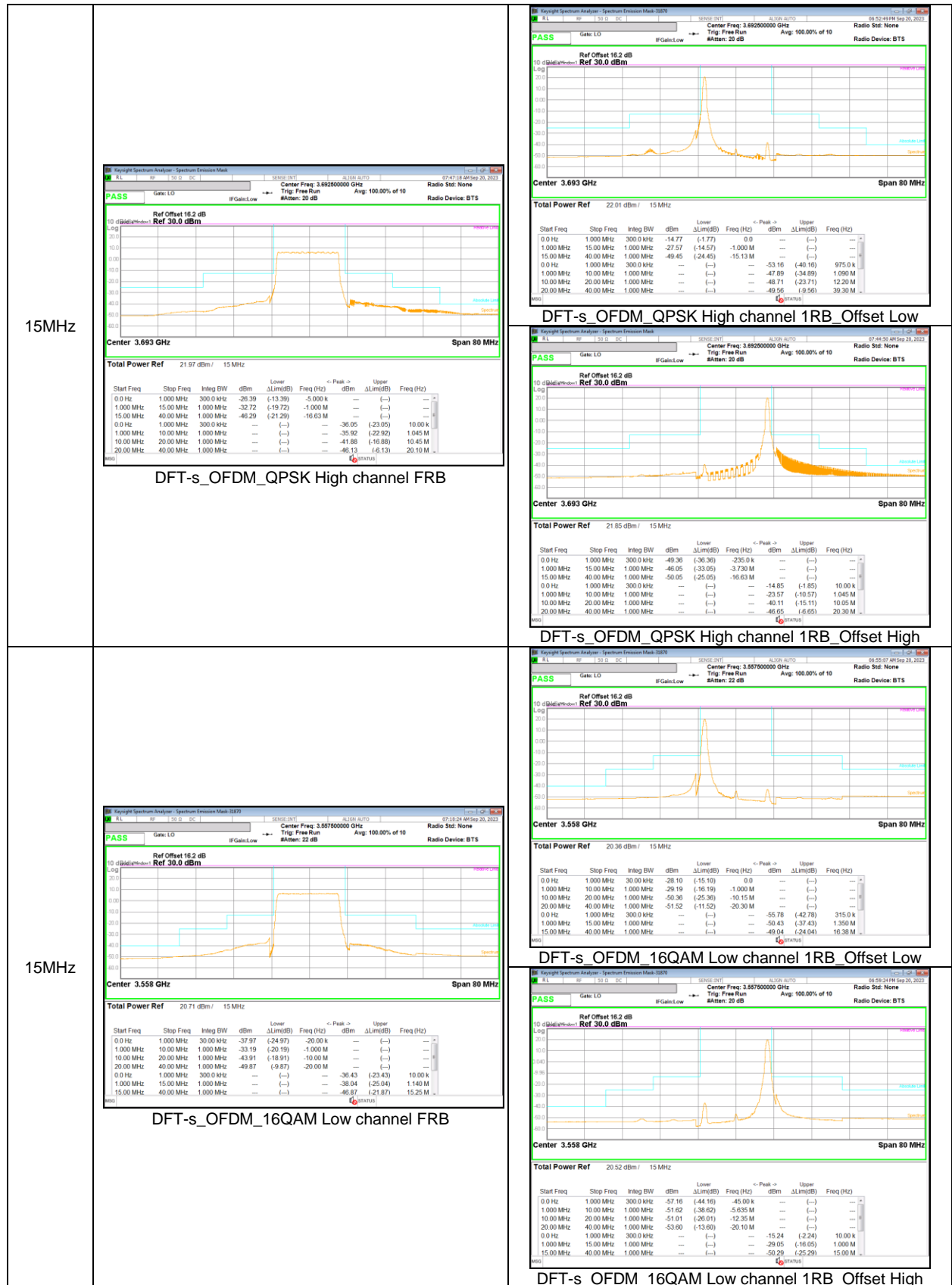




15MHz





15MHz







8.5. CONDUCTED SPURIOUS EMISSIONS

RULE PART(S)

FCC: §2.1051, and §96.41(e)

