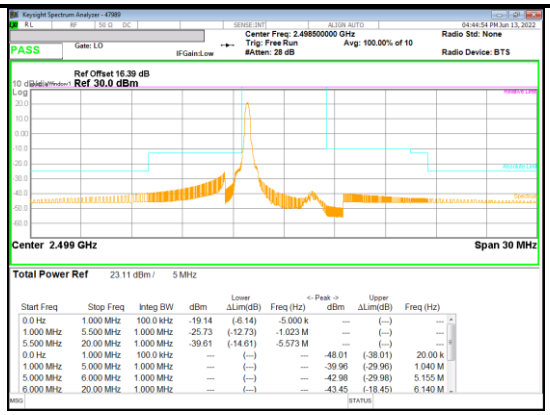
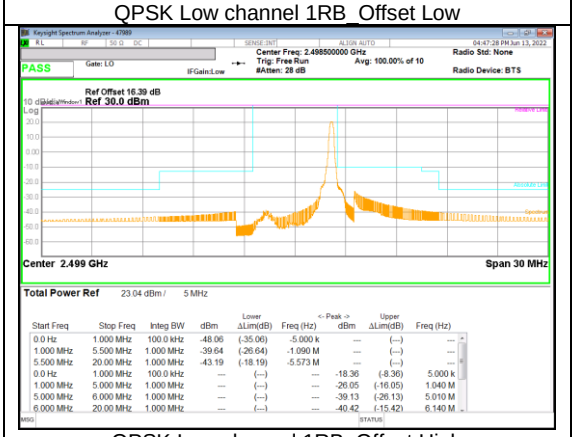
5MHz

QPSK

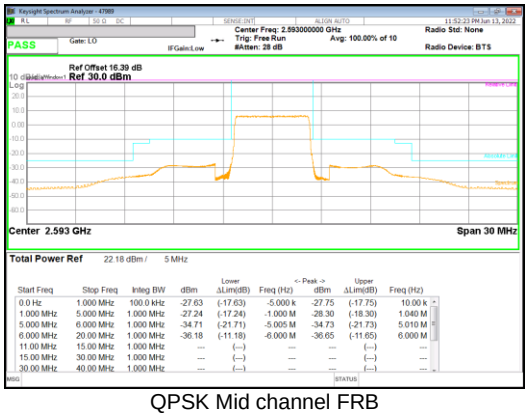
QPSK Low channel FRB



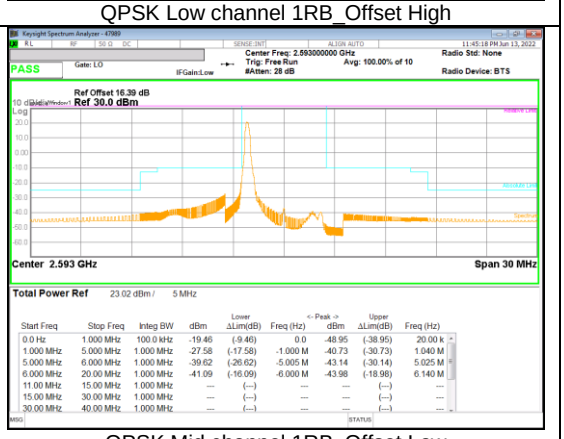
QPSK Low channel 1RB_Offset Low



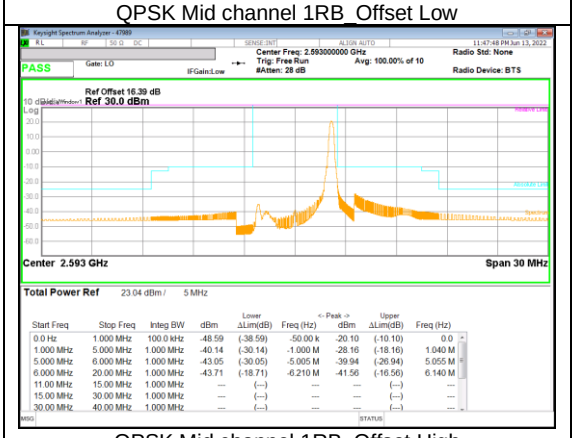
QPSK Low channel 1RB_Offset High



QPSK Mid channel FRB



QPSK Mid channel 1RB_Offset Low



QPSK Mid channel 1RB_Offset High

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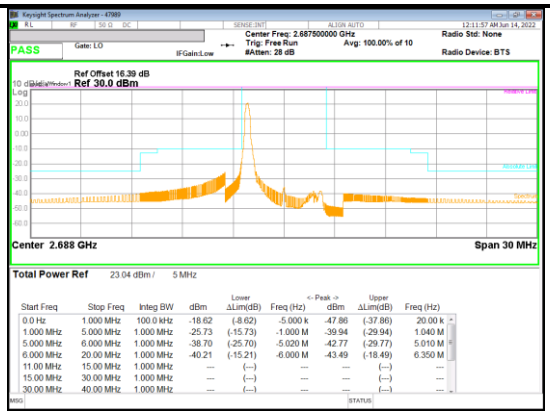
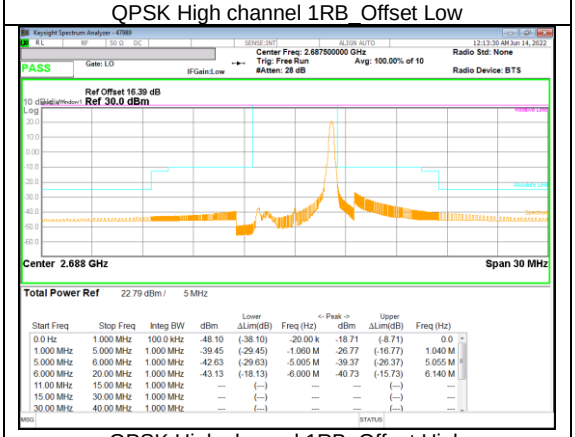
5MHz

QPSK

QPSK High channel FRB



QPSK High channel 1RB_Offset Low

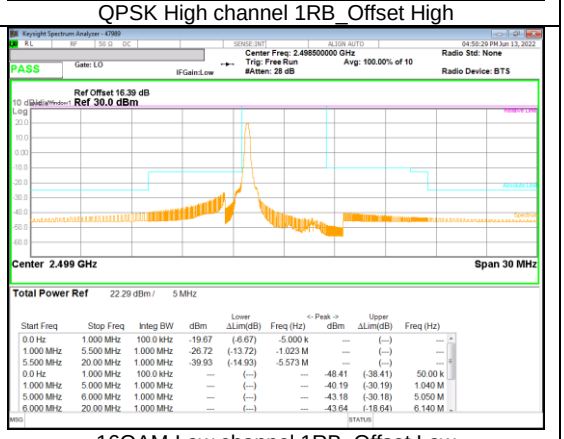


QPSK High channel 1RB_Offset High

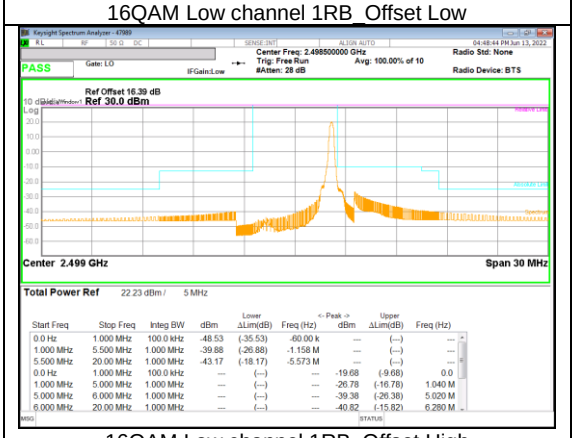
5MHz

16QAM

16QAM Low channel FRB



16QAM Low channel 1RB_Offset Low

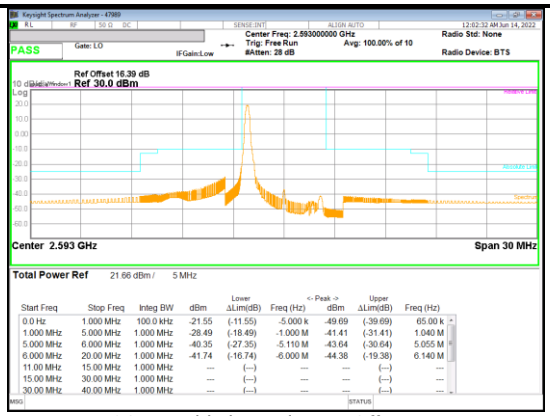


16QAM Low channel 1RB_Offset High

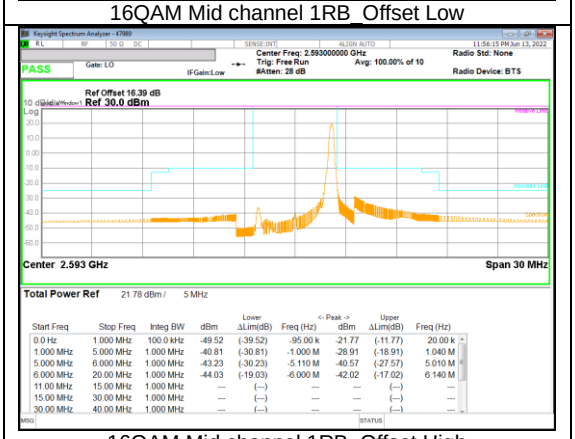
5MHz

16QAM

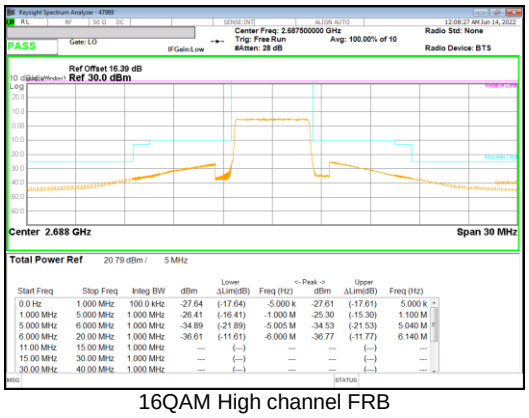
16QAM Mid channel FRB



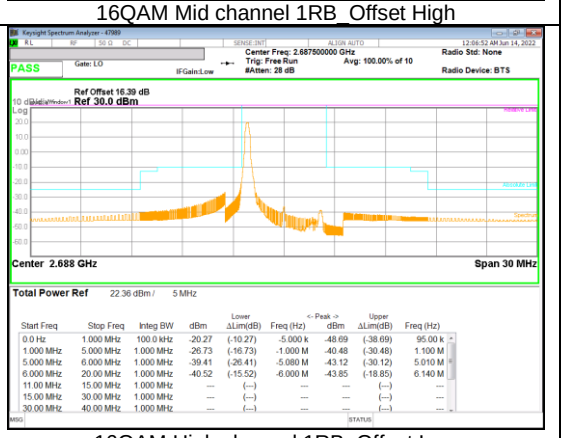
16QAM Mid channel 1RB_Offset Low



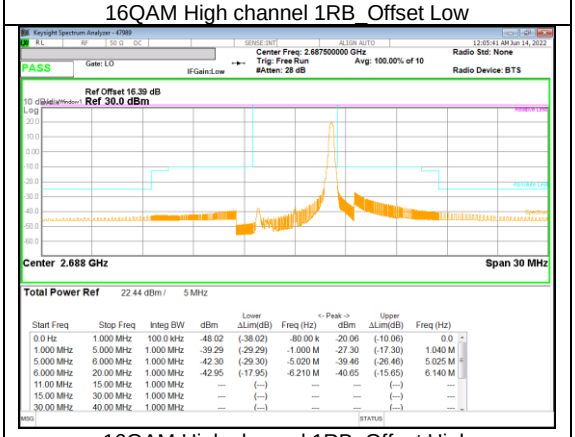
16QAM Mid channel 1RB_Offset High



16QAM High channel FRB



16QAM High channel 1RB_Offset Low



16QAM High channel 1RB_Offset High

9.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §27.53 and 90.691

LIMITS

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

Part 27.53:

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

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

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

Part 90.691(a):

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

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

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

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TEST PROCEDURE

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

a) Set the RBW = 100KHz for emission below 1GHz and 1MHz for emissions above 1GHz (Tests were performed 1MHz [Worst case], to sweep 1 time for all frequency range)
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 1.5 times the OBW;
d) Sweep time = auto couple;
e) Detector = rms;
f) Ensure that the number of measurement points = Max (40001);
g) Trace mode = average(WCDMA, LTE FDD, 5G NR FDD), Max hold(GSM, LTE TDD, 5G NR TDD);

RESULTS

See the following pages.

NOTE1

5G NR: All Waveforms (CP-OFDM vs DFT-s OFDM) and modulations (π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

NOTE2

Please refer to section 5.4 for bandwidth and RB setting about LTE, 5G NR bands.

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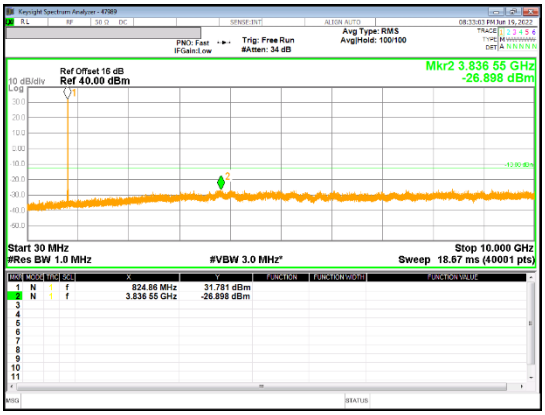
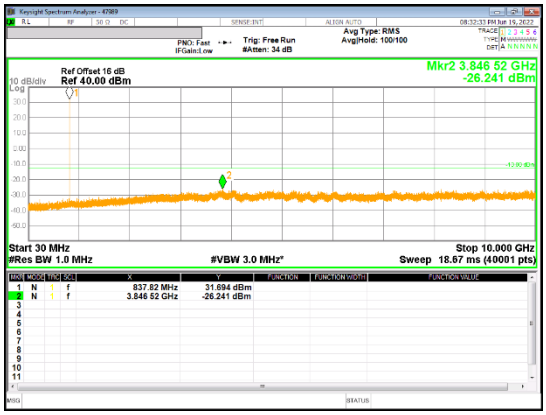
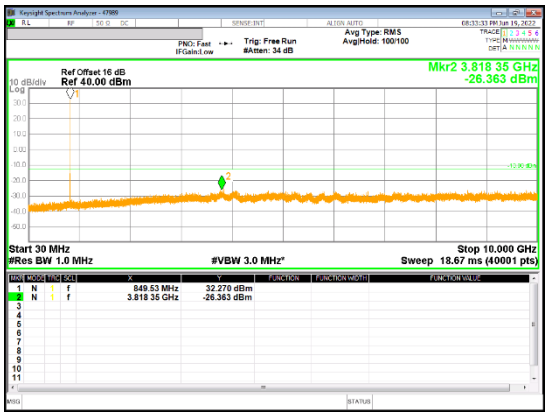
9.3.1. OUT OF BAND EMISSIONS RESULT

