













8.3. OUT OF BAND EMISSIONS

LIMITS

FCC: §27.53 (m)

The minimum permissible attenuation level of any spurious emissions is $55 + 10 \log (P)$ dB where transmitting power (P) in Watts.

RSS199§5.6

The minimum permissible attenuation level of any spurious emissions is $55 + 10 \log (P)$ dB where transmitting power (P) in Watts.

TEST PROCEDURE

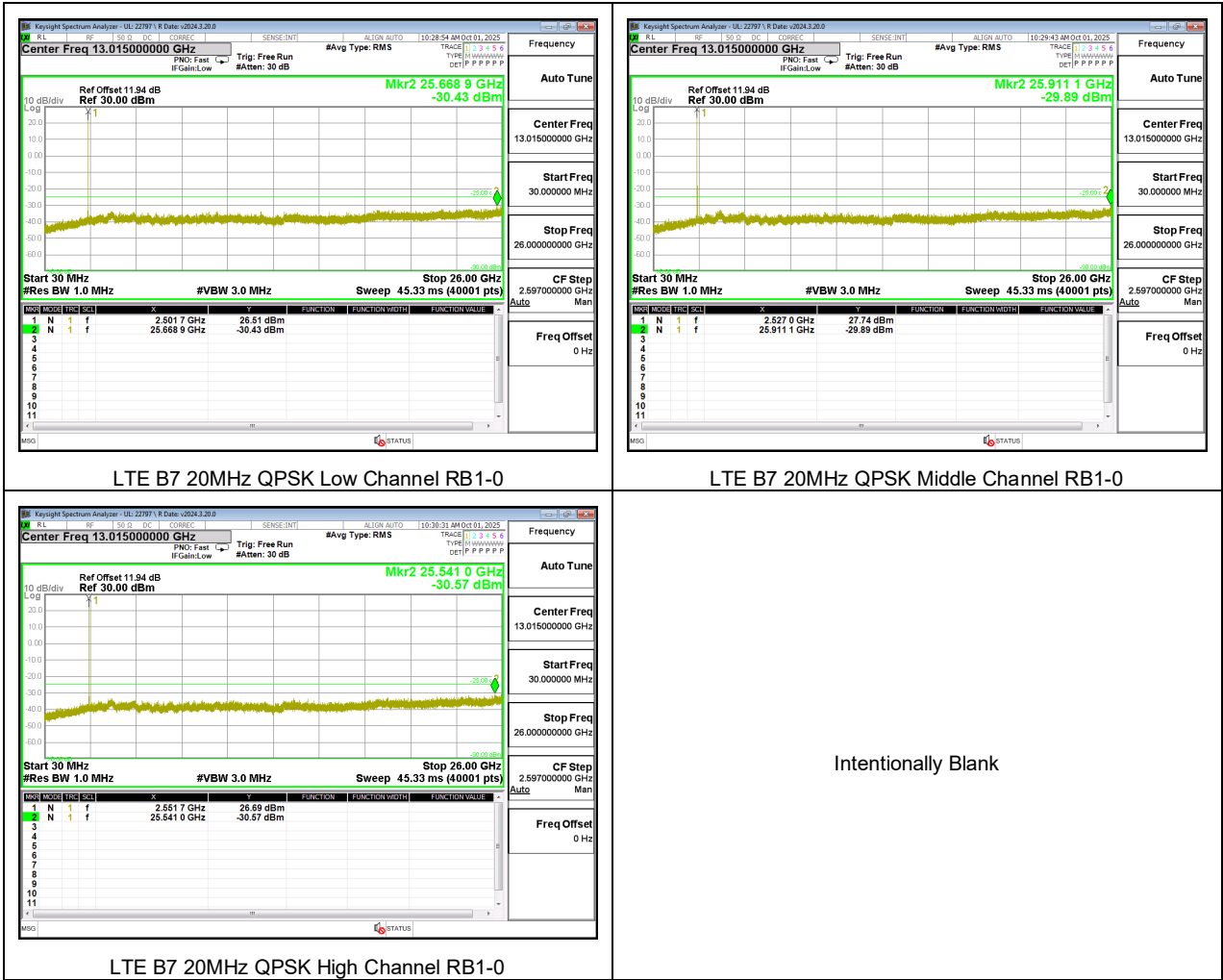
The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case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

