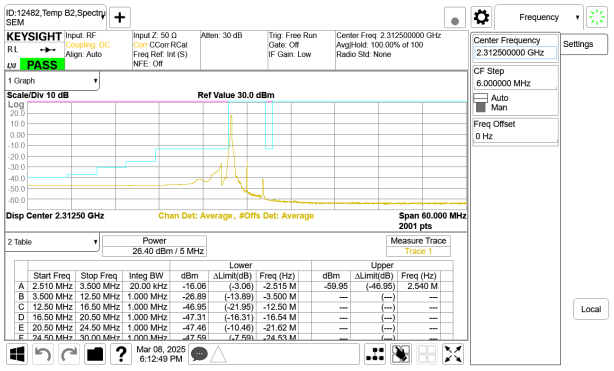
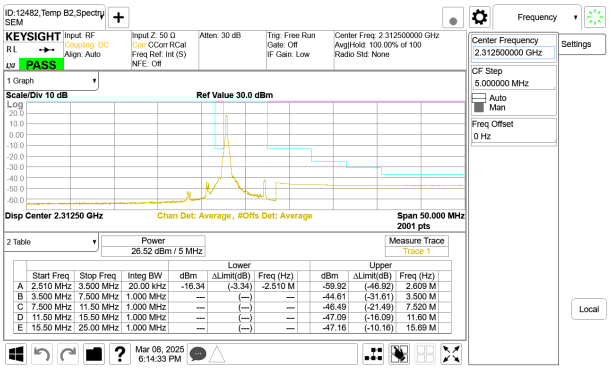
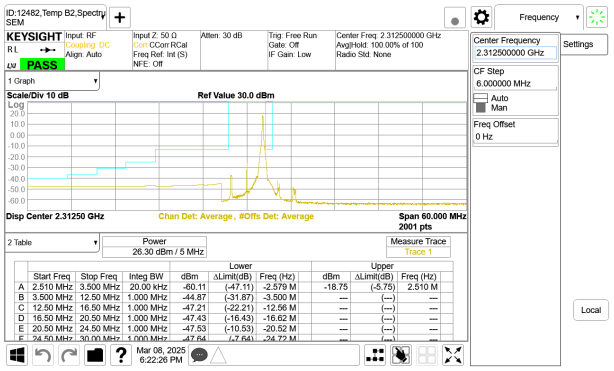


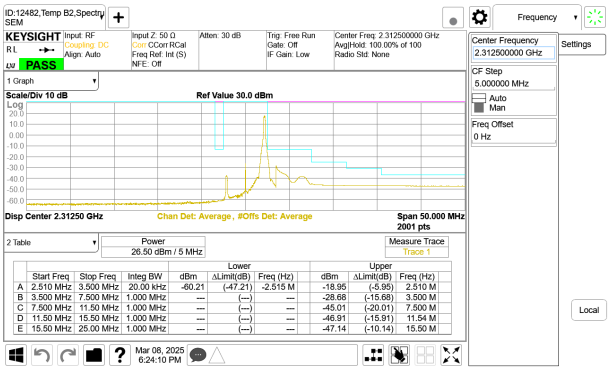
5G NR n30 5MHz BPSK High Channel RB1-0 (Low side)



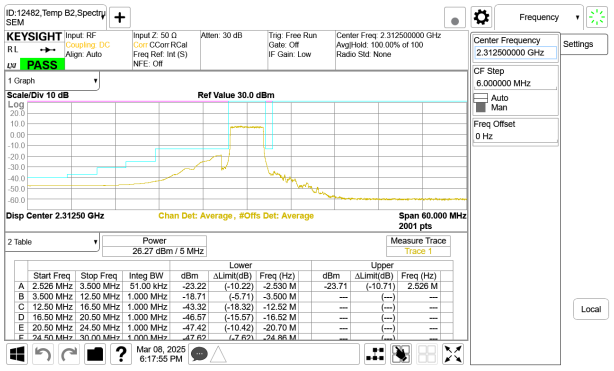
5G NR n30 5MHz BPSK High Channel RB1-0 (High side)



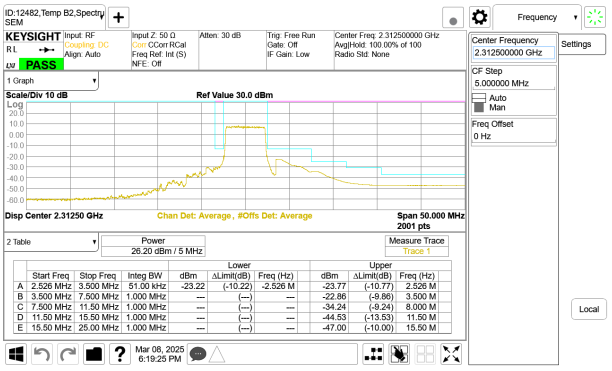
5G NR n30 5MHz BPSK High Channel RB1-24 (Low side)



5G NR n30 5MHz BPSK High Channel RB1-24 (High side)



5G NR n30 5MHz BPSK High Channel RB25-0 (Low side)



5G NR n30 5MHz BPSK High Channel RB25-0 (High side)