GSM 850

GSM 850	 GPRS Low channel	 GPRS Mid channel
	 GPRS High channel	

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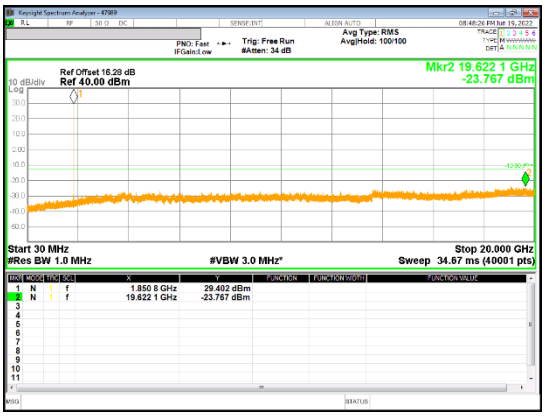
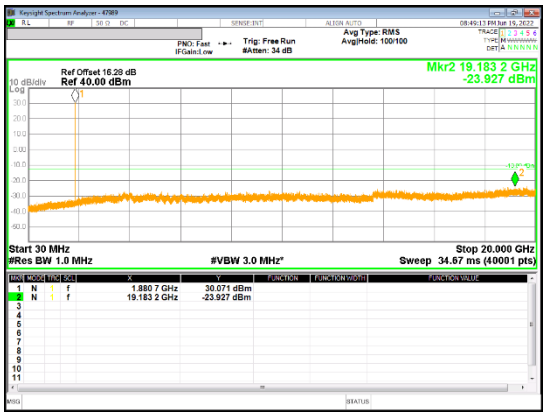
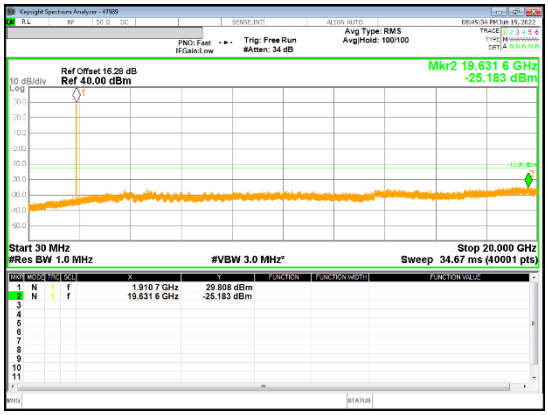
GSM 1900

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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WCDMA Band 4

Band 4

REL99 Low channel

REL99 Mid channel

REL99 High channel

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WCDMA Band 2

Band 2

REL99 Low channel

REL99 Mid channel

REL99 High channel

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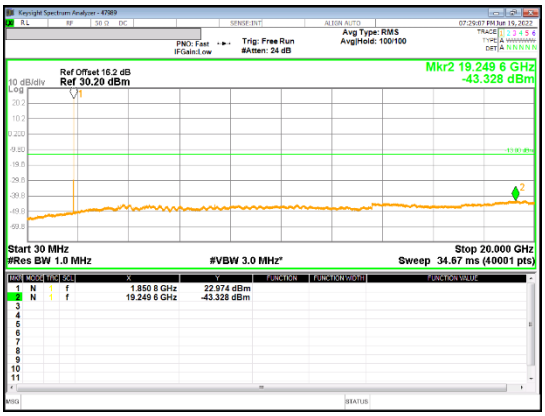
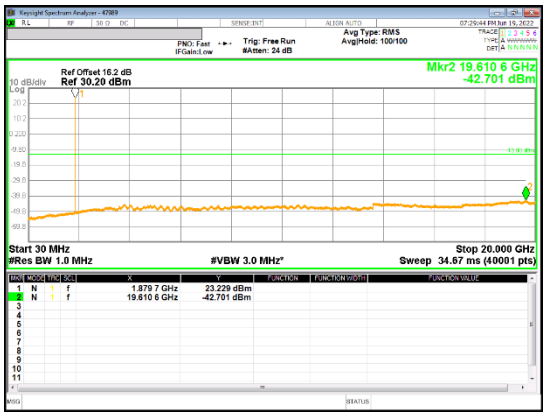
LTE Band 2

3 MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

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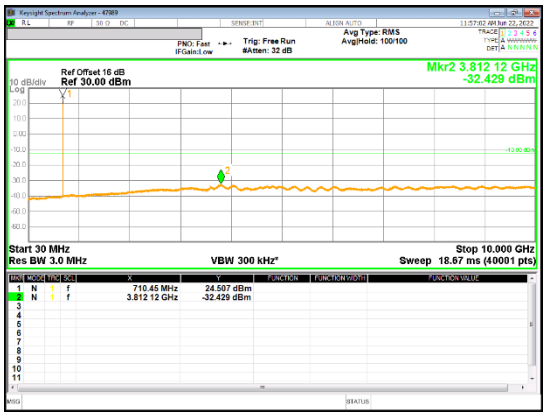
LTE Band 12

5 MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

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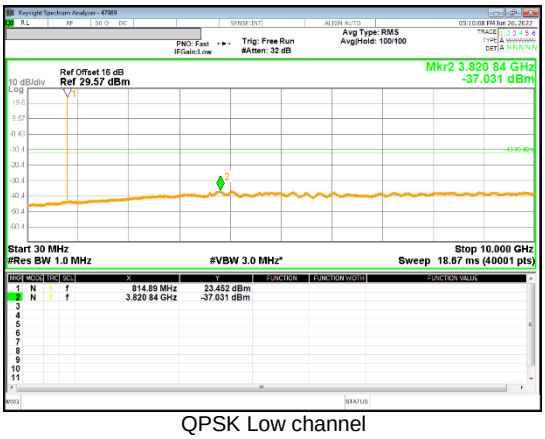
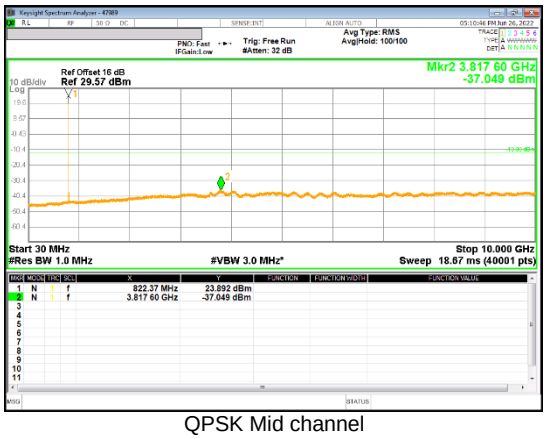
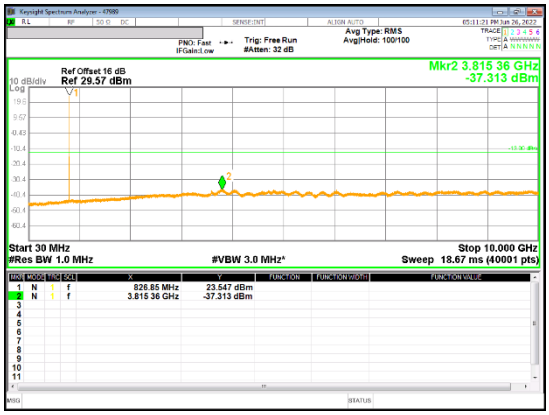
LTE Band 26(Part 90)

5 MHz	 QPSK Low channel	 QPSK Mid channel

LTE Band 26 (Straddle)

5 MHz	 QPSK High channel

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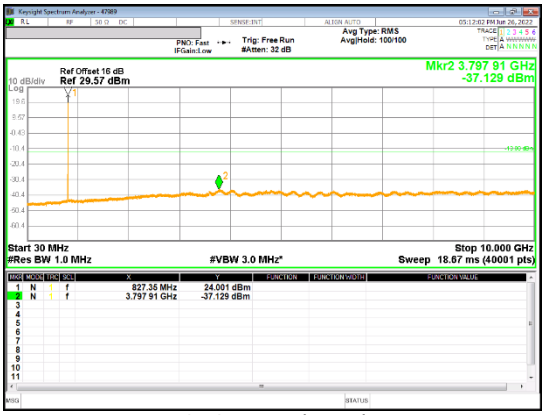
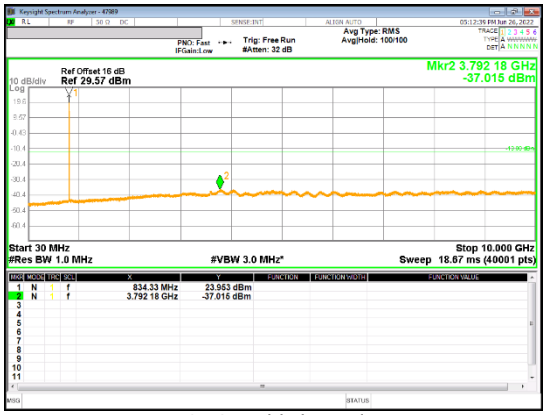
LTE Band 26 (Part 22)

5 MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

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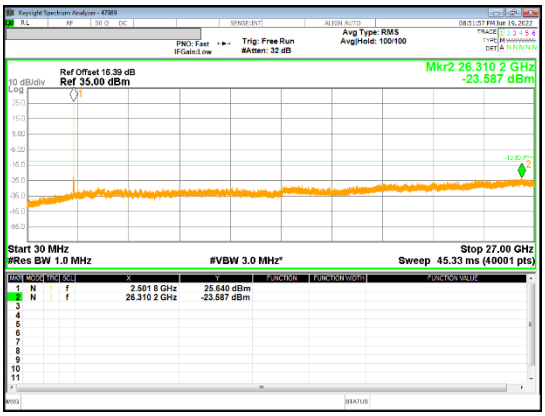
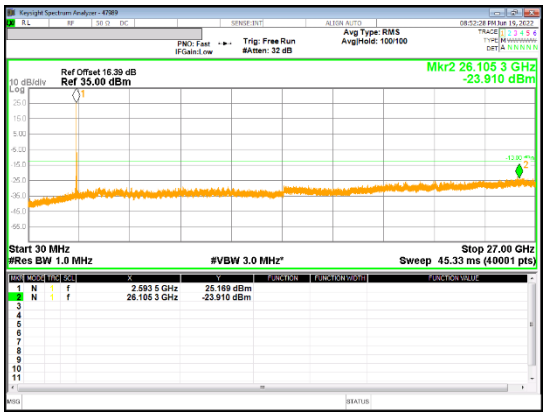
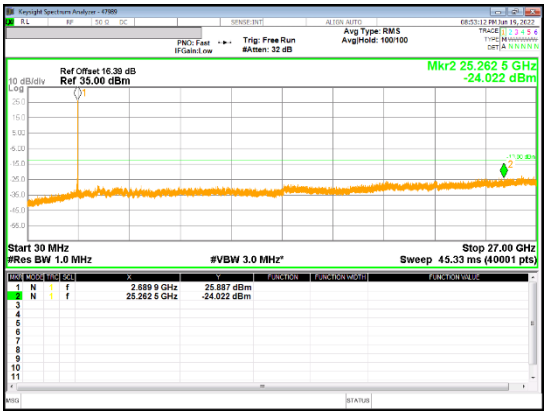
LTE Band 41

10 MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

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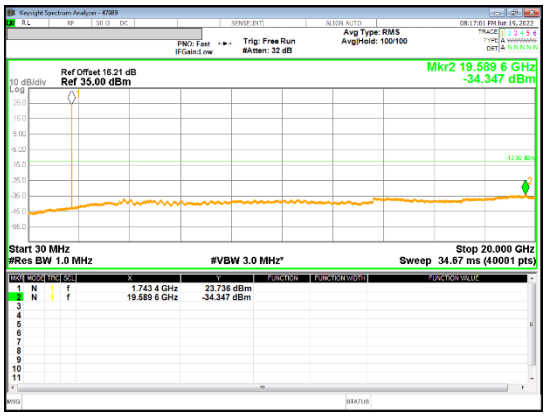
LTE Band 66

5 MHz	 QPSK Low channel	 QPSK Mid channel
	 QPSK High channel	

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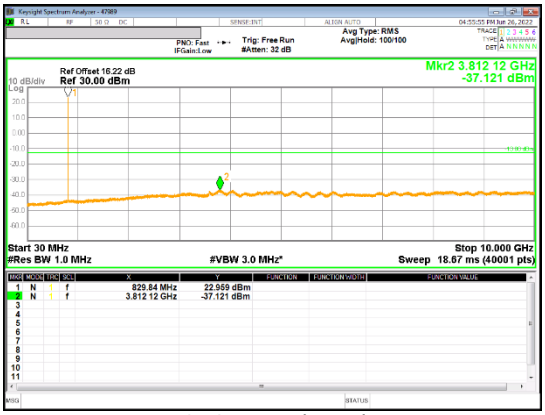
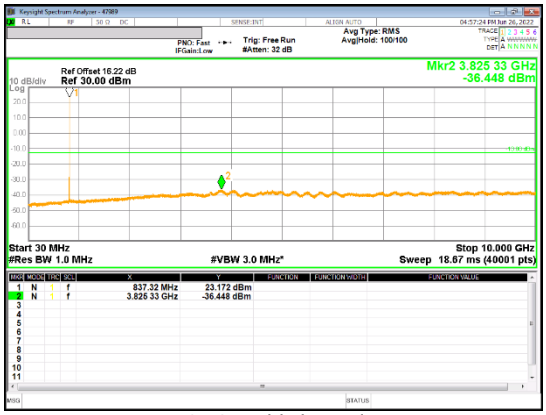
NR Band n5

10 MHz



QPSK Low channel



QPSK Mid channel

QPSK High channel

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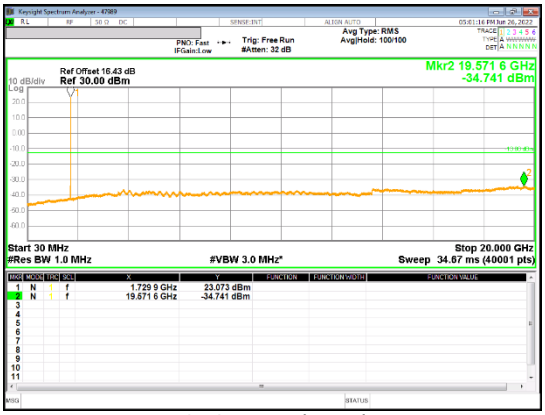
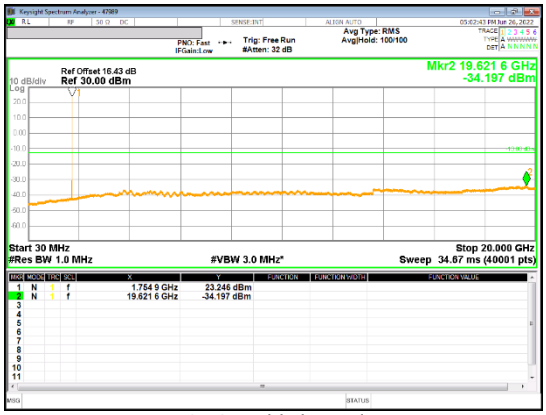
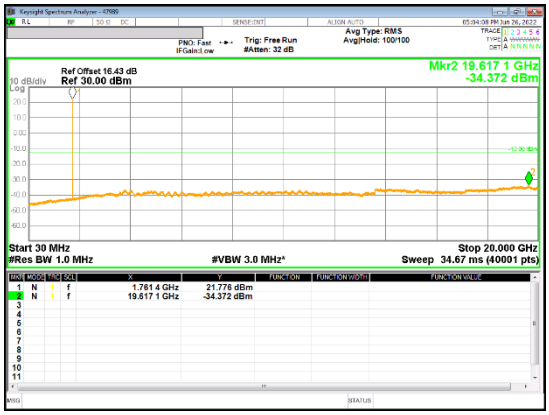
NR Band n66

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 and §90.213

LIMITS

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

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

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

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

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

RESULTS

See the following pages.

