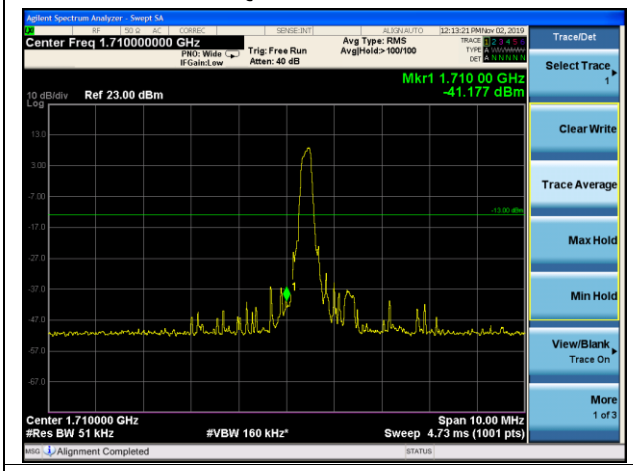
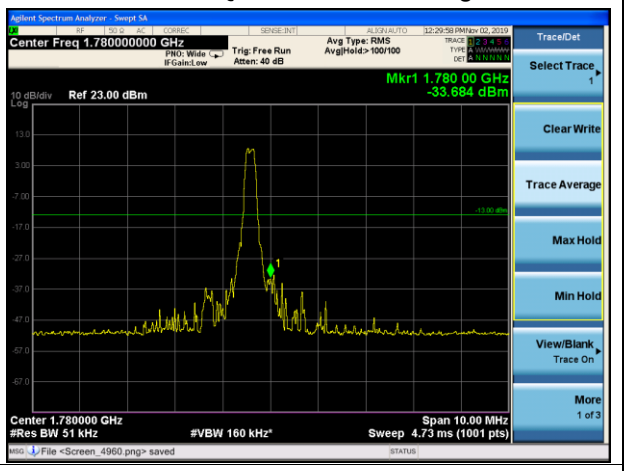
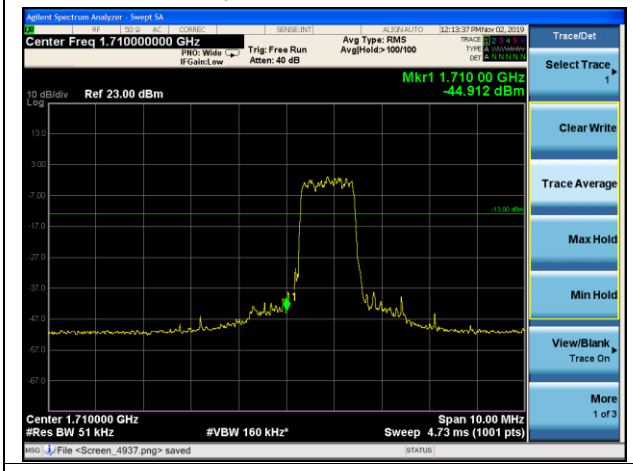
LTE Band 66 QPSK 3MHz CH-Low, 1 RB



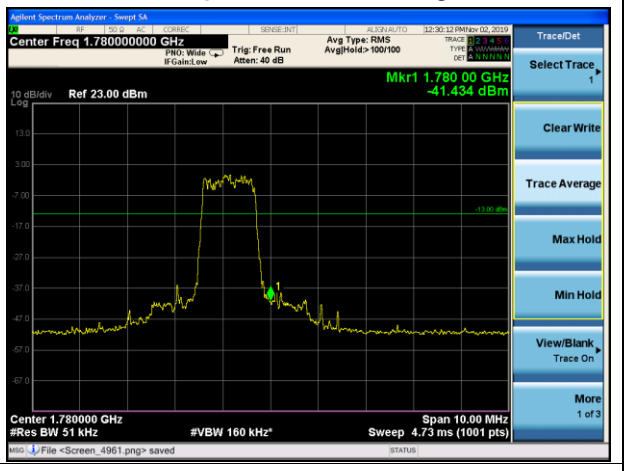
LTE Band 66 QPSK 3MHz CH-High, 1 RB



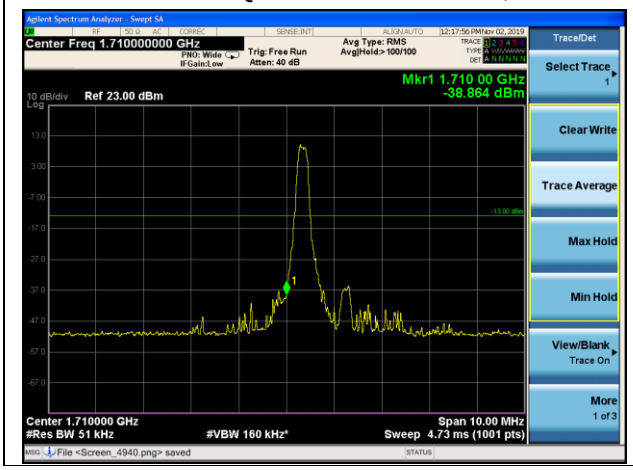
LTE Band 66 QPSK 3MHz CH-Low, 100%RB



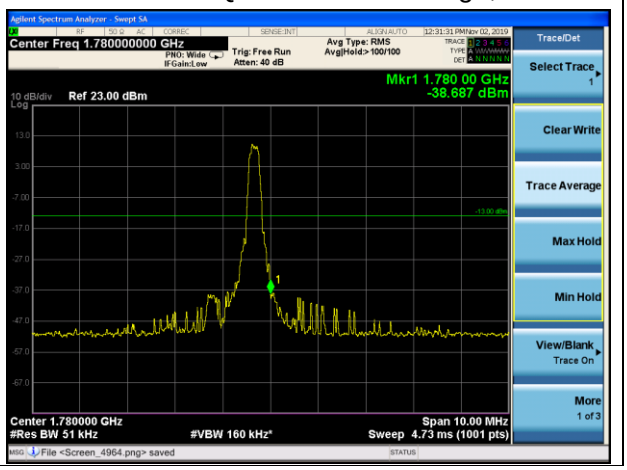
LTE Band 66 QPSK 3MHz CH-High, 100%RB



LTE Band 66 QPSK 5MHz CH-Low, 1 RB



LTE Band 66 QPSK 5MHz CH-High, 1 RB



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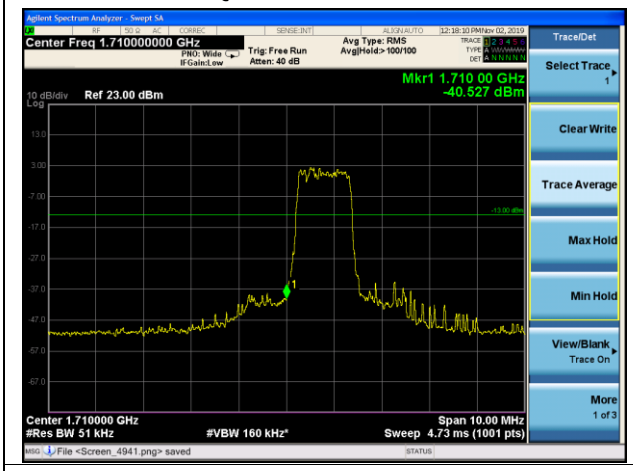
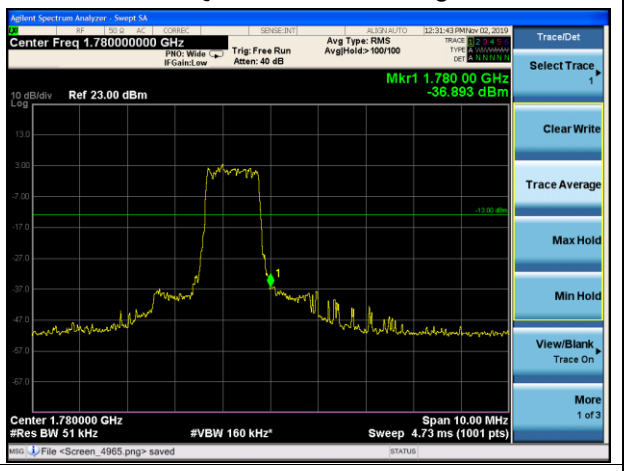
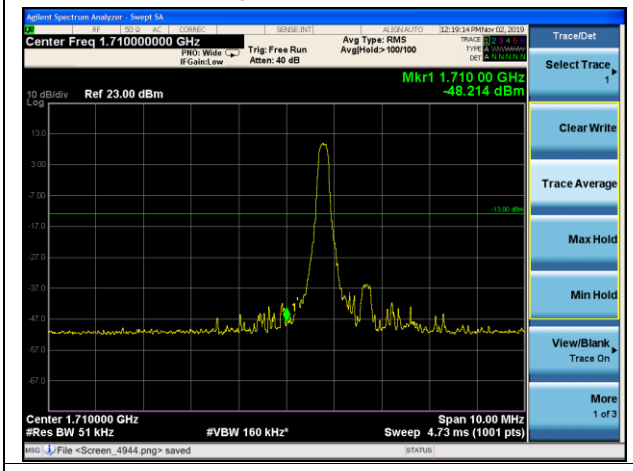
LTE Band 66 QPSK 5MHz CH-Low, 100%RB



