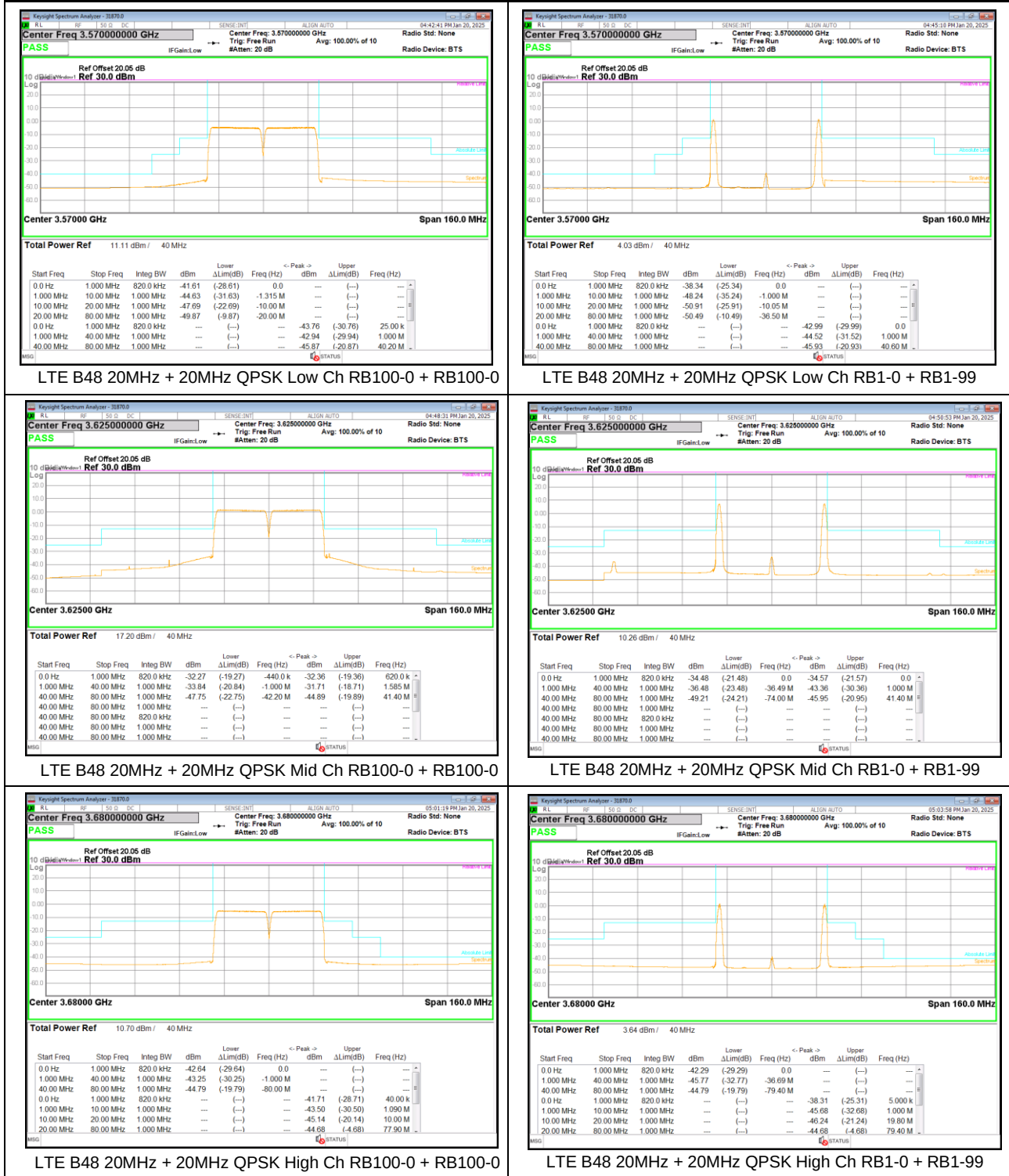


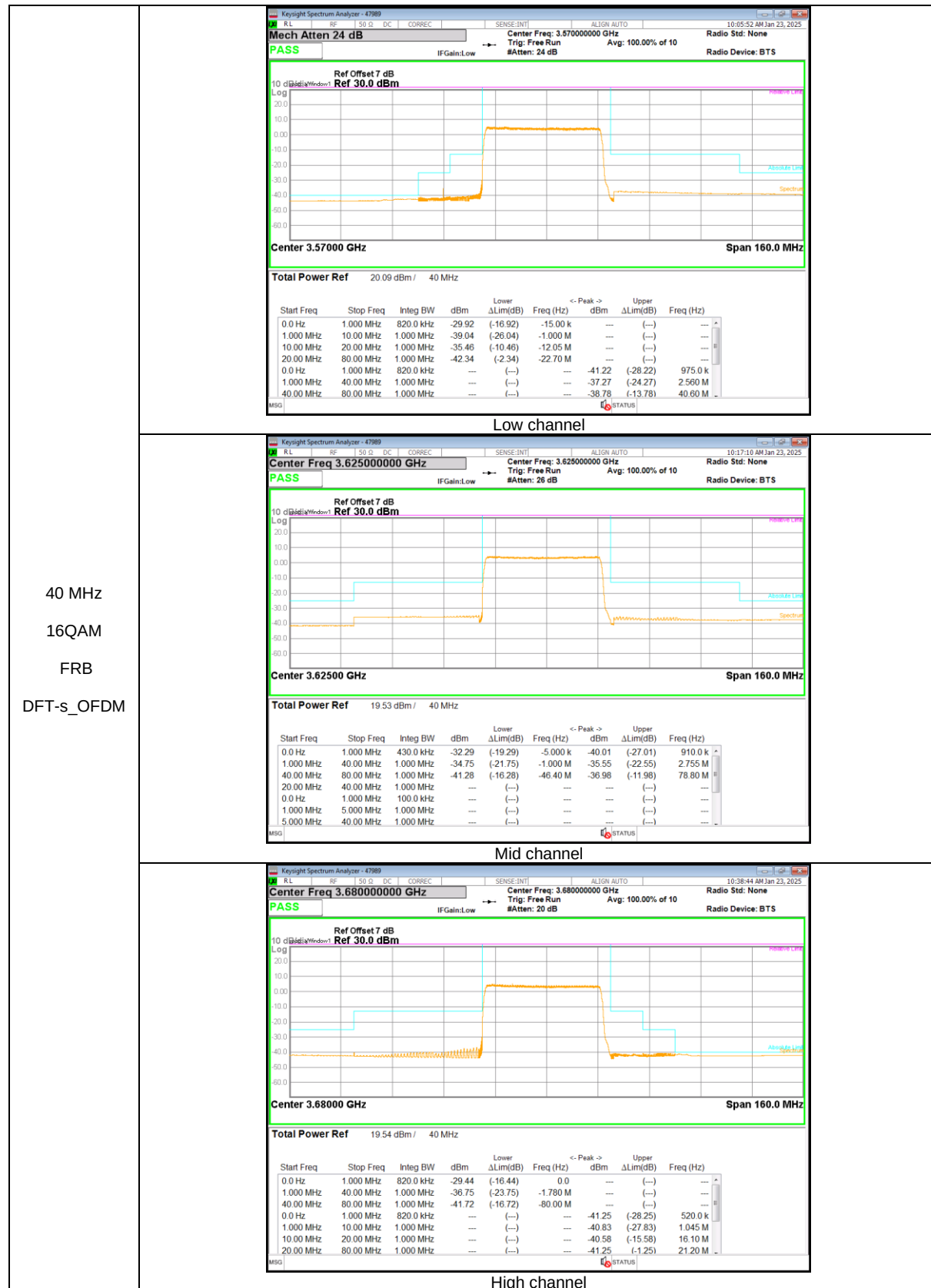
LTE Band 48C (UL CA)