NOTE

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

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9.4.1. FREQUENCY STABILITY RESULTS

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

Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2060.500	Hz	High Channel	2122.000	Hz
Power Supply [Vdc]	Environment Temperature [ºC]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	50	824.20003136	0.000	848.80003137	0.005	2.5
3.86	40	824.20002055	0.013	848.80003243	0.003	2.5
3.86	30	824.20003307	-0.003	848.80003032	0.006	2.5
3.86	***20***	***824.20003097***	***0.000***	***848.80003525***	***0.000***	***2.5***
3.86	10	824.20003114	0.000	848.80003563	0.000	2.5
3.86	0	824.20003619	-0.006	848.80003016	0.006	2.5
3.86	-10	824.20003314	-0.003	848.80003348	0.002	2.5
3.86	-20	824.20003499	-0.005	848.80003048	0.006	2.5
3.86	-30	824.20003528	-0.005	848.80003225	0.004	2.5

Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2060.500	Hz	High Channel	2122.000	Hz
Power Supply [Vdc]	Environment Temperature [ºC]	Frequency Deviation Measureed with Time Elapse				
		Low Channel		High Channel		Limit [ppm]
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	***20***	**824.20003097**	***0***	**848.80003525**	***0***	***2.5***
4.40	20	824.20003391	-0.004	848.80003470	0.001	2.5
3.75	20	824.20003584	-0.006	848.80003510	0.000	2.5

GSM 1900, Channel 512/810, Frequency 1850.0/1910.0 MHz (Lowest Frequency:GPRS / 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	1850.0786	1909.9233		
Extreme (50C)		1850.0787	1909.9233	46.1	0.025
Extreme (40C)		1850.0787	1909.9233	40.6	0.022
Extreme (30C)		1850.0787	1909.9233	46.0	0.024
Extreme (10C)		1850.0787	1909.9233	45.5	0.024
Extreme (0C)		1850.0787	1909.9233	45.4	0.024
Extreme (-10C)		1850.0787	1909.9233	39.4	0.021
Extreme (-20C)		1850.0787	1909.9233	50.2	0.027
Extreme (-30C)		1850.0787	1909.9233	41.0	0.022
20C	15%	1850.0787	1909.9233	30.5	0.016
	-15%	1850.0787	1909.9233	31.7	0.017
	End Point	1850.0787	1909.9233	29.8	0.016

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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 [ºC]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	50	826.40000371	0.002	846.60001048	-0.003	2.5
3.86	40	826.40000419	0.001	846.60000688	0.001	2.5
3.86	30	826.40000504	0.000	846.60000818	-0.001	2.5
3.86	***20***	***826.40000518***	***0.000***	***846.60000773***	***0.000***	***2.5***
3.86	10	826.40000474	0.001	846.60000614	0.002	2.5
3.86	0	826.40000419	0.001	846.60000660	0.001	2.5
3.86	-10	826.40000604	-0.001	846.60000644	0.002	2.5
3.86	-20	826.40000551	0.000	846.60000620	0.002	2.5
3.86	-30	826.40000544	0.000	846.60000770	0.000	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 [ºC]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	***20***	***826.40000518***	***0***	***846.60000773***	***0***	***2.5***
4.40	20	826.40000790	-0.003	846.60000992	-0.003	2.5
3.75	20	826.40000590	-0.001	846.60001050	-0.003	2.5

WCDMA Band 4 (Lowest Frequency: HSDPA / Highest Frequency: HSDPA)

Limit		1710	1755	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.3173	1754.6786		
Extreme (50C)		1710.3173	1754.6786	37.1	0.021
Extreme (40C)		1710.3173	1754.6786	34.2	0.020
Extreme (30C)		1710.3173	1754.6786	34.1	0.020
Extreme (10C)		1710.3173	1754.6786	36.5	0.021
Extreme (0C)		1710.3173	1754.6786	34.3	0.020
Extreme (-10C)		1710.3173	1754.6786	39.4	0.023
Extreme (-20C)		1710.3173	1754.6786	37.5	0.022
Extreme (-30C)		1710.3173	1754.6786	36.1	0.021
20C	15%	1710.3173	1754.6786	19.0	0.011
	-15%	1710.3173	1754.6786	20.0	0.012
	End Point	1710.3173	1754.6786	18.1	0.010

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WCDMA Band 2 (Lowest Frequency: Rel99/ Highest Frequency: HSDPA)

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.3267	1909.6800		
Extreme (50C)		1850.3267	1909.6800	13.4	0.007
Extreme (40C)		1850.3267	1909.6800	14.2	0.008
Extreme (30C)		1850.3267	1909.6800	13.2	0.007
Extreme (10C)		1850.3267	1909.6800	15.0	0.008
Extreme (0C)		1850.3267	1909.6800	10.7	0.006
Extreme (-10C)		1850.3267	1909.6800	17.6	0.009
Extreme (-20C)		1850.3267	1909.6800	18.2	0.010
Extreme (-30C)		1850.3267	1909.6800	16.0	0.008
20C	15%	1850.3267	1909.6800	9.7	0.005
	-15%	1850.3267	1909.6800	9.8	0.005
	End Point	1850.3267	1909.6800	10.7	0.006

LTE Band 2 (Lowest Frequency: QPSK / Highest Frequency: 16QAM)

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	1850.1537	1909.8439		
Extreme (50C)		1850.1537	1909.8439	10.6	0.006
Extreme (40C)		1850.1537	1909.8439	11.1	0.006
Extreme (30C)		1850.1537	1909.8439	10.2	0.005
Extreme (10C)		1850.1537	1909.8439	13.5	0.007
Extreme (0C)		1850.1537	1909.8439	9.6	0.005
Extreme (-10C)		1850.1537	1909.8439	9.2	0.005
Extreme (-20C)		1850.1537	1909.8439	12.9	0.007
Extreme (-30C)		1850.1537	1909.8439	8.9	0.005
20C	15%	1850.1537	1909.8439	8.0	0.004
	-15%	1850.1537	1909.8439	9.4	0.005
	End Point	1850.1537	1909.8439	8.7	0.005

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

Limit		699	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	699.1586	715.8471		
Extreme (50C)		699.1586	715.8471	32.9	0.047
Extreme (40C)		699.1586	715.8471	34.7	0.049
Extreme (30C)		699.1586	715.8471	31.1	0.044
Extreme (10C)		699.1586	715.8471	34.4	0.049
Extreme (0C)		699.1586	715.8471	31.9	0.045
Extreme (-10C)		699.1586	715.8471	29.6	0.042
Extreme (-20C)		699.1586	715.8471	33.5	0.047
Extreme (-30C)		699.1586	715.8471	30.1	0.043
20C	15%	699.1586	715.8471	10.7	0.015
	-15%	699.1586	715.8471	5.2	0.007
	End Point	699.1586	715.8471	5.5	0.008

LTE Band 26

Reference Frequency : LTE Band 26 Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2036.750	Hz	High Channel	2120.750	Hz
Power Supply [Vdc]	Environment Temperature [ºC]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.88	50	814.70000625	0.000	848.30000632	-0.001	2.5
3.88	40	814.70000646	0.000	848.30000338	0.002	2.5
3.88	30	814.70000601	0.000	848.30000407	0.001	2.5
3.88	***20***	***814.70000608***	***0.000***	***848.30000531***	***0.000***	***2.5***
3.88	10	814.70000647	0.000	848.30000443	0.001	2.5
3.88	0	814.70000651	-0.001	848.30000509	0.000	2.5
3.88	-10	814.70000644	0.000	848.30000608	-0.001	2.5
3.88	-20	814.70000638	0.000	848.30000514	0.000	2.5
3.88	-30	814.70000708	-0.001	848.30000644	-0.001	2.5

Reference Frequency : LTE Band 26 Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20ºC						
Limit: +- 2.5 ppm =	Low Channel	2036.750	Hz	High Channel	2120.750	Hz
Power Supply [Vdc]	Environment Temperature [ºC]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	***20***	**814.70000608**	***0***	**848.30000531**	***0***	***2.5***
4.40	20	814.70001985	-0.017	848.30000634	-0.001	2.5
3.75	20	814.70002213	-0.020	848.30000713	-0.002	2.5

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LTE Band 41 (Lowest Frequency: QPSK / Highest Frequency: 16QAM)

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	2496.2505	2689.7456		
Extreme (50C)		2496.2505	2689.7456	13.4	0.005
Extreme (40C)		2496.2505	2689.7456	13.7	0.005
Extreme (30C)		2496.2505	2689.7456	13.8	0.005
Extreme (10C)		2496.2505	2689.7456	17.4	0.007
Extreme (0C)		2496.2505	2689.7456	17.0	0.007
Extreme (-10C)		2496.2505	2689.7456	18.5	0.007
Extreme (-20C)		2496.2505	2689.7456	14.5	0.006
Extreme (-30C)		2496.2505	2689.7456	13.8	0.005
20C	15%	2496.2505	2689.7456	13.9	0.005
	-15%	2496.2505	2689.7456	14.5	0.006
	End Point	2496.2505	2689.7456	12.5	0.005

LTE Band 66 (Lowest Frequency: 16QAM / Highest Frequency: 16QAM)

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.6995	1779.3005		
Extreme (50C)		1710.6995	1779.3006	9.7	0.006
Extreme (40C)		1710.6995	1779.3006	9.2	0.005
Extreme (30C)		1710.6995	1779.3006	10.2	0.006
Extreme (10C)		1710.6995	1779.3006	9.4	0.005
Extreme (0C)		1710.6995	1779.3006	7.6	0.004
Extreme (-10C)		1710.6995	1779.3006	8.9	0.005
Extreme (-20C)		1710.6995	1779.3006	9.1	0.005
Extreme (-30C)		1710.6995	1779.3006	10.2	0.006
20C	15%	1710.6995	1779.3006	7.3	0.004
	-15%	1710.6995	1779.3006	9.3	0.005
	End Point	1710.6995	1779.3006	9.4	0.005

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5G NR Band n5

Reference Frequency : NR n5 Low Channel 826.5 MHz / High Channel 846.5 MHz @ 20°C						
Limit: +- 2.5 ppm =	Low Channel	2066.250	Hz	High Channel	2116.250	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	826.50002143	-0.008	846.50002045	0.001	2.5
3.88	40	826.50001695	-0.003	846.50001899	0.003	2.5
3.88	30	826.50001982	-0.006	846.50001956	0.002	2.5
3.88	***20***	***826.50001487***	***0.000***	***846.50002143***	***0.000***	***2.5***
3.88	10	826.50002036	-0.007	846.50001456	0.008	2.5
3.88	0	826.50001551	-0.001	846.50001911	0.003	2.5
3.88	-10	826.50001576	-0.001	846.50002034	0.001	2.5
3.88	-20	826.50002143	-0.008	846.50001484	0.008	2.5
3.88	-30	826.50001712	-0.003	846.50196300	-2.294	2.5

Reference Frequency : NR n5 Low Channel 826.5 MHz / High Channel 846.5 MHz @ 20°C						
Limit: +- 2.5 ppm =	Low Channel	2066.250	Hz	High Channel	2116.250	Hz
Power Supply [Vdc]	Environment Temperature [°C]	Frequency Deviation Measureed with Time Elapse				Limit [ppm]
		Low Channel		High Channel		
		[MHz]	Delta [ppm]	[MHz]	Delta [ppm]	
3.86	***20***	**826.50001487**	***0***	**846.50002143**	***0***	***2.5***
4.40	20	826.50002301	-0.010	846.50000773	0.016	2.5
3.75	20	826.50001547	-0.001	846.50000647	0.018	2.5

5G NR Band n66 (Lowest Frequency: 16QAM / Highest Frequency: 16QAM)

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.6995	1779.3005		
Extreme (50C)		1710.6995	1779.3006	25.3	0.014
Extreme (40C)		1710.6995	1779.3006	24.0	0.014
Extreme (30C)		1710.6995	1779.3006	22.2	0.013
Extreme (10C)		1710.6995	1779.3006	22.2	0.013
Extreme (0C)		1710.6995	1779.3006	22.9	0.013
Extreme (-10C)		1710.6995	1779.3006	22.8	0.013
Extreme (-20C)		1710.6995	1779.3006	24.4	0.014
Extreme (-30C)		1710.6995	1779.3006	26.4	0.015
20C	15%	1710.6995	1779.3006	7.5	0.004
	-15%	1710.6995	1779.3006	7.0	0.004
	End Point	1710.6995	1779.3006	7.0	0.004

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9.5. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232, §27.50 and §90.635

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:

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

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

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

90.635(b) The maximum output power of the transmitter for mobile stations is 100 watts (20dBw).

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 or 1 second;
e) Detector = rms;
f) Ensure that the number of measurement points ≥ span/RBW;
g) Trace mode = max hold(GSM, WCDMA), average(LTE, 5G NR);

TEST RESULTS

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9.5.1. ERP/EIRP Results

GSM

Band	Mode	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)
GSM 850	GPRS	824.20	32.19	V	3.11	-0.82	28.27	671.43	38.50	-10.23
		824.20	19.45	H	3.11	-0.82	15.53	35.73	38.50	-22.97
		836.60	32.85	V	3.13	-0.93	28.79	756.83	38.50	-9.71
		836.60	21.02	H	3.13	-0.93	16.97	49.77	38.50	-21.53
		848.80	32.80	V	3.15	-1.04	28.61	726.11	38.50	-9.89
		848.80	19.12	H	3.15	-1.04	14.93	31.12	38.50	-23.57
	EGPRS	824.20	29.14	V	3.11	-0.82	25.22	332.66	38.50	-13.28
		824.20	17.02	H	3.11	-0.82	13.10	20.42	38.50	-25.40
		836.60	29.98	V	3.13	-0.93	25.92	390.84	38.50	-12.58
		836.60	17.58	H	3.13	-0.93	13.53	22.54	38.50	-24.97
		848.80	29.70	V	3.15	-1.04	25.51	355.63	38.50	-12.99
		848.80	16.46	H	3.15	-1.04	12.27	16.87	38.50	-26.23

Band	Mode	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)
GSM 1900	GPRS	1850.20	25.77	V	4.62	9.60	30.75	1188.50	33.00	-2.25
		1850.20	17.13	H	4.62	9.60	22.11	162.55	33.00	-10.89
		1880.00	26.00	V	4.65	9.39	30.73	1183.04	33.00	-2.27
		1880.00	19.32	H	4.65	9.39	24.06	254.68	33.00	-8.94
		1909.80	26.34	V	4.68	9.13	30.79	1199.50	33.00	-2.21
		1909.80	21.90	H	4.68	9.13	26.34	430.53	33.00	-6.66
	EGPRS	1850.20	23.78	V	4.62	9.60	28.76	751.62	33.00	-4.24
		1850.20	16.26	H	4.62	9.60	21.24	133.05	33.00	-11.76
		1880.00	24.20	V	4.65	9.39	28.93	781.63	33.00	-4.07
		1880.00	17.79	H	4.65	9.39	22.53	179.06	33.00	-10.47
		1909.80	23.39	V	4.68	9.13	27.84	608.14	33.00	-5.16
		1909.80	19.07	H	4.68	9.13	23.51	224.39	33.00	-9.49