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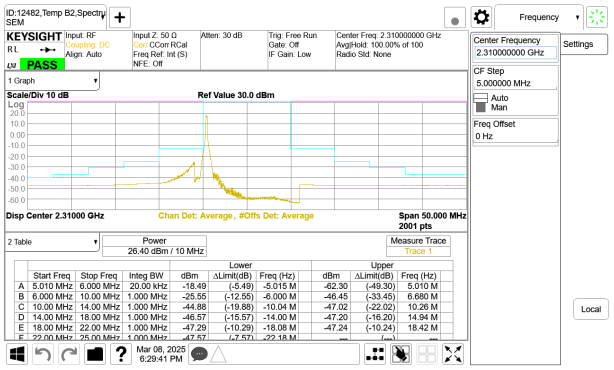
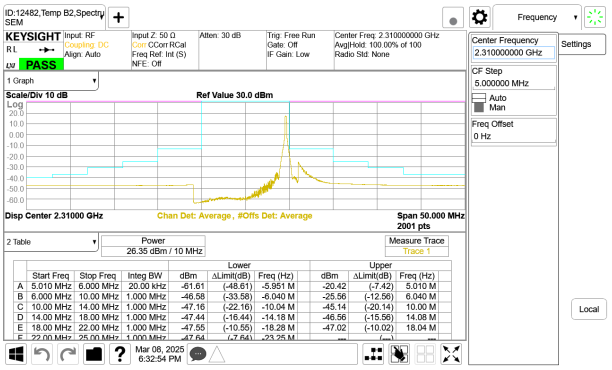
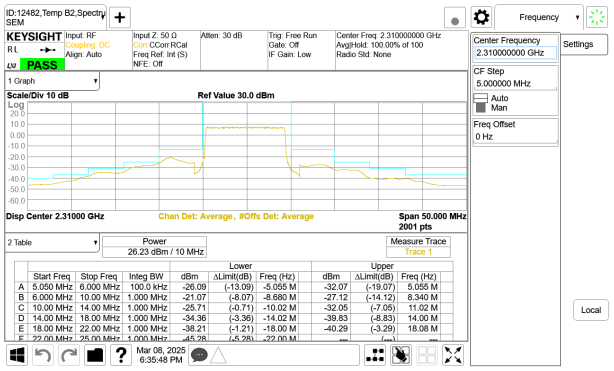


