

5.9 FREQUENCY STABILITY

FCC 47 CFR Part 2.1055 &

FCC 47 CFR Part 22.355 &

Test Requirement: 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, FCC 47 CFR Part 90.213

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 $+50^{\circ}$ C

b) Voltage = low voltage, 3.3 Vdc, Normal, 3.7 Vdc and High voltage, 4.2 Vdc.

2) Frequency Stability vs Temperature:

The EUT is place 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 $+50^{\circ}$ 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	Voltage	Temperature	Deviation	Deviation	Limit	Pass/ Fail
	(MHz)	(Vdc)	(°C)	(Hz)	(ppm)	(ppm)	
LTE Band 2 / 20MHz / Full RB							
QPSK	18900 / 1880.0	VL	TN	32.24	0.0171	N/A	Pass
		VN		31.80	0.0169		Pass
		VH		28.50	0.0152		Pass
		VN	50	29.19	0.0155		Pass
			40	28.36	0.0151		Pass
			30	27.86	0.0148		Pass
			20	31.80	0.0169		Pass
			10	29.26	0.0156		Pass
			0	33.02	0.0176		Pass
			-10	31.23	0.0166		Pass
			-20	29.19	0.0155		Pass
			-30	26.88	0.0143		Pass

5.9.2 LTE Band 4

Modulation	Channel/ Frequency	Voltage	Temperature	Deviation	Deviation	Limit	Pass/ Fail
	(MHz)	(Vdc)	(°C)	(Hz)	(ppm)	(ppm)	
LTE Band 4 / 20MHz / Full RB							
QPSK	20175 / 1732.5	VL	TN	-15.99	-0.0092	N/A	Pass
		VN		-17.91	-0.0103		Pass
		VH		-17.22	-0.0099		Pass
		50	50	-14.88	-0.0086		Pass
		40	40	-15.09	-0.0087		Pass
		30	30	-16.26	-0.0094		Pass
		20	20	-17.91	-0.0103		Pass
		10	10	-14.32	-0.0083		Pass
		0	0	-16.81	-0.0097		Pass
		-10	-10	-16.25	-0.0094		Pass
		-20	-20	-15.33	-0.0088		Pass
		-30	-30	-17.08	-0.0099		Pass

5.9.3 LTE Band 5

Modulation	Channel/ Frequency	Voltage	Temperature	Deviation	Deviation	Limit	Pass/ Fail
	(MHz)	(Vdc)	(°C)	(Hz)	(ppm)	(ppm)	
LTE Band 5 / 10MHz / Full RB							
QPSK	20525 / 836.5	VL	TN	-6.19	-0.0074	± 2.5	Pass
		VN		-7.48	-0.0089	± 2.5	Pass
		VH		-6.35	-0.0076	± 2.5	Pass
		50	50	-8.16	-0.0098	± 2.5	Pass
		40	40	-7.53	-0.0090	± 2.5	Pass
		30	30	-6.98	-0.0083	± 2.5	Pass
		20	20	-7.48	-0.0089	± 2.5	Pass
		10	10	-5.83	-0.0070	± 2.5	Pass
		0	0	-4.31	-0.0052	± 2.5	Pass
		-10	-10	-5.17	-0.0062	± 2.5	Pass
		-20	-20	-4.78	-0.0057	± 2.5	Pass
		-30	-30	-4.51	-0.0054	± 2.5	Pass

5.9.4 LTE Band 12

Modulation	Channel/ Frequency	Voltage	Temperature	Deviation	Deviation	Limit	Pass/ Fail
	(MHz)	(Vdc)	(°C)	(Hz)	(ppm)	(ppm)	
LTE Band 12 / 10MHz / Full RB							
QPSK	23095 / 707.5	VL	TN	-8.50	-0.0120	N/A	Pass
		VN		-10.1	-0.0143		Pass
		VH		-14.62	-0.0207		Pass
		50	50	-8.59	-0.0121		Pass
		40	40	-9.19	-0.0130		Pass
		30	30	-11.68	-0.0165		Pass
		20	20	-10.10	-0.0143		Pass
		10	10	-9.42	-0.0133		Pass
		0	0	-5.63	-0.0080		Pass
		-10	-10	-4.25	-0.0060		Pass
		-20	-20	-3.08	-0.0044		Pass
		-30	-30	-4.23	-0.0060		Pass

