

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					
3.87	-30	-8.58	-0.004564	Within authorized band for Band 2	Pass
	-20	10.83	0.005761		
	-10	-10.90	-0.005798		
	0	-11.79	-0.006271		
	10	-11.92	-0.006340		
	20	-8.15	-0.004335		
	30	10.54	0.005606		
	40	-17.09	-0.009090		
	50	-9.86	-0.005245		
16QAM					
3.87	-30	-9.53	-0.005069	Within authorized band for Band 2	Pass
	-20	-13.85	-0.007367		
	-10	-10.51	-0.005590		
	0	11.44	0.006085		
	10	-14.42	-0.007670		
	20	-14.55	-0.007739		
	30	-8.55	-0.004548		
	40	-10.36	-0.005511		
	50	-9.98	-0.005309		
64QAM					
3.87	-30	8.40	0.004468	Within authorized band for Band 2	Pass
	-20	-2.45	-0.001303		
	-10	-13.85	-0.007367		
	0	-12.93	-0.006878		
	10	-13.55	-0.007207		
	20	-15.54	-0.008266		
	30	-14.86	-0.007904		
	40	-13.09	-0.006963		
	50	-3.78	-0.002011		

Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	9.58	0.005096	Within authorized band for Band 2	Pass
	3.87	-9.14	-0.004862		
	4.45	-13.13	-0.006984		
16QAM					
25	3.45	-5.39	-0.002867	Within authorized band for Band 2	Pass
	3.87	-16.32	-0.008681		
	4.45	9.20	0.004894		
64QAM					
25	3.45	-4.19	-0.002229	Within authorized band for Band 2	Pass
	3.87	-10.93	-0.005814		
	4.45	-11.22	-0.005968		
<i>Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.</i>					

LTE Band 5 part:

Reference Frequency: LTE Band 5(10MHz) Middle channel=20525 Frequency=836.5MHz					
Temperature					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.87	-30	-5.89	-0.007041	±2.5	Pass
	-20	-7.42	-0.008870		
	-10	-8.21	-0.009815		
	0	-10.64	-0.012720		
	10	-5.38	-0.006432		
	20	-8.65	-0.010341		
	30	-3.38	-0.004041		
	40	-2.56	-0.003060		
	50	-8.48	-0.010137		
16QAM					
3.87	-30	-6.88	-0.008225	±2.5	Pass
	-20	-6.67	-0.007974		
	-10	-6.49	-0.007759		
	0	-11.40	-0.013628		
	10	-10.91	-0.013042		
	20	-7.08	-0.008464		
	30	-9.36	-0.011189		
	40	-7.35	-0.008787		
	50	-3.99	-0.004770		
64QAM					
3.87	-30	-4.29	-0.005129	±2.5	Pass
	-20	-10.09	-0.012062		
	-10	-8.55	-0.010221		
	0	4.39	0.005248		
	10	-7.45	-0.008906		
	20	-7.42	-0.008870		
	30	-2.33	-0.002785		
	40	-8.44	-0.010090		
	50	4.23	0.005057		

Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	-9.63	-0.011512	±2.5	Pass
	3.87	-7.24	-0.008655		
	4.45	-6.48	-0.007747		
16QAM					
25	3.45	3.73	0.004459	±2.5	Pass
	3.87	-7.71	-0.009217		
	4.45	-5.15	-0.006157		
64QAM					
25	3.45	-8.94	-0.010687	±2.5	Pass
	3.87	-5.16	-0.006169		
	4.45	-7.77	-0.009289		
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					
3.87	-30	-23.70	-0.009349	Within authorized band for Band 7	Pass
	-20	-15.99	-0.006308		
	-10	-16.58	-0.006540		
	0	-23.56	-0.009294		
	10	-13.66	-0.005389		
	20	-18.25	-0.007199		
	30	20.40	0.008047		
	40	-24.76	-0.009767		
	50	18.88	0.007448		
16QAM					
3.87	-30	14.95	0.005897	Within authorized band for Band 7	Pass
	-20	14.99	0.005913		
	-10	7.15	0.002821		
	0	-3.99	-0.001574		
	10	-17.82	-0.007030		
	20	6.17	0.002434		
	30	-23.46	-0.009254		
	40	-17.02	-0.006714		
	50	-15.91	-0.006276		
64QAM					
3.87	-30	-9.27	-0.003657	Within authorized band for Band 7	Pass
	-20	-15.89	-0.006268		
	-10	-16.97	-0.006694		
	0	15.92	0.006280		
	10	13.85	0.005464		
	20	19.96	0.007874		
	30	-13.43	-0.005298		
	40	-14.71	-0.005803		
	50	17.08	0.006738		

Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	-16.37	-0.006458	Within authorized band for Band 7	Pass
	3.87	-18.20	-0.007179		
	4.45	8.64	0.003408		
16QAM					
25	3.45	-10.01	-0.003949	Within authorized band for Band 7	Pass
	3.87	-19.87	-0.007838		
	4.45	-16.89	-0.006663		
64QAM					
25	3.45	4.62	0.001822	Within authorized band for Band 7	Pass
	3.87	-22.30	-0.008797		
	4.45	-17.14	-0.006761		
<i>Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.</i>					

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					
3.87	-30	-4.98	-0.007039	Within authorized band for Band 12	Pass
	-20	3.76	0.005314		
	-10	-2.42	-0.003420		
	0	2.46	0.003477		
	10	4.18	0.005908		
	20	-5.28	-0.007463		
	30	-5.97	-0.008438		
	40	-5.11	-0.007223		
	50	-2.90	-0.004099		
16QAM					
3.87	-30	-5.08	-0.007180	Within authorized band for Band 12	Pass
	-20	-2.17	-0.003067		
	-10	-6.07	-0.008580		
	0	4.96	0.007011		
	10	-4.49	-0.006346		
	20	1.04	0.001470		
	30	-7.52	-0.010629		
	40	-5.78	-0.008170		
	50	3.05	0.004311		
64QAM					
3.87	-30	-3.68	-0.005201	Within authorized band for Band 12	Pass
	-20	-5.28	-0.007463		
	-10	-6.91	-0.009767		
	0	-4.48	-0.006332		
	10	-6.54	-0.009244		
	20	-2.66	-0.003760		
	30	-7.64	-0.010799		
	40	-8.10	-0.011449		
	50	-7.12	-0.010064		

Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	2.00	0.002827	Within authorized band for Band 12	Pass
	3.87	-5.87	-0.008297		
	4.45	-8.54	-0.012071		
16QAM					
25	3.45	-7.74	-0.010940	Within authorized band for Band 12	Pass
	3.87	-3.19	-0.004509		
	4.45	-5.15	-0.007279		
64QAM					
25	3.45	-3.60	-0.005088	Within authorized band for Band 12	Pass
	3.87	4.08	0.005767		
	4.45	1.26	0.001781		
<i>Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.</i>					

LTE Band 17 part:

Reference Frequency: LTE Band 17(10MHz) Middle channel=23790 Frequency=710.0MHz					
Temperature					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.87	-30	-2.63	-0.003704	Within authorized band for Band 17	Pass
	-20	-6.97	-0.009817		
	-10	-5.58	-0.007859		
	0	-6.61	-0.009310		
	10	-3.95	-0.005563		
	20	-6.54	-0.009211		
	30	-4.19	-0.005901		
	40	-6.41	-0.009028		
	50	-4.23	-0.005958		
16QAM					
3.87	-30	-5.69	-0.008014	Within authorized band for Band 17	Pass
	-20	-5.11	-0.007197		
	-10	-2.93	-0.004127		
	0	-4.86	-0.006845		
	10	-5.12	-0.007211		
	20	-5.39	-0.007592		
	30	-7.22	-0.010169		
	40	-7.82	-0.011014		
	50	-8.25	-0.011620		
64QAM					
3.87	-30	-1.20	-0.001690	Within authorized band for Band 17	Pass
	-20	-6.54	-0.009211		
	-10	-6.11	-0.008606		
	0	-7.71	-0.010859		
	10	-5.61	-0.007901		
	20	-5.25	-0.007394		
	30	-5.05	-0.007113		
	40	-2.33	-0.003282		
	50	-2.80	-0.003944		

Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	-6.49	-0.009141	Within authorized band for Band 17	Pass
	3.87	-9.81	-0.013817		
	4.45	-8.68	-0.012225		
16QAM					
25	3.45	-9.70	-0.013662	Within authorized band for Band 17	Pass
	3.87	-3.35	-0.004718		
	4.45	-5.97	-0.008408		
64QAM					
25	3.45	-5.21	-0.007338	Within authorized band for Band 17	Pass
	3.87	-4.23	-0.005958		
	4.45	1.42	0.002000		
<i>Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.</i>					

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					
3.87	-30	-2.27	-0.000875	Within authorized band for Band 41	Pass
	-20	-3.72	-0.001434		
	-10	-7.62	-0.002936		
	0	-7.95	-0.003064		
	10	-7.68	-0.002960		
	20	-5.32	-0.002050		
	30	-8.80	-0.003391		
	40	-6.22	-0.002397		
	50	-4.79	-0.001846		
16QAM					
3.87	-30	5.55	0.002139	Within authorized band for Band 41	Pass
	-20	-6.11	-0.002355		
	-10	-6.09	-0.002347		
	0	-2.73	-0.001052		
	10	-3.26	-0.001256		
	20	-6.39	-0.002462		
	30	-3.83	-0.001476		
	40	4.99	0.001923		
	50	2.27	0.000875		
64QAM					
3.87	-30	-3.66	-0.001410	Within authorized band for Band 41	Pass
	-20	-4.06	-0.001565		
	-10	-8.68	-0.003345		
	0	-7.58	-0.002921		
	10	6.65	0.002563		
	20	6.90	0.002659		
	30	-6.14	-0.002366		
	40	7.68	0.002960		
	50	-4.43	-0.001707		

Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	-3.69	-0.001422	Within authorized band for Band 41	Pass
	3.87	-7.25	-0.002794		
	4.45	-7.64	-0.002944		
16QAM					
25	3.45	-5.09	-0.001961	Within authorized band for Band41	Pass
	3.87	-8.96	-0.003453		
	4.45	4.26	0.001642		
64QAM					
25	3.45	-10.46	-0.004031	Within authorized band for Band41	Pass
	3.87	-3.62	-0.001395		
	4.45	-4.86	-0.001873		
<i>Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.</i>					

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					
3.87	-30	-5.19	-0.002974	Within authorized band for Band 66	Pass
	-20	-8.44	-0.004837		
	-10	-3.49	-0.002000		
	0	6.97	0.003994		
	10	-5.97	-0.003421		
	20	-6.15	-0.003524		
	30	-7.11	-0.004074		
	40	-9.33	-0.005347		
	50	-7.71	-0.004418		
16QAM					
3.87	-30	-3.23	-0.001851	Within authorized band for Band 66	Pass
	-20	-4.42	-0.002533		
	-10	3.95	0.002264		
	0	-9.58	-0.005490		
	10	6.88	0.003943		
	20	5.36	0.003072		
	30	-8.44	-0.004837		
	40	-6.75	-0.003868		
	50	3.23	0.001851		
64QAM					
3.87	-30	7.01	0.004017	Within authorized band for Band 66	Pass
	-20	5.45	0.003123		
	-10	-7.42	-0.004252		
	0	-6.78	-0.003885		
	10	7.62	0.004367		
	20	-7.41	-0.004246		
	30	-10.11	-0.005794		
	40	-4.56	-0.002613		
	50	-8.00	-0.004585		

