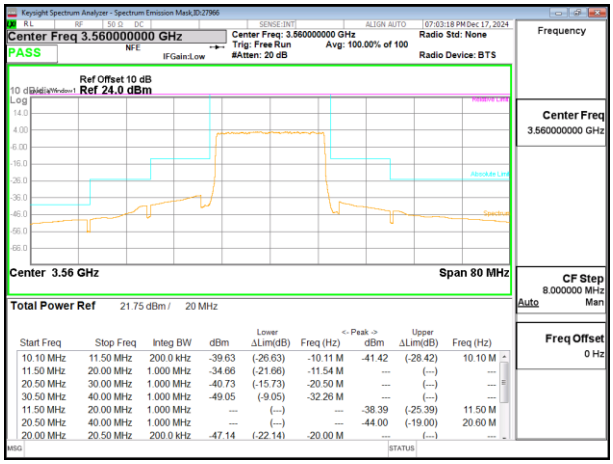
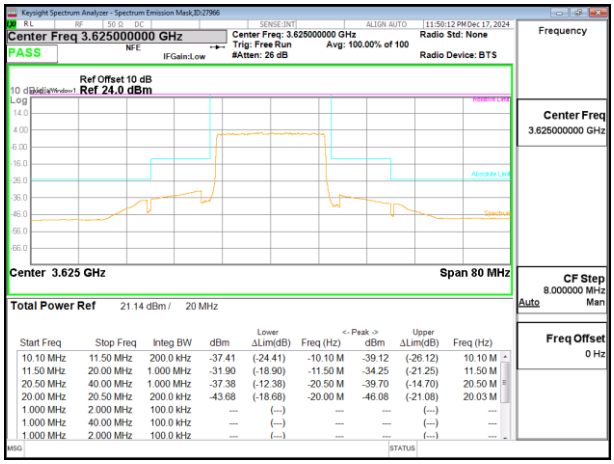
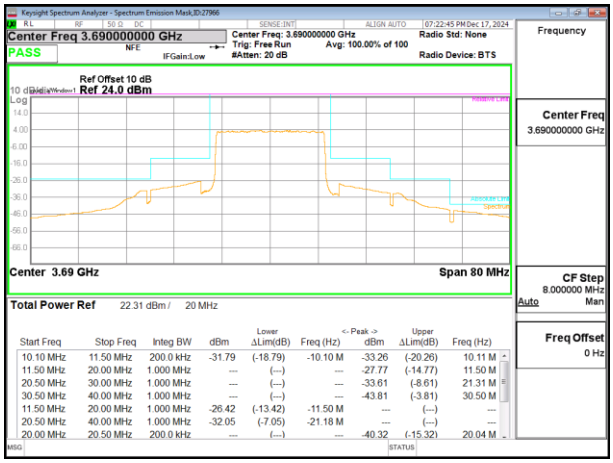


LTE B48 20MHz QPSK Low Channel RB100-0, ID:



LTE B48 20MHz QPSK Middle Channel RB100-0, ID:



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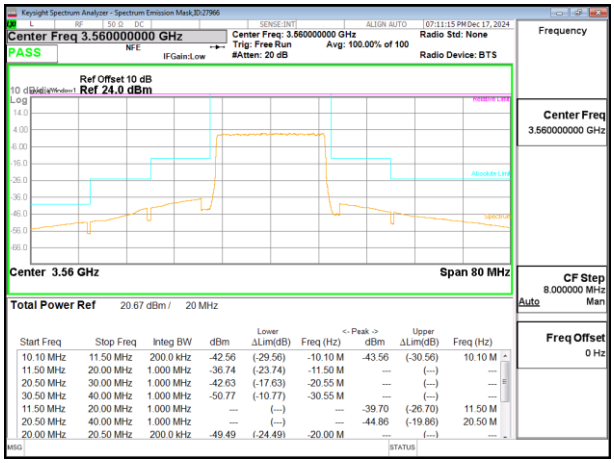
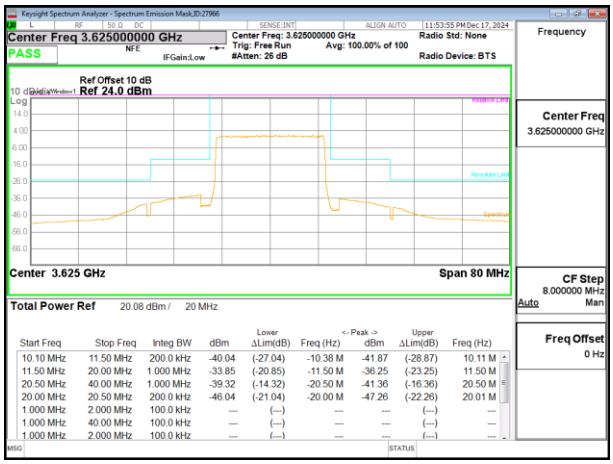


LTE B48 20MHz 16QAM Low Channel RB100-0, ID:



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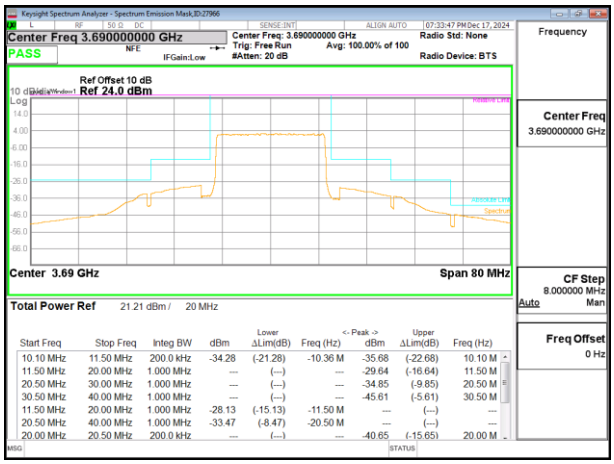


LTE B48 20MHz 16QAM High Channel RB100-0, ID:

9.4. OUT OF BAND EMISSIONS

LIMITS

FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

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.

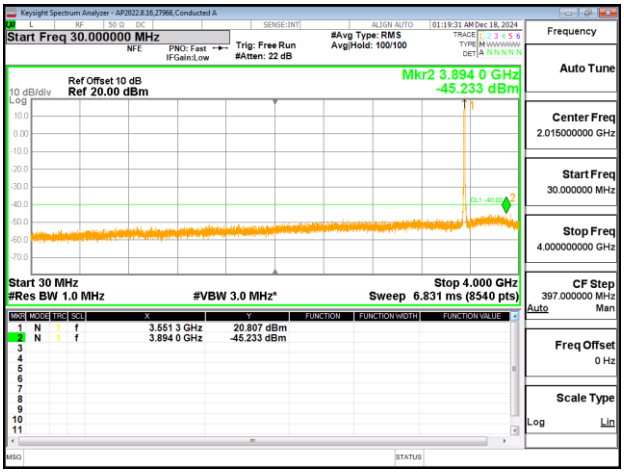
For each out of band emissions measurement:

- Set display line at -13 dBm, -25dBm and -40dBm 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)