For each out of band emissions measurement:

- Set display line at -25dBm according to the band Limit
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.
(NOTE: Worst-case set RBW/VBW to 1MHz/3MHz)

RESULTS

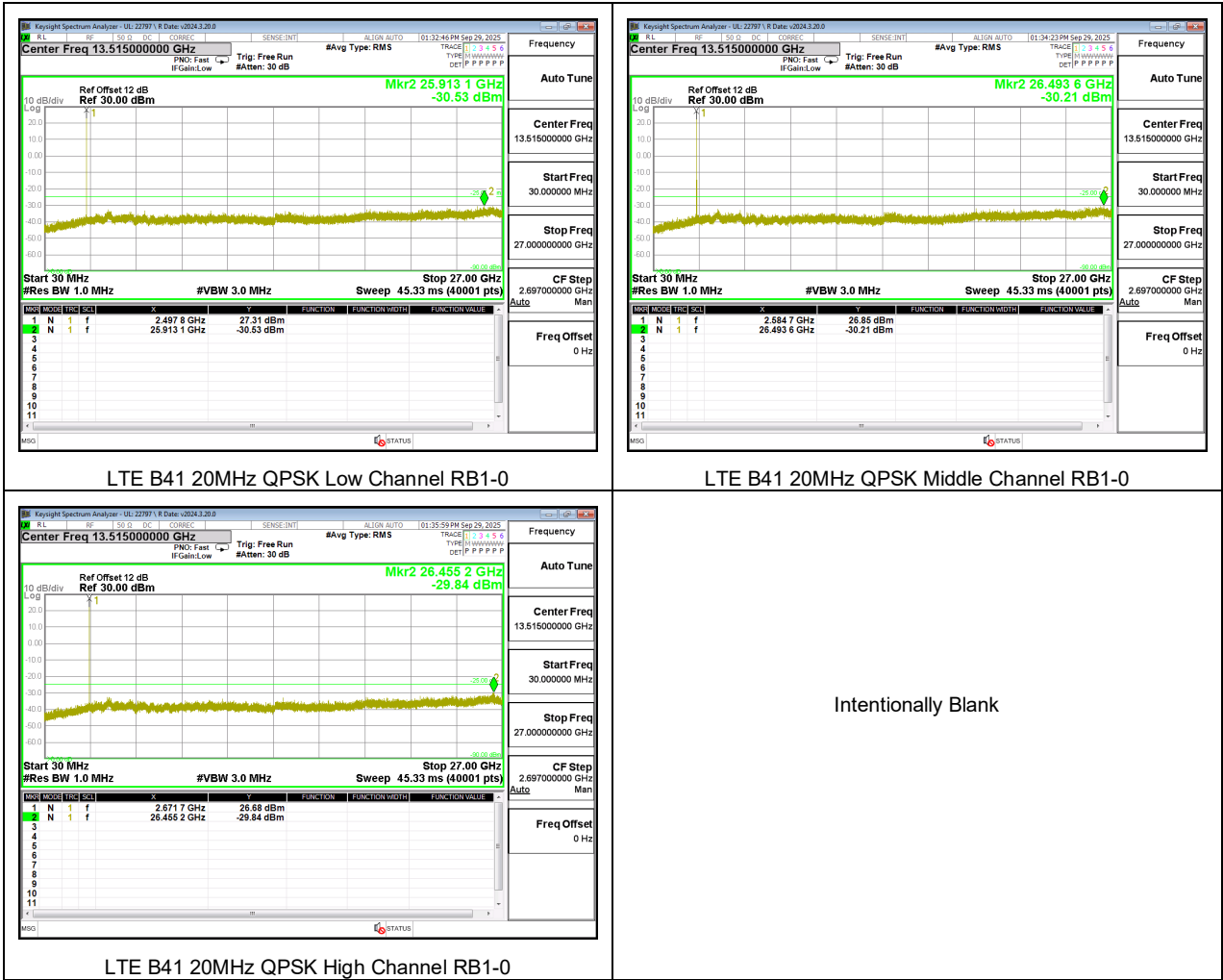
8.3.1. LTE BAND 7



8.3.2. 5G NR n7



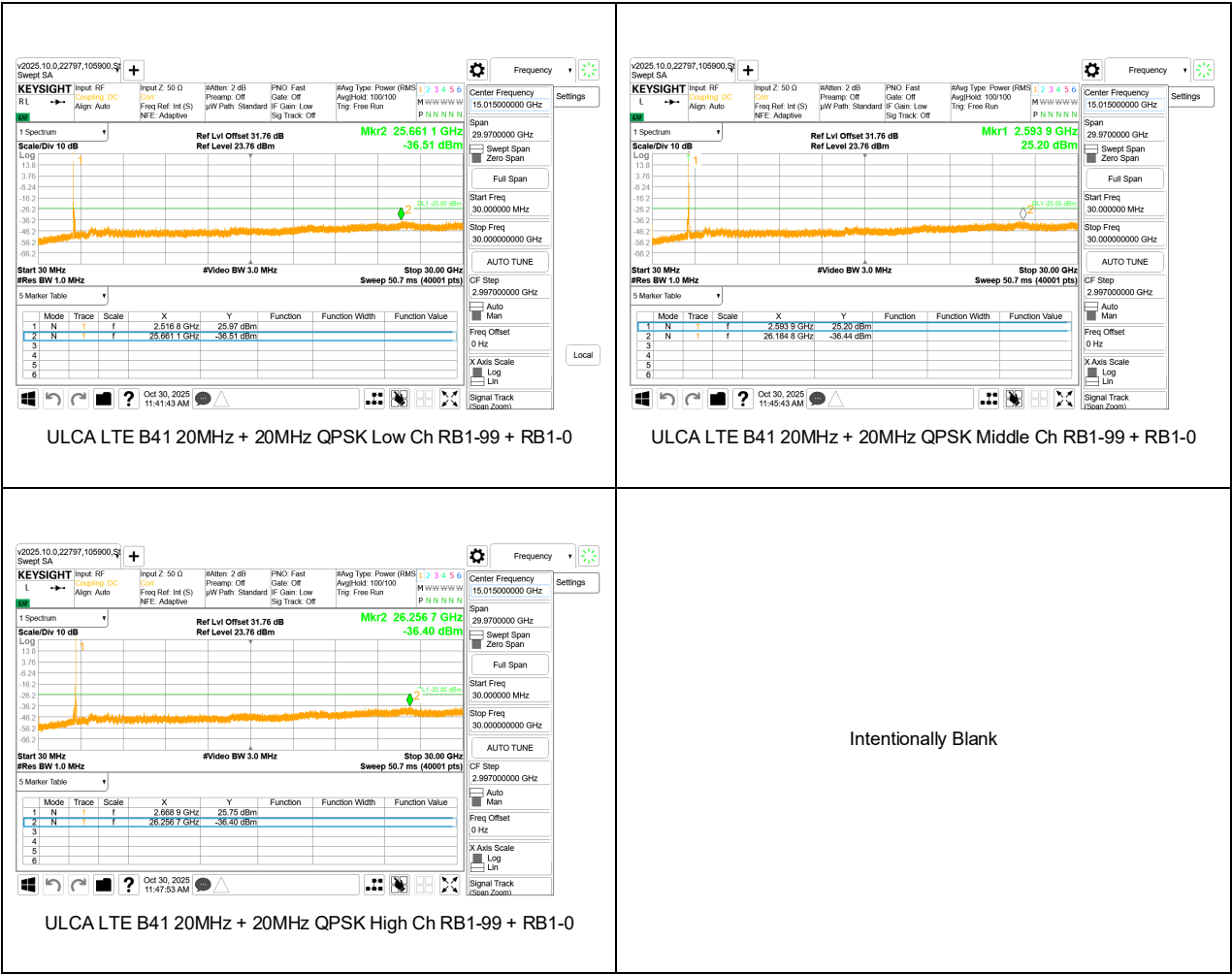
8.3.3. LTE BAND 41 (FCC)



8.3.4. 5G NR n41 (FCC)



