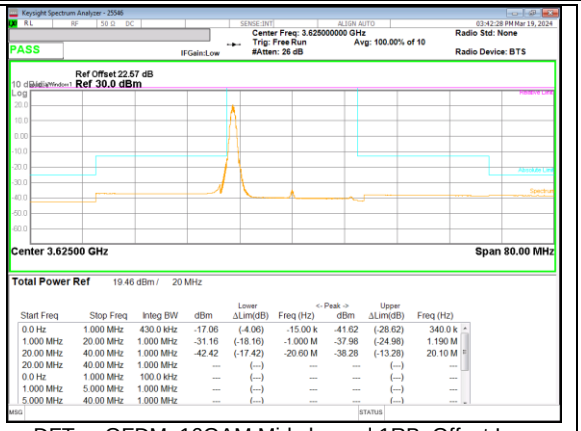
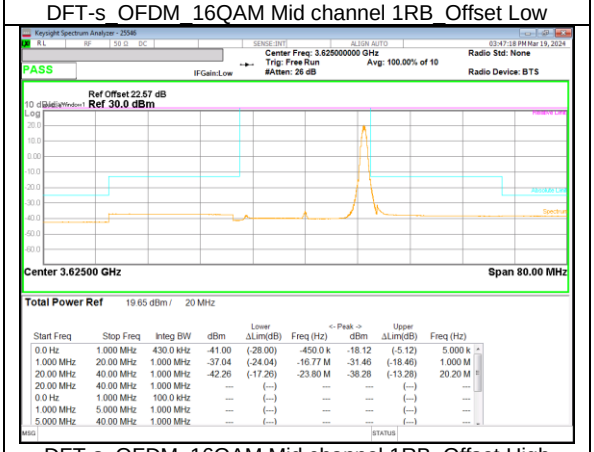
20MHz

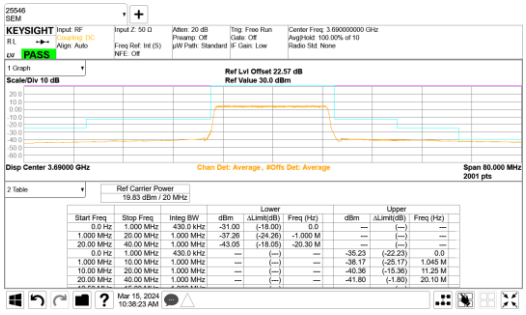
DFT-s_OFDM_16QAM Mid channel FRB



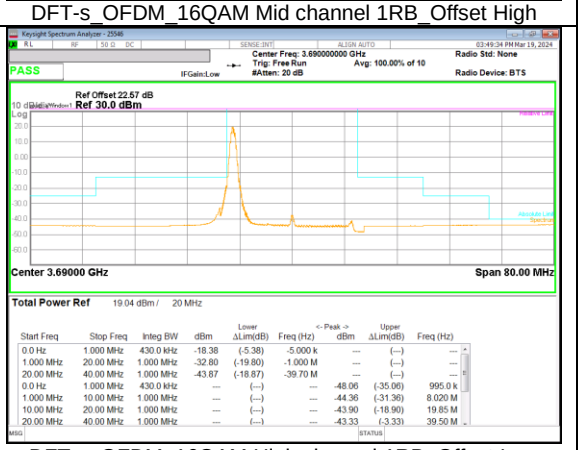
DFT-s_OFDM_16QAM Mid channel 1RB_Offset Low



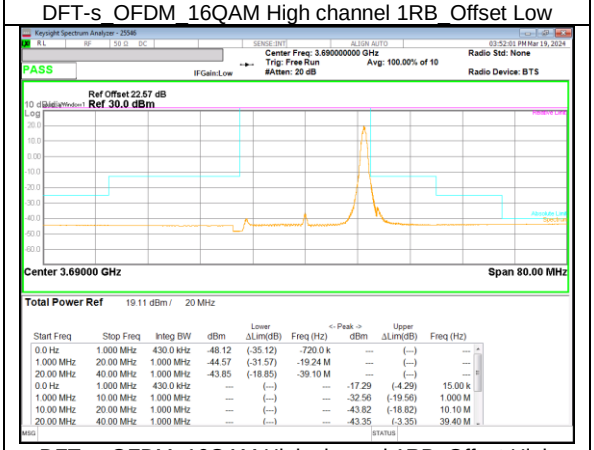
DFT-s_OFDM_16QAM Mid channel 1RB_Offset High



DFT-s_OFDM_16QAM High channel FRB

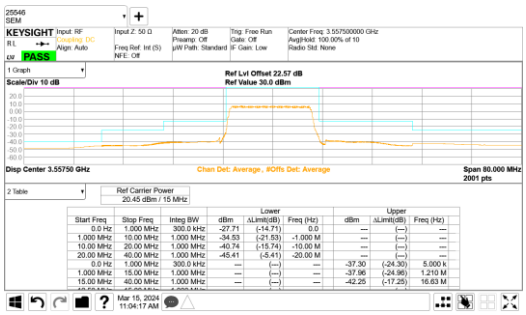


DFT-s_OFDM_16QAM High channel 1RB_Offset Low

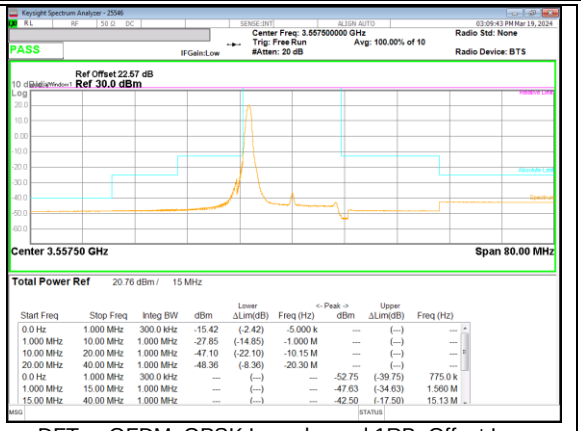


DFT-s_OFDM_16QAM High channel 1RB_Offset High

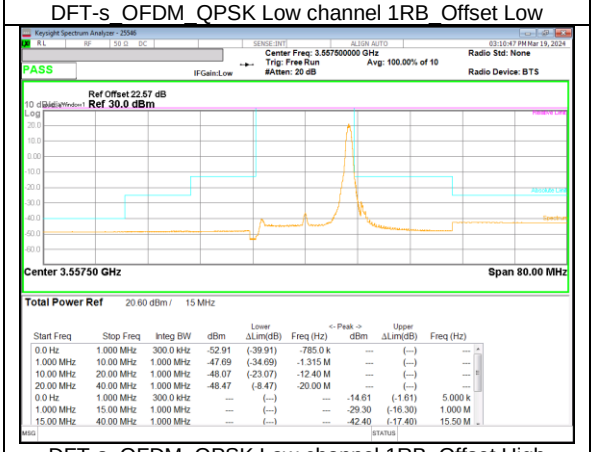
15MHz



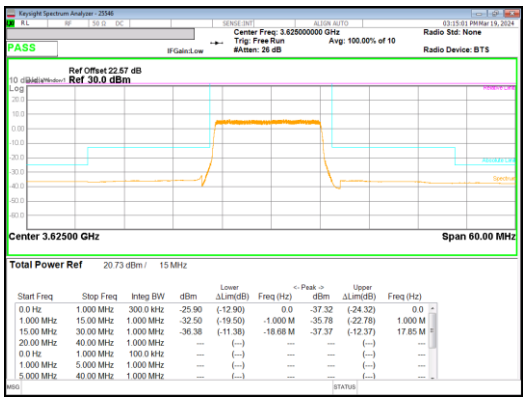
DFT-s_OFDM_QPSK Low channel FRB



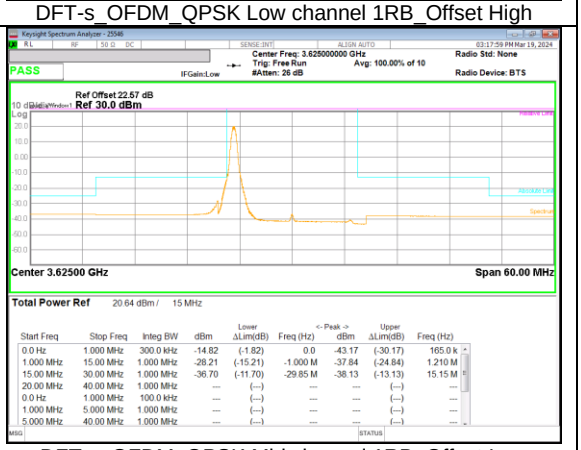
DFT-s_OFDM_QPSK Low channel 1RB_Offset Low



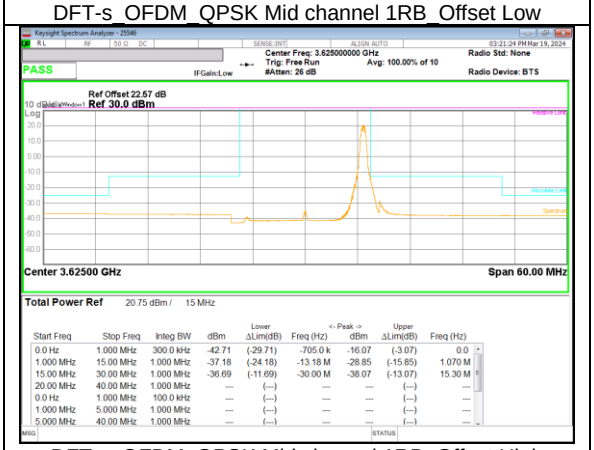
DFT-s_OFDM_QPSK Low channel 1RB_Offset High



