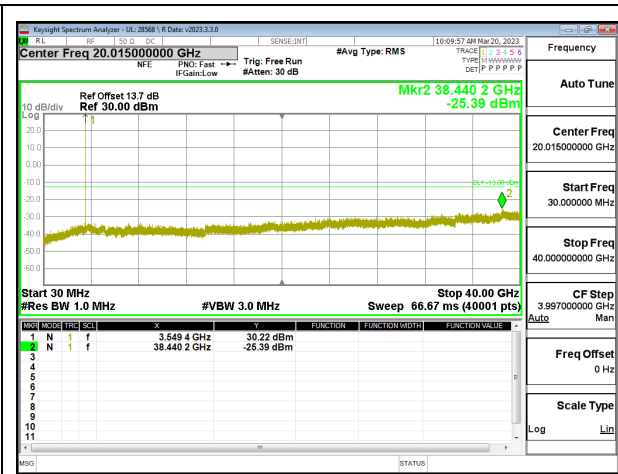
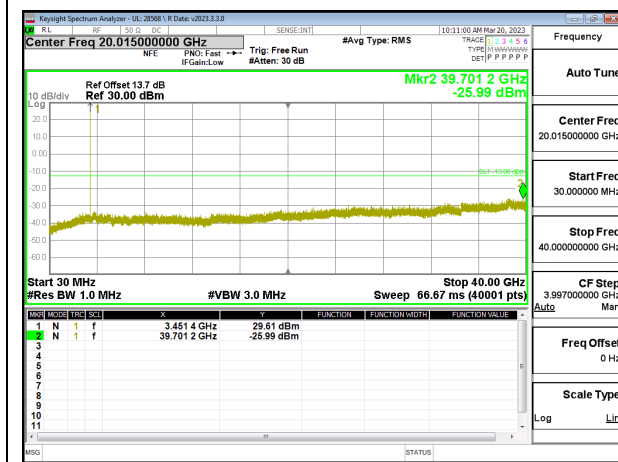


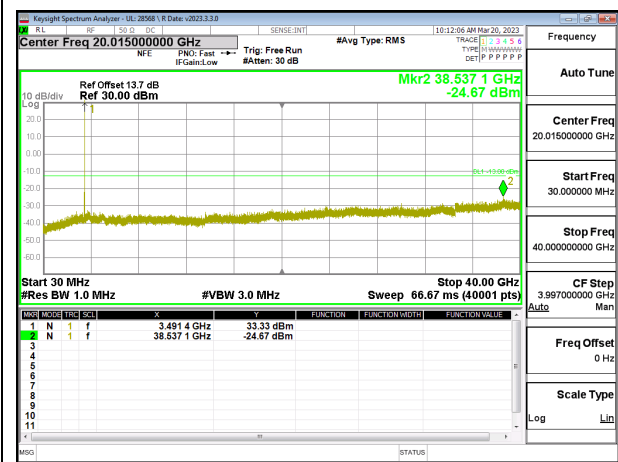
5G NR n77 15MHz BPSK Mid Channel RB1-1



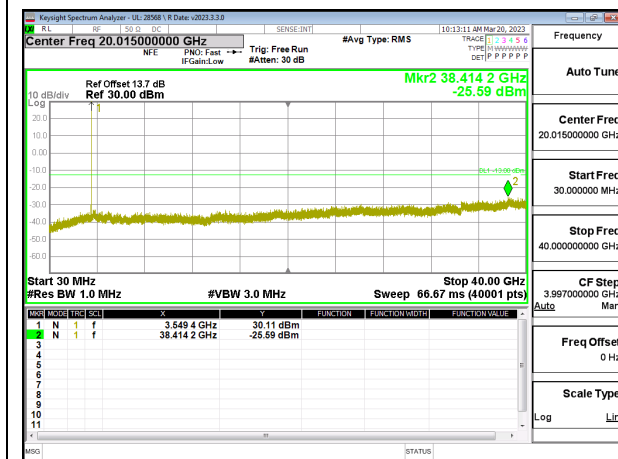
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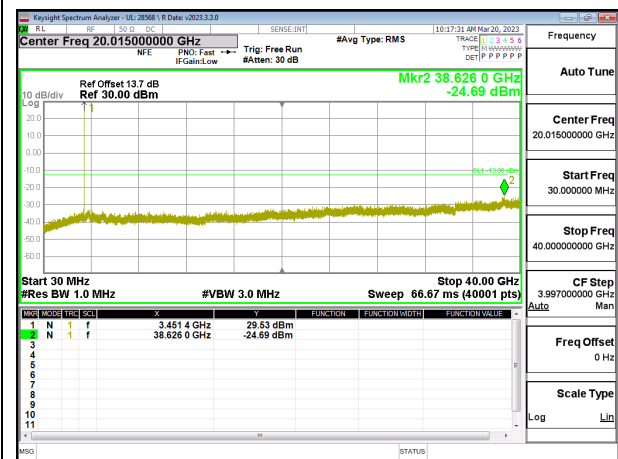
5G NR n77 20MHz BPSK Low Channel RB1-0



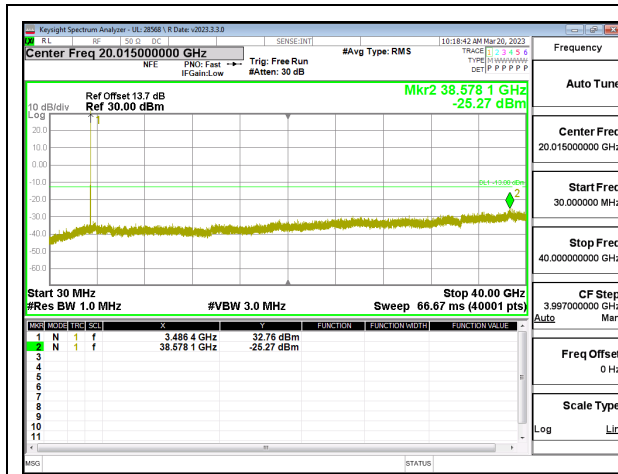
5G NR n77 20MHz BPSK Mid Channel RB1-1



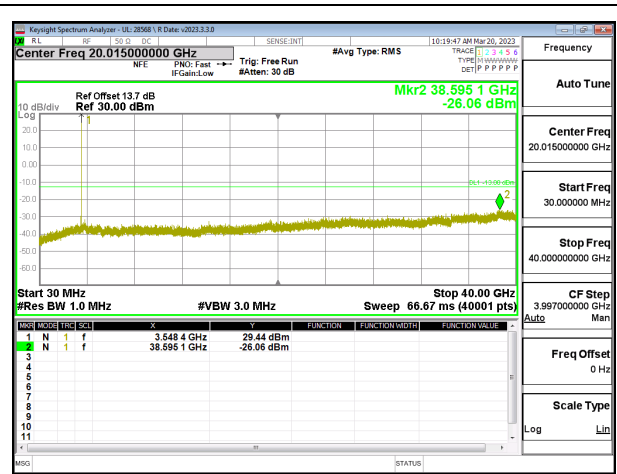
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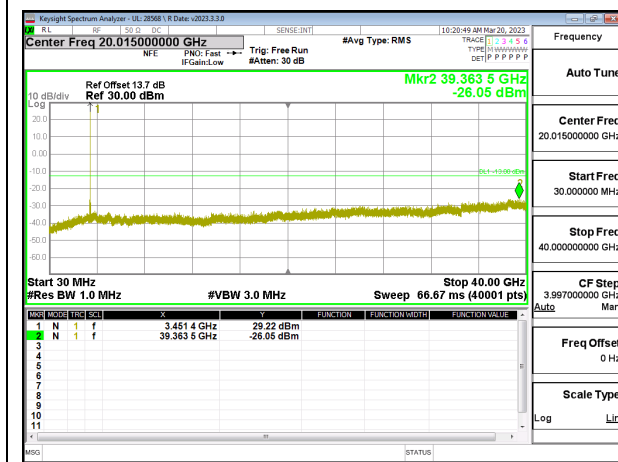
5G NR n77 30MHz BPSK Low Channel RB1-0



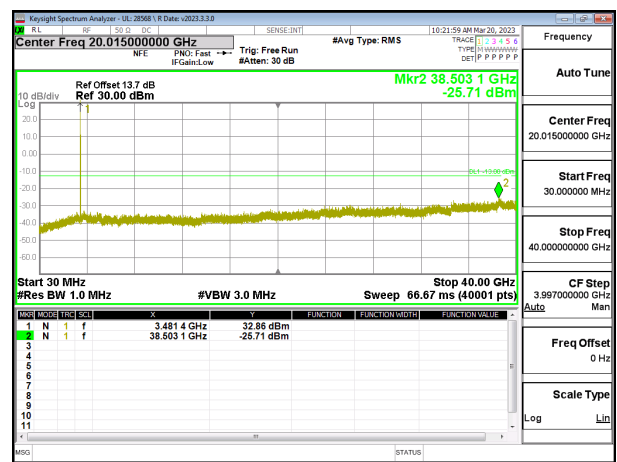
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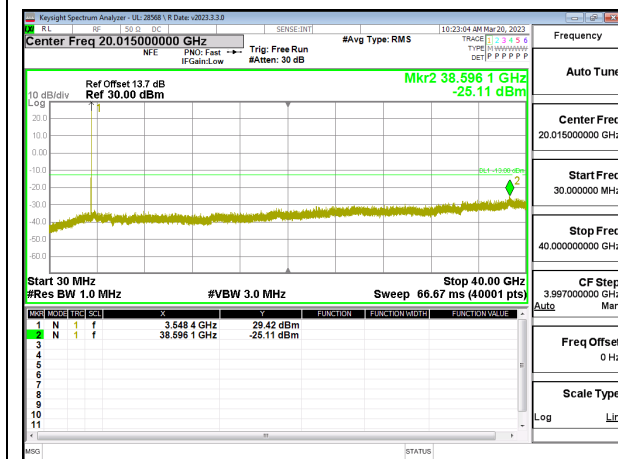
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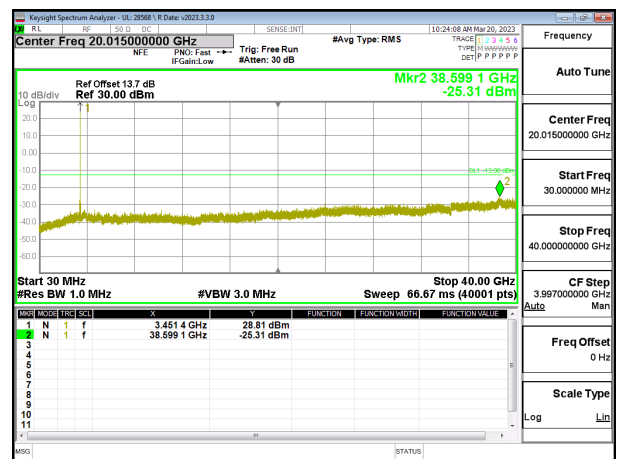
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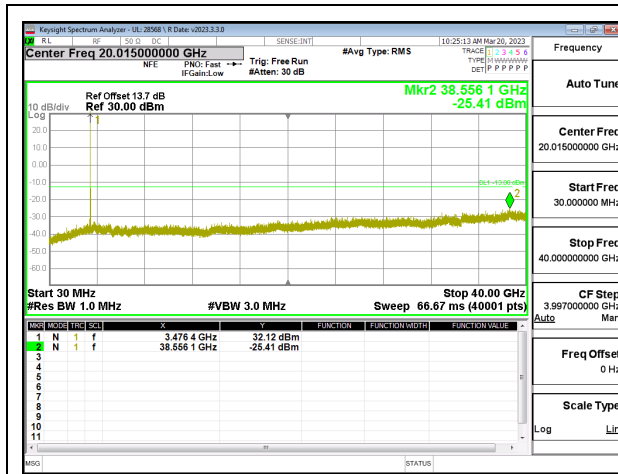
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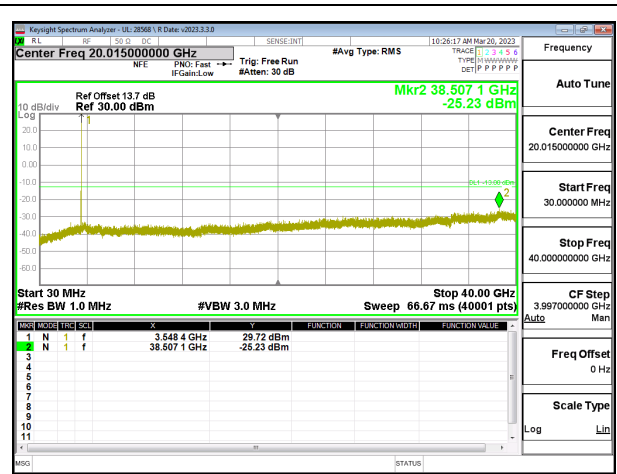
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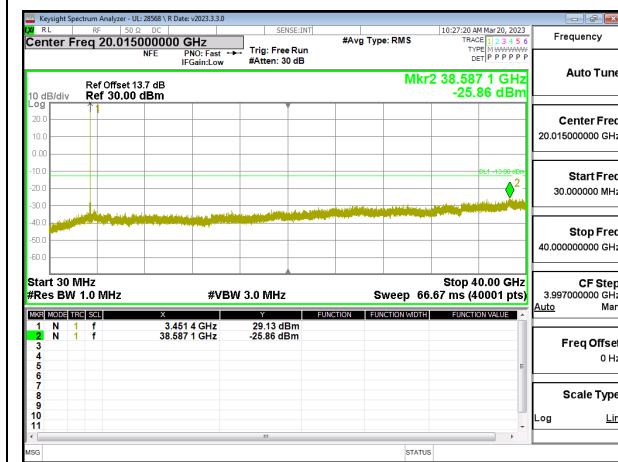
5G NR n77 50MHz BPSK Low Channel RB1-0