Voltage					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	8.90	0.005100	Within authorized band for Band 66	Pass
	3.87	-10.14	-0.005811		
	4.45	4.39	0.002516		
16QAM					
25	3.45	-11.60	-0.006648	Within authorized band for Band 66	Pass
	3.87	-6.79	-0.003891		
	4.45	-5.75	-0.003295		
64QAM					
25	3.45	5.41	0.003100	Within authorized band for Band 66	Pass
	3.87	-9.96	-0.005708		
	4.45	6.47	0.003708		
<i>Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.</i>					

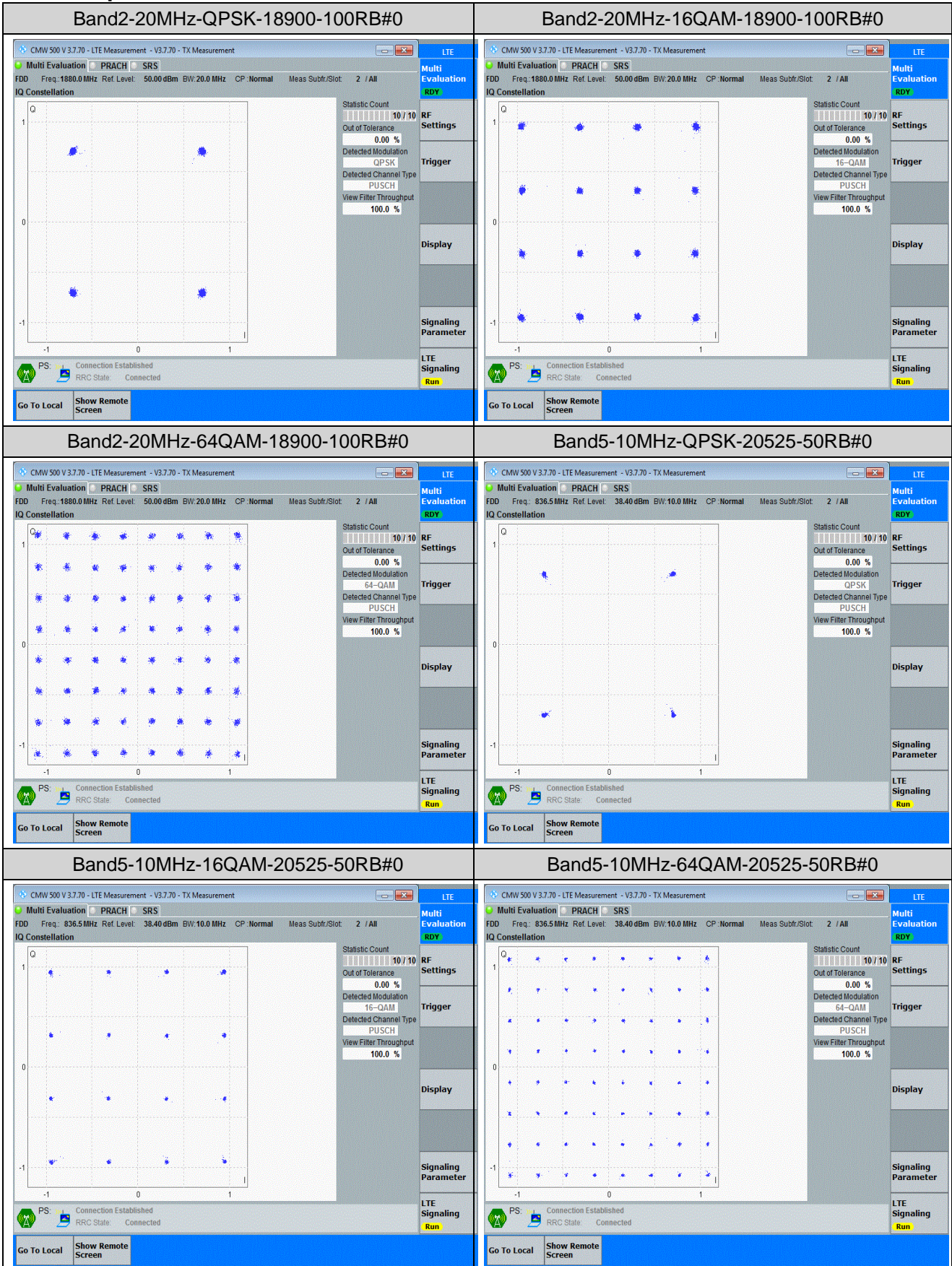
Appendix G: Modulation Characteristics

