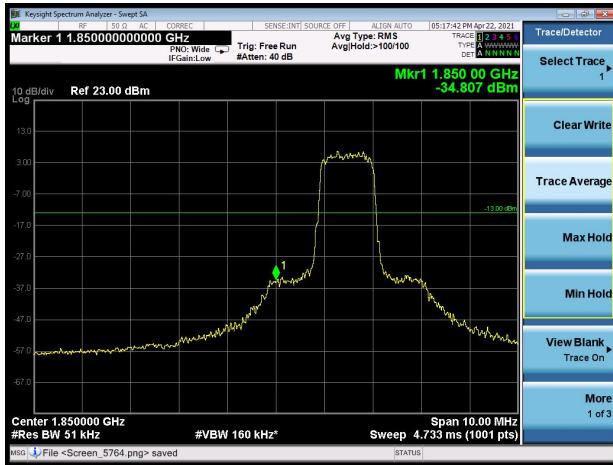




LTE Band 25 15MHz QPSK 100%RB CH-Low



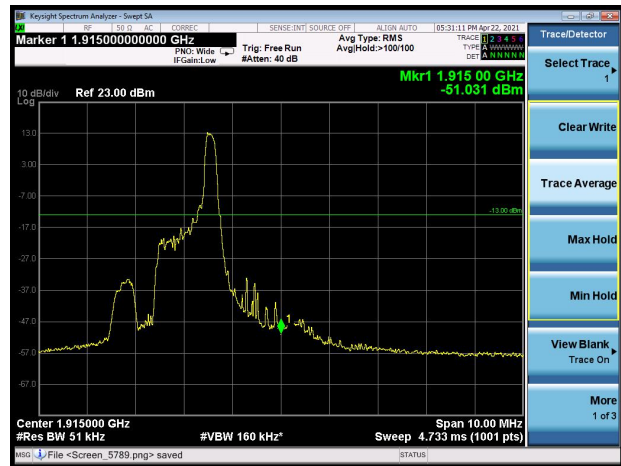
LTE Band 25 15MHz QPSK 100%RB CH-High



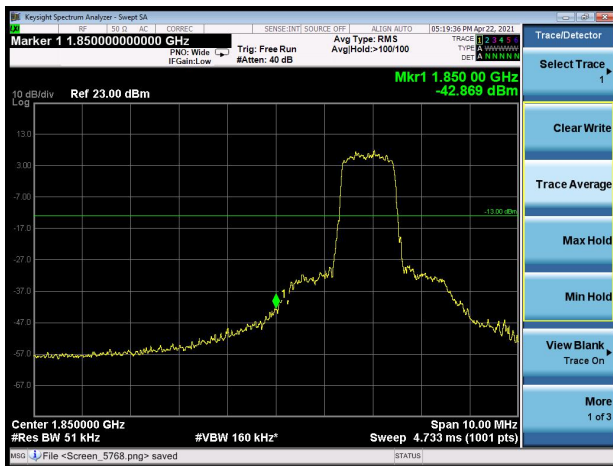
LTE Band 25 20MHz QPSK 1RB CH-Low



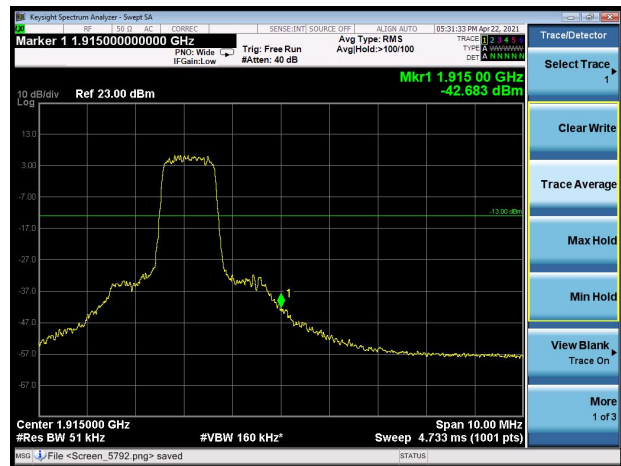
LTE Band 25 20MHz QPSK 1RB CH-High



LTE Band 25 20MHz QPSK 100%RB CH-Low



LTE Band 25 20MHz QPSK 100%RB CH-High





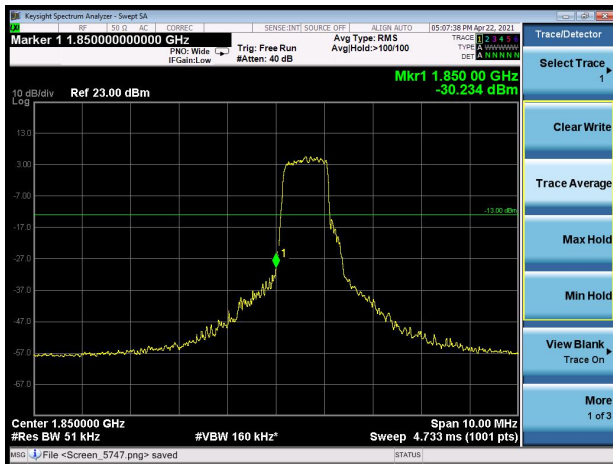
LTE Band 25 1.4MHz 16QAM 1RB CH-Low



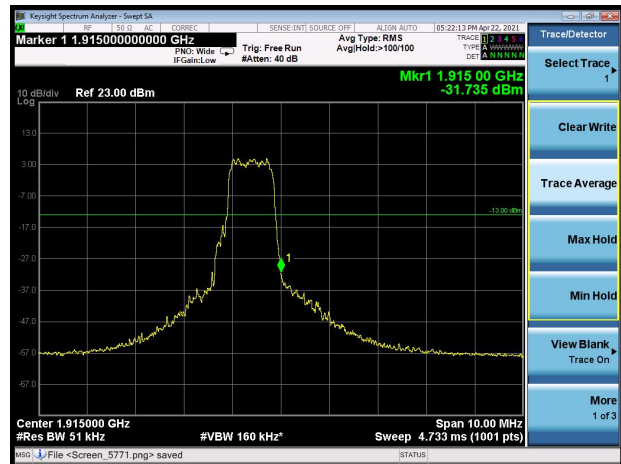
LTE Band 25 1.4MHz 16QAM 1RB CH-High



LTE Band 25 1.4MHz 16QAM 100%RB CH-Low



LTE Band 25 1.4MHz 16QAM 100%RB CH-High



LTE Band 25 3MHz 16QAM 1RB CH-Low

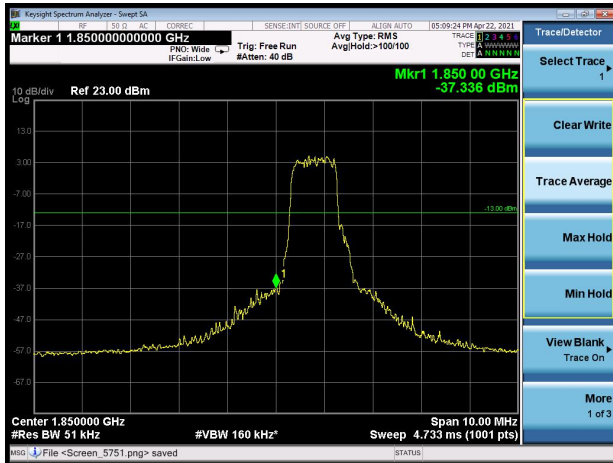


LTE Band 25 3MHz 16QAM 1RB CH-High

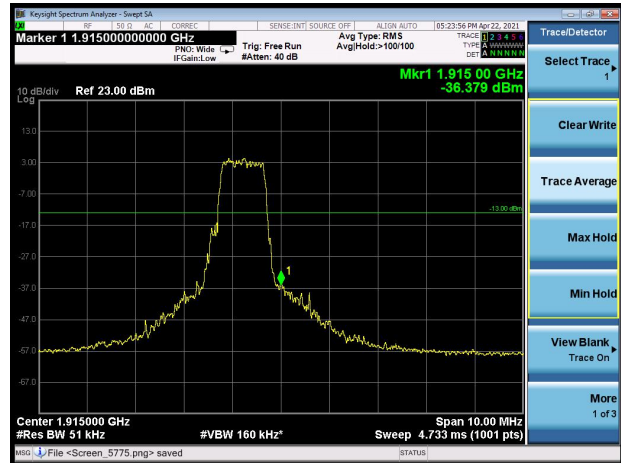




LTE Band 25 3MHz 16QAM 100%RB CH-Low



LTE Band 25 3MHz 16QAM 100%RB CH-High



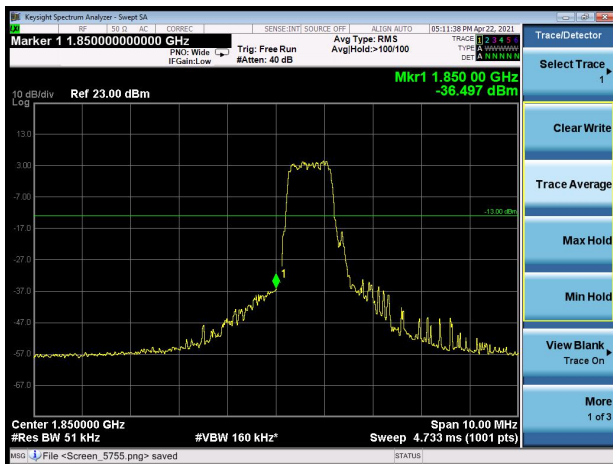
LTE Band 25 5MHz 16QAM 1RB CH-Low



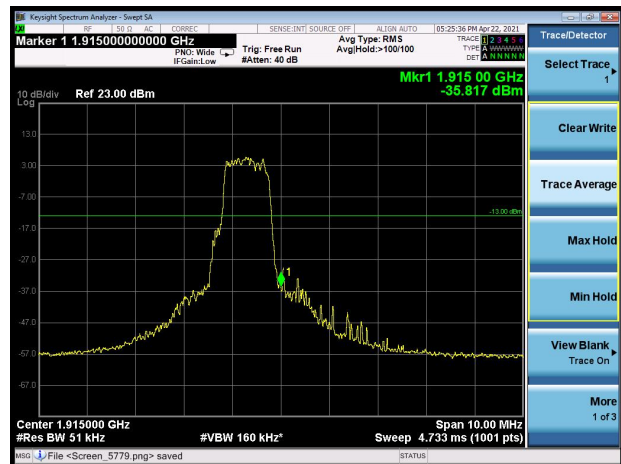
