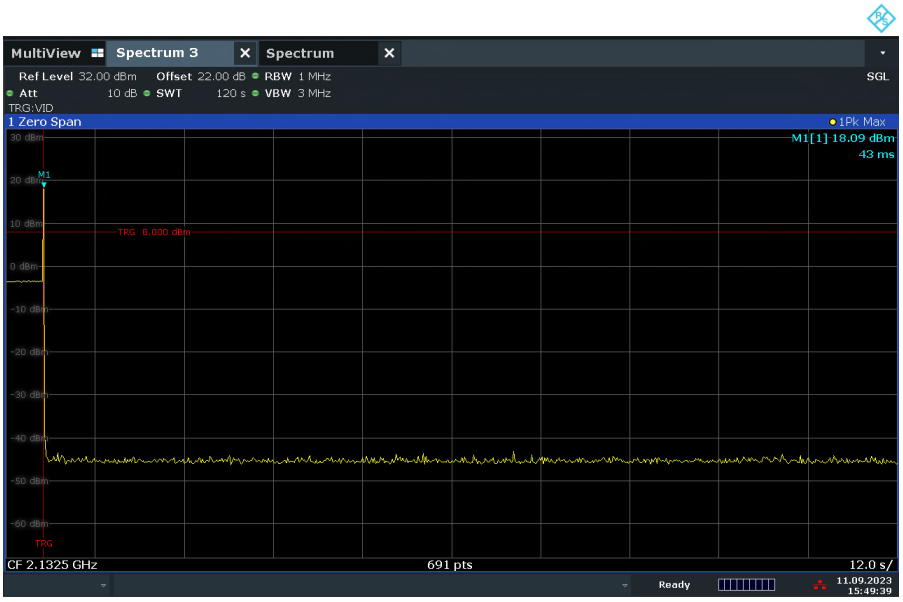
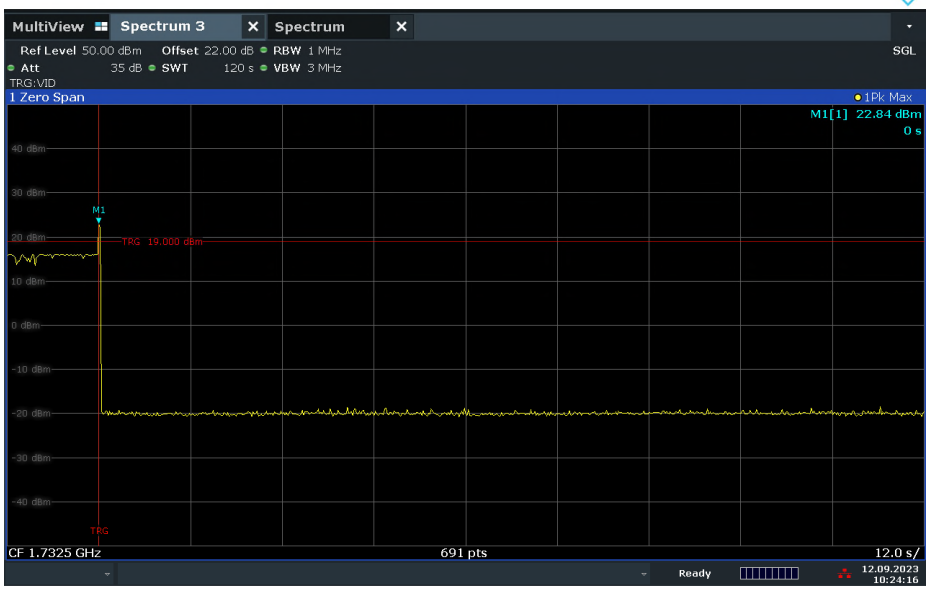
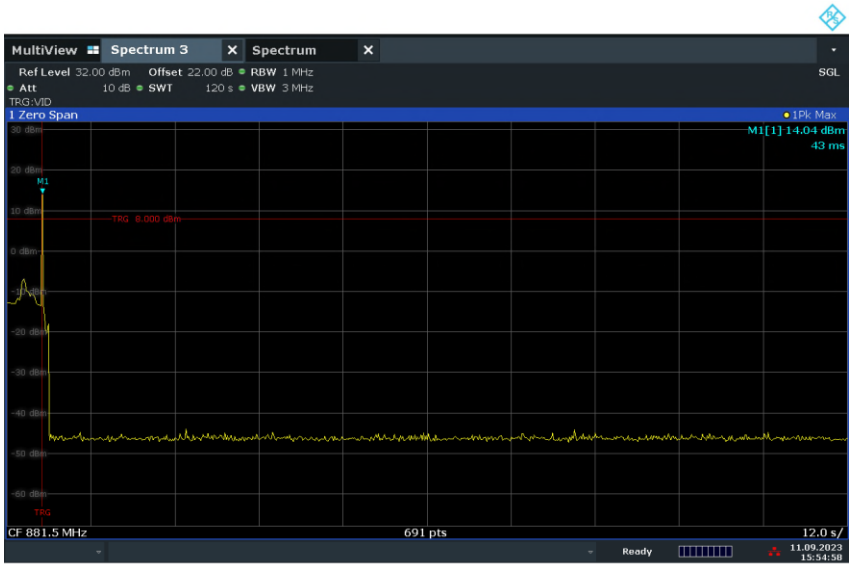
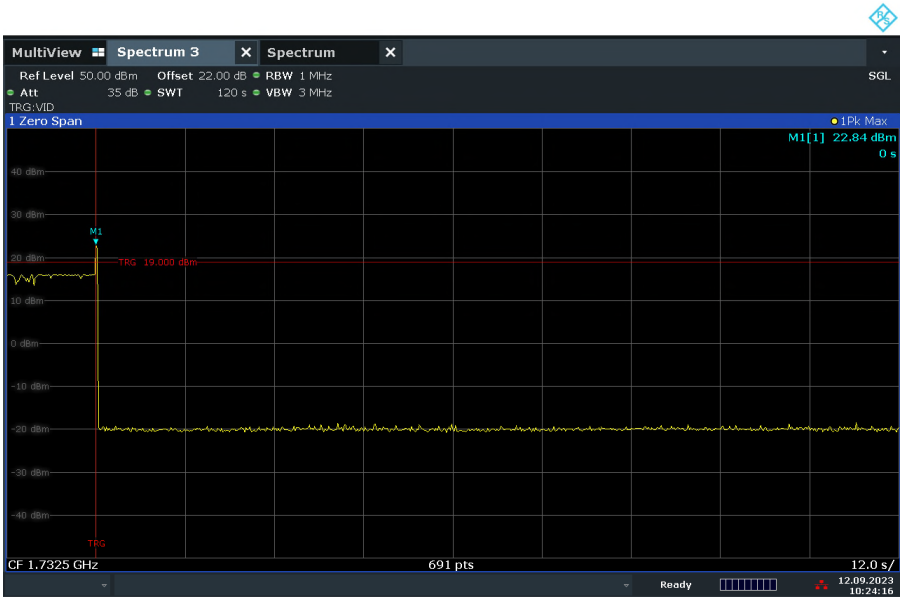
