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 (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	-23.50	-0.012500	Within authorized band for Band 2	Pass
	-20	-41.18	-0.021904		
	-10	-40.00	-0.021277		
	0	-42.43	-0.022569		
	10	-49.47	-0.026314		
	20	-64.77	-0.034452		
	30	-71.95	-0.038271		
	40	14.93	0.007941		
	50	-11.76	-0.006255		
16QAM					
3.85	-30	20.79	0.011059	Within authorized band for Band 2	Pass
	-20	36.64	0.019489		
	-10	27.88	0.014830		
	0	41.93	0.022303		
	10	51.98	0.027649		
	20	11.40	0.006064		
	30	11.03	0.005867		
	40	11.03	0.005867		
	50	20.79	0.011059		
64QAM					
3.85	-30	27.84	0.014809	Within authorized band for Band 2	Pass
	-20	40.41	0.021495		
	-10	63.64	0.033851		
	0	32.26	0.017160		
	10	49.50	0.026330		
	20	-13.09	-0.006963		
	30	13.68	0.007277		
	40	27.59	0.014676		
	50	42.16	0.022426		

Voltage					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	-29.65	-0.015771	Within authorized band for Band 2	Pass
	3.85	34.35	0.018271		
	4.40	-49.62	-0.026394		
16QAM					
25	3.45	38.58	0.020521	Within authorized band for Band 2	Pass
	3.85	-14.98	-0.007968		
	4.40	-10.24	-0.005447		
64QAM					
25	3.45	17.29	0.009197	Within authorized band for Band 2	Pass
	3.85	29.73	0.015814		
	4.40	48.78	0.025947		
Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.					

LTE Band 4 part:

Reference Frequency: LTE Band 4(10MHz) Middle channel=20175 Frequency=1732.5MHz					
Temperature					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	-27.68	-0.015977	Within authorized band for Band 4	Pass
	-20	-30.73	-0.017737		
	-10	-36.88	-0.021287		
	0	-37.84	-0.021841		
	10	-21.74	-0.012548		
	20	-16.32	-0.009420		
	30	-24.29	-0.014020		
	40	18.84	0.010874		
	50	29.44	0.016993		
16QAM					
3.85	-30	14.09	0.008133	Within authorized band for Band 4	Pass
	-20	14.23	0.008214		
	-10	7.17	0.004139		
	0	-16.32	-0.009420		
	10	21.66	0.012502		
	20	8.43	0.004866		
	30	30.41	0.017553		
	40	20.69	0.011942		
	50	13.13	0.007579		
64QAM					
3.85	-30	26.44	0.015261	Within authorized band for Band 4	Pass
	-20	24.69	0.014251		
	-10	8.88	0.005126		
	0	-12.65	-0.007302		
	10	19.61	0.011319		
	20	6.95	0.004012		
	30	20.87	0.012046		
	40	26.74	0.015434		
	50	19.77	0.011411		

Voltage					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	-26.64	-0.015377	Within authorized band for Band 4	Pass
	3.85	-15.31	-0.008837		
	4.40	-39.91	-0.023036		
16QAM					
25	3.45	50.63	0.029224	Within authorized band for Band 4	Pass
	3.85	-10.93	-0.006309		
	4.40	19.91	0.011492		
64QAM					
25	3.45	26.26	0.015157	Within authorized band for Band 4	Pass
	3.85	8.84	0.005102		
	4.40	31.93	0.018430		
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	-19.51	-0.023323	±2.5	Pass
	-20	-29.45	-0.035206		
	-10	-33.09	-0.039558		
	0	-35.20	-0.042080		
	10	-41.74	-0.049898		
	20	-42.37	-0.050652		
	30	-44.57	-0.053282		
	40	-38.65	-0.046204		
	50	-40.41	-0.048308		
16QAM					
3.85	-30	-23.47	-0.028057	±2.5	Pass
	-20	-11.54	-0.013796		
	-10	-3.35	-0.004005		
	0	12.25	0.014644		
	10	16.91	0.020215		
	20	19.93	0.023825		
	30	15.03	0.017968		
	40	14.63	0.017490		
	50	16.75	0.020024		
64QAM					
3.85	-30	14.32	0.017119	±2.5	Pass
	-20	25.03	0.029922		
	-10	40.08	0.047914		
	0	16.91	0.020215		
	10	30.44	0.036390		
	20	34.78	0.041578		
	30	37.35	0.044650		
	40	50.00	0.059773		
	50	-5.01	-0.005989		