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WCDMA

Band	Mode	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)
Band 5	REL99	826.40	22.83	V	3.11	-0.84	18.89	77.45	38.50	-19.61
		826.40	8.96	H	3.11	-0.84	5.02	3.18	38.50	-33.48
		836.60	23.05	V	3.13	-0.93	18.99	79.25	38.50	-19.51
		836.60	12.24	H	3.13	-0.93	8.19	6.59	38.50	-30.31
		846.60	23.49	V	3.14	-1.02	19.33	85.70	38.50	-19.17
		846.60	9.09	H	3.14	-1.02	4.93	3.11	38.50	-33.57
	HSDPA	826.40	21.87	V	3.11	-0.84	17.93	62.09	38.50	-20.57
		826.40	8.10	H	3.11	-0.84	4.13	2.59	38.50	-34.34
		836.60	21.54	V	3.13	-0.93	17.48	55.98	38.50	-21.02
		836.60	8.33	H	3.13	-0.93	4.28	2.68	38.50	-34.22
		846.60	22.52	V	3.14	-1.02	18.36	68.55	38.50	-20.14
		846.60	8.25	H	3.14	-1.02	4.09	2.56	38.50	-34.41

Band	Mode	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)
Band 4	REL99	1712.40	3.59	V	4.44	9.57	8.73	7.46	30.00	-21.27
		1712.40	18.53	H	4.44	9.57	23.66	232.27	30.00	-6.34
		1732.60	2.65	V	4.46	9.64	7.82	6.05	30.00	-22.18
		1732.60	18.34	H	4.46	9.64	23.52	224.91	30.00	-6.48
		1752.60	1.77	V	4.48	9.69	6.98	4.99	30.00	-23.02
		1752.60	17.72	H	4.48	9.69	22.93	196.34	30.00	-7.07
	HSDPA	1712.40	2.49	V	4.44	9.57	7.63	5.79	30.00	-22.37
		1712.40	17.32	H	4.44	9.57	22.45	175.79	30.00	-7.55
		1732.60	1.66	V	4.46	9.64	6.83	4.82	30.00	-23.17
		1732.60	17.56	H	4.46	9.64	22.74	187.93	30.00	-7.26
		1752.60	0.98	V	4.48	9.69	6.19	4.16	30.00	-23.81
		1752.60	16.63	H	4.48	9.69	21.84	152.76	30.00	-8.16

Band	Mode	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)
Band 2	REL99	1852.40	19.08	V	4.62	9.58	24.04	253.69	33.00	-8.96
		1852.40	11.26	H	4.62	9.58	16.23	41.97	33.00	-16.77
		1880.00	19.60	V	4.65	9.39	24.33	270.99	33.00	-8.67
		1880.00	13.51	H	4.65	9.39	18.25	66.76	33.00	-14.75
		1907.60	19.09	V	4.68	9.15	23.56	226.80	33.00	-9.44
		1907.60	15.36	H	4.68	9.15	19.82	96.04	33.00	-13.18
	HSDPA	1852.40	17.74	V	4.62	9.58	22.70	186.34	33.00	-10.30
		1852.40	10.04	H	4.62	9.58	15.01	31.69	33.00	-17.99
		1880.00	18.32	V	4.65	9.39	23.05	201.81	33.00	-9.95
		1880.00	12.27	H	4.65	9.39	17.01	50.18	33.00	-15.99
		1907.60	17.79	V	4.68	9.15	22.26	168.13	33.00	-10.74
		1907.60	14.25	H	4.68	9.15	18.71	74.38	33.00	-14.29

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LTE Band 2(Main Ant)

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)	RB
1.4	QPSK	1850.70	19.09	V	4.62	9.60	24.07	255.27	33.00	-8.93	1/5
		1880.00	19.46	V	4.65	9.39	24.19	262.42	33.00	-8.81	1/0
		1909.30	19.20	V	4.68	9.13	23.65	231.74	33.00	-9.35	1/0
	16-QAM	1850.70	18.20	V	4.62	9.60	23.18	207.97	33.00	-9.82	1/5
		1880.00	18.88	V	4.65	9.39	23.61	229.61	33.00	-9.39	1/0
		1909.30	18.26	V	4.68	9.13	22.71	186.64	33.00	-10.29	1/3
3	QPSK	1851.50	19.39	V	4.62	9.59	24.35	272.27	33.00	-8.65	1/0
		1880.00	19.49	V	4.65	9.39	24.22	264.24	33.00	-8.78	1/0
		1908.50	19.40	V	4.68	9.14	23.86	243.22	33.00	-9.14	1/0
	16-QAM	1851.50	18.57	V	4.62	9.59	23.53	225.42	33.00	-9.47	1/0
		1880.00	18.74	V	4.65	9.39	23.47	222.33	33.00	-9.53	1/0
		1908.50	18.63	V	4.68	9.14	23.09	203.70	33.00	-9.91	1/0
5	QPSK	1852.50	19.34	V	4.62	9.58	24.31	269.77	33.00	-8.69	1/0
		1880.00	19.66	V	4.65	9.39	24.39	274.79	33.00	-8.61	1/0
		1907.50	19.26	V	4.69	9.15	23.73	236.05	33.00	-9.27	1/0
	16-QAM	1852.50	18.52	V	4.62	9.58	23.49	223.36	33.00	-9.51	1/0
		1880.00	19.00	V	4.65	9.39	23.73	236.05	33.00	-9.27	1/0
		1907.50	18.42	V	4.69	9.15	22.89	194.54	33.00	-10.11	1/0
10	QPSK	1855.00	19.21	V	4.62	9.56	24.15	260.02	33.00	-8.85	1/0
		1880.00	19.43	V	4.65	9.39	24.16	260.62	33.00	-8.84	1/0
		1905.00	19.23	V	4.68	9.18	23.73	236.05	33.00	-9.27	1/0
	16-QAM	1855.00	18.48	V	4.62	9.56	23.42	219.79	33.00	-9.58	1/0
		1880.00	18.88	V	4.65	9.39	23.61	229.61	33.00	-9.39	1/49
		1905.00	18.36	V	4.68	9.18	22.86	193.20	33.00	-10.14	1/0
15	QPSK	1857.50	19.19	V	4.63	9.55	24.11	257.63	33.00	-8.89	1/74
		1880.00	19.49	V	4.65	9.39	24.22	264.24	33.00	-8.78	1/0
		1902.50	19.39	V	4.68	9.21	23.93	247.17	33.00	-9.07	1/0
	16-QAM	1857.50	18.41	V	4.63	9.55	23.33	215.28	33.00	-9.67	1/74
		1880.00	18.62	V	4.65	9.39	23.35	216.27	33.00	-9.65	1/37
		1902.50	18.50	V	4.68	9.21	23.04	201.37	33.00	-9.96	1/0
20	QPSK	1860.00	19.40	V	4.63	9.53	24.30	269.15	33.00	-8.70	1/99
		1880.00	19.30	V	4.65	9.39	24.03	252.93	33.00	-8.97	1/99
		1900.00	19.36	V	4.67	9.24	23.93	247.17	33.00	-9.07	1/99
	16-QAM	1860.00	18.26	V	4.63	9.53	23.16	207.01	33.00	-9.84	1/99
		1880.00	17.59	V	4.65	9.39	22.32	170.61	33.00	-10.68	1/99
		1900.00	18.47	V	4.67	9.24	23.04	201.37	33.00	-9.96	1/99

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LTE Band 2(Sub Ant)

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)	RB
1.4	QPSK	1850.70									
		1880.00									
		1909.30									
	16-QAM	1850.70									
		1880.00									
		1909.30									
3	QPSK	1851.50									
		1880.00									
		1908.50									
	16-QAM	1851.50									
		1880.00									
		1908.50									
5	QPSK	1852.50									
		1880.00									
		1907.50									
	16-QAM	1852.50									
		1880.00									
		1907.50									
10	QPSK	1855.00									
		1880.00									
		1905.00									
	16-QAM	1855.00									
		1880.00									
		1905.00									
15	QPSK	1857.50									
		1880.00									
		1902.50									
	16-QAM	1857.50									
		1880.00									
		1902.50									
20	QPSK	1860.00	14.53	V	4.63	9.53	19.43	87.70	33.00	-13.57	1/0
		1880.00	14.42	V	4.65	9.39	19.15	82.22	33.00	-13.85	1/99
		1900.00	14.21	V	4.67	9.24	18.78	75.51	33.00	-14.22	1/0
	16-QAM	1860.00	13.55	V	4.63	9.53	18.45	69.98	33.00	-14.55	1/49
		1880.00	13.63	V	4.65	9.39	18.36	68.55	33.00	-14.64	1/99
		1900.00	13.57	V	4.67	9.24	18.14	65.16	33.00	-14.86	1/0

LTE Band 12

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
1.4	QPSK	699.70	23.09	H	2.87	-0.80	19.41	87.30	34.77	-15.36	1/3
		707.50	22.64	H	2.89	-0.79	18.97	78.89	34.77	-15.80	1/5
		715.30	23.96	H	2.90	-0.77	20.29	106.91	34.77	-14.48	1/5
	16-QAM	699.70	21.94	H	2.87	-0.80	18.26	66.99	34.77	-16.51	1/3
		707.50	21.58	H	2.89	-0.79	17.91	61.80	34.77	-16.86	1/5
		715.30	22.95	H	2.90	-0.77	19.28	84.72	34.77	-15.49	1/5
3	QPSK	700.50	23.13	H	2.88	-0.80	19.46	88.31	34.77	-15.31	1/0
		707.50	22.50	H	2.89	-0.79	18.83	76.38	34.77	-15.94	1/0
		714.50	24.11	H	2.90	-0.77	20.44	110.66	34.77	-14.33	1/0
	16-QAM	700.50	22.09	H	2.88	-0.80	18.42	69.50	34.77	-16.35	1/0
		707.50	21.63	H	2.89	-0.79	17.96	62.52	34.77	-16.81	1/0
		714.50	23.08	H	2.90	-0.77	19.41	87.30	34.77	-15.36	1/0
5	QPSK	701.50	22.94	H	2.88	-0.80	19.27	84.53	34.77	-15.50	1/24
		707.50	22.29	H	2.89	-0.79	18.62	72.78	34.77	-16.15	1/24
		713.50	24.24	H	2.90	-0.77	20.56	113.76	34.77	-14.21	1/0
	16-QAM	701.50	22.10	H	2.88	-0.80	18.43	69.66	34.77	-16.34	1/24
		707.50	21.62	H	2.89	-0.79	17.95	62.37	34.77	-16.82	1/24
		713.50	23.14	H	2.90	-0.77	19.46	88.31	34.77	-15.31	1/0
10	QPSK	704.00	22.63	H	2.88	-0.79	18.96	78.70	34.77	-15.81	1/25
		707.50	22.52	H	2.89	-0.79	18.85	76.74	34.77	-15.92	1/25
		711.00	24.27	H	2.89	-0.78	20.60	114.82	34.77	-14.17	1/25
	16-QAM	704.00	21.61	H	2.88	-0.79	17.94	62.23	34.77	-16.83	1/49
		707.50	21.86	H	2.89	-0.79	18.19	65.92	34.77	-16.58	1/49
		711.00	22.96	H	2.89	-0.78	19.29	84.92	34.77	-15.48	1/49

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LTE Band 26

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
1.4	QPSK	814.70	24.85	V	3.09	-0.73	21.04	127.06	50.00	-28.96	1/3
		823.30	25.73	V	3.10	-0.81	21.83	152.41	50.00	-28.17	1/3
		824.70	25.45	V	3.11	-0.82	21.52	141.91	38.50	-16.98	1/3
		831.50	25.27	V	3.11	-0.88	21.27	133.97	38.50	-17.23	1/3
		848.30	25.10	V	3.15	-1.03	20.92	123.59	38.50	-17.58	1/3
	16-QAM	814.70	24.59	V	3.09	-0.73	20.78	119.67	50.00	-29.22	1/3
		823.30	24.65	V	3.10	-0.81	20.75	118.85	50.00	-29.25	1/3
		824.70	24.20	V	3.11	-0.82	20.27	106.41	38.50	-18.23	1/3
		831.50	24.25	V	3.11	-0.88	20.25	105.93	38.50	-18.25	1/3
		848.30	24.13	V	3.15	-1.03	19.95	98.86	38.50	-18.55	1/3
3	QPSK	815.50	23.88	V	3.08	-0.74	20.06	101.39	50.00	-29.94	1/0
		822.50	25.32	V	3.10	-0.80	21.44	139.38	50.00	-28.58	1/8
		825.50	25.63	V	3.10	-0.83	21.70	147.91	38.50	-16.80	1/14
		831.50	25.04	V	3.11	-0.88	21.04	127.06	38.50	-17.46	1/14
		847.50	25.05	V	3.15	-1.03	20.87	122.18	38.50	-17.63	1/0
	16-QAM	815.50	23.14	V	3.08	-0.74	19.32	85.51	50.00	-30.68	1/0
		822.50	24.26	V	3.10	-0.80	20.36	108.64	50.00	-29.64	1/8
		825.50	24.50	V	3.10	-0.83	20.57	114.02	38.50	-17.93	1/14
		831.50	23.99	V	3.11	-0.88	19.99	99.77	38.50	-18.51	1/0
		847.50	23.60	V	3.15	-1.03	19.42	87.50	38.50	-19.08	1/0
5	QPSK	816.50	23.95	V	3.09	-0.75	20.11	102.57	50.00	-29.89	1/0
		821.50	25.17	V	3.10	-0.79	21.27	133.97	50.00	-28.73	1/12
		826.50	25.14	V	3.11	-0.84	21.19	131.52	38.50	-17.31	1/12
		831.50	25.13	V	3.11	-0.88	21.13	129.72	38.50	-17.37	1/24
		846.50	25.43	V	3.14	-1.02	21.27	133.97	38.50	-17.23	1/0
	16-QAM	816.50	23.66	V	3.09	-0.75	19.82	95.94	50.00	-30.18	1/24
		821.50	24.19	V	3.10	-0.79	20.29	106.91	50.00	-29.71	1/12
		826.50	24.83	V	3.11	-0.84	20.88	122.46	38.50	-17.62	1/12
		831.50	24.34	V	3.11	-0.88	20.34	108.14	38.50	-18.16	1/24
		846.50	24.39	V	3.14	-1.02	20.23	105.44	38.50	-18.27	1/0
10	QPSK	819.00	24.21	V	3.09	-0.77	20.35	108.39	50.00	-29.65	1/0
		829.00	24.83	V	3.11	-0.86	20.86	121.90	38.50	-17.64	1/49
		831.50	25.34	V	3.11	-0.88	21.34	136.14	38.50	-17.16	1/49
		844.00	24.89	V	3.14	-1.00	20.75	118.85	38.50	-17.75	1/0
	16-QAM	819.00	24.20	V	3.09	-0.77	20.34	108.14	50.00	-29.66	1/0
		829.00	23.99	V	3.11	-0.86	20.02	100.46	38.50	-18.48	1/49
		831.50	24.19	V	3.11	-0.88	20.19	104.47	38.50	-18.31	1/25
		844.00	24.40	V	3.14	-1.00	20.26	106.17	38.50	-18.24	1/0
15	QPSK	821.50	24.30	V	3.10	-0.79	20.40	109.65	50.00	-29.60	1/74
		831.50	25.27	V	3.11	-0.88	21.27	133.97	38.50	-17.23	1/74
		841.50	25.18	V	3.13	-0.97	21.07	127.94	38.50	-17.43	1/37
	16-QAM	821.50	23.95	V	3.10	-0.79	20.05	101.16	50.00	-29.95	1/74
		831.50	24.33	V	3.11	-0.88	20.33	107.89	38.50	-18.17	1/74
		841.50	24.52	V	3.13	-0.97	20.41	109.90	38.50	-18.09	1/37