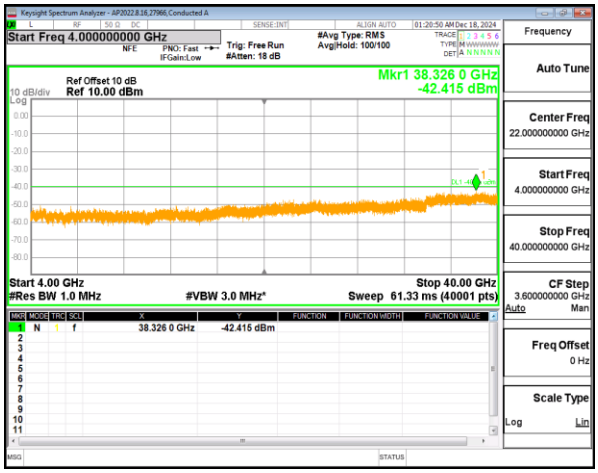
RESULTS

9.4.1. LTE BAND 48

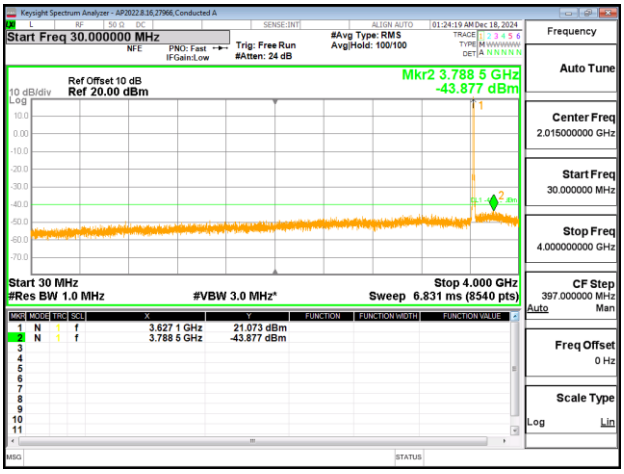
LTE BAND 48



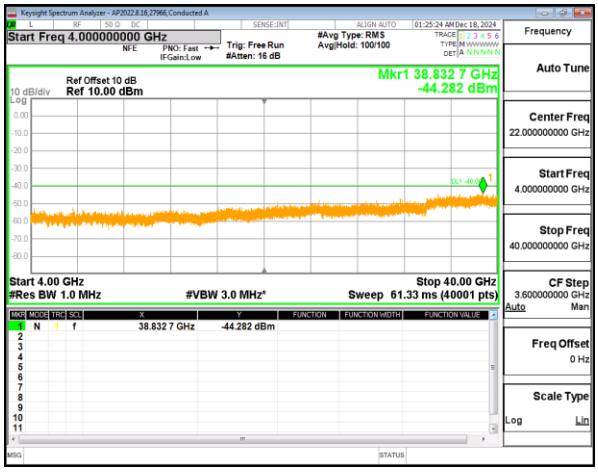
LTE B48 5MHz QPSK Low Channel RB25-0 (30MHz to 4GHz),ID:



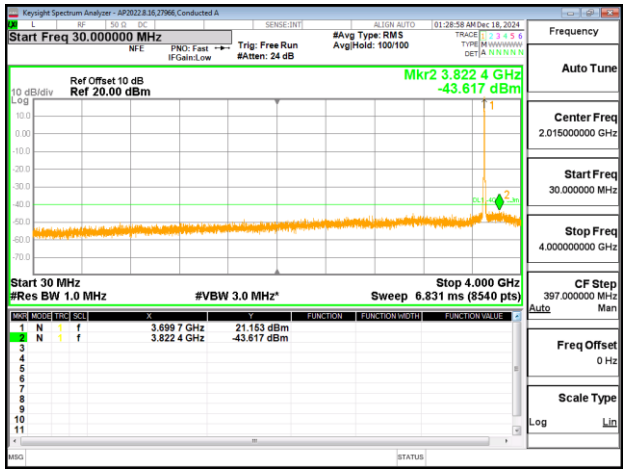
LTE B48 5MHz QPSK Low Channel RB25-0 (4G to 40G) ,ID:



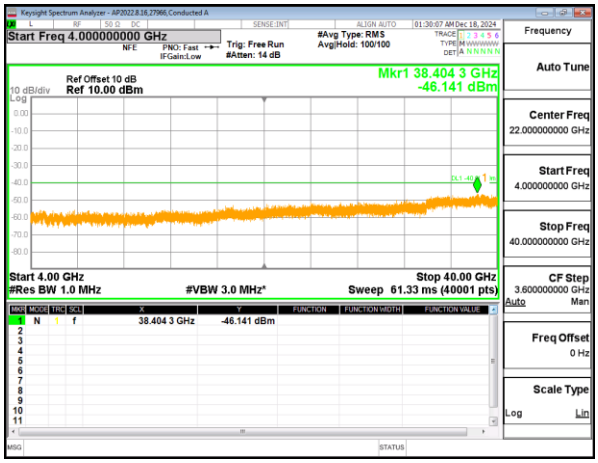
LTE B48 5MHz QPSK Mid Channel RB25-0 (30MHz to 4GHz) ,ID:



LTE B48 5MHz QPSK Middle Channel RB1-0 (4G to 40G) ,ID:



LTE B48 5MHz QPSK High Channel RB25-0 (30MHz to 4GHz) ,ID:



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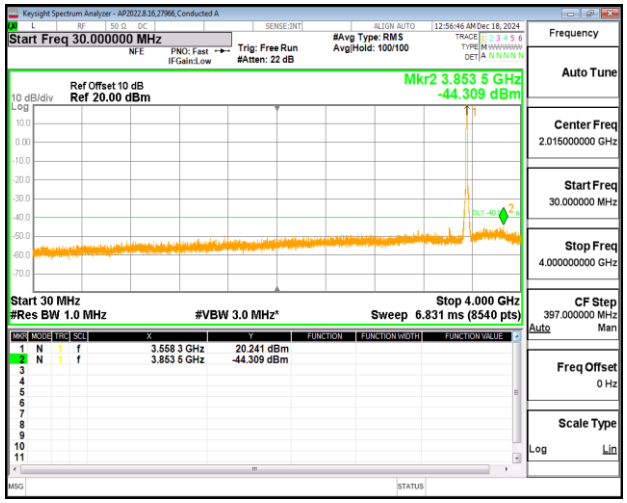
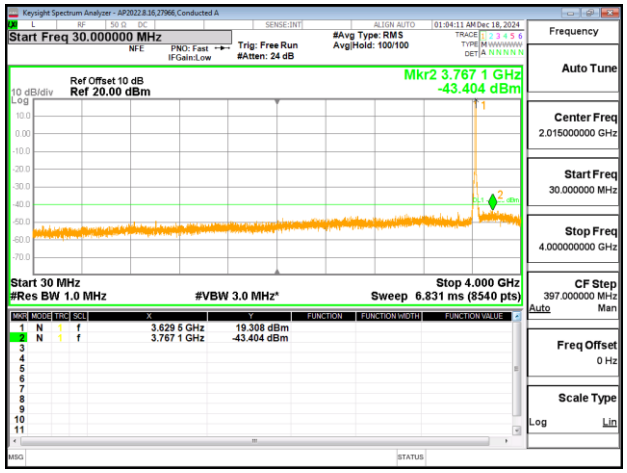


LTE B48 10MHz QPSK Low Channel RB50-0 (30MHz to 4GHz) ,ID:24898

LTE B48 10MHz QPSK Low Channel RB50-0 (4G to 40G) ,ID:



