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UTTR-RF-FCC4G-V1.1

5.8 FIELD STRENGTH OF SPURIOUS RADIATION

Test Requirement: LTE Band 2: FCC 47 CFR Part 24.238(a)
 LTE Band 4: FCC 47 CFR Part 27.53(h)
 LTE Band 5: FCC 47 CFR Part 22.917(a)
 LTE Band 7: FCC 47 CFR Part 27.53(m)(4)

Test Method: ANSI C63.26-2015 & KDB 971168 D01v03r01

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009 MHz-30 MHz	Peak	10 kHz	30 KHz	Peak
30 MHz-1 GHz	Quasi-peak	100 kHz	300 KHz	Peak
Above 1 GHz	Peak	1 MHz	3 MHz	Peak

Limits:

FCC 47 CFR Part 24.238(a), 27.53(h)(1), 22.917(a):

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13 dBm.

FCC 47 CFR Part 27.53(m)(4):

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $55 + 10 \log(P)$ dB. The emission limit equal to -25 dBm.

Test Setup: Refer to section 4.2.1 for details.

Test Procedures: KDB 971168 D01v03r01 Section 7

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

5.8.1 LTE Band 2

LTE Band 2_20 MHz_QPSK							
No.	Frequency (MHz)	SA Reading (dBm)	Correction factor (dB/m)	EIRP Result (dBm)	Limit (dBm)	Margin (dB)	Ant. Pol.
Lowest Channel							
1	125.806	-64.89	-6.21	-71.10	-13.00	-58.10	Horizontal
2	250.486	-68.25	0.66	-67.59	-13.00	-54.59	Horizontal
3	602.929	-75.55	8.77	-66.78	-13.00	-53.78	Horizontal
4	3800.000	-64.29	7.93	-56.36	-13.00	-43.36	Horizontal
5	5700.000	-65.42	11.43	-53.99	-13.00	-40.99	Horizontal
6	38.908	-73.40	2.02	-71.38	-13.00	-58.38	Vertical
7	250.486	-67.99	0.66	-67.33	-13.00	-54.33	Vertical
8	703.731	-75.99	10.93	-65.06	-13.00	-52.06	Vertical
9	3800.000	-64.34	7.93	-56.41	-13.00	-43.41	Vertical
10	5700.000	-64.05	11.43	-52.62	-13.00	-39.62	Vertical
Middle Channel							
1	47.703	-71.26	-3.55	-74.81	-13.00	-61.81	Horizontal
2	252.252	-68.75	0.78	-67.97	-13.00	-54.97	Horizontal
3	602.929	-75.45	8.77	-66.68	-13.00	-53.68	Horizontal
4	3760.000	-63.57	7.79	-55.78	-13.00	-42.78	Horizontal
5	5640.000	-64.87	11.56	-53.31	-13.00	-40.31	Horizontal
6	35.762	-76.74	4.16	-72.58	-13.00	-59.58	Vertical
7	401.105	-74.19	5.06	-69.13	-13.00	-56.13	Vertical
8	602.929	-74.22	8.77	-65.45	-13.00	-52.45	Vertical
9	3760.000	-64.30	7.79	-56.51	-13.00	-43.51	Vertical
10	5640.000	-64.29	11.56	-52.73	-13.00	-39.73	Vertical
Highest Channel							
1	125.806	-64.60	-6.21	-70.81	-13.00	-57.81	Horizontal
2	252.252	-68.85	0.78	-68.07	-13.00	-55.07	Horizontal
3	550.290	-74.89	7.59	-67.30	-13.00	-54.30	Horizontal
4	3720.000	-64.59	7.65	-56.94	-13.00	-43.94	Horizontal
5	5580.000	-66.86	11.70	-55.16	-13.00	-42.16	Horizontal
6	38.908	-73.57	2.02	-71.55	-13.00	-58.55	Vertical
7	250.486	-68.01	0.66	-67.35	-13.00	-54.35	Vertical
8	602.929	-74.35	8.77	-65.58	-13.00	-52.58	Vertical
9	3720.000	-65.40	7.65	-57.75	-13.00	-44.75	Vertical
10	5580.000	-67.33	11.70	-55.63	-13.00	-42.63	Vertical

