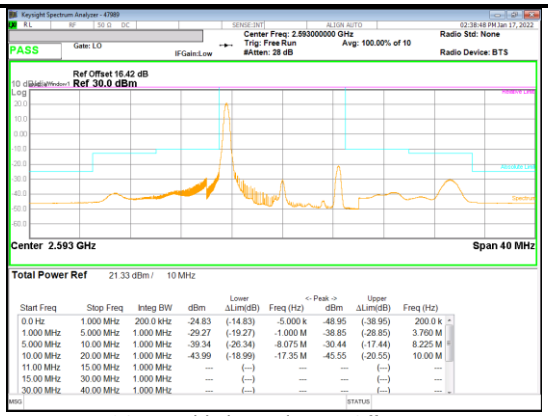
LTE Band 41

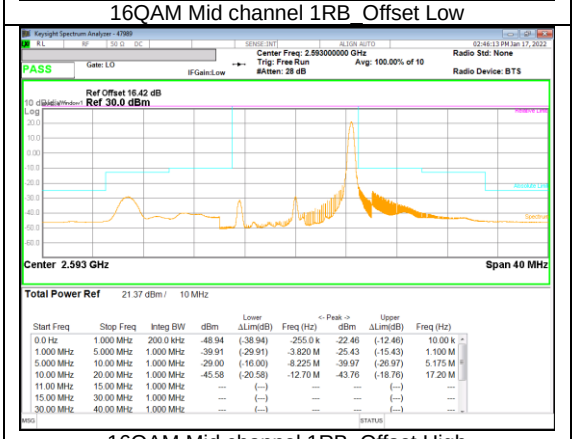
10MHz

16QAM

16QAM Mid channel FRB

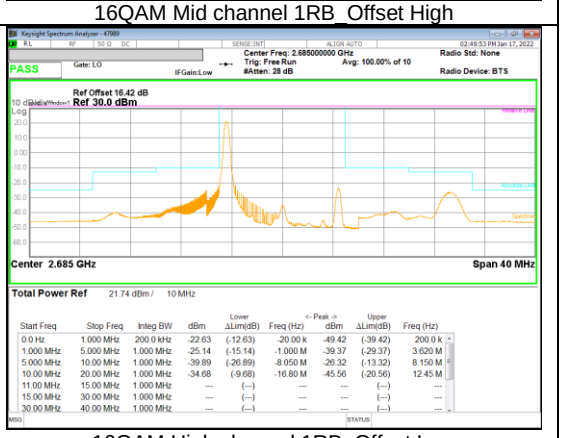


16QAM Mid channel 1RB_Offset Low

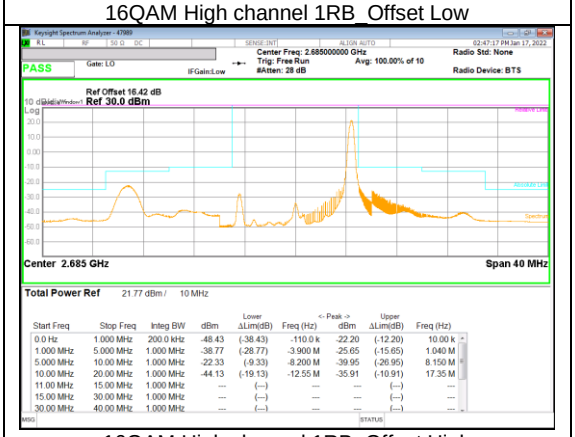


16QAM Mid channel 1RB_Offset High

16QAM High channel FRB



16QAM High channel 1RB_Offset Low



16QAM High channel 1RB_Offset High

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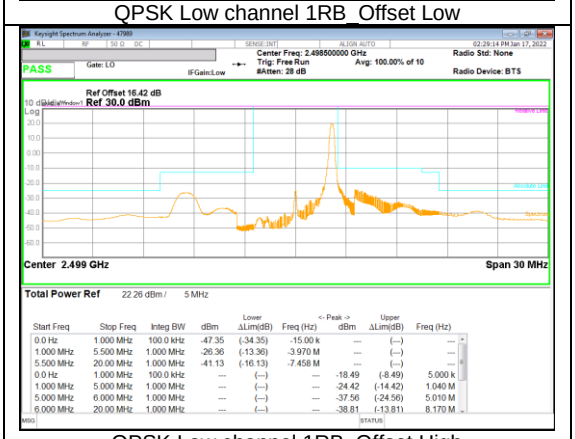
LTE
Band 41

5MHz

QPSK

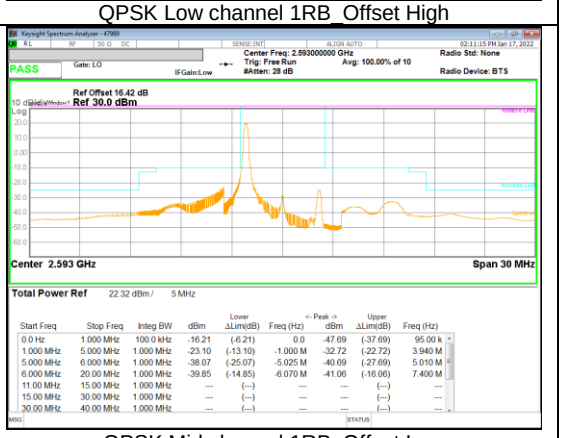
QPSK Low channel FRB

QPSK Low channel 1RB_Offset Low

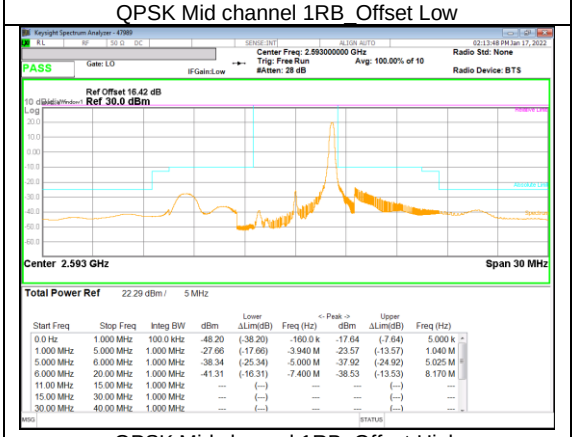


QPSK Low channel 1RB_Offset High

QPSK Mid channel FRB



QPSK Mid channel 1RB_Offset Low



QPSK Mid channel 1RB_Offset High

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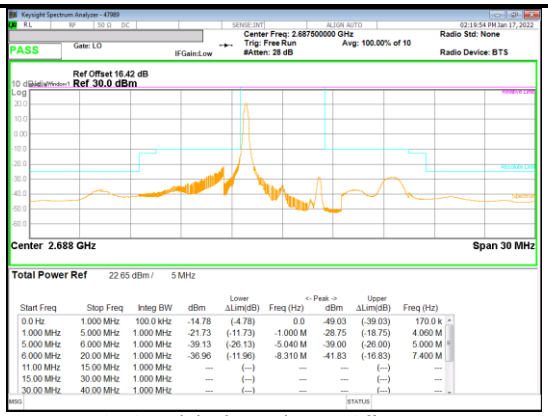
LTE Band 41