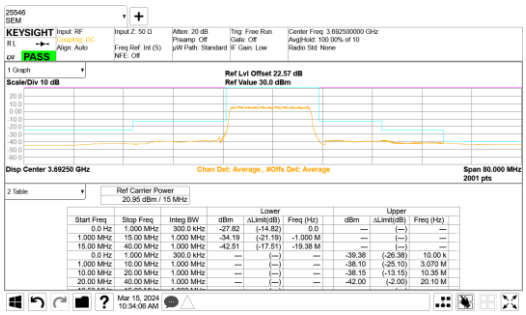
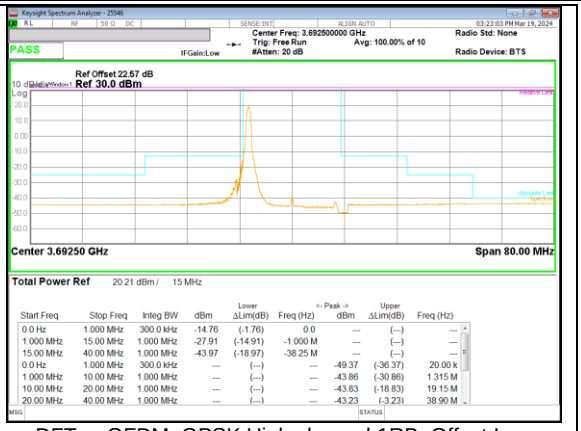
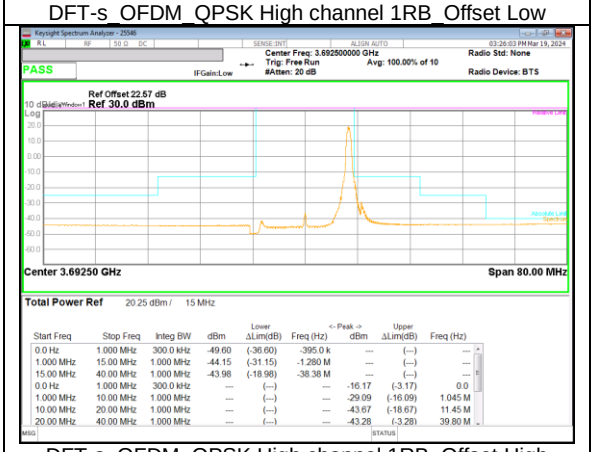
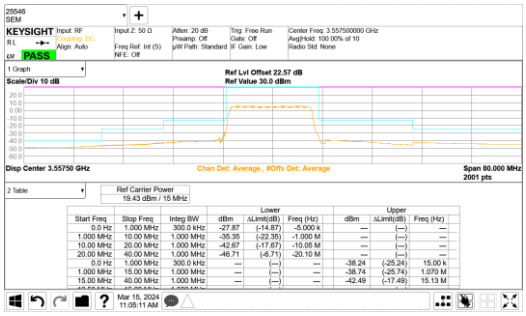
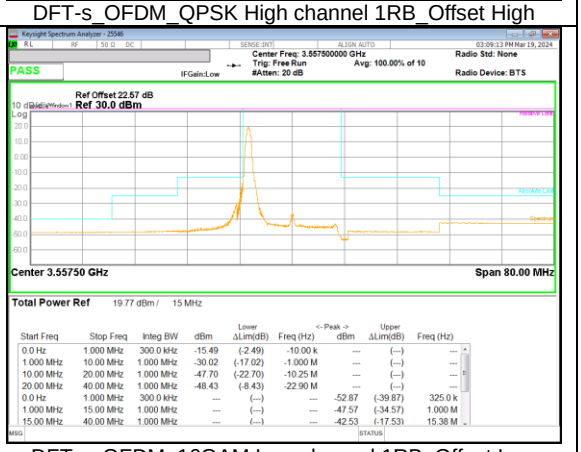
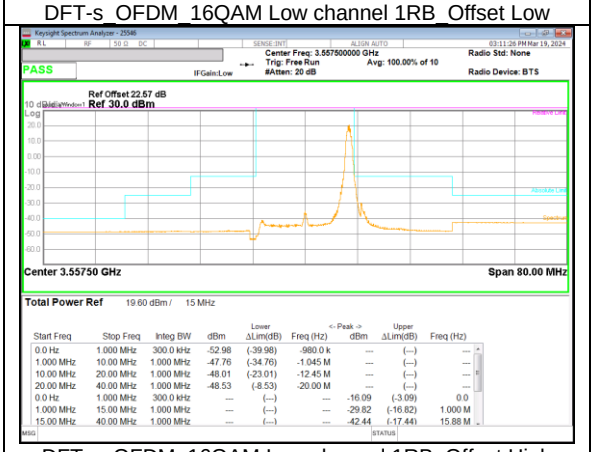
DFT-s_OFDM_QPSK Mid channel FRB



DFT-s_OFDM_QPSK Mid channel 1RB_Offset Low



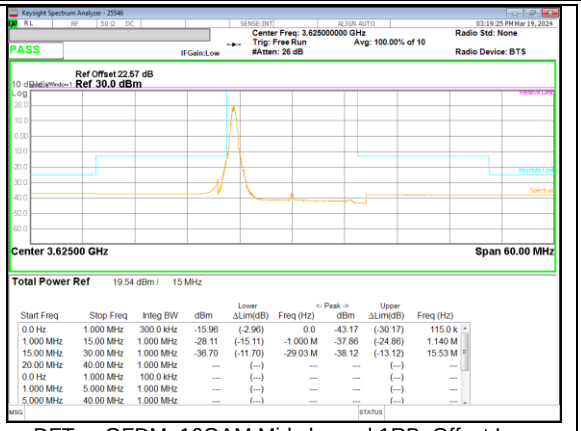
DFT-s_OFDM_QPSK Mid channel 1RB_Offset High

15MHz	 DFT-s_OFDM_QPSK High channel FRB	 DFT-s_OFDM_QPSK High channel 1RB_Offset Low
		 DFT-s_OFDM_QPSK High channel 1RB_Offset High
15MHz	 DFT-s_OFDM_16QAM Low channel FRB	 DFT-s_OFDM_16QAM Low channel 1RB_Offset Low
		 DFT-s_OFDM_16QAM Low channel 1RB_Offset High

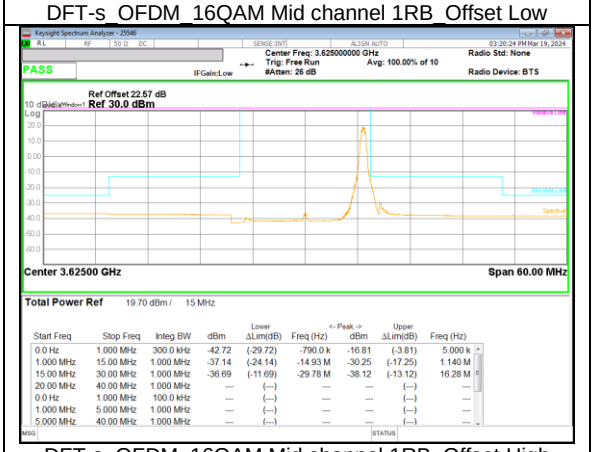
UL KOREA LTD. Suwon Laboratory FORM ID: FCC_96(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

15MHz

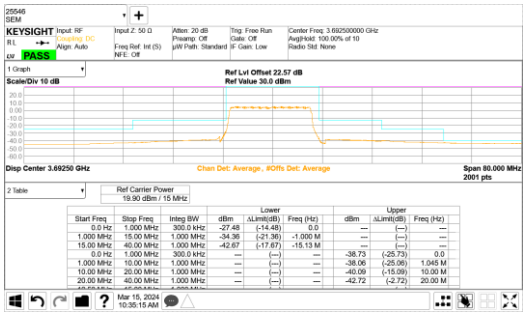
DFT-s_OFDM_16QAM Mid channel FRB



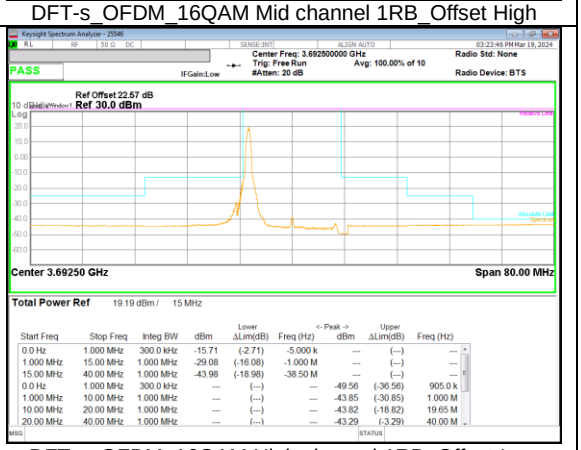
DFT-s_OFDM_16QAM Mid channel 1RB_Offset Low



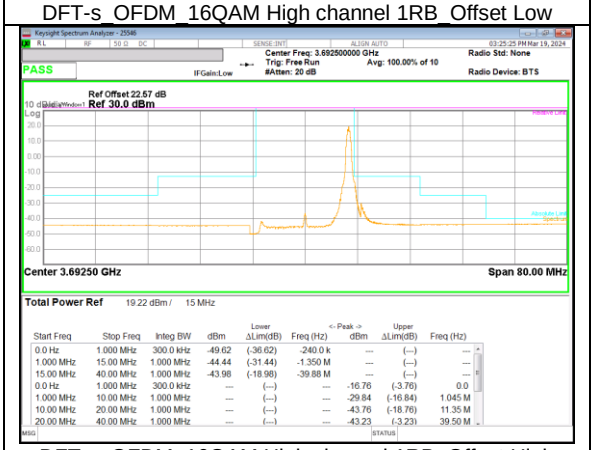
DFT-s_OFDM_16QAM Mid channel 1RB_Offset High