LIMITS

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

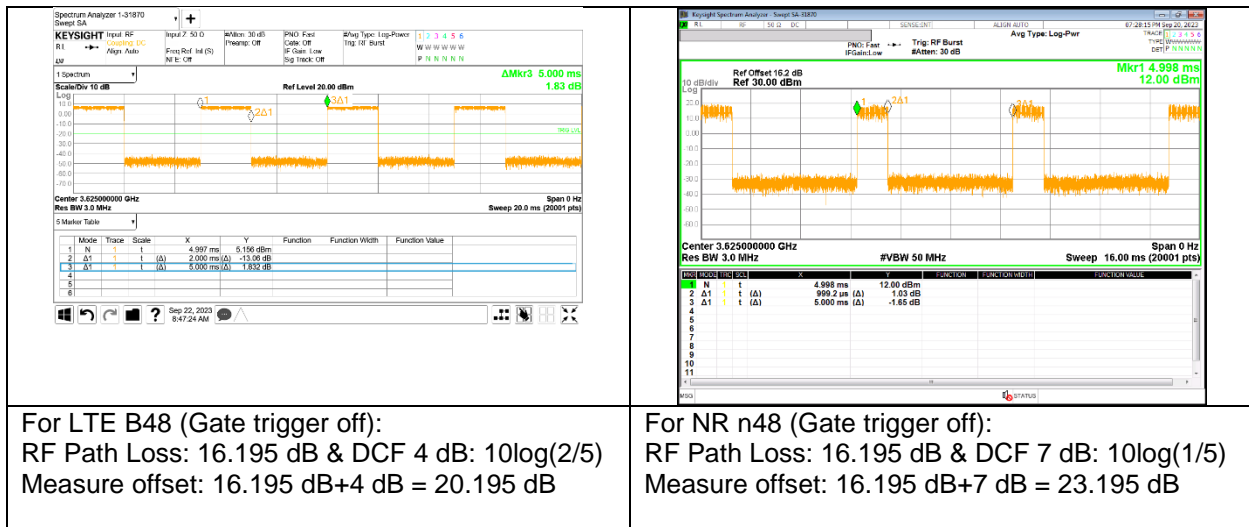
TEST PROCEDURE

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
 - A. (Tests were performed 1MHz [Worst case], to sweep 1 time for all frequency range)
- b) Set VBW ≥ 3 × RBW
- c) Sweep time = auto couple;
- d) Detector = RMS;
- e) Ensure that the number of measurement points = Max (40001);
- f) Trace mode = Average(TDD);

NOTE1



NOTE2

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

NOTE3

5G NR: All Waveforms (CP-OFDM vs DFT-s_OFDM) and modulations ($\pi/2$ 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.

RESULTS

See the following pages.

LTE Band 48



LTE Band 48C(UL CA)



NR Band n48



8.6. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055

LIMITS

For Part 96, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

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)

RESULTS

See the following pages.

LTE Band 48(Lowest Frequency: QPSK / Highest Frequency: QPSK)

Test Date	2023-10-10
Test Engineer	31870

Limit		3550	3700	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	3550.2585	3699.7448	5.0	0.001
Extreme (50C)		3550.2585	3699.7448		
Extreme (40C)		3550.2585	3699.7448		
Extreme (30C)		3550.2585	3699.7448		
Extreme (10C)		3550.2585	3699.7448		
Extreme (0C)		3550.2585	3699.7448		
Extreme (-10C)		3550.2585	3699.7448		
Extreme (-20C)		3550.2585	3699.7448		
Extreme (-30C)		3550.2585	3699.7448		
20C		15%	3550.2585		
	-15%	3550.2585	3699.7448	4.9	0.001
	End Point	3550.2585	3699.7448	5.2	0.001

NR Band n48(Lowest Frequency: QPSK / Highest Frequency: QPSK)

Test Date	2023-10-12
Test Engineer	31870

Limit		3550	3700	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	3550.7003	3699.2962	7.3	0.002
Extreme (50C)		3550.7003	3699.2962		
Extreme (40C)		3550.7003	3699.2962		
Extreme (30C)		3550.7003	3699.2962		
Extreme (10C)		3550.7003	3699.2962		
Extreme (0C)		3550.7003	3699.2962		
Extreme (-10C)		3550.7003	3699.2962		
Extreme (-20C)		3550.7003	3699.2962		
Extreme (-30C)		3550.7003	3699.2962		
20C		15%	3550.7003		
	-15%	3550.7003	3699.2962	11.2	0.003
	End Point	3550.7003	3699.2962	8.9	0.002

8.7. END USER DEVICE(CBSD PROTOCOL)

RULE PART(S)

FCC: §96.47

LIMITS

FCC Part 96.47

(a) End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.

(1) An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.

TEST PROCEDURE

KDB 940660 D01 Part 96 CBRS v03, WINNF-TS-0122 V1.0.2

Additional requirements are required to End-User Device LTE Band 48 and 5G NR n48 devices base on CBSD protocol. During the test, the EUT and its companion certified CBSD (FCC ID: 2AS48SC-220) and (FCC ID: PIDAS2900) devices communicate with each other.

Band	Configuration	Frequency (MHz)	Power (dBm/MHz)	Bandwidth (MHz)
LTE B48	1	3560 – 3580	8	20
	2	3600 – 3620	16	20
5G NR n48	3	3590 – 3610	15	20
	4	3640 – 3660	7	20

Configuration 1

- a) Setup WINNF.PT.C.HBT.1 with 3560MHz-3580MHz and power level 8 dBm/MHz
- b) Enable AP service from companion device.
- c) Check EUT Transmitter Frequency and power
- d) Disable AP service from companion device and check EUT stop transmission within 10s.

Configuration 2

- a) Setup WINNF.PT.C.HBT.1 with 3600MHz-3620MHz and power level 16 dBm/MHz
- b) Enable AP service from companion device.
- c) Check EUT Transmitter Frequency and power
- d) Disable AP service from companion device and check EUT stop transmission within 10s.

Configuration 3

- e) Setup WINNF.PT.C.HBT.1 with 3590MHz-3610MHz and power level 15 dBm/MHz
- f) Enable AP service from companion device.
- g) Check EUT Transmitter Frequency and power
- h) Disable AP service from companion device and check EUT stop transmission within 10s.

Configuration 4

- e) Setup WINNF.PT.C.HBT.1 with 3640MHz-3660MHz and power level 7 dBm/MHz
- f) Enable AP service from companion device.
- g) Check EUT Transmitter Frequency and power
- h) Disable AP service from companion device and check EUT stop transmission within 10s.