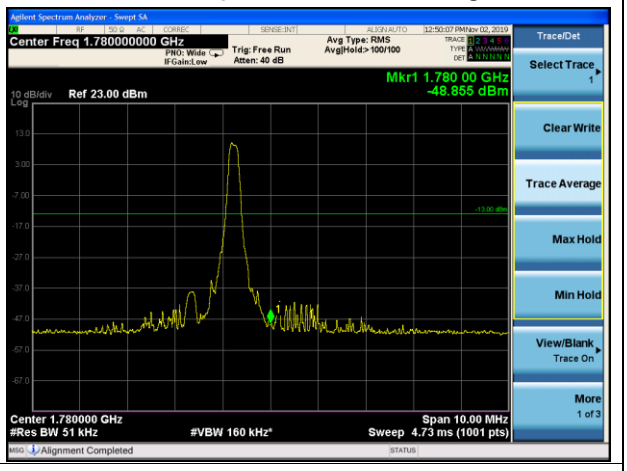
LTE Band 66 QPSK 5MHz CH-High, 100%RB



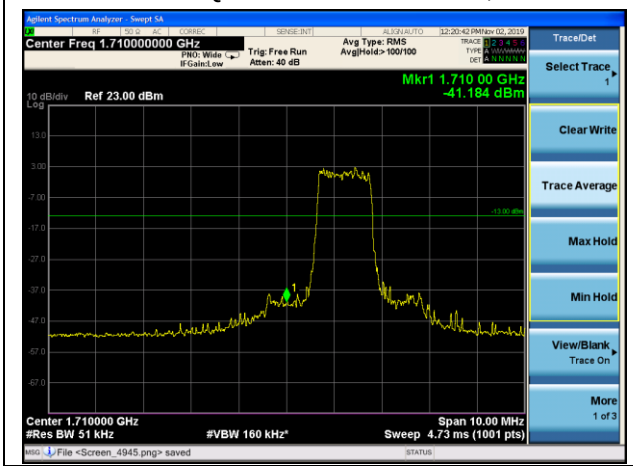
LTE Band 66 QPSK 10MHz CH-Low, 1 RB



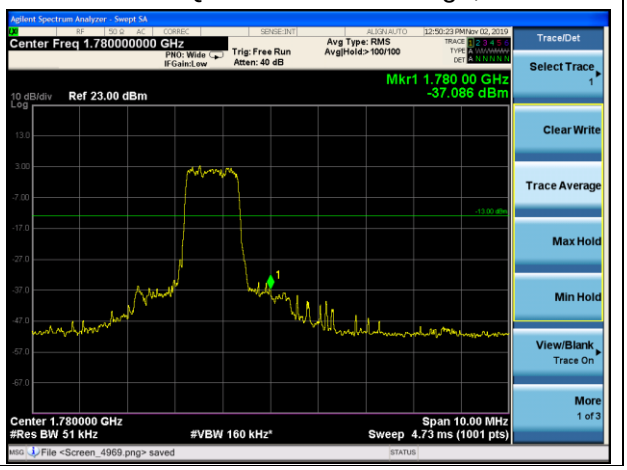
LTE Band 66 QPSK 10MHz CH-High, 1 RB



LTE Band 66 QPSK 10MHz CH-Low, 100%RB



LTE Band 66 QPSK 10MHz CH-High, 100%RB



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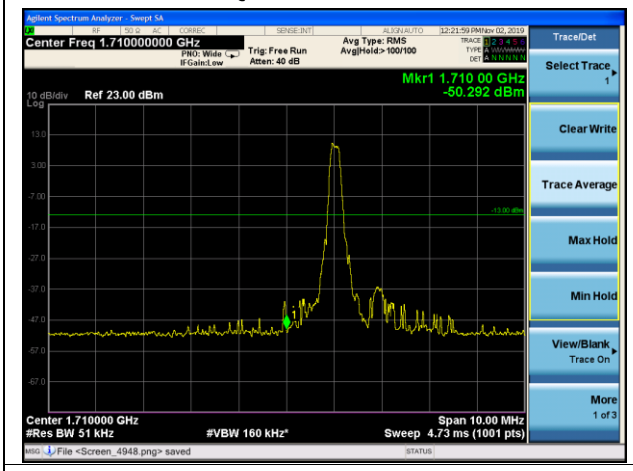
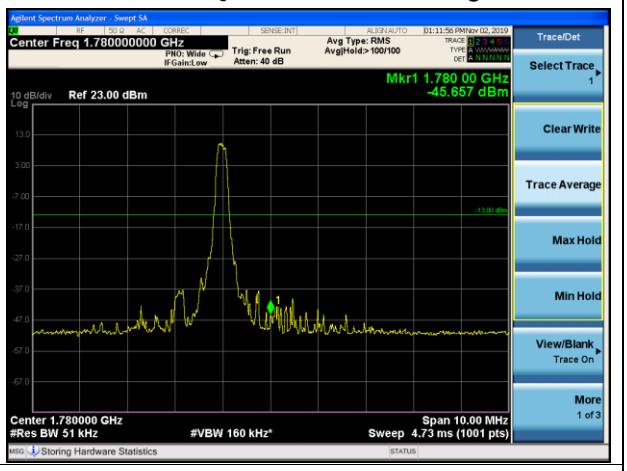
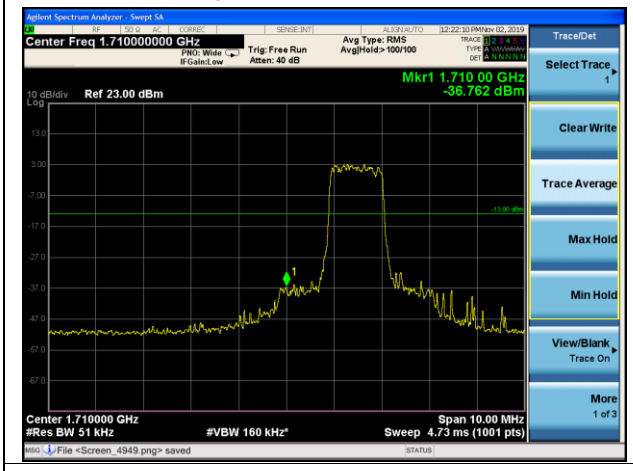
LTE Band 66 QPSK 15MHz CH-Low, 1 RB