5G NR n30 10MHz BPSK Mid Channel RB1-0



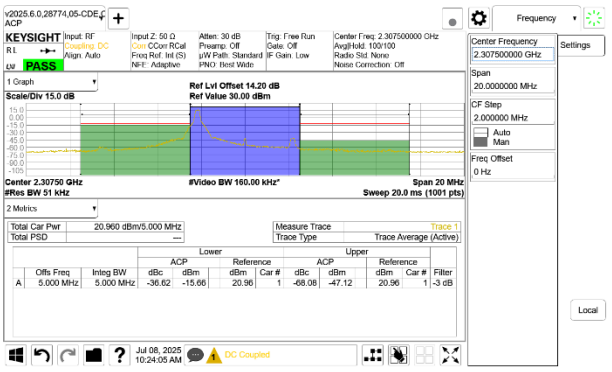
5G NR n30 10MHz BPSK Mid Channel RB1-51



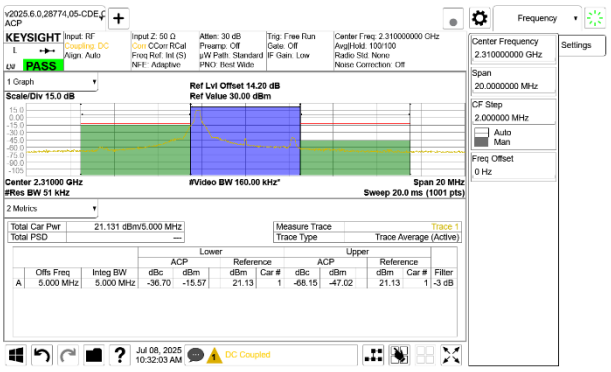
5G NR n30 10MHz BPSK Mid Channel RB50-0

Intentionally Blank

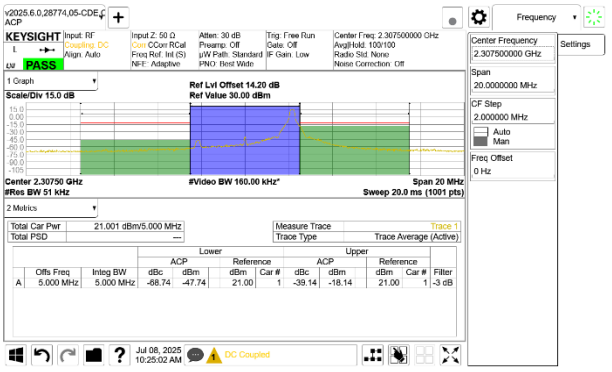
9.2.4. 5G NR n30 ADJACENT CHANNEL POWER



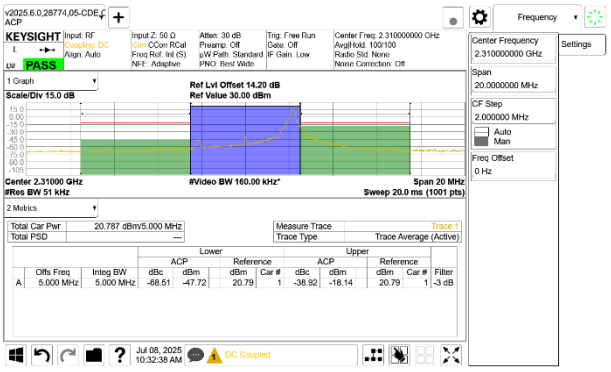
5G NR n30 5MHz BPSK Low Channel RB1-0



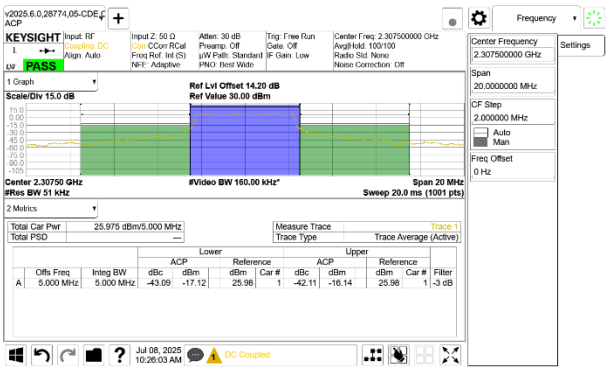
5G NR n30 5MHz BPSK Mid Channel RB1-0



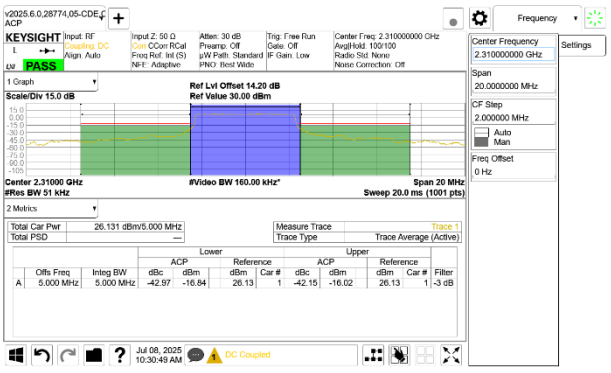
5G NR n30 5MHz BPSK Low Channel RB1-24



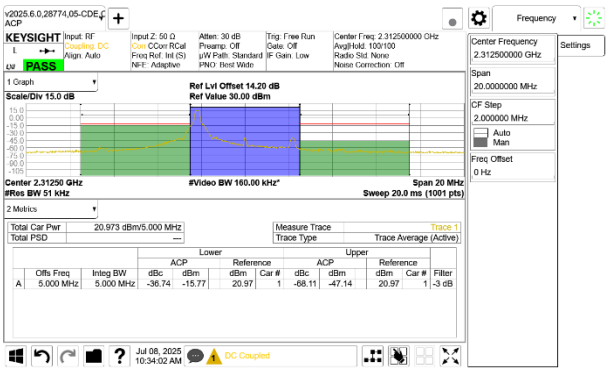
5G NR n30 5MHz BPSK Mid Channel RB1-24



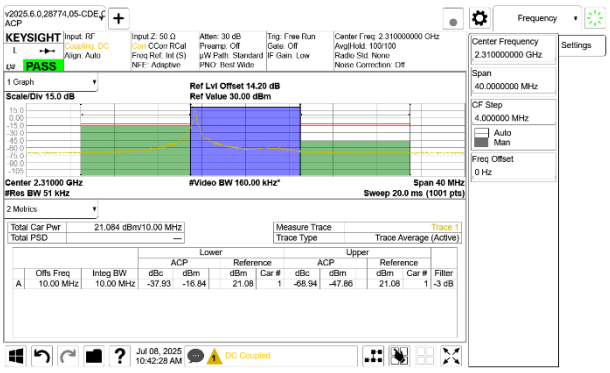
5G NR n30 5MHz BPSK Low Channel RB25-0



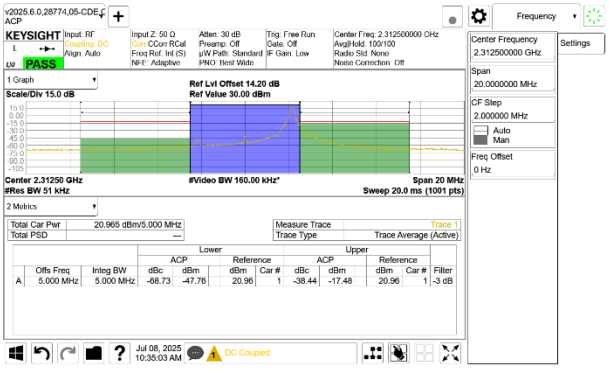
5G NR n30 5MHz BPSK Mid Channel RB25-0



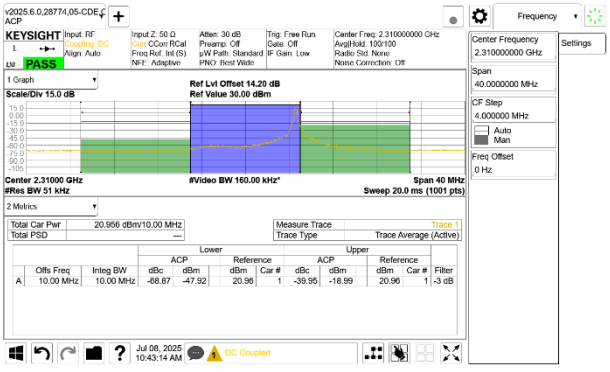
5G NR n30 5MHz BPSK High Channel RB1-0



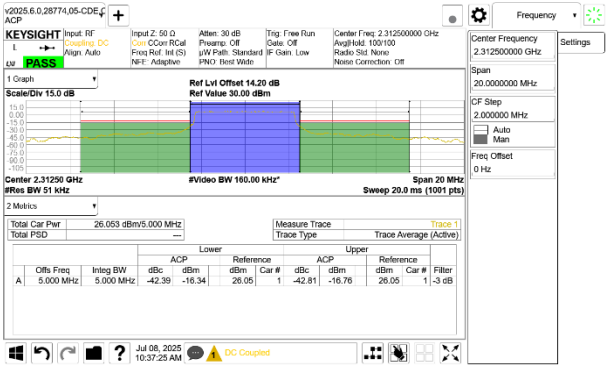
5G NR n30 10MHz BPSK Mid Channel RB1-0



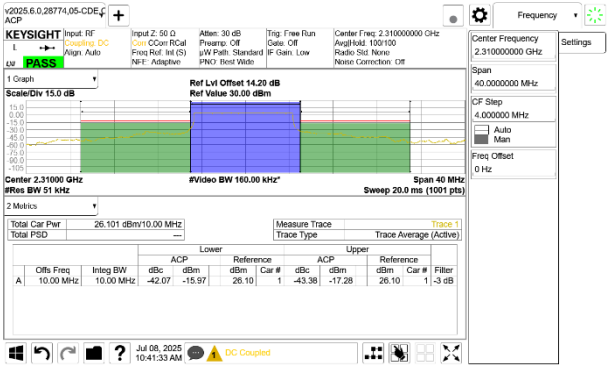
5G NR n30 5MHz BPSK High Channel RB1-24



5G NR n30 10MHz BPSK Mid Channel RB1-51



5G NR n30 5MHz BPSK High Channel RB25-0



5G NR n30 10MHz BPSK Mid Channel RB50-0

9.3. OUT OF BAND EMISSIONS

LIMITS

FCC: §27.53 (a)
The minimum permissible attenuation level of any spurious emissions is 70 + 10 log (P) dB where transmitting power (P) in Watts.

RSS195§5.6.2
The minimum permissible attenuation level of any spurious emissions is 70 + 10 log (P) dB where transmitting power (P) in Watts.