Voltage					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	7.11	0.008500	±2.5	Pass
	3.85	21.24	0.025392		
	4.40	-9.21	-0.011010		
16QAM					
25	3.45	-36.02	-0.043060	±2.5	Pass
	3.85	-44.86	-0.053628		
	4.40	-29.41	-0.035158		
64QAM					
25	3.45	38.88	0.046479	±2.5	Pass
	3.85	18.34	0.021925		
	4.40	50.27	0.060096		
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 (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	-42.14	-0.016623	Within authorized band for Band 7	Pass
	-20	-20.77	-0.008193		
	-10	-22.42	-0.008844		
	0	-12.76	-0.005034		
	10	17.67	0.006970		
	20	-27.72	-0.010935		
	30	-27.62	-0.010895		
	40	-24.52	-0.009673		
	50	-15.85	-0.006252		
16QAM					
3.85	-30	24.33	0.009598	Within authorized band for Band 7	Pass
	-20	31.41	0.012391		
	-10	41.23	0.016264		
	0	38.94	0.015361		
	10	-17.47	-0.006892		
	20	21.11	0.008327		
	30	52.63	0.020761		
	40	34.50	0.013609		
	50	16.09	0.006347		
64QAM					
3.85	-30	36.45	0.014379	Within authorized band for Band 7	Pass
	-20	43.04	0.016978		
	-10	-14.32	-0.005649		
	0	29.18	0.011511		
	10	68.94	0.027195		
	20	41.06	0.016197		
	30	38.50	0.015187		
	40	24.55	0.009684		
	50	48.69	0.019207		

Voltage					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	-27.65	-0.010907	Within authorized band for Band 7	Pass
	3.85	48.02	0.018943		
	4.40	-26.36	-0.010398		
16QAM					
25	3.45	17.77	0.007010	Within authorized band for Band 7	Pass
	3.85	-45.36	-0.017893		
	4.40	47.29	0.018655		
64QAM					
25	3.45	30.83	0.012162	Within authorized band for Band 7	Pass
	3.85	39.35	0.015523		
	4.40	56.08	0.022122		
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 (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
3.85	-30	-37.75	-0.014547	Within authorized band for Band 41	Pass
	-20	19.67	0.007580		
	-10	-67.18	-0.025888		
	0	16.64	0.006412		
	10	-42.09	-0.016220		
	20	-63.66	-0.024532		
	30	-12.97	-0.004998		
	40	-26.15	-0.010077		
	50	-52.56	-0.020254		
16QAM					
3.85	-30	13.45	0.005183	Within authorized band for Band 41	Pass
	-20	31.76	0.012239		
	-10	43.19	0.016644		
	0	-27.28	-0.010513		
	10	21.23	0.008181		
	20	-13.43	-0.005175		
	30	17.74	0.006836		
	40	19.50	0.007514		
	50	26.14	0.010073		
64QAM					
3.85	-30	33.76	0.013010	Within authorized band for Band 41	Pass
	-20	31.47	0.012127		
	-10	30.21	0.011642		
	0	37.22	0.014343		
	10	-20.36	-0.007846		
	20	37.87	0.014593		
	30	57.39	0.022116		
	40	17.70	0.006821		
	50	31.09	0.011981		

Voltage					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	3.45	46.46	0.017904	Within authorized band for Band 41	Pass
	3.85	83.54	0.032193		
	4.40	-62.97	-0.024266		
16QAM					
25	3.45	39.80	0.015337	Within authorized band for Band41	Pass
	3.85	-25.68	-0.009896		
	4.40	27.57	0.010624		
64QAM					
25	3.45	29.57	0.011395	Within authorized band for Band41	Pass
	3.85	51.83	0.019973		
	4.40	33.85	0.013044		
Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.					

