

Appendix F: Frequency Stability

Test Result

LTE Band 2 part:

Reference Frequency: LTE Band 2 (10MHz) Middle channel=18900 Frequency=1880.0MHz					
Temperature					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	8.20	0.004362	Within authorized band for Band 2	Pass
	-20	17.87	0.009505		
	-10	3.72	0.001979		
	0	17.82	0.009479		
	10	12.39	0.006590		
	20	-9.23	-0.004910		
	30	6.88	0.003660		
	40	12.85	0.006835		
	50	8.88	0.004723		
16QAM					
3.85	-30	4.99	0.002654	Within authorized band for Band 2	Pass
	-20	13.88	0.007383		
	-10	-5.12	-0.002723		
	0	2.96	0.001574		
	10	13.90	0.007394		
	20	4.36	0.002319		
	30	-5.74	-0.003053		
	40	3.03	0.001612		
	50	-7.75	-0.004122		
64QAM					
3.85	-30	7.74	0.004117	Within authorized band for Band 2	Pass
	-20	-8.48	-0.004511		
	-10	3.66	0.001947		
	0	-11.50	-0.006117		
	10	-11.52	-0.006128		
	20	5.25	0.002793		
	30	-8.01	-0.004261		
	40	8.90	0.004734		
	50	14.23	0.007569		
Voltage					
Temperature	Power supplied	Frequency error		Limit (ppm)	Result

(°C)	(Vdc)	Hz	ppm		
QPSK					
25	3.50	9.68	0.005149	Within authorized band for Band 2	Pass
	3.85	11.77	0.006261		
	4.40	-2.85	-0.001516		
16QAM					
25	3.50	17.58	0.009351	Within authorized band for Band 2	Pass
	3.85	-2.39	-0.001271		
	4.40	16.31	0.008676		
64QAM					
25	3.50	8.70	0.004628	Within authorized band for Band 2	Pass
	3.85	10.29	0.005473		
	4.40	7.84	0.004170		
Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.					

LTE Band 5 part:

Reference Frequency: LTE Band 5(10MHz) Middle channel=20525 Frequency=836.5MHz					
Temperature					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	-8.81	-0.010532	±2.5	Pass
	-20	-5.24	-0.006264		
	-10	-5.26	-0.006288		
	0	-4.42	-0.005284		
	10	-5.45	-0.006515		
	20	-5.71	-0.006826		
	30	-9.54	-0.011405		
	40	-4.58	-0.005475		
	50	-5.25	-0.006276		
16QAM					
3.85	-30	-7.45	-0.008906	±2.5	Pass
	-20	-11.03	-0.013186		
	-10	-2.20	-0.002630		
	0	2.17	0.002594		
	10	-2.26	-0.002702		
	20	-7.14	-0.008536		
	30	-2.85	-0.003407		
	40	-5.15	-0.006157		
	50	-4.19	-0.005009		
64QAM					
3.85	-30	-3.78	-0.004519	±2.5	Pass
	-20	-4.68	-0.005595		
	-10	-2.40	-0.002869		
	0	2.35	0.002809		
	10	-5.15	-0.006157		
	20	-2.88	-0.003443		
	30	-4.88	-0.005834		
	40	-5.62	-0.006718		
	50	-4.08	-0.004877		
Voltage					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					

25	3.45	-7.98	-0.009540	±2.5	Pass
	3.85	-2.95	-0.003527		
	4.40	-6.39	-0.007639		
16QAM					
25	3.45	-4.09	-0.004889	±2.5	Pass
	3.85	-2.68	-0.003204		
	4.40	4.02	0.004806		
64QAM					
25	3.45	-6.54	-0.007818	±2.5	Pass
	3.85	2.66	0.003180		
	4.40	-4.53	-0.005415		
Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.					

LTE Band 7 part:

Reference Frequency: LTE Band 7(10MHz) Middle channel=21100 Frequency=2535.0MHz					
Temperature					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	2.55	0.001006	Within authorized band for Band 7	Pass
	-20	11.40	0.004497		
	-10	-14.43	-0.005692		
	0	-20.44	-0.008063		
	10	14.52	0.005728		
	20	14.35	0.005661		
	30	-5.08	-0.002004		
	40	-7.01	-0.002765		
	50	5.89	0.002323		
16QAM					
3.85	-30	-13.23	-0.005219	Within authorized band for Band 7	Pass
	-20	-16.25	-0.006410		
	-10	13.98	0.005515		
	0	6.57	0.002592		
	10	13.35	0.005266		
	20	4.65	0.001834		
	30	4.99	0.001968		
	40	9.78	0.003858		
	50	-2.68	-0.001057		
64QAM					
3.85	-30	8.05	0.003176	Within authorized band for Band 7	Pass
	-20	-6.08	-0.002398		
	-10	11.26	0.004442		
	0	-7.48	-0.002951		
	10	-17.97	-0.007089		
	20	-13.69	-0.005400		
	30	6.90	0.002722		
	40	-14.93	-0.005890		
	50	-16.02	-0.006320		
Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					

25	3.45	-15.11	-0.005961	Within authorized band for Band 7	Pass
	3.85	-10.14	-0.004000		
	4.40	15.42	0.006083		
16QAM					
25	3.45	-4.03	-0.001590	Within authorized band for Band 7	Pass
	3.85	-18.80	-0.007416		
	4.40	-6.95	-0.002742		
64QAM					
25	3.45	-11.67	-0.004604	Within authorized band for Band 7	Pass
	3.85	-13.73	-0.005416		
	4.40	-10.56	-0.004166		
Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.					