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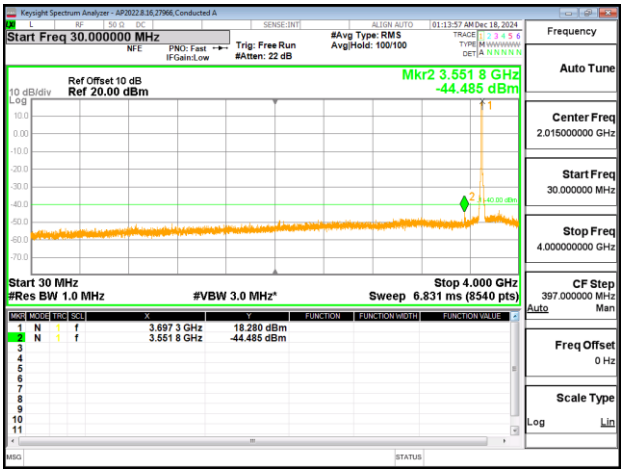
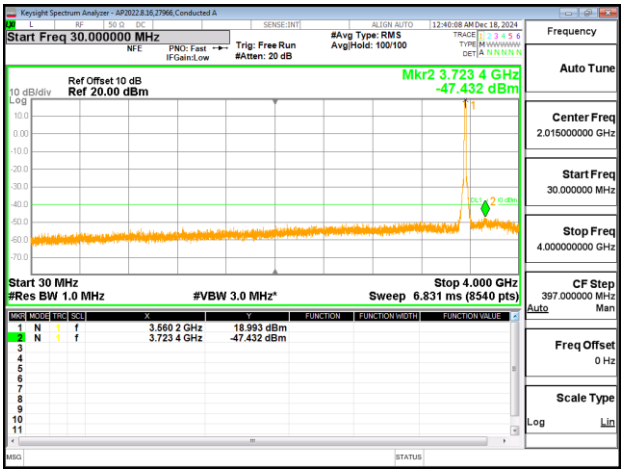
LTE B48 10MHz QPSK Middle Channel RB50-0 (4G to 40G),ID:

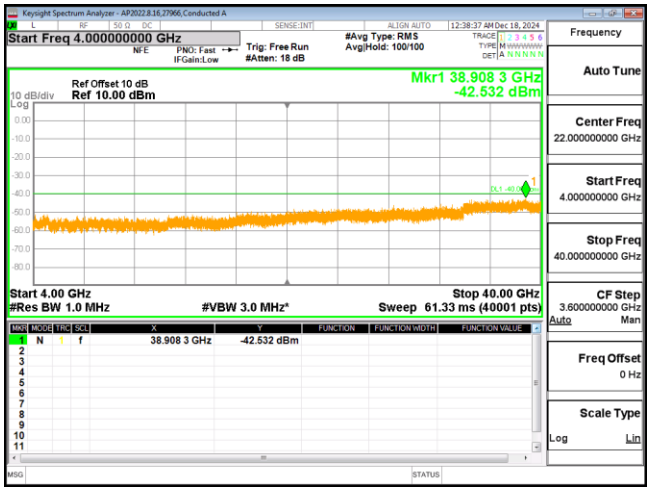


LTE B48 10MHz QPSK High Channel RB50-0 (30MHz to 4GHz),ID:

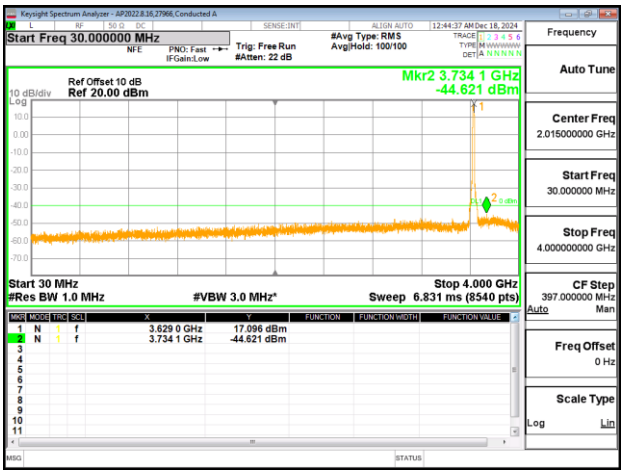
LTE B48 10MHz QPSK High Channel RB50-0 (4G to 40G) ,ID:



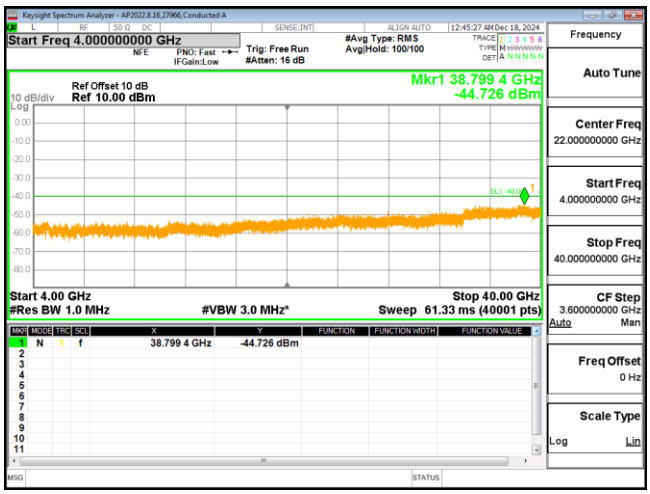
LTE B48 15MHz QPSK Low Channel RB75-0 (30MHz to 4GHz) ,ID:



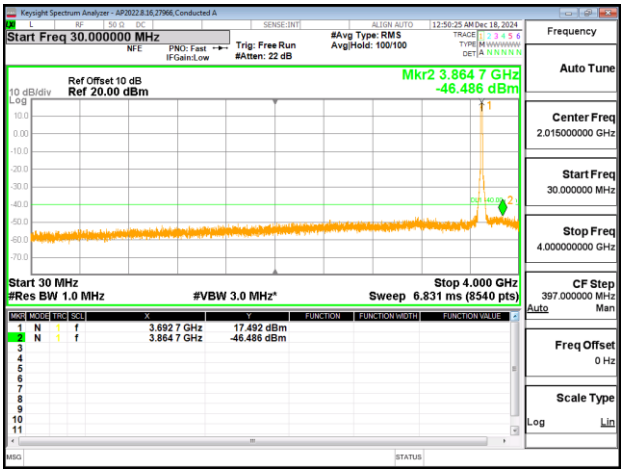
LTE B48 15MHz QPSK Low Channel RB75-0 (4G to 40G) ,ID:



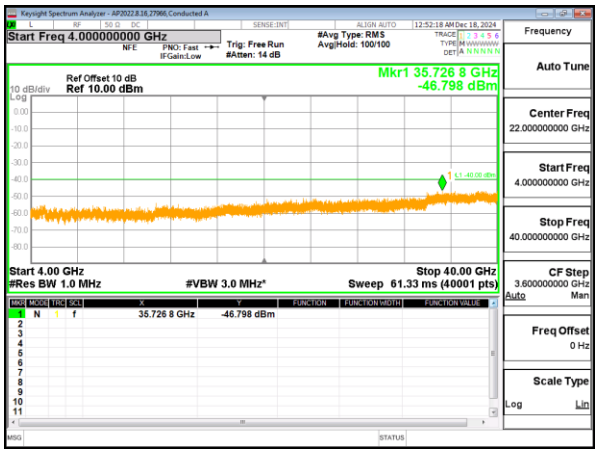
LTE B48 15MHz QPSK Mid Channel RB75-0 (30MHz to 4GHz) ,ID:24898