TEST PROCEDURE

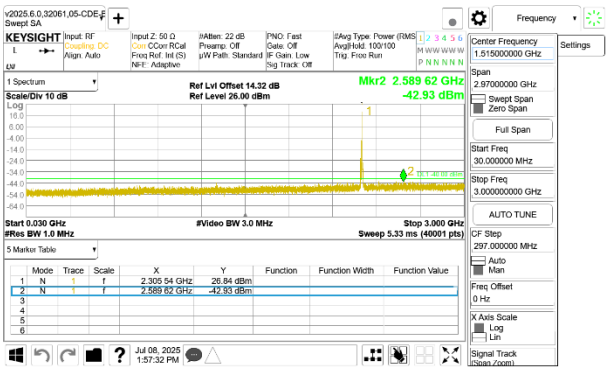
The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case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

For each out of band emissions measurement:

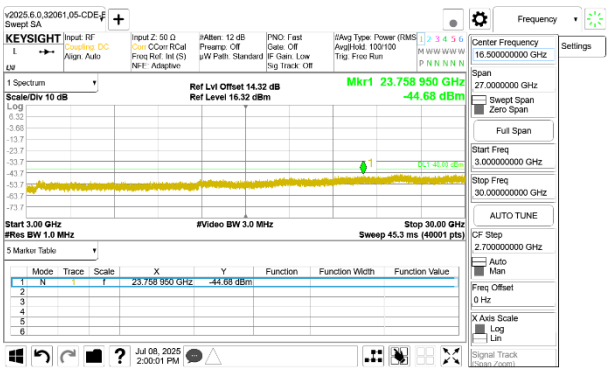
- Set display line at required limit.
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz. (NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

RESULTS

9.3.1. LTE BAND 30

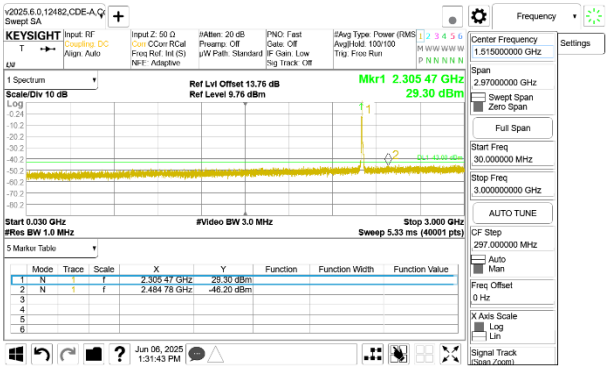


LTE B30 10MHz QPSK Mid Channel RB1-0 (30MHz to 3GHz)

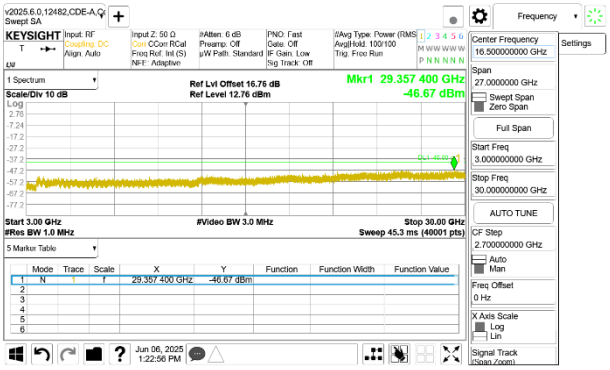


LTE B30 10MHz QPSK Middle Channel RB1-0 (3GHz to 30GHz)

9.3.2. 5G NR n30



5G NR n30 10MHz BPSK Middle Channel RB1-1 (30MHz to 3GHz)



5G NR n30 10MHz BPSK Middle Channel RB1-1 (3GHz to 30GHz)

9.4. 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: RSS195§5.4
The applicant shall ensure frequency stability by showing that the occupied bandwidth is maintained within the range of the operating frequency blocks when testing under the temperature and supply voltage variations specified for the frequency stability measurement in RSS-Gen.

TEST PROCEDURE

Use base station simulator 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, 3.2VDC.

Frequency Stability vs Temperature:
The EUT is place inside a temperature chamber. The temperature is set to 20ºC 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 +50ºC is reached.

Frequency Stability vs Voltage:
The peak frequency error is recorded (worst-case).

RESULTS

See the following pages.

9.4.1. LTE BAND 30 (QPSK 10MHz BANDWIDTH)

Test Engineer ID:	32546	Test Date:	2025-03-04

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	2305.5236	2314.4758			
Extreme (50°C)		2305.5236	2314.4758	-7.4	-0.003	Yes
Extreme (40°C)		2305.5236	2314.4758	-6.8	-0.003	Yes
Extreme (30°C)		2305.5236	2314.4758	-8.6	-0.004	Yes
Extreme (10°C)		2305.5236	2314.4758	5.9	0.003	Yes
Extreme (0°C)		2305.5236	2314.4758	6.4	0.003	Yes
Extreme (-10°C)		2305.5236	2314.4758	-7.2	-0.003	Yes
Extreme (-20°C)		2305.5236	2314.4758	-5.8	-0.002	Yes
Extreme (-30°C)		2305.5236	2314.4758	5.2	0.002	Yes
20°C	15%	2305.5236	2314.4758	5.7	0.002	Yes
	-15%	2305.5236	2314.4758	5.9	0.003	Yes
	End Point Voltage	2305.5236	2314.4758	-6.2	-0.003	Yes

9.4.2. 5G NR n30 (BPSK 10MHz BANDWIDTH)

Test Engineer ID:	12482	Test Date:	2025-03-31

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	2305.3458	2314.2874			
Extreme (50°C)		2305.3458	2314.2874	-6.7	-0.003	Yes
Extreme (40°C)		2305.3458	2314.2874	-6.9	-0.003	Yes
Extreme (30°C)		2305.3458	2314.2874	-8.1	-0.004	Yes
Extreme (10°C)		2305.3458	2314.2874	-7.3	-0.003	Yes
Extreme (0°C)		2305.3458	2314.2874	-6.5	-0.003	Yes
Extreme (-10°C)		2305.3458	2314.2874	-7.6	-0.003	Yes
Extreme (-20°C)		2305.3458	2314.2874	7.3	0.003	Yes
Extreme (-30°C)		2305.3458	2314.2874	-9.1	-0.004	Yes
20°C	15%	2305.3458	2314.2874	-8.2	-0.004	Yes
	-15%	2305.3458	2314.2874	-8.6	-0.004	Yes
	End Point Voltage	2305.3458	2314.2874	-7.8	-0.003	Yes