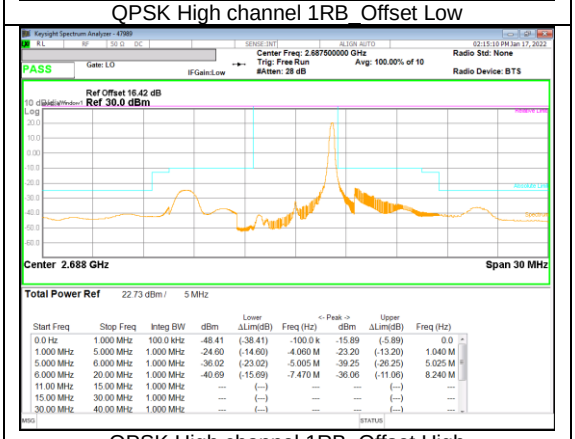
5MHz

QPSK

QPSK High channel FRB



QPSK High channel 1RB_Offset Low



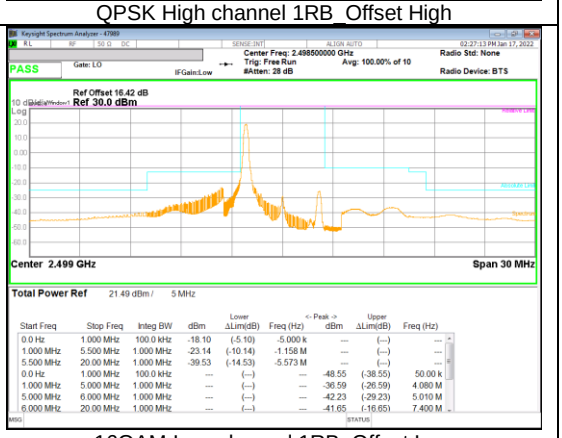
QPSK High channel 1RB_Offset High

LTE Band 41

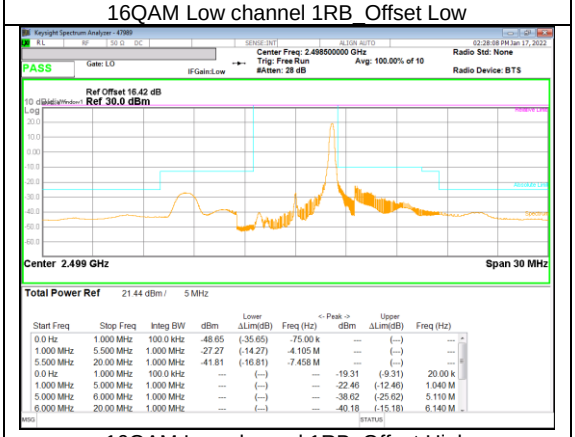
5MHz

16QAM

16QAM Low channel FRB



16QAM Low channel 1RB_Offset Low



16QAM Low channel 1RB_Offset High

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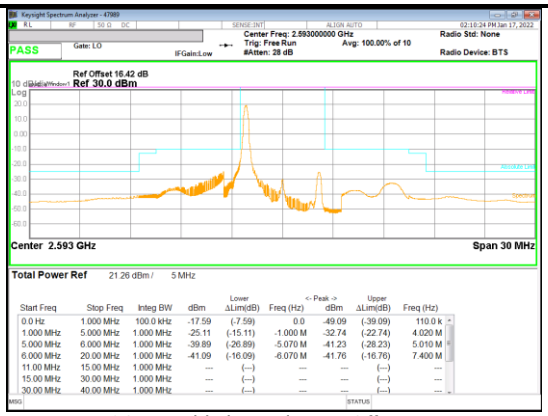
LTE Band 41

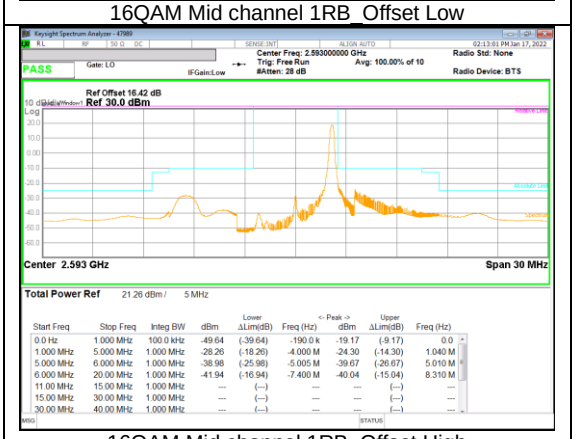
5MHz

16QAM

16QAM Mid channel FRB

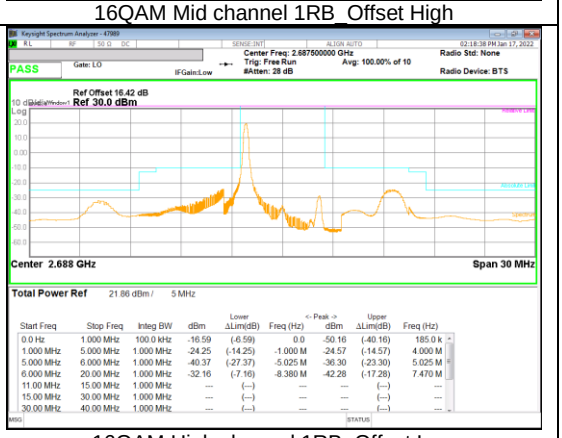


16QAM Mid channel 1RB_Offset Low

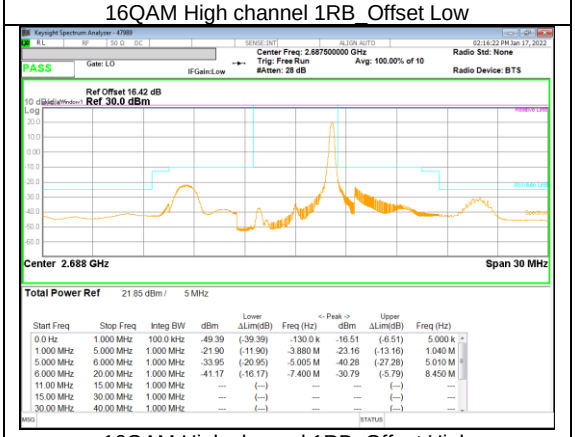


16QAM Mid channel 1RB_Offset High

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, §24.238 and §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:
(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

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), Maxhold(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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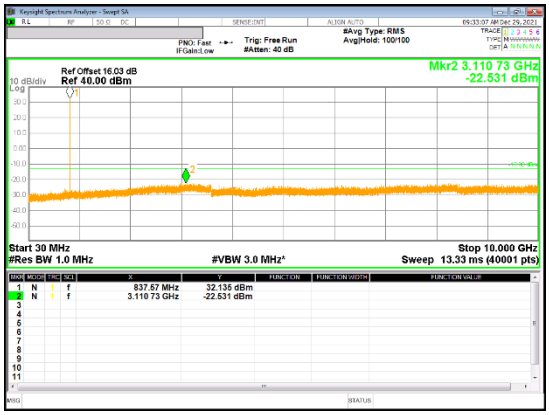
9.3.1. OUT OF BAND EMISSIONS RESULT

GSM 850

GSM 850	 GPRS Low channel	 GPRS Mid channel
	 GPRS High channel	

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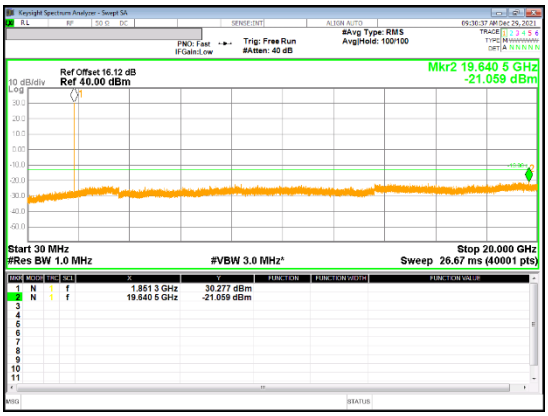
GSM 1900