DFT-s_OFDM_16QAM High channel FRB

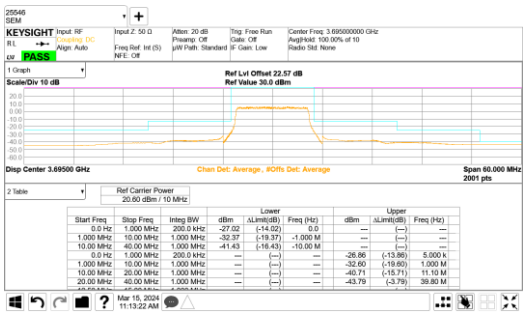


DFT-s_OFDM_16QAM High channel 1RB_Offset Low

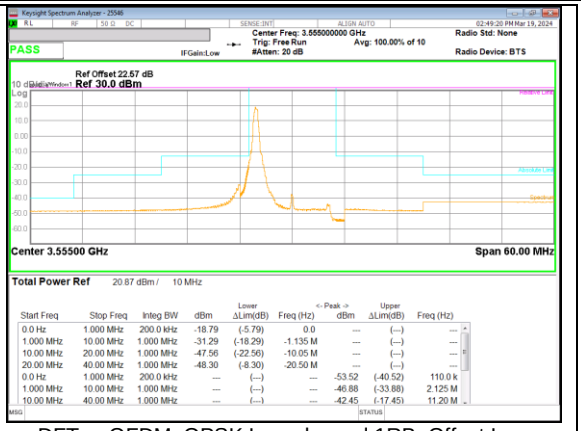


DFT-s_OFDM_16QAM High channel 1RB_Offset High

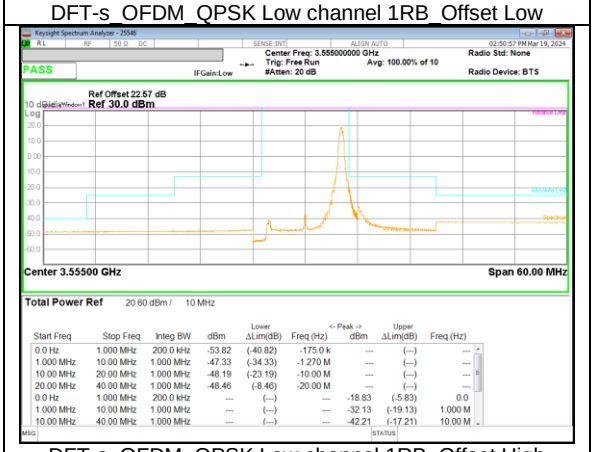
10MHz



DFT-s_OFDM_QPSK Low channel FRB

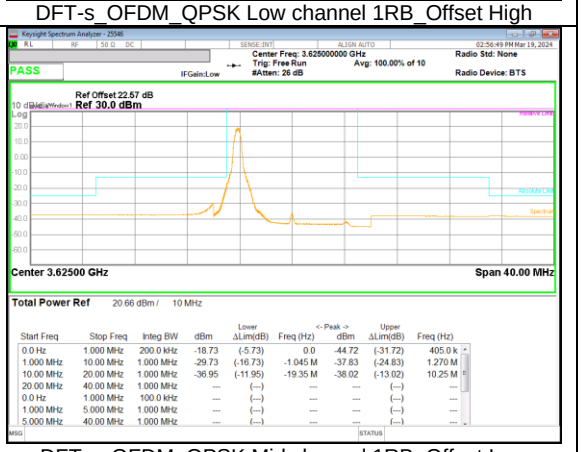


DFT-s_OFDM_QPSK Low channel 1RB_Offset Low

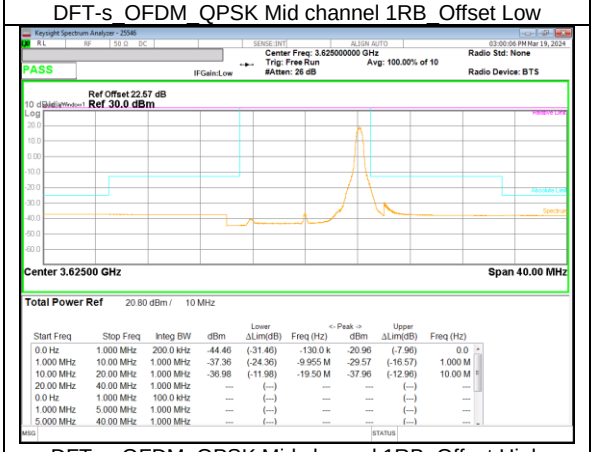


DFT-s_OFDM_QPSK Low channel 1RB_Offset High

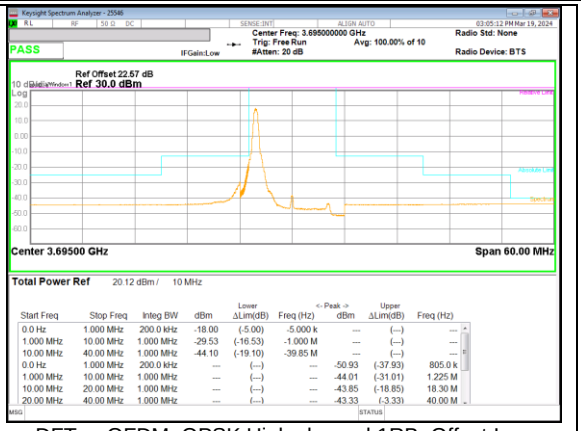
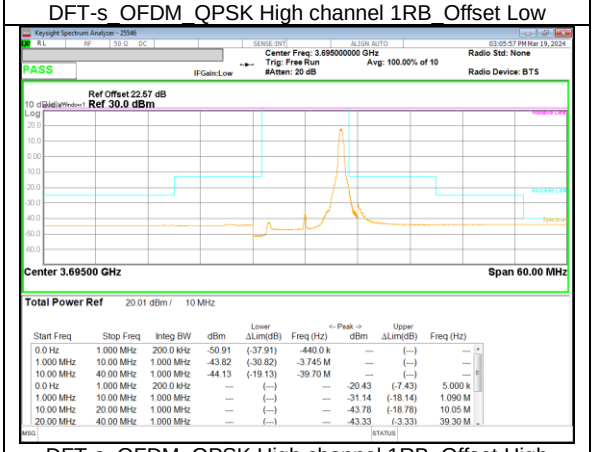
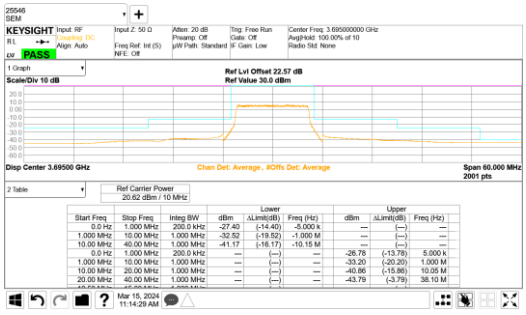
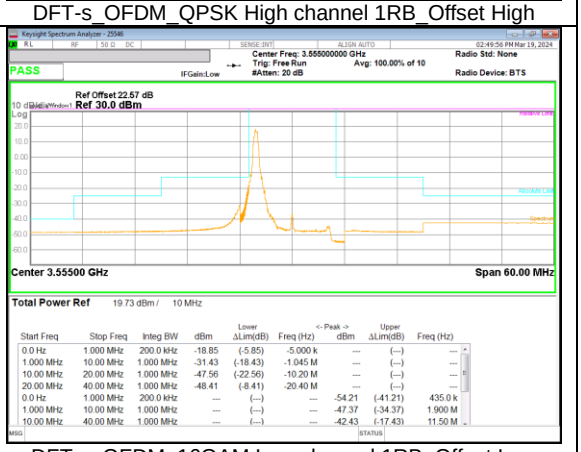
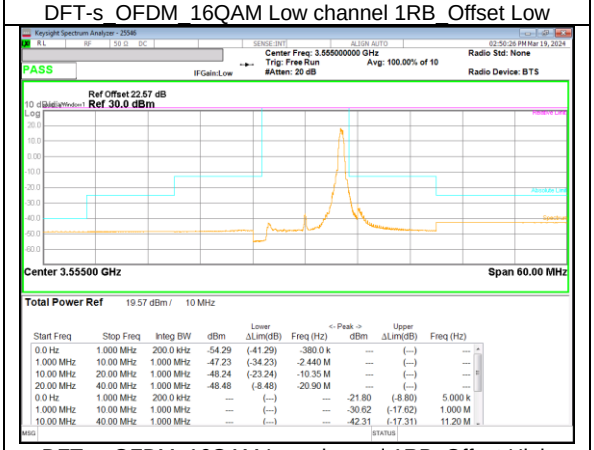
DFT-s_OFDM_QPSK Mid channel FRB



DFT-s_OFDM_QPSK Mid channel 1RB_Offset Low

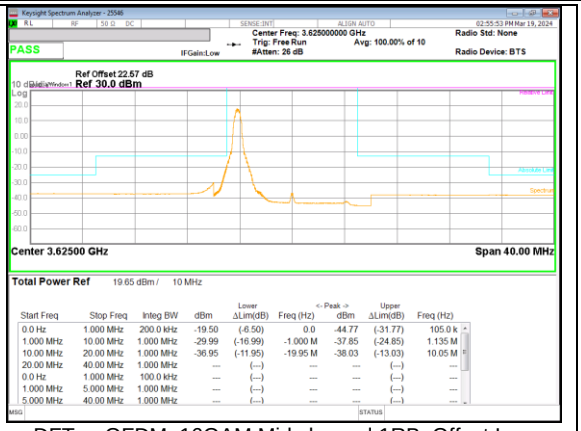


DFT-s_OFDM_QPSK Mid channel 1RB_Offset High

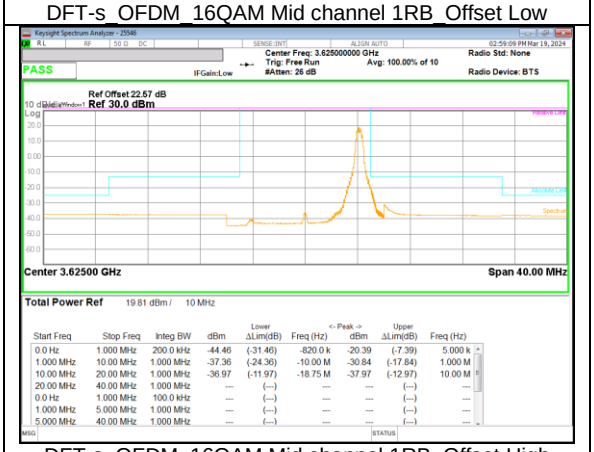
10MHz	 DFT-s_OFDM_QPSK High channel FRB	 DFT-s_OFDM_QPSK High channel 1RB_Offset Low  DFT-s_OFDM_QPSK High channel 1RB_Offset High
10MHz	 DFT-s_OFDM_16QAM Low channel FRB	 DFT-s_OFDM_16QAM Low channel 1RB_Offset Low  DFT-s_OFDM_16QAM Low channel 1RB_Offset High