RESULTS

Next page

8.7.1. END USER DEVICE CONFIGURATION 1

Keysight Spectrum Analyzer - Swept SA

RF 50 Ω AC SENSE:INT ALIGN AUTO 05:06:42 AM Sep 20, 2023

PNO: Fast IFGain:Low Trig: Free Run Atten: 10 dB Avg Type: Log-Pwr Avg|Hold: 100/100

TRACE 1 2 3 4 5 6
 TYPE M W W W W W W W
 DET P N N N N N

10 dB/div Ref 0.00 dBm

Mkr2 3.580 00 GHz
 -61.749 dBm

Start 3.55000 GHz Stop 3.70000 GHz
 #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	3.560 00 GHz	-55.847 dBm			
2	N	1	f	3.580 00 GHz	-61.749 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG STATUS

Operation Mode

WINNF TEST HARNESS RELEASE: 1.0.0.3 - 2018-November-13
 Selected spectrum frequency is {lowFrequency': 3560000000L, 'highFrequency': 3580000000L}
 Granted Spectrum Max Eirp = 8dBm/MHz
 The Mock-SAS has been started please enabling CBSD for the power measurement test, the Mock-SAS will keep running during the test
 the selected test from the user : PowerMeasTest is starting now

Frequency
 Auto Tune
 Center Freq 3.625000000 GHz
 Start Freq 3.550000000 GHz
 Stop Freq 3.700000000 GHz
 CF Step 15.000000 MHz
 Auto Man
 Freq Offset 0 Hz



Stop Operation Within 10 second Mode

NOTE:

Marker 1: Authorized CBSD sends a signal to stop transmission.

Marker 2-1 Delta: Time elapsed since signal to stop transmission. EUD has stopped transmission.

Marker 3-1 Delta: 10 seconds has elapsed since CBSD has sent a signal to stop transmission to EUT.



Stop Operation Within 10 second Mode

NOTE:

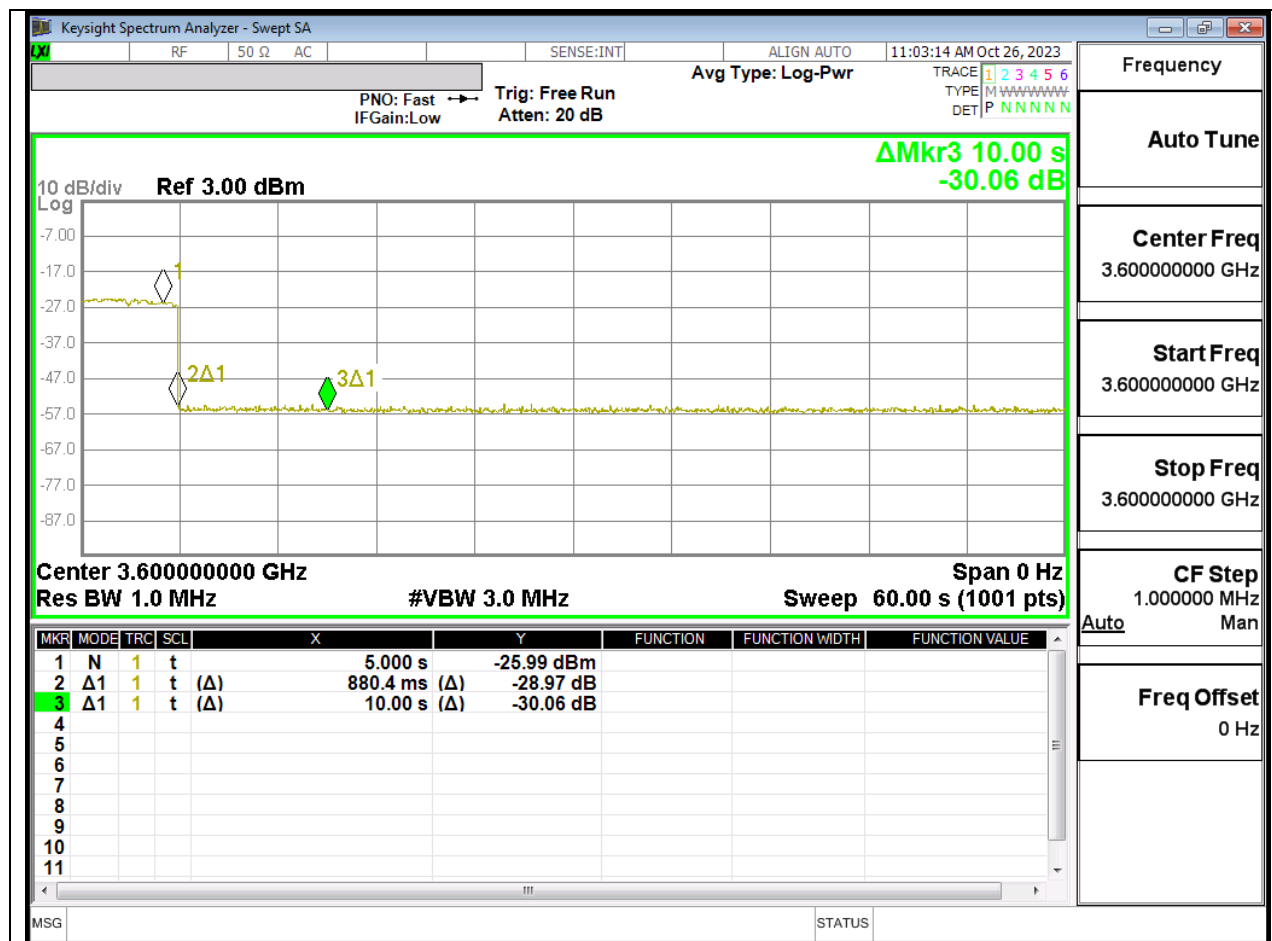
Marker 1: Authorized CBSD sends a signal to stop transmission.

Marker 2-1 Delta: Time elapsed since signal to stop transmission. EUD has stopped transmission.

Marker 3-1 Delta: 10 seconds has elapsed since CBSD has sent a signal to stop transmission to EUT.