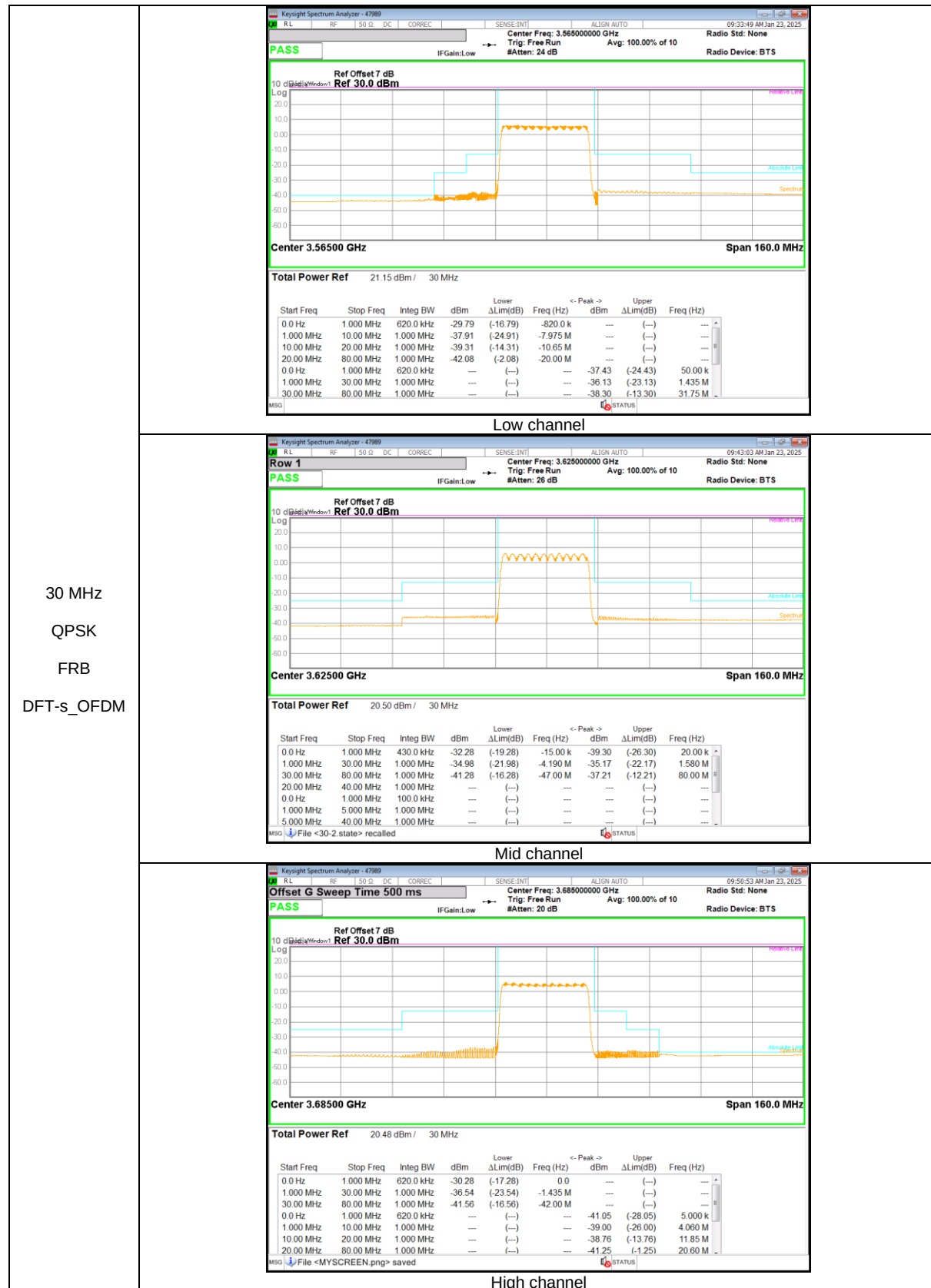


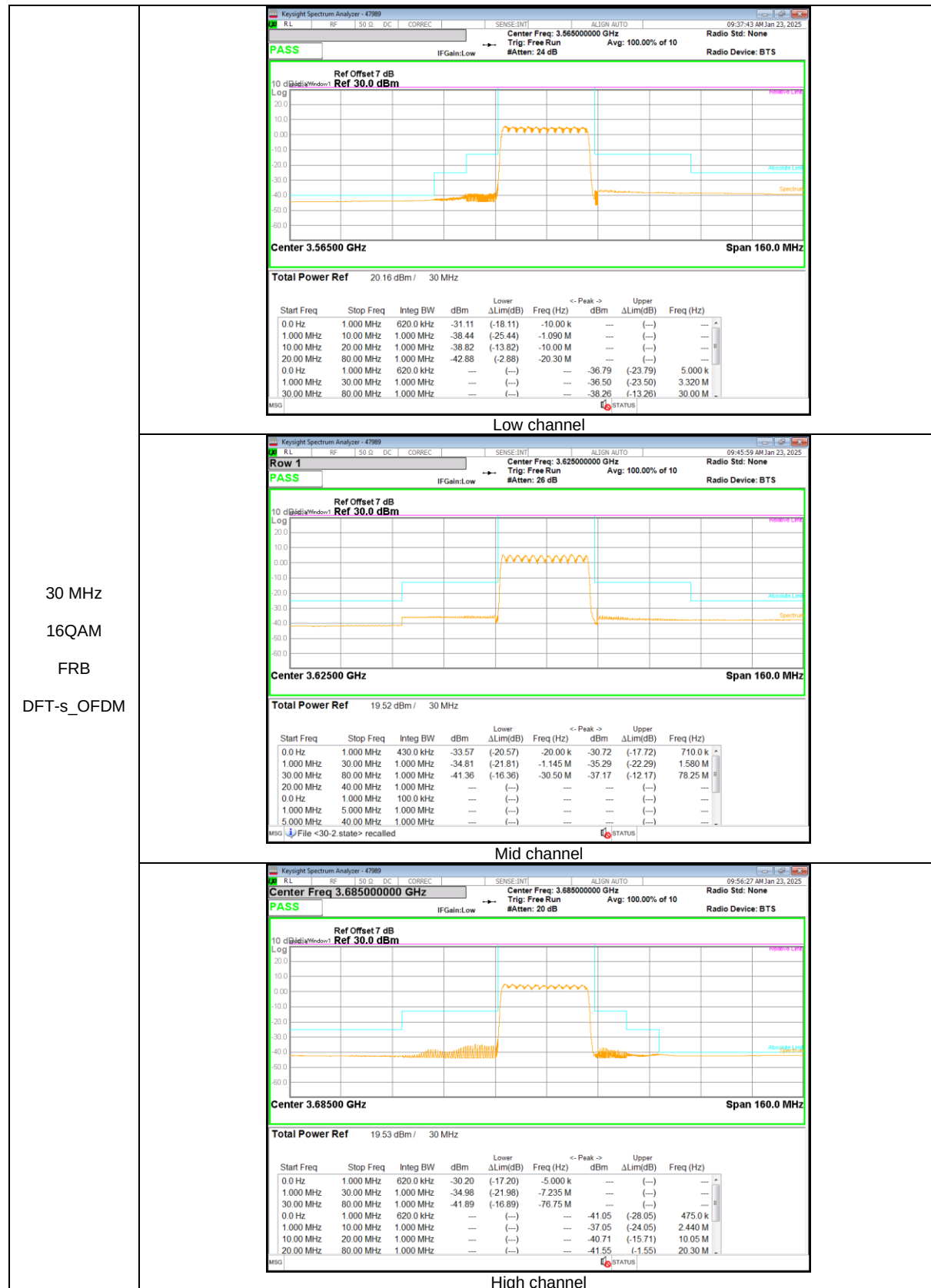


NR Band n48













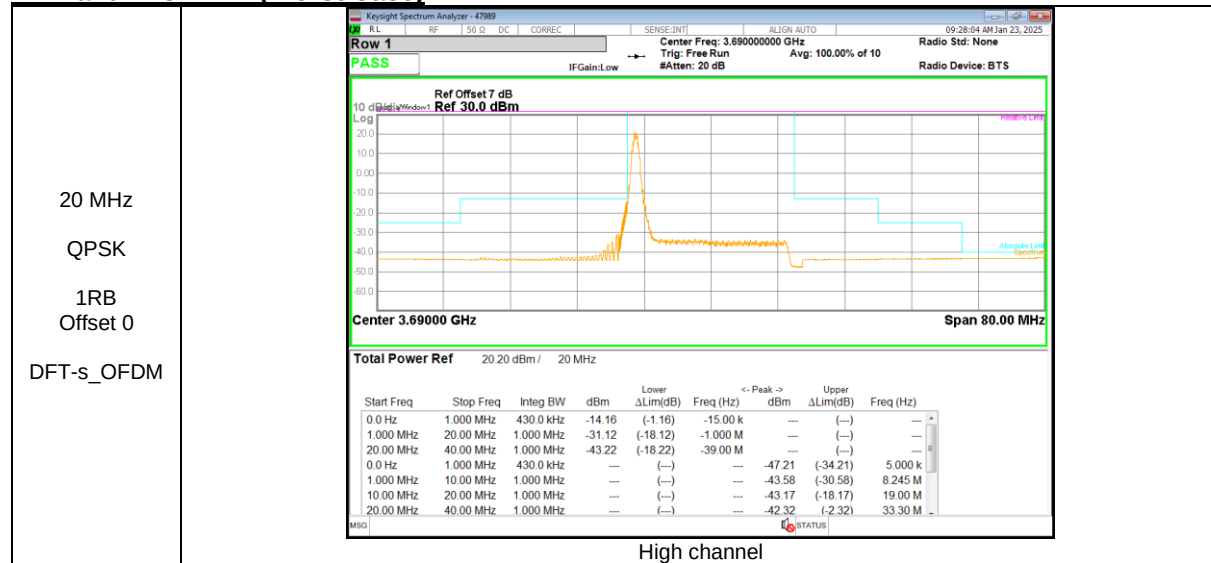








NR Band n48 1 RB (Worst Case)



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.

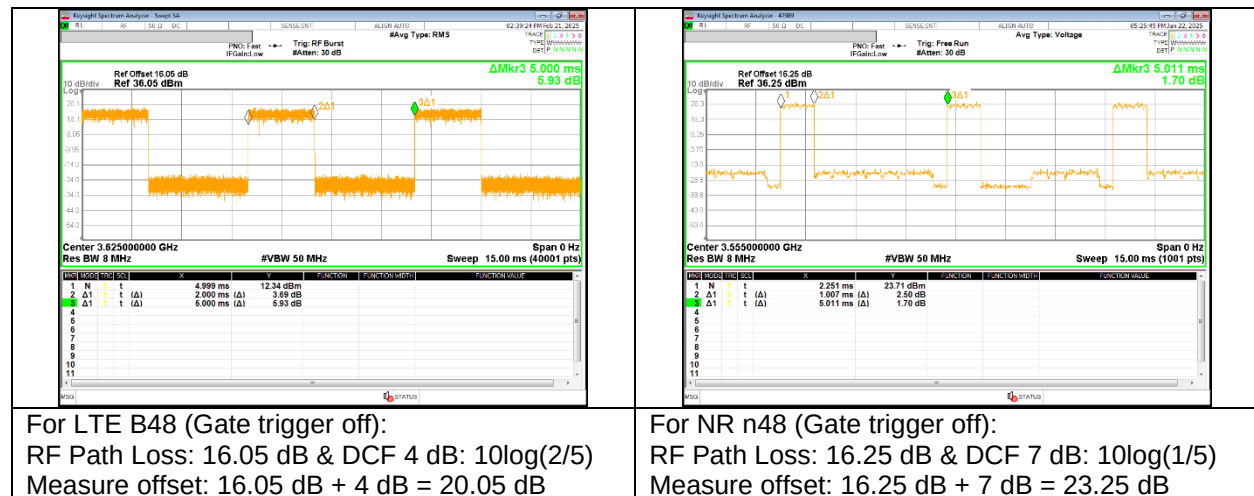
TEST PROCEDURE

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.

- 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)
- Set VBW $\geq 3 \times$ RBW
- Sweep time = auto couple;
- Detector = RMS;
- Ensure that the number of measurement points = Max (40001);
- Trace mode = Average(TDD);