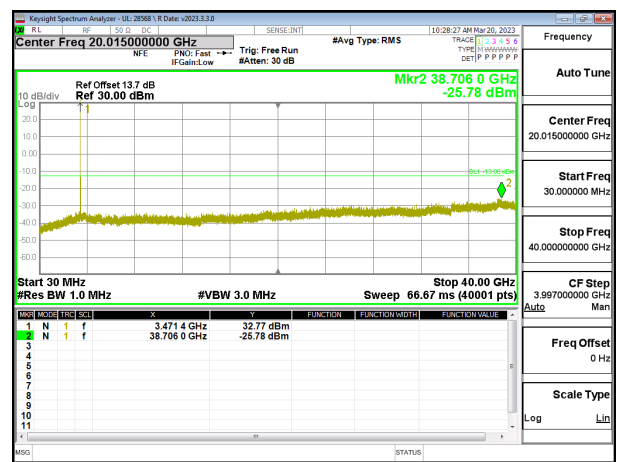
5G NR n77 50MHz BPSK Mid Channel RB1-1



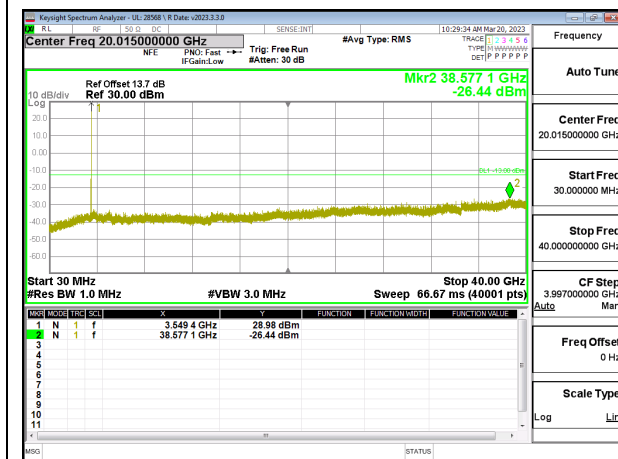
5G NR n77 50MHz BPSK High Channel RB1-132



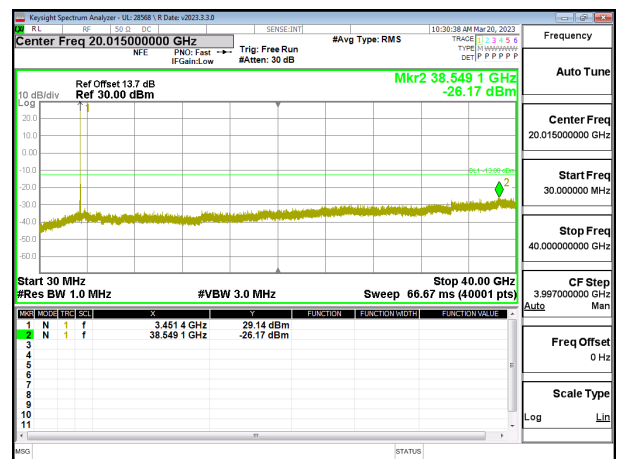
5G NR n77 60MHz BPSK Low Channel RB1-0



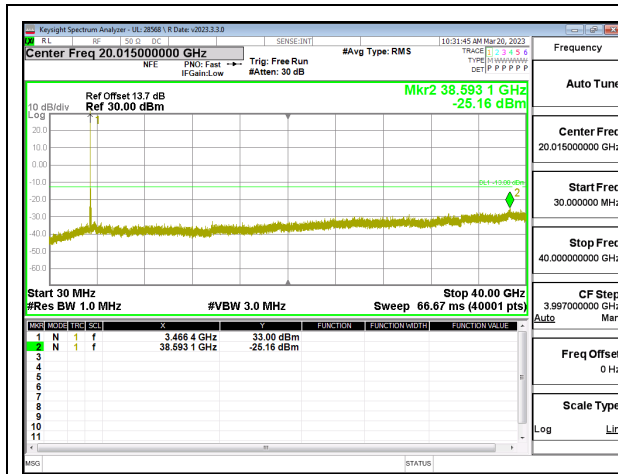
5G NR n77 60MHz BPSK Mid Channel RB1-1



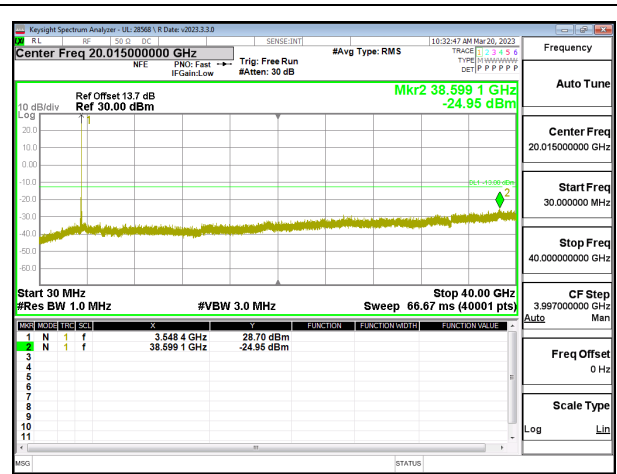
5G NR n77 60MHz BPSK High Channel RB1-161



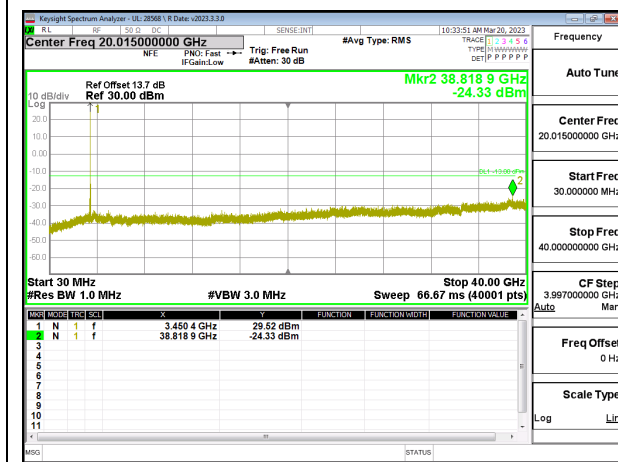
5G NR n77 70MHz BPSK Low Channel RB1-0



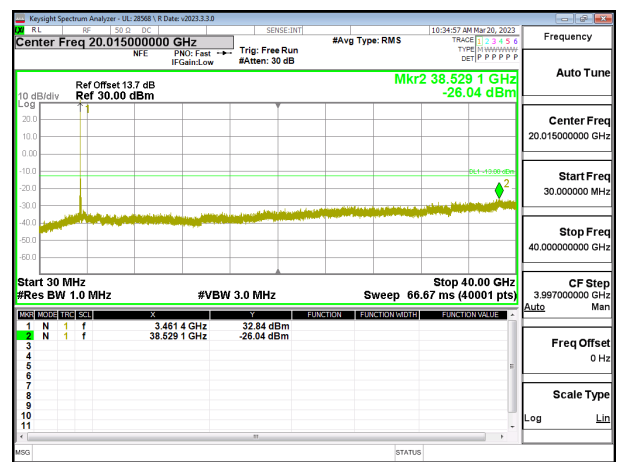
5G NR n77 70MHz BPSK Mid Channel RB1-1



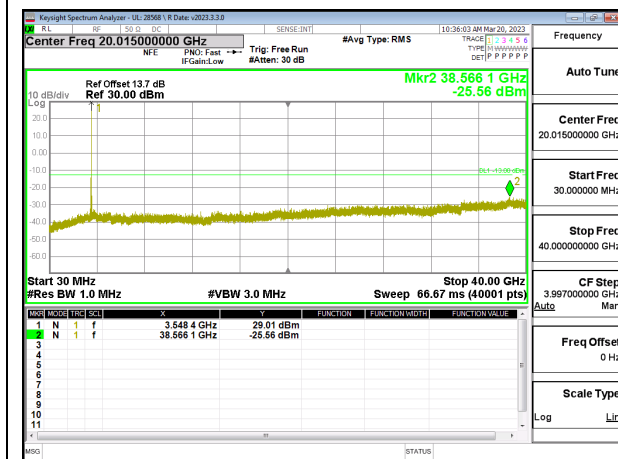
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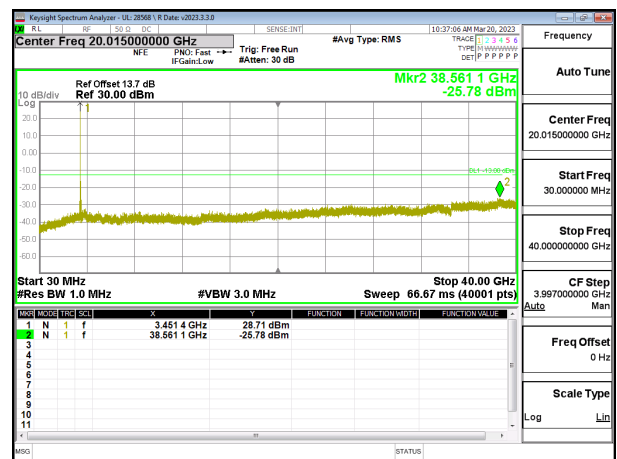
5G NR n77 80MHz BPSK Low Channel RB1-0



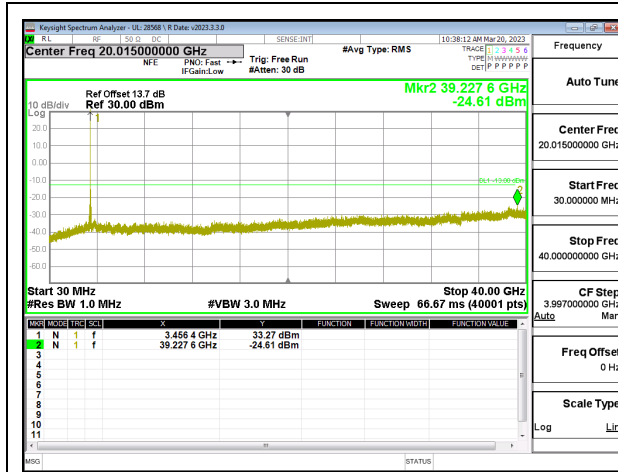
5G NR n77 80MHz BPSK Mid Channel RB1-1



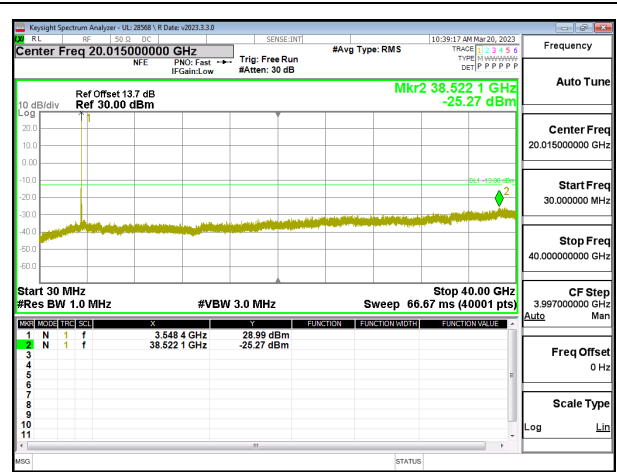
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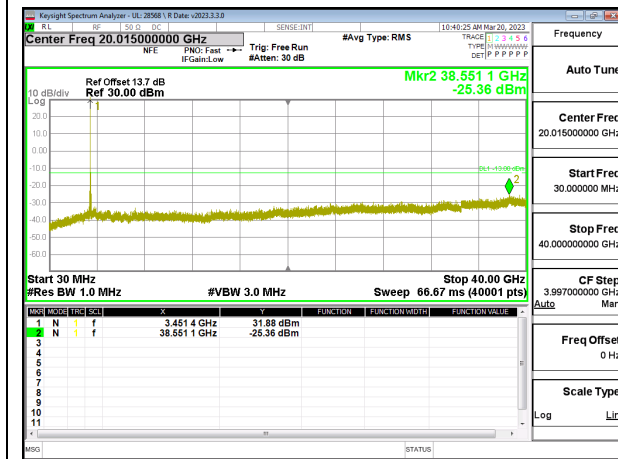
5G NR n77 90MHz BPSK Low Channel RB1-0