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
1.4	QPSK	824.00	25.01	V	3.10	-0.82	21.09	128.53	38.50	-17.41	1/3
	16-QAM		24.06	V	3.10	-0.82	20.14	103.28	38.50	-18.36	1/3
3	QPSK		24.98	V	3.10	-0.82	21.06	127.64	38.50	-17.44	1/14
	16-QAM		24.08	V	3.10	-0.82	20.16	103.75	38.50	-18.34	1/0
5	QPSK		24.86	V	3.10	-0.82	20.94	124.17	38.50	-17.56	1/24
	16-QAM		23.68	V	3.10	-0.82	19.76	94.62	38.50	-18.74	1/0
10	QPSK		24.19	V	3.10	-0.82	20.27	106.41	38.50	-18.23	1/49
	16-QAM		23.31	V	3.10	-0.82	19.39	86.90	38.50	-19.11	1/0
15	QPSK		24.62	V	3.10	-0.82	20.70	117.49	38.50	-17.80	1/74
	16-QAM		23.58	V	3.10	-0.82	19.66	92.47	38.50	-18.84	1/74

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LTE Band 41

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)	RB
5	QPSK	2498.50	19.31	H	5.36	10.18	24.12	258.23	33.00	-8.88	1/0
		2593.00	20.57	H	5.47	10.03	25.13	325.84	33.00	-7.87	1/24
		2687.50	20.14	H	5.57	10.05	24.63	290.40	33.00	-8.37	1/24
	16-QAM	2498.50	18.63	H	5.36	10.18	23.44	220.80	33.00	-9.56	1/24
		2593.00	20.20	H	5.47	10.03	24.76	299.23	33.00	-8.24	1/24
		2687.50	19.32	H	5.57	10.05	23.81	240.44	33.00	-9.19	1/24
10	QPSK	2501.00	19.26	H	5.38	10.17	24.05	254.10	33.00	-8.95	1/25
		2593.00	20.60	H	5.47	10.03	25.16	328.10	33.00	-7.84	1/25
		2685.00	19.64	H	5.56	10.05	24.14	259.42	33.00	-8.86	1/49
	16-QAM	2501.00	18.62	H	5.38	10.17	23.41	219.28	33.00	-9.59	1/0
		2593.00	19.62	H	5.47	10.03	24.18	261.82	33.00	-8.82	1/0
		2685.00	18.87	H	5.56	10.05	23.37	217.27	33.00	-9.63	1/49
15	QPSK	2503.50	19.20	H	5.37	10.17	24.00	251.19	33.00	-9.00	1/0
		2593.00	20.34	H	5.47	10.03	24.90	309.03	33.00	-8.10	1/74
		2682.50	19.42	H	5.56	10.05	23.91	246.04	33.00	-9.09	1/74
	16-QAM	2503.50	18.50	H	5.37	10.17	23.30	213.80	33.00	-9.70	1/0
		2593.00	19.49	H	5.47	10.03	24.05	254.10	33.00	-8.95	1/74
		2682.50	18.48	H	5.56	10.05	22.97	198.15	33.00	-10.03	1/74
20	QPSK	2506.00	19.43	H	5.37	10.16	24.22	264.24	33.00	-8.78	1/0
		2593.00	20.68	H	5.47	10.03	25.24	334.20	33.00	-7.76	1/99
		2680.00	20.08	H	5.56	10.05	24.57	286.42	33.00	-8.43	1/99
	16-QAM	2506.00	18.79	H	5.37	10.16	23.58	228.03	33.00	-9.42	1/0
		2593.00	19.90	H	5.47	10.03	24.46	279.25	33.00	-8.54	1/99
		2680.00	19.31	H	5.56	10.05	23.80	239.88	33.00	-9.20	1/99

LTE Band 66(Main Ant)

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)	RB
1.4	QPSK	1710.70	17.34	H	4.43	9.57	22.48	177.01	30.00	-7.52	1/3
		1745.00	17.11	H	4.47	9.68	22.31	170.22	30.00	-7.69	1/3
		1779.30	16.93	H	4.52	9.70	22.12	162.93	30.00	-7.88	1/3
	16-QAM	1710.70	16.67	H	4.43	9.57	21.81	151.71	30.00	-8.19	1/0
		1745.00	16.29	H	4.47	9.68	21.49	140.93	30.00	-8.51	1/3
		1779.30	16.16	H	4.52	9.70	21.35	136.46	30.00	-8.65	1/3
3	QPSK	1711.50	17.85	H	4.44	9.57	22.99	199.07	30.00	-7.01	1/0
		1745.00	17.31	H	4.47	9.68	22.51	178.24	30.00	-7.49	1/14
		1778.50	17.15	H	4.52	9.70	22.33	171.00	30.00	-7.67	1/0
	16-QAM	1711.50	16.88	H	4.44	9.57	22.02	159.22	30.00	-7.98	1/0
		1745.00	16.46	H	4.47	9.68	21.66	146.55	30.00	-8.34	1/0
		1778.50	16.34	H	4.52	9.70	21.52	141.91	30.00	-8.48	1/14
5	QPSK	1712.50	17.99	H	4.44	9.57	23.13	205.59	30.00	-6.87	1/0
		1745.00	17.32	H	4.47	9.68	22.52	178.65	30.00	-7.48	1/0
		1777.50	17.09	H	4.52	9.70	22.27	168.66	30.00	-7.73	1/0
	16-QAM	1712.50	17.41	H	4.44	9.57	22.55	179.89	30.00	-7.45	1/24
		1745.00	16.54	H	4.47	9.68	21.74	149.28	30.00	-8.26	1/0
		1777.50	16.20	H	4.52	9.70	21.38	137.40	30.00	-8.62	1/0
10	QPSK	1715.00	18.35	H	4.44	9.58	23.50	223.87	30.00	-6.50	1/0
		1745.00	17.27	H	4.47	9.68	22.47	176.60	30.00	-7.53	1/25
		1775.00	17.21	H	4.51	9.70	22.24	167.49	30.00	-7.60	1/0
	16-QAM	1715.00	17.73	H	4.44	9.58	22.88	194.09	30.00	-7.12	1/49
		1745.00	16.27	H	4.47	9.68	21.47	140.28	30.00	-8.53	1/0
		1775.00	16.28	H	4.51	9.70	21.47	140.28	30.00	-8.53	1/0
15	QPSK	1717.50	18.33	H	4.44	9.59	23.48	222.84	30.00	-6.52	1/0
		1745.00	17.21	H	4.47	9.68	22.41	174.18	30.00	-7.59	1/0
		1772.50	16.93	H	4.51	9.70	22.12	162.93	30.00	-7.88	1/0
	16-QAM	1717.50	17.53	H	4.44	9.59	22.68	185.35	30.00	-7.32	1/74
		1745.00	16.39	H	4.47	9.68	21.59	144.21	30.00	-8.41	1/37
		1772.50	16.22	H	4.51	9.70	21.41	138.36	30.00	-8.59	1/0
20	QPSK	1720.00	18.59	H	4.44	9.60	23.75	237.14	30.00	-6.25	1/99
		1745.00	17.37	H	4.47	9.68	22.57	180.72	30.00	-7.43	1/99
		1770.00	17.39	H	4.51	9.70	22.58	181.13	30.00	-7.42	1/0
	16-QAM	1720.00	17.64	H	4.44	9.60	22.80	190.55	30.00	-7.20	1/99
		1745.00	16.73	H	4.47	9.68	21.93	155.96	30.00	-8.07	1/0
		1770.00	16.53	H	4.51	9.70	21.72	148.59	30.00	-8.28	1/0

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LTE Band 66(Sub Ant)

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)	RB
1.4	QPSK	1710.70									
		1745.00									
		1779.30									
	16-QAM	1710.70									
		1745.00									
		1779.30									
3	QPSK	1711.50									
		1745.00									
		1778.50									
	16-QAM	1711.50									
		1745.00									
		1778.50									
5	QPSK	1712.50									
		1745.00									
		1777.50									
	16-QAM	1712.50									
		1745.00									
		1777.50									
10	QPSK	1715.00									
		1745.00									
		1775.00									
	16-QAM	1715.00									
		1745.00									
		1775.00									
15	QPSK	1717.50									
		1745.00									
		1772.50									
	16-QAM	1717.50									
		1745.00									
		1772.50									
20	QPSK	1720.00	14.21	H	4.44	9.61	19.37	86.50	30.00	-10.63	1/99
		1745.00	13.89	H	4.47	9.69	19.10	81.28	30.00	-10.90	1/99
		1770.00	12.77	H	4.51	9.71	17.97	62.66	30.00	-12.03	1/0
	16-QAM	1720.00	13.27	H	4.44	9.61	18.43	69.66	30.00	-11.57	1/99
		1745.00	13.56	H	4.47	9.69	18.77	75.34	30.00	-11.23	1/0
		1770.00	11.74	H	4.51	9.71	16.94	49.43	30.00	-13.06	1/0

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5G NR n5

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
5	QPSK	826.50	24.58	V	3.11	-0.84	20.63	115.61	38.50	-17.87	1/23
		836.50	24.66	V	3.13	-0.93	20.60	114.82	38.50	-17.90	1/23
		846.50	24.61	V	3.14	-1.02	20.45	110.92	38.50	-18.05	1/1
	16-QAM	826.50	23.52	V	3.11	-0.84	19.57	90.57	38.50	-18.93	1/23
		836.50	23.28	V	3.13	-0.93	19.22	83.56	38.50	-19.28	1/23
		846.50	23.49	V	3.14	-1.02	19.33	85.70	38.50	-19.17	1/1
10	QPSK	829.00	25.30	V	3.11	-0.86	21.33	135.83	38.50	-17.17	1/26
		836.50	24.93	V	3.13	-0.93	20.87	122.18	38.50	-17.63	1/26
		844.00	25.25	V	3.14	-1.00	21.11	129.12	38.50	-17.39	1/26
	16-QAM	829.00	24.38	V	3.11	-0.86	20.41	109.90	38.50	-18.09	1/26
		836.50	23.72	V	3.13	-0.93	19.66	92.47	38.50	-18.84	1/26
		844.00	24.12	V	3.14	-1.00	19.98	99.54	38.50	-18.52	1/26
15	QPSK	831.50	25.30	V	3.11	-0.88	21.30	134.90	38.50	-17.20	1/1
		836.50	25.34	V	3.13	-0.93	21.28	134.28	38.50	-17.22	1/1
		841.50	25.52	V	3.13	-0.97	21.41	138.36	38.50	-17.09	1/1
	16-QAM	831.50	24.21	V	3.11	-0.88	20.21	104.95	38.50	-18.29	1/1
		836.50	24.34	V	3.13	-0.93	20.28	106.66	38.50	-18.22	1/1
		841.50	24.59	V	3.13	-0.97	20.48	111.69	38.50	-18.02	1/1
20	QPSK	834.00	25.86	V	3.12	-0.91	21.83	152.41	38.50	-16.67	1/53
		836.50	25.99	V	3.13	-0.93	21.93	155.96	38.50	-16.57	1/53
		839.00	25.17	V	3.13	-0.95	21.09	128.53	38.50	-17.41	1/53
	16-QAM	834.00	24.79	V	3.12	-0.91	20.76	119.12	38.50	-17.74	1/53
		836.50	24.71	V	3.13	-0.93	20.65	116.14	38.50	-17.85	1/53
		839.00	24.12	V	3.13	-0.95	20.04	100.93	38.50	-18.46	1/53

5G NR n66(Main Ant)

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
5	QPSK	1712.50	17.20	V	4.44	9.57	22.34	171.40	30.00	-7.66	1/23
		1745.00	17.62	V	4.47	9.68	22.82	191.43	30.00	-7.18	1/13
		1777.50	18.00	V	4.52	9.70	23.18	207.97	30.00	-6.82	1/13
	16-QAM	1712.50	16.11	V	4.44	9.57	21.25	133.35	30.00	-8.75	1/23
		1745.00	16.19	V	4.47	9.68	21.39	137.72	30.00	-8.61	1/13
		1777.50	16.74	V	4.52	9.70	21.92	155.60	30.00	-8.08	1/13
10	QPSK	1715.00	16.75	V	4.44	9.58	21.90	154.88	30.00	-8.10	1/26
		1745.00	17.19	V	4.47	9.68	22.39	173.38	30.00	-7.61	1/1
		1775.00	18.02	V	4.51	9.70	23.21	209.41	30.00	-6.79	1/26
	16-QAM	1715.00	16.02	V	4.44	9.58	21.17	130.92	30.00	-8.83	1/26
		1745.00	16.52	V	4.47	9.68	21.72	148.59	30.00	-8.28	1/1
		1775.00	16.97	V	4.51	9.70	22.16	164.44	30.00	-7.84	1/26
15	QPSK	1717.50	16.92	V	4.44	9.59	22.07	161.06	30.00	-7.93	1/77
		1745.00	17.20	V	4.47	9.68	22.41	174.18	30.00	-7.59	1/77
		1772.50	17.78	V	4.51	9.70	22.97	198.15	30.00	-7.03	1/77
	16-QAM	1717.50	15.91	V	4.44	9.59	21.06	127.64	30.00	-8.94	1/77
		1745.00	16.29	V	4.47	9.68	21.49	140.93	30.00	-8.51	1/77
		1772.50	16.43	V	4.51	9.70	21.62	145.21	30.00	-8.38	1/77
20	QPSK	1720.00	17.40	V	4.44	9.60	22.56	180.30	30.00	-7.44	1/104
		1745.00	17.97	V	4.47	9.68	23.17	207.49	30.00	-6.83	1/104
		1770.00	17.73	V	4.51	9.70	22.93	196.34	30.00	-7.07	1/1
	16-QAM	1720.00	16.69	V	4.44	9.60	21.85	153.11	30.00	-8.15	1/104
		1745.00	17.10	V	4.47	9.68	22.30	169.82	30.00	-7.70	1/104
		1770.00	16.80	V	4.51	9.70	22.00	158.49	30.00	-8.00	1/1

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5G NR n66(Sub Ant)

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
5	QPSK	1712.50									
		1745.00									
		1777.50									
	16-QAM	1712.50									
		1745.00									
		1777.50									
10	QPSK	1715.00									
		1745.00									
		1775.00									
	16-QAM	1715.00									
		1745.00									
		1775.00									
15	QPSK	1717.50									
		1745.00									
		1772.50									
	16-QAM	1717.50									
		1745.00									
		1772.50									
20	QPSK	1720.00	12.84	V	4.44	9.60	18.00	63.05	30.00	-12.00	1/104
		1745.00	14.87	V	4.47	9.68	20.07	101.58	30.00	-9.93	1/53
		1770.00	16.42	V	4.51	9.70	21.62	145.13	30.00	-8.38	1/53
	16-QAM	1720.00	11.76	V	4.44	9.60	16.92	49.17	30.00	-13.08	1/104
		1745.00	13.83	V	4.47	9.68	19.03	79.95	30.00	-10.97	1/53
		1770.00	15.19	V	4.51	9.70	20.39	109.33	30.00	-9.61	1/53

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9.6. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238, §27. 53 and §90.691

LIMIT

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

Part 27.53:
(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

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

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

Part 90.691(a):

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

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

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

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TEST PROCEDURE

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, 5G NR FDD), Maxhold(GSM, LTE TDD, 5G NR TDD);

RESULTS

See the following pages.