8.7.3. END USER DEVICE CONFIGURATION 3





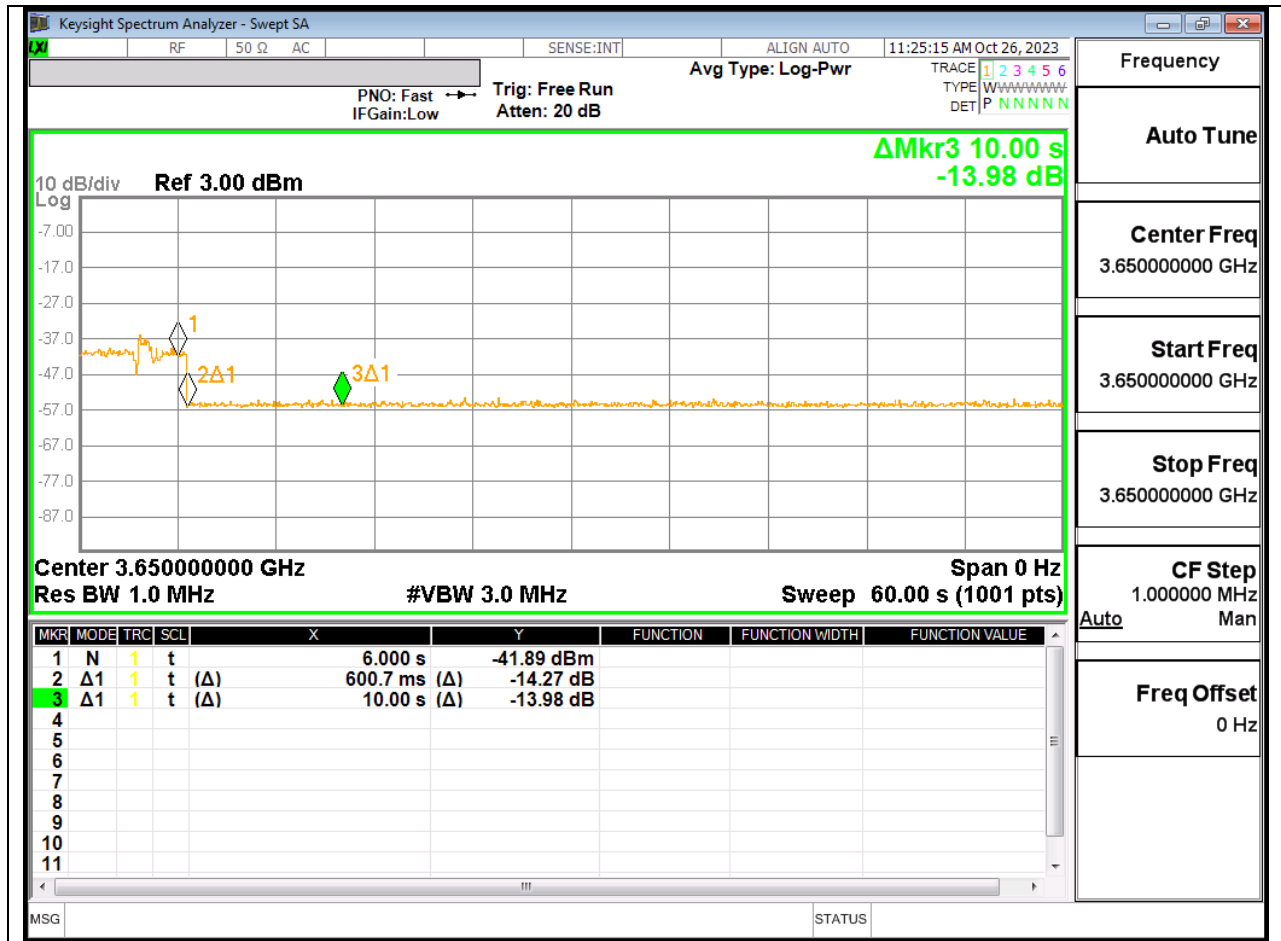
Stop Operation Within 10 second Mode

NOTE:

Marker 1: Authorized CBSD sends a signal to stop transmission.
 Marker 2-1 Delta: Time elapsed since signal to stop transmission. EUD has stopped transmission.
 Marker 3-1 Delta: 10 seconds has elapsed since CBSD has sent a signal to stop transmission to EUT.

8.7.4. END USER DEVICE CONFIGURATION 4





Stop Operation Within 10 second Mode

NOTE:

Marker 1: Authorized CBSD sends a signal to stop transmission.

Marker 2-1 Delta: Time elapsed since signal to stop transmission. EUD has stopped transmission.

Marker 3-1 Delta: 10 seconds has elapsed since CBSD has sent a signal to stop transmission to EUT.

9. RADIATED RESULTS

9.1. RADIATED POWER (EIRP)

RULE PART(S)

FCC: §96.41(b)

LIMITS

§96.41(b) Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table.

Device	Maximum EIRP (dBm/10 megahertz)	Maximum PSD (dBm/MHz)
End User Device	23	n/a

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 \geq OBW;
- b) Set VBW $\geq 3 \times$ RBW;
- c) Set span $\geq 2 \times$ RBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points $\geq 2 \times$ span/RBW;
- g) Trace mode = Average;

NOTE1

5G NR: All Waveforms (CP-OFDM vs DFT-s_OFDM) and modulations ($\pi/2$ 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.

TEST RESULTS

RF Output Power(total power) EIRP results meets Maximum EIRP limit (23 dBm/10MHz) of End User Device.