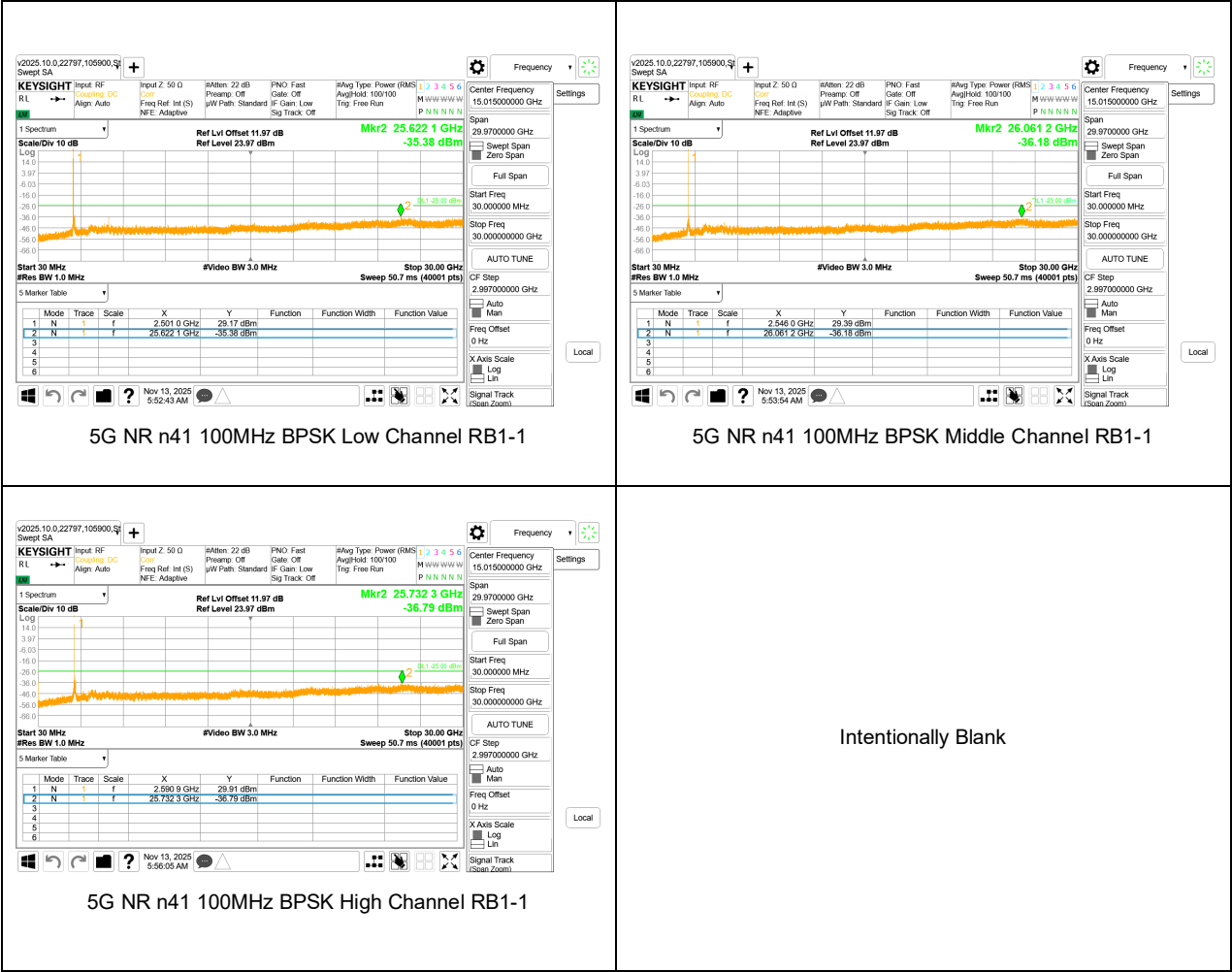
8.3.5. ULCA LTE BAND 41 (FCC)



8.3.6. LTE BAND 41 (IC)



8.3.7. 5G NR n41 (IC)



8.4. FREQUENCY STABILITY

LIMITS

FCC: §27.54

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

ISED: RSS199§5.4

Frequency Stability

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block or frequency block group when tested to the temperature and supply voltage variations specified in RSS-Gen.