LTE Band 25 5MHz 16QAM 1RB CH-High



LTE Band 25 5MHz 16QAM 100%RB CH-Low



LTE Band 25 5MHz 16QAM 100%RB CH-High





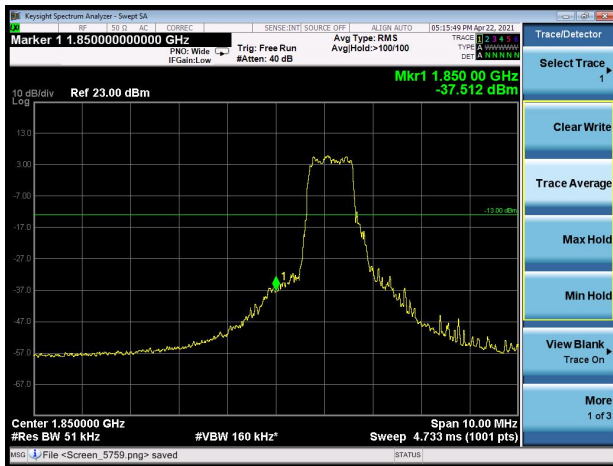
LTE Band 25 10MHz 16QAM 1RB CH-Low



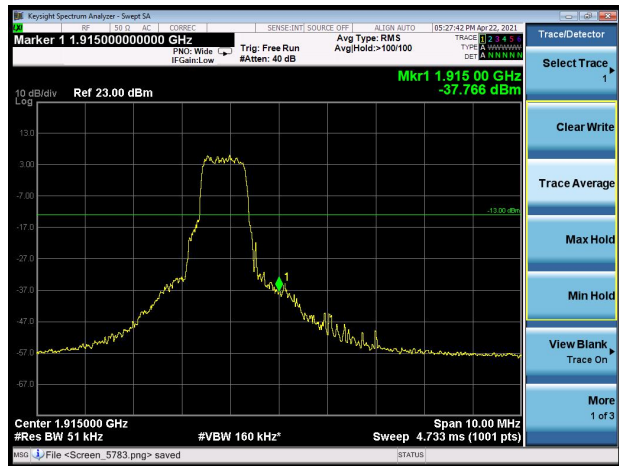
LTE Band 25 10MHz 16QAM 1RB CH-High



LTE Band 25 10MHz 16QAM 100%RB CH-Low



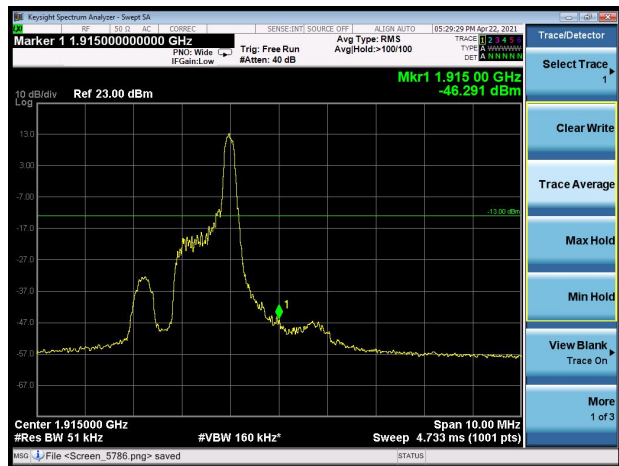
LTE Band 25 10MHz 16QAM 100%RB CH-High



LTE Band 25 15MHz 16QAM 1RB CH-Low

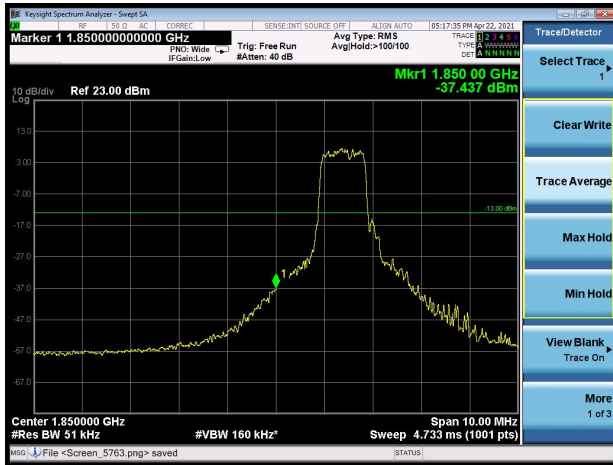


LTE Band 25 15MHz 16QAM 1RB CH-High

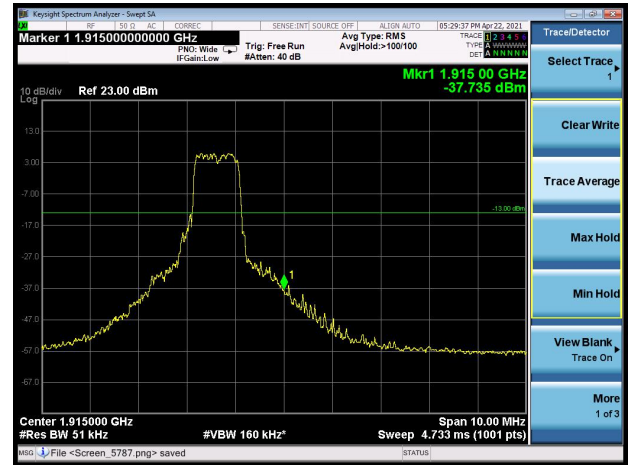




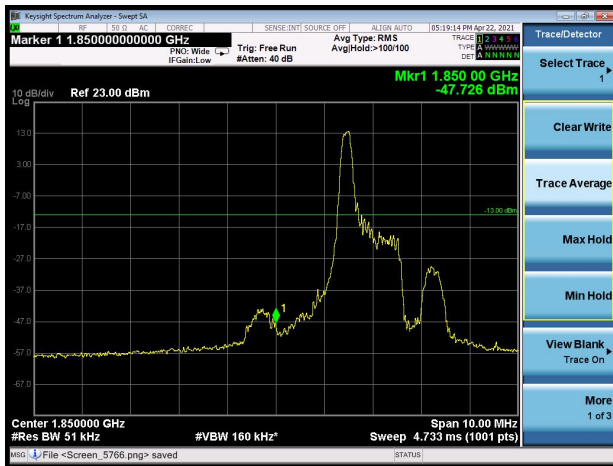
LTE Band 25 15MHz 16QAM 100%RB CH-Low



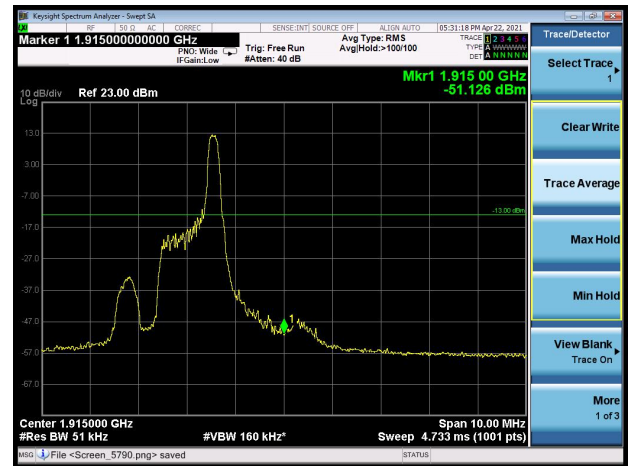
LTE Band 25 15MHz 16QAM 100%RB CH-High



LTE Band 25 20MHz 16QAM 1RB CH-Low



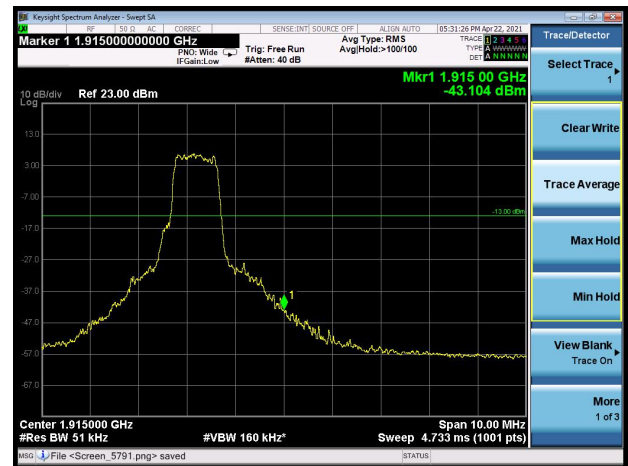
LTE Band 25 20MHz 16QAM 1RB CH-High



LTE Band 25 20MHz 16QAM 100%RB CH-Low



LTE Band 25 20MHz 16QAM 100%RB CH-High



5.4. Peak-to-Average Power Ratio (PAPR)

Ambient condition

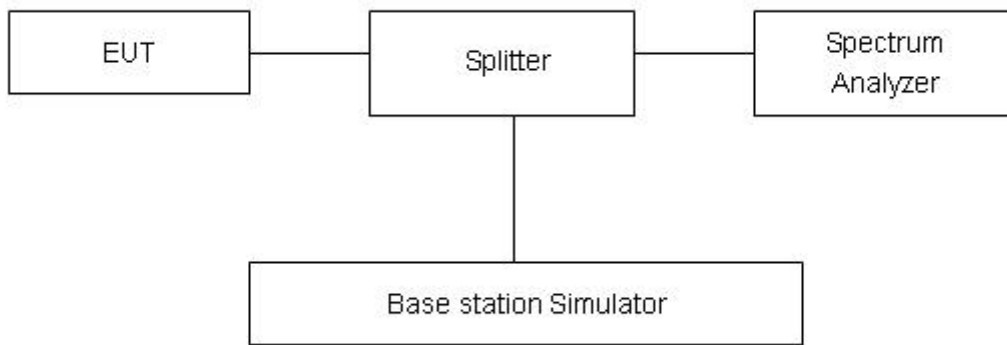