9.5. PEAK-TO-AVERAGE POWER RATIO

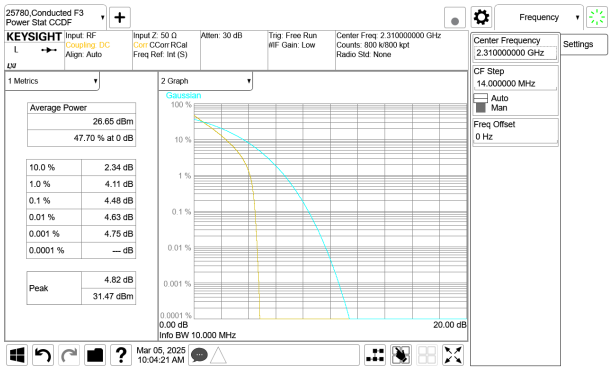
LIMIT

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.

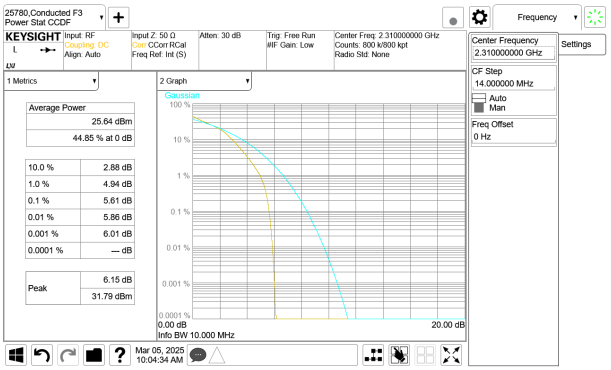
RESULT

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.

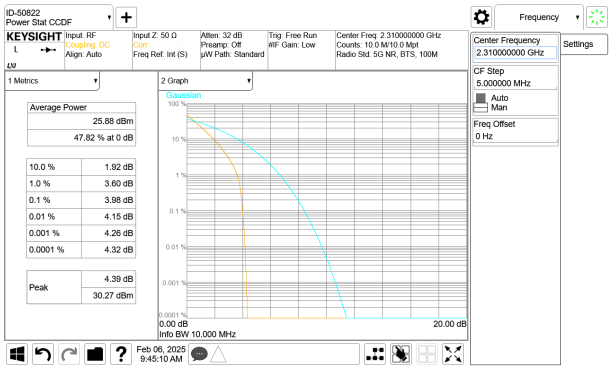
Example Plots: FULL RB



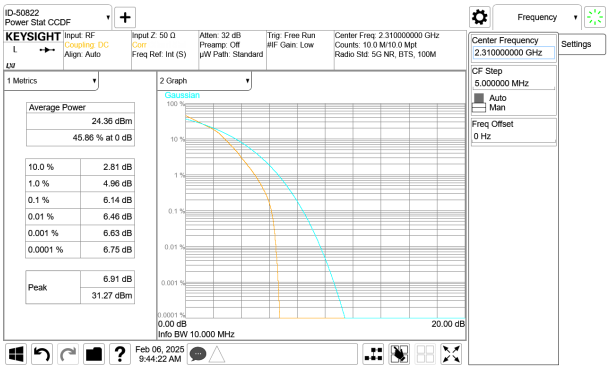
LTE B30 10MHz QPSK Middle Channel



LTE B30 10MHz 16QAM Middle Channel



5G NR n30 10MHz BPSK Middle Channel



5G NR n10 20MHz 16QAM Middle Channel

9.5.1. LTE BAND 30

Test Engineer ID:	25780	Test Date:	2025-03-04

Band	Bandwidth (MHz)	Frequency (MHz)	RB Allocation	RB OffSet	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
						Peak	Average	
LTE Band 30	5MHz	2310.0	25	0	QPSK	31.58	26.75	4.83
					16QAM	31.92	25.76	6.16
	10MHz		50	0	QPSK	31.47	26.65	4.82
					16QAM	31.79	25.64	6.15
Duty Cycle Correction Factor (dB) =			0.00					
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor								

9.5.2. 5G NR n30

Test Engineer ID:	50822	Test Date:	2025-02-05

Band	Bandwidth (MHz)	Frequency (MHz)	RB Allocation	RB OffSet	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
						Peak	Average	
5G NR n30	5MHz	2310.0	25	0	BPSK	30.26	25.93	4.33
					16QAM	31.09	24.35	6.74
	10MHz		50	0	BPSK	30.27	25.88	4.39
					16QAM	31.27	24.36	6.91
Duty Cycle Correction Factor (dB) =			0.00					
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor								

10. RADIATED TEST RESULTS

LIMITS

FCC: §27.53 (a)
For mobile and portable stations operating in the 2305-2315 MHz: by a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

RSS195§5.6
The transmitter unwanted emissions shall be measured with a resolution bandwidth of 1 MHz. A smaller resolution bandwidth is permitted provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz. However, in the 1 MHz bands immediately adjacent to the edges of the frequency range(s) in which the equipment is allowed to operate, a resolution bandwidth of as close as possible to, without being less than 1% of the occupied bandwidth, shall be employed provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz.

RSS195§5.6.2 Mobile, Portable and Low-Power Fixed Subscriber Equipment
The power of any emission outside the frequency range(s) in which the equipment operates shall be attenuated below the transmitter power, P(dBW), by the amount indicated in Table 2 and graphically represented in Figure 2, where p is the transmitter output power measured in watts.

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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.