Test Result

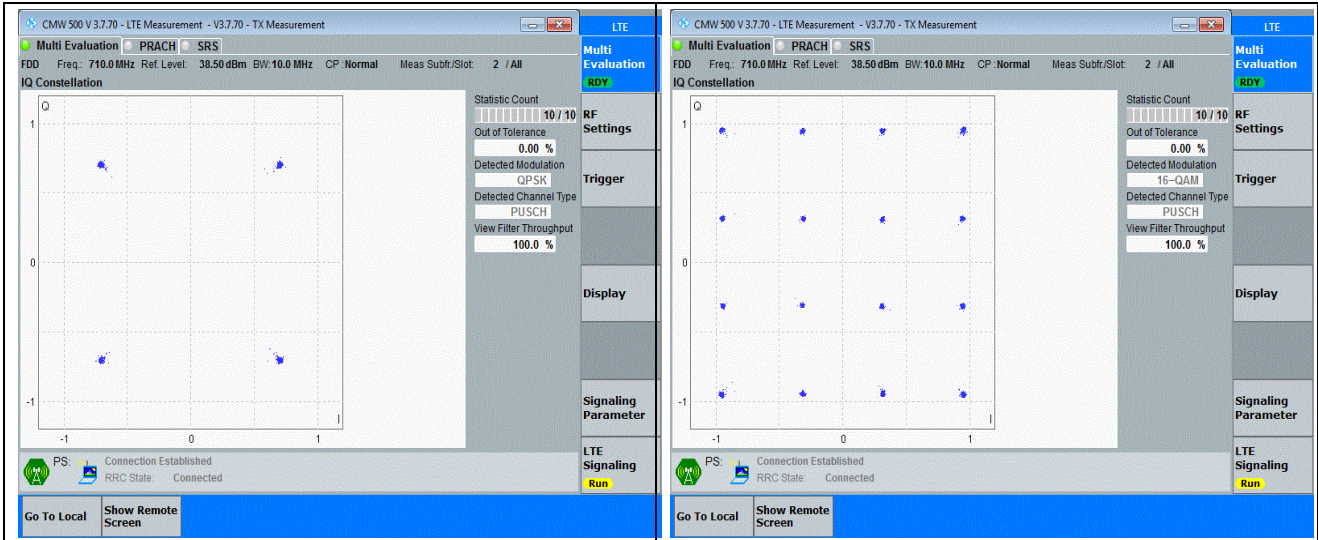
Band	Bandwidth	Modulation	Channel	RB Configuration	Result	Verdict
Band2	20MHz	QPSK	18900	100RB#0	PASS	PASS
Band2	20MHz	16QAM	18900	100RB#0	PASS	PASS
Band2	20MHz	64QAM	18900	100RB#0	PASS	PASS
Band5	10MHz	QPSK	20525	50RB#0	PASS	PASS
Band5	10MHz	16QAM	20525	50RB#0	PASS	PASS
Band5	10MHz	64QAM	20525	50RB#0	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	40640	100RB#0	PASS	PASS
Band41	20MHz	16QAM	40640	100RB#0	PASS	PASS
Band41	20MHz	64QAM	40640	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