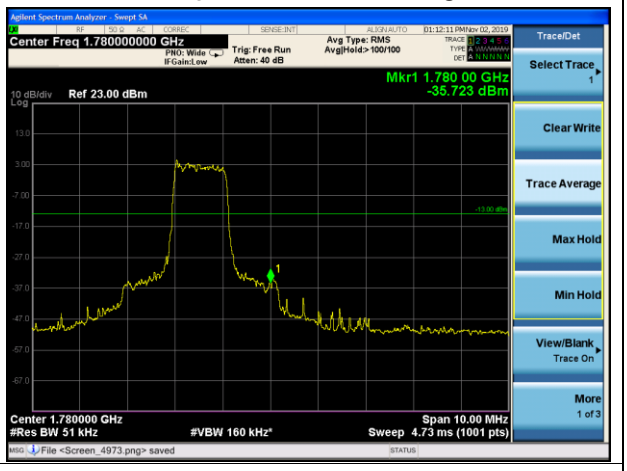
LTE Band 66 QPSK 15MHz CH-High, 1 RB



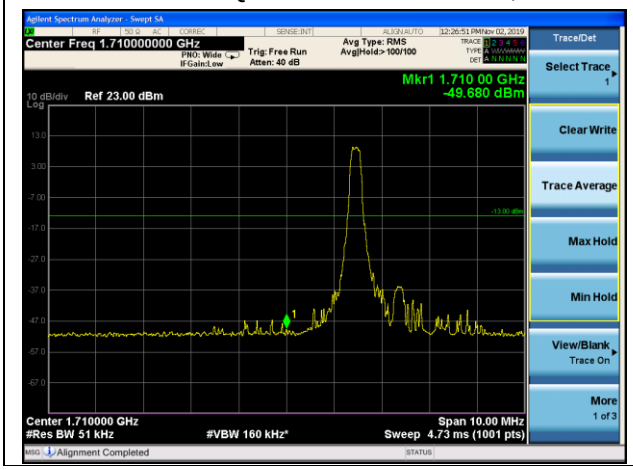
LTE Band 66 QPSK 15MHz CH-Low, 100%RB



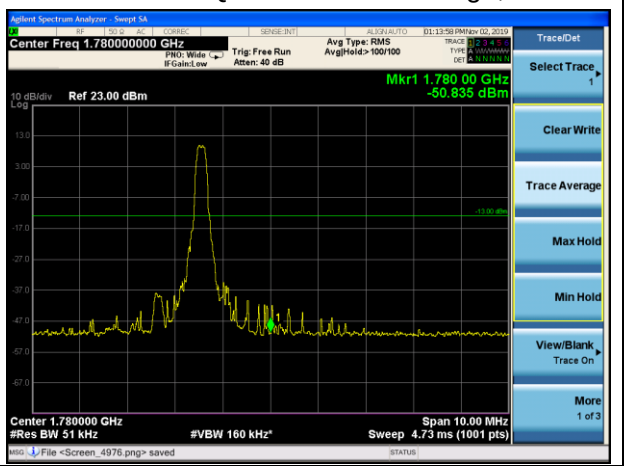
LTE Band 66 QPSK 15MHz CH-High, 100%RB



LTE Band 66 QPSK 20MHz CH-Low, 1 RB



LTE Band 66 QPSK 20MHz CH-High, 1 RB



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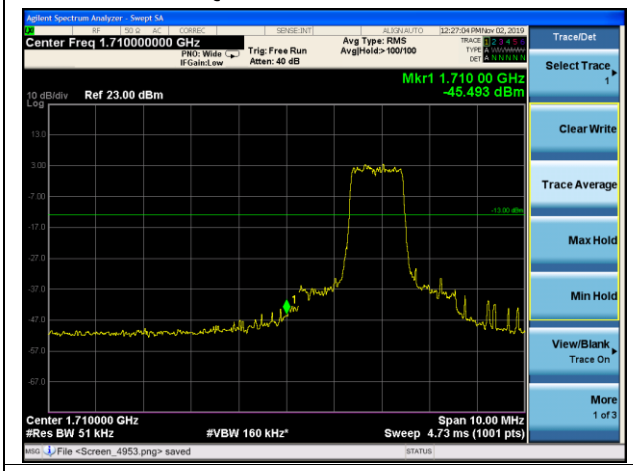
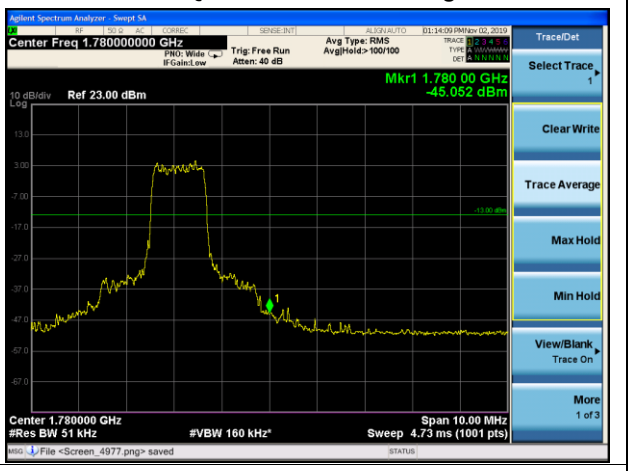
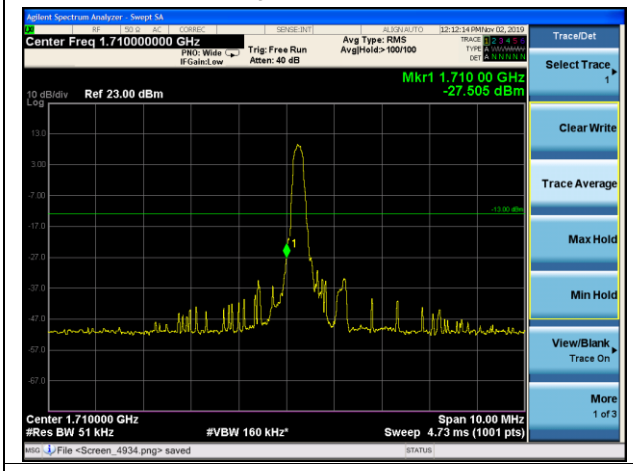
LTE Band 66 QPSK 20MHz CH-Low, 100%RB



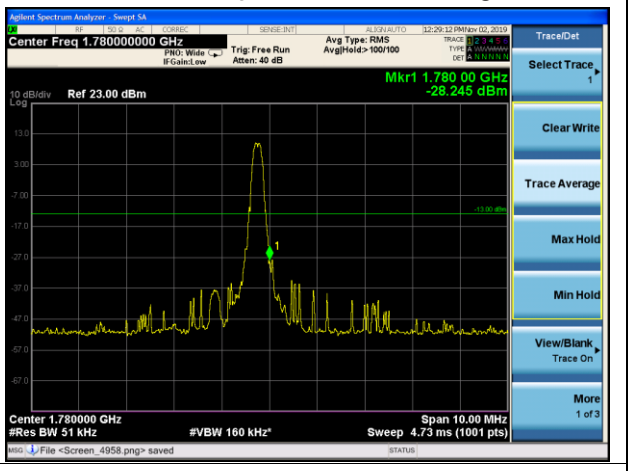
LTE Band 66 QPSK 20MHz CH-High, 100%RB



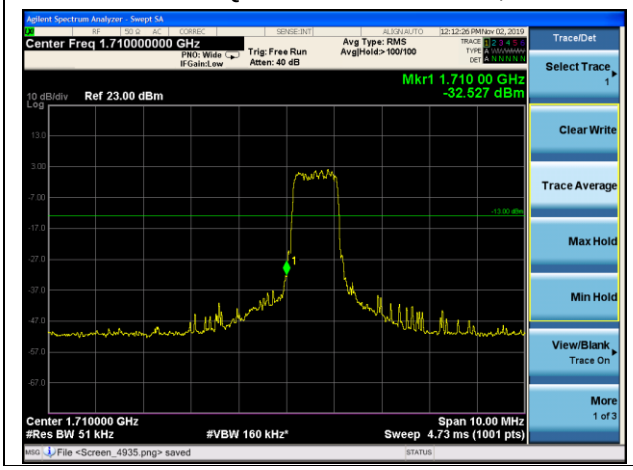
LTE Band 66 16QAM 1.4MHz CH-Low, 1 RB



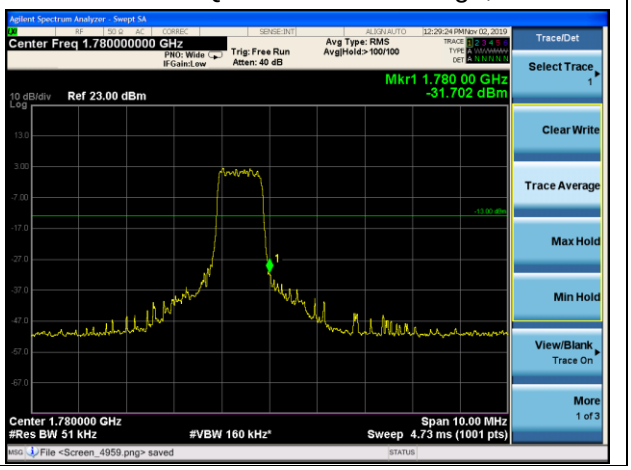
LTE Band 66 16QAM 1.4MHz CH-High, 1 RB



LTE Band 66 16QAM 1.4MHz CH-Low, 100%RB



LTE Band 66 16QAM 1.4MHz CH-High, 100%RB



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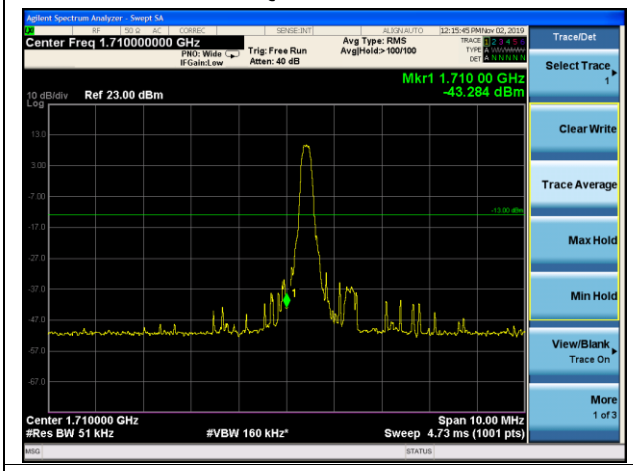
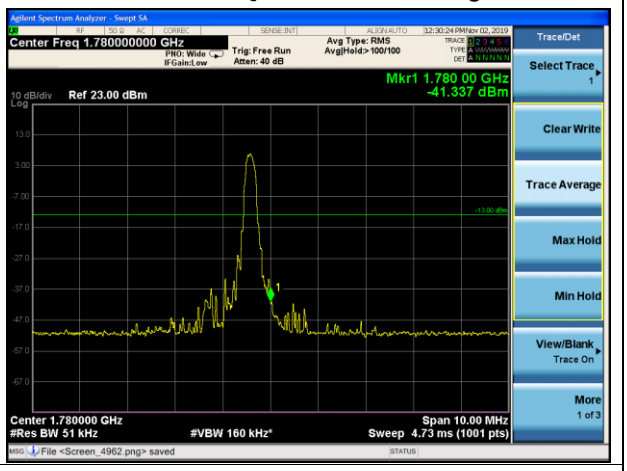
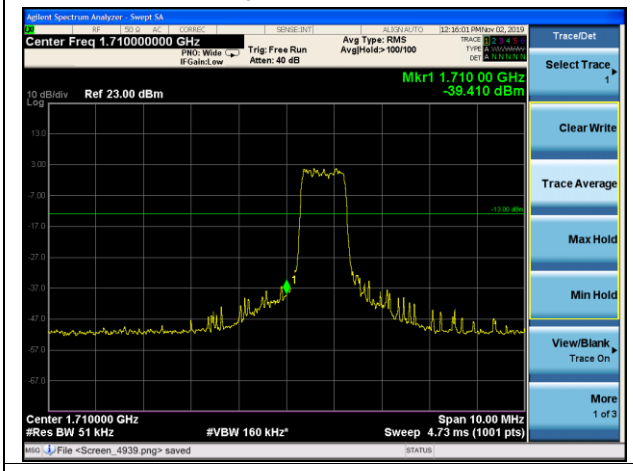
LTE Band 66 16QAM 3MHz CH-Low, 1 RB