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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

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 in 24.232(d).

Measurement Uncertainty

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

Test Results

Mode	Bandwidth	Modulation	Channel/ Frequency (MHz)	Peak-to-Average Power Ratio (PAPR)			Limit (dB)	Conclusion
				Peak (dBm)	Avg (dBm)	PAPR (dB)		
LTE Band 2	1.4MHz	QPSK	18900/1880	26.46	16.32	10.14	≤13	PASS
		16QAM	18900/1880	27.07	15.87	11.20	≤13	PASS
	3MHz	QPSK	18900/1880	26.34	16.18	10.16	≤13	PASS
		16QAM	18900/1880	27.06	15.89	11.17	≤13	PASS
	5MHz	QPSK	18900/1880	27.27	17.54	9.73	≤13	PASS
		16QAM	18900/1880	27.16	16.22	10.94	≤13	PASS
	10MHz	QPSK	18900/1880	27.16	17.18	9.98	≤13	PASS
		16QAM	18900/1880	27.65	16.76	10.89	≤13	PASS
	15MHz	QPSK	18900/1880	27.83	18.48	9.35	≤13	PASS
		16QAM	18900/1880	28.14	18.08	10.06	≤13	PASS
	20MHz	QPSK	18900/1880	27.83	18.49	9.34	≤13	PASS
		16QAM	18900/1880	28.18	18.12	10.06	≤13	PASS