5.8.2 LTE Band 4

LTE Band 4_20 MHz_QPSK							
No.	Frequency (MHz)	SA Reading (dBm)	Correction factor (dB/m)	EIRP Result (dBm)	Limit (dBm)	Margin (dB)	Ant. Pol.
Lowest Channel							
1	47.703	-70.14	-3.55	-73.69	-13.00	-60.69	Horizontal
2	250.486	-66.97	0.66	-66.31	-13.00	-53.31	Horizontal
3	550.290	-73.35	7.59	-65.76	-13.00	-52.76	Horizontal
4	3440.000	-63.65	6.53	-57.12	-13.00	-44.12	Horizontal
5	5160.000	-65.88	10.10	-55.78	-13.00	-42.78	Horizontal
6	39.182	-73.74	1.86	-71.88	-13.00	-58.88	Vertical
7	250.486	-68.23	0.66	-67.57	-13.00	-54.57	Vertical
8	602.929	-73.02	8.77	-64.25	-13.00	-51.25	Vertical
9	3440.000	-61.72	6.53	-55.19	-13.00	-42.19	Vertical
10	5160.000	-66.84	10.10	-56.74	-13.00	-43.74	Vertical
Middle Channel							
1	47.369	-71.79	-3.19	-74.98	-13.00	-61.98	Horizontal
2	401.105	-76.96	5.06	-71.90	-13.00	-58.90	Horizontal
3	838.887	-79.91	12.75	-67.16	-13.00	-54.16	Horizontal
4	3465.000	-62.99	6.62	-56.37	-13.00	-43.37	Horizontal
5	5197.500	-66.09	10.25	-55.84	-13.00	-42.84	Horizontal
6	39.459	-73.54	1.73	-71.81	-13.00	-58.81	Vertical
7	250.486	-67.97	0.66	-67.31	-13.00	-54.31	Vertical
8	602.929	-73.96	8.77	-65.19	-13.00	-52.19	Vertical
9	3440.000	-62.87	6.53	-56.34	-13.00	-43.34	Vertical
10	5197.500	-66.84	10.25	-56.59	-13.00	-43.59	Vertical
Highest Channel							
1	32.640	-78.51	4.80	-73.71	-13.00	-60.71	Horizontal
2	252.252	-68.35	0.78	-67.57	-13.00	-54.57	Horizontal
3	550.290	-74.33	7.59	-66.74	-13.00	-53.74	Horizontal
4	3490.000	-62.39	6.71	-55.68	-13.00	-42.68	Horizontal
5	5235.000	-64.54	10.44	-54.10	-13.00	-41.10	Horizontal
6	38.908	-74.15	2.02	-72.13	-13.00	-59.13	Vertical
7	401.105	-72.68	5.06	-67.62	-13.00	-54.62	Vertical
8	602.929	-75.33	8.77	-66.56	-13.00	-53.56	Vertical
9	3490.000	-61.63	6.71	-54.92	-13.00	-41.92	Vertical
10	5235.000	-65.68	10.44	-55.24	-13.00	-42.24	Vertical