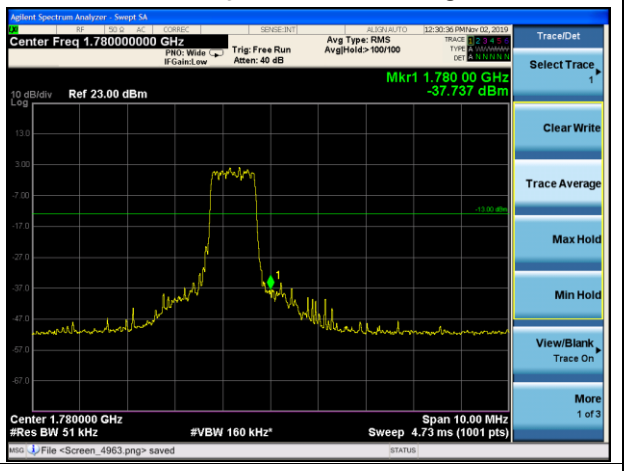
LTE Band 66 16QAM 3MHz CH-High, 1 RB



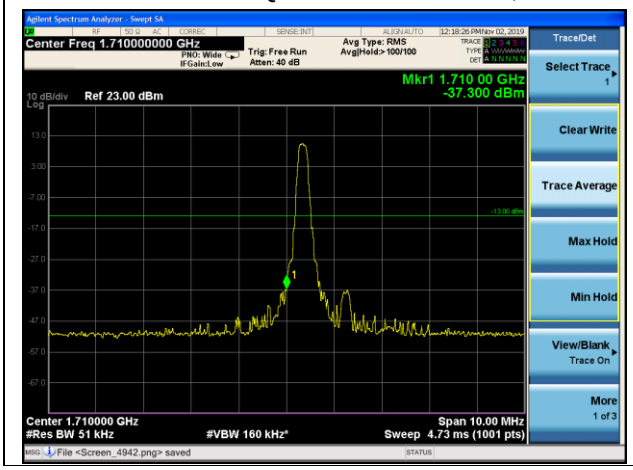
LTE Band 66 16QAM 3MHz CH-Low, 100%RB



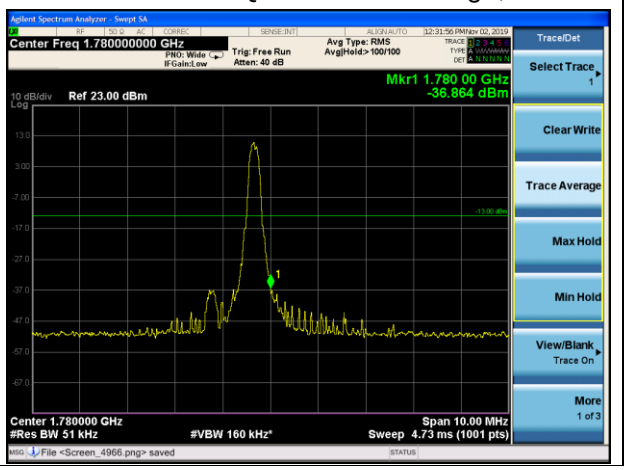
LTE Band 66 16QAM 3MHz CH-High, 100%RB



LTE Band 66 16QAM 5MHz CH-Low, 1 RB



LTE Band 66 16QAM 5MHz CH-High, 1 RB



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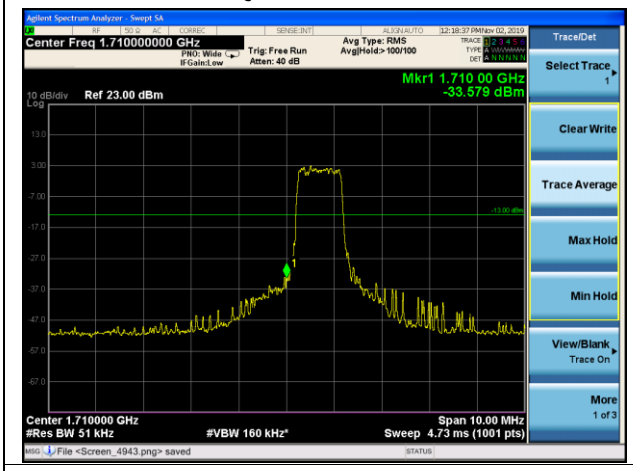
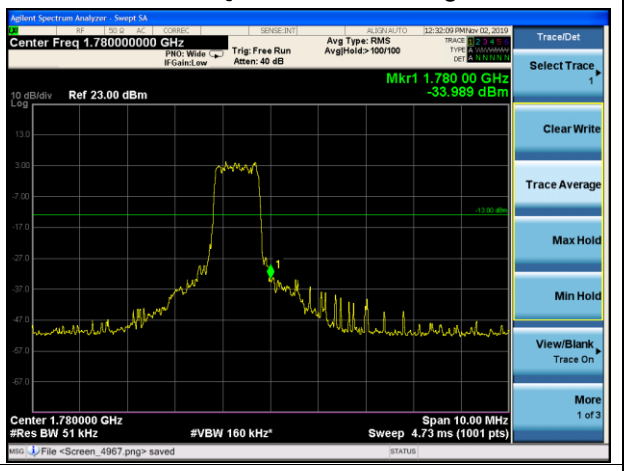
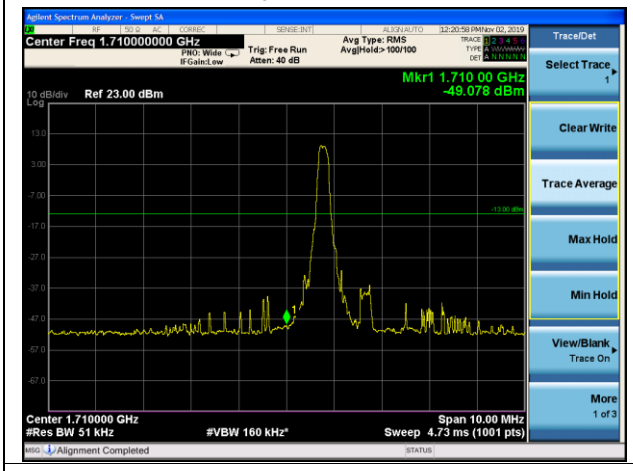
LTE Band 66 16QAM 5MHz CH-Low, 100%RB