Mode	Bandwidth	Modulation	Channel/ Frequency (MHz)	Peak-to-Average Power Ratio (PAPR)			Limit (dB)	Conclusion
				Peak (dBm)	Avg (dBm)	PAPR (dB)		
LTE Band 25	1.4MHz	QPSK	26365/1882.5	26.53	16.45	10.08	≤13	PASS
		16QAM	26365/1882.5	27.02	16.04	10.98	≤13	PASS
	3MHz	QPSK	26365/1882.5	26.31	16.01	10.30	≤13	PASS
		16QAM	26365/1882.5	27.04	16.02	11.02	≤13	PASS
	5MHz	QPSK	26365/1882.5	27.26	17.29	9.97	≤13	PASS
		16QAM	26365/1882.5	27.08	16.06	11.02	≤13	PASS
	10MHz	QPSK	26365/1882.5	27.24	17.71	9.53	≤13	PASS
		16QAM	26365/1882.5	27.72	17.27	10.45	≤13	PASS
	15MHz	QPSK	26365/1882.5	27.82	18.83	8.99	≤13	PASS
		16QAM	26365/1882.5	28.19	18.56	9.63	≤13	PASS
	20MHz	QPSK	26365/1882.5	27.76	18.03	9.73	≤13	PASS
		16QAM	26365/1882.5	28.17	18.48	9.69	≤13	PASS

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 -30°C to +50°C in 10°C step size,

(1) With all power removed, the temperature was decreased to 0°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 -30°C to +50°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