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = -30°C to +50°C
- Voltage = (85% - 100%)

Normal, 3.89VDC

End Voltage, 3.69VDC.

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

8.4.1. LTE BAND 7 (QPSK 20MHz BANDWIDTH)

Test Engineer ID:	105900; 22797	Test Date:	2025-10-8 - 2025-10-22
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Band	7	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2500	2570			
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	2500.8313	2569.1775			
Extreme (50°C)		2500.8312	2569.1775	-7.1	-0.003	Yes
Extreme (40°C)		2500.8312	2569.1775	-3.78	-0.001	Yes
Extreme (30°C)		2500.8312	2569.1775	-7.87	-0.003	Yes
Extreme (10°C)		2500.8312	2569.1775	-4.76	-0.002	Yes
Extreme (0°C)		2500.8312	2569.1775	-3.96	-0.002	Yes
Extreme (-10°C)		2500.8313	2569.1775	3.05	0.001	Yes
Extreme (-20°C)		2500.8312	2569.1775	-2.74	-0.001	Yes
Extreme (-30°C)		2500.8313	2569.1775	5.54	0.002	Yes
20°C	End Point Voltage	2500.8312	2569.1775	-4.4	-0.002	Yes

8.4.2. 5G NR n7 (BPSK 50MHz BANDWIDTH)

Test Engineer ID:	105900; 22797	Test Date:	2025-10-8 - 2025-10-22
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Band	7	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2500	2570			
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	2500.2500	2569.7250			
Extreme (50°C)		2500.2500	2569.7250	-5.3	-0.002	Yes
Extreme (40°C)		2500.2500	2569.7250	-6	-0.002	Yes
Extreme (30°C)		2500.2500	2569.7250	-10.1	-0.004	Yes
Extreme (10°C)		2500.2500	2569.7250	-9.7	-0.004	Yes
Extreme (0°C)		2500.2500	2569.7250	-1.3	-0.001	Yes
Extreme (-10°C)		2500.2500	2569.7250	-5.3	-0.002	Yes
Extreme (-20°C)		2500.2500	2569.7250	-0.8	0.000	Yes
Extreme (-30°C)		2500.2500	2569.7250	-11.5	-0.005	Yes
20°C	End Point Voltage	2500.2500	2569.7250	21	0.008	Yes

8.4.3. LTE B41 (QPSK 20MHz BANDWIDTH, FCC)

Test Engineer ID:	105900; 22797	Test Date:	2025-10-8 - 2025-10-22
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Band	41	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2496	2690			
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	2496.8625	2689.1388			
Extreme (50°C)		2496.8625	2689.1387	-6.92	-0.003	Yes
Extreme (40°C)		2496.8625	2689.1387	-5.91	-0.002	Yes
Extreme (30°C)		2496.8625	2689.1387	-7.21	-0.003	Yes
Extreme (10°C)		2496.8625	2689.1387	-4.97	-0.002	Yes
Extreme (0°C)		2496.8625	2689.1387	-5.36	-0.002	Yes
Extreme (-10°C)		2496.8625	2689.1387	-4.85	-0.002	Yes
Extreme (-20°C)		2496.8625	2689.1387	-4.27	-0.002	Yes
Extreme (-30°C)		2496.8625	2689.1388	6.23	0.002	Yes
20°C	End Point Voltage	2496.8625	2689.1387	-5.21	-0.002	Yes

8.4.4. 5G NR n41 (BPSK 100MHz BANDWIDTH, FCC)

Test Engineer ID:	105900; 22797	Test Date:	2025-10-8 - 2025-10-22
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Band	41	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2496	2690			
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	2497.3540	2688.4500			
Extreme (50°C)		2497.3540	2688.4500	-16.3	-0.006	Yes
Extreme (40°C)		2497.3540	2688.4500	-13.8	-0.005	Yes
Extreme (30°C)		2497.3540	2688.4500	-5.9	-0.002	Yes
Extreme (10°C)		2497.3540	2688.4500	-6.1	-0.002	Yes
Extreme (0°C)		2497.3540	2688.4500	2.8	0.001	Yes
Extreme (-10°C)		2497.3540	2688.4500	-15.5	-0.006	Yes
Extreme (-20°C)		2497.3540	2688.4500	-12.9	-0.005	Yes
Extreme (-30°C)		2497.3540	2688.4500	-14.4	-0.006	Yes
20°C	End Point Voltage	2497.3540	2688.4500	-16.9	-0.007	Yes