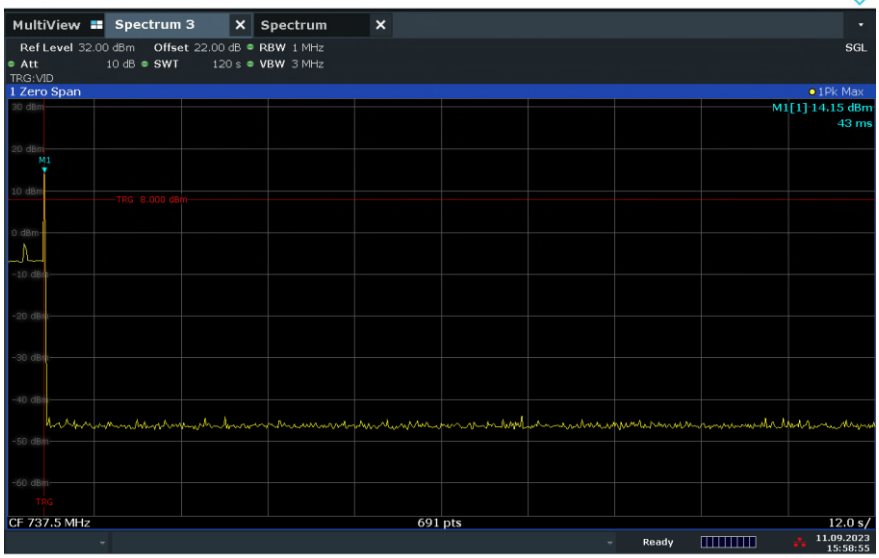
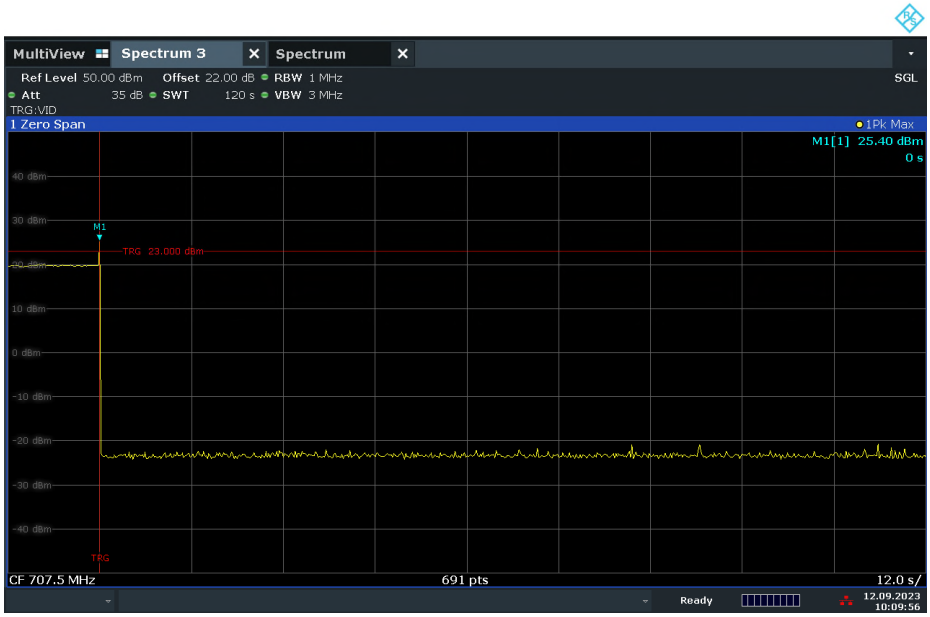
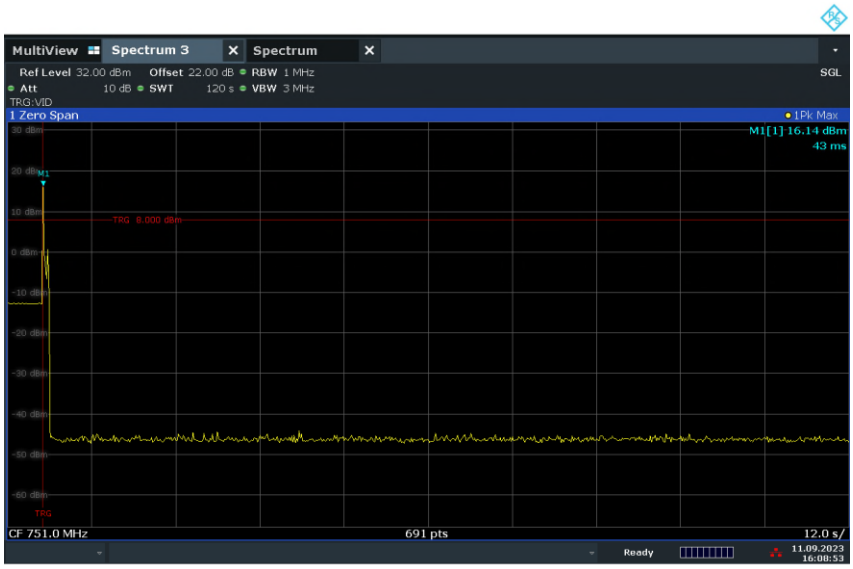