GSM 1900



GPRS Low channel

GPRS Mid channel

GPRS High channel

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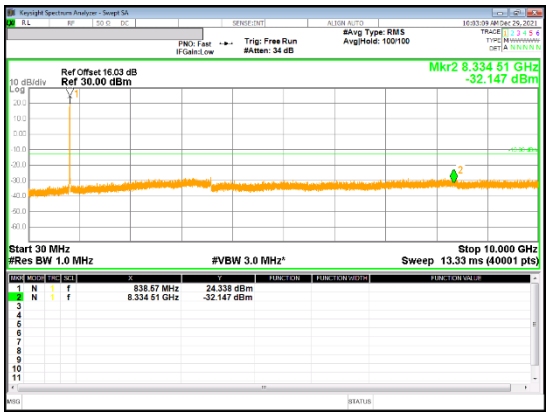
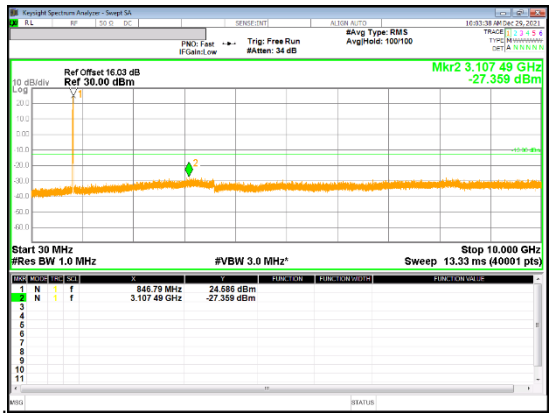
WCDMA Band 5

Band 5	 REL99 Low channel	 REL99 Mid channel
	 REL99 High channel	

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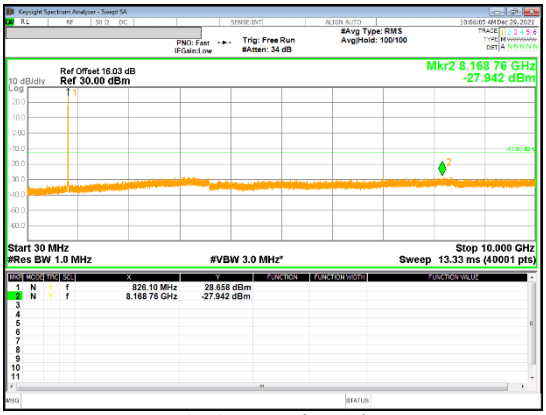
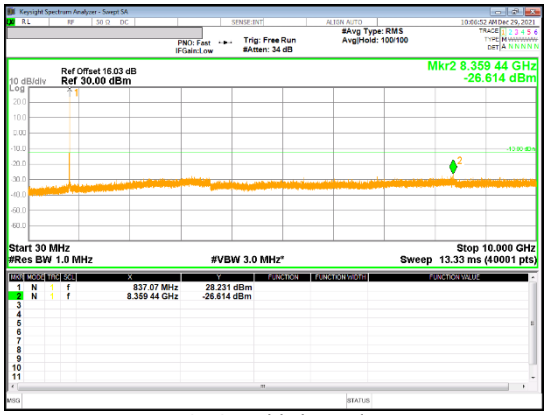
LTE Band 5

LTE Band 5

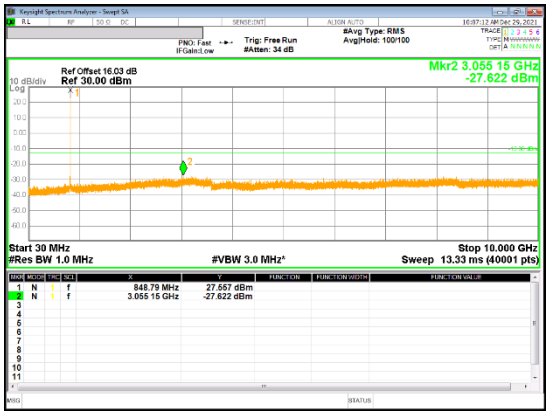
1.4MHz



QPSK Low channel



QPSK Mid channel



QPSK High channel

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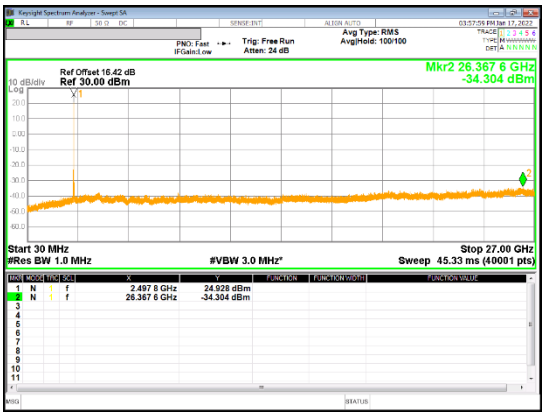
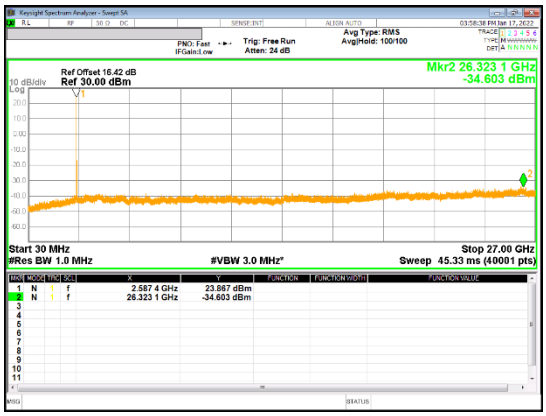
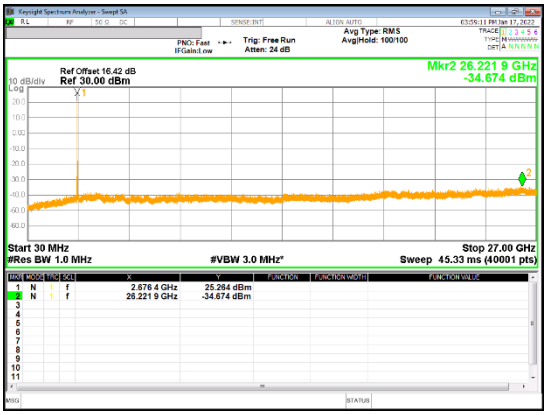
LTE Band 41

LTE Band 41 15MHz	 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 and §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]	
3.85	50	824.20000729	-0.003	848.80000850	-0.003	2.5
3.85	40	824.20000513	-0.001	848.80000850	-0.003	2.5
3.85	30	824.20000958	-0.006	848.80001015	-0.005	2.5
3.85	***20***	***824.20000449***	***0.000***	***848.80000579***	***0.000***	***2.5***
3.85	10	824.20001164	-0.009	848.80000754	-0.002	2.5
3.85	0	824.20000447	0.000	848.80001225	-0.008	2.5
3.85	-10	824.20001041	-0.007	848.80001141	-0.007	2.5
3.85	-20	824.20000918	-0.006	848.80001064	-0.006	2.5
3.85	-30	824.20001612	-0.014	848.80001500	-0.011	2.5

Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2060.500	Hz	High Channel	2122.000	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	***824.20000449***	***0***	***848.80000579***	***0***	***2.5***
4.40	20	824.20002535	-0.025	848.80002522	-0.023	2.5
3.60	20	824.20001833	-0.017	848.80000890	-0.004	2.5

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

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.0740	1909.9230		
Extreme (50C)		1850.0741	1909.9230	22.9	0.012
Extreme (40C)		1850.0741	1909.9230	30.1	0.016
Extreme (30C)		1850.0741	1909.9230	24.7	0.013
Extreme (10C)		1850.0741	1909.9230	14.5	0.008
Extreme (0C)		1850.0741	1909.9231	42.1	0.022
Extreme (-10C)		1850.0741	1909.9231	47.0	0.025
Extreme (-20C)		1850.0741	1909.9231	44.9	0.024
Extreme (-30C)		1850.0741	1909.9231	46.9	0.025
20C	15%	1850.0741	1909.9230	31.5	0.017
	-15%	1850.0741	1909.9230	13.7	0.007
	End Point	1850.0741	1909.9230	13.0	0.007

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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]	
3.85	50	826.40000450	0.001	846.60000560	-0.001	2.5
3.85	40	826.40000538	0.000	846.60000498	0.000	2.5
3.85	30	826.40000450	0.001	846.60000510	0.000	2.5
3.85	***20***	***826.40000538***	***0.000***	***846.60000491***	***0.000***	***2.5***
3.85	10	826.40000426	0.001	846.60000416	0.001	2.5
3.85	0	826.40000463	0.001	846.60000451	0.000	2.5
3.85	-10	826.40000493	0.001	846.60000461	0.000	2.5
3.85	-20	826.40000525	0.000	846.60000476	0.000	2.5
3.85	-30	826.40000316	0.003	846.60000254	0.003	2.5

Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2066.000	Hz	High Channel	2116.500	Hz
Power Supply [Vdc]	Environment Temperature [*C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.85	***20***	**826.40000538**	***0***	**846.60000491**	***0***	***2.5***
4.40	20	826.40000430	0.001	846.60000300	0.002	2.5
3.60	20	826.40000452	0.001	846.60000577	-0.001	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	824.70000681	0.002	848.30000795	0.002	2.5
3.85	40	824.70000631	0.003	848.30001073	-0.001	2.5
3.85	30	824.70000763	0.001	848.30001041	-0.001	2.5
3.85	***20***	***824.70000884***	***0.000***	***848.30000988***	***0.000***	***2.5***
3.85	10	824.70000702	0.002	848.30001279	-0.003	2.5
3.85	0	824.70000771	0.001	848.30001138	-0.002	2.5
3.85	-10	824.70000838	0.001	848.30000991	0.000	2.5
3.85	-20	824.70000818	0.001	848.30001128	-0.002	2.5
3.85	-30	824.70000780	0.001	848.30001901	-0.011	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]	
3.85	***20***	**824.70000884**	***0***	**848.30000988**	***0***	***2.5***
4.40	20	824.70000471	0.005	848.30000923	0.001	2.5
3.60	20	824.70000494	0.005	848.30000821	0.002	2.5

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LTE Band 41 (Lowest Frequency:16QAM / 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	2496.2469	2689.7502		
Extreme (50C)		2496.2469	2689.7502	28.9	0.011
Extreme (40C)		2496.2469	2689.7502	25.7	0.010
Extreme (30C)		2496.2469	2689.7502	29.7	0.011
Extreme (10C)		2496.2469	2689.7502	30.0	0.012
Extreme (0C)		2496.2469	2689.7502	33.2	0.013
Extreme (-10C)		2496.2469	2689.7502	27.4	0.011
Extreme (-20C)		2496.2469	2689.7502	28.5	0.011
Extreme (-30C)		2496.2469	2689.7502	29.0	0.011
20C	15%	2496.2469	2689.7502	28.8	0.011
	-15%	2496.2469	2689.7502	23.3	0.009
	End Point	2496.2469	2689.7502	30.9	0.012

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9.5. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232 and §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:

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

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

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

TEST PROCEDURE

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

For radiated output power measurement with a ESU40:

a) Set the RBW ≥ OBW;

b) Set VBW ≥ 3 × RBW;

c) Set span ≥ 2 x RBW;

d) Sweep time = auto couple;

e) Detector = rms;

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

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

TEST RESULTS

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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	27.38	547.02
		190	836.6	27.75	595.66
		251	848.8	**28.87**	**770.90**
	EGPRS	128	824.2	24.03	252.93
		190	836.6	24.07	255.27
		251	848.8	**25.14**	**326.59**
GSM1900	GPRS	512	1850.2	30.20	1047.13
		661	1880	**30.68**	**1169.50**
		810	1909.8	30.35	1083.93
	EGPRS	512	1850.2	30.14	1032.76
		661	1880	**30.37**	**1088.93**
		810	1909.8	30.04	1009.25

WCDMA

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
Band 5	REL99	4132	826.4	19.30	85.11
		4183	836.6	**19.56**	**90.36**
		4233	846.6	19.21	83.37
	HSDPA	4132	826.4	17.07	50.93
		4183	836.6	**17.27**	**53.33**
		4233	846.6	16.93	49.32

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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	1/0	829.0	**21.31**	**135.21**
			1/0	836.5	21.29	134.59
			1/0	844.0	20.86	121.90
		16QAM	1/0	829.0	19.97	99.31
			1/0	836.5	**20.40**	**109.65**
			1/0	844.0	20.10	102.33
	5	QPSK	1/0	826.5	**20.29**	**106.91**
			1/0	836.5	19.72	93.76
			1/0	846.5	**20.29**	**106.91**
		16QAM	1/0	826.5	19.20	83.18
			1/0	836.5	18.30	67.61
			1/0	846.5	**19.32**	**85.51**
	3	QPSK	1/0	825.5	20.28	106.66
			1/0	836.5	20.07	101.62
			1/0	847.5	**20.46**	**111.17**
		16QAM	1/0	825.5	19.28	84.72
			1/8	836.5	18.75	74.99
			1/8	847.5	**19.70**	**93.33**
	1.4	QPSK	1/5	824.7	20.34	108.14
			1/0	836.5	**20.52**	**112.72**
			1/0	848.3	20.39	109.40
		16QAM	1/5	824.7	19.32	85.51
			1/5	836.5	18.82	76.21
			1/0	848.3	**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	**24.17**	**261.22**
			1/0	2593.0	23.49	223.36
			1/0	2680.0	22.50	177.83
		16QAM	1/99	2506.0	**22.82**	**191.43**
			1/0	2593.0	22.80	190.55
			1/0	2680.0	21.93	155.96
	15	QPSK	1/0	2503.5	**24.20**	**263.03**
			1/0	2593.0	22.94	196.79
			1/0	2682.5	23.06	202.30
		16QAM	1/0	2503.5	**23.86**	**243.22**
			1/37	2593.0	22.25	167.88
			1/0	2682.5	22.22	166.72
	10	QPSK	1/25	2501.0	**23.57**	**227.51**
			1/25	2593.0	22.95	197.24
			1/25	2685.0	22.75	188.36
		16QAM	1/0	2501.0	**23.39**	**218.27**
			1/0	2593.0	22.52	178.65
			1/0	2685.0	22.17	164.82
	5	QPSK	1/0	2498.5	**23.94**	**247.74**
			1/12	2593.0	22.91	195.43
			1/0	2687.5	22.86	193.20
		16QAM	1/12	2498.5	**23.37**	**217.27**
			1/12	2593.0	22.23	167.11
			1/12	2687.5	22.53	179.06

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9.5.2. ERP/EIRP DATA

GSM850

GSM850

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 12/31/2021
Test Engineer: 25546
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	31.72	V	3.0	-1.3	27.38	38.5	-11.1	
824.20	20.19	H	3.0	-1.3	15.85	38.5	-22.7	
Mid Ch								
836.60	32.00	V	3.0	-1.2	27.75	38.5	-10.7	
836.60	20.84	H	3.0	-1.2	16.59	38.5	-21.9	
High Ch								
848.80	33.03	V	3.1	-1.1	28.87	38.5	-9.6	
848.80	21.60	H	3.1	-1.1	17.44	38.5	-21.1	

GSM850

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 12/31/2021
Test Engineer: 25546
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	28.37	V	3.0	-1.3	24.03	38.5	-14.5	
824.20	17.00	H	3.0	-1.3	12.66	38.5	-25.8	
Mid Ch								
836.60	28.32	V	3.0	-1.2	24.07	38.5	-14.4	
836.60	17.08	H	3.0	-1.2	12.83	38.5	-25.7	
High Ch								
848.80	29.30	V	3.1	-1.1	25.14	38.5	-13.4	
848.80	17.87	H	3.1	-1.1	13.71	38.5	-24.8	

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GSM1900

GSM1900

GPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/12/2022
Test Engineer: 19568
Configuration: EUT, X-Position
Location: Chamber 2
Mode: GPRS 1900 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	22.77	V	4.5	9.6	27.95	33.0	-5.0	
1850.20	25.02	H	4.5	9.6	30.20	33.0	-2.8	
Mid Ch								
1880.00	22.57	V	4.5	9.4	27.44	33.0	-5.6	
1880.00	25.81	H	4.5	9.4	30.68	33.0	-2.3	
High Ch								
1909.80	23.04	V	4.5	9.1	27.56	33.0	-5.4	
1909.80	25.82	H	4.5	9.1	30.35	33.0	-2.7	