9.1.1. EIRP Results

LTE Band 48 (ANT F)

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
20	QPSK	3560.00	17.06	H	6.26	10.80	21.60	144.71	23.00	-1.40	1/50
		3625.00	16.66	H	6.32	10.73	21.07	127.96	23.00	-1.93	1/50
		3690.00	15.91	H	6.38	10.59	20.12	102.90	23.00	-2.88	1/50
	16-QAM	3560.00	16.29	H	6.26	10.80	20.83	121.20	23.00	-2.17	1/50
		3625.00	15.95	H	6.32	10.73	20.36	108.66	23.00	-2.64	1/50
		3690.00	15.10	H	6.38	10.59	19.31	85.39	23.00	-3.69	1/50
15	QPSK	3557.50	16.72	H	6.26	10.80	21.27	133.90	23.00	-1.73	1/37
		3625.00	16.38	H	6.32	10.73	20.79	119.97	23.00	-2.21	1/37
		3692.50	15.93	H	6.38	10.59	20.14	103.22	23.00	-2.86	1/0
	16-QAM	3557.50	16.17	H	6.26	10.80	20.72	117.97	23.00	-2.28	1/37
		3625.00	15.75	H	6.32	10.73	20.16	103.77	23.00	-2.84	1/37
		3692.50	14.62	H	6.38	10.59	18.83	76.34	23.00	-4.17	1/37
10	QPSK	3555.00	17.25	H	6.25	10.80	21.79	151.14	23.00	-1.21	1/25
		3625.00	16.46	H	6.32	10.73	20.87	122.20	23.00	-2.13	1/25
		3695.00	15.84	H	6.38	10.58	20.04	100.90	23.00	-2.96	1/25
	16-QAM	3555.00	16.73	H	6.25	10.80	21.27	134.08	23.00	-1.73	1/25
		3625.00	15.81	H	6.32	10.73	20.22	105.22	23.00	-2.78	1/25
		3695.00	15.15	H	6.38	10.58	19.35	86.07	23.00	-3.65	1/0
5	QPSK	3552.50	17.23	H	6.25	10.80	21.78	150.73	23.00	-1.22	1/12
		3625.00	16.69	H	6.32	10.73	21.10	128.85	23.00	-1.90	1/12
		3697.50	15.70	H	6.38	10.57	19.88	97.38	23.00	-3.12	1/12
	16-QAM	3552.50	16.53	H	6.25	10.80	21.08	128.29	23.00	-1.92	1/12
		3625.00	15.85	H	6.32	10.73	20.26	106.19	23.00	-2.74	1/12
		3697.50	14.75	H	6.38	10.57	18.93	78.25	23.00	-4.07	1/12

LTE Band 48C(UL CA) (ANT F)

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)	PCC	SCC
40	QPSK	3569.90	14.91	H	6.27	10.78	19.42	87.44	23.00	-3.58	1/99	1/0
		3625.00	14.98	H	6.32	10.80	19.47	88.43	23.00	-3.53	1/99	1/0
		3680.10	14.66	H	6.37	10.77	19.06	80.51	23.00	-3.94	1/99	1/0
	16-QAM	3569.90	14.21	H	6.27	10.78	18.72	74.43	23.00	-4.28	1/99	1/0
		3625.00	13.82	H	6.32	10.80	18.31	67.70	23.00	-4.69	1/99	1/0
		3680.10	13.93	H	6.37	10.77	18.33	68.05	23.00	-4.67	1/99	1/0

NR Band n48 (ANT F)

DFT-s_OFDM

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
40	QPSK	3570.00	17.37	H	6.27	10.80	21.90	154.87	23.00	-1.10	1/53
		3625.00	16.39	H	6.32	10.73	20.80	120.25	23.00	-2.20	1/53
		3680.00	16.10	H	6.37	10.61	20.34	108.15	23.00	-2.66	1/53
	16-QAM	3570.00	16.66	H	6.27	10.80	21.19	131.51	23.00	-1.81	1/53
		3625.00	15.60	H	6.32	10.73	20.01	100.25	23.00	-2.99	1/53
		3680.00	15.45	H	6.37	10.61	19.69	93.11	23.00	-3.31	1/53
30	QPSK	3565.00	17.40	H	6.27	10.80	21.94	156.18	23.00	-1.06	1/39
		3625.00	16.77	H	6.32	10.73	21.18	131.25	23.00	-1.82	1/39
		3685.00	16.18	H	6.38	10.60	20.41	109.78	23.00	-2.59	1/39
	16-QAM	3565.00	16.67	H	6.27	10.80	21.21	132.01	23.00	-1.79	1/39
		3625.00	16.15	H	6.32	10.73	20.56	113.79	23.00	-2.44	1/39
		3685.00	15.67	H	6.38	10.60	19.90	97.62	23.00	-3.10	1/39
20	QPSK	3560.00	17.39	H	6.26	10.80	21.93	156.13	23.00	-1.07	1/26
		3625.00	16.32	H	6.32	10.73	20.73	118.33	23.00	-2.27	1/26
		3690.00	15.39	H	6.38	10.59	19.60	91.29	23.00	-3.40	1/26
	16-QAM	3560.00	17.14	H	6.26	10.80	21.68	147.40	23.00	-1.32	1/26
		3625.00	15.82	H	6.32	10.73	20.23	105.46	23.00	-2.77	1/26
		3690.00	14.46	H	6.38	10.59	18.67	73.69	23.00	-4.33	1/26
15	QPSK	3557.50	16.91	H	6.26	10.80	21.46	139.88	23.00	-1.54	1/19
		3625.00	16.85	H	6.32	10.73	21.26	133.69	23.00	-1.74	1/19
		3692.50	15.75	H	6.38	10.59	19.96	99.03	23.00	-3.04	1/19
	16-QAM	3557.50	17.40	H	6.26	10.80	21.95	156.59	23.00	-1.05	1/19
		3625.00	17.08	H	6.32	10.73	21.49	140.96	23.00	-1.51	1/19
		3692.50	16.12	H	6.38	10.59	20.33	107.84	23.00	-2.67	1/19
10	QPSK	3555.00	17.40	H	6.25	10.80	21.94	156.45	23.00	-1.06	1/12
		3625.00	17.26	H	6.32	10.73	21.67	146.92	23.00	-1.33	1/12
		3695.00	16.31	H	6.38	10.58	20.51	112.43	23.00	-2.49	1/12
	16-QAM	3555.00	16.93	H	6.25	10.80	21.47	140.40	23.00	-1.53	1/12
		3625.00	16.76	H	6.32	10.73	21.17	130.94	23.00	-1.83	1/12
		3695.00	15.56	H	6.38	10.58	19.76	94.60	23.00	-3.24	1/12