5.8.3 LTE Band 5

LTE Band 5_ 10 MHz_ QPSK							
No.	Frequency (MHz)	SA Reading (dBm)	Correction factor (dB/m)	EIRP Result (dBm)	Limit (dBm)	Margin (dB)	Ant. Pol.
Lowest Channel							
1	34.527	-72.75	4.61	-68.14	-13.00	-55.14	Horizontal
2	120.612	-65.44	-6.41	-71.85	-13.00	-58.85	Horizontal
3	875.013	-48.29	13.26	-35.03	-13.00	-22.03	Horizontal
4	1658.000	-36.47	0.27	-36.20	-13.00	-23.20	Horizontal
5	2487.000	-58.25	3.64	-54.61	-13.00	-41.61	Horizontal
6	32.411	-68.81	4.74	-64.07	-13.00	-51.07	Vertical
7	44.154	-65.89	-1.18	-67.07	-13.00	-54.07	Vertical
8	875.013	-49.18	13.26	-35.92	-13.00	-22.92	Vertical
9	1658.000	-36.18	0.27	-35.91	-13.00	-22.91	Vertical
10	2487.000	-59.84	3.64	-56.20	-13.00	-43.20	Vertical
Middle Channel							
1	34.045	-72.27	4.79	-67.48	-13.00	-54.48	Horizontal
2	120.612	-65.53	-6.41	-71.94	-13.00	-58.94	Horizontal
3	881.184	-48.90	13.51	-35.39	-13.00	-22.39	Horizontal
4	1673.000	-37.22	0.36	-36.86	-13.00	-23.86	Horizontal
5	2509.500	-58.78	3.71	-55.07	-13.00	-42.07	Horizontal
6	32.640	-68.98	4.80	-64.18	-13.00	-51.18	Vertical
7	38.365	-68.85	2.50	-66.35	-13.00	-53.35	Vertical
8	881.184	-51.14	13.51	-37.63	-13.00	-24.63	Vertical
9	1673.000	-38.08	0.36	-37.72	-13.00	-24.72	Vertical
10	2509.500	-61.81	3.71	-58.10	-13.00	-45.10	Vertical
Highest Channel							
1	34.770	-72.33	4.51	-67.82	-13.00	-54.82	Horizontal
2	120.612	-64.81	-6.41	-71.22	-13.00	-58.22	Horizontal
3	887.398	-49.92	13.66	-36.26	-13.00	-23.26	Horizontal
4	1688.000	-37.03	0.46	-36.57	-13.00	-23.57	Horizontal
5	2532.000	-59.53	3.76	-55.77	-13.00	-42.77	Horizontal
6	34.285	-69.09	4.70	-64.39	-13.00	-51.39	Vertical
7	44.779	-65.34	-1.68	-67.02	-13.00	-54.02	Vertical
8	887.398	-51.39	13.66	-37.73	-13.00	-24.73	Vertical
9	1688.000	-38.98	0.46	-38.52	-13.00	-25.52	Vertical
10	2532.000	-60.89	3.76	-57.13	-13.00	-44.13	Vertical

5.8.4 LTE Band 7

LTE Band 7_20 MHz_QPSK							
No.	Frequency (MHz)	SA Reading (dBm)	Correction factor (dB/m)	EIRP Result (dBm)	Limit (dBm)	Margin (dB)	Ant. Pol.
Lowest Channel							
1	127.586	-66.47	-6.36	-72.83	-25.00	-47.83	Horizontal
2	255.823	-67.52	1.00	-66.52	-25.00	-41.52	Horizontal
3	602.929	-75.90	8.77	-67.13	-25.00	-42.13	Horizontal
4	5020.000	-63.88	9.58	-54.30	-25.00	-29.30	Horizontal
5	7530.000	-64.51	13.67	-50.84	-25.00	-25.84	Horizontal
6	39.182	-72.56	1.86	-70.70	-25.00	-45.70	Vertical
7	252.252	-68.21	0.78	-67.43	-25.00	-42.43	Vertical
8	602.929	-73.62	8.77	-64.85	-25.00	-39.85	Vertical
9	5020.000	-63.69	9.58	-54.11	-25.00	-29.11	Vertical
10	7530.000	-64.32	13.67	-50.65	-25.00	-25.65	Vertical
Middle Channel							
1	126.693	-67.31	-6.27	-73.58	-25.00	-48.58	Horizontal
2	266.839	-67.39	1.68	-65.71	-25.00	-40.71	Horizontal
3	919.132	-80.83	13.83	-67.00	-25.00	-42.00	Horizontal
4	5070.000	-63.54	9.77	-53.77	-25.00	-28.77	Horizontal
5	7605.000	-65.36	13.78	-51.58	-25.00	-26.58	Horizontal
6	35.762	-77.32	4.16	-73.16	-25.00	-48.16	Vertical
7	502.247	-72.99	6.74	-66.25	-25.00	-41.25	Vertical
8	602.929	-73.39	8.77	-64.62	-25.00	-39.62	Vertical
9	5070.000	-62.73	9.77	-52.96	-25.00	-27.96	Vertical
10	7605.000	-65.39	13.78	-51.61	-25.00	-26.61	Vertical
Highest Channel							
1	35.511	-77.72	4.24	-73.48	-25.00	-48.48	Horizontal
2	252.252	-68.22	0.78	-67.44	-25.00	-42.44	Horizontal
3	925.613	-80.90	13.76	-67.14	-25.00	-42.14	Horizontal
4	5120.000	-58.21	9.95	-48.26	-25.00	-23.26	Horizontal
5	7680.000	-65.12	13.86	-51.26	-25.00	-26.26	Horizontal
6	39.459	-72.66	1.73	-70.93	-25.00	-45.93	Vertical
7	250.486	-67.66	0.66	-67.00	-25.00	-42.00	Vertical
8	602.929	-73.37	8.77	-64.60	-25.00	-39.60	Vertical
9	5120.000	-57.09	9.95	-47.14	-25.00	-22.14	Vertical
10	7680.000	-65.98	13.86	-52.12	-25.00	-27.12	Vertical