GSM1900

EGPRS

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/12/2022
Test Engineer: 19568
Configuration: EUT, X-Position
Location: Chamber 2
Mode: EGPRS 1900 MHz Fundamentals

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	22.75	V	4.5	9.6	27.93	33.0	-5.1	
1850.20	24.96	H	4.5	9.6	30.14	33.0	-2.9	
Mid Ch								
1880.00	21.74	V	4.5	9.4	26.61	33.0	-6.4	
1880.00	25.50	H	4.5	9.4	30.37	33.0	-2.6	
High Ch								
1909.80	22.64	V	4.5	9.1	27.16	33.0	-5.8	
1909.80	25.51	H	4.5	9.1	30.04	33.0	-3.0	

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WCDMA Band 5

Band 5 REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 12/31/2021
Test Engineer: 25546
Configuration: EUT, X-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	19.19	V	3.0	-1.3	14.87	38.5	-23.6	
826.40	23.62	H	3.0	-1.3	19.30	38.5	-19.2	
Mid Ch								
836.60	18.90	V	3.0	-1.2	14.65	38.5	-23.8	
836.60	23.81	H	3.0	-1.2	19.56	38.5	-18.9	
High Ch								
846.60	17.56	V	3.0	-1.1	13.39	38.5	-25.1	
846.60	23.39	H	3.0	-1.1	19.21	38.5	-19.3	

Band 5 HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 12/31/2021
Test Engineer: 25546
Configuration: EUT, X-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	16.79	V	3.0	-1.3	12.47	38.5	-26.0	
826.40	21.39	H	3.0	-1.3	17.07	38.5	-21.4	
Mid Ch								
836.60	16.23	V	3.0	-1.2	11.98	38.5	-26.5	
836.60	21.52	H	3.0	-1.2	17.27	38.5	-21.2	
High Ch								
846.60	15.24	V	3.0	-1.1	11.07	38.5	-27.4	
846.60	21.11	H	3.0	-1.1	16.93	38.5	-21.6	

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LTE Band 5

LTE Band 5

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/13/2022
Test Engineer: 19227
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_QPSK Band 5 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	25.62	V	3.0	-1.3	21.31	38.5	-17.2	
829.00	12.14	H	3.0	-1.3	7.84	38.5	-30.7	
Mid Ch								
836.50	25.54	V	3.0	-1.2	21.29	38.5	-17.2	
836.50	12.57	H	3.0	-1.2	8.32	38.5	-30.2	
High Ch								
844.00	25.06	V	3.0	-1.2	20.86	38.5	-17.6	
844.00	13.25	H	3.0	-1.2	9.06	38.5	-29.4	

LTE Band 5

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/13/2022
Test Engineer: 19227
Configuration: EUT, Z-Position
Location: Chamber 2
Mode: LTE_16QAM Band 5 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	24.28	V	3.0	-1.3	19.97	38.5	-18.5	
829.00	10.90	H	3.0	-1.3	6.60	38.5	-31.9	
Mid Ch								
836.50	24.65	V	3.0	-1.2	20.40	38.5	-18.1	
836.50	11.59	H	3.0	-1.2	7.34	38.5	-31.2	
High Ch								
844.00	24.30	V	3.0	-1.2	20.10	38.5	-18.4	
844.00	12.45	H	3.0	-1.2	8.26	38.5	-30.2	

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LTE Band 5

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 12/30/2021
Test Engineer: 19227
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	24.61	V	3.0	-1.3	20.29	38.5	-18.2	
826.50	12.74	H	3.0	-1.3	8.41	38.5	-30.1	
Mid Ch								
836.50	23.97	V	3.0	-1.2	19.72	38.5	-18.8	
836.50	12.25	H	3.0	-1.2	8.00	38.5	-30.5	
High Ch								
846.50	24.47	V	3.0	-1.1	20.29	38.5	-18.2	
846.50	14.62	H	3.0	-1.1	10.44	38.5	-28.1	

LTE Band 5

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 12/30/2021
Test Engineer: 19227
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	23.52	V	3.0	-1.3	19.20	38.5	-19.3	
826.50	11.91	H	3.0	-1.3	7.58	38.5	-30.9	
Mid Ch								
836.50	22.55	V	3.0	-1.2	18.30	38.5	-20.2	
836.50	10.93	H	3.0	-1.2	6.68	38.5	-31.8	
High Ch								
846.50	23.50	V	3.0	-1.1	19.32	38.5	-19.2	
846.50	13.55	H	3.0	-1.1	9.37	38.5	-29.1	

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LTE Band 5

3MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 12/30/2021
Test Engineer: 19227
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 3MHz 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								
825.50	24.61	V	3.0	-1.3	20.28	38.5	-18.2	
825.50	12.68	H	3.0	-1.3	8.35	38.5	-30.1	
Mid Ch								
836.50	24.32	V	3.0	-1.2	20.07	38.5	-18.4	
836.50	12.46	H	3.0	-1.2	8.21	38.5	-30.3	
High Ch								
847.50	24.63	V	3.0	-1.1	20.46	38.5	-18.0	
847.50	14.39	H	3.0	-1.1	10.22	38.5	-28.3	

LTE Band 5

3MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 12/30/2021
Test Engineer: 19227
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 3MHz 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								
825.50	23.61	V	3.0	-1.3	19.28	38.5	-19.2	
825.50	12.02	H	3.0	-1.3	7.69	38.5	-30.8	
Mid Ch								
836.50	23.00	V	3.0	-1.2	18.75	38.5	-19.7	
836.50	11.37	H	3.0	-1.2	7.12	38.5	-31.4	
High Ch								
847.50	23.87	V	3.0	-1.1	19.70	38.5	-18.8	
847.50	13.94	H	3.0	-1.1	9.77	38.5	-28.7	

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LTE Band 5

1.4MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 12/30/2021
Test Engineer: 19227
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 5 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.70	24.68	V	3.0	-1.3	20.34	38.5	-18.2	
824.70	12.78	H	3.0	-1.3	8.45	38.5	-30.1	
Mid Ch								
836.50	24.77	V	3.0	-1.2	20.52	38.5	-18.0	
836.50	12.66	H	3.0	-1.2	8.41	38.5	-30.1	
High Ch								
848.30	24.56	V	3.1	-1.1	20.39	38.5	-18.1	
848.30	14.76	H	3.1	-1.1	10.59	38.5	-27.9	

LTE Band 5

1.4MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 12/30/2021
Test Engineer: 19227
Configuration: EUT, Z-Position
Location: Chamber 1
Mode: LTE_16QAM Band 5 Fundamentals, 1.4MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.70	23.66	V	3.0	-1.3	19.32	38.5	-19.2	
824.70	11.75	H	3.0	-1.3	7.42	38.5	-31.1	
Mid Ch								
836.50	23.07	V	3.0	-1.2	18.82	38.5	-19.7	
836.50	12.10	H	3.0	-1.2	7.85	38.5	-30.7	
High Ch								
848.30	24.04	V	3.1	-1.1	19.87	38.5	-18.6	
848.30	13.89	H	3.1	-1.1	9.72	38.5	-28.8	

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LTE Band 41

LTE Band 41

20MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/11/2021
Test Engineer: 19568
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 41 Fundamentals, 20MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2506.00	19.22	V	5.2	10.2	24.17	33.0	-8.8	
2506.00	18.19	H	5.2	10.2	23.15	33.0	-9.9	
Mid Ch								
2593.00	18.71	V	5.3	10.1	23.49	33.0	-9.5	
2593.00	16.41	H	5.3	10.1	21.19	33.0	-11.8	
High Ch								
2680.00	17.74	V	5.4	10.2	22.50	33.0	-10.5	
2680.00	16.00	H	5.4	10.2	20.76	33.0	-12.2	