NR Band n48(SRS1) (ANT C)

BW (MHz)	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)
40	3570.00	13.05	H	6.27	10.78	17.56	57.01	23.00	-5.44
	3624.99	11.32	H	6.32	10.80	15.81	38.07	23.00	-7.19
	3679.98	8.66	H	6.37	10.77	13.06	20.23	23.00	-9.94
30	3565.02								
	3624.99								
	3684.99								
20	3560.00								
	3624.99								
	3690.00								
15	3575.52								
	3624.99								
	3692.49								
10	3555.00								
	3624.99								
	3694.98								

NR Band n48(SRS2) (ANT I)

BW (MHz)	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)
40	3570.00	15.66	H	6.27	10.78	20.17	103.99	23.00	-2.83
	3624.99	15.28	H	6.32	10.80	19.77	94.76	23.00	-3.23
	3679.98	15.36	H	6.37	10.77	19.76	94.73	23.00	-3.24
30	3565.02								
	3624.99								
	3684.99								
20	3560.00								
	3624.99								
	3690.00								
15	3575.52								
	3624.99								
	3692.49								
10	3555.00								
	3624.99								
	3694.98								

NR Band n48(SRS3) (ANT D)

BW (MHz)	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)
40	3570.00								
	3624.99								
	3679.98								
30	3565.02	15.33	H	6.27	10.77	19.84	96.32	23.00	-3.16
	3624.99	15.85	H	6.32	10.80	20.34	108.05	23.00	-2.66
	3684.99	15.16	H	6.38	10.77	19.55	90.23	23.00	-3.45
20	3560.00								
	3624.99								
	3690.00								
15	3575.52								
	3624.99								
	3692.49								
10	3555.00								
	3624.99								
	3694.98								

9.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053 and §96.41(e)

LIMIT

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

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 $\geq 3 \times$ RBW;
- c) Sweep time = auto couple;
- d) Detector = rms;
- e) Ensure that the number of measurement points \geq span/RBW;
- f) Trace mode = Average;

NOTE1

5G NR: All Waveforms (CP-OFDM vs DFT-s_OFDM) and modulations ($\pi/2$ 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 band.

RESULTS

See the following pages.

9.2.1. SPURIOUS RADIATION PLOTS

LTE Band 48

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		Samaung							
Project #:		4790976523							
Date:		2023-10-08							
Test Engineer:		24542							
Configuration:		EUT / AC Adapter, Y-Position							
Location:		Chamber 2							
Mode:		LTE_QPSK Band 48 Harmonics, 10MHz Bandwidth							
Test Voltage:		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, 3555MHz									
10MHz	7110.00	-19.6	V	3.0	42.8	1.0	-61.3	-40.0	-21.3
	10665.00	-21.0	V	3.0	41.3	1.0	-61.3	-40.0	-21.3
	14220.00	-15.8	V	3.0	43.3	1.0	-58.1	-40.0	-18.1
QPSK	7110.00	-20.7	H	3.0	42.8	1.0	-62.4	-40.0	-22.4
	10665.00	-21.1	H	3.0	41.3	1.0	-61.4	-40.0	-21.4
ANT F	14220.00	-16.3	H	3.0	43.3	1.0	-58.6	-40.0	-18.6
Mid Ch, 3625MHz									
	7250.00	-20.4	V	3.0	42.7	1.0	-62.1	-40.0	-22.1
	10875.00	-20.5	V	3.0	41.4	1.0	-60.9	-40.0	-20.9
	14500.00	-15.1	V	3.0	43.5	1.0	-57.6	-40.0	-17.6
	7250.00	-17.6	H	3.0	42.7	1.0	-59.3	-40.0	-19.3
	10875.00	-20.7	H	3.0	41.4	1.0	-61.0	-40.0	-21.0
	14500.00	-15.2	H	3.0	43.5	1.0	-57.7	-40.0	-17.7
High Ch, 3695MHz									
	7390.00	-19.1	V	3.0	42.6	1.0	-60.7	-40.0	-20.7
	11085.00	-19.4	V	3.0	41.5	1.0	-59.8	-40.0	-19.8
	14780.00	-15.7	V	3.0	43.7	1.0	-58.4	-40.0	-18.4
	7390.00	-18.5	H	3.0	42.6	1.0	-60.1	-40.0	-20.1
	11085.00	-19.0	H	3.0	41.5	1.0	-59.5	-40.0	-19.5
	14780.00	-16.0	H	3.0	43.7	1.0	-58.6	-40.0	-18.6

LTE Band 48C(UL CA)