NOTE1



NOTE2

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

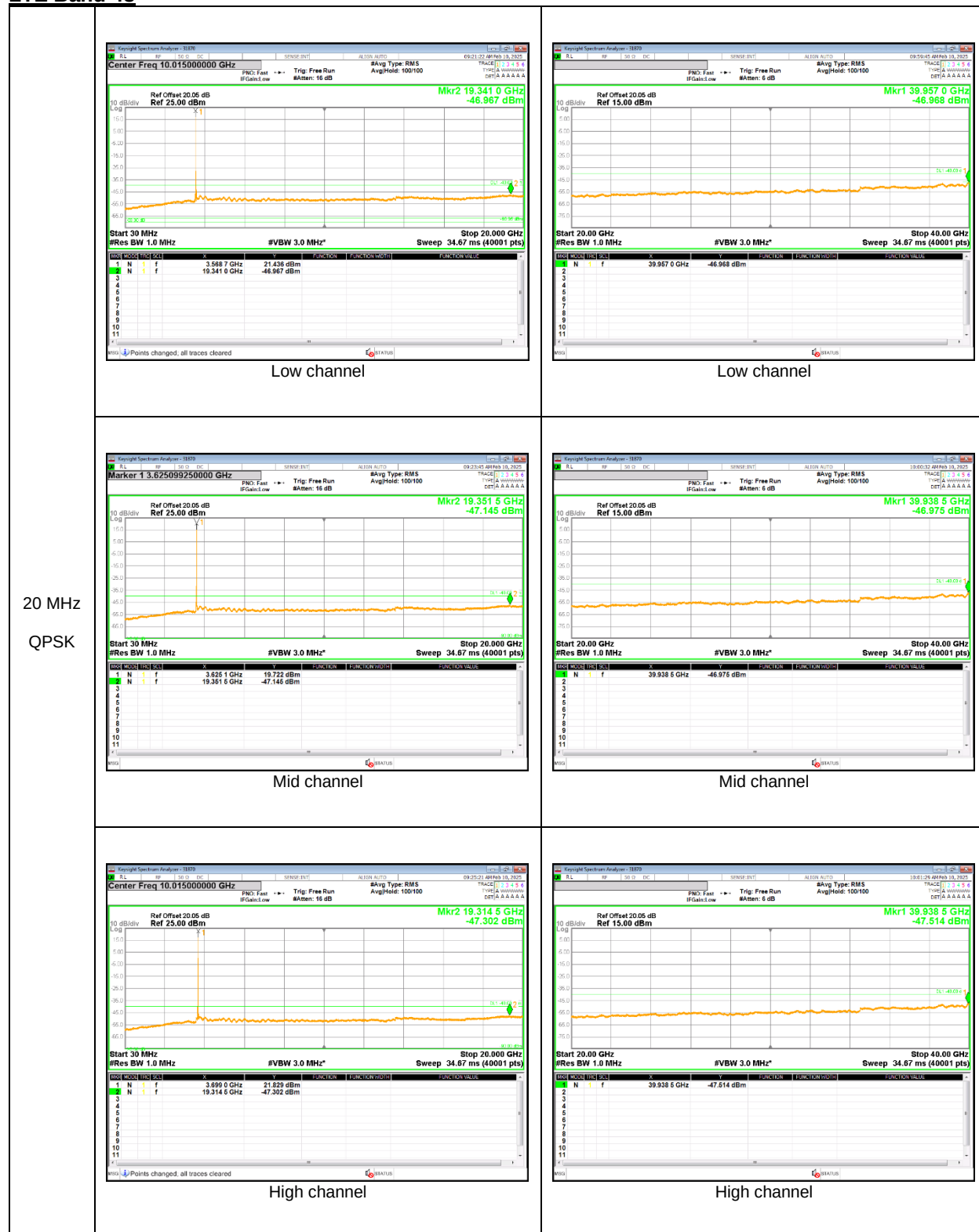
NOTE3

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

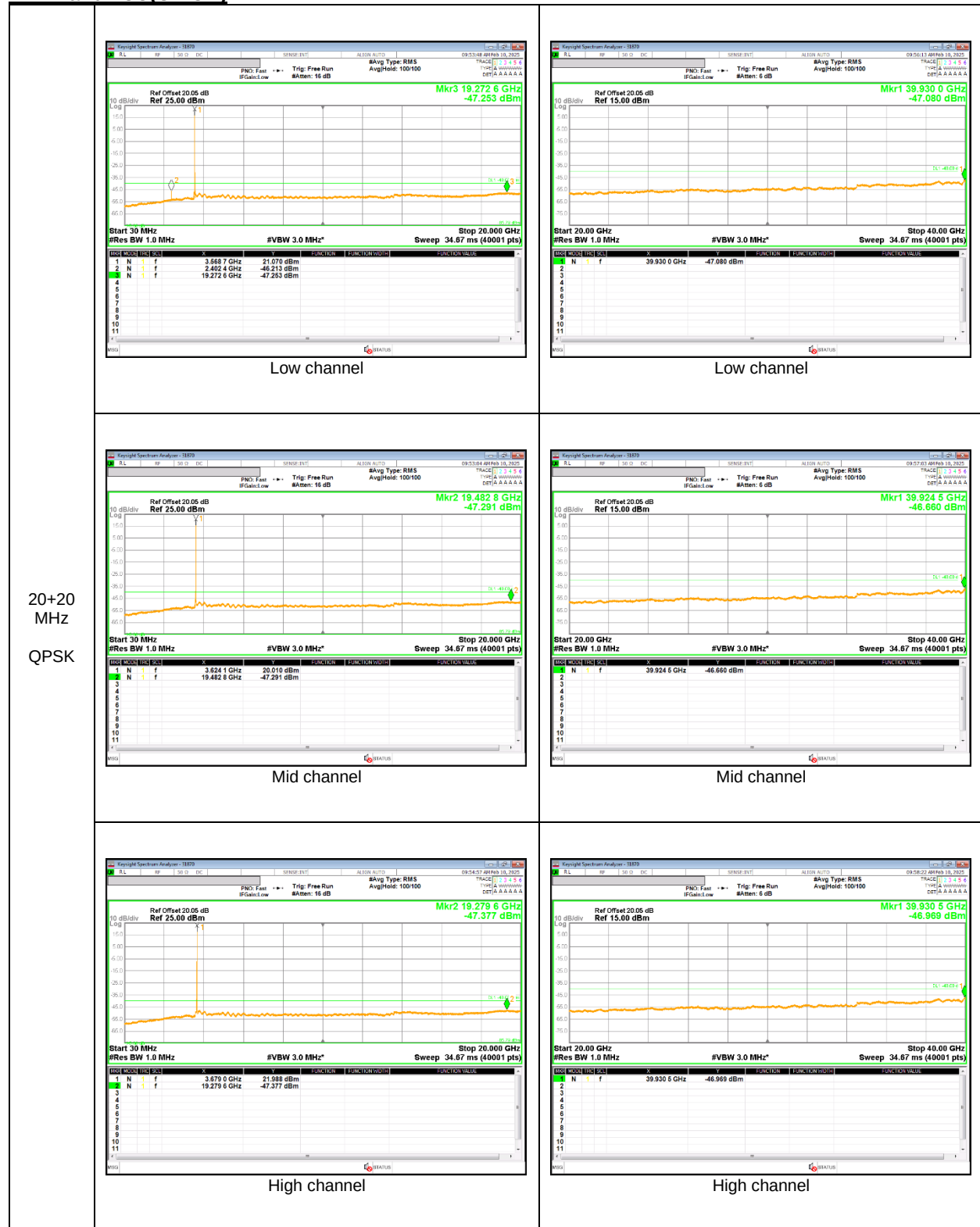
RESULTS

See the following pages.

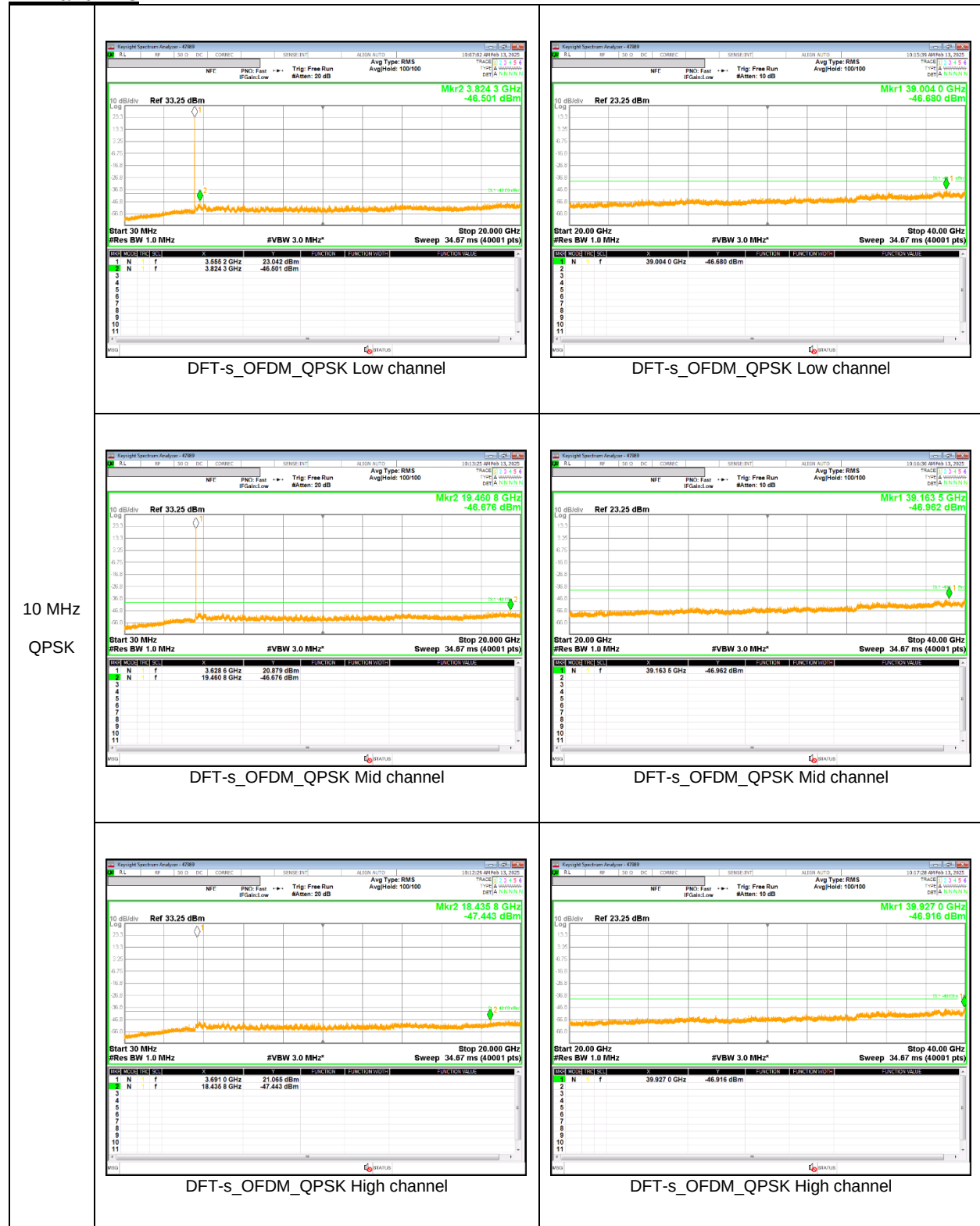
LTE Band 48



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 OBW results)

RESULTS

See the following pages.