5G NR n77 90MHz BPSK Mid Channel RB1-1



5G NR n77 90MHz BPSK High Channel RB1-244



5G NR n77 100MHz BPSK Mid Channel RB1-1

Intentionally Blank

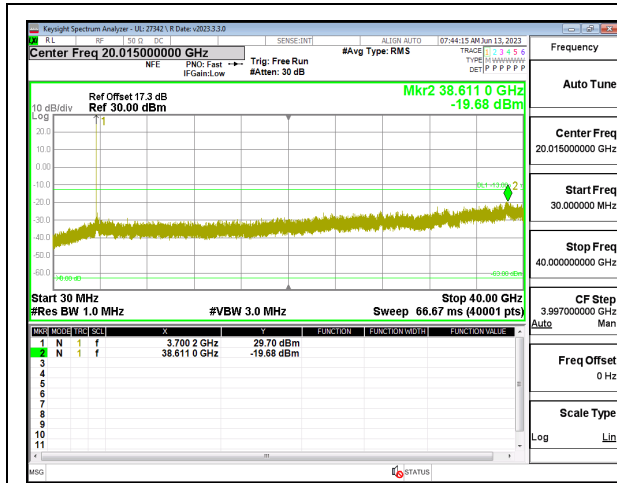
9.3.16. 5G NR n77 (Part 27 3700-3980MHz)

LIMITS

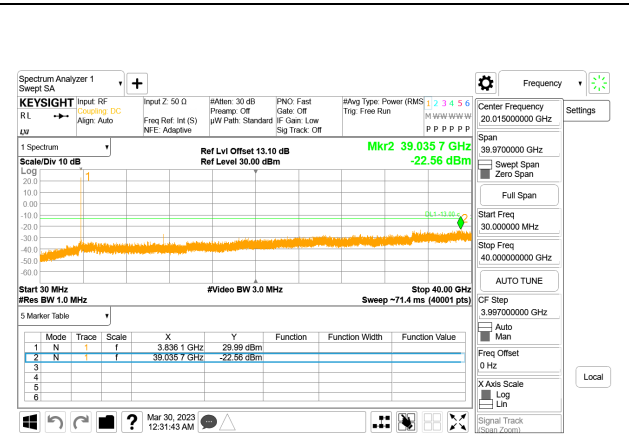
FCC: §27.53

Emission limits

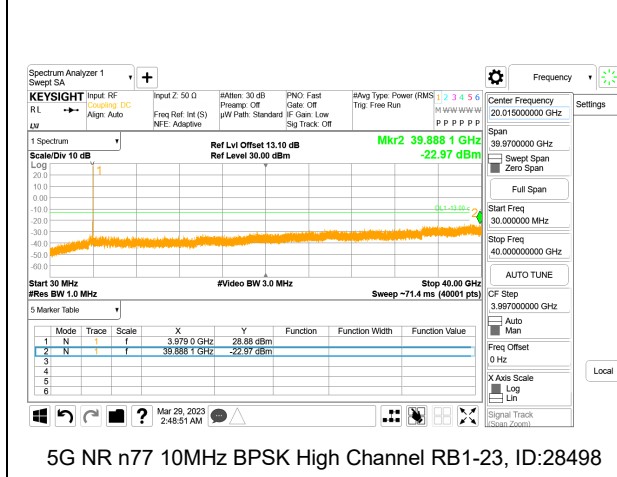
- (1) 3.7 GHz Service. The following emission limits apply to stations transmitting in the 3700-3980 MHz band:
- (2) For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz.



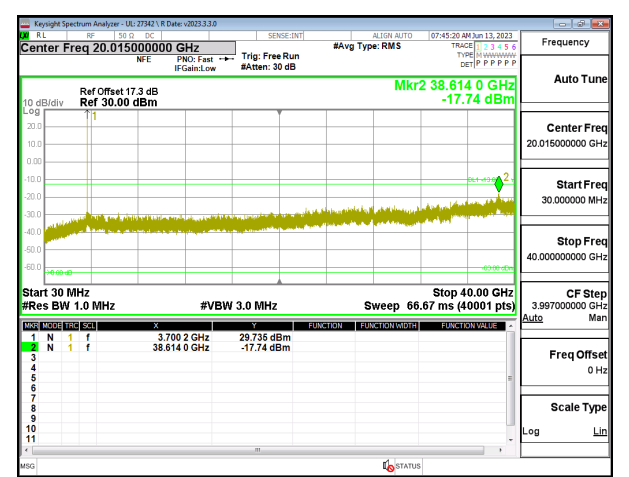
5G NR n77 10MHz BPSK Low Channel RB1-0



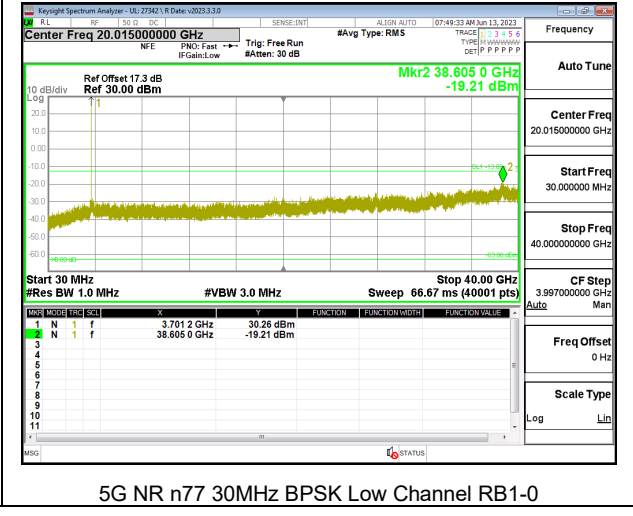
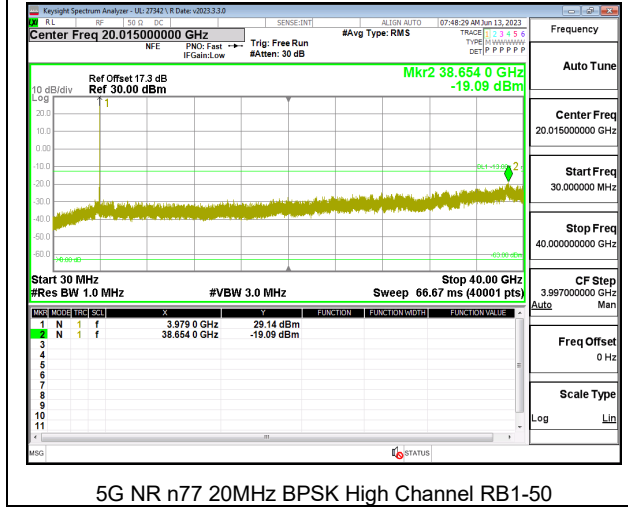
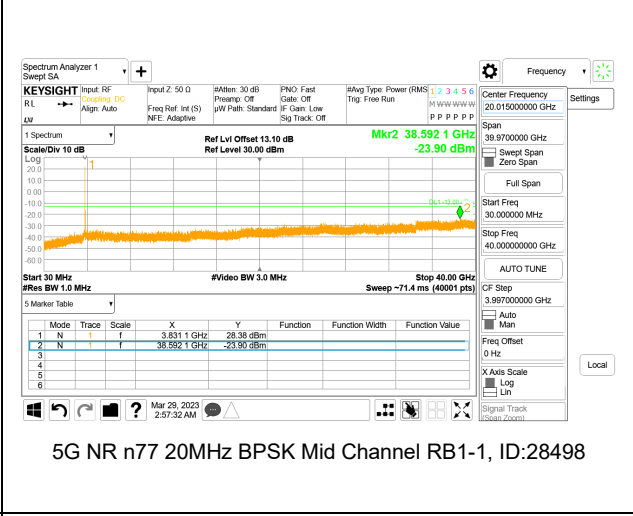
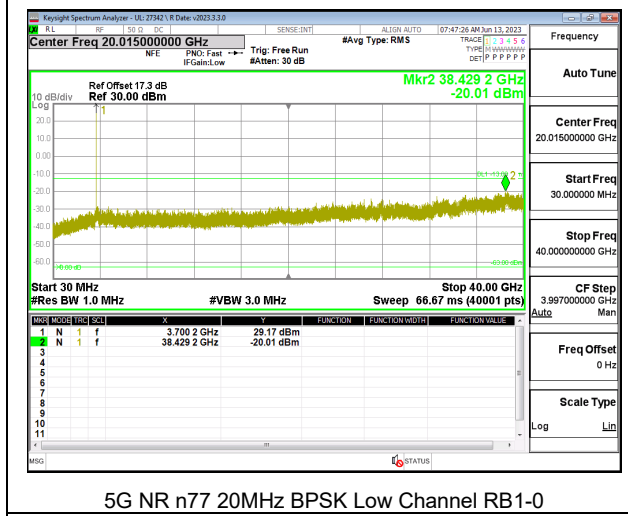
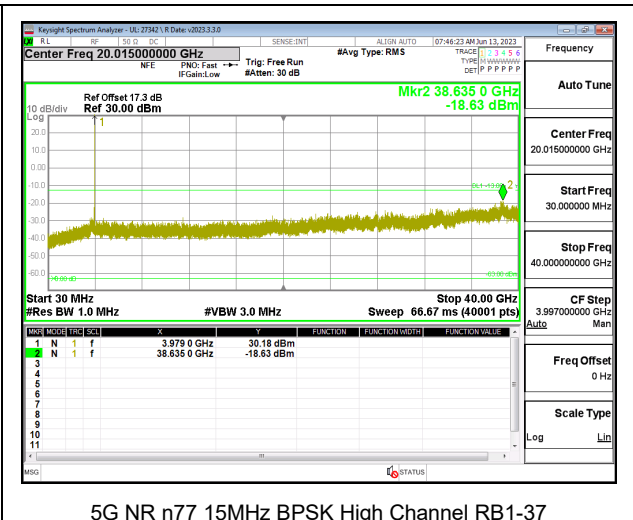
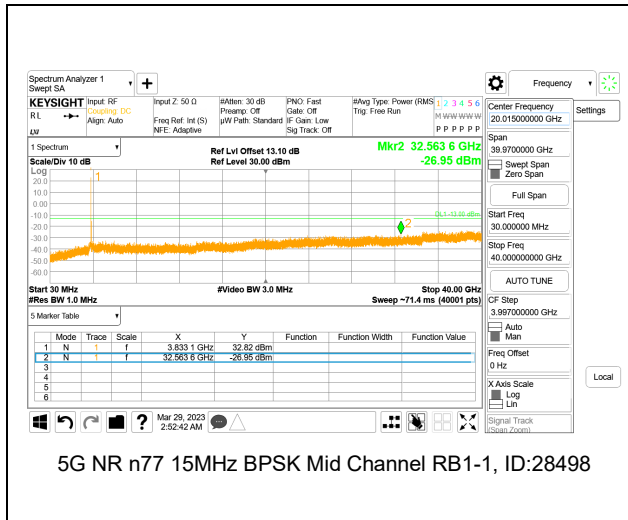
5G NR n77 10MHz BPSK Mid Channel RB1-1, ID:28498