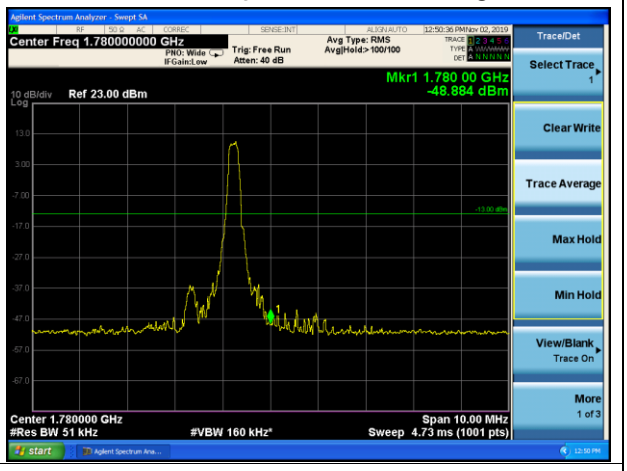
LTE Band 66 16QAM 5MHz CH-High, 100%RB



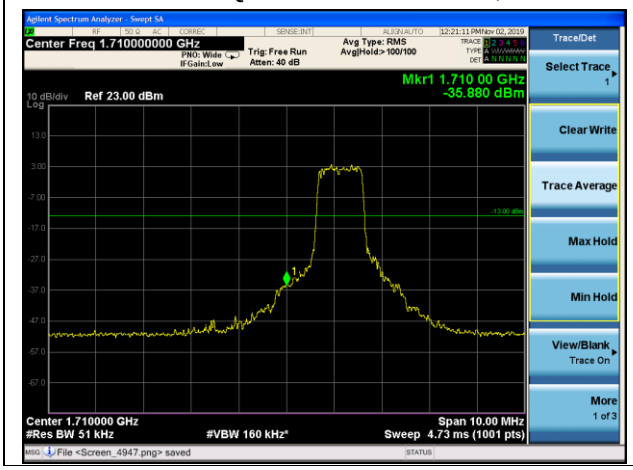
LTE Band 66 16QAM 10MHz CH-Low, 1 RB



LTE Band 66 16QAM 10MHz CH-High, 1 RB



LTE Band 66 16QAM 10MHz CH-Low, 100%RB



LTE Band 66 16QAM 10MHz CH-High, 100%RB

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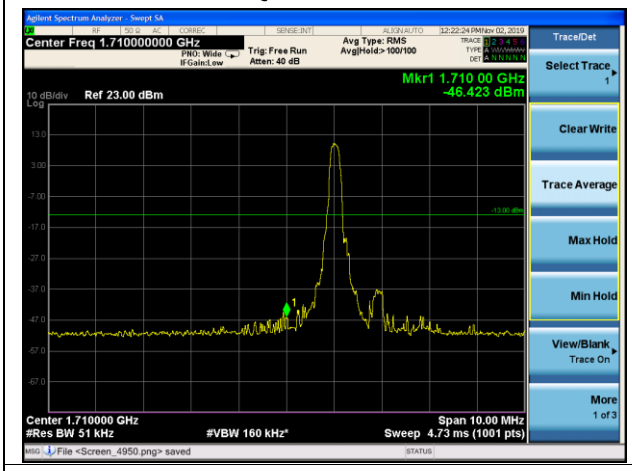
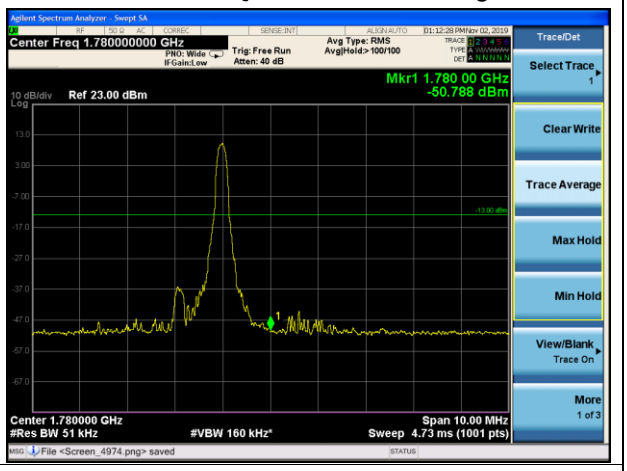
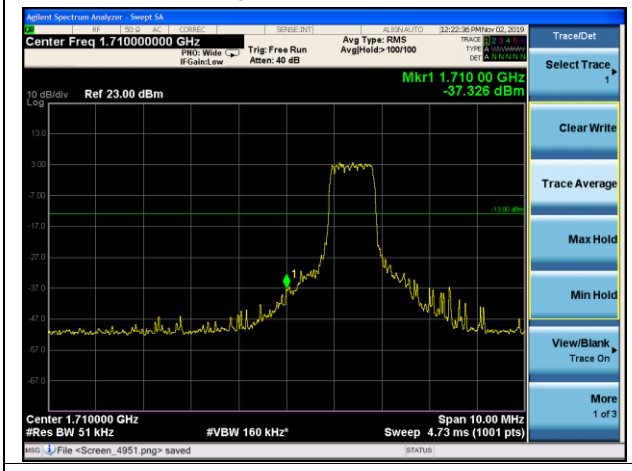
LTE Band 66 16QAM 15MHz CH-Low, 1 RB



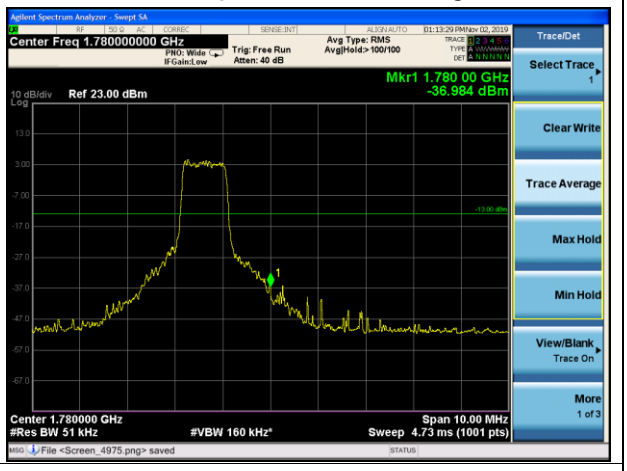
LTE Band 66 16QAM 15MHz CH-High, 1 RB



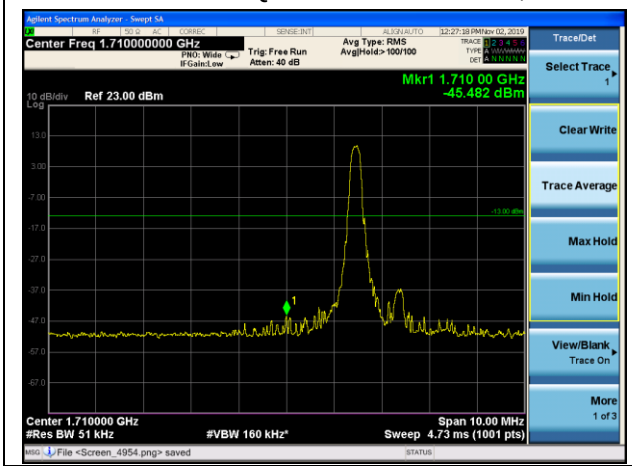
LTE Band 66 16QAM 15MHz CH-Low, 100%RB



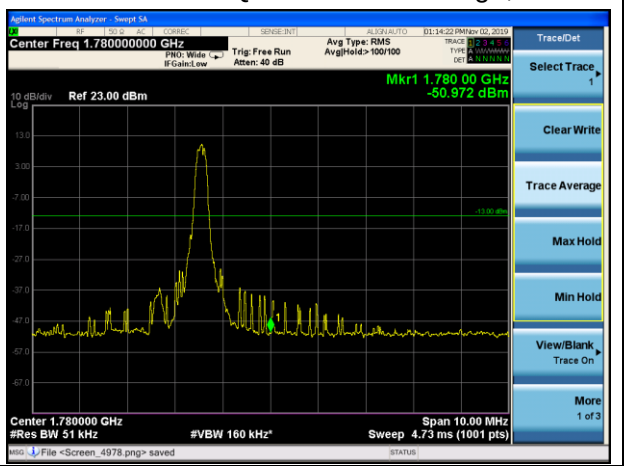
LTE Band 66 16QAM 15MHz CH-High, 100%RB



LTE Band 66 16QAM 20MHz CH-Low, 1 RB



LTE Band 66 16QAM 20MHz CH-High, 1 RB



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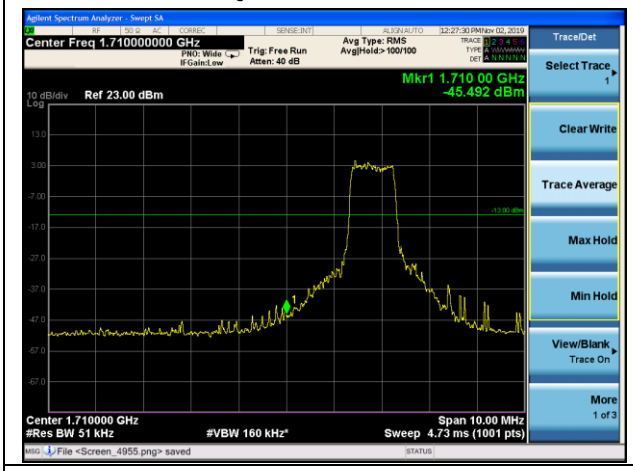
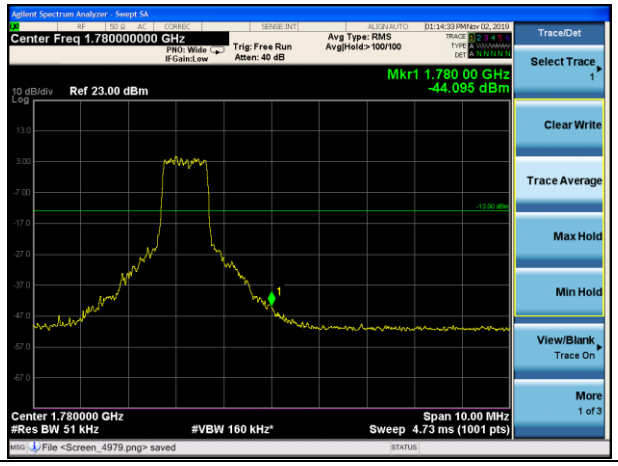
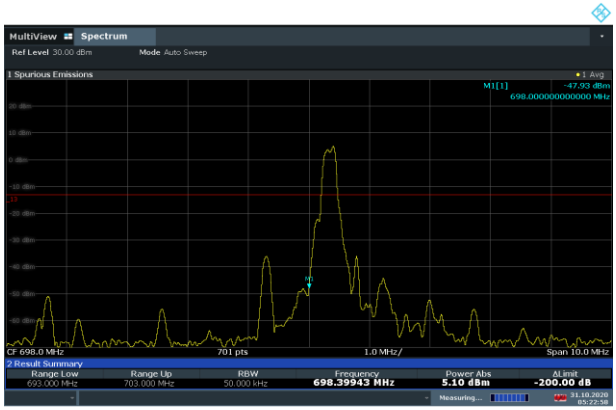
LTE Band 66 16QAM 20MHz CH-Low, 100%RB