LTE Band 48(Lowest Frequency: 16QAM / Highest Frequency: QPSK)

Test Date	2025-02-05
Test Engineer	47989

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	3550.2592	3699.7357		
Extreme (50C)		3550.2592	3699.7357	49.4	0.014
Extreme (40C)		3550.2592	3699.7357	46.5	0.013
Extreme (30C)		3550.2592	3699.7357	44.3	0.012
Extreme (10C)		3550.2592	3699.7357	41.0	0.011
Extreme (0C)		3550.2592	3699.7357	38.8	0.011
Extreme (-10C)		3550.2592	3699.7357	36.6	0.010
Extreme (-20C)		3550.2592	3699.7357	34.2	0.009
Extreme (-30C)		3550.2592	3699.7357	31.1	0.009
20C	15%	3550.2592	3699.7357	47.5	0.013
	-15%	3550.2592	3699.7357	21.6	0.006
	End Point	3550.2592	3699.7357	19.5	0.005

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

Test Date	2025-02-07
Test Engineer	47989

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	3550.6909	3699.3103		
Extreme (50C)		3550.6910	3699.3104	50.4	0.014
Extreme (40C)		3550.6909	3699.3103	48.1	0.013
Extreme (30C)		3550.6909	3699.3103	44.9	0.012
Extreme (10C)		3550.6909	3699.3103	42.2	0.012
Extreme (0C)		3550.6909	3699.3103	40.0	0.011
Extreme (-10C)		3550.6909	3699.3103	36.8	0.010
Extreme (-20C)		3550.6909	3699.3103	33.9	0.009
Extreme (-30C)		3550.6909	3699.3103	31.8	0.009
20C	15%	3550.6910	3699.3103	47.1	0.013
	-15%	3550.6909	3699.3103	23.4	0.006
	End Point	3550.6909	3699.3103	20.5	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

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

Configuration 2

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

Configuration 3

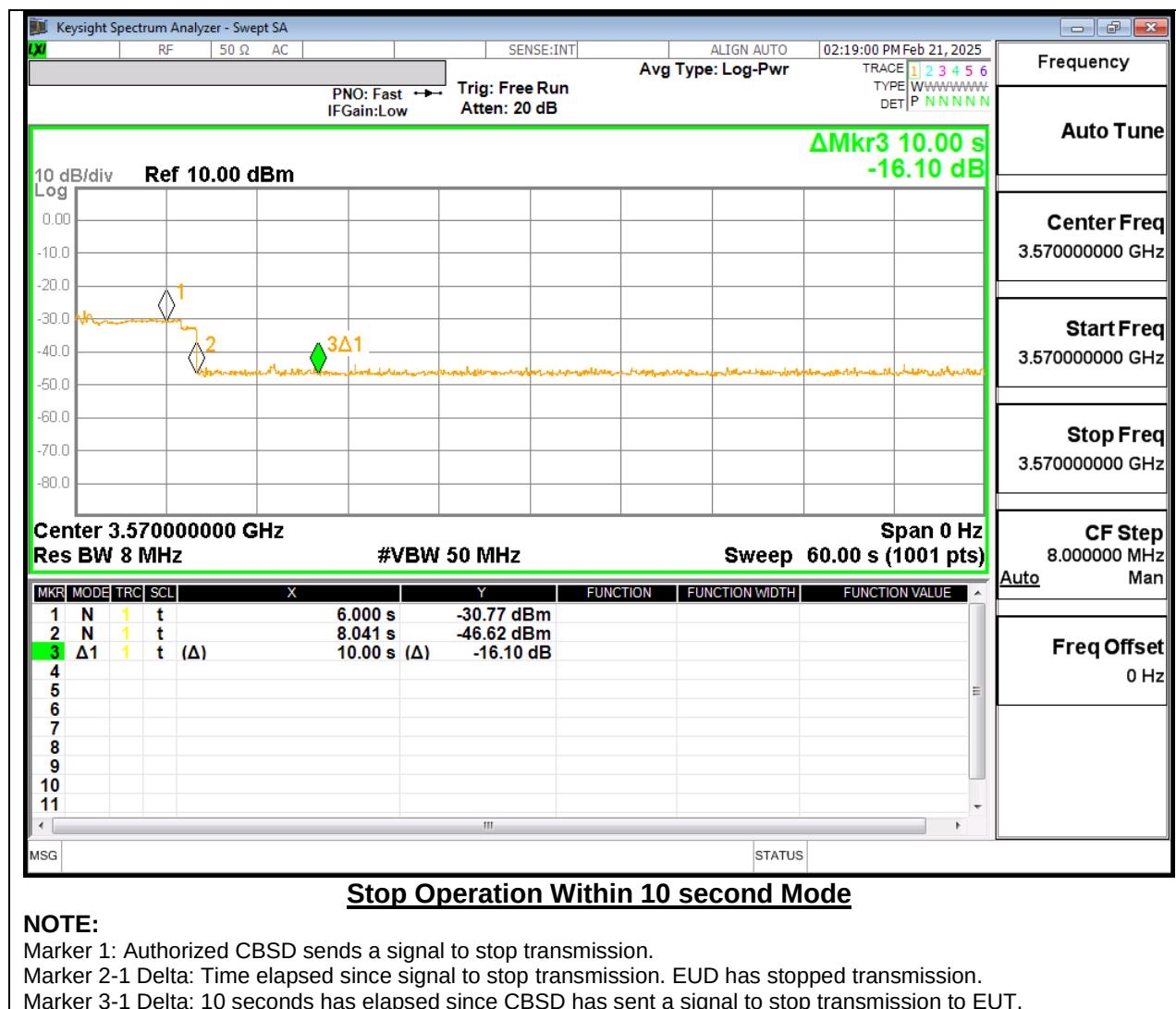
- Setup WINNF.PT.C.HBT.1 with 3590MHz-3610MHz and power level 15 dBm/MHz
- Enable AP service from companion device.
- Check EUT Transmitter Frequency and power
- Disable AP service from companion device and check EUT stop transmission within 10s.