8.4.5. ULCA LTE BAND 41 (QPSK 20MHz + 20MHz BANDWIDTH, FCC)

Test Engineer ID:	105900; 22797	Test Date:	2025-10-8 - 2025-10-22
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Band	41	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2496	2690		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	2496.8350	2689.1900			
Extreme (50°C)		2496.8350	2689.1900	33.82	0.013	Yes
Extreme (40°C)		2496.8350	2689.1900	36.76	0.014	Yes
Extreme (30°C)		2496.8350	2689.1900	33.41	0.013	Yes
Extreme (10°C)		2496.8350	2689.1900	13.95	0.005	Yes
Extreme (0°C)		2496.8350	2689.1900	-19.75	-0.008	Yes
Extreme (-10°C)		2496.8350	2689.1900	-36.97	-0.014	Yes
Extreme (-20°C)		2496.8350	2689.1900	-41.79	-0.016	Yes
Extreme (-30°C)		2496.8350	2689.1900	-36.5	-0.014	Yes
20°C	End Point Voltage	2496.8350	2689.1900	13.43	0.005	Yes

8.5. PEAK-TO-AVERAGE POWER RATIO

LIMIT

ISED: RSS199§5.5

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

The worst-case antenna port for conducted power shown in section 6.4. 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.

8.5.1. LTE BAND 7

Test Engineer ID:		33499	Test Date:		10-10-25 thru 10/22/2025			
Band	Bandwidth (MHz)	Frequency (MHz)	RB Allocation	RB OffSet	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
						Peak	Average	
LTE Band 7	5MHz	2535.0	25	0	QPSK	27.63	22.25	5.38
					16QAM	27.38	21.38	6.00
	10MHz		50	0	QPSK	27.60	22.23	5.37
					16QAM	27.40	21.15	6.25
	15MHz		75	0	QPSK	27.34	22.14	5.20
					16QAM	27.66	21.22	6.44
	20MHz		100	0	QPSK	27.41	22.18	5.23
					16QAM	27.52	21.20	6.32
Duty Cycle Correction Factor (dB) =			0.00					
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor								

8.5.2. 5G NR n7

Test Engineer ID:		33499	Test Date:		10-10-25 thru 10/22/2025			
Band	Bandwidth (MHz)	Frequency (MHz)	RB Allocation	RB OffSet	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
						Peak	Average	
5G NR n7	5MHz	2535.0	25	0	BPSK	27.00	22.71	4.29
					16QAM	27.85	21.29	6.55
	10MHz		50	0	BPSK	26.65	22.73	3.92
					16QAM	27.98	21.20	6.78
	15MHz		75	0	BPSK	26.68	22.70	3.97
					16QAM	28.05	21.21	6.84
	20MHz		100	0	BPSK	26.75	22.77	3.98
					16QAM	27.62	21.19	6.43
	25MHz		128	0	BPSK	27.23	22.56	4.67
					16QAM	27.68	21.25	6.44
	30MHz		160	0	BPSK	27.45	22.72	4.73
					16QAM	27.46	21.17	6.28
	35MHz		180	0	BPSK	27.16	22.57	4.59
					16QAM	27.73	21.21	6.53
	40MHz		216	0	BPSK	27.82	22.72	5.10
					16QAM	28.06	21.10	6.96
	50MHz		270	0	BPSK	27.52	22.67	4.85
					16QAM	28.19	21.14	7.05
Duty Cycle Correction Factor (dB) =			0.00					
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor								