NOTE1

5G NR: All Waveforms (CP-OFDM vs DFT-s OFDM) and modulations (π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

NOTE2

Please refer to section 5.4 for bandwidth and RB setting about LTE, 5G NR 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 #:	4790406778
Date:	6/16/2022
Test Engineer:	26087
Configuration:	EUT / AC Adapter, Earphone, 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	-10.1	V	3.0	40.9	1.0	-50.0	-13.0	-37.0	
2472.60	-8.3	V	3.0	41.5	1.0	-48.8	-13.0	-35.8	
3296.80	-10.7	V	3.0	42.3	1.0	-52.0	-13.0	-39.0	
1648.40	-9.5	H	3.0	40.9	1.0	-49.4	-13.0	-36.4	
2472.60	-6.6	H	3.0	41.5	1.0	-47.1	-13.0	-34.1	
3296.80	-11.5	H	3.0	42.3	1.0	-52.8	-13.0	-39.8	
Mid Ch, 836.6MHz									
1673.20	-10.4	V	3.0	40.9	1.0	-50.3	-13.0	-37.3	
2509.80	-5.3	V	3.0	41.6	1.0	-45.9	-13.0	-32.9	
3346.40	-10.8	V	3.0	42.3	1.0	-52.1	-13.0	-39.1	
1673.20	-8.3	H	3.0	40.9	1.0	-48.2	-13.0	-35.2	
2509.80	-3.5	H	3.0	41.6	1.0	-44.1	-13.0	-31.1	
3346.40	-11.4	H	3.0	42.3	1.0	-52.7	-13.0	-39.7	
High Ch, 848.8MHz									
1697.60	-11.2	V	3.0	40.9	1.0	-51.2	-13.0	-38.2	
2546.40	-9.0	V	3.0	41.6	1.0	-49.7	-13.0	-36.7	
3395.20	-11.5	V	3.0	42.3	1.0	-52.9	-13.0	-39.9	
1697.60	-10.3	H	3.0	40.9	1.0	-50.2	-13.0	-37.2	
2546.40	-1.9	H	3.0	41.6	1.0	-42.5	-13.0	-29.5	
3395.20	-11.5	H	3.0	42.3	1.0	-52.8	-13.0	-39.8	

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GSM850

EGPRS

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

Company: Samsung
Project #: 4790406778
Date: 6/15/2022
Test Engineer: 26087
Configuration: EUT / AC Adapter, Earphone, X-Position
Location: Chamber 2
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	-10.4	V	3.0	40.9	1.0	-50.3	-13.0	-37.3	
2472.60	-8.0	V	3.0	41.5	1.0	-48.6	-13.0	-35.6	
3296.80	-11.4	V	3.0	42.3	1.0	-52.7	-13.0	-39.7	
1648.40	-9.1	H	3.0	40.9	1.0	-49.0	-13.0	-36.0	
2472.60	-6.0	H	3.0	41.5	1.0	-46.5	-13.0	-33.5	
3296.80	-10.9	H	3.0	42.3	1.0	-52.2	-13.0	-39.2	
Mid Ch, 836.6MHz									
1673.20	-10.4	V	3.0	40.9	1.0	-50.3	-13.0	-37.3	
2509.80	-5.6	V	3.0	41.6	1.0	-46.2	-13.0	-33.2	
3346.40	-11.6	V	3.0	42.3	1.0	-52.9	-13.0	-39.9	
1673.20	-11.6	H	3.0	40.9	1.0	-51.6	-13.0	-38.6	
2509.80	-4.0	H	3.0	41.6	1.0	-44.6	-13.0	-31.6	
3346.40	-11.2	H	3.0	42.3	1.0	-52.5	-13.0	-39.5	
High Ch, 848.8MHz									
1697.60	-11.7	V	3.0	40.9	1.0	-51.6	-13.0	-38.6	
2546.40	-4.4	V	3.0	41.6	1.0	-45.1	-13.0	-32.1	
3395.20	-11.9	V	3.0	42.3	1.0	-53.2	-13.0	-40.2	
1697.60	-10.6	H	3.0	40.9	1.0	-50.5	-13.0	-37.5	
2546.40	-1.9	H	3.0	41.6	1.0	-42.6	-13.0	-29.6	
3395.20	-11.6	H	3.0	42.3	1.0	-52.9	-13.0	-39.9	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27/90(04)
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GSM1900

GSM1900

GPRS

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

Company: Samsung
Project #: 4790406778
Date: 6/15/2022
Test Engineer: 25770
Configuration: EUT / 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	6.2	V	3.0	45.8	1.0	-38.6	-13.0	-25.6	
5550.60	4.8	V	3.0	45.7	1.0	-39.9	-13.0	-26.9	
7400.80	16.1	V	3.0	44.6	1.0	-27.5	-13.0	-14.5	
3700.40	1.4	H	3.0	45.8	1.0	-43.4	-13.0	-30.4	
5550.60	4.9	H	3.0	45.7	1.0	-39.8	-13.0	-26.8	
7400.80	22.9	H	3.0	44.6	1.0	-20.7	-13.0	-7.7	
Mid Ch, 1880MHz									
3760.00	5.1	V	3.0	45.8	1.0	-39.7	-13.0	-26.7	
5640.00	4.8	V	3.0	45.7	1.0	-39.9	-13.0	-26.9	
7520.00	18.0	V	3.0	44.5	1.0	-25.5	-13.0	-12.5	
3760.00	8.1	H	3.0	45.8	1.0	-36.7	-13.0	-23.7	
5640.00	5.9	H	3.0	45.7	1.0	-38.8	-13.0	-25.8	
7520.00	23.1	H	3.0	44.5	1.0	-20.4	-13.0	-7.4	
High Ch, 1909.8MHz									
3819.60	2.0	V	3.0	45.8	1.0	-42.9	-13.0	-29.9	
5729.40	4.8	V	3.0	45.7	1.0	-39.9	-13.0	-26.9	
7639.20	16.8	V	3.0	44.4	1.0	-26.6	-13.0	-13.6	
3819.60	5.2	H	3.0	45.8	1.0	-39.7	-13.0	-26.7	
5729.40	6.7	H	3.0	45.7	1.0	-38.0	-13.0	-25.0	
7639.20	21.6	H	3.0	44.4	1.0	-21.9	-13.0	-8.9	

GSM1900

EGPRS

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

Company: Samsung
Project #: 4790406778
Date: 6/15/2022
Test Engineer: 25770
Configuration: EUT / 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	1.9	V	3.0	45.8	1.0	-42.9	-13.0	-29.9	
5550.60	4.3	V	3.0	45.7	1.0	-40.4	-13.0	-27.4	
7400.80	14.1	V	3.0	44.6	1.0	-29.5	-13.0	-16.5	
3700.40	1.6	H	3.0	45.8	1.0	-43.2	-13.0	-30.2	
5550.60	3.7	H	3.0	45.7	1.0	-41.0	-13.0	-28.0	
7400.80	22.3	H	3.0	44.6	1.0	-21.3	-13.0	-8.3	
Mid Ch, 1880MHz									
3760.00	1.7	V	3.0	45.8	1.0	-43.1	-13.0	-30.1	
5640.00	3.9	V	3.0	45.7	1.0	-40.8	-13.0	-27.8	
7520.00	18.1	V	3.0	44.5	1.0	-25.4	-13.0	-12.4	
3760.00	6.1	H	3.0	45.8	1.0	-38.8	-13.0	-25.8	
5640.00	4.8	H	3.0	45.7	1.0	-39.9	-13.0	-26.9	
7520.00	21.2	H	3.0	44.5	1.0	-22.3	-13.0	-9.3	
High Ch, 1909.8MHz									
3819.60	1.5	V	3.0	45.8	1.0	-43.3	-13.0	-30.3	
5729.40	4.4	V	3.0	45.7	1.0	-40.3	-13.0	-27.3	
7639.20	16.6	V	3.0	44.4	1.0	-26.8	-13.0	-13.8	
3819.60	3.8	H	3.0	45.8	1.0	-41.1	-13.0	-28.1	
5729.40	4.4	H	3.0	45.7	1.0	-40.3	-13.0	-27.3	
7639.20	17.6	H	3.0	44.4	1.0	-25.9	-13.0	-12.9	

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WCDMA Band 5

Band 5 REL99

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

Company: Samsung
Project #: 4790406778
Date: 6/16/2022
Test Engineer: 26087
Configuration: EUT / AC Adapter, Earphone, Z-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	-11.7	V	3.0	40.9	1.0	-51.6	-13.0	-38.6	
2479.20	-8.9	V	3.0	41.6	1.0	-49.4	-13.0	-36.4	
3305.60	-6.0	V	3.0	42.3	1.0	-47.3	-13.0	-34.3	
1652.80	-12.3	H	3.0	40.9	1.0	-52.2	-13.0	-39.2	
2479.20	-9.2	H	3.0	41.6	1.0	-49.8	-13.0	-36.8	
3305.60	-6.0	H	3.0	42.3	1.0	-47.3	-13.0	-34.3	
Mid Ch, 836.6MHz									
1673.20	-11.8	V	3.0	40.9	1.0	-51.8	-13.0	-38.8	
2509.80	-8.8	V	3.0	41.6	1.0	-49.4	-13.0	-36.4	
3346.40	-5.7	V	3.0	42.3	1.0	-47.0	-13.0	-34.0	
1673.20	-11.8	H	3.0	40.9	1.0	-51.7	-13.0	-38.7	
2509.80	-9.2	H	3.0	41.6	1.0	-49.8	-13.0	-36.8	
3346.40	-5.6	H	3.0	42.3	1.0	-46.9	-13.0	-33.9	
High Ch, 846.6MHz									
1693.20	-11.6	V	3.0	40.9	1.0	-51.5	-13.0	-38.5	
2539.80	-8.7	V	3.0	41.6	1.0	-49.3	-13.0	-36.3	
3386.40	-5.6	V	3.0	42.3	1.0	-46.9	-13.0	-33.9	
1693.20	-12.2	H	3.0	40.9	1.0	-52.2	-13.0	-39.2	
2539.80	-9.0	H	3.0	41.6	1.0	-49.6	-13.0	-36.6	
3386.40	-5.5	H	3.0	42.3	1.0	-46.8	-13.0	-33.8	

Band 5 HSDPA

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

Company: Samsung
Project #: 4790406782
Date: 6/30/2022
Test Engineer: 26087
Configuration: EUT / AC Adapter, Earphone, Z-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	-12.8	V	3.0	40.9	1.0	-52.8	-13.0	-39.8	
2479.20	-9.0	V	3.0	41.6	1.0	-49.5	-13.0	-36.5	
3305.60	-6.0	V	3.0	42.3	1.0	-47.3	-13.0	-34.3	
1652.80	-12.3	H	3.0	40.9	1.0	-52.3	-13.0	-39.3	
2479.20	-9.3	H	3.0	41.6	1.0	-49.9	-13.0	-36.9	
3305.60	-6.1	H	3.0	42.3	1.0	-47.4	-13.0	-34.4	
Mid Ch, 836.6MHz									
1673.20	-13.0	V	3.0	40.9	1.0	-52.9	-13.0	-39.9	
2509.80	-8.9	V	3.0	41.6	1.0	-49.4	-13.0	-36.4	
3346.40	-5.7	V	3.0	42.3	1.0	-47.0	-13.0	-34.0	
1673.20	-12.5	H	3.0	40.9	1.0	-52.4	-13.0	-39.4	
2509.80	-9.3	H	3.0	41.6	1.0	-49.9	-13.0	-36.9	
3346.40	-5.7	H	3.0	42.3	1.0	-47.0	-13.0	-34.0	
High Ch, 846.6MHz									
1693.20	-12.7	V	3.0	40.9	1.0	-52.6	-13.0	-39.6	
2539.80	-8.7	V	3.0	41.6	1.0	-49.4	-13.0	-36.4	
3386.40	-5.6	V	3.0	42.3	1.0	-46.9	-13.0	-33.9	
1693.20	-13.4	H	3.0	40.9	1.0	-53.3	-13.0	-40.3	
2539.80	-9.1	H	3.0	41.6	1.0	-49.7	-13.0	-36.7	
3386.40	-5.7	H	3.0	42.3	1.0	-47.0	-13.0	-34.0	

WCDMA Band 4

Band 4 REL99

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

Company: Samsung
Project #: 4790406778
Date: 6/17/2022
Test Engineer: 25770
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: Rel99 Band 4 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, 1712.4MHz									
3424.80	-3.7	V	3.0	45.7	1.0	-48.4	-13.0	-35.4	
5137.20	-8.7	V	3.0	45.8	1.0	-53.5	-13.0	-40.5	
6849.60	-3.2	V	3.0	44.9	1.0	-47.1	-13.0	-34.1	
3424.80	-3.9	H	3.0	45.7	1.0	-48.6	-13.0	-35.6	
5137.20	-8.5	H	3.0	45.8	1.0	-53.3	-13.0	-40.3	
6849.60	1.7	H	3.0	44.9	1.0	-42.3	-13.0	-29.3	
Mid Ch, 1732.6MHz									
3465.20	-4.6	V	3.0	45.7	1.0	-49.4	-13.0	-36.4	
5197.80	-8.3	V	3.0	45.8	1.0	-53.1	-13.0	-40.1	
6930.40	-2.5	V	3.0	44.8	1.0	-46.4	-13.0	-33.4	
3465.20	-4.5	H	3.0	45.7	1.0	-49.2	-13.0	-36.2	
5197.80	-8.1	H	3.0	45.8	1.0	-52.9	-13.0	-39.9	
6930.40	2.3	H	3.0	44.8	1.0	-41.5	-13.0	-28.5	
High Ch, 1752.6MHz									
3505.20	-7.0	V	3.0	45.7	1.0	-51.7	-13.0	-38.7	
5257.80	-8.0	V	3.0	45.8	1.0	-52.8	-13.0	-39.8	
7010.40	-3.0	V	3.0	44.8	1.0	-46.8	-13.0	-33.8	
3505.20	-4.8	H	3.0	45.7	1.0	-49.6	-13.0	-36.6	
5257.80	-8.4	H	3.0	45.8	1.0	-53.2	-13.0	-40.2	
7010.40	1.6	H	3.0	44.8	1.0	-42.2	-13.0	-29.2	

Band 4 HSDPA

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

Company: Samsung
Project #: 4790406778
Date: 6/17/2022
Test Engineer: 25770
Configuration: EUT / Z-Position
Location: Chamber 1
Mode: HSDPA Band 4 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, 1712.4MHz									
3424.80	-5.4	V	3.0	45.7	1.0	-50.1	-13.0	-37.1	
5137.20	-8.6	V	3.0	45.8	1.0	-53.4	-13.0	-40.4	
6849.60	-4.2	V	3.0	44.9	1.0	-48.1	-13.0	-35.1	
3424.80	-5.8	H	3.0	45.7	1.0	-50.5	-13.0	-37.5	
5137.20	-8.4	H	3.0	45.8	1.0	-53.2	-13.0	-40.2	
6849.60	0.7	H	3.0	44.9	1.0	-43.2	-13.0	-30.2	
Mid Ch, 1732.6MHz									
3465.20	-6.1	V	3.0	45.7	1.0	-50.9	-13.0	-37.9	
5197.80	-8.6	V	3.0	45.8	1.0	-53.4	-13.0	-40.4	
6930.40	-4.1	V	3.0	44.8	1.0	-47.9	-13.0	-34.9	
3465.20	-6.4	H	3.0	45.7	1.0	-51.2	-13.0	-38.2	
5197.80	-8.5	H	3.0	45.8	1.0	-53.3	-13.0	-40.3	
6930.40	-0.7	H	3.0	44.8	1.0	-44.6	-13.0	-31.6	
High Ch, 1752.6MHz									
3505.20	-7.5	V	3.0	45.7	1.0	-52.2	-13.0	-39.2	
5257.80	-8.1	V	3.0	45.8	1.0	-52.9	-13.0	-39.9	
7010.40	-4.1	V	3.0	44.8	1.0	-47.8	-13.0	-34.8	
3505.20	-7.0	H	3.0	45.7	1.0	-51.8	-13.0	-38.8	
5257.80	-8.0	H	3.0	45.8	1.0	-52.8	-13.0	-39.8	
7010.40	-0.2	H	3.0	44.8	1.0	-44.0	-13.0	-31.0	