LTE Band 41

20MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/11/2021
Test Engineer: 19568
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 41 Fundamentals, 20MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2506.00	17.87	V	5.2	10.2	22.82	33.0	-10.2	
2506.00	16.03	H	5.2	10.2	20.99	33.0	-12.0	
Mid Ch								
2593.00	18.02	V	5.3	10.1	22.80	33.0	-10.2	
2593.00	15.57	H	5.3	10.1	20.35	33.0	-12.6	
High Ch								
2680.00	17.17	V	5.4	10.2	21.93	33.0	-11.1	
2680.00	15.42	H	5.4	10.2	20.18	33.0	-12.8	

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LTE Band 41

15MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/11/2021
Test Engineer: 19568
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 41 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2503.50	19.24	V	5.2	10.2	24.20	33.0	-8.8	
2503.50	18.50	H	5.2	10.2	23.46	33.0	-9.5	
Mid Ch								
2593.00	18.16	V	5.3	10.1	22.94	33.0	-10.1	
2593.00	15.67	H	5.3	10.1	20.45	33.0	-12.5	
High Ch								
2682.50	18.30	V	5.4	10.2	23.06	33.0	-9.9	
2682.50	14.73	H	5.4	10.2	19.49	33.0	-13.5	

LTE Band 41

15MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/11/2021
Test Engineer: 19568
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 41 Fundamentals, 15MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2503.50	18.90	V	5.2	10.2	23.86	33.0	-9.1	
2503.50	17.73	H	5.2	10.2	22.69	33.0	-10.3	
Mid Ch								
2593.00	17.47	V	5.3	10.1	22.25	33.0	-10.7	
2593.00	15.31	H	5.3	10.1	20.09	33.0	-12.9	
High Ch								
2682.50	17.46	V	5.4	10.2	22.22	33.0	-10.8	
2682.50	13.89	H	5.4	10.2	18.65	33.0	-14.3	

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LTE Band 41

10MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/11/2021
Test Engineer: 19568
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 41 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2501.00	18.60	V	5.2	10.2	23.57	33.0	-9.4	
2501.00	18.07	H	5.2	10.2	23.04	33.0	-10.0	
Mid Ch								
2593.00	18.17	V	5.3	10.1	22.95	33.0	-10.0	
2593.00	15.71	H	5.3	10.1	20.49	33.0	-12.5	
High Ch								
2685.00	17.99	V	5.4	10.2	22.75	33.0	-10.2	
2685.00	15.62	H	5.4	10.2	20.38	33.0	-12.6	

LTE Band 41

10MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/11/2021
Test Engineer: 19568
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 41 Fundamentals, 10MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2501.00	18.42	V	5.2	10.2	23.39	33.0	-9.6	
2501.00	17.53	H	5.2	10.2	22.50	33.0	-10.5	
Mid Ch								
2593.00	17.74	V	5.3	10.1	22.52	33.0	-10.5	
2593.00	15.07	H	5.3	10.1	19.85	33.0	-13.1	
High Ch								
2685.00	17.41	V	5.4	10.2	22.17	33.0	-10.8	
2685.00	14.22	H	5.4	10.2	18.98	33.0	-14.0	

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LTE Band 41

5MHz

QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/11/2021
Test Engineer: 19568
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 41 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2498.50	18.97	V	5.2	10.2	23.94	33.0	-9.1	
2498.50	18.09	H	5.2	10.2	23.06	33.0	-9.9	
Mid Ch								
2593.00	18.13	V	5.3	10.1	22.91	33.0	-10.1	
2593.00	15.69	H	5.3	10.1	20.47	33.0	-12.5	
High Ch								
2687.50	18.09	V	5.4	10.2	22.86	33.0	-10.1	
2687.50	15.57	H	5.4	10.2	20.33	33.0	-12.7	

LTE Band 41

5MHz

16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 4790215260
Date: 1/11/2021
Test Engineer: 19568
Configuration: EUT, Y-Position
Location: Chamber 2
Mode: LTE_16QAM Band 41 Fundamentals, 5MHz Bandwidth

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
2498.50	18.40	V	5.2	10.2	23.37	33.0	-9.6	
2498.50	17.39	H	5.2	10.2	22.36	33.0	-10.6	
Mid Ch								
2593.00	17.45	V	5.3	10.1	22.23	33.0	-10.8	
2593.00	14.98	H	5.3	10.1	19.76	33.0	-13.2	
High Ch								
2687.50	17.76	V	5.4	10.2	22.53	33.0	-10.5	
2687.50	15.54	H	5.4	10.2	20.30	33.0	-12.7	

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9.6. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

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

LIMIT

Part 22.917(a) & Part 24.238(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.

Part 27.53:

(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 FDD), Maxhold(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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9.6.1. SPURIOUS RADIATION PLOTS

GSM850

GSM850

GPRS

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

Company:	Samsung
Project #:	4790215260
Date:	1/3/2022
Test Engineer:	19227
Configuration:	EUT / AC Adapter, X-Position
Location:	Chamber 2
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	-13.9	V	3.0	40.9	1.0	-53.9	-13.0	-40.9	
2472.60	-11.8	V	3.0	41.5	1.0	-52.3	-13.0	-39.3	
3296.80	-8.8	V	3.0	42.3	1.0	-50.2	-13.0	-37.2	
4121.00	-9.6	V	3.0	42.4	1.0	-51.0	-13.0	-38.0	
4945.20	-7.9	V	3.0	43.0	1.0	-49.9	-13.0	-36.9	
1648.40	-10.8	H	3.0	40.9	1.0	-50.7	-13.0	-37.7	
2472.60	-12.1	H	3.0	41.5	1.0	-52.6	-13.0	-39.6	
3296.80	-8.8	H	3.0	42.3	1.0	-50.1	-13.0	-37.1	
4121.00	-9.2	H	3.0	42.4	1.0	-50.7	-13.0	-37.7	
4945.20	-7.8	H	3.0	43.0	1.0	-49.7	-13.0	-36.7	
Mid Ch, 836.6MHz									
1673.20	-11.6	V	3.0	40.9	1.0	-51.6	-13.0	-38.6	
2509.80	-11.7	V	3.0	41.6	1.0	-52.3	-13.0	-39.3	
3346.40	-8.5	V	3.0	42.3	1.0	-49.8	-13.0	-36.8	
4183.00	-9.3	V	3.0	42.5	1.0	-50.7	-13.0	-37.7	
5019.60	-7.7	V	3.0	43.0	1.0	-49.7	-13.0	-36.7	
1673.20	-9.1	H	3.0	40.9	1.0	-49.0	-13.0	-36.0	
2509.80	-12.1	H	3.0	41.6	1.0	-52.7	-13.0	-39.7	
3346.40	-8.4	H	3.0	42.3	1.0	-49.7	-13.0	-36.7	
4183.00	-8.9	H	3.0	42.5	1.0	-50.4	-13.0	-37.4	
5019.60	-7.4	H	3.0	43.0	1.0	-49.4	-13.0	-36.4	
High Ch, 848.8MHz									
1697.60	-11.7	V	3.0	40.9	1.0	-51.6	-13.0	-38.6	
2546.40	-11.5	V	3.0	41.6	1.0	-52.1	-13.0	-39.1	
3395.20	-8.4	V	3.0	42.3	1.0	-49.7	-13.0	-36.7	
4244.00	-8.9	V	3.0	42.5	1.0	-50.4	-13.0	-37.4	
5092.80	-7.9	V	3.0	43.0	1.0	-50.0	-13.0	-37.0	
1697.60	-8.0	H	3.0	40.9	1.0	-47.9	-13.0	-34.9	
2546.40	-11.7	H	3.0	41.6	1.0	-52.4	-13.0	-39.4	
3395.20	-8.4	H	3.0	42.3	1.0	-49.7	-13.0	-36.7	
4244.00	-9.0	H	3.0	42.5	1.0	-50.5	-13.0	-37.5	
5092.80	-7.5	H	3.0	43.0	1.0	-49.5	-13.0	-36.5	