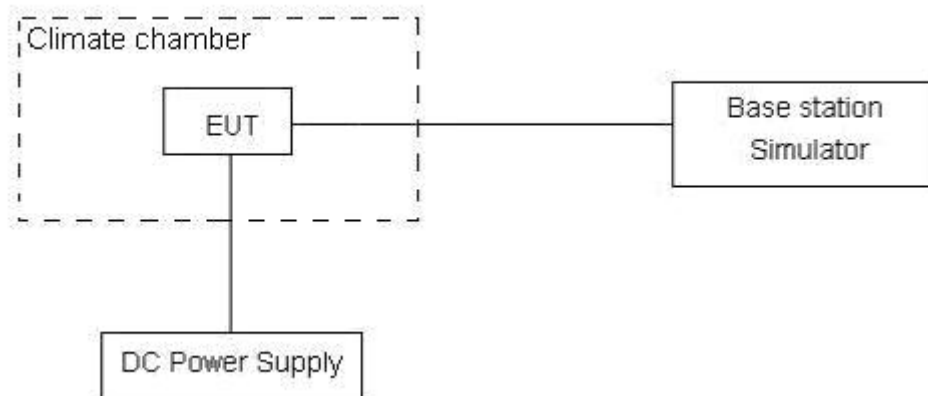
Frequency Stability (Voltage Variation)

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

Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced 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 3.1 V and 4.2 V, with a nominal voltage of 3.3V.

Test setup



**Limits**

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block

Measurement Uncertainty

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



Test Result

LTE Band 2						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	1.4MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	4.99	6.64	0.00265	0.00353	PASS
Extreme (50℃)		16.90	15.14	0.00899	0.00805	PASS
Extreme (40℃)		11.55	9.42	0.00614	0.00501	PASS
Extreme (30℃)		7.19	17.81	0.00383	0.00947	PASS
Extreme (20℃)		3.28	11.02	0.00175	0.00586	PASS
Extreme (10℃)		17.05	5.21	0.00907	0.00277	PASS
Extreme (0℃)		8.89	16.47	0.00473	0.00876	PASS
Extreme (-10℃)		6.66	6.91	0.00354	0.00368	PASS
Extreme (-20℃)		4.51	8.54	0.00240	0.00454	PASS
Extreme (-30℃)		12.60	8.39	0.00670	0.00446	PASS
25℃	LV	16.04	3.79	0.00853	0.00202	PASS
	HV	17.52	11.09	0.00932	0.00590	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	3MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	13.04	3.21	0.00694	0.00171	PASS
Extreme (50℃)		8.73	8.99	0.00464	0.00478	PASS
Extreme (40℃)		6.30	7.87	0.00335	0.00418	PASS
Extreme (30℃)		11.49	5.87	0.00611	0.00312	PASS
Extreme (20℃)		2.86	14.04	0.00152	0.00747	PASS
Extreme (10℃)		7.48	8.90	0.00398	0.00474	PASS
Extreme (0℃)		11.13	15.08	0.00592	0.00802	PASS
Extreme (-10℃)		8.23	6.81	0.00438	0.00362	PASS
Extreme (-20℃)		1.31	6.17	0.00070	0.00328	PASS
Extreme (-30℃)		15.63	17.84	0.00831	0.00949	PASS
25℃	LV	15.61	3.27	0.00830	0.00174	PASS
	HV	5.65	2.21	0.00301	0.00118	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	5MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	2.39	6.78	0.00127	0.00361	PASS
Extreme (50℃)		8.47	15.44	0.00450	0.00821	PASS



Extreme (40°C)		2.23	14.48	0.00119	0.00770	PASS
Extreme (30°C)		4.35	16.98	0.00231	0.00903	PASS
Extreme (20°C)		2.69	1.63	0.00143	0.00087	PASS
Extreme (10°C)		9.01	11.18	0.00479	0.00594	PASS
Extreme (0°C)		5.02	5.42	0.00267	0.00288	PASS
Extreme (-10°C)		15.95	2.00	0.00848	0.00106	PASS
Extreme (-20°C)		13.85	10.14	0.00737	0.00539	PASS
Extreme (-30°C)		6.11	9.35	0.00325	0.00497	PASS
25°C	LV	16.44	6.79	0.00874	0.00361	PASS
	HV	2.37	17.72	0.00126	0.00943	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	10MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25°C)	Normal	9.59	6.44	0.00510	0.00342	PASS
Extreme (50°C)		11.48	7.75	0.00610	0.00412	PASS
Extreme (40°C)		15.50	11.11	0.00825	0.00591	PASS
Extreme (30°C)		15.91	6.82	0.00846	0.00363	PASS
Extreme (20°C)		1.34	2.68	0.00071	0.00143	PASS
Extreme (10°C)		17.23	10.52	0.00917	0.00560	PASS
Extreme (0°C)		12.30	4.54	0.00654	0.00241	PASS
Extreme (-10°C)		12.03	4.50	0.00640	0.00240	PASS
Extreme (-20°C)		9.97	4.88	0.00530	0.00259	PASS
Extreme (-30°C)		14.86	10.65	0.00790	0.00567	PASS
25°C	LV	10.21	11.65	0.00543	0.00619	PASS
	HV	10.99	2.74	0.00584	0.00146	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	15MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25°C)	Normal	8.80	1.87	0.00468	0.00100	PASS
Extreme (50°C)		13.92	6.10	0.00740	0.00324	PASS
Extreme (40°C)		14.98	10.07	0.00797	0.00535	PASS
Extreme (30°C)		15.66	2.19	0.00833	0.00117	PASS
Extreme (20°C)		11.85	11.65	0.00630	0.00620	PASS
Extreme (10°C)		4.95	13.11	0.00263	0.00698	PASS
Extreme (0°C)		4.60	2.87	0.00245	0.00153	PASS
Extreme (-10°C)		2.34	7.73	0.00125	0.00411	PASS
Extreme (-20°C)		7.52	16.10	0.00400	0.00856	PASS
Extreme (-30°C)		1.65	12.45	0.00088	0.00662	PASS
25°C	LV	11.29	17.05	0.00601	0.00907	PASS



Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	20MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25°C)	Normal	17.74	5.43	0.00944	0.00289	PASS
Extreme (50°C)		8.63	4.01	0.00459	0.00213	PASS
Extreme (40°C)		4.24	17.00	0.00225	0.00904	PASS
Extreme (30°C)		15.47	6.27	0.00823	0.00334	PASS
Extreme (20°C)		17.49	12.65	0.00930	0.00673	PASS
Extreme (10°C)		3.61	1.49	0.00192	0.00079	PASS
Extreme (0°C)		13.24	10.73	0.00704	0.00571	PASS
Extreme (-10°C)		15.18	11.18	0.00808	0.00595	PASS
Extreme (-20°C)		16.15	2.08	0.00859	0.00110	PASS
Extreme (-30°C)		16.12	10.42	0.00857	0.00554	PASS
25°C	LV	6.07	17.93	0.00323	0.00953	PASS
	HV	13.93	6.61	0.00741	0.00352	PASS

LTE Band 25						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	1.4MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25°C)	Normal	16.14	10.59	0.00859	0.00563	PASS
Extreme (50°C)		13.94	3.33	0.00741	0.00177	PASS
Extreme (40°C)		5.67	3.86	0.00302	0.00205	PASS
Extreme (30°C)		11.26	9.34	0.00599	0.00497	PASS
Extreme (20°C)		2.70	4.91	0.00144	0.00261	PASS
Extreme (10°C)		9.11	16.83	0.00485	0.00895	PASS
Extreme (0°C)		5.18	10.74	0.00275	0.00571	PASS
Extreme (-10°C)		14.65	6.30	0.00779	0.00335	PASS
Extreme (-20°C)		7.91	10.43	0.00421	0.00555	PASS
Extreme (-30°C)		10.28	5.75	0.00547	0.00306	PASS
25°C	LV	11.07	17.55	0.00589	0.00934	PASS
	HV	17.69	1.66	0.00941	0.00089	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	3MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	



Normal (25°C)	Normal	15.51	9.17	0.00825	0.00488	PASS
Extreme (50°C)		13.10	3.10	0.00697	0.00165	PASS
Extreme (40°C)		5.61	12.80	0.00298	0.00681	PASS
Extreme (30°C)		15.64	11.92	0.00832	0.00634	PASS
Extreme (20°C)		14.20	1.37	0.00756	0.00073	PASS
Extreme (10°C)		3.04	15.83	0.00162	0.00842	PASS
Extreme (0°C)		6.94	7.01	0.00369	0.00373	PASS
Extreme (-10°C)		1.07	18.00	0.00057	0.00957	PASS
Extreme (-20°C)		7.38	3.94	0.00393	0.00210	PASS
Extreme (-30°C)		2.91	17.90	0.00155	0.00952	PASS
25°C		LV	9.10	16.01	0.00484	0.00851
	HV	9.23	13.20	0.00491	0.00702	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	5MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25°C)	Normal	3.98	6.84	0.00212	0.00364	PASS
Extreme (50°C)		14.43	15.84	0.00767	0.00843	PASS
Extreme (40°C)		15.94	16.07	0.00848	0.00855	PASS
Extreme (30°C)		14.05	2.61	0.00748	0.00139	PASS
Extreme (20°C)		9.86	10.39	0.00524	0.00553	PASS
Extreme (10°C)		9.89	14.40	0.00526	0.00766	PASS
Extreme (0°C)		16.75	1.23	0.00891	0.00066	PASS
Extreme (-10°C)		6.48	11.10	0.00345	0.00590	PASS
Extreme (-20°C)		7.92	6.07	0.00421	0.00323	PASS
Extreme (-30°C)		6.60	16.25	0.00351	0.00865	PASS
25°C		LV	2.55	13.25	0.00135	0.00705
	HV	7.53	9.49	0.00401	0.00505	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	10MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25°C)	Normal	8.03	7.47	0.00427	0.00398	PASS
Extreme (50°C)		7.96	16.33	0.00423	0.00869	PASS
Extreme (40°C)		6.80	10.96	0.00362	0.00583	PASS
Extreme (30°C)		9.12	9.09	0.00485	0.00484	PASS
Extreme (20°C)		13.30	8.67	0.00708	0.00461	PASS
Extreme (10°C)		15.02	6.97	0.00799	0.00371	PASS
Extreme (0°C)		12.36	14.49	0.00657	0.00771	PASS
Extreme (-10°C)		7.47	15.85	0.00397	0.00843	PASS
Extreme (-20°C)		7.03	13.31	0.00374	0.00708	PASS
Extreme (-30°C)		17.12	10.93	0.00911	0.00581	PASS



25°C	LV	16.59	4.27	0.00883	0.00227	PASS
	HV	12.39	8.85	0.00659	0.00471	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	15MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25°C)	Normal	3.80	12.34	0.00202	0.00656	
Extreme (50°C)		17.66	5.63	0.00940	0.00299	PASS
Extreme (40°C)		14.95	14.67	0.00795	0.00780	PASS
Extreme (30°C)		15.32	17.86	0.00815	0.00950	PASS
Extreme (20°C)		2.97	1.69	0.00158	0.00090	PASS
Extreme (10°C)		3.05	17.36	0.00162	0.00924	PASS
Extreme (0°C)		13.29	2.76	0.00707	0.00147	PASS
Extreme (-10°C)		4.48	6.57	0.00239	0.00350	PASS
Extreme (-20°C)		5.58	17.89	0.00297	0.00951	PASS
Extreme (-30°C)		1.89	7.12	0.00100	0.00379	PASS
25°C	LV	14.90	2.51	0.00793	0.00133	PASS
	HV	15.64	17.48	0.00832	0.00930	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	20MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25°C)	Normal	8.07	10.97	0.00429	0.00583	
Extreme (50°C)		17.14	16.36	0.00912	0.00870	PASS
Extreme (40°C)		11.20	17.54	0.00596	0.00933	PASS
Extreme (30°C)		2.85	1.24	0.00152	0.00066	PASS
Extreme (20°C)		10.05	8.75	0.00534	0.00466	PASS
Extreme (10°C)		13.48	14.89	0.00717	0.00792	PASS
Extreme (0°C)		13.58	5.71	0.00722	0.00304	PASS
Extreme (-10°C)		6.39	13.97	0.00340	0.00743	PASS
Extreme (-20°C)		5.88	3.45	0.00313	0.00183	PASS
Extreme (-30°C)		17.95	2.72	0.00955	0.00145	PASS
25°C	LV	12.28	1.01	0.00653	0.00054	PASS
	HV	3.74	10.42	0.00199	0.00554	PASS

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.