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WCDMA Band 2

Band 2 REL99

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

Company: Samsung
Project #: 4790406778
Date: 6/16/2022
Test Engineer: 25770
Configuration: EUT / Y-Position
Location: Chamber 1
Mode: Rel99 Band 2 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, 1852.4MHz									
3704.80	-10.8	V	3.0	45.8	1.0	-55.6	-13.0	-42.6	
5557.20	-7.4	V	3.0	45.7	1.0	-52.1	-13.0	-39.1	
7409.60	5.9	V	3.0	44.6	1.0	-37.6	-13.0	-24.6	
3704.80	-9.3	H	3.0	45.8	1.0	-54.2	-13.0	-41.2	
5557.20	-7.8	H	3.0	45.7	1.0	-52.6	-13.0	-39.6	
7409.60	-0.1	H	3.0	44.6	1.0	-43.7	-13.0	-30.7	
Mid Ch, 1880MHz									
3760.00	-10.3	V	3.0	45.8	1.0	-55.1	-13.0	-42.1	
5640.00	-7.2	V	3.0	45.7	1.0	-52.0	-13.0	-39.0	
7520.00	3.0	V	3.0	44.5	1.0	-40.5	-13.0	-27.5	
3760.00	-10.1	H	3.0	45.8	1.0	-54.9	-13.0	-41.9	
5640.00	-7.7	H	3.0	45.7	1.0	-52.4	-13.0	-39.4	
7520.00	1.8	H	3.0	44.5	1.0	-41.7	-13.0	-28.7	
High Ch, 1907.6MHz									
3815.20	-10.3	V	3.0	45.8	1.0	-55.1	-13.0	-42.1	
5722.80	-6.3	V	3.0	45.7	1.0	-51.0	-13.0	-38.0	
7630.40	2.3	V	3.0	44.4	1.0	-41.2	-13.0	-28.2	
3815.20	-10.4	H	3.0	45.8	1.0	-55.3	-13.0	-42.3	
5722.80	-7.4	H	3.0	45.7	1.0	-52.2	-13.0	-39.2	
7630.40	-1.4	H	3.0	44.4	1.0	-44.8	-13.0	-31.8	

Band 2 HSDPA

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

Company: Samsung
Project #: 4790406778
Date: 6/17/2022
Test Engineer: 25770
Configuration: EUT / Y-Position
Location: Chamber 1
Mode: HSDPA Band 2 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, 1852.4MHz									
3704.80	-10.8	V	3.0	45.8	1.0	-55.6	-13.0	-42.6	
5557.20	-7.7	V	3.0	45.7	1.0	-52.4	-13.0	-39.4	
7409.60	4.0	V	3.0	44.6	1.0	-39.5	-13.0	-26.5	
3704.80	-10.1	H	3.0	45.8	1.0	-54.9	-13.0	-41.9	
5557.20	-7.9	H	3.0	45.7	1.0	-52.6	-13.0	-39.6	
7409.60	-1.8	H	3.0	44.6	1.0	-45.4	-13.0	-32.4	
Mid Ch, 1880MHz									
3760.00	-10.8	V	3.0	45.8	1.0	-55.6	-13.0	-42.6	
5640.00	-7.6	V	3.0	45.7	1.0	-52.4	-13.0	-39.4	
7520.00	0.9	V	3.0	44.5	1.0	-42.6	-13.0	-29.6	
3760.00	-10.8	H	3.0	45.8	1.0	-55.6	-13.0	-42.6	
5640.00	-7.8	H	3.0	45.7	1.0	-52.5	-13.0	-39.5	
7520.00	0.3	H	3.0	44.5	1.0	-43.2	-13.0	-30.2	
High Ch, 1907.6MHz									
3815.20	-10.5	V	3.0	45.8	1.0	-55.3	-13.0	-42.3	
5722.80	-6.6	V	3.0	45.7	1.0	-51.3	-13.0	-38.3	
7630.40	1.8	V	3.0	44.4	1.0	-41.6	-13.0	-28.6	
3815.20	-10.5	H	3.0	45.8	1.0	-55.4	-13.0	-42.4	
5722.80	-7.6	H	3.0	45.7	1.0	-52.3	-13.0	-39.3	
7630.40	-2.3	H	3.0	44.4	1.0	-45.7	-13.0	-32.7	

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LTE Band 2

LTE Band 2

Main Ant

3MHz

QPSK

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

Company: Samsung
Project #: 4790406778
Date: 6/14/2022
Test Engineer: 25770
Configuration: EUT / AC Adapter, Z-position
Location: Chamber 1
Mode: LTE_QPSK Band 2 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, 1851.5MHz									
3703.00	-8.5	V	3.0	45.8	1.0	-53.3	-13.0	-40.3	
5554.50	-7.2	V	3.0	45.7	1.0	-51.9	-13.0	-38.9	
7406.00	4.0	V	3.0	44.6	1.0	-39.6	-13.0	-26.6	
3703.00	-5.8	H	3.0	45.8	1.0	-50.6	-13.0	-37.6	
5554.50	-5.5	H	3.0	45.7	1.0	-50.2	-13.0	-37.2	
7406.00	12.5	H	3.0	44.6	1.0	-31.1	-13.0	-18.1	
Mid Ch, 1880MHz									
3760.00	-8.4	V	3.0	45.8	1.0	-53.2	-13.0	-40.2	
5640.00	-7.5	V	3.0	45.7	1.0	-52.2	-13.0	-39.2	
7520.00	5.8	V	3.0	44.5	1.0	-37.7	-13.0	-24.7	
3760.00	-5.9	H	3.0	45.8	1.0	-50.7	-13.0	-37.7	
5640.00	-5.2	H	3.0	45.7	1.0	-50.0	-13.0	-37.0	
7520.00	12.9	H	3.0	44.5	1.0	-30.6	-13.0	-17.6	
High Ch, 1908.5MHz									
3817.00	-8.7	V	3.0	45.8	1.0	-53.5	-13.0	-40.5	
5725.50	-6.5	V	3.0	45.7	1.0	-51.2	-13.0	-38.2	
7634.00	7.6	V	3.0	44.4	1.0	-35.8	-13.0	-22.8	
3817.00	-9.3	H	3.0	45.8	1.0	-54.1	-13.0	-41.1	
5725.50	-2.7	H	3.0	45.7	1.0	-47.4	-13.0	-34.4	
7634.00	12.5	H	3.0	44.4	1.0	-31.0	-13.0	-18.0	

LTE Band 2

Sub Ant

20 MHz

QPSK

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

Company: Samsung
Project #: 4790406778
Date: 6/20/2022
Test Engineer: 26087
Configuration: EUT / Earphone, X-Position
Location: Chamber 1
Mode: LTE_QPSK Band 2 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, 1860MHz									
3720.00	-0.7	V	3.0	45.8	1.0	-45.5	-13.0	-32.5	
5580.00	-3.7	V	3.0	45.7	1.0	-48.5	-13.0	-35.5	
7440.00	-1.4	V	3.0	44.5	1.0	-44.9	-13.0	-31.9	
3720.00	3.3	H	3.0	45.8	1.0	-41.5	-13.0	-28.5	
5580.00	-3.7	H	3.0	45.7	1.0	-48.5	-13.0	-35.5	
7440.00	-1.5	H	3.0	44.5	1.0	-45.0	-13.0	-32.0	
Mid Ch, 1880MHz									
3760.00	-2.7	V	3.0	45.8	1.0	-47.6	-13.0	-34.6	
5640.00	-3.5	V	3.0	45.7	1.0	-48.3	-13.0	-35.3	
7520.00	-1.5	V	3.0	44.5	1.0	-45.0	-13.0	-32.0	
3760.00	1.1	H	3.0	45.8	1.0	-43.8	-13.0	-30.8	
5640.00	-3.5	H	3.0	45.7	1.0	-48.2	-13.0	-35.2	
7520.00	-1.6	H	3.0	44.5	1.0	-45.1	-13.0	-32.1	
High Ch, 1900MHz									
3800.00	-1.2	V	3.0	45.8	1.0	-46.0	-13.0	-33.0	
5700.00	-3.3	V	3.0	45.7	1.0	-48.0	-13.0	-35.0	
7600.00	-1.3	V	3.0	44.5	1.0	-44.7	-13.0	-31.7	
3800.00	0.4	H	3.0	45.8	1.0	-44.5	-13.0	-31.5	
5700.00	-3.3	H	3.0	45.7	1.0	-48.0	-13.0	-35.0	
7600.00	-1.3	H	3.0	44.5	1.0	-44.8	-13.0	-31.8	

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LTE Band 12

LTE
Band 12

5MHz

QPSK

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

Company:	Samsung
Project #:	4790406778
Date:	6/16/2022
Test Engineer:	26087
Configuration:	EUT / AC Adapter, Earphone, X-Position
Location:	Chamber 2
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	-26.7	V	3.0	41.0	1.0	-66.7	-13.0	-53.7	
2104.50	-22.3	V	3.0	41.0	1.0	-62.3	-13.0	-49.3	
2806.00	-24.7	V	3.0	42.0	1.0	-65.7	-13.0	-52.7	
1403.00	-25.6	H	3.0	41.0	1.0	-65.5	-13.0	-52.5	
2104.50	-18.9	H	3.0	41.0	1.0	-58.9	-13.0	-45.9	
2806.00	-24.9	H	3.0	42.0	1.0	-65.9	-13.0	-52.9	
Mid Ch, 707.5MHz									
1415.00	-27.0	V	3.0	41.0	1.0	-66.9	-13.0	-53.9	
2122.50	-23.6	V	3.0	41.0	1.0	-63.6	-13.0	-50.6	
2830.00	-24.9	V	3.0	42.0	1.0	-65.9	-13.0	-52.9	
1415.00	-25.3	H	3.0	41.0	1.0	-65.2	-13.0	-52.2	
2122.50	-24.0	H	3.0	41.0	1.0	-64.1	-13.0	-51.1	
2830.00	-24.8	H	3.0	42.0	1.0	-65.8	-13.0	-52.8	
High Ch, 713.5MHz									
1427.00	-26.6	V	3.0	41.0	1.0	-66.5	-13.0	-53.5	
2140.50	-20.9	V	3.0	41.1	1.0	-60.9	-13.0	-47.9	
2854.00	-24.9	V	3.0	42.1	1.0	-66.0	-13.0	-53.0	
1427.00	-25.0	H	3.0	41.0	1.0	-65.0	-13.0	-52.0	
2140.50	-16.8	H	3.0	41.1	1.0	-56.9	-13.0	-43.9	
2854.00	-25.0	H	3.0	42.1	1.0	-66.1	-13.0	-53.1	

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LTE Band 26 (Part 90)

LTE Band 26

5 MHz

QPSK

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

Company: Samsung
Project #: 4790406778
Date: 6/21/2022
Test Engineer: 19568
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 26 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, 816.5MHz									
1633.00	-15.3	V	3.0	40.9	1.0	-55.3	-13.0	-42.3	
2449.50	-13.3	V	3.0	41.5	1.0	-53.8	-13.0	-40.8	
3266.00	-10.5	V	3.0	42.3	1.0	-51.8	-13.0	-38.8	
1633.00	-16.1	H	3.0	40.9	1.0	-56.0	-13.0	-43.0	
2449.50	-13.6	H	3.0	41.5	1.0	-54.1	-13.0	-41.1	
3266.00	-10.4	H	3.0	42.3	1.0	-51.7	-13.0	-38.7	
Mid Ch, 821.5MHz									
1643.00	-14.6	V	3.0	40.9	1.0	-54.5	-13.0	-41.5	
2464.50	-13.1	V	3.0	41.5	1.0	-53.7	-13.0	-40.7	
3286.00	-10.4	V	3.0	42.3	1.0	-51.7	-13.0	-38.7	
1643.00	-15.4	H	3.0	40.9	1.0	-55.3	-13.0	-42.3	
2464.50	-13.5	H	3.0	41.5	1.0	-54.1	-13.0	-41.1	
3286.00	-10.4	H	3.0	42.3	1.0	-51.7	-13.0	-38.7	

LTE Band 26 (Straddle)

LTE Band 26

5 MHz

QPSK

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

Company: Samsung
Project #: 4790406778
Date: 6/20/2022
Test Engineer: 19568
Configuration: EUT / AC Adapter, Y-Position
Location: Chamber 2
Mode: LTE_QPSK Band 26 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
Straddle Ch, 824MHz									
1648.00	-15.0	V	3.0	40.9	1.0	-54.9	-13.0	-41.9	
2472.00	-13.0	V	3.0	41.5	1.0	-53.6	-13.0	-40.6	
3296.00	-10.3	V	3.0	42.3	1.0	-51.6	-13.0	-38.6	
1648.00	-16.5	H	3.0	40.9	1.0	-56.4	-13.0	-43.4	
2472.00	-13.3	H	3.0	41.5	1.0	-53.9	-13.0	-40.9	
3296.00	-10.2	H	3.0	42.3	1.0	-51.5	-13.0	-38.5	

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LTE Band 26 (Part 22)

LTE
Band 26

5MHz

QPSK

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

Company:	Samsung
Project #:	4790406778
Date:	6/20/2022
Test Engineer:	19568
Configuration:	EUT / AC Adapter, Y-Position
Location:	Chamber 2
Mode:	LTE_QPSK Band 26 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, 826.5MHz									
1653.00	-15.5	V	3.0	40.9	1.0	-55.4	-13.0	-42.4	
2479.50	-13.1	V	3.0	41.6	1.0	-53.6	-13.0	-40.6	
3306.00	-10.2	V	3.0	42.3	1.0	-51.5	-13.0	-38.5	
1653.00	-16.6	H	3.0	40.9	1.0	-56.5	-13.0	-43.5	
2479.50	-13.4	H	3.0	41.6	1.0	-54.0	-13.0	-41.0	
3306.00	-10.2	H	3.0	42.3	1.0	-51.5	-13.0	-38.5	
Mid Ch, 831.5MHz									
1663.00	-15.2	V	3.0	40.9	1.0	-55.1	-13.0	-42.1	
2494.50	-13.0	V	3.0	41.6	1.0	-53.6	-13.0	-40.6	
3326.00	-10.1	V	3.0	42.3	1.0	-51.4	-13.0	-38.4	
1663.00	-16.4	H	3.0	40.9	1.0	-56.4	-13.0	-43.4	
2494.50	-13.4	H	3.0	41.6	1.0	-53.9	-13.0	-40.9	
3326.00	-10.0	H	3.0	42.3	1.0	-51.3	-13.0	-38.3	
High Ch, 846.5MHz									
1693.00	-15.2	V	3.0	40.9	1.0	-55.1	-13.0	-42.1	
2539.50	-12.8	V	3.0	41.6	1.0	-53.5	-13.0	-40.5	
3386.00	-9.8	V	3.0	42.3	1.0	-51.1	-13.0	-38.1	
1693.00	-16.4	H	3.0	40.9	1.0	-56.3	-13.0	-43.3	
2539.50	-13.1	H	3.0	41.6	1.0	-53.8	-13.0	-40.8	
3386.00	-9.8	H	3.0	42.3	1.0	-51.1	-13.0	-38.1	