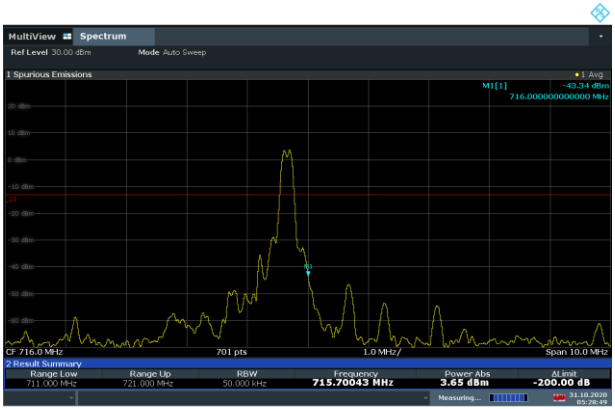
LTE Band 66 16QAM 20MHz CH-High, 100%RB



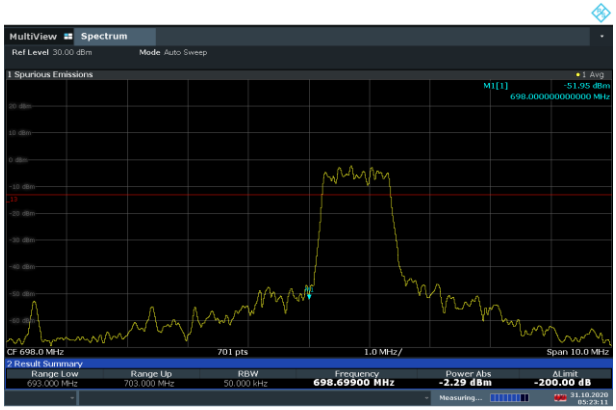
LTE Band 85 QPSK 5MHz CH-Low, 1 RB



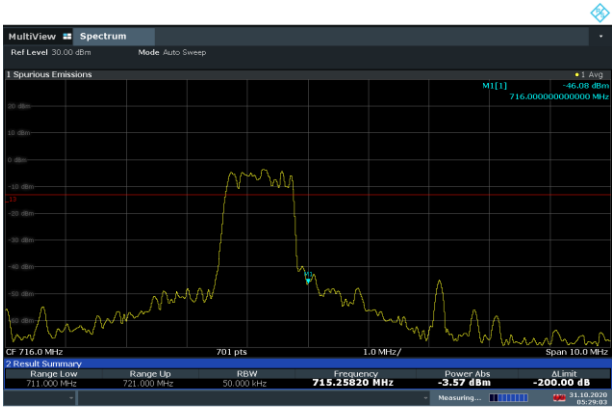
LTE Band 85 QPSK 5MHz CH-High, 1 RB



LTE Band 85 QPSK 5MHz CH-Low, 100%RB



LTE Band 85 QPSK 5MHz CH-High, 100%RB



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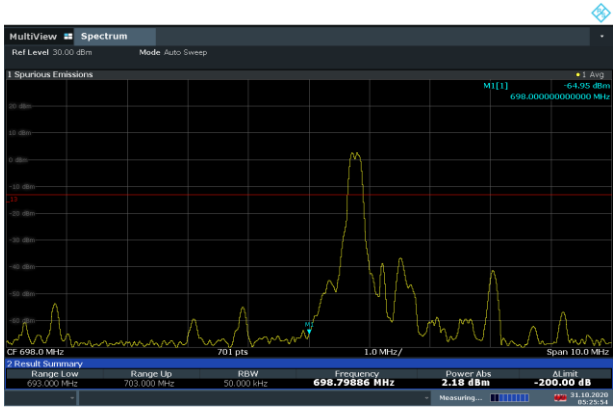
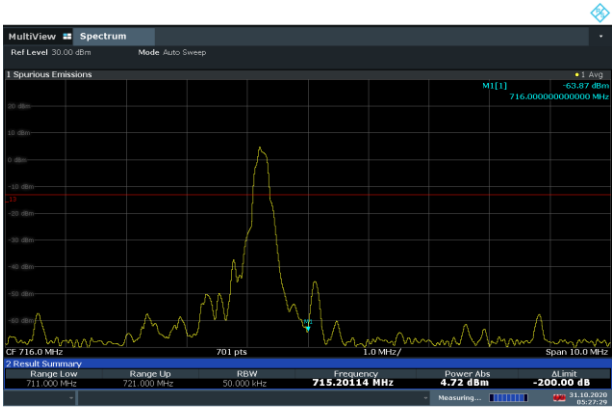
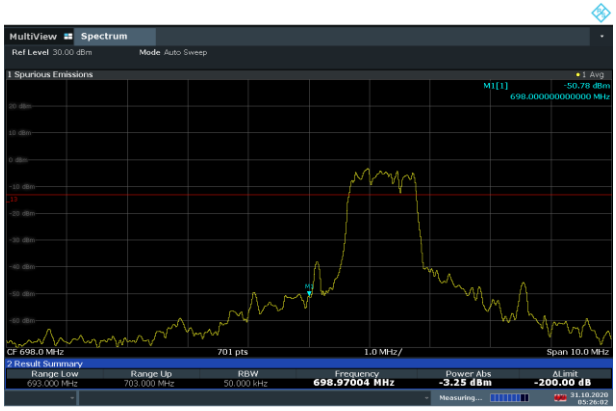
LTE Band 85 QPSK 10MHz CH-Low, 1 RB



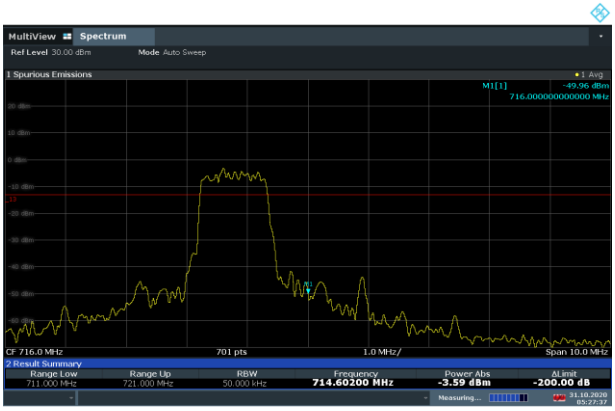
LTE Band 85 QPSK 10MHz CH-High, 1 RB



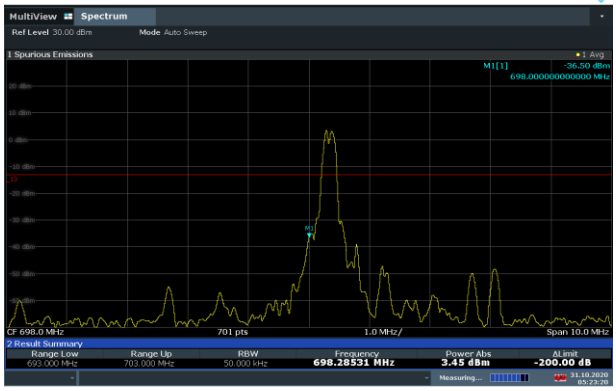
LTE Band 85 QPSK 10MHz CH-Low, 100%RB



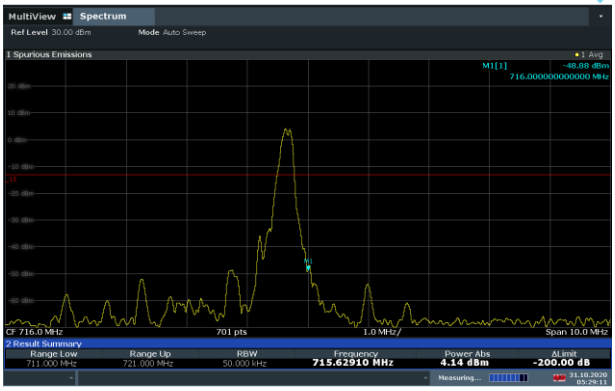
LTE Band 85 QPSK 10MHz CH-High, 100%RB



LTE Band 85 16QAM 5MHz CH-Low, 1 RB



LTE Band 85 16QAM 5MHz CH-High, 1 RB



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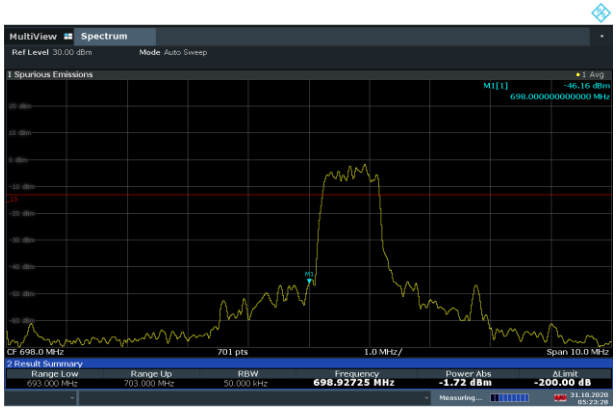
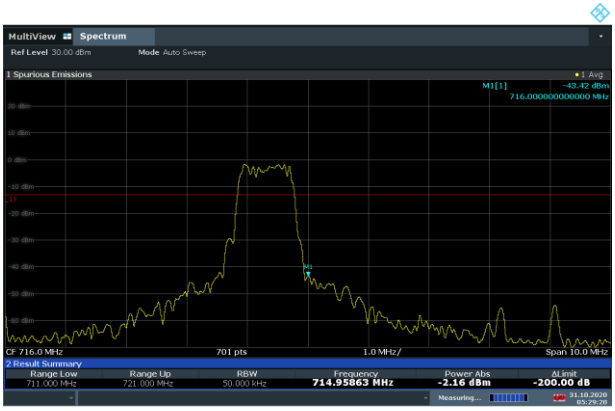
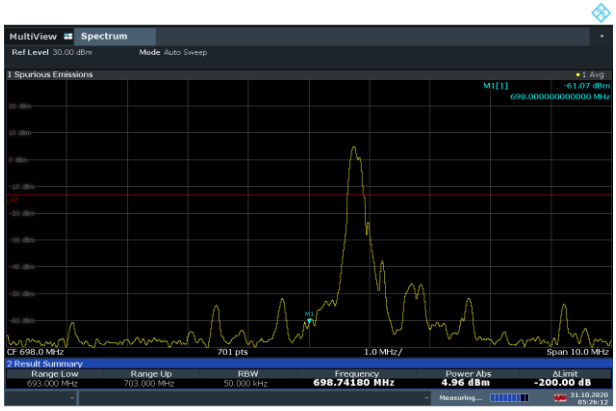
LTE Band 85 16QAM 5MHz CH-Low, 100%RB