RBW is set to 1 kHz (0.009MHz~ 0.15 MHz),

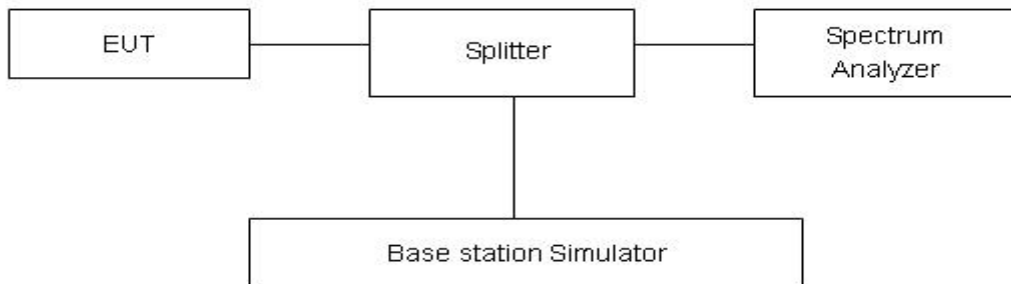
RBW is set to 10 kHz (0.15 MHz~ 30 MHz)

RBW is set to 100 kHz (30MHz~1000 MHz)

RBW is set to 1000 kHz (above 1000MHz)

The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee’s frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log₁₀ (P) dB.”

Limit	-13 dBm
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Measurement Uncertainty

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

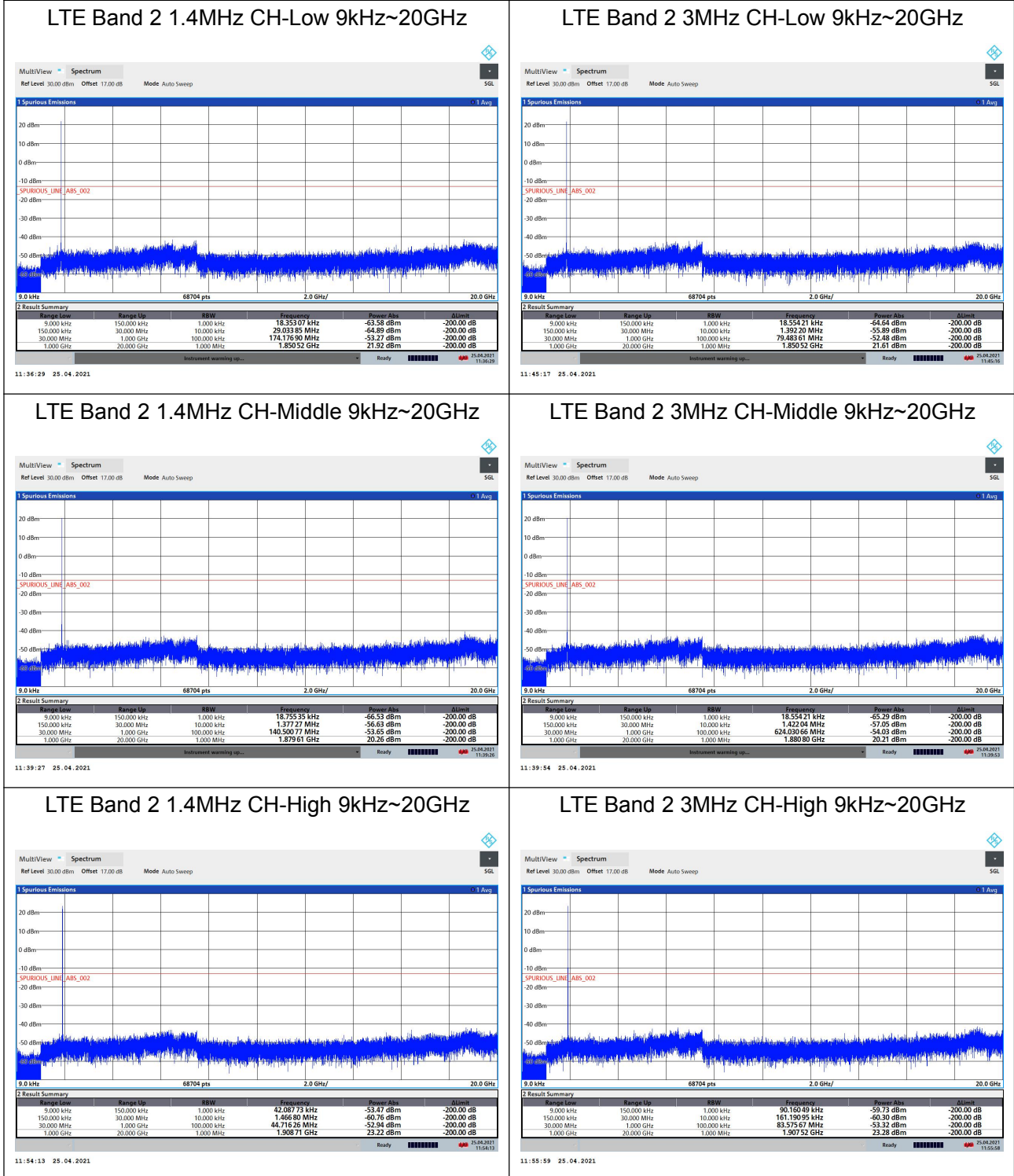
Frequency	Uncertainty
9kHz-1GHz	0.684 dB
1GHz-20GHz	1.407 dB