10MHz

DFT-s_OFDM_16QAM Mid channel FRB

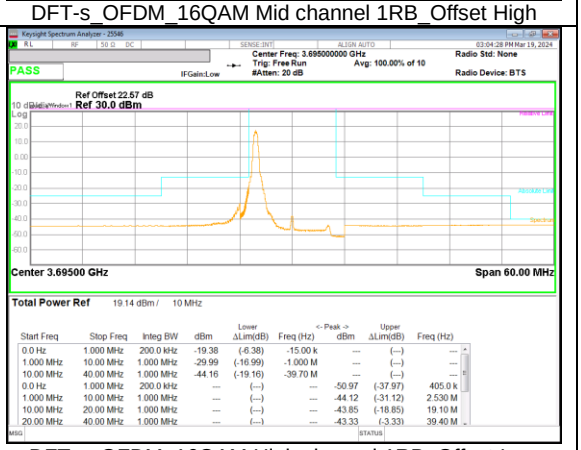


DFT-s_OFDM_16QAM Mid channel 1RB_Offset Low

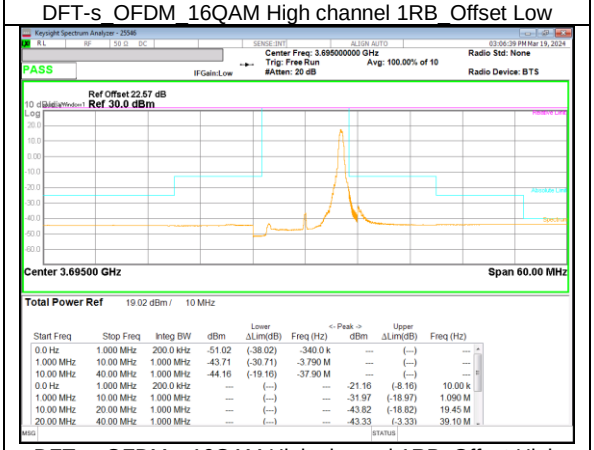


DFT-s_OFDM_16QAM Mid channel 1RB_Offset High

DFT-s_OFDM_16QAM High channel FRB



DFT-s_OFDM_16QAM High channel 1RB_Offset Low



DFT-s_OFDM_s16QAM High channel 1RB_Offset High

8.5. CONDUCTED SPURIOUS EMISSIONS

RULE PART(S)

FCC: §2.1051, and §96.41(e)

LIMITS

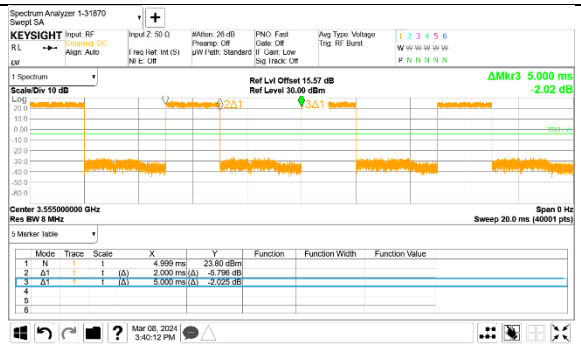
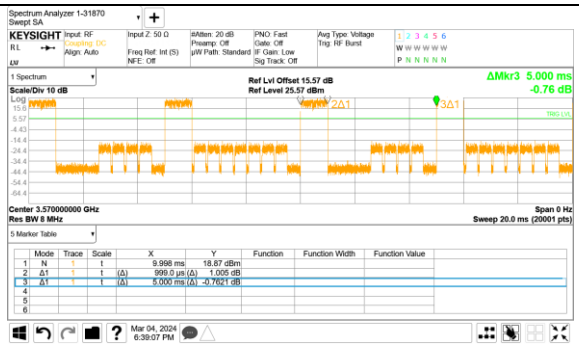
The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

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

	
For LTE B48 (Gate trigger off): RF Path Loss: 15.57 dB & DCF 4 dB: 10log(2/5) Measure offset: 15.57 dB+4 dB = 19.57 dB	For NR n48 (Gate trigger off): RF Path Loss: 15.57 dB & DCF 7 dB: 10log(1/5) Measure offset: 15.57 dB+7 dB = 22.57 dB

NOTE2

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

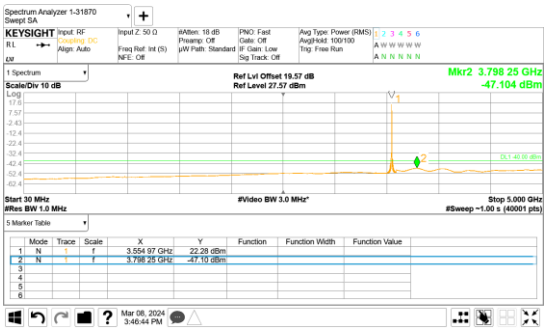
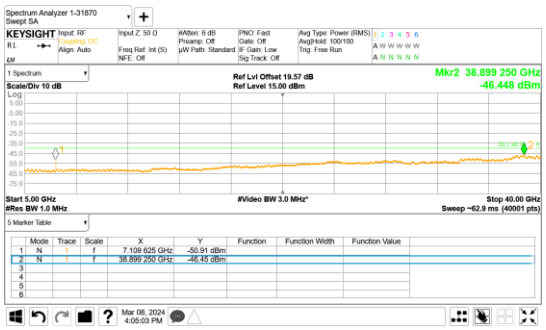
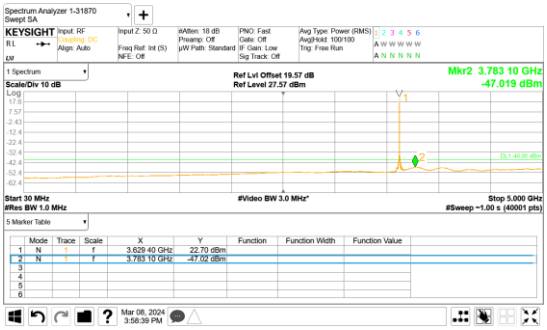
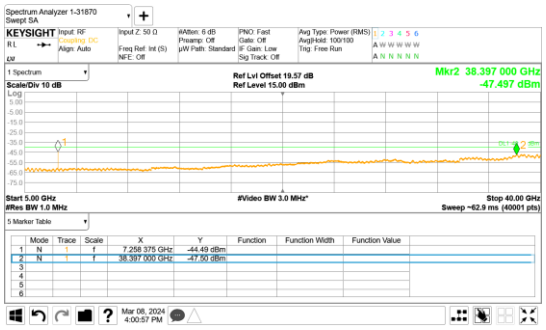
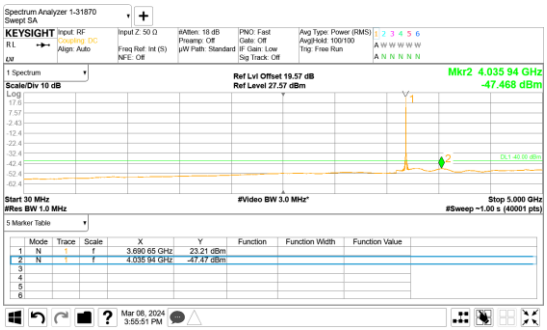
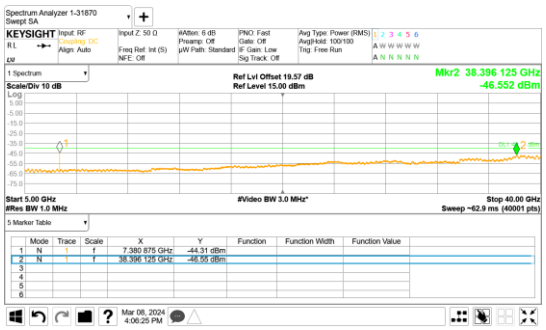
NOTE3

LTE: It was tested at 1RB QPSK as worst case (the highst output power and density).
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.

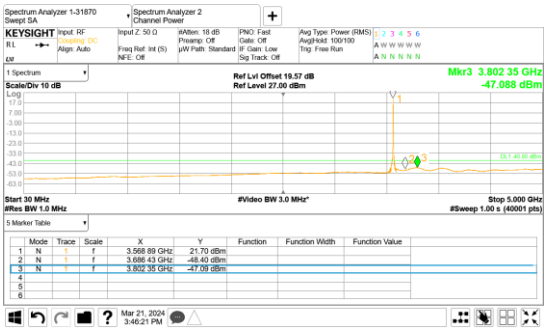
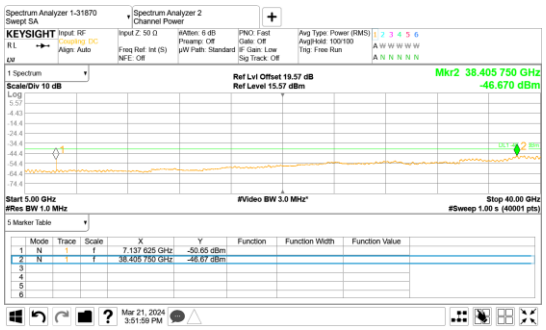
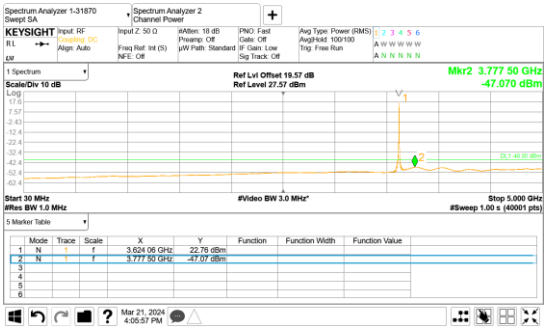
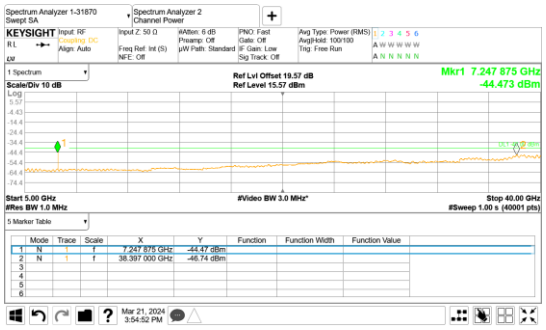
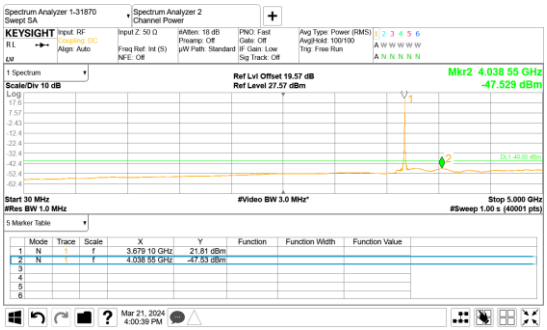
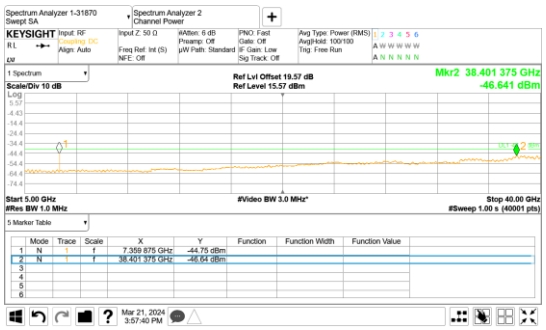
RESULTS

See the following pages.