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		4790976523							
Date:		2023-10-23							
Test Engineer:		26460							
Configuration:		EUT / AC Adapter, Y-Position							
Location:		Chamber 2							
Mode:		ULCA QPSK Band 48C Harmonics, 40MHz Bandwidth							
Test Voltage:		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, 3569.9MHz									
7139.80	-20.6	V	3.0	42.8	1.0	-62.4	-40.0	-22.4	
10709.70	-20.2	V	3.0	41.3	1.0	-60.5	-40.0	-20.5	
14279.60	-14.0	V	3.0	43.3	1.0	-56.3	-40.0	-16.3	
QPSK									
7139.80	-20.6	H	3.0	42.8	1.0	-62.3	-40.0	-22.3	
10709.70	-20.6	H	3.0	41.3	1.0	-60.9	-40.0	-20.9	
ANT F									
14279.60	-14.3	H	3.0	43.3	1.0	-56.6	-40.0	-16.6	
Mid Ch, 3625MHz									
7250.00	-18.5	V	3.0	42.7	1.0	-60.2	-40.0	-20.2	
10875.00	-20.3	V	3.0	41.4	1.0	-60.6	-40.0	-20.6	
14500.00	-14.9	V	3.0	43.5	1.0	-57.4	-40.0	-17.4	
7250.00	-17.8	H	3.0	42.7	1.0	-59.5	-40.0	-19.5	
10875.00	-20.2	H	3.0	41.4	1.0	-60.6	-40.0	-20.6	
14500.00	-15.2	H	3.0	43.5	1.0	-57.7	-40.0	-17.7	
High Ch, 3680.1MHz									
7360.20	-19.1	V	3.0	42.6	1.0	-60.8	-40.0	-20.8	
11040.30	-19.0	V	3.0	41.4	1.0	-59.4	-40.0	-19.4	
14720.40	-12.2	V	3.0	43.6	1.0	-54.9	-40.0	-14.9	
7360.20	-19.6	H	3.0	42.6	1.0	-61.2	-40.0	-21.2	
11040.30	-19.3	H	3.0	41.4	1.0	-59.7	-40.0	-19.7	
14720.40	-12.6	H	3.0	43.6	1.0	-55.2	-40.0	-15.2	

NR Band n48

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement										
		Company:	Samsung							
		Project #:	4790976523							
		Date:	2023-10-13							
		Test Engineer:	26087							
		Configuration:	EUT / Adapter, X-Position							
		Location:	Chamber 2							
		Mode:	5G NR_QPSK NR n48 Harmonics, 20MHz Bandwidth							
		Test Voltage:	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	
20 MHz										
DFT-s OFDM										
QPSK										
ANT F										
Low Ch, 3560MHz										
7120.00	-20.3	V	3.0	42.8	1.0	-62.1	-40.0	-22.1		
10680.00	-20.5	V	3.0	41.3	1.0	-60.8	-40.0	-20.8		
14240.00	-15.7	V	3.0	43.3	1.0	-58.1	-40.0	-18.1		
7120.00	-22.1	H	3.0	42.8	1.0	-63.9	-40.0	-23.9		
10680.00	-20.7	H	3.0	41.3	1.0	-61.0	-40.0	-21.0		
14240.00	-16.0	H	3.0	43.3	1.0	-58.4	-40.0	-18.4		
Mid Ch, 3625MHz										
7250.00	-18.2	V	3.0	42.7	1.0	-59.9	-40.0	-19.9		
10875.00	-20.3	V	3.0	41.4	1.0	-60.6	-40.0	-20.6		
14500.00	-15.2	V	3.0	43.5	1.0	-57.6	-40.0	-17.6		
7250.00	-20.6	H	3.0	42.7	1.0	-62.3	-40.0	-22.3		
10875.00	-20.4	H	3.0	41.4	1.0	-60.8	-40.0	-20.8		
14500.00	-15.2	H	3.0	43.5	1.0	-57.7	-40.0	-17.7		
High Ch, 3690MHz										
7380.00	-18.9	V	3.0	42.6	1.0	-60.6	-40.0	-20.6		
11070.00	-19.2	V	3.0	41.5	1.0	-59.6	-40.0	-19.6		
14760.00	-15.1	V	3.0	43.7	1.0	-57.8	-40.0	-17.8		
7380.00	-21.3	H	3.0	42.6	1.0	-62.9	-40.0	-22.9		
11070.00	-19.2	H	3.0	41.5	1.0	-59.7	-40.0	-19.7		
14760.00	-15.5	H	3.0	43.7	1.0	-58.1	-40.0	-18.1		