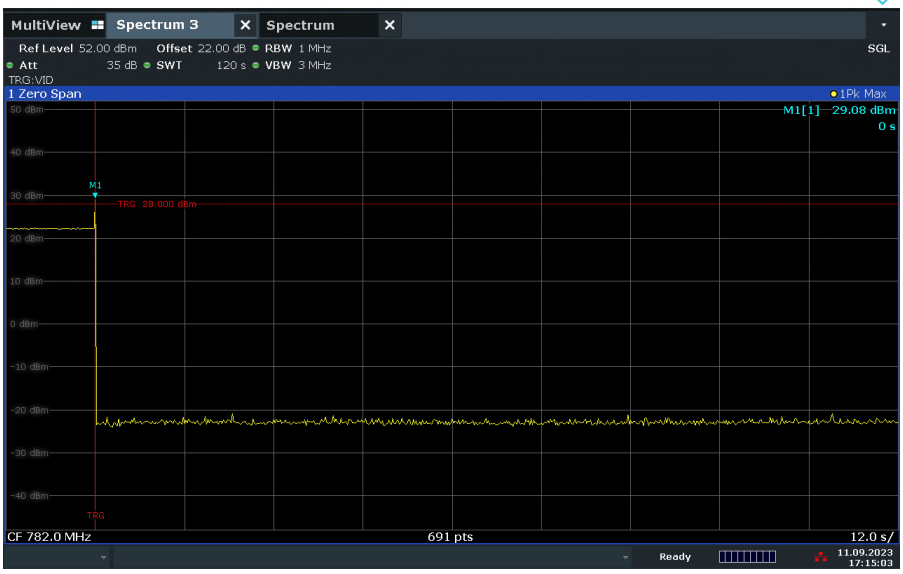
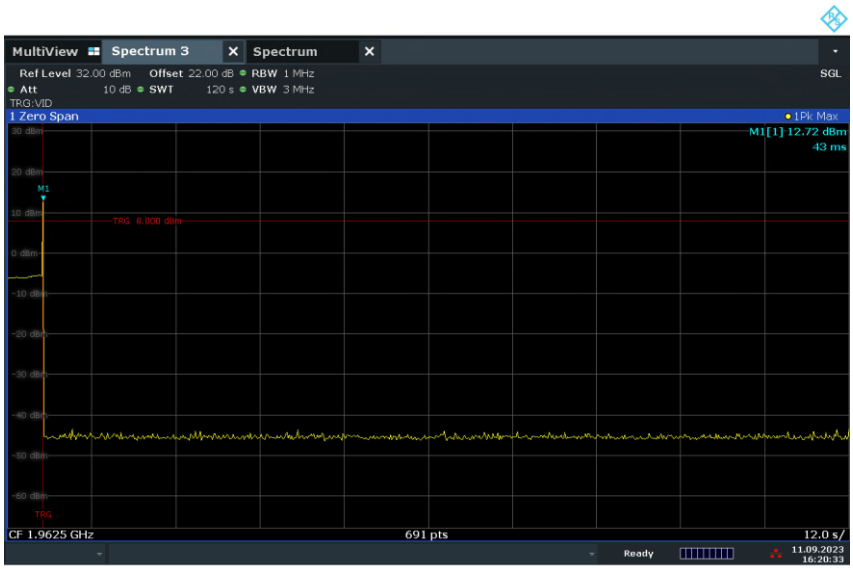
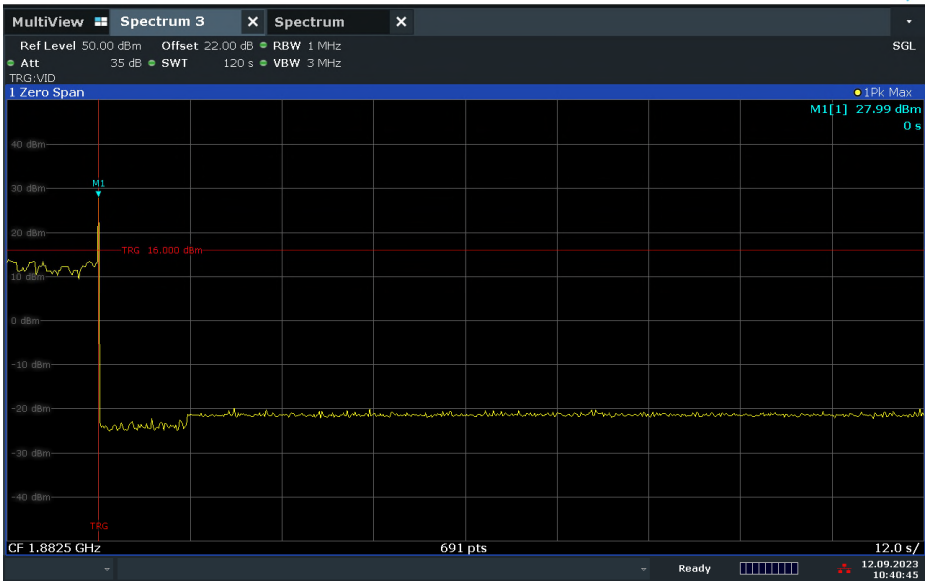
Retry Event - LTE Band 4 Downlink 5MHz Bandwidth Mid Channel – Server Port.
 15:49:39 11.09.2023
Retry Event - LTE Band 4 Uplink 5MHz Bandwidth Mid Channel – Donnor Port.
 10:24:17 12.09.2023