Appendix G: Modulation Characteristics

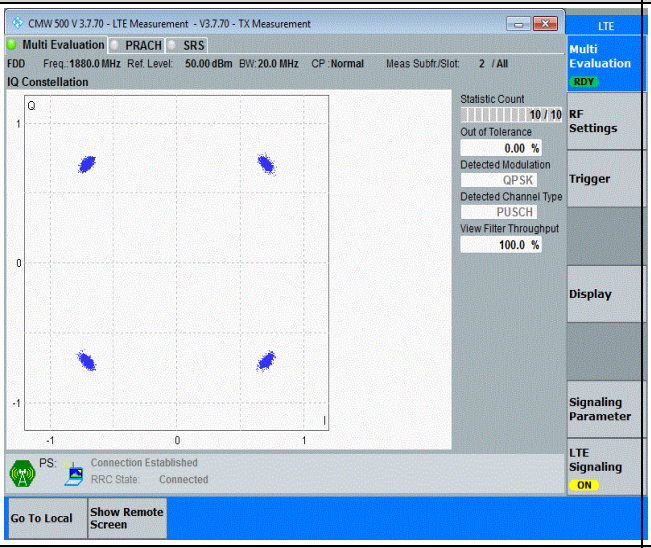
Test Result

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
Band4	20MHz	QPSK	20175	100RB#0	PASS	PASS
Band4	20MHz	16QAM	20175	100RB#0	PASS	PASS
Band4	20MHz	64QAM	20175	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
Band41	20MHz	QPSK	40640	100RB#0	PASS	PASS
Band41	20MHz	16QAM	40640	100RB#0	PASS	PASS
Band41	20MHz	64QAM	40640	100RB#0	PASS	PASS

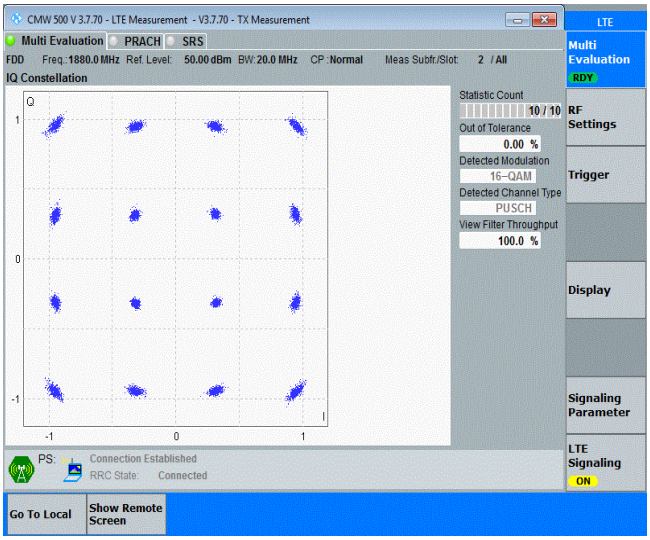
Remark: All bandwidth and all modulation had been tested, but only the worst case data displayed in this report.