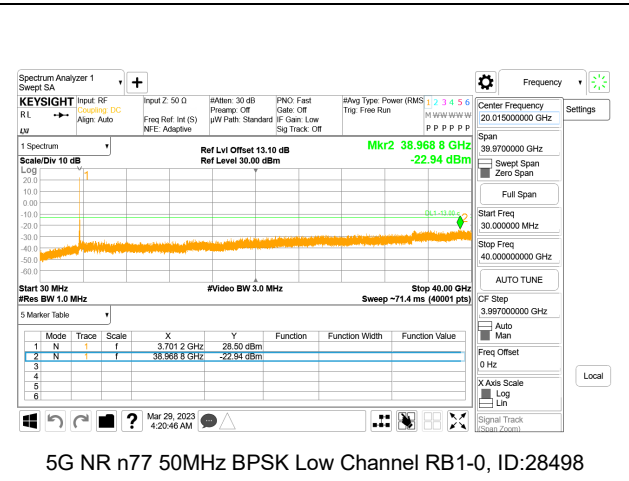
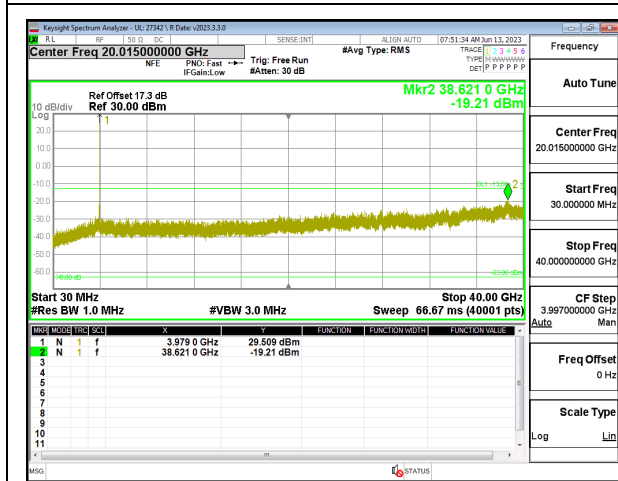
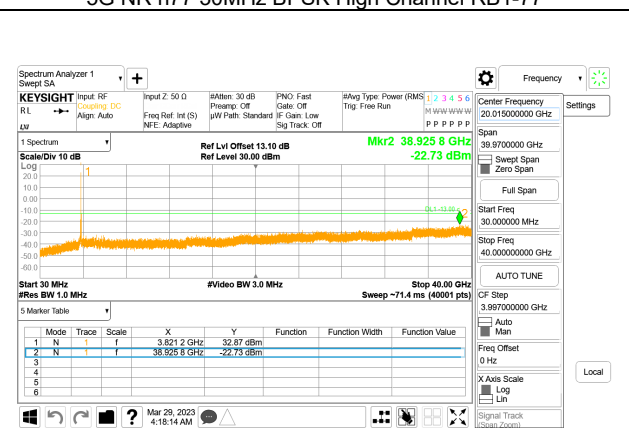
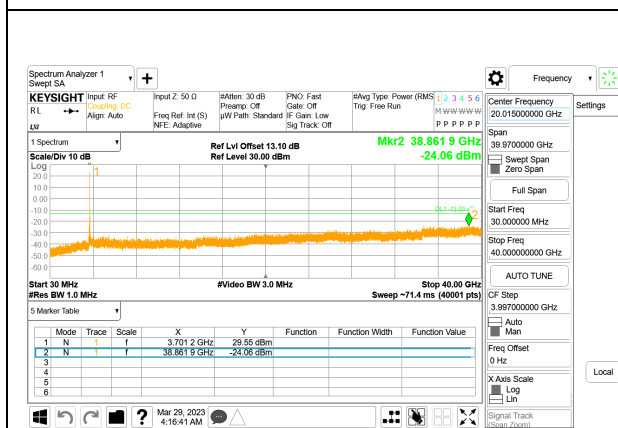
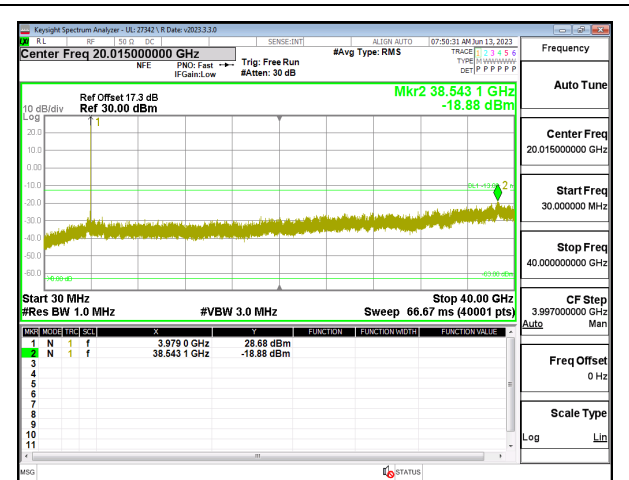
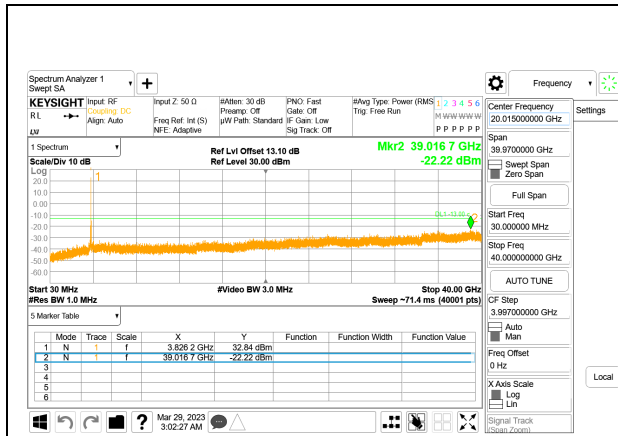


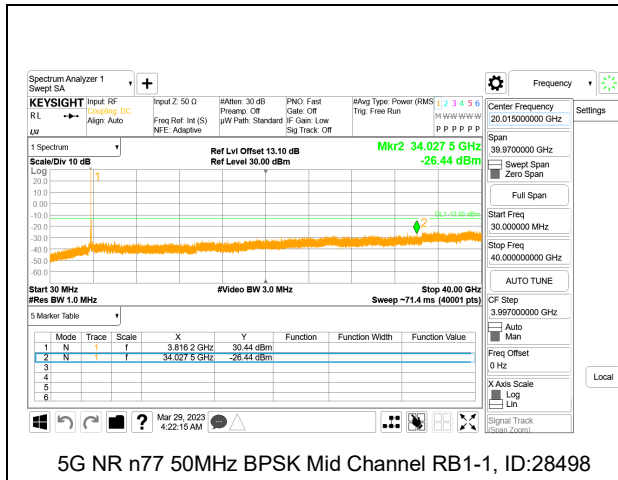
5G NR n77 10MHz BPSK High Channel RB1-23, ID:28498



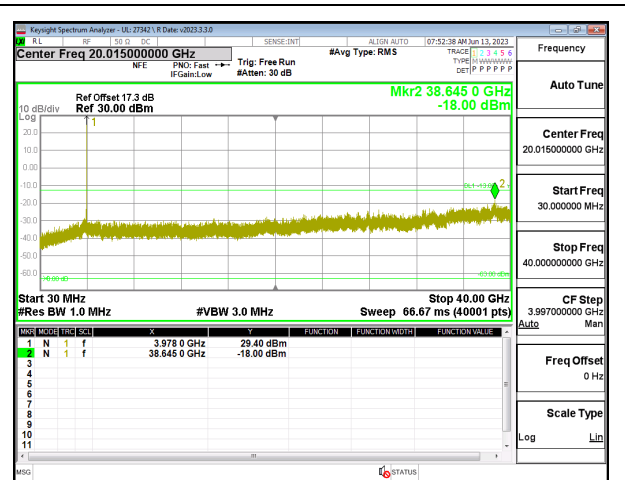
5G NR n77 15MHz BPSK Low Channel RB1-0



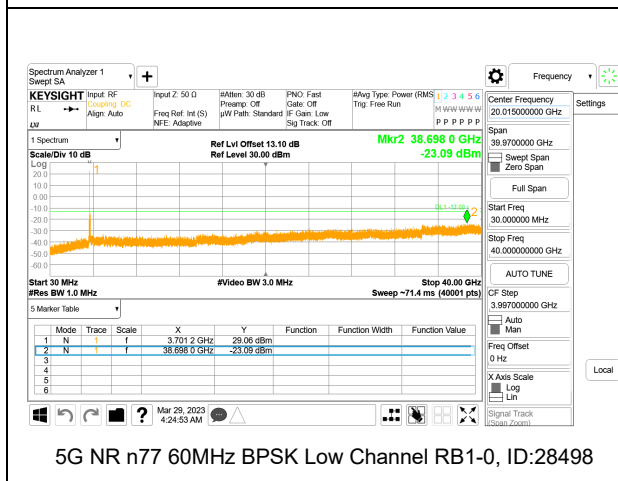




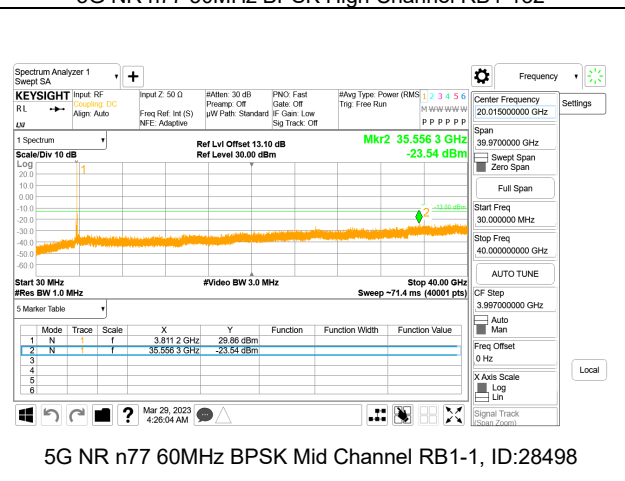
5G NR n77 50MHz BPSK Mid Channel RB1-1, ID:28498



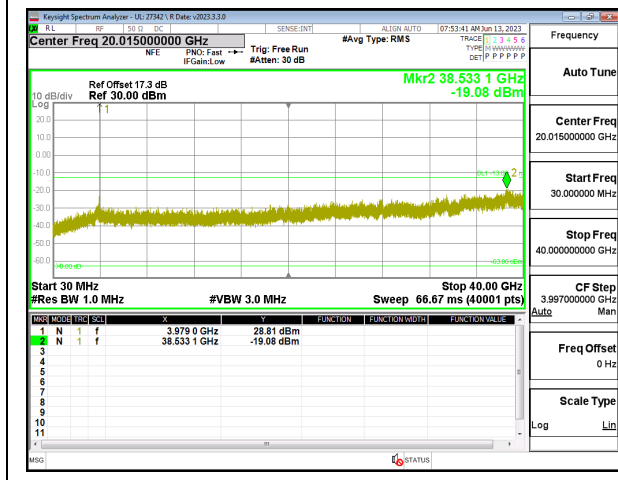
5G NR n77 50MHz BPSK High Channel RB1-132



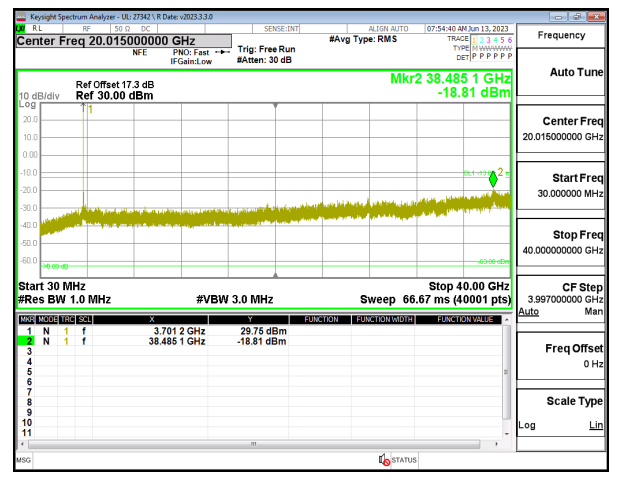
5G NR n77 60MHz BPSK Low Channel RB1-0, ID:28498