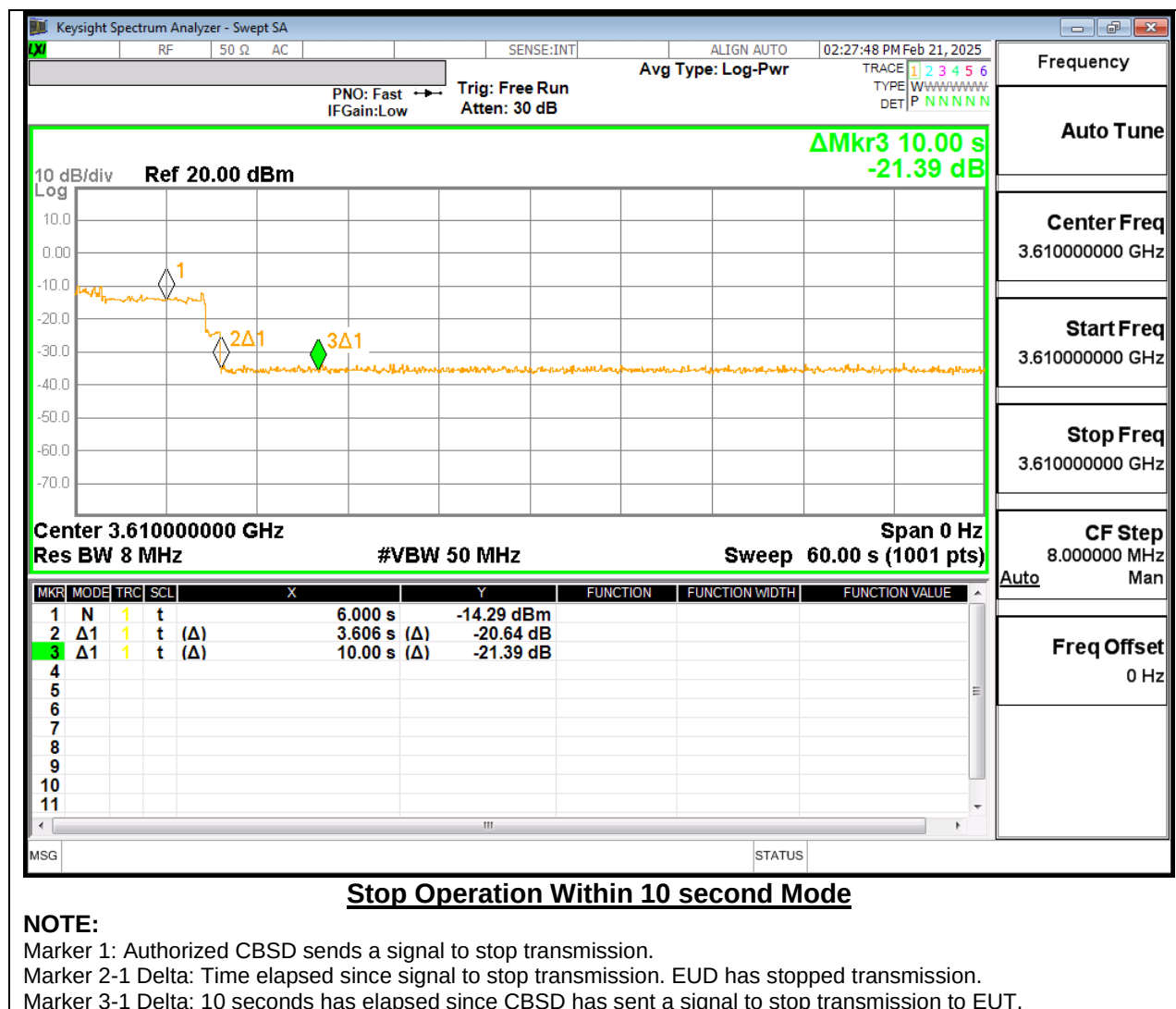
Configuration 4

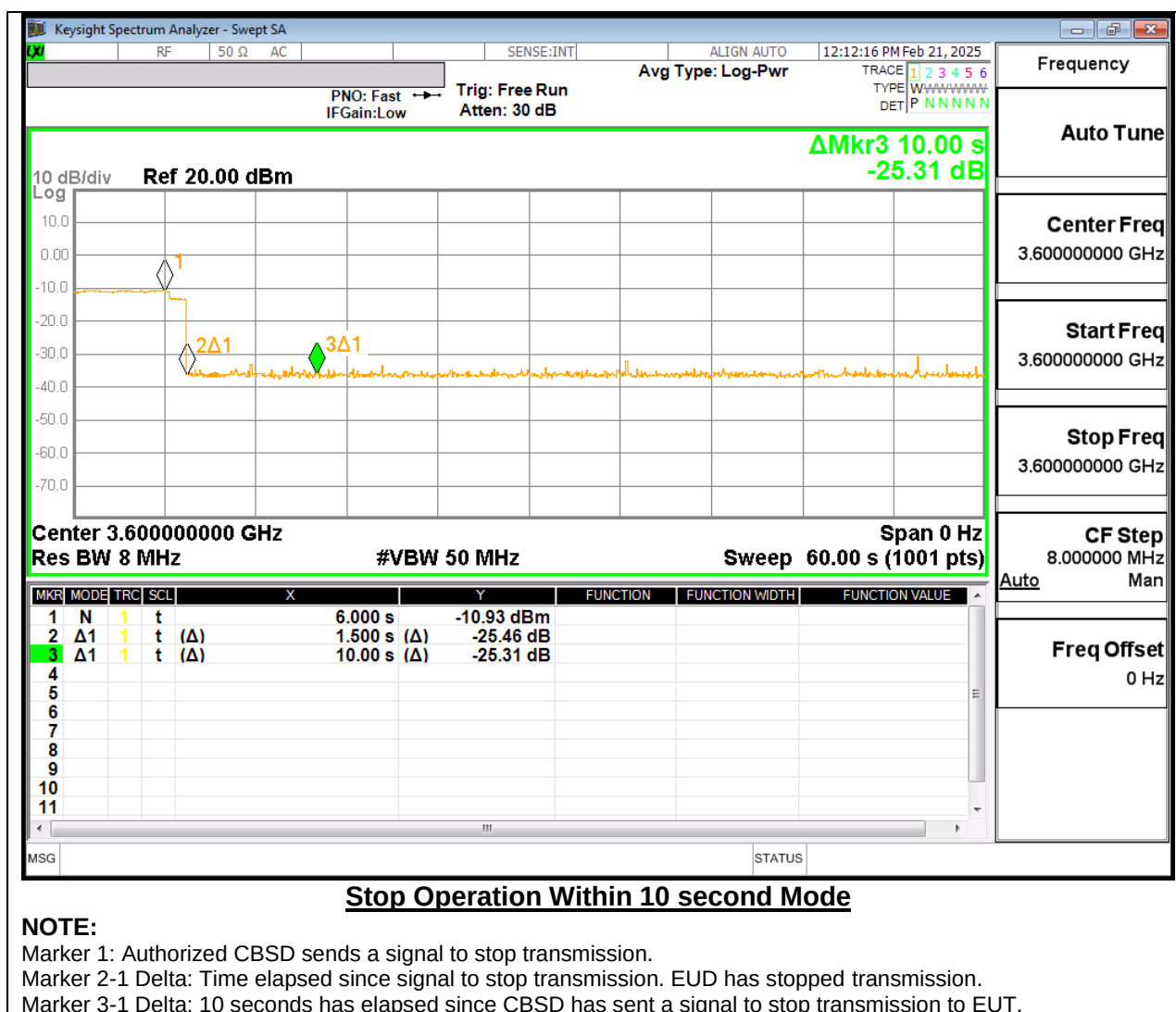
- Setup WINNF.PT.C.HBT.1 with 3640MHz-3660MHz and power level 7 dBm/MHz
- Enable AP service from companion device.
- Check EUT Transmitter Frequency and power
- Disable AP service from companion device and check EUT stop transmission within 10s.