Test Graphs

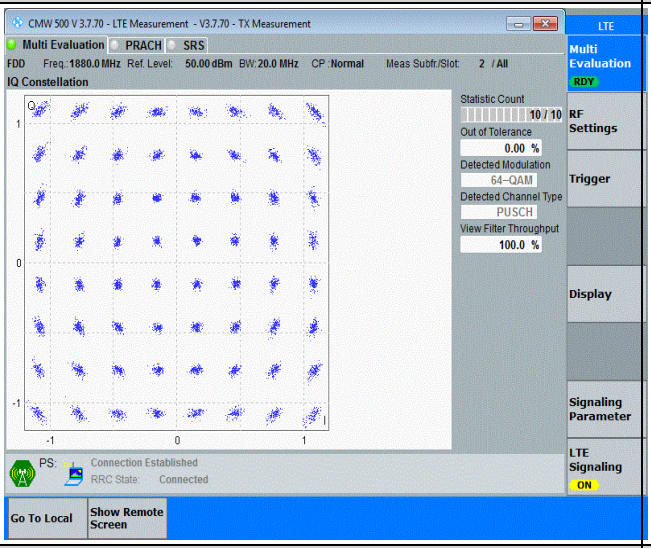
Band2-20MHz-QPSK-18900-100RB#0



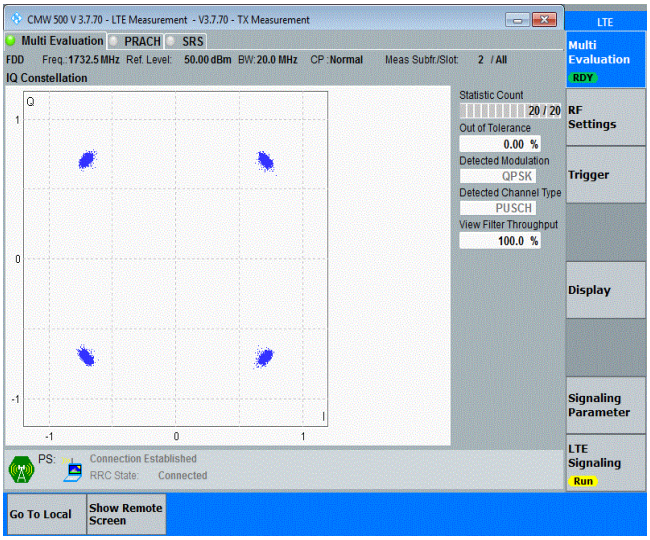
Band2-20MHz-16QAM-18900-100RB#0



Band2-20MHz-64QAM-18900-100RB#0