LTE Band 12 part:

Reference Frequency: LTE Band 12(10MHz) Middle channel=23095 Frequency=707.5MHz					
Temperature					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	-3.96	-0.005597	Within authorized band for Band 12	Pass
	-20	6.28	0.008876		
	-10	-4.56	-0.006445		
	0	-2.42	-0.003420		
	10	-5.71	-0.008071		
	20	5.15	0.007279		
	30	5.26	0.007435		
	40	-4.55	-0.006431		
	50	-4.19	-0.005922		
16QAM					
3.85	-30	4.39	0.006205	Within authorized band for Band 12	Pass
	-20	-5.48	-0.007746		
	-10	1.85	0.002615		
	0	-7.05	-0.009965		
	10	-1.66	-0.002346		
	20	-4.28	-0.006049		
	30	-5.79	-0.008184		
	40	2.76	0.003901		
	50	-3.33	-0.004707		
64QAM					
3.85	-30	-1.52	-0.002148	Within authorized band for Band 12	Pass
	-20	-5.44	-0.007689		
	-10	-2.13	-0.003011		
	0	-2.69	-0.003802		
	10	2.19	0.003095		
	20	2.46	0.003477		
	30	-5.64	-0.007972		
	40	-3.66	-0.005173		
	50	3.15	0.004452		
Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					

25	3.45	-3.16	-0.004466	Within authorized band for Band 12	Pass
	3.85	3.26	0.004608		
	4.40	-7.04	-0.009951		
16QAM					
25	3.45	-1.36	-0.001922	Within authorized band for Band 12	Pass
	3.85	-7.44	-0.010516		
	4.40	2.13	0.003011		
64QAM					
25	3.45	-3.91	-0.005527	Within authorized band for Band 12	Pass
	3.85	4.25	0.006007		
	4.40	-1.77	-0.002502		
Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.					

LTE Band 17 part:

Reference Frequency: LTE Band 17(10MHz) Middle channel=23790 Frequency=710.0MHz					
Temperature					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	-5.95	-0.008380	Within authorized band for Band 17	Pass
	-20	-0.94	-0.001324		
	-10	-3.03	-0.004268		
	0	-4.18	-0.005887		
	10	-4.28	-0.006028		
	20	-8.18	-0.011521		
	30	-2.73	-0.003845		
	40	-3.92	-0.005521		
	50	-3.00	-0.004225		
16QAM					
3.85	-30	-1.95	-0.002746	Within authorized band for Band 17	Pass
	-20	2.88	0.004056		
	-10	-5.55	-0.007817		
	0	-8.67	-0.012211		
	10	-3.62	-0.005099		
	20	-5.82	-0.008197		
	30	-3.55	-0.005000		
	40	-4.08	-0.005746		
	50	2.00	0.002817		
64QAM					
3.85	-30	-4.79	-0.006746	Within authorized band for Band 17	Pass
	-20	-2.98	-0.004197		
	-10	-6.29	-0.008859		
	0	-3.79	-0.005338		
	10	-5.02	-0.007070		
	20	-4.32	-0.006085		
	30	-6.04	-0.008507		
	40	-3.71	-0.005225		
	50	-5.24	-0.007380		
Voltage					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					

25	3.45	-5.92	-0.008338	Within authorized band for Band 17	Pass
	3.85	-4.76	-0.006704		
	4.40	-5.36	-0.007549		
16QAM					
25	3.45	-4.81	-0.006775	Within authorized band for Band 17	Pass
	3.85	-9.46	-0.013324		
	4.40	-3.53	-0.004972		
64QAM					
25	3.45	-6.47	-0.009113	Within authorized band for Band 17	Pass
	3.85	-4.91	-0.006915		
	4.40	-6.32	-0.008901		
Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.					