RESULTS

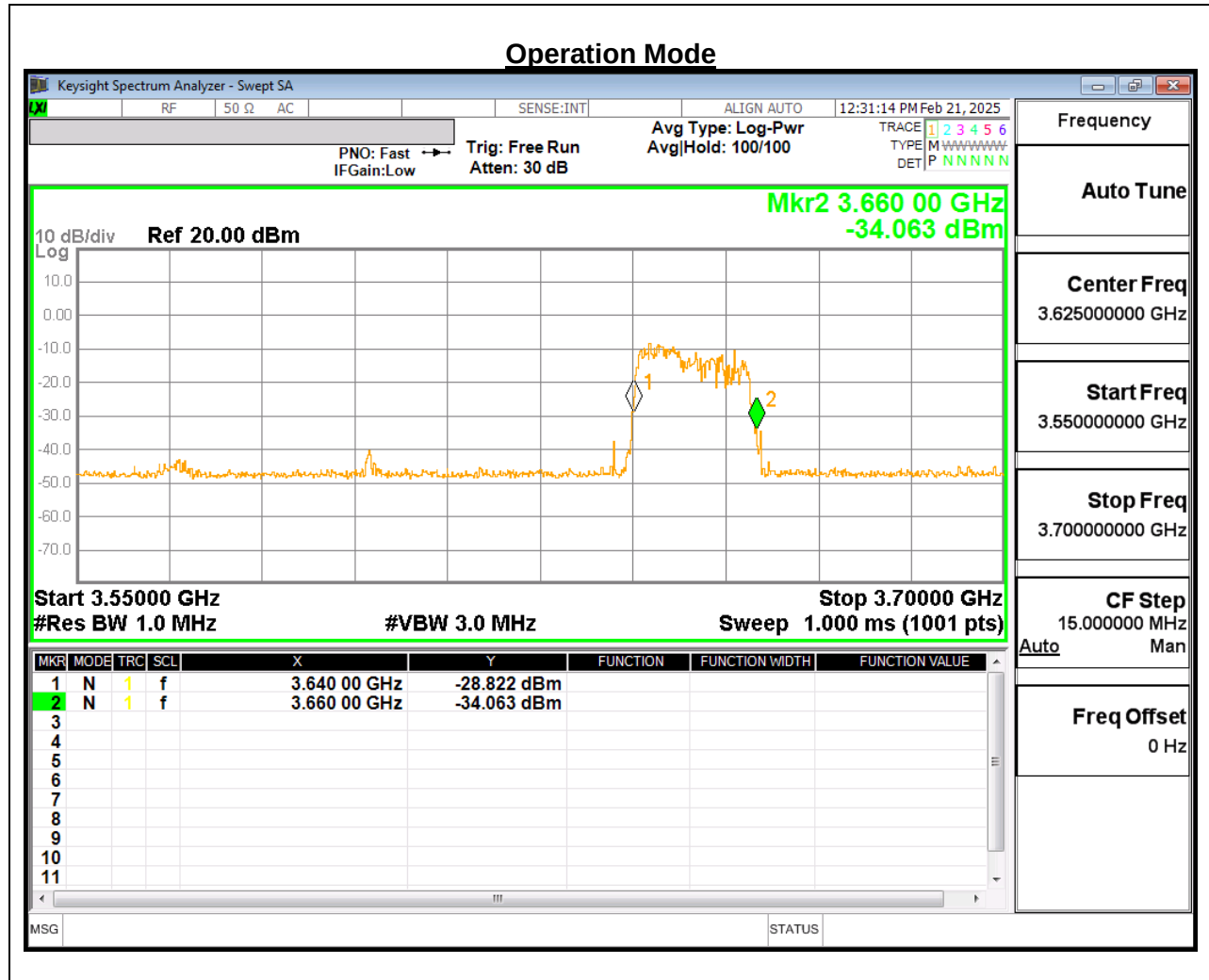
Next page

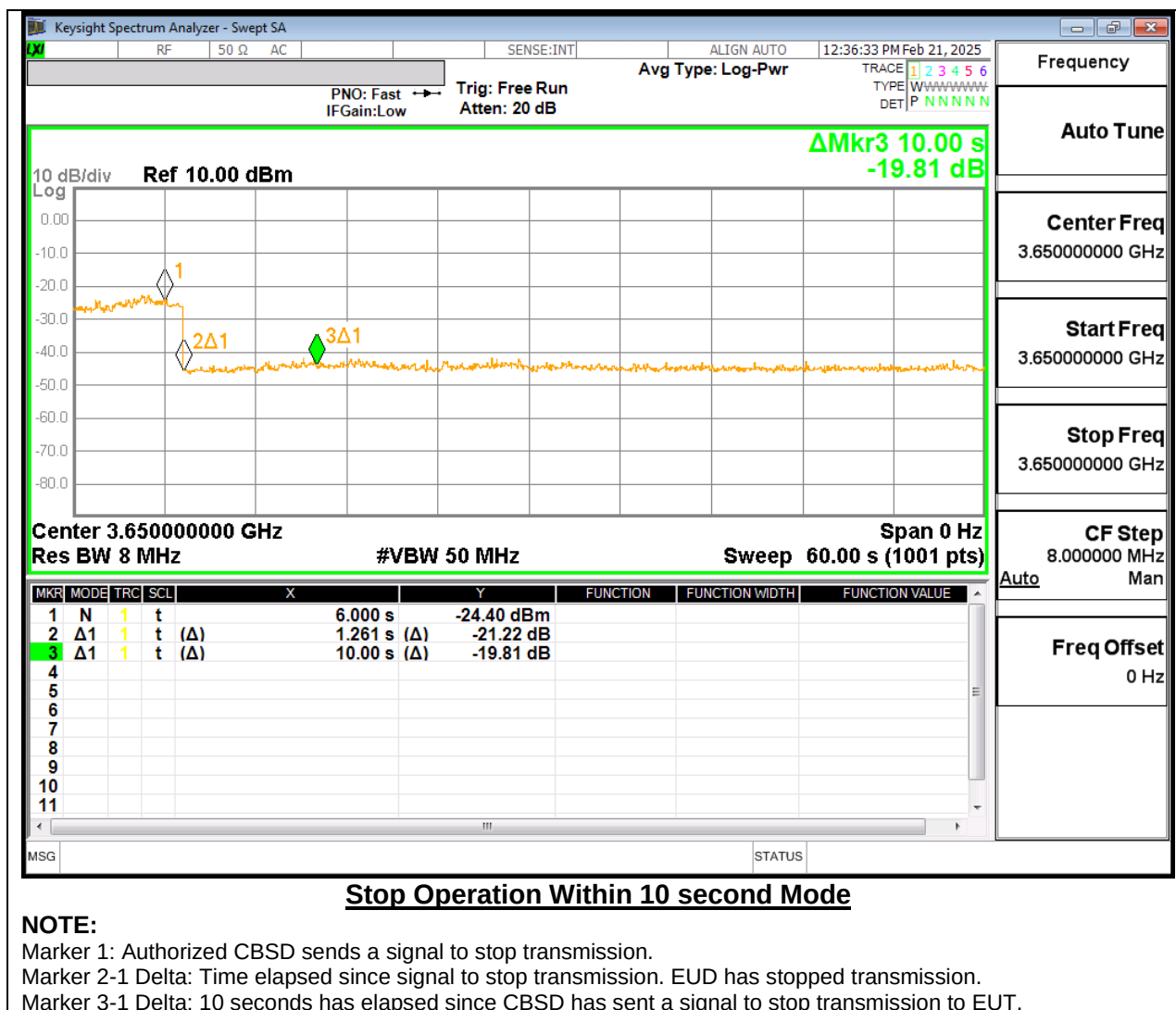






8.7.4. END USER DEVICE CONFIGURATION 4





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:

- Set the RBW $\geq$ OBW
- Set VBW $\geq 3 \times$ RBW;
- Set span $\geq 2 \times$ RBW;
- Sweep time = auto couple;
- Detector = rms;
- Ensure that the number of measurement points $\geq 2 \times$ span/RBW;
- 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

LTE B48C A-MPR is implemented in this EUT when operating the A-MPR Specification in 3GPP TS 36.101 (Table 6.6.2.2A.4-1). Also only Emission mask test item were performed A-MPR condition.

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

BW (MHz)	Modulation	Frequency (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	15.19	H	6.27	10.93	19.85	96.61	23.00	-3.15	1/99
		3625.00	14.82	H	6.33	10.94	19.44	87.90	23.00	-3.56	1/99
		3690.00	14.97	H	6.39	10.76	19.34	85.90	23.00	-3.66	1/99
	16-QAM	3560.00	14.35	H	6.27	10.93	19.01	79.62	23.00	-3.99	1/99
		3625.00	14.41	H	6.33	10.94	19.03	79.98	23.00	-3.97	1/0
		3690.00	13.57	H	6.39	10.76	17.94	62.23	23.00	-5.06	1/0
15	QPSK	3557.50	15.21	H	6.27	10.93	19.86	96.83	23.00	-3.14	1/37
		3625.00	15.22	H	6.33	10.94	19.84	96.38	23.00	-3.16	1/37
		3692.50	15.62	H	6.39	10.75	19.98	99.54	23.00	-3.02	1/37
	16-QAM	3557.50	14.59	H	6.27	10.93	19.24	83.95	23.00	-3.76	1/0
		3625.00	14.66	H	6.33	10.94	19.28	84.72	23.00	-3.72	1/0
		3692.50	14.93	H	6.39	10.75	19.29	84.92	23.00	-3.71	1/37
10	QPSK	3555.00	15.16	H	6.27	10.92	19.81	95.72	23.00	-3.19	1/25
		3625.00	15.30	H	6.33	10.94	19.92	98.17	23.00	-3.08	1/49
		3695.00	14.91	H	6.39	10.74	19.26	84.33	23.00	-3.74	1/49
	16-QAM	3555.00	14.66	H	6.27	10.92	19.31	85.31	23.00	-3.69	1/0
		3625.00	14.62	H	6.33	10.94	19.24	83.95	23.00	-3.76	1/49
		3695.00	13.98	H	6.39	10.74	18.33	68.08	23.00	-4.67	1/0
5	QPSK	3552.50	14.25	H	6.27	10.92	18.90	77.62	23.00	-4.10	1/12
		3625.00	15.08	H	6.33	10.94	19.70	93.33	23.00	-3.30	1/12
		3697.50	14.53	H	6.40	10.73	18.87	77.09	23.00	-4.13	1/0
	16-QAM	3552.50	13.71	H	6.27	10.92	18.36	68.55	23.00	-4.64	1/0
		3625.00	14.48	H	6.33	10.94	19.10	81.28	23.00	-3.90	1/0
		3697.50	13.60	H	6.40	10.73	17.94	62.23	23.00	-5.06	1/12