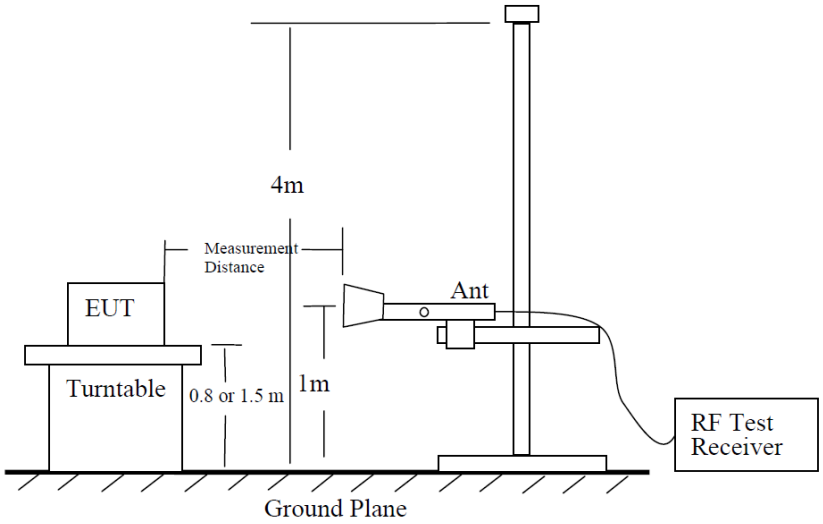


Figure 6—Test site-up for radiated ERP and/or EIRP measurements

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

a) E (dBµV/m) = Measured amplitude level (dBµV) + Cable Loss (dB) + Antenna Factor (dB/m).
b) E (dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m).
c) E (dBµV/m) = EIRP (dBm) − 20log(D) + 104.8; where D is the measurement distance (in the far field region) in m.
d) EIRP (dBm) = E (dBµV/m) + 20log(D) − 104.8; where D is the measurement distance (in the far field region) in m.

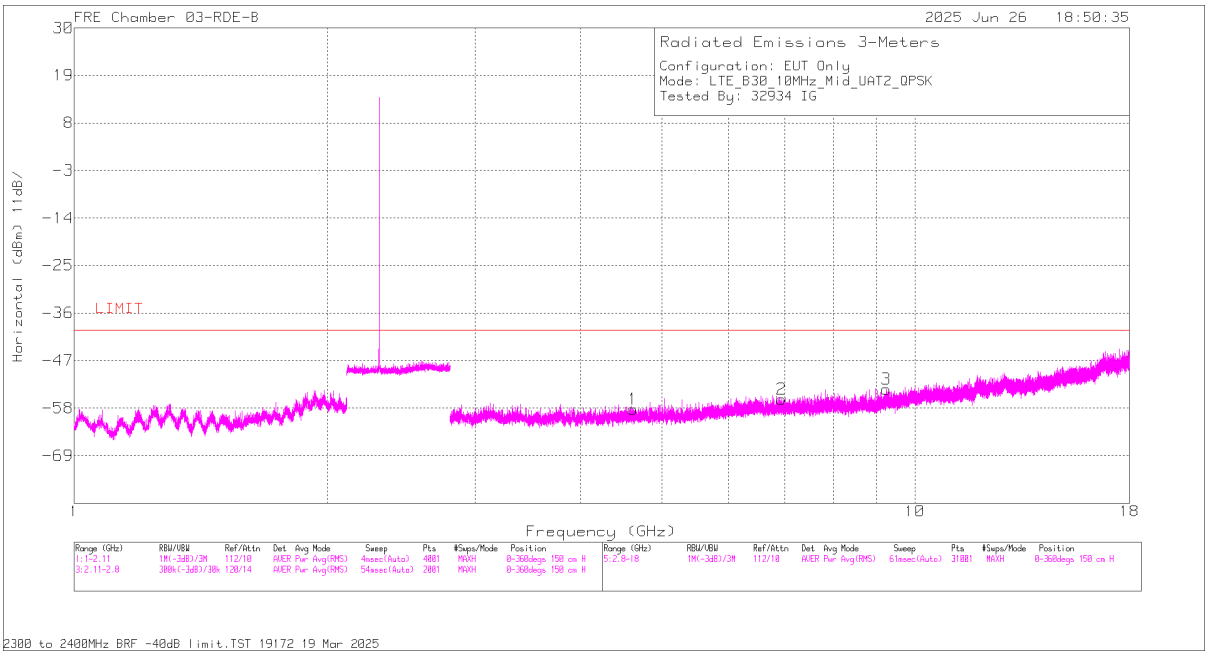
So, from d)

The measuring distance is usually at 3m, then 20*Log(3)=9.5424

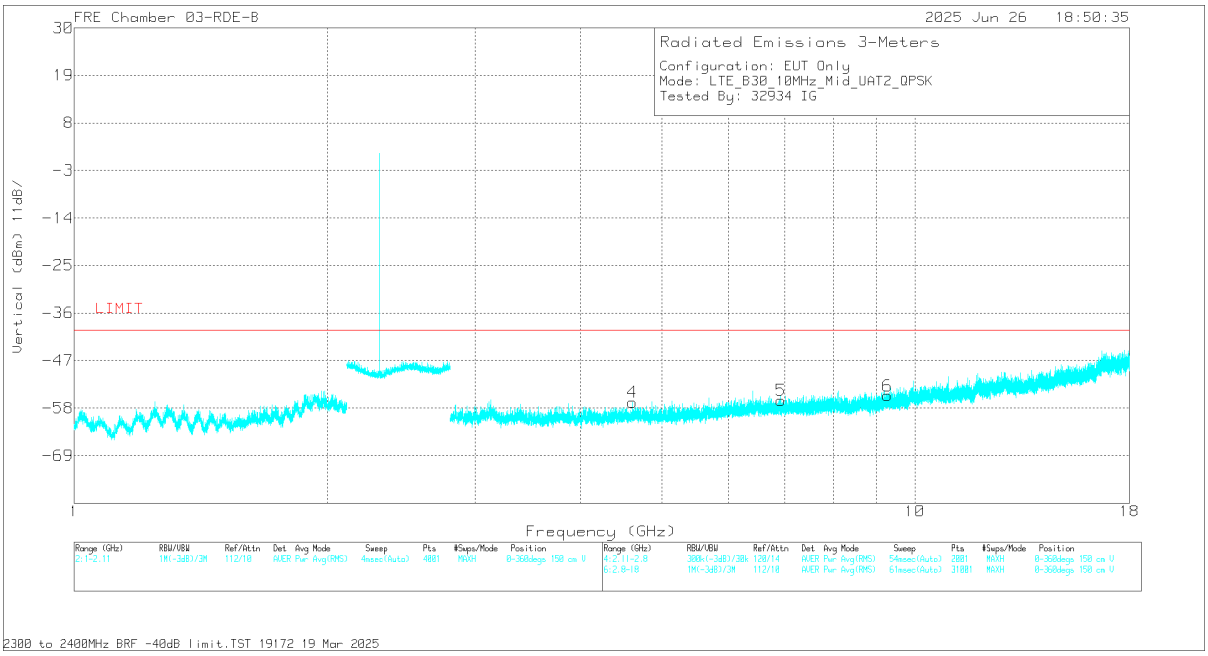
Then, EIRP (dBm) = E (dBµV/m) + 9.5424 − 104.8 = E (dBµV/m) – 95.2576