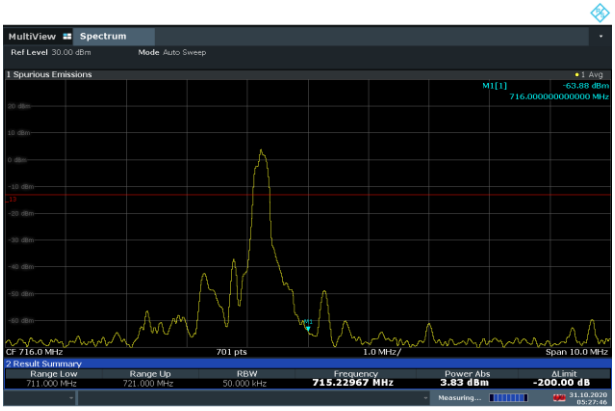
LTE Band 85 16QAM 5MHz CH-High, 100%RB



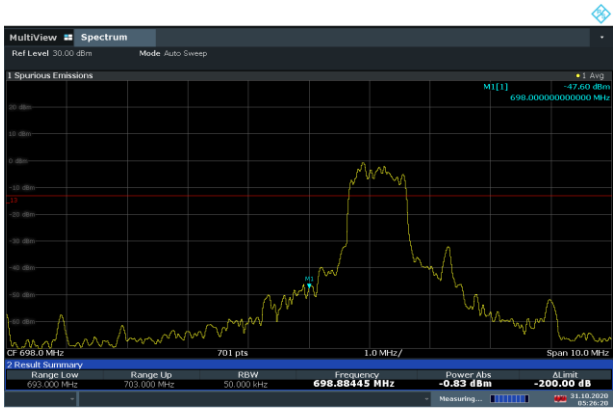
LTE Band 85 16QAM 10MHz CH-Low, 1 RB



LTE Band85 16QAM 10MHz CH-High, 1 RB



LTE Band 85 16QAM 10MHz CH-Low, 100%RB



LTE Band 85 16QAM 10MHz CH-High, 100%RB

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5.4 Peak-to-Average Power Ratio (PAPR)

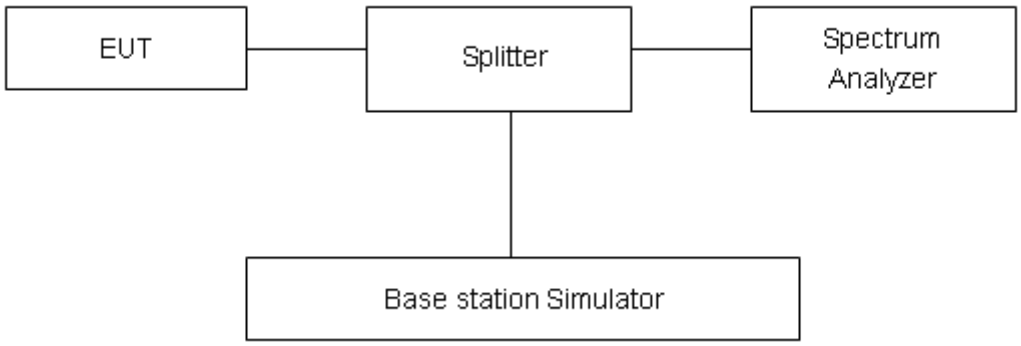
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Measure the total peak power and record as PPk. And measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (*e.g.*, dBm). Determine the PAPR from:
PAPR (dB) = PPk (dBm) - PAvg (dBm).

Test Setup



Limits

Rule Part 27.50(d)(5) Equipment employed must be authorized in accordance with the provisions of 24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for thenormal distribution is with the coverage factor k = 2, U= 0.4 dB.

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Test Results

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)			Limit (dB)	Conclusion
				Peak (dBm)	Avg (dBm)	PAPR (dB)		
Band4	1.4MHz	QPSK	20175/1732.5	23.43	12.53	10.90	≤13	PASS
		16QAM	20175/1732.5	24.39	12.40	11.99	≤13	PASS
	3MHz	QPSK	20175/1732.5	23.60	13.26	10.34	≤13	PASS
		16QAM	20175/1732.5	24.04	13.30	10.74	≤13	PASS
	5MHz	QPSK	20175/1732.5	24.50	14.70	9.80	≤13	PASS
		16QAM	20175/1732.5	25.02	15.21	9.81	≤13	PASS
	10MHz	QPSK	20175/1732.5	24.53	15.52	9.01	≤13	PASS
		16QAM	20175/1732.5	25.59	16.65	8.94	≤13	PASS
	15MHz	QPSK	20175/1732.5	25.01	14.42	10.59	≤13	PASS
		16QAM	20175/1732.5	25.50	14.54	10.96	≤13	PASS
	20MHz	QPSK	20175/1732.5	25.13	15.81	9.32	≤13	PASS
		16QAM	20175/1732.5	25.57	15.03	10.54	≤13	PASS

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)			Limit (dB)	Conclusion
				Peak (dBm)	Avg (dBm)	PAPR (dB)		
Band12	1.4MHz	QPSK	23095/707.5	24.28	13.25	11.03	≤13	PASS
		16QAM	23095/707.5	25.39	13.80	11.59	≤13	PASS
	3MHz	QPSK	23095/707.5	24.24	13.53	10.71	≤13	PASS
		16QAM	23095/707.5	25.25	13.69	11.56	≤13	PASS
	5MHz	QPSK	23095/707.5	25.33	15.72	9.61	≤13	PASS
		16QAM	23095/707.5	25.98	16.05	9.93	≤13	PASS
	10MHz	QPSK	23095/707.5	25.34	16.16	9.18	≤13	PASS
		16QAM	23095/707.5	26.46	17.39	9.07	≤13	PASS

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)			Limit (dB)	Conclusion
				Peak (dBm)	Avg (dBm)	PAPR (dB)		
Band13	5MHz	QPSK	23230/782	25.09	15.20	9.89	≤13	PASS
		16QAM	23230/782	25.52	15.79	9.73	≤13	PASS
	10MHz	QPSK	23230/782	25.35	16.16	9.19	≤13	PASS
		16QAM	23230/782	26.25	16.72	9.53	≤13	PASS

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Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)			Limit (dB)	Conclusion
				Peak (dBm)	Avg (dBm)	PAPR (dB)		
Ban66	1.4MHz	QPSK	132322/1745	23.82	12.16	11.66	≤13	PASS
		16QAM	132322/1745	24.75	12.57	12.18	≤13	PASS
	3MHz	QPSK	132322/1745	23.85	13.63	10.22	≤13	PASS
		16QAM	132322/1745	24.53	13.63	10.90	≤13	PASS
	5MHz	QPSK	132322/1745	24.60	15.17	9.43	≤13	PASS
		16QAM	132322/1745	25.31	15.56	9.75	≤13	PASS
	10MHz	QPSK	132322/1745	24.55	15.07	9.48	≤13	PASS
		16QAM	132322/1745	25.64	16.13	9.51	≤13	PASS
	15MHz	QPSK	132322/1745	25.13	15.94	9.19	≤13	PASS
		16QAM	132322/1745	25.62	15.97	9.65	≤13	PASS
	20MHz	QPSK	132322/1745	25.10	15.69	9.41	≤13	PASS
		16QAM	132322/1745	25.55	14.98	10.57	≤13	PASS

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)			Limit (dB)	Conclusion
				Peak (dBm)	Avg (dBm)	PAPR (dB)		
Band85	5MHz	QPSK	134092/707	20.02	10.22	9.80	≤13	PASS
		16QAM	134092/707	20.98	10.64	10.34	≤13	PASS
	10MHz	QPSK	134092/707	20.14	10.30	9.84	≤13	PASS
		16QAM	134092/707	19.99	10.09	9.90	≤13	PASS

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5.5 Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -40°C to +85°C in 10°C step size.

(1)With all power removed, the temperature was decreased to -10°C and permitted to stabilize for three hours.

(2)Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -40°C to +85°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

Frequency Stability (Voltage Variation)

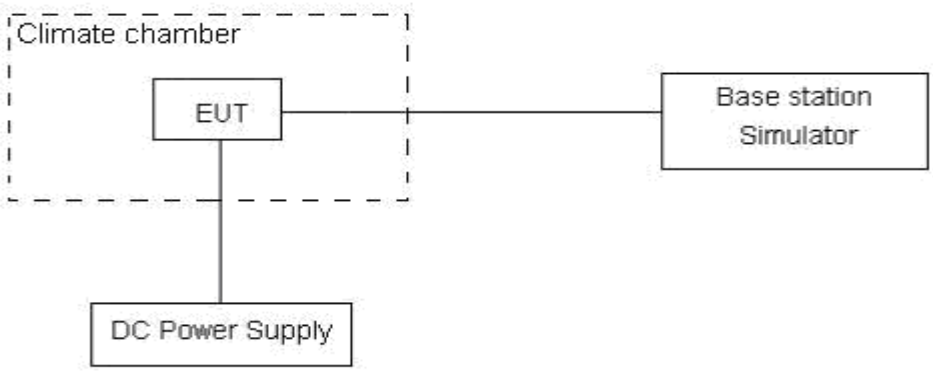
The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

This transceiver is specified to operate with an input voltage of between 2.6 V and 4.8 V, with a nominal voltage of 3.3V.

Test setup



Limits

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor k = 3,U=0.01ppm.