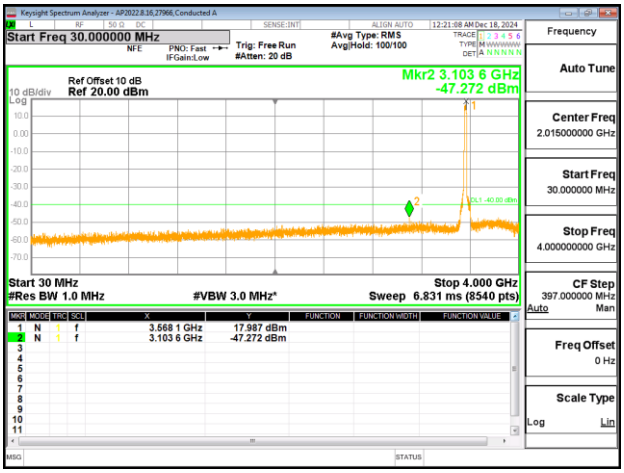
LTE B48 15MHz QPSK Middle Channel RB75-0 (4G to 40G),ID:



LTE B48 15MHz QPSK High Channel RB75-0 (30MHz to 4GHz),ID:

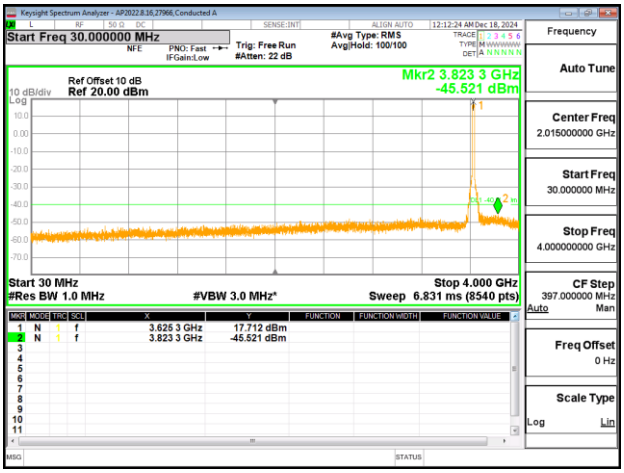


LTE B48 15MHz QPSK High Channel RB75-0 (4G to 40G) ,ID:

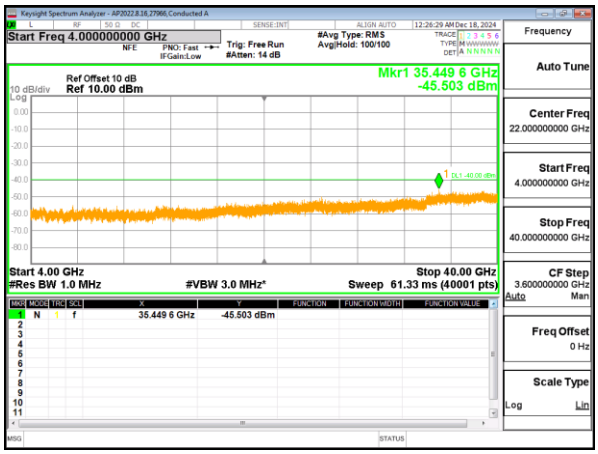


LTE B48 20MHz QPSK Low Channel RB100-0 (30MHz to 4GHz) ,ID:

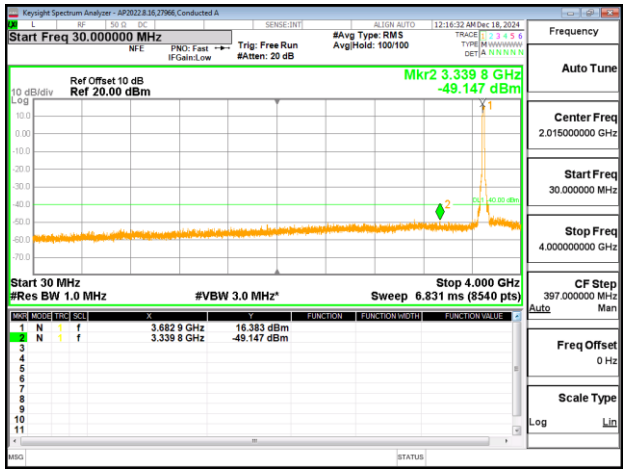
LTE B48 20MHz QPSK Low Channel RB100-0 (4G to 40G) ,ID:



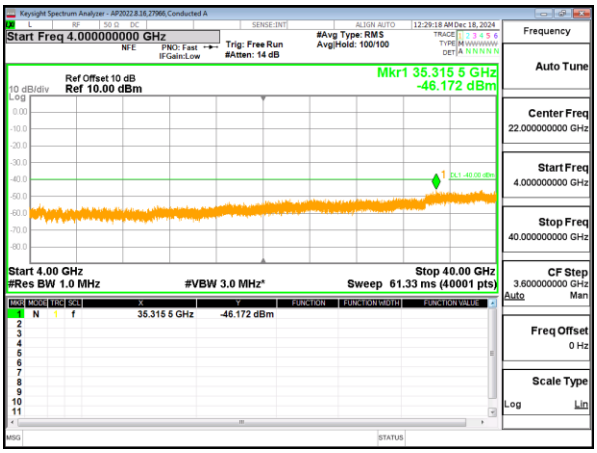
LTE B48 20MHz QPSK Mid Channel RB100-0 (30MHz to 4GHz) ,ID:



LTE B48 20MHz QPSK Middle Channel RB100-0 (4G to 40G),ID:



LTE B48 20MHz QPSK High Channel RB100-0 (30MHz to 4GHz),ID:



LTE B48 20MHz QPSK High Channel RB100-0 (4G to 40G) ,ID:

9.5. FREQUENCY STABILITY

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

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

  Low voltage, 102VAC, Normal, 120VAC and High voltage, 138VAC.
  End Voltage, 34VAC

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

9.5.1. LTE BAND 48

Test Engineer ID:	27966	Test Date:	12/18/2024

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	3550.9552	3699.0748			
Extreme (50°C)		3550.9553	3699.0748	11.5	0.003	Yes
Extreme (40°C)		3550.9553	3699.0748	9.9	0.003	Yes
Extreme (30°C)		3550.9553	3699.0748	12.7	0.004	Yes
Extreme (10°C)		3550.9553	3699.0748	10.1	0.003	Yes
Extreme (0°C)		3550.9553	3699.0748	10.8	0.003	Yes
Extreme (-10°C)		3550.9553	3699.0748	10.5	0.003	Yes
Extreme (-20°C)		3550.9553	3699.0748	11.2	0.003	Yes
Extreme (-30°C)		3550.9553	3699.0748	11.4	0.003	Yes
20°C	15%	3550.9553	3699.0748	16.0	0.004	Yes
	-15%	3550.9553	3699.0748	15.8	0.004	Yes
	End Point Voltage	3550.9553	3699.0748	12.8	0.004	Yes

9.6. PEAK-TO-AVERAGE POWER RATIO

LIMIT

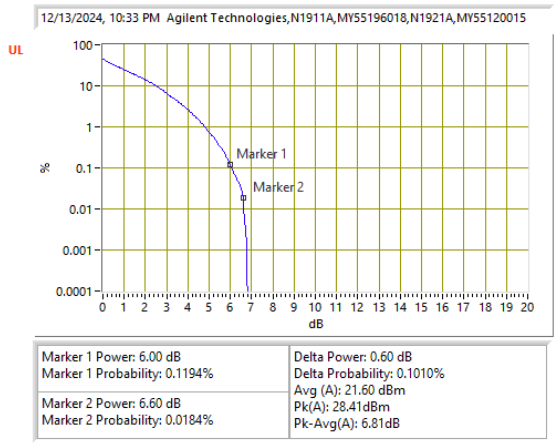
In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

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.