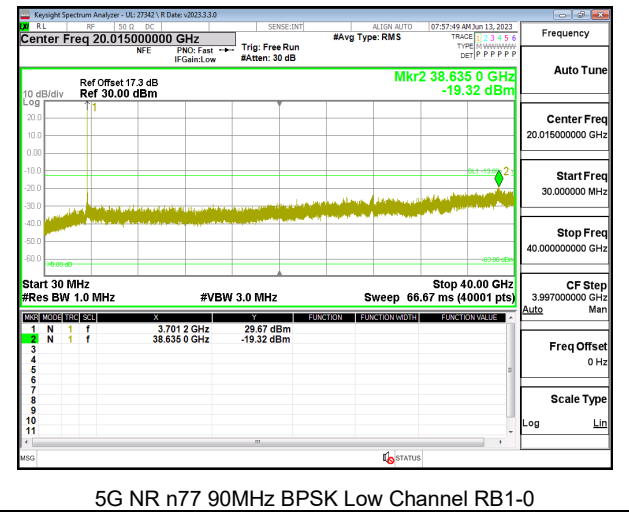
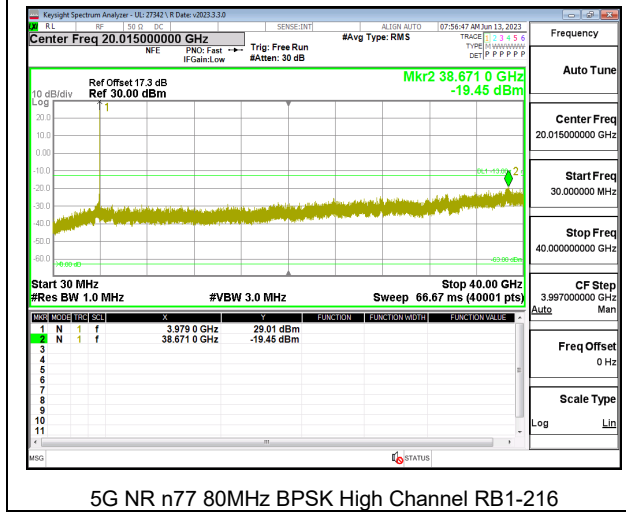
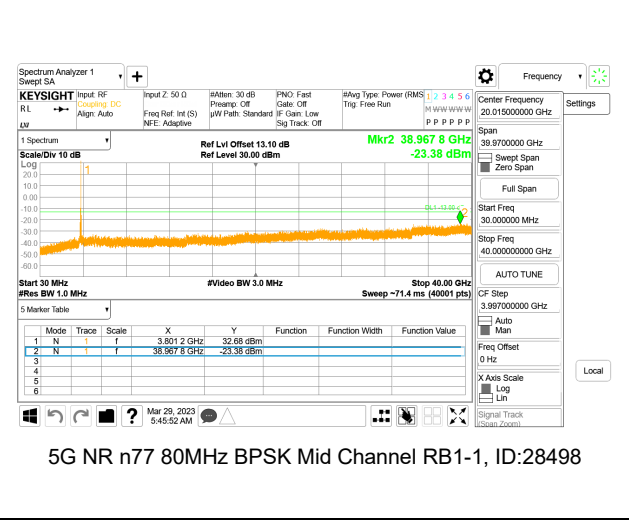
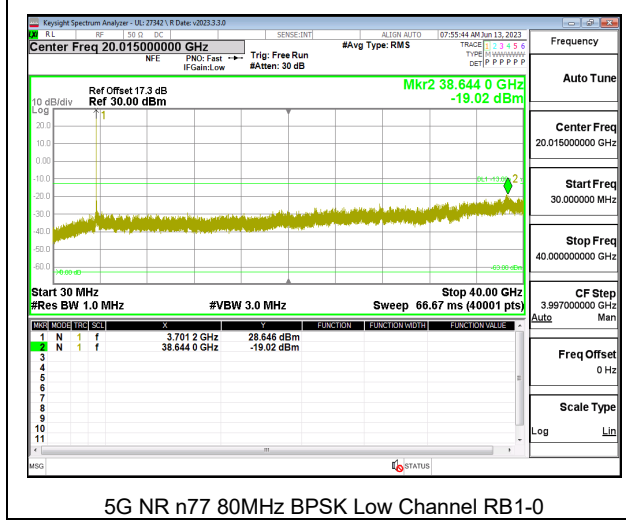
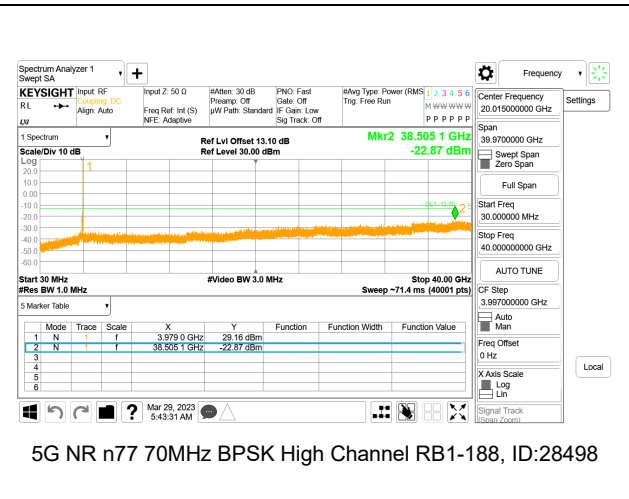
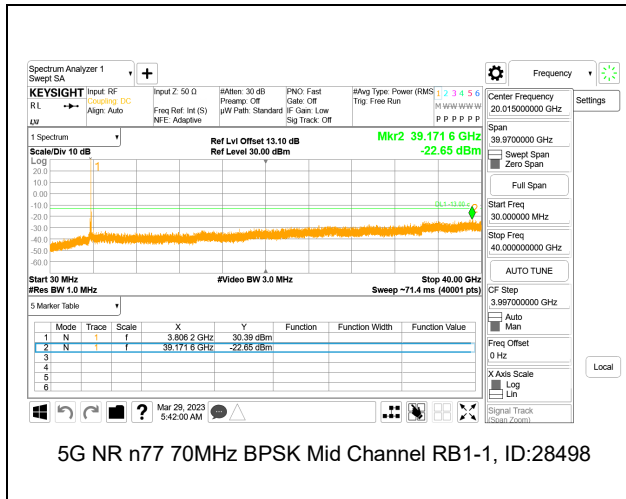
5G NR n77 60MHz BPSK Mid Channel RB1-1, ID:28498

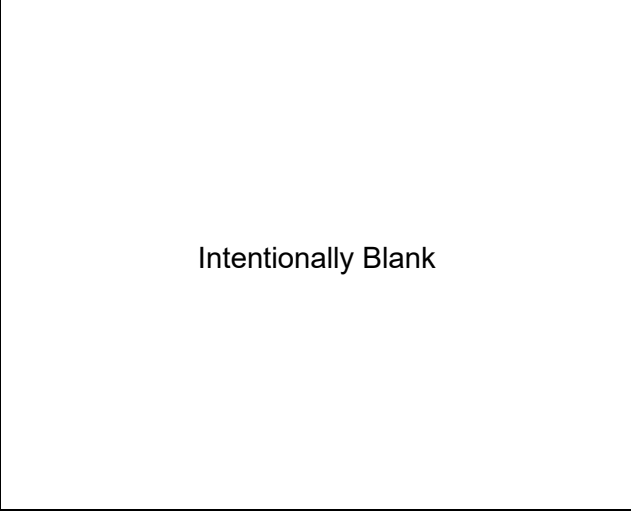
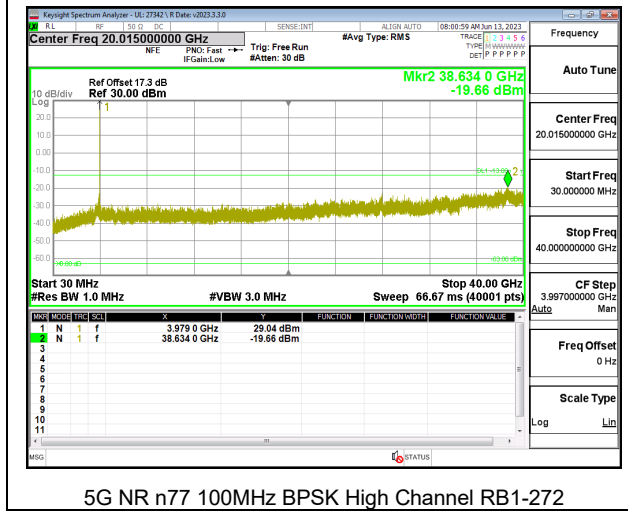
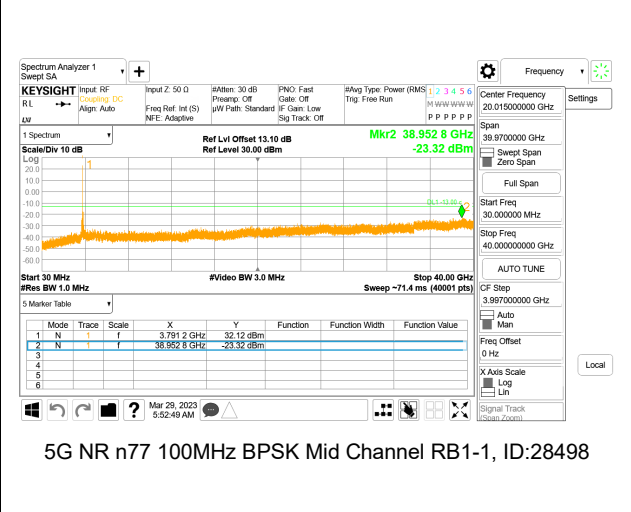
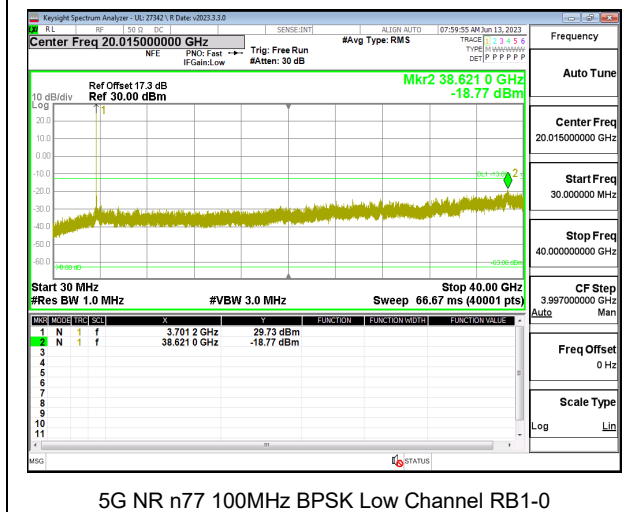
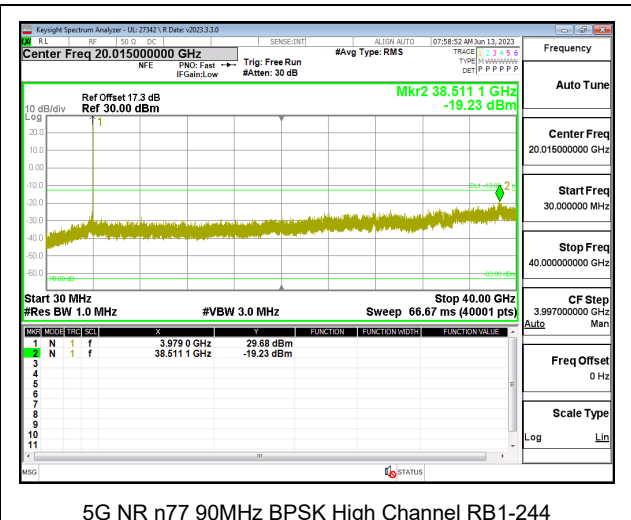
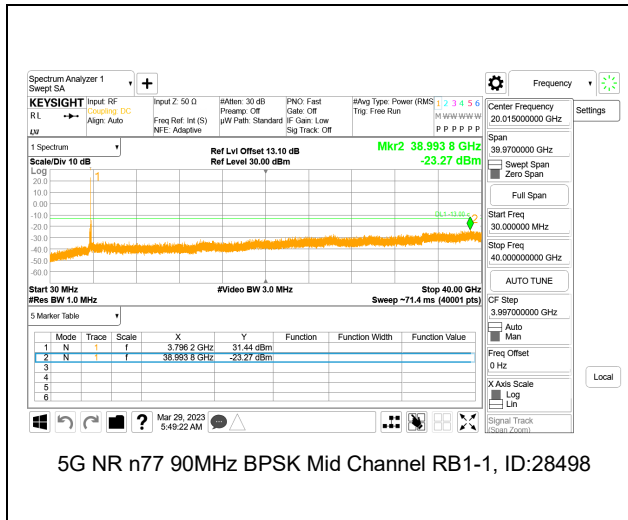


5G NR n77 60MHz BPSK High Channel RB1-161



5G NR n77 70MHz BPSK Low Channel RB1-0





9.4. FREQUENCY STABILITY

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = -30°C to +50°C
- Voltage = (85% - 115%)

Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC.
End Voltage, 2.95VDC.

Frequency Stability vs Temperature:

The EUT is placed inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50°C is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

RESULTS

See the following pages.