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Test Result

LTE Band 4						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability（ppm）	Frequency Stability（ppm）	Verdict
Bandwidth	20MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal（25℃）	Normal	10.23	8.16	0.00544	0.00434	PASS
Extreme（85℃）		1.63	5.36	0.00087	0.00285	PASS
Extreme（80℃）		1.14	17.98	0.00061	0.00957	PASS
Extreme（70℃）		3.92	15.07	0.00208	0.00802	PASS
Extreme（60℃）		2.76	5.69	0.00147	0.00302	PASS
Extreme（50℃）		10.55	12.31	0.00561	0.00655	PASS
Extreme（40℃）		16.83	7.27	0.00895	0.00386	PASS
Extreme（30℃）		6.71	16.89	0.00357	0.00898	PASS
Extreme（20℃）		6.85	6.47	0.00364	0.00344	PASS
Extreme（10℃）		13.80	6.55	0.00734	0.00348	PASS
Extreme（0℃）		6.27	6.01	0.00333	0.00320	PASS
Extreme（-10℃）		1.22	12.63	0.00065	0.00672	PASS
Extreme（-20℃）		6.13	1.70	0.00326	0.00091	PASS
Extreme（-30℃）		7.65	16.23	0.00407	0.00863	PASS
Extreme（-40℃）		1.46	6.41	0.00077	0.00341	PASS
25℃	LV	13.39	9.58	0.00712	0.00510	PASS
	HV	9.70	4.32	0.00516	0.00230	PASS

LTE Band 12						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability（ppm）	Frequency Stability（ppm）	Verdict
Bandwidth	10MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal（25℃）	Normal	8.55	9.13	0.00455	0.00485	PASS
Extreme（85℃）		5.23	1.96	0.00278	0.00104	PASS
Extreme（80℃）		17.39	10.08	0.00925	0.00536	PASS
Extreme（70℃）		10.21	4.05	0.00543	0.00215	PASS
Extreme（60℃）		13.94	6.49	0.00742	0.00345	PASS
Extreme（50℃）		1.48	2.56	0.00079	0.00136	PASS
Extreme（40℃）		17.40	17.98	0.00925	0.00956	PASS
Extreme（30℃）		2.29	13.64	0.00122	0.00726	PASS
Extreme（20℃）		11.73	10.40	0.00624	0.00553	PASS
Extreme（10℃）		16.49	9.90	0.00877	0.00527	PASS

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Extreme（0℃）		5.67	8.91	0.00302	0.00474	PASS
Extreme（-10℃）		9.89	3.95	0.00526	0.00210	PASS
Extreme（-20℃）		3.92	2.50	0.00209	0.00133	PASS
Extreme（-30℃）		2.14	7.71	0.00114	0.00410	PASS
Extreme（-40℃）		1.42	15.19	0.00076	0.00808	PASS
25℃	LV	9.33	2.59	0.00496	0.00138	PASS
	HV	4.56	15.53	0.00243	0.00826	PASS

LTE Band 13						
Condition		**Freq.Error (Hz)**	**Freq.Error (Hz)**	**Frequency Stability（ppm）**	**Frequency Stability（ppm）**	**Verdict**
Bandwidth	**10MHz**					
Temperature	**Voltage**	**16QAM**	**QPSK**	**16QAM**	**QPSK**	
Normal（25℃）	Normal	5.40	14.07	0.00287	0.00749	PASS
Extreme（85℃）		9.90	15.59	0.00526	0.00829	PASS
Extreme（80℃）		9.16	9.46	0.00487	0.00503	PASS
Extreme（70℃）		4.29	16.99	0.00228	0.00904	PASS
Extreme（60℃）		1.07	16.85	0.00057	0.00896	PASS
Extreme（50℃）		1.08	17.95	0.00058	0.00955	PASS
Extreme（40℃）		5.57	4.97	0.00296	0.00264	PASS
Extreme（30℃）		6.16	9.48	0.00328	0.00504	PASS
Extreme（20℃）		4.63	7.07	0.00246	0.00376	PASS
Extreme（10℃）		5.37	12.94	0.00286	0.00688	PASS
Extreme（0℃）		14.62	8.18	0.00778	0.00435	PASS
Extreme（-10℃）		4.92	15.30	0.00262	0.00814	PASS
Extreme（-20℃）		9.50	16.72	0.00505	0.00890	PASS
Extreme（-30℃）		17.39	9.02	0.00925	0.00480	PASS
Extreme（-40℃）		1.34	11.02	0.00071	0.00586	PASS
25℃	LV	16.07	2.17	0.00855	0.00115	PASS
	HV	7.56	7.69	0.00402	0.00409	PASS

LTE Band 66						
Condition		**Freq.Error (Hz)**	**Freq.Error (Hz)**	**Frequency Stability（ppm）**	**Frequency Stability（ppm）**	**Verdict**
Bandwidth	**20MHz**					
Temperature	**Voltage**	**16QAM**	**QPSK**	**16QAM**	**QPSK**	
Normal（25℃）	Normal	16.52	3.98	0.00879	0.00212	PASS
Extreme（85℃）		11.00	1.98	0.00585	0.00105	PASS
Extreme（80℃）		10.25	2.35	0.00545	0.00125	PASS
Extreme（70℃）		15.14	14.12	0.00805	0.00751	PASS

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Extreme（60℃）		15.42	3.58	0.00820	0.00191	PASS
Extreme（50℃）		4.43	15.40	0.00236	0.00819	PASS
Extreme（40℃）		17.09	7.68	0.00909	0.00409	PASS
Extreme（30℃）		1.84	5.37	0.00098	0.00285	PASS
Extreme（20℃）		4.26	1.52	0.00227	0.00081	PASS
Extreme（10℃）		16.89	16.10	0.00898	0.00856	PASS
Extreme（0℃）		8.33	3.08	0.00443	0.00164	PASS
Extreme（-10℃）		14.88	9.87	0.00791	0.00525	PASS
Extreme（-20℃）		9.26	12.90	0.00493	0.00686	PASS
Extreme（-30℃）		4.71	17.85	0.00251	0.00949	PASS
Extreme（-40℃）		4.98	5.41	0.00265	0.00288	PASS
25℃	LV	12.26	5.35	0.00652	0.00285	PASS
	HV	12.35	13.06	0.00657	0.00695	PASS

LTE Band 85						
Condition		**Freq.Error (Hz)**	**Freq.Error (Hz)**	**Frequency Stability（ppm）**	**Frequency Stability（ppm）**	**Verdict**
Bandwidth	**20MHz**					
Temperature	**Voltage**	**16QAM**	**QPSK**	**16QAM**	**QPSK**	
Normal（25℃）		8.02	11.69	0.00427	0.00622	PASS
Extreme（85℃）		7.95	7.37	0.00423	0.00392	PASS
Extreme（80℃）		6.07	8.54	0.00323	0.00454	PASS
Extreme（70℃）		3.51	13.56	0.00187	0.00721	PASS
Extreme（60℃）		3.22	10.80	0.00171	0.00574	PASS
Extreme（50℃）		14.56	13.74	0.00775	0.00731	PASS
Extreme（40℃）		3.52	12.45	0.00187	0.00662	PASS
Extreme（30℃）	Normal	3.66	5.71	0.00195	0.00304	PASS
Extreme（20℃）		6.05	8.88	0.00322	0.00472	PASS
Extreme（10℃）		7.99	16.69	0.00425	0.00888	PASS
Extreme（0℃）		17.36	5.11	0.00923	0.00272	PASS
Extreme（-10℃）		12.73	6.11	0.00677	0.00325	PASS
Extreme（-20℃）		15.16	8.99	0.00806	0.00478	PASS
Extreme（-30℃）		17.22	13.60	0.00916	0.00723	PASS
Extreme（-40℃）		12.29	6.31	0.00654	0.00336	PASS
25℃	LV	13.61	16.85	0.00724	0.00896	PASS
	HV	15.39	3.91	0.00819	0.00208	PASS

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5.6 Spurious Emissions at Antenna Terminals

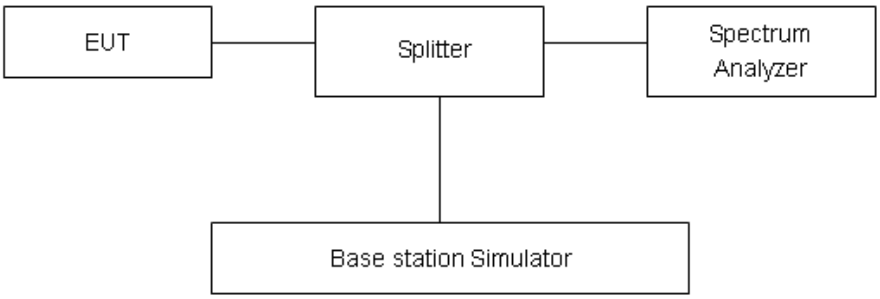
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 9kHz to the 10th harmonic of the carrier. The peak detector is used.
RBW is set to 100kHz, VBW is set to 300kHz for 30MHz~1GHz
RBW is set to 1MHz, VBW is set to 3MHz for above 1GHz, Sweep is set to ATUO.
Of those disturbances below (limit – 20 dB), the mark is not required for the EUT.
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB..”

Rule Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically

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radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Part 27.53((h)/(g) Limit		-13 dBm
Part 27.53(f) Limit	Limit out of the band 1559-1610 MHz	-13 dBm
	Limit in the band 1559-1610 MHz	-40 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
9kHz-1GHz	0.684 dB
1GHz-27GHz	1.407 dB

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