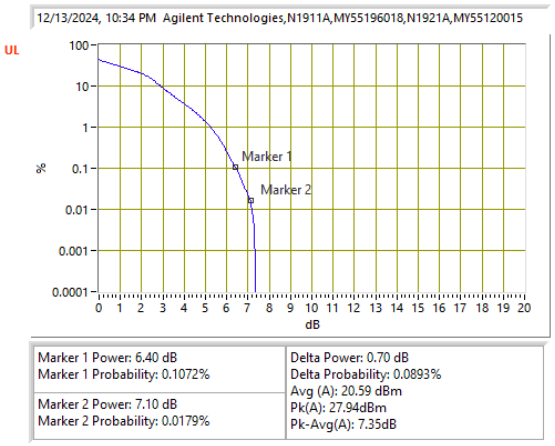
9.6.1. LTE BAND 48

Test Engineer ID:	27966	Test Date:	12/13/2024



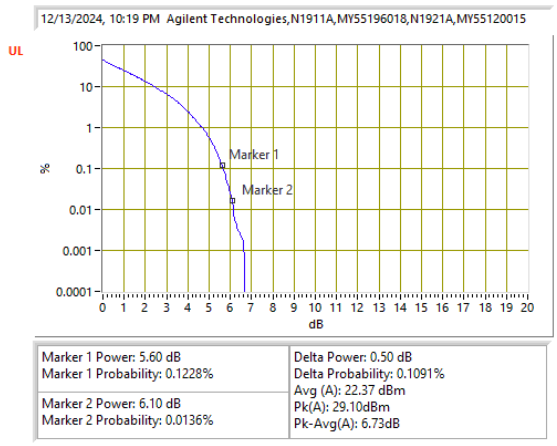
Marker 1 Power: 6.00 dB Marker 1 Probability: 0.1194%	Delta Power: 0.60 dB Delta Probability: 0.1010% Avg (A): 21.60 dBm Pk(A): 28.41dBm Pk-Avg(A): 6.81dB
Marker 2 Power: 6.60 dB Marker 2 Probability: 0.0184%	

LTE B48 5MHz QPSK Middle Channel RB25-0, ID:



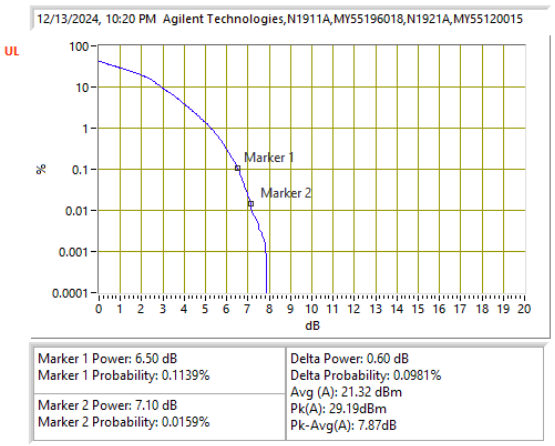
Marker 1 Power: 6.40 dB Marker 1 Probability: 0.1072%	Delta Power: 0.70 dB Delta Probability: 0.0893% Avg (A): 20.59 dBm Pk(A): 27.94dBm Pk-Avg(A): 7.35dB
Marker 2 Power: 7.10 dB Marker 2 Probability: 0.0179%	

LTE B48 5MHz 16QAM Middle Channel RB25-0, ID:



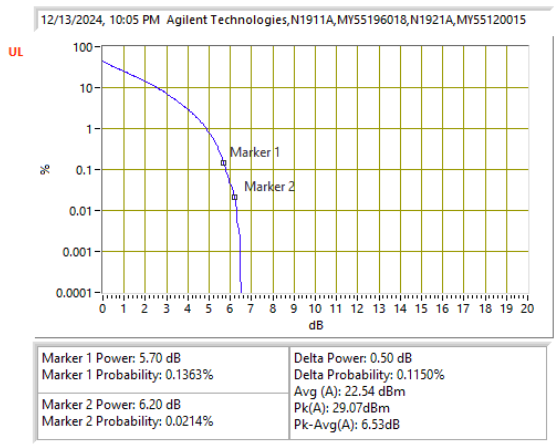
Marker 1 Power: 5.60 dB Marker 1 Probability: 0.1228%	Delta Power: 0.50 dB Delta Probability: 0.1091% Avg (A): 22.37 dBm Pk(A): 29.10dBm Pk-Avg(A): 6.73dB
Marker 2 Power: 6.10 dB Marker 2 Probability: 0.0136%	

LTE B48 10MHz QPSK Middle Channel RB50-0, ID:



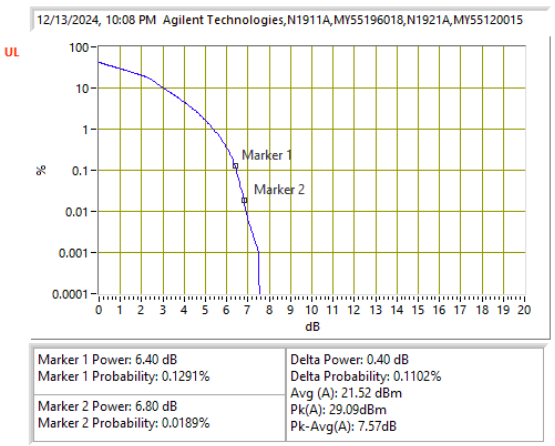
Marker 1 Power: 6.50 dB Marker 1 Probability: 0.1139%	Delta Power: 0.60 dB Delta Probability: 0.0981% Avg (A): 21.32 dBm Pk(A): 29.19dBm Pk-Avg(A): 7.87dB
Marker 2 Power: 7.10 dB Marker 2 Probability: 0.0159%	

LTE B48 10MHz 16QAM Middle Channel RB50-0, ID:



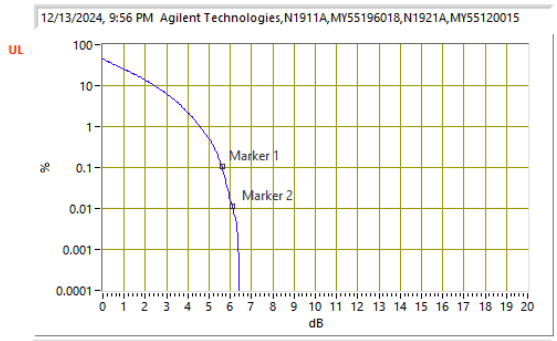
Marker 1 Power: 5.70 dB Marker 1 Probability: 0.1363%	Delta Power: 0.50 dB Delta Probability: 0.1150% Avg (A): 22.54 dBm Pk(A): 29.07dBm Pk-Avg(A): 6.53dB
Marker 2 Power: 6.20 dB Marker 2 Probability: 0.0214%	

LTE B48 15MHz QPSK Middle Channel RB75-0, ID:

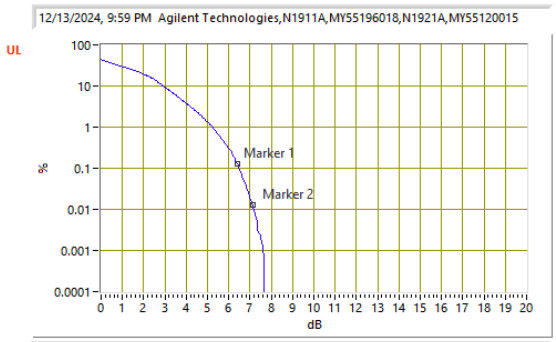


Marker 1 Power: 6.40 dB Marker 1 Probability: 0.1291%	Delta Power: 0.40 dB Delta Probability: 0.1102% Avg (A): 21.52 dBm Pk(A): 29.09dBm Pk-Avg(A): 7.57dB
Marker 2 Power: 6.80 dB Marker 2 Probability: 0.0189%	

LTE B48 15MHz 16QAM Middle Channel RB75-0, ID:



LTE B48 20MHz QPSK Middle Channel RB100-0, ID



LTE B48 20MHz 16QAM Middle Channel RB100-0, ID

10. RADIATED TEST RESULTS

Radiated measurement using the Field Strength Method

Using the test configuration shown in Figure 6 below, We measure the radiated emissions 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 method.