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.

Example Plot



Horizontal Polarity



Vertical Polarity

Trace Markers

Frequency (GHz)	Meter Reading (dBuV)	Det	223084 ACF (dB/m)	EIRP CF	Gain/Loss (dB)	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
4.616647	52.66	RMS	33.8	-95.2	-49.03	-57.77	-40	-17.77	H
4.581343	53.61	RMS	33.8	-95.2	-49.00	-56.79	-40	-16.79	V
6.929991	51.59	RMS	35.6	-95.2	-47.20	-55.21	-40	-15.21	V
6.938326	50.53	RMS	35.6	-95.2	-47.43	-56.50	-40	-16.50	H
9.250199	50.71	RMS	36.4	-95.2	-46.68	-54.77	-40	-14.77	H
9.258044	50.93	RMS	36.4	-95.2	-46.60	-54.47	-40	-14.47	V

10.1. FIELD STRENGTH OF SPURIOUS RADIATION, ABOVE 1GHz

TEST PROCEDURE

KDB 971168 D01 /D02

All tests above 1GHz were done with a Resolution Bandwidth of 1MHz, and a Video Bandwidth of 3MHz

RESULTS

10.1.1. LTE BAND 30

LTE BAND 30 (QPSK 10.0MHZ BANDWIDTH, ANT 1)

Project #:	15496277
Date:	2025-06-26
Test Engineer:	32934
Configuration:	EUT Only
Mode	LTE B30 QPSK 10MHz
Chamber #:	03-RDE-B

Frequency (GHz)	Meter Reading (dBuV)	Det	223084 ACF (dBm)	EIRP CF	Gain/Loss (dB)	Corrected Reading (dBm)	LIMIT(dB/m)	Margin (dB)	Polarity
Mid Channel, 2310MHz									
4.616647	52.66	RMS	33.8	-95.2	-49.03	-57.77	-40	-17.77	H
4.581343	53.61	RMS	33.8	-95.2	-49.00	-56.79	-40	-16.79	V
6.929991	51.59	RMS	35.6	-95.2	-47.20	-55.21	-40	-15.21	V
6.938326	50.53	RMS	35.6	-95.2	-47.43	-56.50	-40	-16.50	H
9.250199	50.71	RMS	36.4	-95.2	-46.68	-54.77	-40	-14.77	H
9.258044	50.93	RMS	36.4	-95.2	-46.60	-54.47	-40	-14.47	V

LTE BAND 30 (QPSK 10.0MHZ BANDWIDTH, ANT 2)

Project #:	15496277
Date:	2025-06-26
Test Engineer:	32934
Configuration:	EUT Only
Mode	LTE B30 QPSK 10MHz
Chamber #:	03-RDE-B

Frequency (GHz)	Meter Reading (dBuV)	Det	223084 ACF (dBm)	EIRP CF	Gain/Loss (dB)	Corrected Reading (dBm)	LIMIT(dB/m)	Margin (dB)	Polarity
Mid Channel, 2310MHz									
4.624982	52.13	RMS	33.9	-95.2	-49.10	-58.27	-40	-18.27	H
4.614195	53.59	RMS	33.8	-95.2	-48.90	-56.71	-40	-16.71	V
6.930481	50.54	RMS	35.6	-95.2	-47.20	-56.26	-40	-16.26	V
6.939307	51.15	RMS	35.6	-95.2	-47.50	-55.95	-40	-15.95	H
9.243335	51.68	RMS	36.4	-95.2	-46.53	-53.65	-40	-13.65	H
9.283541	50.37	RMS	36.4	-95.2	-46.70	-55.13	-40	-15.13	V

LTE BAND 30 (QPSK 10.0MHZ BANDWIDTH, ANT 3)

Project #:	15496277
Date:	2025-06-26
Test Engineer:	32934
Configuration:	EUT Only
Mode	LTE B30 QPSK 10MHz
Chamber #:	03-RDE-B

Frequency (GHz)	Meter Reading (dBuV)	Det	223084 ACF (dBm)	EIRP CF	Gain/Loss (dB)	Corrected Reading (dBm)	LIMIT(dB/m)	Margin (dB)	Polarity
Mid Channel, 2310MHz									
4.626944	52.38	RMS	33.9	-95.2	-49.00	-57.92	-40	-17.92	H
4.594092	52.14	RMS	33.8	-95.2	-49.00	-58.26	-40	-18.26	V
9.139386	51.85	RMS	36.1	-95.2	-46.00	-53.25	-40	-13.25	H
9.146741	50.15	RMS	36.2	-95.2	-46.20	-55.05	-40	-15.05	V
6.896158	51.26	RMS	35.6	-95.2	-47.20	-55.54	-40	-15.54	V
6.934894	50.68	RMS	35.6	-95.2	-47.40	-56.32	-40	-16.32	H

LTE BAND 30 (QPSK 10.0MHZ BANDWIDTH, ANT 4)