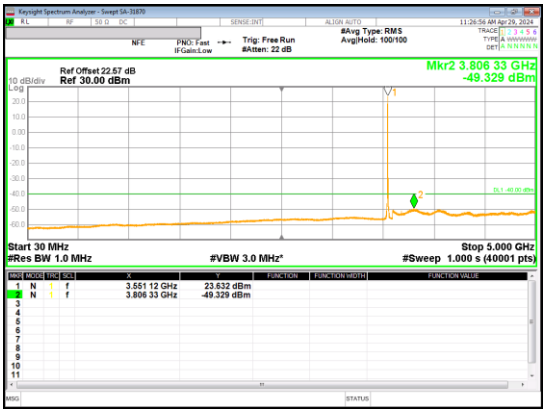
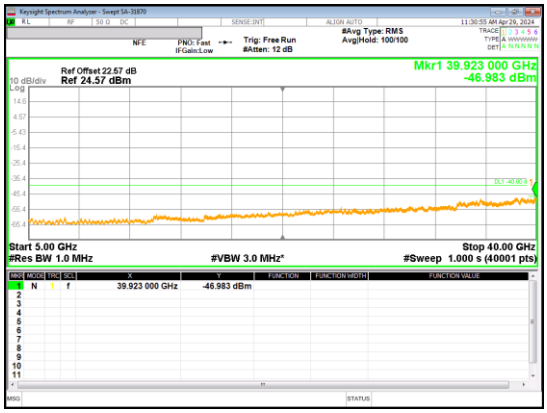
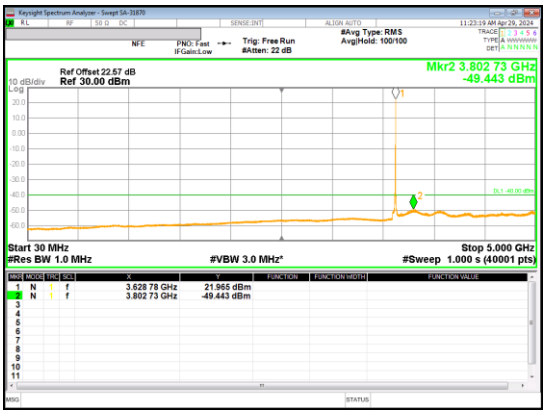
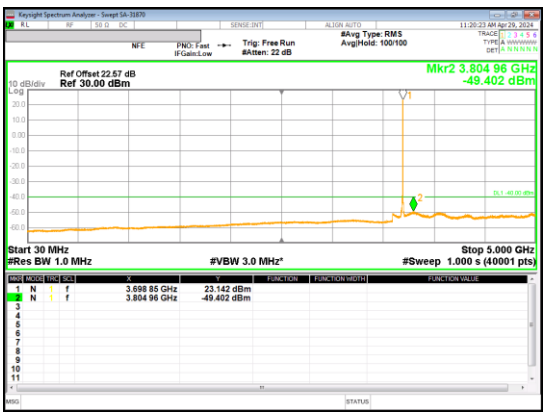
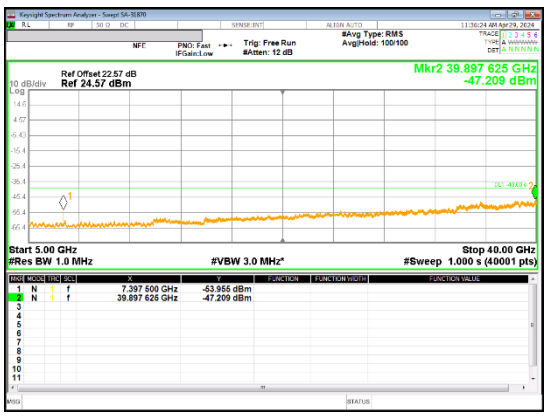
LTE Band 48

5 MHz QPSK	 Low channel (30 MHz ~ 5 GHz)	 Low channel (5 GHz ~ 40 GHz)
	 Mid channel (30 MHz ~ 5 GHz)	 Mid channel (5 GHz ~ 40 GHz)
	 High channel (30 MHz ~ 5 GHz)	 High channel (5 GHz ~ 40 GHz)

LTE Band 48C(UL CA)

20+20 MHz QPSK	 Low channel (30 MHz ~ 5 GHz)	 Low channel (5 GHz ~ 40 GHz)
	 Mid channel (30 MHz ~ 5 GHz)	 Mid channel (5 GHz ~ 40 GHz)
	 High channel (30 MHz ~ 5 GHz)	 High channel (5 GHz ~ 40 GHz)

NR Band n48

40 MHz QPSK	 DFT-s_OFDM_QPSK Low channel (30 MHz ~ 5 GHz)	 DFT-s_OFDM_QPSK Low channel (5 GHz ~ 40 GHz)
	 DFT-s_OFDM_QPSK Mid channel (30 MHz ~ 5 GHz)	 DFT-s_OFDM_QPSK Mid channel (5 GHz ~ 40 GHz)
	 DFT-s_OFDM_QPSK High channel (30 MHz ~ 5 GHz)	 DFT-s_OFDM_QPSK High channel (5 GHz ~ 40 GHz)

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 OBW results)

RESULTS

See the following pages.

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

Test Date	2024-03-19
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	3550.2508	3699.7399		
Extreme (50C)		3550.2508	3699.7399	33.2	0.009
Extreme (40C)		3550.2508	3699.7399	25.1	0.007
Extreme (30C)		3550.2508	3699.7399	22.2	0.006
Extreme (10C)		3550.2508	3699.7399	31.8	0.009
Extreme (0C)		3550.2508	3699.7399	15.6	0.004
Extreme (-10C)		3550.2508	3699.7399	19.3	0.005
Extreme (-20C)		3550.2508	3699.7399	18.5	0.005
Extreme (-30C)		3550.2508	3699.7399	22.2	0.006
20C	15%	3550.2508	3699.7399	23.8	0.007
	-15%	3550.2508	3699.7399	17.9	0.005
	End Point	3550.2508	3699.7399	16.6	0.005

NR Band n48(Lowest Frequency: 16QAM / Highest Frequency: QPSK)

Test Date	2024-03-25
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	3550.6916	3699.2933		
Extreme (50C)		3550.6916	3699.2933	20.3	0.006
Extreme (40C)		3550.6916	3699.2933	16.4	0.005
Extreme (30C)		3550.6916	3699.2933	24.3	0.007
Extreme (10C)		3550.6916	3699.2933	22.5	0.006
Extreme (0C)		3550.6916	3699.2933	18.7	0.005
Extreme (-10C)		3550.6916	3699.2933	20.4	0.006
Extreme (-20C)		3550.6916	3699.2933	21.7	0.006
Extreme (-30C)		3550.6916	3699.2933	23.4	0.006
20C	15%	3550.6916	3699.2933	30.4	0.008
	-15%	3550.6916	3699.2933	26.4	0.007
	End Point	3550.6916	3699.2933	22.5	0.006

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

Operation Mode

```
- Device.X_QUCELL_CBRS.Grant.1.
- Device.X_QUCELL_CBRS.Grant.1.GrantID = 120145617
- Device.X_QUCELL_CBRS.Grant.1.Status = Authorized
- Device.X_QUCELL_CBRS.Grant.1.LowFrequency = 3560000000
- Device.X_QUCELL_CBRS.Grant.1.HighFrequency = 3580000000
- Device.X_QUCELL_CBRS.Grant.1.MaxEIRP = 8000
- Device.X_QUCELL_CBRS.Grant.1.GrantExpireTime = 2024-02-29T23:44:39Z
- Device.X_QUCELL_CBRS.Grant.1.HeartbeatInterval = 60
- Device.X_QUCELL_CBRS.Grant.1.ChannelType = GAA
w Device.X_QUCELL_CBRS.Grant.1.Relinquishment = 0
```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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.