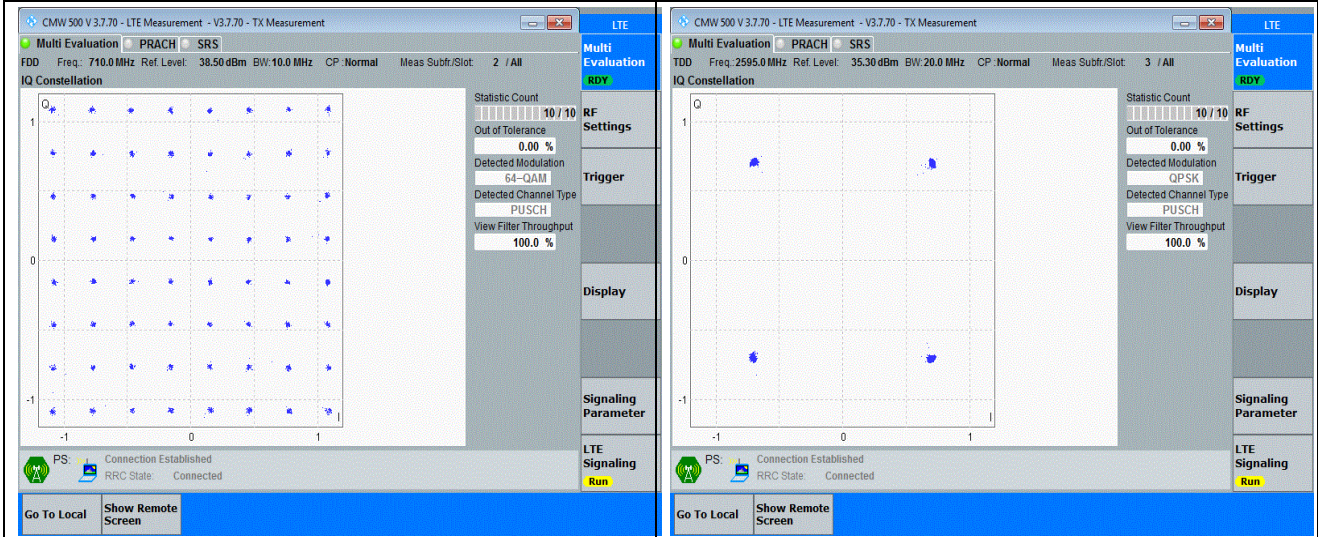


<p align="center">Band7-20MHz-QPSK-21100-100RB#0</p>	<p align="center">Band7-20MHz-16QAM-21100-100RB#0</p>
<p align="center">Band7-20MHz-64QAM-21100-100RB#0</p>	<p align="center">Band12-10MHz-QPSK-23095-50RB#0</p>
<p align="center">Band12-10MHz-16QAM-23095-50RB#0</p>	<p align="center">Band12-10MHz-64QAM-23095-50RB#0</p>
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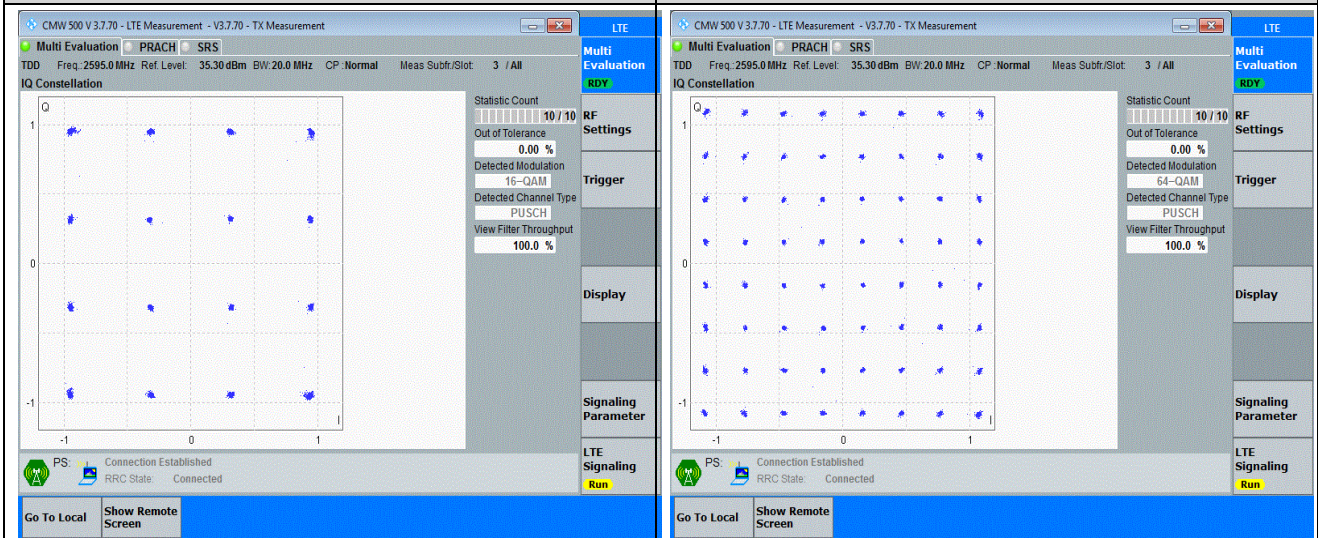
Band17-10MHz-64QAM-23790-50RB#0