Project #:	15496277
Date:	2025-06-26
Test Engineer:	34934
Configuration:	EUT Only
Mode	LTE B30 QPSK 10MHz
Chamber #:	03-RDE-B

Frequency (GHz)	Meter Reading (dBuV)	Det	223084 ACF (dBm)	EIRP CF	Gain/Loss (dB)	Corrected Reading (dBm)	LIMIT(dB/m)	Margin (dB)	Polarity
Mid Channel, 2310MHz									
4.607821	52.62	RMS	33.8	-95.2	-49.00	-57.78	-40	-17.78	H
4.585756	52.21	RMS	33.8	-95.2	-48.90	-58.09	-40	-18.09	V
6.925087	49.84	RMS	35.6	-95.2	-47.20	-56.96	-40	-16.96	H
6.927049	50.29	RMS	35.6	-95.2	-47.20	-56.51	-40	-16.51	V
9.243825	50.55	RMS	36.4	-95.2	-46.58	-54.83	-40	-14.83	H
9.253141	51.67	RMS	36.4	-95.2	-46.60	-53.73	-40	-13.73	V

10.1.2. 5G NR n30

5G NR n30 (BPSK 10.0MHZ BANDWIDTH, ANT 1)

Project #:	15496277
Date:	2025-06-27
Test Engineer:	111411
Configuration:	EUT Only
Mode	5G NR n30 BPSK 10MHz
Chamber #:	03-RDE-B

Frequency (GHz)	Meter Reading (dBuV)	Det	223084 ACF (dBm)	EIRP CF	Gain/Loss (dB)	Corrected Reading (dBm)	LIMIT(dB/m)	Margin (dB)	Polarity
Mid Channel, 2310MHz									
4.628414	52.56	RMS	33.9	-95.2	-48.96	-57.70	-40	-17.70	H
4.624002	54.17	RMS	33.9	-95.2	-49.10	-56.23	-40	-16.23	V
6.911849	51.11	RMS	35.6	-95.2	-47.20	-55.69	-40	-15.69	H
6.916752	51.68	RMS	35.6	-95.2	-47.20	-55.12	-40	-15.12	V
9.212935	50.16	RMS	36.3	-95.2	-46.10	-54.84	-40	-14.84	V
9.259025	50.67	RMS	36.4	-95.2	-46.70	-54.83	-40	-14.83	H

5G NR n30 (BPSK 10.0MHZ BANDWIDTH, ANT 2)

Project #:	15496277
Date:	2025-06-27
Test Engineer:	111411
Configuration:	EUT Only
Mode	5G NR n30 BPSK 10MHz
Chamber #:	03-RDE-B

Frequency (GHz)	Meter Reading (dBuV)	Det	223084 ACF (dBm)	EIRP CF	Gain/Loss (dB)	Corrected Reading (dBm)	LIMIT(dB/m)	Margin (dB)	Polarity
Mid Channel, 2310MHz									
4.624982	53.28	RMS	33.9	-95.2	-49.10	-57.12	-40	-17.12	H
4.640673	52.51	RMS	33.9	-95.2	-49.20	-57.99	-40	-17.99	V
6.892726	50.93	RMS	35.6	-95.2	-47.30	-55.97	-40	-15.97	V
6.919204	51.1	RMS	35.6	-95.2	-47.20	-55.70	-40	-15.70	H
9.255593	51.58	RMS	36.4	-95.2	-46.56	-53.78	-40	-13.78	V
9.269322	51.06	RMS	36.4	-95.2	-46.60	-54.34	-40	-14.34	H

5G NR n30 (BPSK 10.0MHZ BANDWIDTH, ANT 3)

Project #:	15496277
Date:	2025-06-27
Test Engineer:	111411
Configuration:	EUT Only
Mode	5G NR n30 BPSK 10MHz
Chamber #:	03-RDE-B

Frequency (GHz)	Meter Reading (dBuV)	Det	223084 ACF (dB/m)	EIRP CF	Gain/Loss (dB)	Corrected Reading (dBm)	LIMIT(dB/m)	Margin (dB)	Polarity
Mid Channel, 2310MHz									
4.524466	53.86	RMS	33.8	-95.2	-48.80	-56.34	-40	-16.34	H
4.524956	52.57	RMS	33.8	-95.2	-48.80	-57.63	-40	-17.63	V
6.883410	50.55	RMS	35.6	-95.2	-47.26	-56.31	-40	-16.31	V
6.899100	50.83	RMS	35.6	-95.2	-47.11	-55.88	-40	-15.88	H
9.251180	51.87	RMS	36.4	-95.2	-46.60	-53.53	-40	-13.53	H
9.279128	51.15	RMS	36.4	-95.2	-46.89	-54.54	-40	-14.54	V

5G NR n30 (BPSK 10.0MHZ BANDWIDTH, ANT 4)

Project #:	15496277
Date:	2025-06-27
Test Engineer:	32934
Configuration:	EUT Only
Mode	5G NR n30 BPSK 10MHz
Chamber #:	03-RDE-B

Frequency (GHz)	Meter Reading (dBuV)	Det	223084 ACF (dBm)	EIRP CF	Gain/Loss (dB)	Corrected Reading (dBm)	LIMIT(dB/m)	Margin (dB)	Polarity
Mid Channel, 2310MHz									
4.653911	53.15	RMS	33.9	-95.2	-49.20	-57.35	-40	-17.35	H
4.668621	53.51	RMS	33.9	-95.2	-49.36	-57.15	-40	-17.15	V
6.950584	51.63	RMS	35.6	-95.2	-47.56	-55.53	-40	-15.53	H
7.020210	52.93	RMS	35.6	-95.2	-47.80	-54.47	-40	-14.47	V
9.253141	51.17	RMS	36.4	-95.2	-46.60	-54.23	-40	-14.23	H
9.258535	51.00	RMS	36.4	-95.2	-46.65	-54.45	-40	-14.45	V

UL VERIFICATION SERVICES INC.
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 319-4000 FAX: (510) 661-0888

11. SETUP PHOTOS

Refer to 15496277-EP1V1 for setup photos.

END OF REPORT

UL VERIFICATION SERVICES INC.
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