9.4.1. LTE BAND 7 AND 5G NR n7

LIMITS

FCC: §27.54

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

Test Engineer ID:	27342	Test Date:	3/16/2023
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LTE BAND 7 QPSK (20MHz BANDWIDTH)

Band	7	Frequency Range		Frequency Error Reading (Hz)	Limit	
		2500	2570		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Condition		Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Temperature	Voltage					
Normal (20°C)	Normal	2500.8250	2569.1850			
Extreme (50°C)		2500.8250	2569.1850	7.0	0.003	Yes
Extreme (40°C)		2500.8250	2569.1850	3.4	0.001	Yes
Extreme (30°C)		2500.8250	2569.1850	3.6	0.001	Yes
Extreme (10°C)		2500.8250	2569.1850	-5.3	-0.002	Yes
Extreme (0°C)		2500.8250	2569.1850	4.1	0.002	Yes
Extreme (-10°C)		2500.8250	2569.1850	3.1	0.001	Yes
Extreme (-20°C)		2500.8250	2569.1850	4.9	0.002	Yes
Extreme (-30°C)		2500.8250	2569.1850	2.2	0.001	Yes
20°C	15%	2500.8250	2569.1850	-3.0	-0.001	Yes
	-15%	2500.8250	2569.1850	-2.2	-0.001	Yes
	End Point Voltage	2500.8250	2569.1850	1.3	0.001	Yes

5G NR n7 BPSK (40MHz BANDWIDTH)

Band	7	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2500	2570		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Normal (20°C)	Normal	2499.5200	2570.4800			
Extreme (50°C)		2499.5200	2570.4800	-6.29	-0.002	Yes
Extreme (40°C)		2499.5200	2570.4800	-4.06	-0.002	Yes
Extreme (30°C)		2499.5200	2570.4800	-2.23	-0.001	Yes
Extreme (10°C)		2499.5200	2570.4800	-3.36	-0.001	Yes
Extreme (0°C)		2499.5200	2570.4800	-4.25	-0.002	Yes
Extreme (-10°C)		2499.5200	2570.4800	-4.58	-0.002	Yes
Extreme (-20°C)		2499.5200	2570.4800	-1.9	-0.001	Yes
Extreme (-30°C)		2499.5200	2570.4800	-7.39	-0.003	Yes
20°C	15%	2499.5200	2570.4800	-2.02	-0.001	Yes
	-15%	2499.5200	2570.4800	-8.87	-0.003	Yes
	End Point Voltage	2499.5200	2570.4800	-1.85	-0.001	Yes

9.4.2. LTE BAND 12 AND 5G NR n12

LIMITS

FCC: §27.54

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

Test Engineer ID:	27342	Test Date:	3/16/2023
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LTE BAND 12 QPSK (10MHz BANDWIDTH)

Band		12		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		699	716	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage							
Normal (20°C)	Normal	699.3975	715.6000					
Extreme (50°C)		699.3975	715.6000	1.8	0.003	Yes		
Extreme (40°C)		699.3975	715.6000	-2.1	-0.003	Yes		
Extreme (30°C)		699.3975	715.6000	-1.7	-0.002	Yes		
Extreme (10°C)		699.3975	715.6000	-2.4	-0.003	Yes		
Extreme (0°C)		699.3975	715.6000	0.3	0.000	Yes		
Extreme (-10°C)		699.3975	715.6000	-1.3	-0.002	Yes		
Extreme (-20°C)		699.3975	715.6000	1.7	0.002	Yes		
Extreme (-30°C)		699.3975	715.6000	1.9	0.003	Yes		
20°C		15%	699.3975	715.6000	1.5	0.002	Yes	
	-15%	699.3975	715.6000	-0.8	-0.001	Yes		
	End Point Voltage	699.3975	715.6000	0.6	0.001	Yes		

5G NR n12 BPSK (15MHz BANDWIDTH)

Band	12	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		699	716		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Normal (20°C)	Normal	699.1988	715.0388			
Extreme (50°C)		699.1988	715.0388	1.390	0.002	Yes
Extreme (40°C)		699.1988	715.0388	0.255	0.000	Yes
Extreme (30°C)		699.1988	715.0388	-0.820	-0.001	Yes
Extreme (10°C)		699.1988	715.0388	0.143	0.000	Yes
Extreme (0°C)		699.1988	715.0388	-0.412	-0.001	Yes
Extreme (-10°C)		699.1988	715.0388	1.040	0.001	Yes
Extreme (-20°C)		699.1988	715.0388	-0.943	-0.001	Yes
Extreme (-30°C)		699.1988	715.0388	-0.782	-0.001	Yes
20°C		15%	699.1988	715.0388	-2.370	-0.003
	-15%	699.1988	715.0388	-1.350	-0.002	Yes
	End Point Voltage	699.1988	715.0388	-1.280	-0.002	Yes

9.4.3. LTE BAND 13

LIMITS

FCC: §27.54

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

Test Engineer ID:	27342	Test Date:	3/16/2023
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QPSK (10MHz BANDWIDTH)

Band		13		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		777	787	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage							
Normal (20°C)	Normal	777.3700	786.5975					
Extreme (50°C)		777.3700	786.5975	0.3	0.000	Yes		
Extreme (40°C)		777.3700	786.5975	-1.2	-0.001	Yes		
Extreme (30°C)		777.3700	786.5975	1.5	0.002	Yes		
Extreme (10°C)		777.3700	786.5975	1.8	0.002	Yes		
Extreme (0°C)		777.3700	786.5975	0.6	0.001	Yes		
Extreme (-10°C)		777.3700	786.5975	-2.0	-0.003	Yes		
Extreme (-20°C)		777.3700	786.5975	-4.6	-0.006	Yes		
Extreme (-30°C)		777.3700	786.5975	1.8	0.002	Yes		
20°C	15%	777.3700	786.5975	1.9	0.002	Yes		
	-15%	777.3700	786.5975	3.0	0.004	Yes		
	End Point Voltage	777.3700	786.5975	0.2	0.000	Yes		

9.4.4. LTE BAND 14 AND 5G NR n14

LIMITS

FCC: §90.539

€ The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 ppm or better when AFC is locked to a base station, and 5 ppm or better when AFC is not locked.

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LTE BAND 14 QPSK (10MHz BANDWIDTH)

Band		14		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		788	798	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage							
Normal (20°C)	Normal	788.3950	797.5975					
Extreme (50°C)		788.3950	797.5975	0.2		0.000	Yes	
Extreme (40°C)		788.3950	797.5975	-1.4		-0.002	Yes	
Extreme (30°C)		788.3950	797.5975	-1.2		-0.002	Yes	
Extreme (10°C)		788.3950	797.5975	1.0		0.001	Yes	
Extreme (0°C)		788.3950	797.5975	-0.7		-0.001	Yes	
Extreme (-10°C)		788.3950	797.5975	-0.1		0.000	Yes	
Extreme (-20°C)		788.3950	797.5975	-1.5		-0.002	Yes	
Extreme (-30°C)		788.3950	797.5975	0.6		0.001	Yes	
20°C	15%	788.3950	797.5975	-0.2		0.000	Yes	
	-15%	788.3950	797.5975	1.1		0.001	Yes	
	End Point Voltage	788.3950	797.5975	0.5		0.001	Yes	

5G NR n14 BPSK (10MHz BANDWIDTH)

Band	14	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		788	798		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Normal (20°C)	Normal	787.5450	787.5250			
Extreme (50°C)		787.5450	787.5250	1.22	0.002	Yes
Extreme (40°C)		787.5450	787.5250	-1.31	-0.002	Yes
Extreme (30°C)		787.5450	787.5250	-0.686	-0.001	Yes
Extreme (10°C)		787.5450	787.5250	0.783	0.001	Yes
Extreme (0°C)		787.5450	787.5250	0.649	0.001	Yes
Extreme (-10°C)		787.5450	787.5250	-0.665	-0.001	Yes
Extreme (-20°C)		787.5450	787.5250	-0.545	-0.001	Yes
Extreme (-30°C)		787.5450	787.5250	-0.251	0.000	Yes
20°C	15%	787.5450	787.5250	-0.956	-0.001	Yes
	-15%	787.5450	787.5250	-0.61	-0.001	Yes
	End Point Voltage	787.5450	787.5250	-0.059	0.000	Yes

9.4.5. LTE BAND 17

LIMITS

FCC: §27.54

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

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QPSK (10MHz BANDWIDTH)

Band		17		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		704	716	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage							
Normal (20°C)	Normal	704.3875	715.6100					
Extreme (50°C)		704.3875	715.6100	0.2	0.000	Yes		
Extreme (40°C)		704.3875	715.6100	1.1	0.001	Yes		
Extreme (30°C)		704.3875	715.6100	-2.7	-0.004	Yes		
Extreme (10°C)		704.3875	715.6100	0.9	0.001	Yes		
Extreme (0°C)		704.3875	715.6100	1.1	0.002	Yes		
Extreme (-10°C)		704.3875	715.6100	2.0	0.003	Yes		
Extreme (-20°C)		704.3875	715.6100	2.9	0.004	Yes		
Extreme (-30°C)		704.3875	715.6100	-1.2	-0.002	Yes		
20°C	15%	704.3875	715.6100	-1.5	-0.002	Yes		
	-15%	704.3875	715.6100	-0.4	-0.001	Yes		
	End Point Voltage	704.3875	715.6100	-1.4	-0.002	Yes		

9.4.6. LTE BAND 25 AND 5G NR n25

LIMITS

FCC: §24.235

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

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LTE BAND 25 QPSK (20MHz BANDWIDTH)

Band	25		Frequency Range		Frequency Error Reading (Hz)	Limit	
	Condition		1850	1915		2.5	
Temperature	Voltage		Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal		1850.9200	1914.0950			
Extreme (50°C)			1850.9200	1914.0950	-1.0	-0.001	Yes
Extreme (40°C)			1850.9200	1914.0950	2.0	0.001	Yes
Extreme (30°C)			1850.9200	1914.0950	1.2	0.001	Yes
Extreme (10°C)			1850.9200	1914.0950	-6.8	-0.004	Yes
Extreme (0°C)			1850.9200	1914.0950	4.4	0.002	Yes
Extreme (-10°C)			1850.9200	1914.0950	2.5	0.001	Yes
Extreme (-20°C)			1850.9200	1914.0950	-6.5	-0.003	Yes
Extreme (-30°C)			1850.9200	1914.0950	1.5	0.001	Yes
20°C	15%		1850.9200	1914.0950	-3.7	-0.002	Yes
	-15%		1850.9200	1914.0950	-3.0	-0.002	Yes
	End Point Voltage		1850.9200	1914.0950	-3.7	-0.002	Yes

5G NR n25 BPSK (40MHz BANDWIDTH)

Band	25	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		1850	1915		2.5	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	
Normal (20°C)	Normal	1850.1900	1914.7500			
Extreme (50°C)		1850.1900	1914.7500	2.56	0.001	Yes
Extreme (40°C)		1850.1900	1914.7500	0.67	0.000	Yes
Extreme (30°C)		1850.1900	1914.7500	0.598	0.000	Yes
Extreme (10°C)		1850.1900	1914.7500	-2.08	-0.001	Yes
Extreme (0°C)		1850.1900	1914.7500	-1.57	-0.001	Yes
Extreme (-10°C)		1850.1900	1914.7500	-3.61	-0.002	Yes
Extreme (-20°C)		1850.1900	1914.7500	-6.01	-0.003	Yes
Extreme (-30°C)		1850.1900	1914.7500	-4.5	-0.002	Yes
20°C	15%	1850.1900	1914.7500	-4.74	-0.003	Yes
	-15%	1850.1900	1914.7500	-5.91	-0.003	Yes
	End Point Voltage	1850.1900	1914.7500	-4.58	-0.002	Yes

9.4.7. LTE BAND 26 AND 5G NR n26 (PART 90S)

LIMITS

FCC: §90.213

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

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LTE BAND 26 QPSK (10MHz BANDWIDTH)

Band	26	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		814	824		2.5	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	
Normal (20°C)	Normal	814.3925	823.6000			
Extreme (50°C)		814.3925	823.6000	1.1	0.001	Yes
Extreme (40°C)		814.3925	823.6000	-0.8	-0.001	Yes
Extreme (30°C)		814.3925	823.6000	1.5	0.002	Yes
Extreme (10°C)		814.3925	823.6000	0.1	0.000	Yes
Extreme (0°C)		814.3925	823.6000	1.4	0.002	Yes
Extreme (-10°C)		814.3925	823.6000	5.0	0.006	Yes
Extreme (-20°C)		814.3925	823.6000	3.1	0.004	Yes
Extreme (-30°C)		814.3925	823.6000	-0.1	0.000	Yes
20°C	15%	814.3925	823.6000	1.0	0.001	Yes
	-15%	814.3925	823.6000	0.6	0.001	Yes
	End Point Voltage	814.3925	823.6000	3.7	0.004	Yes