LTE Band 41 part:

Reference Frequency: LTE Band 41 (10MHz) Middle channel=40640 Frequency=2595.0MHz					
Temperature					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	11.01	0.004246	Within authorized band for Band 41	Pass
	-20	-7.14	-0.002754		
	-10	-10.61	-0.004092		
	0	4.89	0.001886		
	10	-9.37	-0.003614		
	20	6.67	0.002572		
	30	-11.46	-0.004420		
	40	-8.58	-0.003309		
	50	8.00	0.003085		
16QAM					
3.85	-30	3.42	0.001319	Within authorized band for Band 41	Pass
	-20	12.36	0.004767		
	-10	3.09	0.001192		
	0	-9.93	-0.003830		
	10	-12.43	-0.004794		
	20	-5.94	-0.002291		
	30	-10.43	-0.004022		
	40	1.99	0.000767		
	50	6.19	0.002387		
64QAM					
3.85	-30	8.58	0.003309	Within authorized band for Band 41	Pass
	-20	-9.33	-0.003598		
	-10	-7.61	-0.002935		
	0	-4.99	-0.001924		
	10	8.73	0.003367		
	20	-7.05	-0.002719		
	30	-6.65	-0.002565		
	40	4.35	0.001678		
	50	4.25	0.001639		
Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					

25	3.45	7.93	0.003058	Within authorized band for Band 41	Pass
	3.85	9.38	0.003617		
	4.40	9.06	0.003494		
16QAM					
25	3.45	-10.50	-0.004049	Within authorized band for Band41	Pass
	3.85	-13.52	-0.005214		
	4.40	-10.90	-0.004204		
64QAM					
25	3.45	7.88	0.003039	Within authorized band for Band41	Pass
	3.85	-14.23	-0.005488		
	4.40	-14.10	-0.005438		
Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.					

LTE Band 66 part:

Reference Frequency: LTE Band 66 (10MHz) Middle channel=132322 Frequency=1745.0MHz					
Temperature					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	9.20	0.005272	Within authorized band for Band 66	Pass
	-20	-8.13	-0.004659		
	-10	-6.97	-0.003994		
	0	-9.50	-0.005444		
	10	-6.14	-0.003519		
	20	5.22	0.002991		
	30	12.47	0.007146		
	40	11.56	0.006625		
	50	7.21	0.004132		
16QAM					
3.85	-30	6.62	0.003794	Within authorized band for Band 66	Pass
	-20	14.39	0.008246		
	-10	5.92	0.003393		
	0	6.32	0.003622		
	10	9.08	0.005203		
	20	4.39	0.002516		
	30	7.94	0.004550		
	40	6.01	0.003444		
	50	6.52	0.003736		
64QAM					
3.85	-30	12.72	0.007289	Within authorized band for Band 66	Pass
	-20	12.79	0.007330		
	-10	10.99	0.006298		
	0	8.58	0.004917		
	10	10.60	0.006074		
	20	3.05	0.001748		
	30	9.30	0.005330		
	40	8.50	0.004871		
	50	7.88	0.004516		
Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					

25	3.45	7.50	0.004298	Within authorized band for Band 66	Pass
	3.85	7.42	0.004252		
	4.40	-5.19	-0.002974		
16QAM					
25	3.45	6.90	0.003954	Within authorized band for Band 66	Pass
	3.85	4.35	0.002493		
	4.40	-7.85	-0.004499		
64QAM					
25	3.45	-8.10	-0.004642	Within authorized band for Band 66	Pass
	3.85	2.89	0.001656		
	4.40	7.40	0.004241		
Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.					

Appendix G: Modulation Characteristics

Test Result

Band	Bandwidth	Modulation	Channel	RB Configuration	Result	Verdict
Band2	20MHz	QPSK	18900	100RB#0	PASS	PASS
Band2	20MHz	16QAM	18900	100RB#0	PASS	PASS
Band2	20MHz	64QAM	18900	100RB#0	PASS	PASS
Band5	10MHz	QPSK	20525	50RB#0	PASS	PASS
Band5	10MHz	16QAM	20525	50RB#0	PASS	PASS
Band5	10MHz	64QAM	20525	50RB#0	PASS	PASS
Band7	20MHz	QPSK	21100	100RB#0	PASS	PASS
Band7	20MHz	16QAM	21100	100RB#0	PASS	PASS
Band7	20MHz	64QAM	21100	100RB#0	PASS	PASS
Band12	10MHz	QPSK	23095	50RB#0	PASS	PASS
Band12	10MHz	16QAM	23095	50RB#0	PASS	PASS
Band12	10MHz	64QAM	23095	50RB#0	PASS	PASS
Band17	10MHz	QPSK	23790	50RB#0	PASS	PASS
Band17	10MHz	16QAM	23790	50RB#0	PASS	PASS
Band17	10MHz	64QAM	23790	50RB#0	PASS	PASS
Band41	20MHz	QPSK	40620	100RB#0	PASS	PASS
Band41	20MHz	16QAM	40620	100RB#0	PASS	PASS
Band41	20MHz	64QAM	40620	100RB#0	PASS	PASS
Band66	20MHz	QPSK	132322	100RB#0	PASS	PASS
Band66	20MHz	16QAM	132322	100RB#0	PASS	PASS
Band66	20MHz	64QAM	132322	100RB#0	PASS	PASS

Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.

Test Graphs