Band4-20MHz-QPSK-20175-100RB#0



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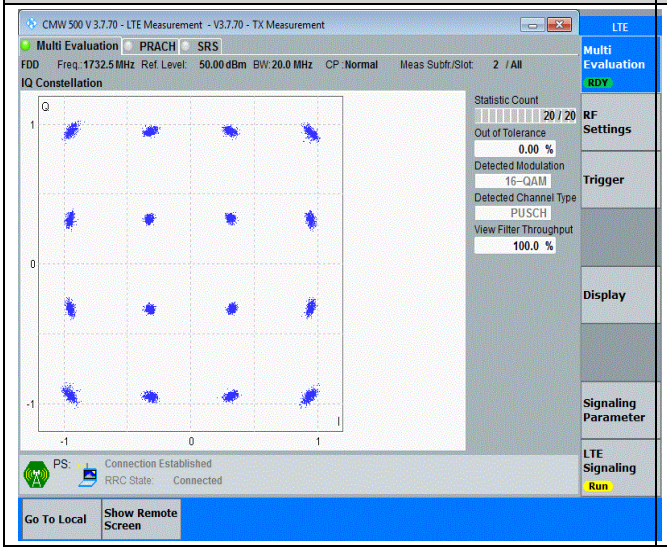
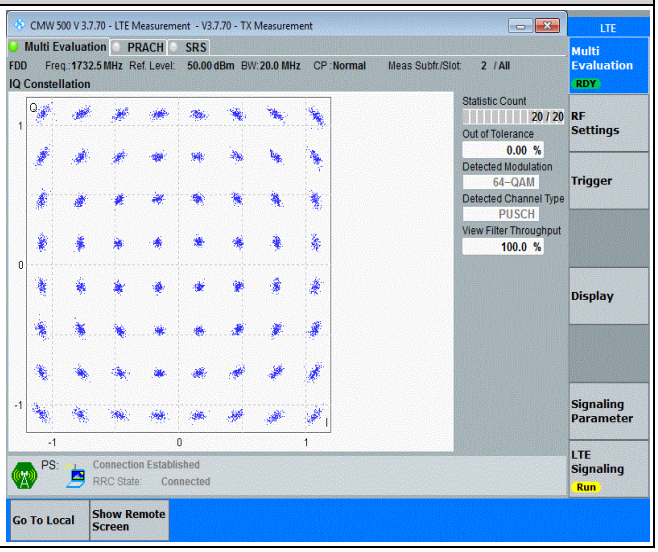
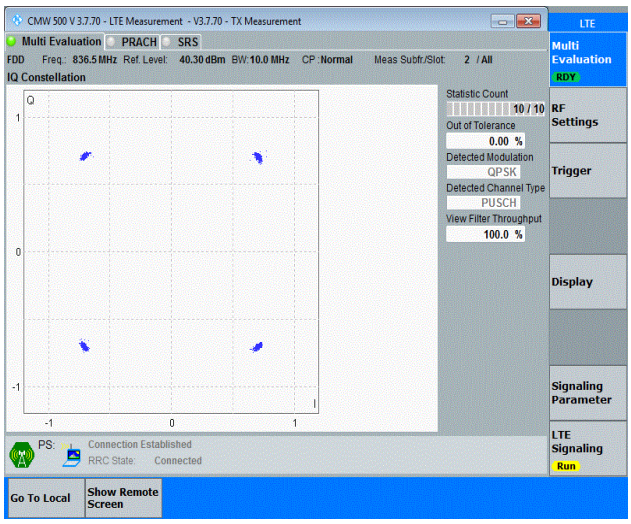