Retry Event - LTE Band 5 Downlink 5MHz Bandwidth Mid Channel – Server Port.
 15:54:59 11.09.2023
Retry Event - LTE Band 4 Uplink 5MHz Bandwidth Mid Channel – Donnor Port.
 10:24:17 12.09.2023

Retry Event - LTE Band 12 Downlink 5MHz Bandwidth Mid Channel – Server Port.
 15:58:56 11.09.2023
Retry Event - LTE Band 12 Uplink 5MHz Bandwidth Mid Channel – Donnor Port.
 10:09:56 12.09.2023

Retry Event - LTE Band 13 Downlink 5MHz Bandwidth Mid Channel – Server Port.
 16:08:53 11.09.2023
Retry Event - LTE Band 13 Uplink 5MHz Bandwidth Mid Channel – Donnor Port.
 17:15:03 11.09.2023

Retry Event - LTE Band 25 Downlink 5MHz Bandwidth Mid Channel – Server Port.
 16:20:34 11.09.2023
Retry Event - LTE Band 25 Uplink 5MHz Bandwidth Mid Channel – Donnor Port.
 10:40:46 12.09.2023

2.12 Out Of Band Gain Limit

2.12.1 Specification Reference

FCC 47 CFR Part 20. Clause 20.21(e)(9)(i)(E)
KDB935210 D04, Clause 7.15

2.12.2 Standard Applicable

FCC 47 CFR Part 20. Clause 20.21(e)(9)(i)(E) Out of Band Gain Limits:

(1) A frequency selective booster shall have the following minimum attenuation referenced to the gain in the center of the pass band of the booster:

(i) -20 dB at the band edge, where band edge is the end of the licensee's allocated spectrum,
(ii) -30 dB at 1 MHz offset from band edge,
(iii) -40 dB at 5 MHz offset from band edge.

(2) A frequency selective booster having maximum gain greater than 80 dB (referenced to the center of the pass band) shall limit the out of band gain to 60 dB at 0.2 MHz offset from the band edge, and 45 dB at 1 MHz offset from the band edge, where band edge is the end of the licensee's allocated spectrum.

2.12.3 Equipment Under Test and Modification State

Serial No: 560311000026 / Test Configuration A and B

2.12.4 Date of Test/Initial of test personnel who performed the test.

September 11, 2023/MARG

2.12.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.12.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	26.4°C
Relative Humidity	53.7%
ATM Pressure	99.1kPa

2.12.7 Additional Observations

- This is conducted Test. Test procedure is per Section 7.15 of KDB935210 (D04 Provider Specific Booster Measurements v02r03). Appropriate offset (line losses) applied.
- The test procedure is according to 7.15.1 of KDB935210. The signal generator was set to transmit a CW signal with output power level set to that as determined in clause 7.2.2 of KDB935210.