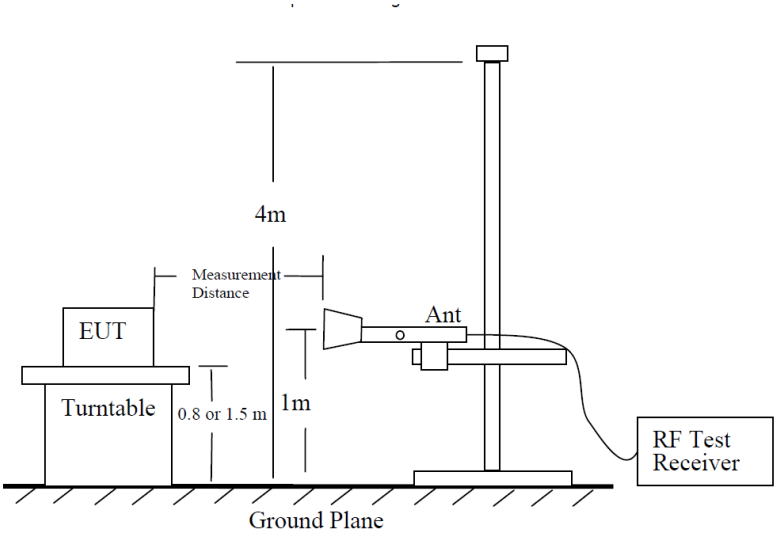


Figure 6—Test site-up for radiated ERP and/or EIRP measurements

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.

10.1. FIELD STRENGTH OF SPURIOUS RADIATION

LIMITS

FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(2) Additional protection levels. Notwithstanding paragraph (d)(1) of this section, the conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

TEST PROCEDURE

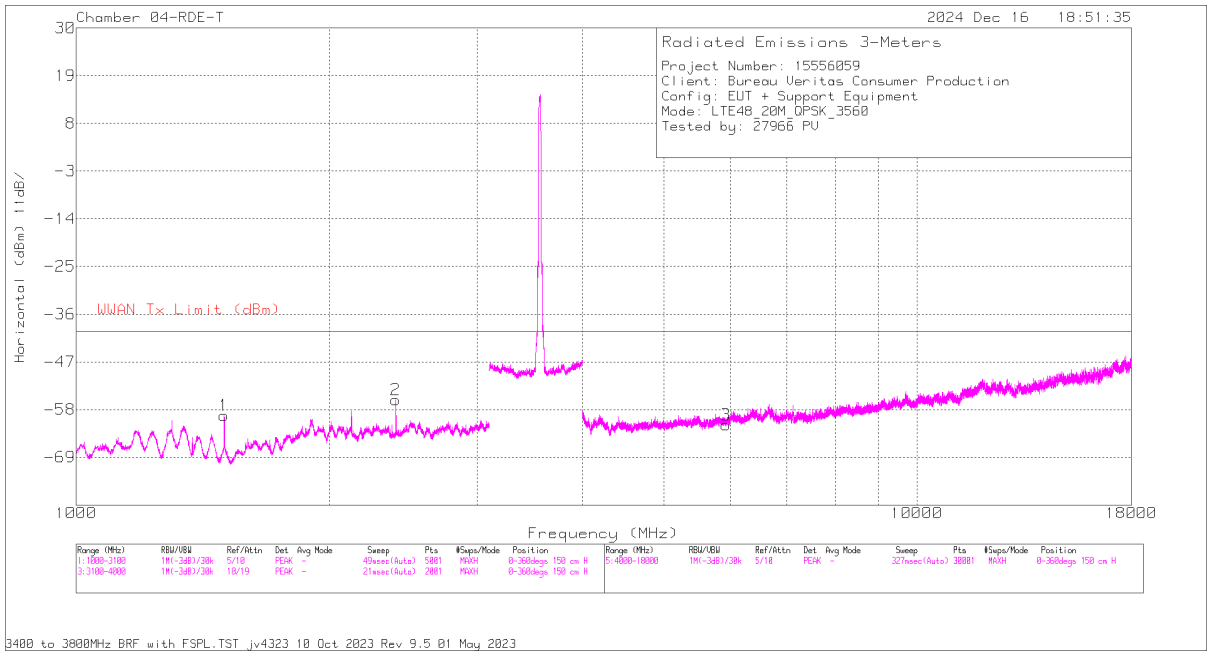
KDB 971168 D01/D02

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

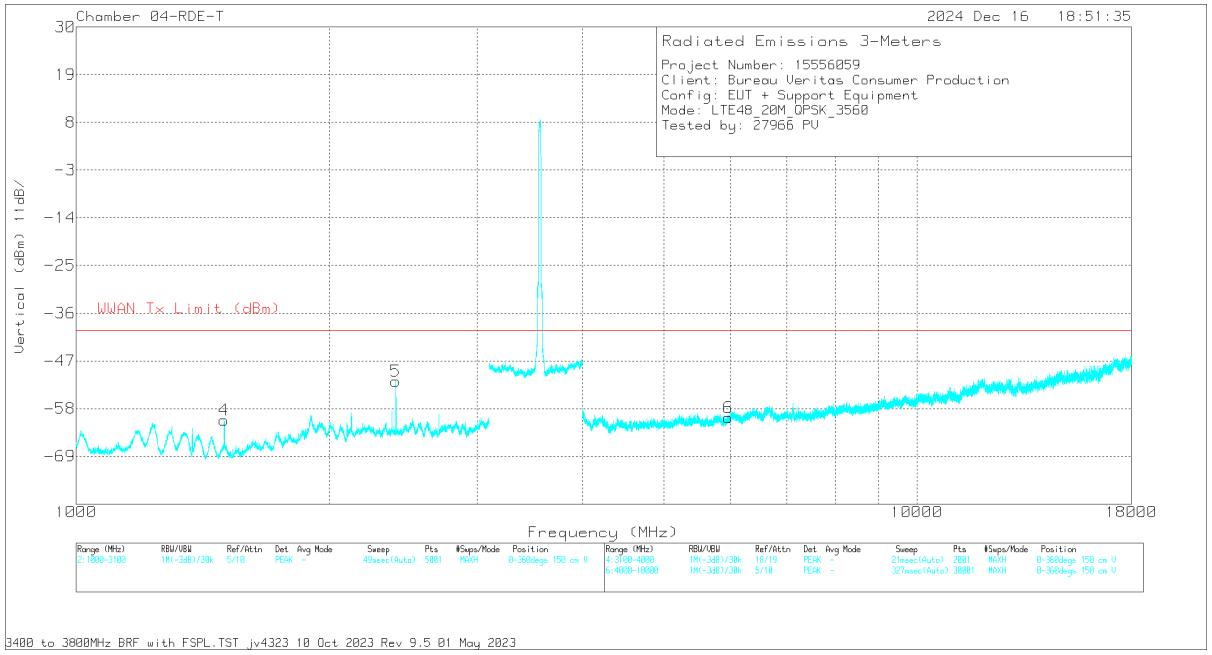
RESULT

10.1.1. LTE Band 48

QPSK LTE BAND 48 (20.0MHZ BANDWIDTH)