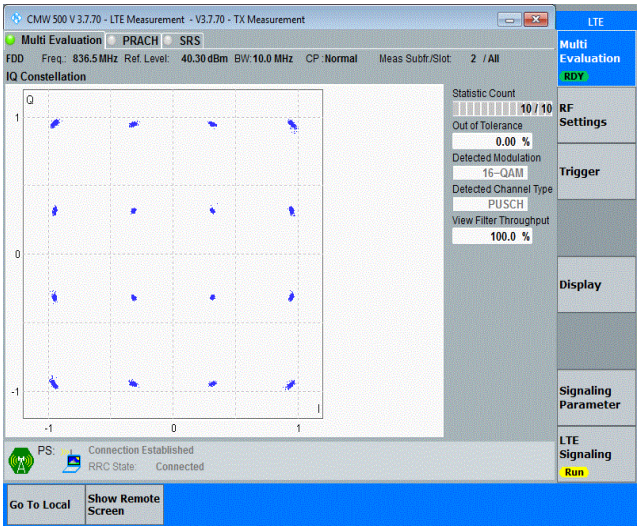
Band4-20MHz-64QAM-20175-100RB#0



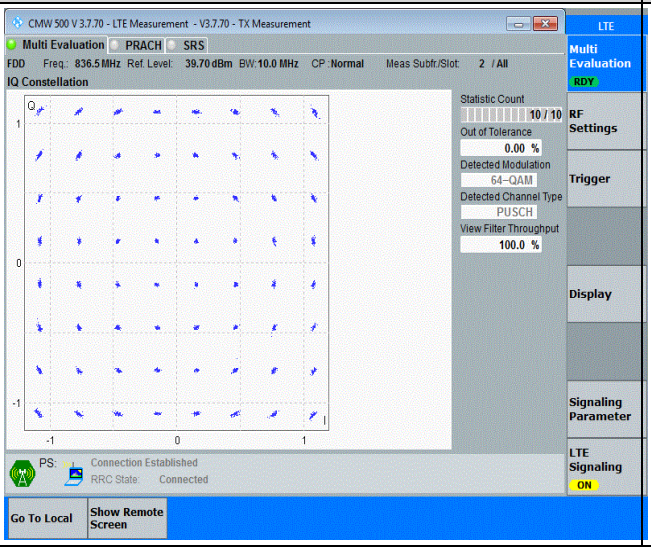
Band5-10MHz-QPSK-20525-50RB#0



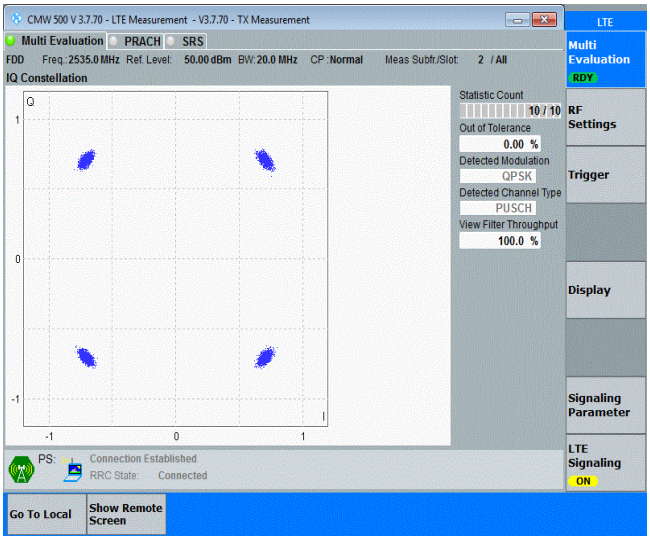
Band5-10MHz-16QAM-20525-50RB#0



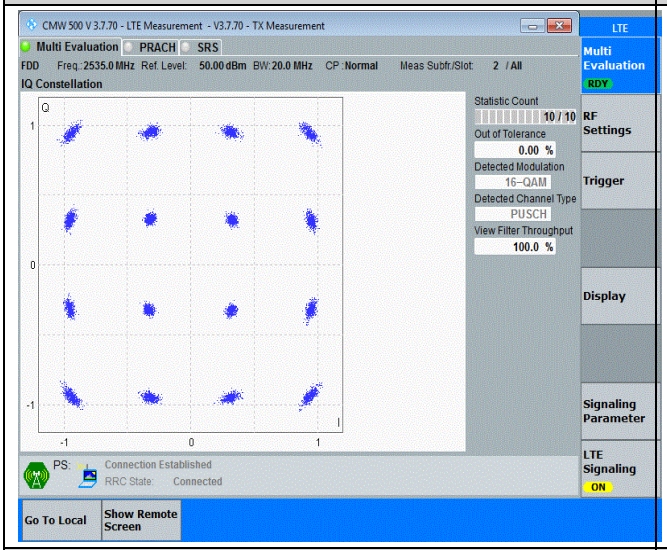
Band5-10MHz-64QAM-20525-50RB#0



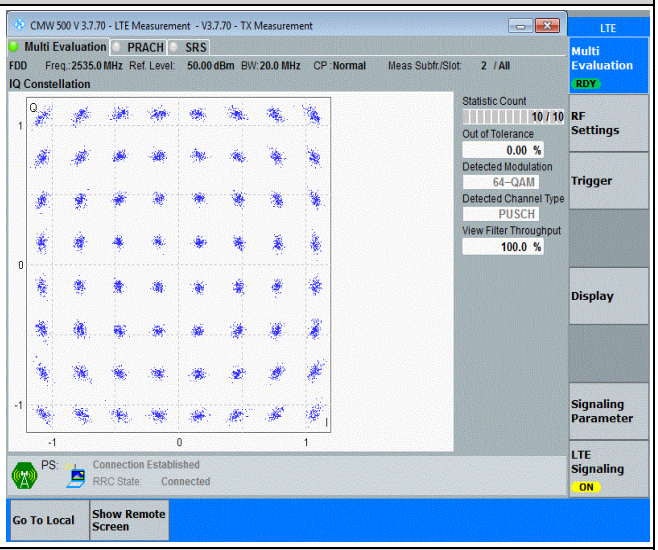
Band7-20MHz-QPSK-21100-100RB#0