- The EUT operated in Test Mode with the gain set to the maximum gain and a minimum bandwidth setting (5MHz).
- Setup the EUT according to Figure 2 or 3 of Section 6.3.3 of KDB935210 D04 as appropriate.
- Evaluations are conducted at Server and Donnor ports.
- Operational uplink and downlink bands for LTE Band 2, 4, 5, 12, 13, 25 were tested.

2.12.8 Test Results

Out of Band Gain Limit – LTE Band 2 Downlink (1930 – 1990 MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-83.71	10.29	94	-
0 (Low Band Edge)	-83.94	-41.22	42.72	74
-0.2	-83.69	-39.07	44.62	60
-1	-83.69	-46.28	37.41	45
-5	-83.45	-65.49	17.96	54
0 (High Band Edge)	-83.81	-41.84	41.97	74
+0.2	-83.41	-41.66	41.75	60
+1	-83.48	-49.16	34.32	45
+5	-83.83	-62.49	21.34	54

Out of Band Gain Limit – LTE Band 2 Uplink (1930 – 1990 MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-78.47	13.10	91.57	-
0 (Low Band Edge)	-78.70	-38.79	39.91	71.57
-0.2	-78.61	-37.79	40.82	60
-1	-78.43	-45.30	33.13	45
-5	-78.63	-59.12	19.51	51.57

0 (High Band Edge)	-78.58	-39.35	39.23	71.57
+0.2	-78.33	-37.92	40.41	60
+1	-78.80	-45.12	33.68	45
+5	-78.96	-58.90	20.06	51.57

Out of Band Gain Limit – LTE Band 4 Downlink (2110 – 2155 MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-83.9	5.48	89.38	-
0 (Low Band Edge)	-83.38	-39.54	43.84	69.38
-0.2	-83.26	-39.70	43.56	60
-1	-83.29	-49.97	33.32	45
-5	-83.26	-58.35	24.91	49.38
0 (High Band Edge)	-83.42	-39.32	44.1	69.38
+0.2	-83.66	-40.45	43.21	60
+1	-83.57	-47.39	36.18	45
+5	-83.52	-56.44	27.08	49.38

Out of Band Gain Limit – LTE Band 4 Uplink (1710 – 1755 MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-78.38	15.34	93.72	-
0 (Low Band Edge)	-78.37	-37.69	40.68	73.72
-0.2	-78.93	-36.95	41.98	60
-1	-78.11	-44.65	33.46	45
-5	-78.34	-58.56	19.78	53.72
0 (High Band Edge)	-78.72	-37.57	41.15	73.72

+0.2	-78.47	-36.09	42.38	60
+1	-78.73	-43.39	35.34	45
+5	-78.37	-58.38	19.99	53.72

Out of Band Gain Limit – LTE Band 5 Downlink (869 – 894 MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-83.81	12.33	96.14	-
0 (Low Band Edge)	-83.97	-50.34	33.63	76.14
-0.2	-83.63	-46.78	36.85	60
-1	-83.05	-53.27	29.78	45
-5	-83.94	-61.21	22.73	56.14
0 (High Band Edge)	-83.72	-47.46	36.26	76.14
+0.2	-83.03	-47.04	35.99	60
+1	-83.45	-53.23	30.22	45
+5	-83.10	-60.17	22.93	56.14

Out of Band Gain Limit – LTE Band 5 Uplink (824 – 849 MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-75.15	11.26	86.41	-
0 (Low Band Edge)	-75.56	-42.53	33.03	66.41
-0.2	-75.32	-40.97	34.35	60
-1	-75.14	-49.09	26.05	45
-5	-75.94	-60.98	14.96	46.41
0 (High Band Edge)	-75.317	-42.96	32.357	66.41
+0.2	-75.25	-40.95	34.3	60
+1	-75.11	-78.79	-3.68	45