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LTE Band 41

LTE
Band 41

Main Ant

10MHz

QPSK

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

Company:	Samsung
Project #:	4790406778
Date:	6/14/2022
Test Engineer:	25770
Configuration:	EUT / AC Adapter, X-Position
Location:	Chamber 1
Mode:	LTE_QPSK Band 41 Harmonics, 10MHz 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, 2501MHz									
5002.00	-15.7	V	3.0	45.8	1.0	-60.5	-25.0	-35.5	
7503.00	5.5	V	3.0	44.5	1.0	-38.0	-25.0	-13.0	
10004.00	-9.6	V	3.0	42.6	1.0	-51.2	-25.0	-26.2	
5002.00	-15.3	H	3.0	45.8	1.0	-60.1	-25.0	-35.1	
7503.00	-0.3	H	3.0	44.5	1.0	-43.8	-25.0	-18.8	
10004.00	-11.0	H	3.0	42.6	1.0	-52.6	-25.0	-27.6	
Mid Ch, 2593MHz									
5186.00	-14.4	V	3.0	45.8	1.0	-59.2	-25.0	-34.2	
7779.00	3.4	V	3.0	44.4	1.0	-39.9	-25.0	-14.9	
10372.00	-9.7	V	3.0	42.7	1.0	-51.4	-25.0	-26.4	
5186.00	-14.7	H	3.0	45.8	1.0	-59.5	-25.0	-34.5	
7779.00	-3.8	H	3.0	44.4	1.0	-47.1	-25.0	-22.1	
10372.00	-11.0	H	3.0	42.7	1.0	-52.7	-25.0	-27.7	
High Ch, 2685MHz									
5370.00	-11.7	V	3.0	45.8	1.0	-56.4	-25.0	-31.4	
8055.00	7.7	V	3.0	44.2	1.0	-35.5	-25.0	-10.5	
10740.00	-4.0	V	3.0	42.8	1.0	-45.9	-25.0	-20.9	
5370.00	-12.6	H	3.0	45.8	1.0	-57.4	-25.0	-32.4	
8055.00	-0.9	H	3.0	44.2	1.0	-44.1	-25.0	-19.1	
10740.00	-6.6	H	3.0	42.8	1.0	-48.4	-25.0	-23.4	

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LTE Band 66

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

Company: Samsung
Project #: 4790406778
Date: 6/15/2022
Test Engineer: 25770
Configuration: EUT / AC Adapter, Z-Position
Location: Chamber 1
Mode: LTE_QPSK Band 66 Harmonics, 5MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

LTE Band 66

Main Ant

5 MHz

QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1712.5MHz									
3425.00	1.8	V	3.0	45.7	1.0	-42.9	-13.0	-29.9	
5137.50	-8.6	V	3.0	45.8	1.0	-53.4	-13.0	-40.4	
6850.00	2.9	V	3.0	44.9	1.0	-41.0	-13.0	-28.0	
8562.50	-2.6	V	3.0	43.8	1.0	-45.4	-13.0	-32.4	
10275.00	0.4	V	3.0	42.7	1.0	-41.3	-13.0	-28.3	
3425.00	2.2	H	3.0	45.7	1.0	-42.5	-13.0	-29.5	
5137.50	-8.5	H	3.0	45.8	1.0	-53.3	-13.0	-40.3	
6850.00	8.8	H	3.0	44.9	1.0	-35.1	-13.0	-22.1	
8562.50	1.6	H	3.0	43.8	1.0	-41.3	-13.0	-28.3	
10275.00	0.4	H	3.0	42.7	1.0	-41.3	-13.0	-28.3	
Mid Ch, 1745MHz									
3490.00	-8.6	V	3.0	45.7	1.0	-53.3	-13.0	-40.3	
5235.00	-7.9	V	3.0	45.8	1.0	-52.7	-13.0	-39.7	
6980.00	3.4	V	3.0	44.8	1.0	-40.4	-13.0	-27.4	
8725.00	-2.4	V	3.0	43.7	1.0	-45.1	-13.0	-32.1	
10470.00	0.5	V	3.0	42.7	1.0	-41.2	-13.0	-28.2	
3490.00	-8.3	H	3.0	45.7	1.0	-53.0	-13.0	-40.0	
5235.00	-6.5	H	3.0	45.8	1.0	-51.3	-13.0	-38.3	
6980.00	8.3	H	3.0	44.8	1.0	-35.5	-13.0	-22.5	
8725.00	1.8	H	3.0	43.7	1.0	-40.9	-13.0	-27.9	
10470.00	0.6	H	3.0	42.7	1.0	-41.1	-13.0	-28.1	
High Ch, 1777.5MHz									
3555.00	-8.2	V	3.0	45.8	1.0	-53.0	-13.0	-40.0	
5332.50	-7.8	V	3.0	45.8	1.0	-52.5	-13.0	-39.5	
7110.00	5.0	V	3.0	44.7	1.0	-38.8	-13.0	-25.8	
8887.50	-4.5	V	3.0	43.6	1.0	-47.1	-13.0	-34.1	
10665.00	1.1	V	3.0	42.8	1.0	-40.8	-13.0	-27.8	
3555.00	-7.6	H	3.0	45.8	1.0	-52.4	-13.0	-39.4	
5332.50	-8.1	H	3.0	45.8	1.0	-52.9	-13.0	-39.9	
7110.00	9.6	H	3.0	44.7	1.0	-34.2	-13.0	-21.2	
8887.50	0.2	H	3.0	43.6	1.0	-42.5	-13.0	-29.5	
10665.00	0.5	H	3.0	42.8	1.0	-41.3	-13.0	-28.3	

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

Company:	Samsung
Project #:	4790406778
Date:	6/23/2022
Test Engineer:	19568
Configuration:	EUT / AC Adapter, Earphone, Z-Position
Location:	Chamber 1
Mode:	LTE_QPSK Band 66 Harmonics, 20MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

LTE Band 66

Sub Ant

20 MHz

QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1720MHz									
3440.00	2.4	V	3.0	45.7	1.0	-42.3	-13.0	-29.3	
5160.00	-9.0	V	3.0	45.8	1.0	-53.8	-13.0	-40.8	
6880.00	-5.7	V	3.0	44.9	1.0	-49.6	-13.0	-36.6	
3440.00	4.9	H	3.0	45.7	1.0	-39.9	-13.0	-26.9	
5160.00	-9.0	H	3.0	45.8	1.0	-53.8	-13.0	-40.8	
6880.00	-5.8	H	3.0	44.9	1.0	-49.7	-13.0	-36.7	
Mid Ch, 1745MHz									
3490.00	3.8	V	3.0	45.7	1.0	-40.9	-13.0	-27.9	
5235.00	-8.4	V	3.0	45.8	1.0	-53.2	-13.0	-40.2	
6980.00	-5.7	V	3.0	44.8	1.0	-49.5	-13.0	-36.5	
3490.00	2.5	H	3.0	45.7	1.0	-42.2	-13.0	-29.2	
5235.00	-8.3	H	3.0	45.8	1.0	-53.1	-13.0	-40.1	
6980.00	-5.9	H	3.0	44.8	1.0	-49.7	-13.0	-36.7	
High Ch, 1770MHz									
3540.00	5.5	V	3.0	45.8	1.0	-39.3	-13.0	-26.3	
5310.00	-8.3	V	3.0	45.8	1.0	-53.0	-13.0	-40.0	
7080.00	-5.6	V	3.0	44.7	1.0	-49.3	-13.0	-36.3	
3540.00	5.4	H	3.0	45.8	1.0	-39.4	-13.0	-26.4	
5310.00	-8.4	H	3.0	45.8	1.0	-53.1	-13.0	-40.1	
7080.00	-5.3	H	3.0	44.7	1.0	-49.0	-13.0	-36.0	

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NR Band n5

NR n5

10 MHz

QPSK

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

Company: Samsung
Project #: 4790406778
Date: 6/20/2022
Test Engineer: 19568
Configuration: EUT / AC Adapter, Earphone, Y-Position
Location: Chamber 1
Mode: 5G NR_QPSK NR n5 Harmonics, 10MHz 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, 829MHz									
1658.00	-13.4	V	3.0	45.6	1.0	-58.0	-13.0	-45.0	
2487.00	-12.1	V	3.0	45.5	1.0	-56.6	-13.0	-43.6	
3316.00	-9.6	V	3.0	45.7	1.0	-54.3	-13.0	-41.3	
1658.00	-13.3	H	3.0	45.6	1.0	-57.9	-13.0	-44.9	
2487.00	-12.4	H	3.0	45.5	1.0	-56.9	-13.0	-43.9	
3316.00	-9.5	H	3.0	45.7	1.0	-54.2	-13.0	-41.2	
Mid Ch, 836.5MHz									
1673.00	-11.6	V	3.0	45.6	1.0	-56.2	-13.0	-43.2	
2509.50	-12.0	V	3.0	45.5	1.0	-56.4	-13.0	-43.4	
3346.00	-9.4	V	3.0	45.7	1.0	-54.1	-13.0	-41.1	
1673.00	-14.5	H	3.0	45.6	1.0	-59.1	-13.0	-46.1	
2509.50	-12.8	H	3.0	45.5	1.0	-57.3	-13.0	-44.3	
3346.00	-9.6	H	3.0	45.7	1.0	-54.3	-13.0	-41.3	
High Ch, 844MHz									
1688.00	-13.9	V	3.0	45.6	1.0	-58.5	-13.0	-45.5	
2532.00	-12.1	V	3.0	45.5	1.0	-56.6	-13.0	-43.6	
3376.00	-9.3	V	3.0	45.7	1.0	-54.0	-13.0	-41.0	
1688.00	-14.3	H	3.0	45.6	1.0	-58.9	-13.0	-45.9	
2532.00	-12.6	H	3.0	45.5	1.0	-57.1	-13.0	-44.1	
3376.00	-9.4	H	3.0	45.7	1.0	-54.1	-13.0	-41.1	

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NR Band n66

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

Company: Samsung
Project #: 4790406778
Date: 6/20/2022
Test Engineer: 19568
Configuration: EUT / AC Adapter, Earphone, Z-Position
Location: Chamber 1
Mode: 5G NR_QPSK NR n66 Harmonics, 20MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

NR n66

Main Ant

20 MHz

QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1720MHz									
3440.00	0.9	V	3.0	45.7	1.0	-43.8	-13.0	-30.8	
5160.00	-8.7	V	3.0	45.8	1.0	-53.5	-13.0	-40.5	
6880.00	4.0	V	3.0	44.9	1.0	-39.9	-13.0	-26.9	
8600.00	-3.6	V	3.0	43.8	1.0	-46.4	-13.0	-33.4	
10320.00	0.2	V	3.0	42.7	1.0	-41.5	-13.0	-28.5	
3440.00	1.1	H	3.0	45.7	1.0	-43.6	-13.0	-30.6	
5160.00	-8.0	H	3.0	45.8	1.0	-52.8	-13.0	-39.8	
6880.00	8.0	H	3.0	44.9	1.0	-35.9	-13.0	-22.9	
8600.00	0.8	H	3.0	43.8	1.0	-42.0	-13.0	-29.0	
10320.00	0.1	H	3.0	42.7	1.0	-41.6	-13.0	-28.6	
Mid Ch, 1745MHz									
3490.00	1.9	V	3.0	45.7	1.0	-42.9	-13.0	-29.9	
5235.00	-8.3	V	3.0	45.8	1.0	-53.1	-13.0	-40.1	
6980.00	3.6	V	3.0	44.8	1.0	-40.2	-13.0	-27.2	
8725.00	-4.5	V	3.0	43.7	1.0	-47.2	-13.0	-34.2	
10470.00	0.3	V	3.0	42.7	1.0	-41.5	-13.0	-28.5	
3490.00	5.7	H	3.0	45.7	1.0	-39.1	-13.0	-26.1	
5235.00	-6.8	H	3.0	45.8	1.0	-51.6	-13.0	-38.6	
6980.00	10.7	H	3.0	44.8	1.0	-33.0	-13.0	-20.0	
8725.00	-1.0	H	3.0	43.7	1.0	-43.8	-13.0	-30.8	
10470.00	0.2	H	3.0	42.7	1.0	-41.5	-13.0	-28.5	
High Ch, 1770MHz									
3540.00	-8.3	V	3.0	45.8	1.0	-53.1	-13.0	-40.1	
5310.00	-8.3	V	3.0	45.8	1.0	-53.1	-13.0	-40.1	
7080.00	7.3	V	3.0	44.7	1.0	-36.4	-13.0	-23.4	
8850.00	-4.9	V	3.0	43.6	1.0	-47.6	-13.0	-34.6	
10620.00	0.5	V	3.0	42.8	1.0	-41.3	-13.0	-28.3	
3540.00	-7.7	H	3.0	45.8	1.0	-52.4	-13.0	-39.4	
5310.00	-7.6	H	3.0	45.8	1.0	-52.4	-13.0	-39.4	
7080.00	9.2	H	3.0	44.7	1.0	-34.5	-13.0	-21.5	
8850.00	-1.6	H	3.0	43.6	1.0	-44.3	-13.0	-31.3	
10620.00	0.4	H	3.0	42.8	1.0	-41.4	-13.0	-28.4	

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

Company:	Samsung
Project #:	4790406778
Date:	6/20/2022
Test Engineer:	19568
Configuration:	EUT / Earphone, X-Position
Location:	Chamber 1
Mode:	5G NR_QPSK NR n66 Harmonics, 20MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

NR n66

Sub Ant

20 MHz

QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1720MHz									
3440.00	-9.3	V	3.0	45.7	1.0	-54.0	-13.0	-41.0	
5160.00	-9.4	V	3.0	45.8	1.0	-54.2	-13.0	-41.2	
6880.00	4.3	V	3.0	44.9	1.0	-39.6	-13.0	-26.6	
3440.00	-9.6	H	3.0	45.7	1.0	-54.3	-13.0	-41.3	
5160.00	-9.1	H	3.0	45.8	1.0	-53.9	-13.0	-40.9	
6880.00	0.8	H	3.0	44.9	1.0	-43.1	-13.0	-30.1	
Mid Ch, 1745MHz									
3490.00	-9.1	V	3.0	45.7	1.0	-53.9	-13.0	-40.9	
5235.00	-9.3	V	3.0	45.8	1.0	-54.1	-13.0	-41.1	
6980.00	5.0	V	3.0	44.8	1.0	-38.8	-13.0	-25.8	
3490.00	-9.2	H	3.0	45.7	1.0	-54.0	-13.0	-41.0	
5235.00	-9.3	H	3.0	45.8	1.0	-54.1	-13.0	-41.1	
6980.00	0.3	H	3.0	44.8	1.0	-43.5	-13.0	-30.5	
High Ch, 1770MHz									
3540.00	-8.5	V	3.0	45.8	1.0	-53.2	-13.0	-40.2	
5310.00	-8.9	V	3.0	45.8	1.0	-53.6	-13.0	-40.6	
7080.00	5.3	V	3.0	44.7	1.0	-38.4	-13.0	-25.4	
3540.00	-8.5	H	3.0	45.8	1.0	-53.2	-13.0	-40.2	
5310.00	-8.8	H	3.0	45.8	1.0	-53.6	-13.0	-40.6	
7080.00	1.2	H	3.0	44.7	1.0	-42.5	-13.0	-29.5	

END OF REPORT