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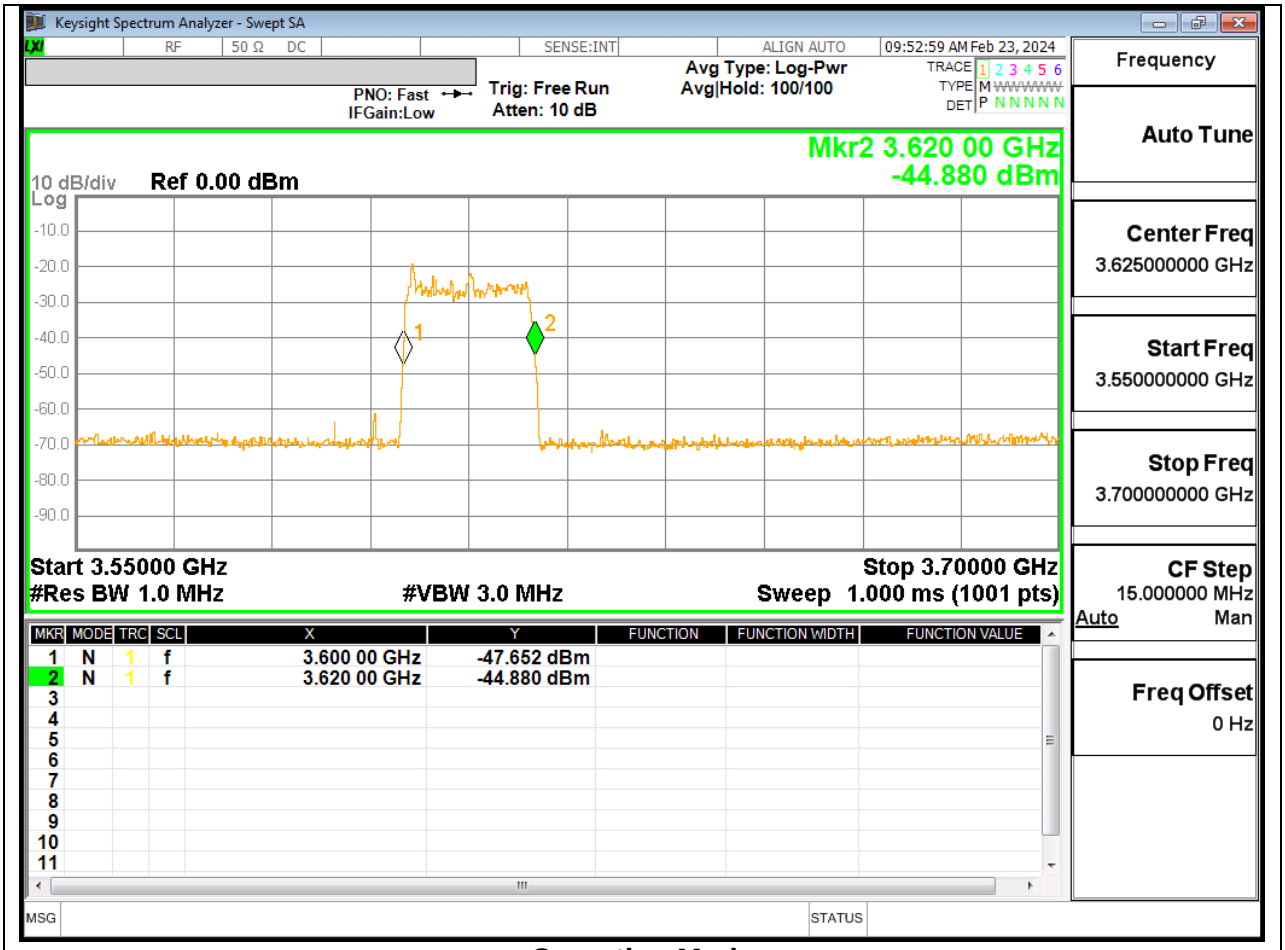
8.7.2. END USER DEVICE CONFIGURATION 2



Operation Mode

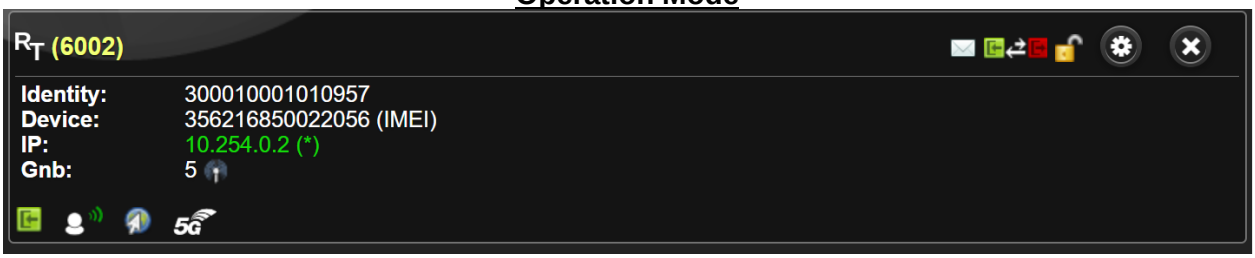
```
- Device.X_QUCELL_CBRS.Grant.1.
- Device.X_QUCELL_CBRS.Grant.1.GrantID = 749066467
- Device.X_QUCELL_CBRS.Grant.1.Status = Authorized
- Device.X_QUCELL_CBRS.Grant.1.LowFrequency = 3600000000
- Device.X_QUCELL_CBRS.Grant.1.HighFrequency = 3620000000
- Device.X_QUCELL_CBRS.Grant.1.MaxEIRP = 16000
- Device.X_QUCELL_CBRS.Grant.1.GrantExpireTime = 2024-03-01T00:49:49Z
- Device.X_QUCELL_CBRS.Grant.1.HeartbeatInterval = 60
- Device.X_QUCELL_CBRS.Grant.1.ChannelType = GAA
w Device.X_QUCELL_CBRS.Grant.1.Relinquishment = 0
```

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

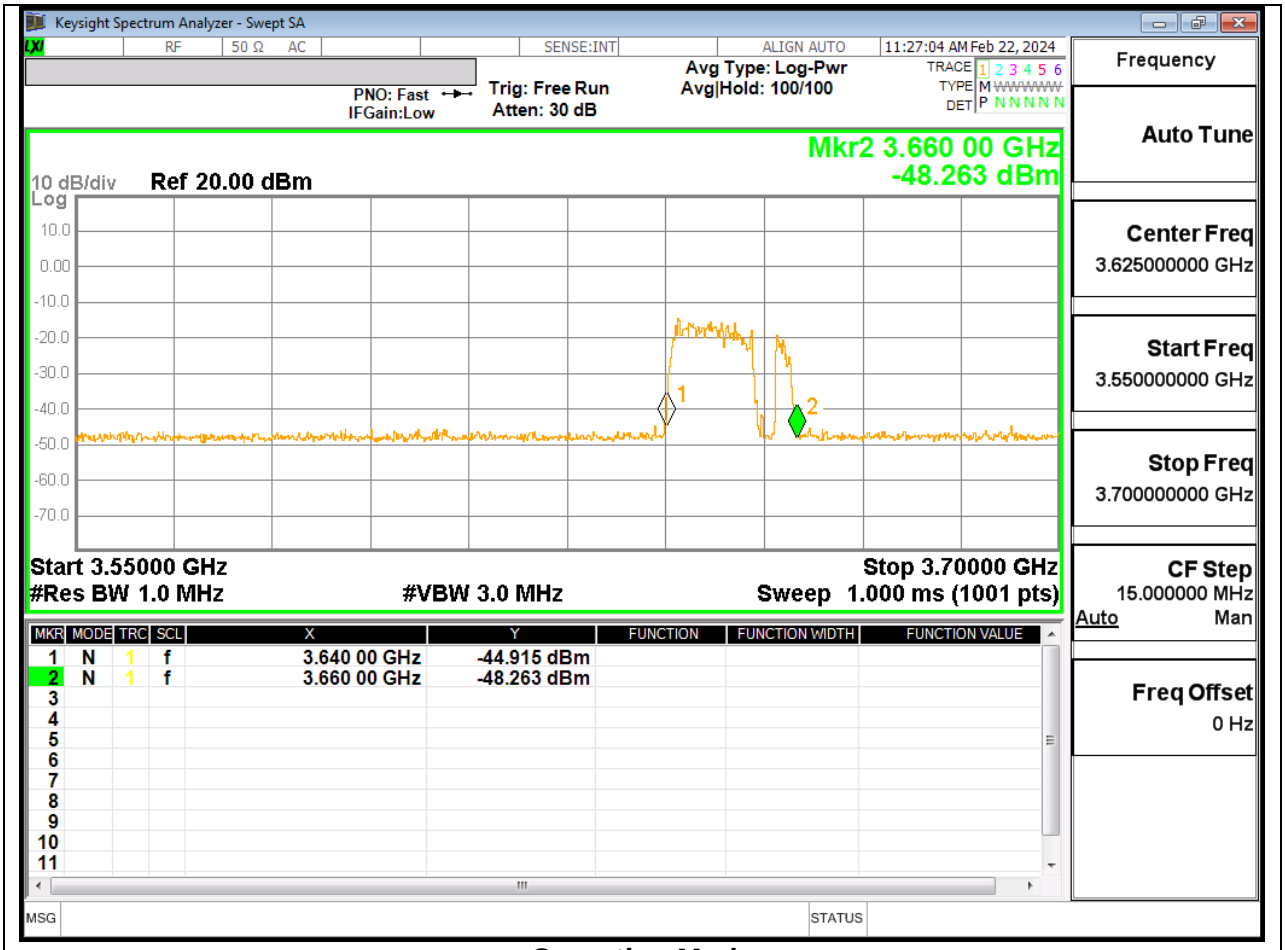
Operation Mode



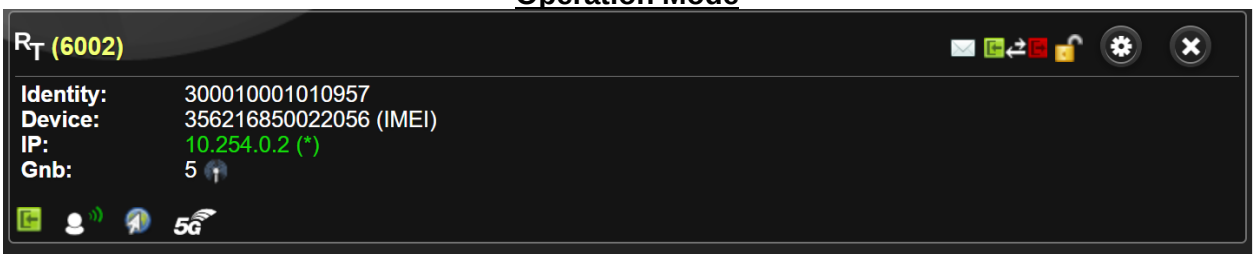
Stop Operation Within 10 second Mode

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



Operation Mode



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

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.