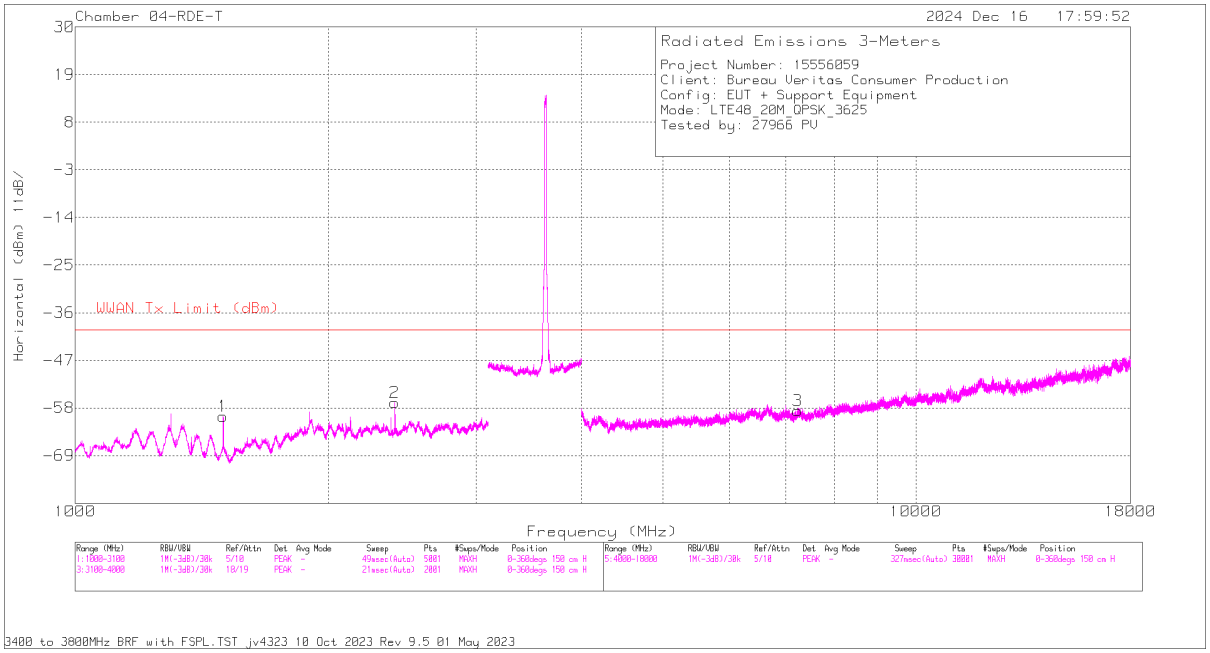
HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	79834 ACF (dB/m)	CF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBm)	WWAN Tx Limit (dBm)	Margin (dB)	Polarity
	Low Channel, 3560MHz									
1	* 1499.8	-51.73	Pk	28	11.5	-47.15	-59.38	-40	-19.38	H
	* 1500.367	-54.69	RMS	28	11.5	-47.18	-62.37	-40	-22.37	H
2	2400.28	-51.08	Pk	32.1	11.5	-48.27	-55.75	-40	-15.75	H
	2400.22	-50.86	RMS	32.1	11.5	-48.28	-55.54	-40	-15.54	H
3	5926.868	-63.57	Pk	35.3	11.4	-44.58	-61.45	-40	-21.45	H
4	* 1499.8	-53.42	Pk	28	11.9	-47.15	-60.67	-40	-20.67	V
5	2400.28	-46.88	Pk	32.1	11.4	-48.27	-51.65	-40	-11.65	V
	2400.028	-47.16	RMS	32.1	11.4	-48.29	-51.95	-40	-11.95	V
6	5963.735	-62.58	Pk	35.3	11.8	-44.6	-60.08	-40	-20.08	V



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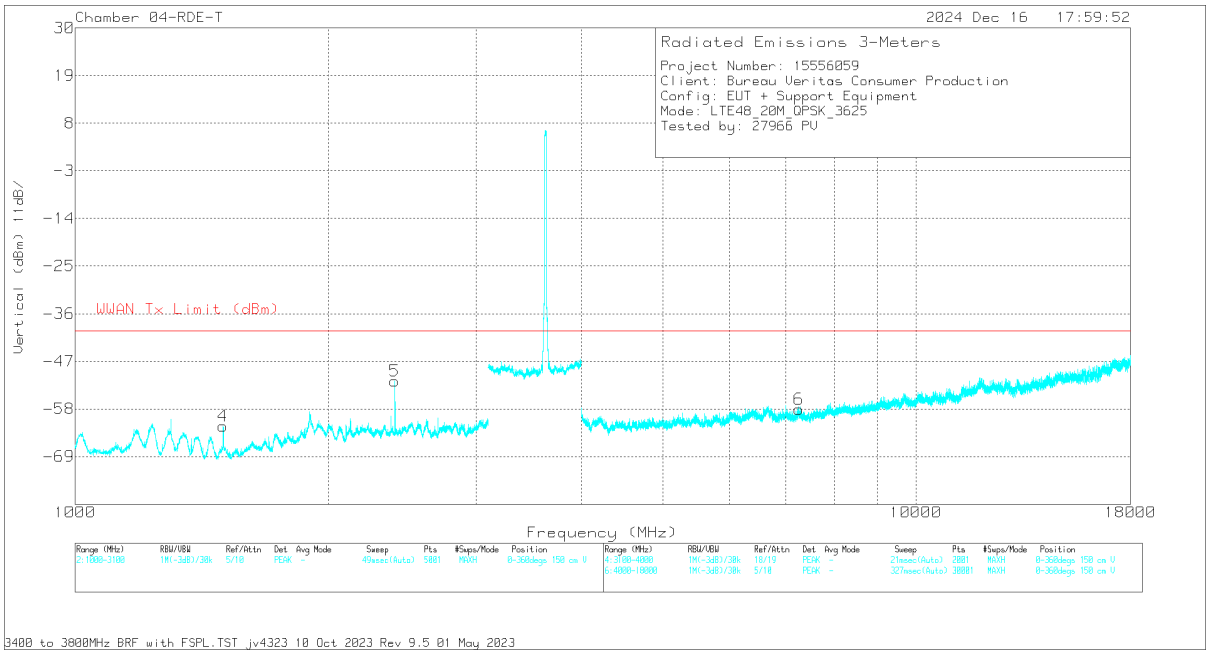
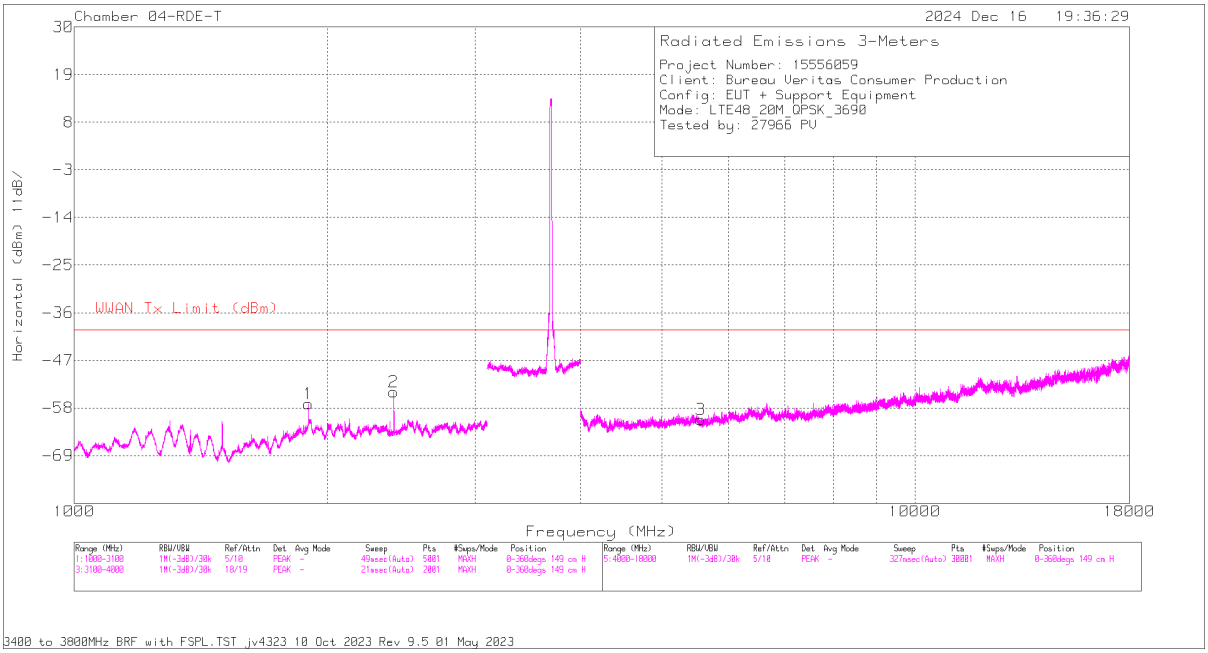


VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	79834 ACF (dB/m)	CF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBm)	WWAN Tx Limit (dBm)	Margin (dB)	Polarity
	Mid Channel, 3625MHz									
1	* 1499.8	-52.21	Pk	28	11.5	-47.15	-59.86	-40	-19.86	H
	* 1499.926	-50.76	RMS	28	11.5	-47.15	-58.41	-40	-18.41	H
2	2399.86	-52.01	Pk	32.1	11.5	-48.29	-56.7	-40	-16.7	H
	2399.994	-53.19	RMS	32.1	11.5	-48.29	-57.88	-40	-17.88	H
3	7233.069	-62.32	Pk	35.4	11.9	-43.61	-58.63	-40	-18.63	H
	7234.087	-64.95	RMS	35.4	12	-43.64	-61.19	-40	-21.19	H
4	* 1499.8	-54.74	Pk	28	11.9	-47.15	-61.99	-40	-21.99	V
5	2400.28	-46.72	Pk	32.1	11.4	-48.27	-51.49	-40	-11.49	V
	2399.969	-48.74	RMS	32.1	11.4	-48.29	-53.53	-40	-13.53	V
6	* 7256.402	-61.19	Pk	35.3	12	-44.09	-57.98	-40	-17.98	V
	* 7254.48	-63.3	RMS	35.3	11.9	-43.99	-60.09	-40	-20.09	V



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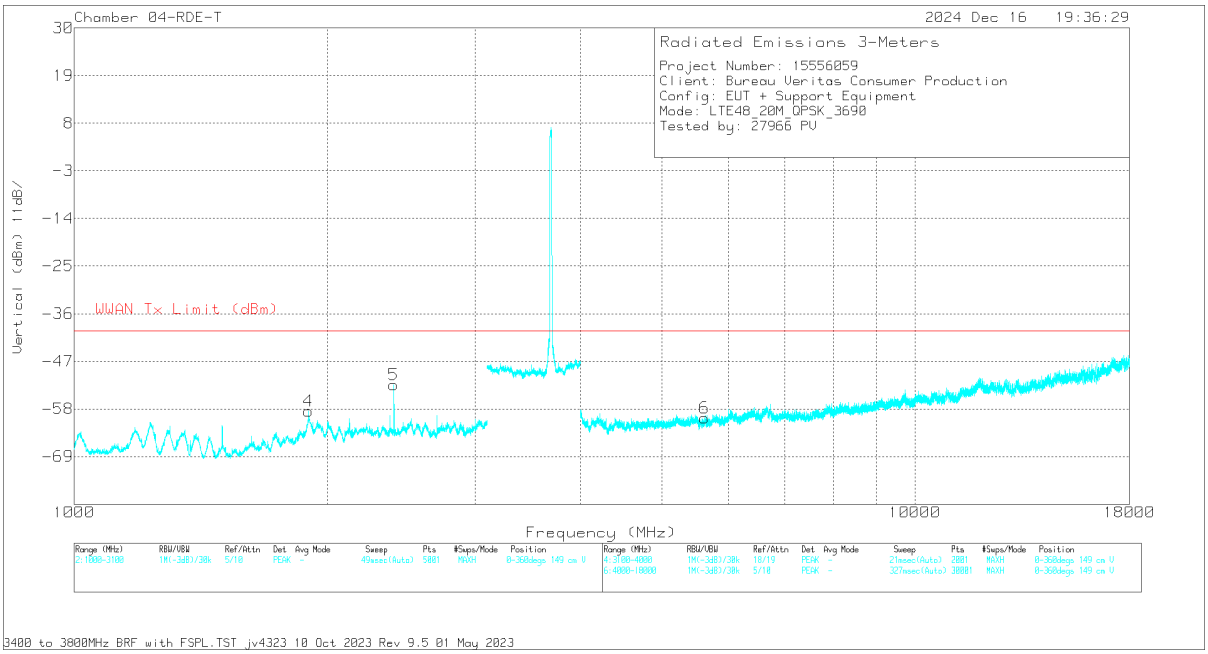

VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	79834 ACF (dB/m)	CF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBm)	WWAN Tx Limit (dBm)	Margin (dB)	Polarity
	High Channel, 3690MHz									
1	1900.06	-52.36	Pk	31.8	12.1	-48.53	-56.99	-40	-16.99	H
	1900.326	-57.35	RMS	31.8	12.2	-48.5	-61.85	-40	-21.85	H
2	2400.28	-49.6	Pk	32.1	11.5	-48.27	-54.27	-40	-14.27	H
	2400.13	-49.74	RMS	32.1	11.5	-48.28	-54.42	-40	-14.42	H
3	5560.068	-62.02	Pk	34.6	12.1	-45.34	-60.66	-40	-20.66	H
4	1900.48	-54.89	Pk	31.8	13.1	-48.49	-58.48	-40	-18.48	V
	1899.318	-58.98	RMS	31.8	13	-48.51	-62.69	-40	-22.69	V
5	2400.28	-47.66	Pk	32.1	11.4	-48.27	-52.43	-40	-12.43	V
	2399.987	-47.45	RMS	32.1	11.4	-48.29	-52.24	-40	-12.24	V
6	5616.534	-61.54	Pk	34.6	12	-45.09	-60.03	-40	-20.03	V