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

Company:	Samsung
Project #:	4790215260
Date:	1/3/2022
Test Engineer:	19227
Configuration:	EUT / AC Adapter, X-Position
Location:	Chamber 2
Mode:	EGPRS 850 MHz Harmonics
Test Votage:	AC 120 V, 60 Hz

GSM850

EGPRS

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1648.40	-14.5	V	3.0	40.9	1.0	-54.4	-13.0	-41.4	
2472.60	-11.8	V	3.0	41.5	1.0	-52.3	-13.0	-39.3	
3296.80	-9.0	V	3.0	42.3	1.0	-50.3	-13.0	-37.3	
4121.00	-9.6	V	3.0	42.4	1.0	-51.0	-13.0	-38.0	
4945.20	-8.0	V	3.0	43.0	1.0	-50.0	-13.0	-37.0	
1648.40	-15.1	H	3.0	40.9	1.0	-55.0	-13.0	-42.0	
2472.60	-12.1	H	3.0	41.5	1.0	-52.7	-13.0	-39.7	
3296.80	-8.9	H	3.0	42.3	1.0	-50.2	-13.0	-37.2	
4121.00	-9.3	H	3.0	42.4	1.0	-50.7	-13.0	-37.7	
4945.20	-7.8	H	3.0	43.0	1.0	-49.8	-13.0	-36.8	
Mid Ch, 836.6MHz									
1673.20	-14.6	V	3.0	40.9	1.0	-54.5	-13.0	-41.5	
2509.80	-11.7	V	3.0	41.6	1.0	-52.3	-13.0	-39.3	
3346.40	-8.6	V	3.0	42.3	1.0	-49.9	-13.0	-36.9	
4183.00	-9.3	V	3.0	42.5	1.0	-50.7	-13.0	-37.7	
5019.60	-7.7	V	3.0	43.0	1.0	-49.8	-13.0	-36.8	
1673.20	-14.9	H	3.0	40.9	1.0	-54.8	-13.0	-41.8	
2509.80	-12.2	H	3.0	41.6	1.0	-52.8	-13.0	-39.8	
3346.40	-8.6	H	3.0	42.3	1.0	-49.9	-13.0	-36.9	
4183.00	-9.0	H	3.0	42.5	1.0	-50.4	-13.0	-37.4	
5019.60	-7.5	H	3.0	43.0	1.0	-49.6	-13.0	-36.6	
High Ch, 848.8MHz									
1697.60	-14.4	V	3.0	40.9	1.0	-54.3	-13.0	-41.3	
2546.40	-11.6	V	3.0	41.6	1.0	-52.2	-13.0	-39.2	
3395.20	-8.5	V	3.0	42.3	1.0	-49.8	-13.0	-36.8	
4244.00	-9.1	V	3.0	42.5	1.0	-50.6	-13.0	-37.6	
5092.80	-8.0	V	3.0	43.0	1.0	-50.0	-13.0	-37.0	
1697.60	-13.7	H	3.0	40.9	1.0	-53.6	-13.0	-40.6	
2546.40	-11.8	H	3.0	41.6	1.0	-52.5	-13.0	-39.5	
3395.20	-8.5	H	3.0	42.3	1.0	-49.8	-13.0	-36.8	
4244.00	-9.0	H	3.0	42.5	1.0	-50.5	-13.0	-37.5	
5092.80	-7.6	H	3.0	43.0	1.0	-49.6	-13.0	-36.6	

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GSM1900

GSM1900

GPRS

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

Company: Samsung
Project #: 4790215260
Date: 1/12/2022
Test Engineer: 19568
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
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	-10.5	V	3.0	42.3	1.0	-51.9	-13.0	-38.9	
5550.60	-7.1	V	3.0	43.1	1.0	-49.2	-13.0	-36.2	
7400.80	-5.2	V	3.0	42.7	1.0	-47.0	-13.0	-34.0	
3700.40	-10.2	H	3.0	42.3	1.0	-51.6	-13.0	-38.6	
5550.60	-7.0	H	3.0	43.1	1.0	-49.1	-13.0	-36.1	
7400.80	-5.2	H	3.0	42.7	1.0	-46.9	-13.0	-33.9	
Mid Ch, 1880MHz									
3760.00	-10.1	V	3.0	42.3	1.0	-51.4	-13.0	-38.4	
5640.00	-6.8	V	3.0	43.2	1.0	-48.9	-13.0	-35.9	
7520.00	-4.3	V	3.0	42.7	1.0	-46.0	-13.0	-33.0	
3760.00	-10.0	H	3.0	42.3	1.0	-51.3	-13.0	-38.3	
5640.00	-6.8	H	3.0	43.2	1.0	-49.0	-13.0	-36.0	
7520.00	-5.2	H	3.0	42.7	1.0	-46.9	-13.0	-33.9	
High Ch, 1909.8MHz									
3819.60	-10.2	V	3.0	42.3	1.0	-51.5	-13.0	-38.5	
5729.40	-6.9	V	3.0	43.2	1.0	-49.0	-13.0	-36.0	
7639.20	-5.2	V	3.0	42.6	1.0	-46.8	-13.0	-33.8	
3819.60	-9.9	H	3.0	42.3	1.0	-51.2	-13.0	-38.2	
5729.40	-6.8	H	3.0	43.2	1.0	-49.0	-13.0	-36.0	
7639.20	-5.3	H	3.0	42.6	1.0	-46.9	-13.0	-33.9	

GSM1900

EGPRS

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

Company: Samsung
Project #: 4790215260
Date: 1/12/2022
Test Engineer: 19568
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: EGPRS 1900 MHz Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-10.5	V	3.0	42.3	1.0	-51.8	-13.0	-38.8	
5550.60	-7.2	V	3.0	43.1	1.0	-49.4	-13.0	-36.4	
7400.80	-5.2	V	3.0	42.7	1.0	-46.9	-13.0	-33.9	
3700.40	-10.2	H	3.0	42.3	1.0	-51.6	-13.0	-38.6	
5550.60	-7.1	H	3.0	43.1	1.0	-49.2	-13.0	-36.2	
7400.80	-5.2	H	3.0	42.7	1.0	-46.9	-13.0	-33.9	
Mid Ch, 1880MHz									
3760.00	-10.2	V	3.0	42.3	1.0	-51.6	-13.0	-38.6	
5640.00	-6.8	V	3.0	43.2	1.0	-48.9	-13.0	-35.9	
7520.00	-5.3	V	3.0	42.7	1.0	-47.0	-13.0	-34.0	
3760.00	-10.0	H	3.0	42.3	1.0	-51.3	-13.0	-38.3	
5640.00	-6.9	H	3.0	43.2	1.0	-49.0	-13.0	-36.0	
7520.00	-5.3	H	3.0	42.7	1.0	-46.9	-13.0	-33.9	
High Ch, 1909.8MHz									
3819.60	-10.2	V	3.0	42.3	1.0	-51.6	-13.0	-38.6	
5729.40	-6.9	V	3.0	43.2	1.0	-49.1	-13.0	-36.1	
7639.20	-5.2	V	3.0	42.6	1.0	-46.8	-13.0	-33.8	
3819.60	-10.0	H	3.0	42.3	1.0	-51.4	-13.0	-38.4	
5729.40	-7.0	H	3.0	43.2	1.0	-49.2	-13.0	-36.2	
7639.20	-5.3	H	3.0	42.6	1.0	-46.9	-13.0	-33.9	