5.9 FREQUENCY STABILITY

Test Requirement: FCC 47 CFR Part 2.1055 &
 FCC 47 CFR Part 22.355 &
 FCC 47 CFR Part 24.235 &
 FCC 47 CFR Part 27.54,
Test Method: ANSI C63.26-2015 & KDB 971168 D01v03r01

Limits:
FCC 47 CFR Part 22.355
 The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

FCC 47 CFR Part 24.235, FCC 47 CFR Part 27.54
 The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Setup: Refer to section 4.2.2 for details.

Test Procedures:

- 1) Use CMW 500 or CMU 200 with Frequency Error measurement capability.
 - a) Temp. = -30° to $+50^{\circ}\text{C}$
 - b) Voltage = low voltage, 3.6 Vdc, Normal, 3.9 Vdc and High voltage, 4.3 Vdc.

2) 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 $+50^{\circ}\text{C}$ is reached.

3) Frequency Stability vs Voltage:

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

Equipment Used: Refer to section 3 for details.

Test Result: Pass

5.9.1 LTE Band 2

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature ($^{\circ}\text{C}$)	Deviation		Limit (ppm)	Pass/ Fail
				(Hz)	(ppm)		
LTE Band 2 / 20MHz / Full RB							
QPSK	18900 / 1880.0	VL	TN	38	0.0202	N/A	Pass
		VN		39	0.0207		Pass
		VH		38	0.0202		Pass
			50	38	0.0202		Pass
			40	33	0.0176		Pass
			30	34	0.0181		Pass
			20	33	0.0176		Pass
			10	39	0.0207		Pass
			0	36	0.0191		Pass
			-10	37	0.0197		Pass
			-20	37	0.0197		Pass
			-30	39	0.0207		Pass

5.9.2 LTE Band 4

Modulation	Channel/ Frequency	Voltage (Vdc)	Temperature (°C)	Deviation		Limit (ppm)	Pass/ Fail
	(MHz)			(Hz)	(ppm)		
LTE Band 4 / 20MHz / Full RB							
QPSK	20175 / 1732.5	VL	TN	41	0.0237	N/A	Pass
		VN		43	0.0248		Pass
		VH		37	0.0214		Pass
		VN	50	38	0.0219		Pass
			40	39	0.0225		Pass
			30	39	0.0225		Pass
			20	37	0.0214		Pass
			10	41	0.0237		Pass
			0	42	0.0242		Pass
			-10	38	0.0219		Pass
			-20	40	0.0231		Pass
			-30	35	0.0202		Pass

5.9.3 LTE Band 5

Modulation	Channel/ Frequency	Voltage (Vdc)	Temperature (°C)	Deviation		Limit (ppm)	Pass/ Fail
	(MHz)			(Hz)	(ppm)		
LTE Band 5 / 10MHz / Full RB							
QPSK	20525 / 836.5	VL	TN	-25	-0.0299	N/A	Pass
		VN		-25	-0.0299		Pass
		VH		-24	-0.0287		Pass
		VN	50	-28	-0.0335		Pass
			40	-24	-0.0287		Pass
			30	-25	-0.0299		Pass
			20	-29	-0.0347		Pass
			10	-29	-0.0347		Pass
			0	-26	-0.0311		Pass
			-10	-26	-0.0311		Pass
			-20	-28	-0.0335		Pass
			-30	-27	-0.0323		Pass

5.9.4 LTE Band 7

Modulation	Channel/ Frequency	Voltage	Temperature	Deviation		Limit	Pass/ Fail
	(MHz)	(Vdc)	(°C)	(Hz)	(ppm)	(ppm)	
LTE Band 7 / 20MHz / Full RB							
QPSK	21100 / 2535	VL	TN	-35	-0.0138	N/A	Pass
		VN		-33	-0.0130		Pass
		VH		-35	-0.0138		Pass
		VN	50	-34	-0.0134		Pass
			40	-37	-0.0146		Pass
			30	-39	-0.0154		Pass
			20	-37	-0.0146		Pass
			10	-34	-0.0134		Pass
			0	-38	-0.0150		Pass
			-10	-38	-0.0150		Pass
			-20	-37	-0.0146		Pass
			-30	-36	-0.0142		Pass

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***

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