Test Result

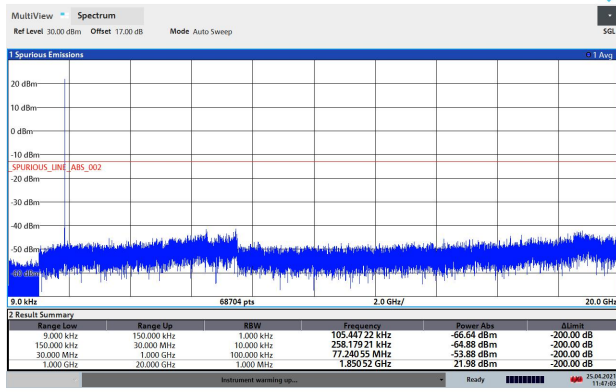
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions more than 20 dB below the limit are not reported.

The signal beyond the limit is carrier.



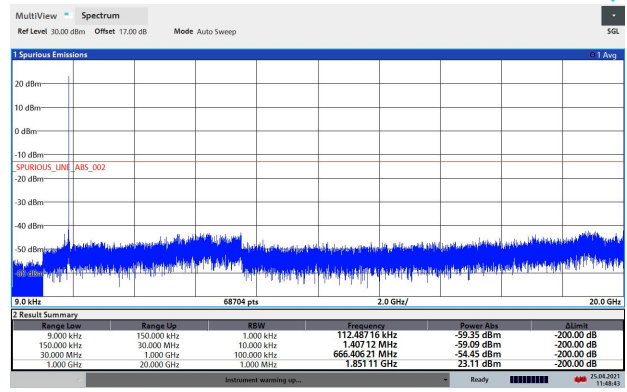


LTE Band 2 5MHz CH-Low 9kHz~20GHz



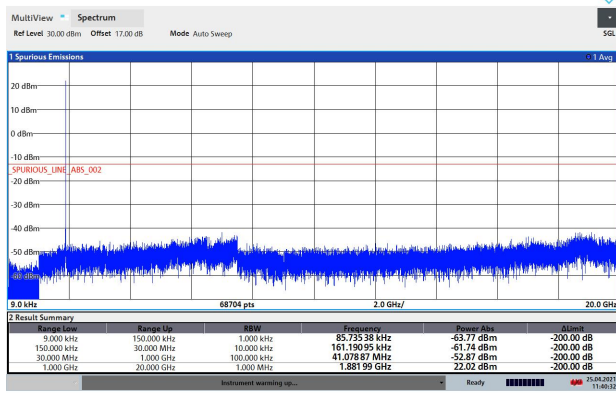
11:47:03 25.04.2021

LTE Band 2 10MHz CH-Low 9kHz~20GHz



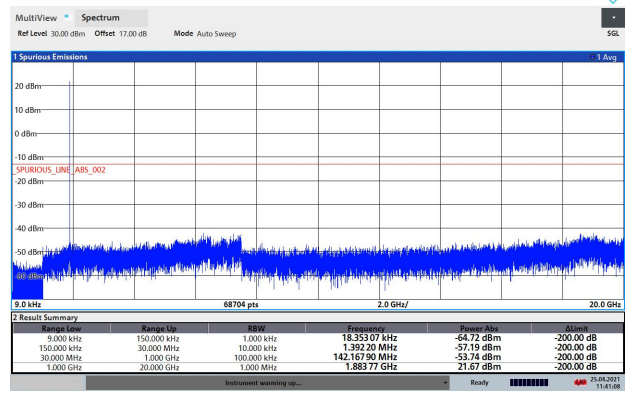
11:48:43 25.04.2021

LTE Band 2 5MHz CH-Middle 9kHz~20GHz



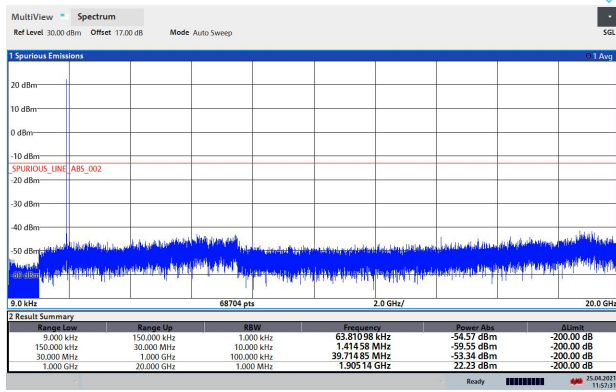
11:40:32 25.04.2021

LTE Band 2 10MHz CH-Middle 9kHz~20GHz



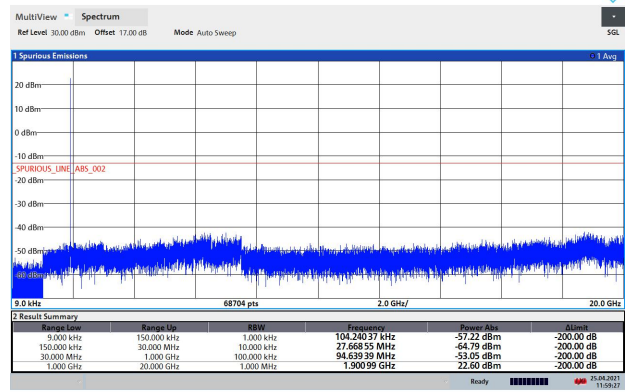
11:41:09 25.04.2021

LTE Band 2 5MHz CH-High 9kHz~20GHz



11:57:32 25.04.2021

LTE Band 2 10MHz CH-High 9kHz~20GHz



11:59:27 25.04.2021