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WCDMA Band 5

Band 5 REL99

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

Company: Samsung
Project #: 4790215260
Date: 1/3/2022
Test Engineer: 19227
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: Rel99 Band 5 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-16.1	V	3.0	40.9	1.0	-56.0	-13.0	-43.0	
2479.20	-13.1	V	3.0	41.6	1.0	-53.7	-13.0	-40.7	
3305.60	-10.1	V	3.0	42.3	1.0	-51.4	-13.0	-38.4	
1652.80	-16.8	H	3.0	40.9	1.0	-56.7	-13.0	-43.7	
2479.20	-13.5	H	3.0	41.6	1.0	-54.1	-13.0	-41.1	
3305.60	-10.3	H	3.0	42.3	1.0	-51.6	-13.0	-38.6	
Mid Ch, 836.6MHz									
1673.20	-16.0	V	3.0	40.9	1.0	-56.0	-13.0	-43.0	
2509.80	-13.1	V	3.0	41.6	1.0	-53.7	-13.0	-40.7	
3346.40	-9.8	V	3.0	42.3	1.0	-51.1	-13.0	-38.1	
1673.20	-16.7	H	3.0	40.9	1.0	-56.6	-13.0	-43.6	
2509.80	-13.5	H	3.0	41.6	1.0	-54.1	-13.0	-41.1	
3346.40	-9.9	H	3.0	42.3	1.0	-51.2	-13.0	-38.2	
High Ch, 846.6MHz									
1693.20	-15.9	V	3.0	40.9	1.0	-55.9	-13.0	-42.9	
2539.80	-12.8	V	3.0	41.6	1.0	-53.4	-13.0	-40.4	
3386.40	-9.8	V	3.0	42.3	1.0	-51.1	-13.0	-38.1	
1693.20	-16.5	H	3.0	40.9	1.0	-56.5	-13.0	-43.5	
2539.80	-13.3	H	3.0	41.6	1.0	-53.9	-13.0	-40.9	
3386.40	-9.8	H	3.0	42.3	1.0	-51.1	-13.0	-38.1	

Band 5 HSDPA

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

Company: Samsung
Project #: 4790215260
Date: 1/3/2022
Test Engineer: 19227
Configuration: EUT / AC Adapter, X-Position
Location: Chamber 2
Mode: HSDPA Band 5 Harmonics
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1652.80	-16.2	V	3.0	40.9	1.0	-56.1	-13.0	-43.1	
2479.20	-13.2	V	3.0	41.6	1.0	-53.7	-13.0	-40.7	
3305.60	-10.3	V	3.0	42.3	1.0	-51.6	-13.0	-38.6	
1652.80	-16.8	H	3.0	40.9	1.0	-56.7	-13.0	-43.7	
2479.20	-13.6	H	3.0	41.6	1.0	-54.1	-13.0	-41.1	
3305.60	-10.3	H	3.0	42.3	1.0	-51.6	-13.0	-38.6	
Mid Ch, 836.6MHz									
1673.20	-16.0	V	3.0	40.9	1.0	-56.0	-13.0	-43.0	
2509.80	-13.2	V	3.0	41.6	1.0	-53.8	-13.0	-40.8	
3346.40	-9.9	V	3.0	42.3	1.0	-51.2	-13.0	-38.2	
1673.20	-16.7	H	3.0	40.9	1.0	-56.6	-13.0	-43.6	
2509.80	-13.5	H	3.0	41.6	1.0	-54.1	-13.0	-41.1	
3346.40	-9.9	H	3.0	42.3	1.0	-51.2	-13.0	-38.2	
High Ch, 846.6MHz									
1693.20	-15.9	V	3.0	40.9	1.0	-55.9	-13.0	-42.9	
2539.80	-13.0	V	3.0	41.6	1.0	-53.6	-13.0	-40.6	
3386.40	-9.9	V	3.0	42.3	1.0	-51.2	-13.0	-38.2	
1693.20	-16.6	H	3.0	40.9	1.0	-56.5	-13.0	-43.5	
2539.80	-13.3	H	3.0	41.6	1.0	-53.9	-13.0	-40.9	
3386.40	-9.9	H	3.0	42.3	1.0	-51.2	-13.0	-38.2	

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LTE Band 5

LTE
Band 5

1.4MHz

QPSK

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

Company:	Samsung
Project #:	4790215260
Date:	12/30/2021
Test Engineer:	19227
Configuration:	EUT, Z-Position
Location:	Chamber 1
Mode:	LTE_QPSK Band 5 Harmonics, 1.4MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.7MHz									
1649.40	-14.7	V	3.0	45.6	1.0	-59.3	-13.0	-46.3	
2474.10	-6.8	V	3.0	45.4	1.0	-51.2	-13.0	-38.2	
3298.80	-4.1	V	3.0	45.7	1.0	-48.8	-13.0	-35.8	
1649.40	-15.1	H	3.0	45.6	1.0	-59.7	-13.0	-46.7	
2474.10	-11.9	H	3.0	45.4	1.0	-56.4	-13.0	-43.4	
3298.80	-4.0	H	3.0	45.7	1.0	-48.7	-13.0	-35.7	
Mid Ch, 836.5MHz									
1673.00	-15.5	V	3.0	45.6	1.0	-60.1	-13.0	-47.1	
2509.50	-9.1	V	3.0	45.5	1.0	-53.6	-13.0	-40.6	
3346.00	-3.9	V	3.0	45.7	1.0	-48.6	-13.0	-35.6	
1673.00	-16.3	H	3.0	45.6	1.0	-60.9	-13.0	-47.9	
2509.50	-11.5	H	3.0	45.5	1.0	-56.0	-13.0	-43.0	
3346.00	-2.8	H	3.0	45.7	1.0	-47.5	-13.0	-34.5	
High Ch, 848.3MHz									
1696.60	-15.5	V	3.0	45.6	1.0	-60.0	-13.0	-47.0	
2544.90	-8.1	V	3.0	45.5	1.0	-52.5	-13.0	-39.5	
3393.20	-2.6	V	3.0	45.7	1.0	-47.3	-13.0	-34.3	
1696.60	-15.8	H	3.0	45.6	1.0	-60.4	-13.0	-47.4	
2544.90	-11.1	H	3.0	45.5	1.0	-55.5	-13.0	-42.5	
3393.20	-0.8	H	3.0	45.7	1.0	-45.5	-13.0	-32.5	

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LTE Band 41

LTE Band 41

15MHz

QPSK

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

Company:	Samsung
Project #:	4790215260
Date:	1/11/2021
Test Engineer:	19568
Configuration:	EUT, Z-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 41 Harmonics, 15MHz 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, 2503.5MHz									
5007.00	-19.0	V	3.0	43.0	1.0	-61.1	-25.0	-36.1	
7510.50	-18.3	V	3.0	42.7	1.0	-60.0	-25.0	-35.0	
10014.00	-15.1	V	3.0	41.1	1.0	-55.2	-25.0	-30.2	
5007.00	-19.8	H	3.0	43.0	1.0	-61.8	-25.0	-36.8	
7510.50	-18.4	H	3.0	42.7	1.0	-60.1	-25.0	-35.1	
10014.00	-15.2	H	3.0	41.1	1.0	-55.3	-25.0	-30.3	
Mid Ch, 2593MHz									
5186.00	-19.6	V	3.0	43.1	1.0	-61.7	-25.0	-36.7	
7779.00	-6.8	V	3.0	42.5	1.0	-48.3	-25.0	-23.3	
10372.00	-14.9	V	3.0	41.3	1.0	-55.2	-25.0	-30.2	
5186.00	-19.8	H	3.0	43.1	1.0	-61.9	-25.0	-36.9	
7779.00	-3.4	H	3.0	42.5	1.0	-45.0	-25.0	-20.0	
10372.00	-14.8	H	3.0	41.3	1.0	-55.1	-25.0	-30.1	
High Ch, 2682.5MHz									
5365.00	-19.1	V	3.0	43.1	1.0	-61.2	-25.0	-36.2	
8047.50	-18.4	V	3.0	42.4	1.0	-59.8	-25.0	-34.8	
10730.00	-14.0	V	3.0	41.4	1.0	-54.4	-25.0	-29.4	
5365.00	-18.9	H	3.0	43.1	1.0	-61.0	-25.0	-36.0	
8047.50	-18.4	H	3.0	42.4	1.0	-59.8	-25.0	-34.8	
10730.00	-13.9	H	3.0	41.4	1.0	-54.4	-25.0	-29.4	

END OF REPORT

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