TEST RESULTS

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

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9.1.1. EIRP Results

LTE Band 48 (ANT E)

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	15.96	H	6.26	10.80	20.50	112.20	23.00	-2.50	1/49
		3625.00	16.73	H	6.32	10.73	21.14	130.02	23.00	-1.86	1/49
		3690.00	16.56	H	6.38	10.59	20.77	119.40	23.00	-2.23	1/49
	16-QAM	3560.00	15.72	H	6.26	10.80	20.26	106.17	23.00	-2.74	1/49
		3625.00	16.13	H	6.32	10.73	20.54	113.24	23.00	-2.46	1/49
		3690.00	15.97	H	6.38	10.59	20.18	104.23	23.00	-2.82	1/99
15	QPSK	3557.50	16.31	H	6.26	10.80	20.86	121.90	23.00	-2.14	1/37
		3625.00	16.76	H	6.32	10.73	21.17	130.92	23.00	-1.83	1/37
		3692.50	16.87	H	6.38	10.59	21.08	128.23	23.00	-1.92	1/37
	16-QAM	3557.50	15.37	H	6.26	10.80	19.92	98.17	23.00	-3.08	1/37
		3625.00	16.16	H	6.32	10.73	20.57	114.02	23.00	-2.43	1/0
		3692.50	15.65	H	6.38	10.59	19.86	96.83	23.00	-3.14	1/74
10	QPSK	3555.00	16.29	H	6.25	10.80	20.83	121.06	23.00	-2.17	1/49
		3625.00	16.82	H	6.32	10.73	21.23	132.74	23.00	-1.77	1/25
		3695.00	16.93	H	6.38	10.58	21.13	129.72	23.00	-1.87	1/49
	16-QAM	3555.00	15.65	H	6.25	10.80	20.19	104.47	23.00	-2.81	1/25
		3625.00	16.24	H	6.32	10.73	20.65	116.14	23.00	-2.35	1/0
		3695.00	16.39	H	6.38	10.58	20.59	114.55	23.00	-2.41	1/25
5	QPSK	3552.50	16.20	H	6.25	10.80	20.75	118.85	23.00	-2.25	1/24
		3625.00	17.21	H	6.32	10.73	21.62	145.21	23.00	-1.38	1/12
		3697.50	16.79	H	6.38	10.57	20.97	125.03	23.00	-2.03	1/12
	16-QAM	3552.50	15.27	H	6.25	10.80	19.82	95.94	23.00	-3.18	1/0
		3625.00	16.40	H	6.32	10.73	20.81	120.50	23.00	-2.19	1/12
		3697.50	16.26	H	6.38	10.57	20.44	110.66	23.00	-2.56	1/12

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

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	15.87	H	6.27	10.78	20.38	109.14	23.00	-2.62	1/99	1/0
		3625.00	16.49	H	6.32	10.80	20.98	125.31	23.00	-2.02	1/99	1/0
		3680.10	16.39	H	6.37	10.77	20.79	119.95	23.00	-2.21	1/99	1/0
	16-QAM	3569.90	15.22	H	6.27	10.78	19.73	93.97	23.00	-3.27	1/99	1/0
		3625.00	15.91	H	6.32	10.80	20.40	109.65	23.00	-2.60	1/99	1/0
		3680.10	15.94	H	6.37	10.77	20.34	108.14	23.00	-2.66	1/99	1/0

NR Band n48 (ANT E)

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	16.96	H	6.27	10.80	21.49	140.93	23.00	-1.51	1/1
		3625.00	17.11	H	6.32	10.73	21.52	141.91	23.00	-1.48	1/1
		3680.00	17.04	H	6.37	10.61	21.28	134.28	23.00	-1.72	1/1
	16-QAM	3570.00	16.02	H	6.27	10.80	20.55	113.50	23.00	-2.45	1/1
		3625.00	16.33	H	6.32	10.73	20.74	118.58	23.00	-2.26	1/1
		3680.00	16.02	H	6.37	10.61	20.26	106.17	23.00	-2.74	1/1
30	QPSK	3565.00	16.63	H	6.27	10.80	21.17	130.92	23.00	-1.83	1/1
		3625.00	17.08	H	6.32	10.73	21.49	140.93	23.00	-1.51	1/76
		3685.00	17.25	H	6.38	10.60	21.48	140.60	23.00	-1.52	1/76
	16-QAM	3565.00	16.02	H	6.27	10.80	20.56	113.76	23.00	-2.44	1/1
		3625.00	16.26	H	6.32	10.73	20.67	116.68	23.00	-2.33	1/76
		3685.00	16.28	H	6.38	10.60	20.51	112.46	23.00	-2.49	1/76
20	QPSK	3560.00	16.55	H	6.26	10.80	21.09	128.53	23.00	-1.91	1/49
		3625.00	17.26	H	6.32	10.73	21.67	146.89	23.00	-1.33	1/49
		3690.00	17.23	H	6.38	10.59	21.44	139.32	23.00	-1.56	1/49
	16-QAM	3560.00	15.74	H	6.26	10.80	20.28	106.66	23.00	-2.72	1/49
		3625.00	16.60	H	6.32	10.73	21.01	126.18	23.00	-1.99	1/49
		3690.00	16.31	H	6.38	10.59	20.52	112.72	23.00	-2.48	1/49
15	QPSK	3557.50	16.50	H	6.26	10.80	21.05	127.35	23.00	-1.95	1/1
		3625.00	17.02	H	6.32	10.73	21.43	139.00	23.00	-1.57	1/36
		3692.50	16.96	H	6.38	10.59	21.17	130.92	23.00	-1.83	1/19
	16-QAM	3557.50	16.09	H	6.26	10.80	20.64	115.88	23.00	-2.36	1/1
		3625.00	16.33	H	6.32	10.73	20.74	118.58	23.00	-2.26	1/36
		3692.50	15.98	H	6.38	10.59	20.19	104.47	23.00	-2.81	1/19
10	QPSK	3555.00	16.58	H	6.25	10.80	21.12	129.42	23.00	-1.88	1/1
		3625.00	17.37	H	6.32	10.73	21.78	150.66	23.00	-1.22	1/22
		3695.00	16.89	H	6.38	10.58	21.09	128.53	23.00	-1.91	1/22
	16-QAM	3555.00	15.80	H	6.25	10.80	20.34	108.14	23.00	-2.66	1/1
		3625.00	16.57	H	6.32	10.73	20.98	125.31	23.00	-2.02	1/22
		3695.00	16.02	H	6.38	10.58	20.22	105.20	23.00	-2.78	1/22

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	11.00	H	6.27	10.78	15.52	35.65	23.00	-7.48
	3624.99	10.17	H	6.32	10.80	14.66	29.24	23.00	-8.34
	3679.98	9.18	H	6.37	10.77	13.58	22.80	23.00	-9.42

NR Band n48(SRS2) (ANT F)

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)
20	3560.00	15.35	H	6.26	10.77	19.86	96.83	23.00	-3.14
	3624.99	15.61	H	6.32	10.80	20.10	102.33	23.00	-2.90
	3690.00	15.55	H	6.38	10.76	19.94	98.63	23.00	-3.06

NR Band n48(SRS3) (ANT A)

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)
15	3575.52	10.29	H	6.26	10.77	14.80	30.20	23.00	-8.20
	3624.99	12.20	H	6.32	10.80	16.69	46.67	23.00	-6.31
	3692.49	11.81	H	6.38	10.76	16.19	41.59	23.00	-6.81

9.2. RADIATIED SPURIOUS EMISSION

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 ≥ 3 × RBW;
c) Sweep time = auto couple;
d) Detector = rms;
e) Ensure that the number of measurement points ≥ span/RBW;
f) Trace mode = Average;

NOTE1

LTE: It was tested at 1RB QPSK as worst case (the highst output power and density).
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 band.

NOTE3

For interband ULCA, it was checked in the RSE considering intermodulation, but no additional spurious emissions were founded.

RESULTS

See the following pages.

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9.2.1. SPURIOUS RADIATION PLOTS

LTE Band 48

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

Company:	Sasmung
Project #:	4791196575
Date:	2024-03-06
Test Engineer:	28183
Configuration:	EUT / AC Adapter, Z-Position, Open
Location:	Chamber 2
Mode:	LTE_QPSK Band 48 Harmonics, 5MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

5 MHz
QPSK
ANT E

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3552.5MHz									
7105.00	-21.3	V	3.0	42.8	1.0	-63.1	-40.0	-23.1	
10657.50	-20.8	V	3.0	41.3	1.0	-61.1	-40.0	-21.1	
14210.00	-15.4	V	3.0	43.3	1.0	-57.7	-40.0	-17.7	
7105.00	-21.5	H	3.0	42.8	1.0	-63.3	-40.0	-23.3	
10657.50	-21.0	H	3.0	41.3	1.0	-61.3	-40.0	-21.3	
14210.00	-15.6	H	3.0	43.3	1.0	-57.9	-40.0	-17.9	
Mid Ch, 3625MHz									
7250.00	-19.9	V	3.0	42.7	1.0	-61.6	-40.0	-21.6	
10875.00	-19.8	V	3.0	41.4	1.0	-60.2	-40.0	-20.2	
14500.00	-15.1	V	3.0	43.5	1.0	-57.6	-40.0	-17.6	
7250.00	-18.0	H	3.0	42.7	1.0	-59.7	-40.0	-19.7	
10875.00	-20.3	H	3.0	41.4	1.0	-60.7	-40.0	-20.7	
14500.00	-15.2	H	3.0	43.5	1.0	-57.7	-40.0	-17.7	
High Ch, 3697.5MHz									
7395.00	-20.1	V	3.0	42.6	1.0	-61.7	-40.0	-21.7	
11092.50	-18.6	V	3.0	41.5	1.0	-59.0	-40.0	-19.0	
14790.00	-15.0	V	3.0	43.7	1.0	-57.7	-40.0	-17.7	
7395.00	-18.9	H	3.0	42.6	1.0	-60.5	-40.0	-20.5	
11092.50	-18.9	H	3.0	41.5	1.0	-59.4	-40.0	-19.4	
14790.00	-15.5	H	3.0	43.7	1.0	-58.2	-40.0	-18.2	

LTE Band 48C(UL CA)

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

Company: Samsung
Project #: 4791196575
Date: 2024-03-25
Test Engineer: 28775
Configuration: EUT / AC Adapter, Z-Position, Open
Location: Chamber 2
Mode: ULCA QPSK Band 48C Harmonics, 40MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