5G NR n26 BPSK (20MHz BANDWIDTH)

Band	26	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		814	824		2.5	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	
Normal (20°C)	Normal	814.0725	823.5350			
Extreme (50°C)		814.0725	823.5350	1.6	0.002	Yes
Extreme (40°C)		814.0725	823.5350	-3.38	-0.004	Yes
Extreme (30°C)		814.0725	823.5350	-3.8	-0.005	Yes
Extreme (10°C)		814.0725	823.5350	-4.05	-0.005	Yes
Extreme (0°C)		814.0725	823.5350	-3.64	-0.004	Yes
Extreme (-10°C)		814.0725	823.5350	-3.61	-0.004	Yes
Extreme (-20°C)		814.0725	823.5350	-3.61	-0.004	Yes
Extreme (-30°C)		814.0725	823.5350	-3.48	-0.004	Yes
20°C		15%	814.0725	823.5350	-3.87	-0.005
	-15%	814.0725	823.5350	-4.13	-0.005	Yes
	End Point Voltage	814.0725	823.5350	-2.36	-0.003	Yes

9.4.8. LTE BAND 26 AND 5G NR n26 (PART 22)

LIMITS

FCC: §22.355

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

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LTE BAND 26 QPSK (15MHz BANDWIDTH)

Band		26		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		824	849	2.5	Within Authorized Frequency Block (Hz)			
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)					
Normal (20°C)	Normal	824.3350	848.6725					
Extreme (50°C)		824.3350	848.6725	0.6	0.001	Yes		
Extreme (40°C)		824.3350	848.6725	-0.6	-0.001	Yes		
Extreme (30°C)		824.3350	848.6725	-2.0	-0.002	Yes		
Extreme (10°C)		824.3350	848.6725	0.5	0.001	Yes		
Extreme (0°C)		824.3350	848.6725	2.2	0.003	Yes		
Extreme (-10°C)		824.3350	848.6725	2.6	0.003	Yes		
Extreme (-20°C)		824.3350	848.6725	1.3	0.002	Yes		
Extreme (-30°C)		824.3350	848.6725	1.4	0.002	Yes		
20°C	15%	824.3350	848.6725	2.3	0.003	Yes		
	-15%	824.3350	848.6725	1.7	0.002	Yes		
	End Point Voltage	824.3350	848.6725	3.9	0.005	Yes		

5G NR n26 BPSK (20MHz BANDWIDTH)

Band	26	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		814	824		2.5	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	
Normal (20°C)	Normal	824.0900	848.5275			
Extreme (50°C)		824.0900	848.5275	2.33	0.003	Yes
Extreme (40°C)		824.0900	848.5275	0.862	0.001	Yes
Extreme (30°C)		824.0900	848.5275	-0.327	0.000	Yes
Extreme (10°C)		824.0900	848.5275	1.44	0.002	Yes
Extreme (0°C)		824.0900	848.5275	-0.561	-0.001	Yes
Extreme (-10°C)		824.0900	848.5275	-1.61	-0.002	Yes
Extreme (-20°C)		824.0900	848.5275	-1.52	-0.002	Yes
Extreme (-30°C)		824.0900	848.5275	-1.22	-0.001	Yes
20°C	15%	824.0900	848.5275	-0.902	-0.001	Yes
	-15%	824.0900	848.5275	0.666	0.001	Yes
	End Point Voltage	824.0900	848.5275	-1.07	-0.001	Yes

9.4.9. LTE BAND 30 AND 5G NR n30

LIMITS

FCC: §27.54

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

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LTE BAND 30 QPSK (10MHz BANDWIDTH)

Band		30		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2305	2315	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage							
Normal (20°C)	Normal	2305.3950	2314.6000					
Extreme (50°C)		2305.3950	2314.6000	-1.1	0.000	Yes		
Extreme (40°C)		2305.3950	2314.6000	6.3	0.003	Yes		
Extreme (30°C)		2305.3950	2314.6000	-0.1	0.000	Yes		
Extreme (10°C)		2305.3950	2314.6000	23.0	0.010	Yes		
Extreme (0°C)		2305.3950	2314.6000	-2.3	-0.001	Yes		
Extreme (-10°C)		2305.3950	2314.6000	1.5	0.001	Yes		
Extreme (-20°C)		2305.3950	2314.6000	-3.4	-0.001	Yes		
Extreme (-30°C)		2305.3950	2314.6000	5.4	0.002	Yes		
20°C		15%	2305.3950	2314.6000	2.8	0.001	Yes	
	-15%	2305.3950	2314.6000	-0.3	0.000	Yes		
	End Point Voltage	2305.3950	2314.6000	5.8	0.002	Yes		

5G NR n30 BPSK (10MHz BANDWIDTH)

Band	30	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2305	2315		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Normal (20°C)	Normal	2305.2100	2314.4125			
Extreme (50°C)		2305.2100	2314.4125	-5.44	-0.002	Yes
Extreme (40°C)		2305.2100	2314.4125	-8.55	-0.004	Yes
Extreme (30°C)		2305.2100	2314.4125	-6.35	-0.003	Yes
Extreme (10°C)		2305.2100	2314.4125	-5.18	-0.002	Yes
Extreme (0°C)		2305.2100	2314.4125	-5.1	-0.002	Yes
Extreme (-10°C)		2305.2100	2314.4125	-8.1	-0.004	Yes
Extreme (-20°C)		2305.2100	2314.4125	-1.98	-0.001	Yes
Extreme (-30°C)		2305.2100	2314.4125	-7.38	-0.003	Yes
20°C	15%	2305.2100	2314.4125	-2.13	-0.001	Yes
	-15%	2305.2100	2314.4125	-6.56	-0.003	Yes
	End Point Voltage	2305.2100	2314.4125	-8.52	-0.004	Yes

9.4.10. LTE BAND 41 AND 5G NR n41

LIMITS

FCC: §27.54

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

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LTE BAND 41 QPSK (20MHz BANDWIDTH)

Band		41		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2496	2690	0	Within Authorized Frequency Block (Hz)			
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)					
Normal (20°C)	Normal	2496.8700	2689.1350					
Extreme (50°C)		2496.8700	2689.1350	-1.5	-0.001	Yes		
Extreme (40°C)		2496.8700	2689.1350	-2.2	-0.001	Yes		
Extreme (30°C)		2496.8700	2689.1350	-2.9	-0.001	Yes		
Extreme (10°C)		2496.8700	2689.1350	-3.1	-0.001	Yes		
Extreme (0°C)		2496.8700	2689.1350	-2.3	-0.001	Yes		
Extreme (-10°C)		2496.8700	2689.1350	-5.5	-0.002	Yes		
Extreme (-20°C)		2496.8700	2689.1350	-3.7	-0.001	Yes		
Extreme (-30°C)		2496.8700	2689.1350	-6.6	-0.003	Yes		
20°C	15%	2496.8700	2689.1350	-2.4	-0.001	Yes		
	-15%	2496.8700	2689.1350	-1.4	-0.001	Yes		
	End Point Voltage	2496.8700	2689.1350	-4.2	-0.002	Yes		

5G NR n41 BPSK (100MHz BANDWIDTH)

Band	41	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2496	2690		0	
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	2495.8750	2689.0500			
Extreme (50°C)		2495.8750	2689.0500	-5.42	-0.002	Yes
Extreme (40°C)		2495.8750	2689.0500	-4.31	-0.002	Yes
Extreme (30°C)		2495.8750	2689.0500	-8.82	-0.003	Yes
Extreme (10°C)		2495.8750	2689.0500	-8.73	-0.003	Yes
Extreme (0°C)		2495.8750	2689.0500	-4.06	-0.002	Yes
Extreme (-10°C)		2495.8750	2689.0500	-5.64	-0.002	Yes
Extreme (-20°C)		2495.8750	2689.0500	-5.45	-0.002	Yes
Extreme (-30°C)		2495.8750	2689.0500	-6.94	-0.003	Yes
20°C	15%	2495.8750	2689.0500	-9.51	-0.004	Yes
	-15%	2495.8750	2689.0500	-5.33	-0.002	Yes
	End Point Voltage	2495.8750	2689.0500	-10.6	-0.004	Yes

9.4.11. LTE BAND 48 AND 5G NR n48

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LTE BAND 48 QPSK (20MHz BANDWIDTH)

Band		48		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		3550	3700	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage							
Normal (20°C)	Normal	3550.8500	3699.1650					
Extreme (50°C)		3550.8500	3699.1650	7.7	0.002	Yes		
Extreme (40°C)		3550.8500	3699.1650	5.9	0.002	Yes		
Extreme (30°C)		3550.8500	3699.1650	-11.1	-0.003	Yes		
Extreme (10°C)		3550.8500	3699.1650	-0.6	0.000	Yes		
Extreme (0°C)		3550.8500	3699.1650	-0.2	0.000	Yes		
Extreme (-10°C)		3550.8500	3699.1650	-3.0	-0.001	Yes		
Extreme (-20°C)		3550.8500	3699.1650	-0.7	0.000	Yes		
Extreme (-30°C)		3550.8500	3699.1650	6.2	0.002	Yes		
20°C		15%	3550.8500	3699.1650	-2.3	-0.001	Yes	
	-15%	3550.8500	3699.1650	-0.9	0.000	Yes		
	End Point Voltage	3550.8500	3699.1650	-0.9	0.000	Yes		

5G NR n48 BPSK (40MHz BANDWIDTH)

Band	48	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		3550	3700		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Normal (20°C)	Normal	3549.8200	3698.0100			
Extreme (50°C)		3549.8200	3698.0100	-1.67	0.000	Yes
Extreme (40°C)		3549.8200	3698.0100	-1.3	0.000	Yes
Extreme (30°C)		3549.8200	3698.0100	-4.12	-0.001	Yes
Extreme (10°C)		3549.8200	3698.0100	-5.66	-0.002	Yes
Extreme (0°C)		3549.8200	3698.0100	-7.63	-0.002	Yes
Extreme (-10°C)		3549.8200	3698.0100	-6.74	-0.002	Yes
Extreme (-20°C)		3549.8200	3698.0100	-2.47	-0.001	Yes
Extreme (-30°C)		3549.8200	3698.0100	-2.32	-0.001	Yes
20°C	15%	3549.8200	3698.0100	-5.84	-0.002	Yes
	-15%	3549.8200	3698.0100	-9.26	-0.003	Yes
	End Point Voltage	3549.8200	3698.0100	1.25	0.000	Yes

9.4.12. LTE BAND 66 AND 5G NR n66

LIMITS

FCC: §27.54

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

Test Engineer ID:	27342	Test Date:	3/16/2023
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LTE BAND 66 QPSK (20MHz BANDWIDTH)

Band	66	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		1710	1780		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Normal (20°C)	Normal	1710.8050	1779.1900			
Extreme (50°C)		1710.8050	1779.1900	-4.7	-0.003	Yes
Extreme (40°C)		1710.8050	1779.1900	-1.0	-0.001	Yes
Extreme (30°C)		1710.8050	1779.1900	-0.4	0.000	Yes
Extreme (10°C)		1710.8050	1779.1900	-2.9	-0.002	Yes
Extreme (0°C)		1710.8050	1779.1900	1.3	0.001	Yes
Extreme (-10°C)		1710.8050	1779.1900	3.0	0.002	Yes
Extreme (-20°C)		1710.8050	1779.1900	0.5	0.000	Yes
Extreme (-30°C)		1710.8050	1779.1900	-5.4	-0.003	Yes
20°C		15%	1710.8050	1779.1900	-5.4	-0.003
	-15%	1710.8050	1779.1900	-0.4	0.000	Yes
	End Point Voltage	1710.8050	1779.1900	-0.9	0.000	Yes

5G NR n66 BPSK (40MHz BANDWIDTH)

Band	66	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		1710	1780		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Normal (20°C)	Normal	1709.3400	1780.5500			
Extreme (50°C)		1709.3400	1780.5500	-3.31	-0.002	Yes
Extreme (40°C)		1709.3400	1780.5500	-4.24	-0.002	Yes
Extreme (30°C)		1709.3400	1780.5500	-8.21	-0.005	Yes
Extreme (10°C)		1709.3400	1780.5500	-3.65	-0.002	Yes
Extreme (0°C)		1709.3400	1780.5500	-5.98	-0.003	Yes
Extreme (-10°C)		1709.3400	1780.5500	-2.85	-0.002	Yes
Extreme (-20°C)		1709.3400	1780.5500	-3.75	-0.002	Yes
Extreme (-30°C)		1709.3400	1780.5500	-4.66	-0.003	Yes
20°C	15%	1709.3400	1780.5500	-5.79	-0.003	Yes
	-15%	1709.3400	1780.5500	-3.98	-0.002	Yes
	End Point Voltage	1709.3400	1780.5500	-4.66	-0.003	Yes