Band41-20MHz-QPSK-40640-100RB#0



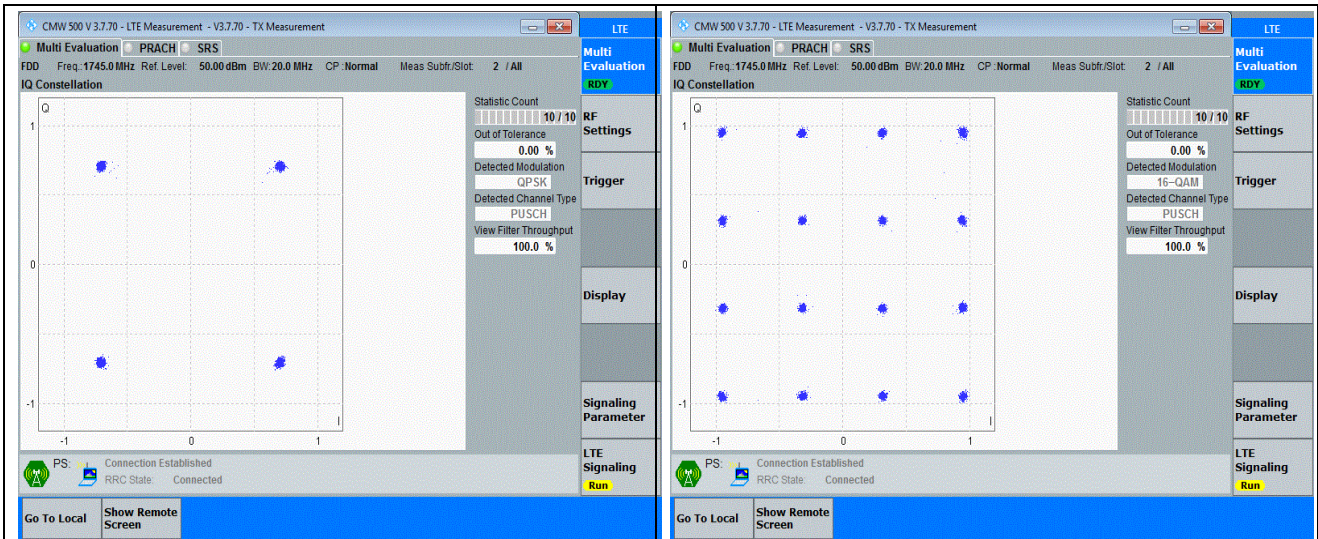
Band41-20MHz-16QAM-40640-100RB#0

Band41-20MHz-64QAM-40640-100RB#0



Band66-20MHz-QPSK-132322-100RB#0

Band66-20MHz-16QAM-132322-100RB#0



Band66-20MHz-64QAM-132322-100RB#0