20+20 MHz

QPSK

ANT E

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, PCC : 3560 MHz SCC : 3579.8 MHz									
7139.80	-21.3	V	3.0	42.8	1.0	-63.0	-40.0	-23.0	
10709.70	-19.9	V	3.0	41.3	1.0	-60.2	-40.0	-20.2	
14279.60	-15.4	V	3.0	43.3	1.0	-57.7	-40.0	-17.7	
7139.80	-21.8	H	3.0	42.8	1.0	-63.6	-40.0	-23.6	
10709.70	-20.3	H	3.0	41.3	1.0	-60.6	-40.0	-20.6	
14279.60	-15.9	H	3.0	43.3	1.0	-58.3	-40.0	-18.3	
Mid Ch, PCC : 3615.1 MHz SCC : 3634.9 MHz									
7250.00	-19.9	V	3.0	42.7	1.0	-61.6	-40.0	-21.6	
10875.00	-20.0	V	3.0	41.4	1.0	-60.4	-40.0	-20.4	
14500.00	-15.4	V	3.0	43.5	1.0	-57.9	-40.0	-17.9	
7250.00	-18.8	H	3.0	42.7	1.0	-60.5	-40.0	-20.5	
10875.00	-19.9	H	3.0	41.4	1.0	-60.2	-40.0	-20.2	
14500.00	-16.1	H	3.0	43.5	1.0	-58.6	-40.0	-18.6	
High Ch PCC : 3670.2 MHz SCC : 3690 MHz									
7360.20	-20.9	V	3.0	42.6	1.0	-62.6	-40.0	-22.6	
11040.30	-18.9	V	3.0	41.4	1.0	-59.3	-40.0	-19.3	
14720.40	-15.0	V	3.0	43.6	1.0	-57.6	-40.0	-17.6	
7360.20	-21.2	H	3.0	42.6	1.0	-62.9	-40.0	-22.9	
11040.30	-19.0	H	3.0	41.4	1.0	-59.4	-40.0	-19.4	
14720.40	-15.3	H	3.0	43.6	1.0	-58.0	-40.0	-18.0	

NR Band n48

10 MHz
DFT-s OFDM
QPSK
ANT E

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

Company: Samsung
Project #: 4791196575
Date: 2024-03-06
Test Engineer: 28775
Configuration: EUT / AC Adapter, Z-Position, Open
Location: Chamber 2
Mode: 5G NR_QPSK NR n48 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, 3555MHz									
7110.00	-21.0	V	3.0	42.8	1.0	-62.7	-40.0	-22.7	
10665.00	-20.8	V	3.0	41.3	1.0	-61.1	-40.0	-21.1	
14220.00	-15.7	V	3.0	43.3	1.0	-58.0	-40.0	-18.0	
7110.00	-21.1	H	3.0	42.8	1.0	-62.9	-40.0	-22.9	
10665.00	-21.2	H	3.0	41.3	1.0	-61.5	-40.0	-21.5	
14220.00	-16.0	H	3.0	43.3	1.0	-58.3	-40.0	-18.3	
Mid Ch, 3625MHz									
7250.00	-19.5	V	3.0	42.7	1.0	-61.2	-40.0	-21.2	
10875.00	-19.5	V	3.0	41.4	1.0	-59.9	-40.0	-19.9	
14500.00	-15.5	V	3.0	43.5	1.0	-57.9	-40.0	-17.9	
7250.00	-18.1	H	3.0	42.7	1.0	-59.8	-40.0	-19.8	
10875.00	-19.9	H	3.0	41.4	1.0	-60.3	-40.0	-20.3	
14500.00	-16.0	H	3.0	43.5	1.0	-58.5	-40.0	-18.5	
High Ch, 3695MHz									
7390.00	-19.7	V	3.0	42.6	1.0	-61.4	-40.0	-21.4	
11085.00	-18.8	V	3.0	41.5	1.0	-59.2	-40.0	-19.2	
14780.00	-15.4	V	3.0	43.7	1.0	-58.0	-40.0	-18.0	
7390.00	-19.2	H	3.0	42.6	1.0	-60.9	-40.0	-20.9	
11085.00	-19.1	H	3.0	41.5	1.0	-59.5	-40.0	-19.5	
14780.00	-15.6	H	3.0	43.7	1.0	-58.3	-40.0	-18.3	

40 MHz
ANT C
SRS1

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

Company: Samsung
Project #: 4791196575
Date: 2024-04-04
Test Engineer: 28183
Configuration: EUT / X-Position, Open
Location: Chamber 2
Mode: 5G NR n48(SRS) 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
Low Ch, 3570MHz									
7140.00	-23.1	V	3.0	42.8	1.0	-64.8	-40.0	-24.8	
10710.00	-23.4	V	3.0	41.3	1.0	-63.7	-40.0	-23.7	
14280.00	-18.0	V	3.0	43.3	1.0	-60.3	-40.0	-20.3	
7140.00	-23.5	H	3.0	42.8	1.0	-65.2	-40.0	-25.2	
10710.00	-23.6	H	3.0	41.3	1.0	-63.9	-40.0	-23.9	
14280.00	-18.2	H	3.0	43.3	1.0	-60.6	-40.0	-20.6	
Mid Ch, 3625MHz									
7250.00	-19.9	V	3.0	42.7	1.0	-61.6	-40.0	-21.6	
10875.00	-23.2	V	3.0	41.4	1.0	-63.5	-40.0	-23.5	
14500.00	-18.1	V	3.0	43.5	1.0	-60.6	-40.0	-20.6	
7250.00	-21.5	H	3.0	42.7	1.0	-63.2	-40.0	-23.2	
10875.00	-23.3	H	3.0	41.4	1.0	-63.7	-40.0	-23.7	
14500.00	-18.5	H	3.0	43.5	1.0	-61.0	-40.0	-21.0	
High Ch, 3680MHz									
7360.00	-20.2	V	3.0	42.7	1.0	-61.9	-40.0	-21.9	
11040.00	-22.1	V	3.0	41.4	1.0	-62.5	-40.0	-22.5	
14720.00	-17.4	V	3.0	43.6	1.0	-60.1	-40.0	-20.1	
7360.00	-22.2	H	3.0	42.7	1.0	-63.8	-40.0	-23.8	
11040.00	-22.3	H	3.0	41.4	1.0	-62.7	-40.0	-22.7	
14720.00	-17.8	H	3.0	43.6	1.0	-60.4	-40.0	-20.4	

20 MHz

ANT F

SRS2

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

Company: Samsung
Project #: 4791196575
Date: 2024-04-05
Test Engineer: 28775
Configuration: EUT/ AC Adapter, Z-Position, FF
Location: Chamber 2
Mode: 5G NR n48(SRS) 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, 3560MHz									
7120.00	-24.0	V	3.0	42.8	1.0	-65.7	-40.0	-25.7	
10680.00	-23.5	V	3.0	41.3	1.0	-63.8	-40.0	-23.8	
14240.00	-18.1	V	3.0	43.3	1.0	-60.4	-40.0	-20.4	
7120.00	-23.5	H	3.0	42.8	1.0	-65.2	-40.0	-25.2	
10680.00	-23.8	H	3.0	41.3	1.0	-64.1	-40.0	-24.1	
14240.00	-18.5	H	3.0	43.3	1.0	-60.8	-40.0	-20.8	
Mid Ch, 3625MHz									
7250.00	-22.5	V	3.0	42.7	1.0	-64.2	-40.0	-24.2	
10875.00	-23.0	V	3.0	41.4	1.0	-63.4	-40.0	-23.4	
14500.00	-18.2	V	3.0	43.5	1.0	-60.7	-40.0	-20.7	
7250.00	-20.6	H	3.0	42.7	1.0	-62.3	-40.0	-22.3	
10875.00	-23.1	H	3.0	41.4	1.0	-63.5	-40.0	-23.5	
14500.00	-18.5	H	3.0	43.5	1.0	-61.0	-40.0	-21.0	
High Ch, 3690MHz									
7380.00	-23.6	V	3.0	42.6	1.0	-65.2	-40.0	-25.2	
11070.00	-21.8	V	3.0	41.5	1.0	-62.2	-40.0	-22.2	
14760.00	-17.4	V	3.0	43.7	1.0	-60.1	-40.0	-20.1	
7380.00	-23.7	H	3.0	42.6	1.0	-65.3	-40.0	-25.3	
11070.00	-21.9	H	3.0	41.5	1.0	-62.3	-40.0	-22.3	
14760.00	-17.7	H	3.0	43.7	1.0	-60.4	-40.0	-20.4	

15 MHz

ANT A

SRS3

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

Company: Samsung
Project #: 4791196575
Date: 2024-04-05
Test Engineer: 28183
Configuration: EUT / AC Adapter, Y-Position, FF
Location: Chamber 2
Mode: 5G NR n48(SRS) Harmonics, 15MHz Bandwidth
Test Votage: AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3557.5MHz									
7115.00	-22.5	V	3.0	42.8	1.0	-64.2	-40.0	-24.2	
10672.50	-23.4	V	3.0	41.3	1.0	-63.7	-40.0	-23.7	
14230.00	-17.8	V	3.0	43.3	1.0	-60.1	-40.0	-20.1	
7115.00	-23.5	H	3.0	42.8	1.0	-65.3	-40.0	-25.3	
10672.50	-23.5	H	3.0	41.3	1.0	-63.8	-40.0	-23.8	
14230.00	-18.3	H	3.0	43.3	1.0	-60.6	-40.0	-20.6	
Mid Ch, 3625MHz									
7250.00	-21.6	V	3.0	42.7	1.0	-63.3	-40.0	-23.3	
10875.00	-22.6	V	3.0	41.4	1.0	-63.0	-40.0	-23.0	
14500.00	-18.0	V	3.0	43.5	1.0	-60.5	-40.0	-20.5	
7250.00	-23.0	H	3.0	42.7	1.0	-64.7	-40.0	-24.7	
10875.00	-22.8	H	3.0	41.4	1.0	-63.2	-40.0	-23.2	
14500.00	-18.4	H	3.0	43.5	1.0	-60.9	-40.0	-20.9	
High Ch, 3692.5MHz									
7385.00	-22.7	V	3.0	42.6	1.0	-64.4	-40.0	-24.4	
11077.50	-21.4	V	3.0	41.5	1.0	-61.9	-40.0	-21.9	
14770.00	-17.2	V	3.0	43.7	1.0	-59.9	-40.0	-19.9	
7385.00	-23.6	H	3.0	42.6	1.0	-65.3	-40.0	-25.3	
11077.50	-21.9	H	3.0	41.5	1.0	-62.3	-40.0	-22.3	
14770.00	-17.6	H	3.0	43.7	1.0	-60.3	-40.0	-20.3	

END OF TEST REPORT

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