9.4.13. 5G NR n70

LIMITS

FCC: §27.54

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

Test Engineer ID:	27342	Test Date:	3/16/2023
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5G NR n70 BPSK (15MHz BANDWIDTH)

Band		70		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		1695	1710	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage							
Normal (20°C)	Normal	1694.6888	1709.6550					
Extreme (50°C)		1694.6888	1709.6550	-6.7	-0.004	Yes		
Extreme (40°C)		1694.6888	1709.6550	-4.72	-0.003	Yes		
Extreme (30°C)		1694.6888	1709.6550	-2.05	-0.001	Yes		
Extreme (10°C)		1694.6888	1709.6550	-4.25	-0.002	Yes		
Extreme (0°C)		1694.6888	1709.6550	-2.78	-0.002	Yes		
Extreme (-10°C)		1694.6888	1709.6550	-4.19	-0.002	Yes		
Extreme (-20°C)		1694.6888	1709.6550	-3.14	-0.002	Yes		
Extreme (-30°C)		1694.6888	1709.6550	-5.01	-0.003	Yes		
20°C	15%	1694.6888	1709.6550	-4.22	-0.002	Yes		
	-15%	1694.6888	1709.6550	-5.06	-0.003	Yes		
	End Point Voltage	1694.6888	1709.6550	-1.7	-0.001	Yes		

9.4.14. LTE BAND 71 AND 5G NR n71

LIMITS

FCC: §27.54

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

Test Engineer ID:	27342	Test Date:	3/16/2023
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LTE BAND 71 QPSK (20MHz BANDWIDTH)

Band	71	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		663	698		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Normal (20°C)	Normal	663.8300	697.1850			
Extreme (50°C)		663.8300	697.1850	2.3	0.003	Yes
Extreme (40°C)		663.8300	697.1850	1.7	0.003	Yes
Extreme (30°C)		663.8300	697.1850	0.8	0.001	Yes
Extreme (10°C)		663.8300	697.1850	-2.3	-0.003	Yes
Extreme (0°C)		663.8300	697.1850	-0.9	-0.001	Yes
Extreme (-10°C)		663.8300	697.1850	0.3	0.000	Yes
Extreme (-20°C)		663.8300	697.1850	0.1	0.000	Yes
Extreme (-30°C)		663.8300	697.1850	2.4	0.004	Yes
20°C	15%	663.8300	697.1850	1.8	0.003	Yes
	-15%	663.8300	697.1850	-1.9	-0.003	Yes
	End Point Voltage	663.8300	697.1850	-1.5	-0.002	Yes

5G NR n71 BPSK (20MHz BANDWIDTH)

Band	71	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		663	698		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Normal (20°C)	Normal	657.2150	689.1350			
Extreme (50°C)		657.2150	689.1350	1.42	0.002	Yes
Extreme (40°C)		657.2150	689.1350	0.977	0.001	Yes
Extreme (30°C)		657.2150	689.1350	-4.98	-0.007	Yes
Extreme (10°C)		657.2150	689.1350	-4.16	-0.006	Yes
Extreme (0°C)		657.2150	689.1350	-5.53	-0.008	Yes
Extreme (-10°C)		657.2150	689.1350	-3.5	-0.005	Yes
Extreme (-20°C)		657.2150	689.1350	-4.65	-0.007	Yes
Extreme (-30°C)		657.2150	689.1350	-4.55	-0.007	Yes
20°C		15%	657.2150	689.1350	-0.088	0.000
	-15%	657.2150	689.1350	1.08	0.002	Yes
	End Point Voltage	657.2150	689.1350	-1.01	-0.001	Yes

9.4.15. 5G NR n77 (Part 27 3450-3550MHz)

LIMITS

FCC: §27.54

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

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5G NR n77 BPSK (100MHz BANDWIDTH)

Band	77	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		3450	3550		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)			
Normal (20°C)	Normal	3449.7750	3549.1000			
Extreme (50°C)		3449.7750	3549.1000	-6.9	-0.002	Yes
Extreme (40°C)		3449.7750	3549.1000	-9.32	-0.003	Yes
Extreme (30°C)		3449.7750	3549.1000	-5.19	-0.001	Yes
Extreme (10°C)		3449.7750	3549.1000	-10.84	-0.003	Yes
Extreme (0°C)		3449.7750	3549.1000	-12.73	-0.004	Yes
Extreme (-10°C)		3449.7750	3549.1000	-13.38	-0.004	Yes
Extreme (-20°C)		3449.7750	3549.1000	-14.82	-0.004	Yes
Extreme (-30°C)		3449.7750	3549.1000	-6.52	-0.002	Yes
20°C	15%	3449.7750	3549.1000	-4.92	-0.001	Yes
	-15%	3449.7750	3549.1000	-6.84	-0.002	Yes
	End Point Voltage	3449.7750	3549.1000	-4.5	-0.001	Yes

9.4.16. 5G NR n77 (Part 27 3700-3980MHz)

LIMITS

FCC: §27.54

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

Test Engineer ID:	27342	Test Date:	3/16/2023
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5G NR n77 BPSK (100MHz BANDWIDTH)

Band		77		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		3700	3980	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage							
Normal (20°C)	Normal	3699.7500	3979.1500					
Extreme (50°C)		3699.7500	3979.1500	-13.25	-0.003	Yes		
Extreme (40°C)		3699.7500	3979.1500	-8.03	-0.002	Yes		
Extreme (30°C)		3699.7500	3979.1500	-6.99	-0.002	Yes		
Extreme (10°C)		3699.7500	3979.1500	-5.72	-0.001	Yes		
Extreme (0°C)		3699.7500	3979.1500	-9.35	-0.002	Yes		
Extreme (-10°C)		3699.7500	3979.1500	-7.13	-0.002	Yes		
Extreme (-20°C)		3699.7500	3979.1500	-6.71	-0.002	Yes		
Extreme (-30°C)		3699.7500	3979.1500	-8.13	-0.002	Yes		
20°C	15%	3699.7500	3979.1500	-14.93	-0.004	Yes		
	-15%	3699.7500	3979.1500	-14.28	-0.004	Yes		
	End Point Voltage	3699.7500	3979.1500	-1.62	0.000	Yes		

9.5. PEAK-TO-AVERAGE POWER RATIO

LIMIT

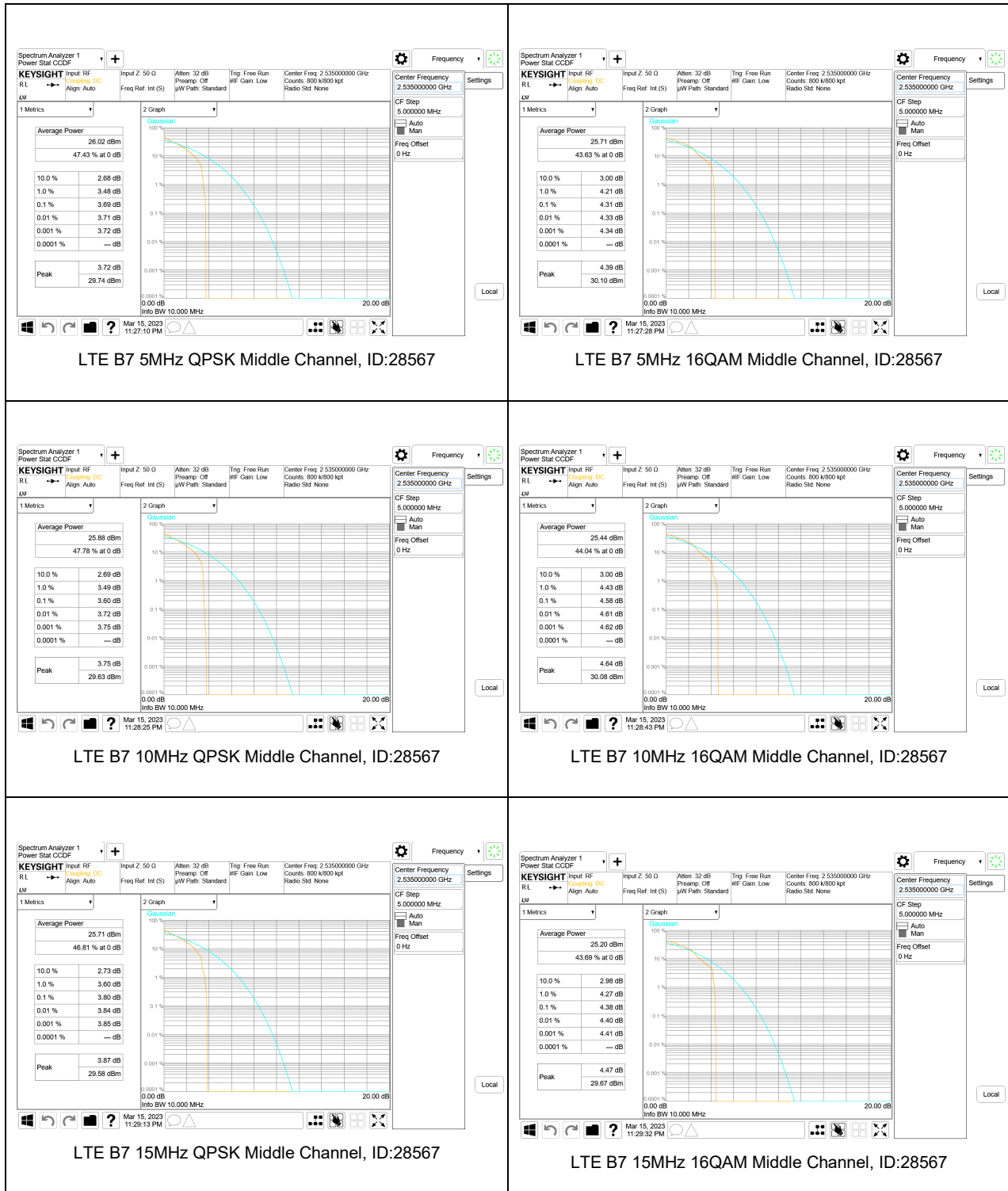
In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

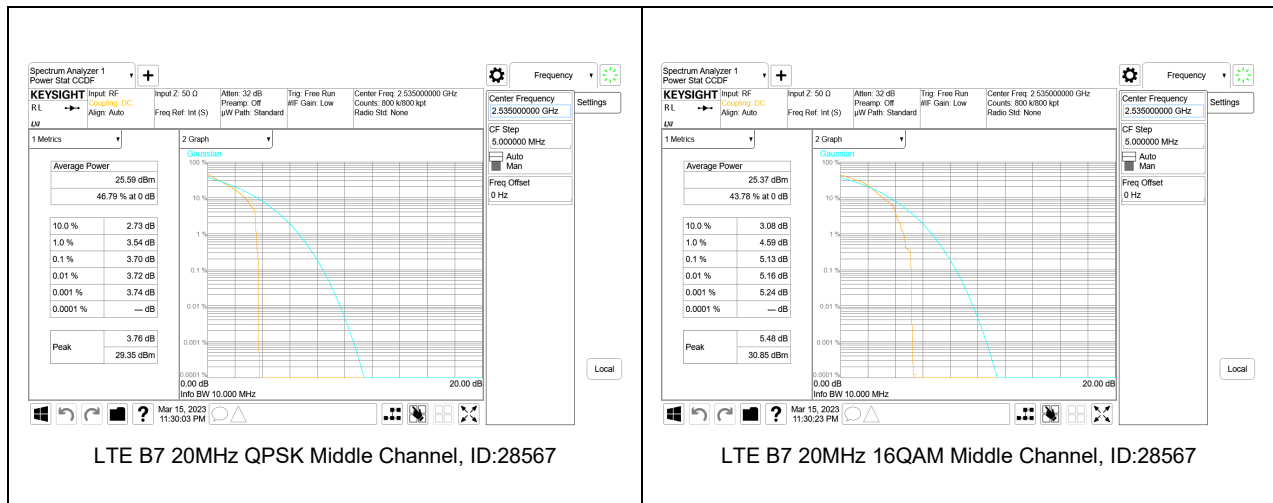
RESULT

Antenna 1 was used to measure as the worst case; full resource block (FRB) for each bandwidth was used to measure as the worst case. The results from all CCDF measurements are passed with 13dB peak-to-average power ratio criteria.

9.5.1. LTE BAND 7 AND 5G NR n7

LTE BAND 7





5G NR n7

Test Engineer ID:	27342	Test Date:	3/22/2023
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