Band7-20MHz-16QAM-21100-100RB#0

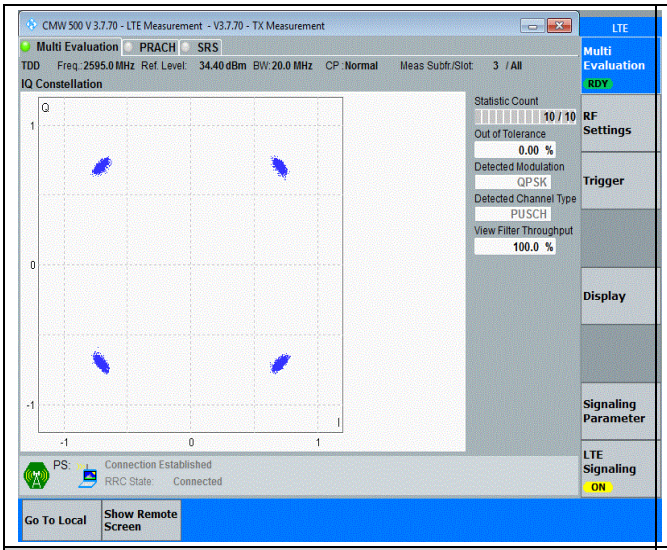


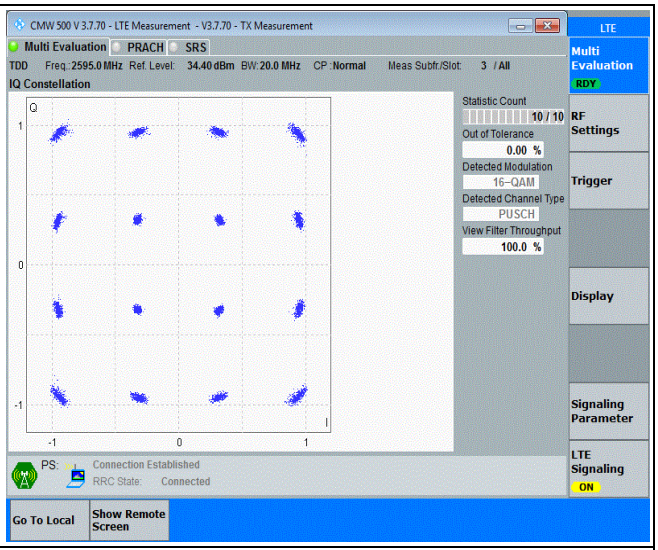
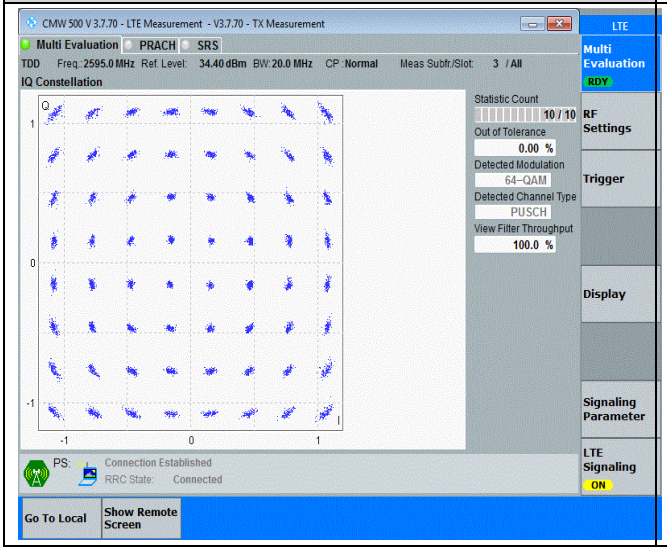
Band7-20MHz-64QAM-21100-100RB#0



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

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





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