LTE Band 48C(UL CA)

BW (MHz)	Modulation	Frequency (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)	RB	
											PCC	SCC
40	QPSK	3569.90	15.74	H	6.28	10.95	20.41	109.90	23.00	-2.59	1/99	1/0
		3625.00	15.23	H	6.33	10.94	19.85	96.61	23.00	-3.15	1/99	1/0
		3680.10	15.54	H	6.38	10.79	19.95	98.86	23.00	-3.05	1/99	1/0
	16-QAM	3569.90	15.54	H	6.28	10.95	20.21	104.95	23.00	-2.79	1/99	1/0
		3625.00	14.80	H	6.33	10.94	19.42	87.50	23.00	-3.58	1/99	1/0
		3680.10	14.49	H	6.38	10.79	18.90	77.62	23.00	-4.10	1/99	1/0

NR Band n48 DFT-s OFDM

BW (MHz)	Modulation	Frequency (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	15.23	H	6.28	10.95	19.89	97.50	23.00	-3.11	1/104
		3625.00	15.47	H	6.33	10.94	20.09	102.09	23.00	-2.91	1/53
		3680.00	14.65	H	6.38	10.79	19.06	80.54	23.00	-3.94	1/53
	16-QAM	3570.00	14.38	H	6.28	10.95	19.04	80.17	23.00	-3.96	1/53
		3625.00	14.48	H	6.33	10.94	19.10	81.28	23.00	-3.90	1/53
		3680.00	13.48	H	6.38	10.79	17.89	61.52	23.00	-5.11	1/53
30	QPSK	3565.00	15.27	H	6.28	10.94	19.92	98.17	23.00	-3.08	1/76
		3625.00	15.03	H	6.33	10.94	19.65	92.26	23.00	-3.35	1/76
		3685.00	15.53	H	6.39	10.78	19.92	98.17	23.00	-3.08	1/39
	16-QAM	3565.00	14.65	H	6.28	10.94	19.30	85.11	23.00	-3.70	1/76
		3625.00	14.23	H	6.33	10.94	18.85	76.74	23.00	-4.15	1/76
		3685.00	14.44	H	6.39	10.78	18.83	76.38	23.00	-4.17	1/39
20	QPSK	3560.00	15.25	H	6.27	10.93	19.91	97.95	23.00	-3.09	1/49
		3625.00	14.88	H	6.33	10.94	19.50	89.13	23.00	-3.50	1/1
		3690.00	15.54	H	6.39	10.76	19.91	97.95	23.00	-3.09	1/49
	16-QAM	3560.00	14.24	H	6.27	10.93	18.90	77.62	23.00	-4.10	1/49
		3625.00	14.19	H	6.33	10.94	18.81	76.03	23.00	-4.19	1/26
		3690.00	14.46	H	6.39	10.76	18.83	76.38	23.00	-4.17	1/1
15	QPSK	3557.50	15.06	H	6.27	10.93	19.71	93.54	23.00	-3.29	1/36
		3625.00	14.90	H	6.33	10.94	19.52	89.54	23.00	-3.48	1/36
		3692.50	14.69	H	6.39	10.75	19.05	80.35	23.00	-3.95	1/36
	16-QAM	3557.50	14.23	H	6.27	10.93	18.88	77.27	23.00	-4.12	1/36
		3625.00	14.30	H	6.33	10.94	18.92	77.98	23.00	-4.08	1/19
		3692.50	14.47	H	6.39	10.75	18.83	76.38	23.00	-4.17	1/1
10	QPSK	3555.00	14.38	H	6.27	10.92	19.03	79.98	23.00	-3.97	1/1
		3625.00	15.14	H	6.33	10.94	19.76	94.62	23.00	-3.24	1/22
		3695.00	15.65	H	6.39	10.74	20.00	100.00	23.00	-3.00	1/1
	16-QAM	3555.00	13.74	H	6.27	10.92	18.39	69.02	23.00	-4.61	1/22
		3625.00	13.88	H	6.33	10.94	18.50	70.79	23.00	-4.50	1/22
		3695.00	14.43	H	6.39	10.74	18.78	75.51	23.00	-4.22	1/22

NR Band n48 (SRS2)

BW (MHz)	Frequency (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)
30	3565.02	15.24	H	6.28	10.76	19.71	93.54	23.00	-3.29
	3624.99	14.72	H	6.33	10.86	19.24	83.95	23.00	-3.76
	3684.99	15.63	H	6.39	10.80	20.04	100.93	23.00	-2.96

NR Band n48 (SRS3)

BW (MHz)	Frequency (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)
10	3555.00	13.67	H	6.27	10.72	18.12	64.86	23.00	-4.88
	3624.99	15.65	H	6.33	10.86	20.17	103.99	23.00	-2.83
	3694.98	16.34	H	6.39	10.78	20.73	118.30	23.00	-2.27

NR Band n48 (SRS4)

BW (MHz)	Frequency (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)
10	3555.00	12.91	H	6.27	10.72	17.36	54.41	23.00	-5.64
	3624.99	13.49	H	6.33	10.86	18.01	63.26	23.00	-4.99
	3694.98	13.80	H	6.39	10.78	18.19	65.90	23.00	-4.81

9.2. RADIATED 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:

- h) Set the RBW = 1 MHz for emissions above 1 GHz
- i) Set VBW $\geq 3 \times$ RBW;
- j) Set span ≥ 1.5 times the OBW;
- k) Sweep time = auto couple;
- l) Detector = rms;
- m) Ensure that the number of measurement points $\geq 2 \times$ span/RBW;
- n) Trace Mode = average;

NOTE1

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

NOTE3

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

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:		Samsung							
Project #:		4791615583							
Date:		2025-02-13							
Test Engineer:		26087							
Configuration:		EUT / AC Adapter, Z-Position							
Location:		Chamber 2							
Mode:		LTE_QPSK Band 48 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	-18.9	V	3.0	43.2	1.0	-61.1	-40.0	-21.1	
10672.50	-18.0	V	3.0	41.0	1.0	-58.0	-40.0	-18.0	
14230.00	-10.4	V	3.0	40.1	1.0	-49.5	-40.0	-9.5	
7115.00	-19.2	H	3.0	43.2	1.0	-61.4	-40.0	-21.4	
10672.50	-17.9	H	3.0	41.0	1.0	-57.9	-40.0	-17.9	
14230.00	-8.9	H	3.0	40.1	1.0	-47.9	-40.0	-7.9	
Mid Ch, 3625MHz									
7250.00	-18.3	V	3.0	43.1	1.0	-60.4	-40.0	-20.4	
10875.00	-17.5	V	3.0	40.8	1.0	-57.3	-40.0	-17.3	
14500.00	-11.6	V	3.0	40.1	1.0	-50.7	-40.0	-10.7	
7250.00	-18.4	H	3.0	43.1	1.0	-60.6	-40.0	-20.6	
10875.00	-17.3	H	3.0	40.8	1.0	-57.1	-40.0	-17.1	
14500.00	-11.2	H	3.0	40.1	1.0	-50.3	-40.0	-10.3	
High Ch, 3692.5MHz									
7385.00	-18.6	V	3.0	43.0	1.0	-60.6	-40.0	-20.6	
11077.50	-16.9	V	3.0	40.7	1.0	-56.6	-40.0	-16.6	
14770.00	-12.6	V	3.0	40.1	1.0	-51.7	-40.0	-11.7	
7385.00	-18.6	H	3.0	43.0	1.0	-60.6	-40.0	-20.6	
11077.50	-16.9	H	3.0	40.7	1.0	-56.5	-40.0	-16.5	
14770.00	-12.8	H	3.0	40.1	1.0	-51.9	-40.0	-11.9	