8.5.3. LTE BAND 41 (FCC)

Test Engineer ID:	33499	Test Date:	10-10-25 thru 10/22/2025
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Band	Bandwidth (MHz)	Frequency (MHz)	RB Allocation	RB OffSet	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
						Peak	Average	
LTE Band 41	5MHz	2593.0	25	0	QPSK	26.37	21.43	4.94
					16QAM	26.76	20.44	6.32
	10MHz		50	0	QPSK	26.57	21.47	5.10
					16QAM	26.85	20.46	6.39
	15MHz		75	0	QPSK	26.61	21.43	5.18
					16QAM	26.93	20.43	6.50
	20MHz		100	0	QPSK	26.73	21.45	5.28
					16QAM	26.94	20.49	6.45
Duty Cycle Correction Factor (dB) =			0.00					
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor								

8.5.4. 5G NR n41 (FCC)

Test Engineer ID:	33499	Test Date:	10-10-25 thru 10/22/2025
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Band	Bandwidth (MHz)	Frequency (MHz)	RB Allocation	RB OffSet	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
						Peak	Average	
5G NR n41	10MHz	2593.0	24	0	BPSK	28.48	20.91	7.57
					16QAM	28.33	19.76	8.57
	15MHz		36	0	BPSK	28.92	19.56	9.36
					16QAM	29.34	18.36	10.98
	20MHz		50	0	BPSK	28.70	20.12	8.58
					16QAM	28.80	18.55	10.25
	25MHz		64	0	BPSK	29.21	20.52	8.69
					16QAM	28.65	18.82	9.83
	30MHz		75	0	BPSK	28.46	20.83	7.63
					16QAM	29.09	19.19	9.90
	35MHz		90	0	BPSK	29.36	24.80	4.56
					16QAM	29.28	22.63	6.65
	40MHz		100	0	BPSK	28.40	20.42	7.98
					16QAM	29.16	19.70	9.46
	45MHz		108	0	BPSK	29.36	24.92	4.45
					16QAM	29.34	22.69	6.65
	50MHz		128	0	BPSK	29.35	24.33	5.02
					16QAM	29.16	22.45	6.71
	60MHz		162	0	BPSK	28.35	24.06	4.29
					16QAM	28.90	22.44	6.45
	70MHz		180	0	BPSK	28.32	24.08	4.24
					16QAM	29.00	22.59	6.41
	80MHz		216	0	BPSK	28.40	24.07	4.32
					16QAM	28.90	22.45	6.46
	90MHz		243	0	BPSK	28.42	24.53	3.89
					16QAM	28.79	23.38	5.41
	100MHz		270	0	BPSK	28.53	24.39	4.14
					16QAM	29.03	23.52	5.52
Duty Cycle Correction Factor (dB) =			0.00					
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor								

8.5.5. ULCA LTE BAND 41 (FCC)

Test Engineer ID:	33499	Test Date:	10-10-25 thru 10/22/2025
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Band	Bandwidth (MHz)	PCC f (MHz)	SCC1 f (MHz)	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
					Peak	Average	
ULCA LTE Band 41 (FCC)	5MHz / 20MHz	2583.8	2595.5	QPSK	26.24	21.14	5.10
				16QAM	26.67	20.40	6.27
	20MHz / 5MHz	2590.5	2602.2	QPSK	26.71	21.43	5.28
				16QAM	26.84	20.42	6.42
	10MHz / 20MHz	2583.6	2598.0	QPSK	26.47	21.39	5.08
				16QAM	26.69	20.35	6.34
	20MHz / 10MHz	2588.1	2602.5	QPSK	26.57	21.31	5.26
				16QAM	26.84	20.39	6.45
	15MHz / 15MHz	2585.5	2600.5	QPSK	26.54	21.28	5.26
				16QAM	26.37	21.23	5.14
	15MHz / 20MHz	2583.3	2600.4	QPSK	26.43	21.22	5.21
				16QAM	26.36	21.20	5.16
	20MHz / 15MHz	2585.6	2602.7	QPSK	26.55	21.28	5.27
				16QAM	26.75	20.30	6.45
	20MHz / 20MHz	2583.1	2602.9	QPSK	26.52	21.30	5.22
				16QAM	26.45	21.33	5.12
Duty Cycle Correction Factor (dB) =			0.00				
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor							

9. RADIATED TEST RESULTS

Radiated measurement using the Field Strength Method

Using the test configuration shown in Figure 6 below, the radiated emissions is measured directly from the EUT and convert the measured field strength or received power to ERP or EIRP, as required, for comparison to the applicable limits. As stated in 5.5.1 of ANSI C63.26-2015, the field strength measurement method using a test site validated to the requirements of ANSI C63.4 is an alternative to the substitution measurement.