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company: Samsung Project #: 4790976523 Date: 2023-10-23 Test Engineer: 28183 Configuration: EUT / AC Adapter, X-Position Location: Chamber 1 Mode: 5G NR_QPSK NR n48 Harmonics, 40MHz 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
40 MHz									
ANT C									
SRS1									
Low Ch, 3570MHz									
7140.00	-14.4	V	3.0	45.1	1.0	-58.5	-40.0	-18.5	
10710.00	-14.7	V	3.0	43.5	1.0	-57.2	-40.0	-17.2	
14280.00	-13.9	V	3.0	44.4	1.0	-57.4	-40.0	-17.4	
7140.00	-14.9	H	3.0	45.1	1.0	-59.0	-40.0	-19.0	
10710.00	-14.7	H	3.0	43.5	1.0	-57.2	-40.0	-17.2	
14280.00	-14.0	H	3.0	44.4	1.0	-57.5	-40.0	-17.5	
Mid Ch, 3624.99MHz									
7249.98	-14.6	V	3.0	45.1	1.0	-58.7	-40.0	-18.7	
10874.97	-15.1	V	3.0	43.4	1.0	-57.5	-40.0	-17.5	
14499.96	-14.5	V	3.0	44.6	1.0	-58.1	-40.0	-18.1	
7249.98	-14.6	H	3.0	45.1	1.0	-58.6	-40.0	-18.6	
10874.97	-15.0	H	3.0	43.4	1.0	-57.4	-40.0	-17.4	
14499.96	-13.9	H	3.0	44.6	1.0	-57.5	-40.0	-17.5	
High Ch, 3679.98MHz									
7359.96	-14.9	V	3.0	45.0	1.0	-58.9	-40.0	-18.9	
11039.94	-14.3	V	3.0	43.4	1.0	-56.7	-40.0	-16.7	
14719.92	-13.7	V	3.0	44.7	1.0	-57.4	-40.0	-17.4	
7359.96	-14.6	H	3.0	45.0	1.0	-58.6	-40.0	-18.6	
11039.94	-14.7	H	3.0	43.4	1.0	-57.1	-40.0	-17.1	
14719.92	-13.4	H	3.0	44.7	1.0	-57.1	-40.0	-17.1	
UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company: Samsung Project #: 4790976523 Date: 2023-10-23 Test Engineer: 28183 Configuration: EUT / AC Adapter, Z-Position Location: Chamber 1 Mode: 5G NR_QPSK NR n48 Harmonics, 40MHz 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
40 MHz									
ANT I									
SRS2									
Low Ch, 3570MHz									
7140.00	-13.3	V	3.0	45.1	1.0	-57.4	-40.0	-17.4	
10710.00	-14.9	V	3.0	43.5	1.0	-57.4	-40.0	-17.4	
14280.00	-13.3	V	3.0	44.4	1.0	-56.8	-40.0	-16.8	
7140.00	-11.6	H	3.0	45.1	1.0	-55.7	-40.0	-15.7	
10710.00	-14.3	H	3.0	43.5	1.0	-56.8	-40.0	-16.8	
14280.00	-16.2	H	3.0	44.4	1.0	-59.6	-40.0	-19.6	
Mid Ch, 3624.99MHz									
7249.98	-13.3	V	3.0	45.1	1.0	-57.4	-40.0	-17.4	
10874.97	-15.2	V	3.0	43.4	1.0	-57.7	-40.0	-17.7	
14499.96	-14.3	V	3.0	44.6	1.0	-57.8	-40.0	-17.8	
7249.98	-12.5	H	3.0	45.1	1.0	-56.5	-40.0	-16.5	
10874.97	-15.4	H	3.0	43.4	1.0	-57.8	-40.0	-17.8	
14499.96	-13.9	H	3.0	44.6	1.0	-57.5	-40.0	-17.5	
High Ch, 3679.98MHz									
7359.96	-15.0	V	3.0	45.0	1.0	-59.0	-40.0	-19.0	
11039.94	-14.6	V	3.0	43.4	1.0	-57.0	-40.0	-17.0	
14719.92	-13.4	V	3.0	44.7	1.0	-57.1	-40.0	-17.1	
7359.96	-14.7	H	3.0	45.0	1.0	-58.7	-40.0	-18.7	
11039.94	-14.7	H	3.0	43.4	1.0	-57.1	-40.0	-17.1	
14719.92	-13.9	H	3.0	44.7	1.0	-57.6	-40.0	-17.6	

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		4790976523							
Date:		2023-10-23							
Test Engineer:		28183							
Configuration:		EUT / AC Adapter, Z-Position							
Location:		Chamber 1							
Mode:		5G NR_QPSK NR n48 Harmonics, 30MHz Bandwidth							
Test Voltage:		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, 3565.02MHz									
7130.04	-15.1	V	3.0	45.1	1.0	-59.2	-40.0	-19.2	
10695.06	-14.5	V	3.0	43.5	1.0	-57.0	-40.0	-17.0	
14260.08	-13.6	V	3.0	44.4	1.0	-57.0	-40.0	-17.0	
ANT D									
7130.04	-15.1	H	3.0	45.1	1.0	-59.2	-40.0	-19.2	
10695.06	-14.5	H	3.0	43.5	1.0	-57.0	-40.0	-17.0	
14260.08	-13.7	H	3.0	44.4	1.0	-57.1	-40.0	-17.1	
SRS3									
Mid Ch, 3624.99MHz									
7249.98	-15.0	V	3.0	45.1	1.0	-59.1	-40.0	-19.1	
10874.97	-15.1	V	3.0	43.4	1.0	-57.6	-40.0	-17.6	
14499.96	-14.4	V	3.0	44.6	1.0	-57.9	-40.0	-17.9	
7249.98	-14.4	H	3.0	45.1	1.0	-58.5	-40.0	-18.5	
10874.97	-15.1	H	3.0	43.4	1.0	-57.6	-40.0	-17.6	
14499.96	-13.8	H	3.0	44.6	1.0	-57.4	-40.0	-17.4	
High Ch, 3684.99MHz									
7369.98	-14.9	V	3.0	45.0	1.0	-58.9	-40.0	-18.9	
11054.97	-15.0	V	3.0	43.4	1.0	-57.4	-40.0	-17.4	
14739.96	-13.9	V	3.0	44.7	1.0	-57.6	-40.0	-17.6	
7369.98	-14.8	H	3.0	45.0	1.0	-58.8	-40.0	-18.8	
11054.97	-14.8	H	3.0	43.4	1.0	-57.2	-40.0	-17.2	
14739.96	-13.9	H	3.0	44.7	1.0	-57.6	-40.0	-17.6	

END OF TEST REPORT