5.9.5 LTE Band 13

Modulation	Channel/ Frequency	Voltage	Temperature	Deviation	Deviation	Limit	Pass/ Fail
	(MHz)	(Vdc)	(°C)	(Hz)	(ppm)	(ppm)	
LTE Band 13 / 10MHz / Full RB							
QPSK	23230 / 782	VL	TN	-17.68	-0.0102	N/A	Pass
		VN		-20.90	-0.0121		Pass
		VH		-19.16	-0.0111		Pass
		50	50	-15.63	-0.0090		Pass
		40	40	-17.25	-0.0100		Pass
		30	30	-18.14	-0.0105		Pass
		20	20	-20.90	-0.0121		Pass
		10	10	-17.83	-0.0103		Pass
		0	0	-15.24	-0.0088		Pass
		-10	-10	-15.89	-0.0092		Pass
		-20	-20	-19.21	-0.0111		Pass
		-30	-30	-17.99	-0.0104		Pass

5.9.6 LTE Band 25

Modulation	Channel/ Frequency	Voltage	Temperature	Deviation	Deviation	Limit	Pass/ Fail
		(MHz)	(Vdc)	(°C)	(Hz)	(ppm)	
LTE Band 25/ 20MHz / Full RB							
QPSK	26590 / 1905	VL	TN	-9.16	-0.0052	N/A	Pass
		VN		-8.91	-0.0051		Pass
		VH		-10.07	-0.0058		Pass
		50	50	-9.19	-0.0053		Pass
		40	40	-6.51	-0.0037		Pass
		30	30	-7.37	-0.0042		Pass
		20	20	-8.91	-0.0051		Pass
		10	10	-8.13	-0.0047		Pass
		0	0	-7.88	-0.0045		Pass
		-10	-10	-8.25	-0.0047		Pass
		-20	-20	-6.41	-0.0037		Pass
		-30	-30	-7.82	-0.0045		Pass

5.9.7 LTE Band 26

Modulation	Channel/ Frequency	Voltage	Temperature	Deviation	Deviation	Limit	Pass/ Fail
		(MHz)	(Vdc)	(°C)	(Hz)	(ppm)	
LTE Band 26 / 15MHz / Full RB							
QPSK	26915 / 836.5	VL	TN	3.21	0.0038	± 2.5	Pass
		VN		2.72	0.0033	± 2.5	Pass
		VH		-4.30	-0.0051	± 2.5	Pass
		50	50	3.14	0.0038	± 2.5	Pass
		40	40	-3.58	-0.0043	± 2.5	Pass
		30	30	-6.25	-0.0075	± 2.5	Pass
		20	20	2.72	0.0033	± 2.5	Pass
		10	10	-4.36	-0.0052	± 2.5	Pass
		0	0	-2.02	-0.0024	± 2.5	Pass
		-10	-10	-2.72	-0.0033	± 2.5	Pass
		-20	-20	3.32	0.0040	± 2.5	Pass
		-30	-30	2.33	0.0028	± 2.5	Pass

5.9.8 LTE Band 26 (Part 90S)

Modulation	Channel/ Frequency	Voltage	Temperature	Deviation	Deviation	Limit	Pass/ Fail
	(MHz)	(Vdc)	(°C)	(Hz)	(ppm)	(ppm)	
LTE Band 26 / 10MHz / Full RB							
QPSK	26740 / 819	VL	TN	4.12	0.0050	± 2.5	Pass
		VN		3.66	0.0045	± 2.5	Pass
		VH		-4.33	-0.0053	± 2.5	Pass
		VN	50	-3.29	-0.0040	± 2.5	Pass
			40	-5.31	-0.0065	± 2.5	Pass
			30	-7.21	-0.0088	± 2.5	Pass
			20	4.43	0.0054	± 2.5	Pass
			10	-2.98	-0.0036	± 2.5	Pass
			0	-2.22	-0.0027	± 2.5	Pass
			-10	-2.54	-0.0031	± 2.5	Pass
			-20	4.32	0.0053	± 2.5	Pass
			-30	3.19	0.0039	± 2.5	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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