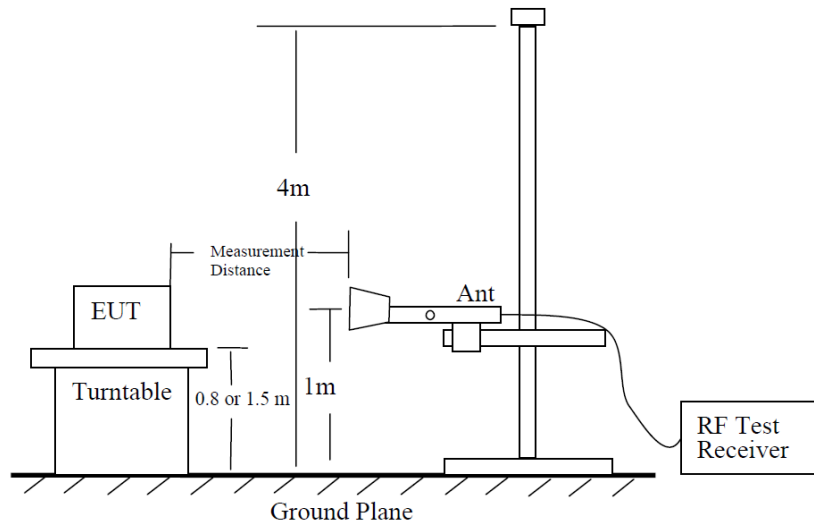


Figure 6—Test site-up for radiated ERP and/or EIRP measurements

Radiated Power Measurement Calculation According to ANSI C63.26-2015

- a) $E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}.$
- b) $E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}.$
- c) $E \text{ (dB}\mu\text{V/m)} = \text{EIRP (dBm)} - 20\log(D) + 104.8;$ where D is the measurement distance (in the far field region) in m.
- d) $\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8;$ where D is the measurement distance (in the far field region) in m.

So, from d)

The measuring distance is usually at 3m, then $20 \cdot \log(3) = 9.5424$

Then, $\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 9.5424 - 104.8 = E \text{ (dB}\mu\text{V/m)} - 95.2576$

Note: Confidence check of each chamber is performed daily to see if any degradation from expected/normal reading reference data. Ambient check of each chamber is performed monthly.

9.1. EFFECTIVE RADIATED POWER ERP/EIRP

RULE PART(S)

FCC: 27.50 (h) (2)
ISED: RSS199§5.5

LIMITS

FCC: 27.50 (h) - Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

ISED: RSS199§5.5 - The maximum output power of the equipment shall comply with the limits referred as the equivalent isotropically radiated power (e.i.r.p.) or total radiated power (TRP), measured in terms of average values.

Subscriber equipment other than fixed subscriber equipment shall not exceed an e.i.r.p of 2W per channel bandwidth

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.

EIRP/ERP TEST PROCEDURE

ANSI C63.26:2015
KDB 971168 D01 Section 5.6

$$\text{ERP/EIRP} = \text{PMeas} + \text{GT} - \text{LC}$$

where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);

PMeas = measured transmitter output power or PSD, in dBm or dBW;

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

TEST RESULTS

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
Config 0 - Ant F						
LTE B41 - QPSK	1.980	5.020	0.394	39.44	4.04	0.505
LTE B41 - 16QAM	1.980	5.000	0.396	39.60	4.02	0.505
GNR FR1 n41 - BPSK	1.500	10.000	0.150	15.00	8.24	0.667
GNR FR1 n41 - 16QAM	1.500	10.000	0.150	15.00	8.24	0.667
LTE ULCA B41 - QPSK	3.000	5.000	0.600	60.00	2.22	0.333
LTE ULCA B41 - 16QAM	3.000	5.000	0.600	60.00	2.22	0.333