+5	-75.95	-60.25	15.7	46.41

Out of Band Gain Limit – LTE Band 12 Downlink (729 – 746MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-79.49	8.30	87.79	-
0 (Low Band Edge)	-79.75	-49.26	30.49	67.79
-0.2	-79.61	-44.41	35.2	60
-1	-80.81	-51.74	29.07	45
-5	-80.09	-60.61	19.48	47.79
0 (High Band Edge)	-80.04	-50.83	29.21	67.79
+0.2	-79.99	-58.69	21.3	60
+1	-79.17	-58.96	20.21	45
+5	-80.12	-60.16	19.96	47.79

Out of Band Gain Limit - LTE Band 12 Uplink (699 – 716MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-78.28	10.52	88.8	
0 (Low Band Edge)	-78	-43.33	34.67	68.8
-0.2	-78.70	-42.29	36.41	60
-1	-78.26	-49.39	28.87	45
-5	-78.32	-62.49	15.83	48.8
0 (High Band Edge)	-78.52	-45.56	32.96	68.8
+0.2	-78.29	-43.90	34.39	60
+1	-78.15	-52.56	25.59	45
+5	-78.38	-66.51	11.87	48.8

Out of Band Gain Limit – LTE Band 13 Downlink (746 – 756MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-80.20	11.33	91.53	-
0 (Low Band Edge)	-80.91	-44.25	36.66	71.53
-0.2	-79.31	-43.01	36.3	60
-1	-80.85	-49.75	31.1	45
-5	-80.84	-60.97	19.87	51.53
0 (High Band Edge)	-80	-44.26	35.74	71.53
+0.2	-80.04	-42.76	37.28	60
+1	-80.84	-49.66	31.18	45
+5	-79.27	-56.64	22.63	51.53

Out of Band Gain Limit – LTE Band 13 Uplink (777 – 787 MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-75.85	15.35	91.2	-
0 (Low Band Edge)	-75.28	-49.43	25.85	71.2
-0.2	-75.38	-59.63	15.75	60
-1	-75.63	-61.52	14.11	45
-5	-75.81	-60.96	14.85	51.2
0 (High Band Edge)	-75.25	-50.52	24.73	71.2
+0.2	-75.92	-60.55	15.37	60
+1	-75.44	-59.32	16.12	45
+5	-75.48	-61.43	14.05	51.2

Out of Band Gain Limit – LTE Band 25 Downlink (1930 – 1995 MHz)				
	Input Power (dBm)	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-82.93	9.05	91.98	
0 (Low Band Edge)	-83.05	-37.77	45.28	71.98
-0.2	-82.49	-36.95	45.54	60
-1	-82.93	-57.74	25.19	45
-5	-83.70	-58.32	25.38	51.98
0 (High Band Edge)	-83.39	-40.29	43.1	71.98
+0.2	-83.26	-39.18	44.08	60
+1	-83.70	-46.47	37.23	45
+5	-82.49	-57.61	24.88	51.98

Out of Band Gain Limit - LTE Band 25 Uplink (1850 – 1915 MHz)				
Offset (MHz)	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**	**Gain Limit (dB)**
Centre Frequency	-78.77	14.32	93.09	-
0 (Low Band Edge)	-78.39	-38.11	40.28	73.09
-0.2	-77.99	-37.41	40.58	60
-1	-78.75	-45.12	33.63	45
-5	-78.50	-59.73	18.77	53.09
0 (High Band Edge)	-78.20	-39.14	39.06	73.09
+0.2	-78.98	-37.46	41.52	60
+1	-78.49	-44.87	33.62	45
+5	-78.80	-58.31	20.49	53.09

2.13 Frequency Stability

2.13.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1055
FCC 47 CFR Part 22, Clause 22.355
FCC 47 CFR Part 24, Clause 24.235
RSS-132, Clause 5.3
RSS-133, Clause 6.3
FCC 47 CFR Part 27, Clause 27.54
RSS-139, Clause 6.4
RSS-130, Clause 4.5
RSS-195, Clause 5.4

2.13.2 Standard Applicable

FCC Part 22.355:
The carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C–1 of this section.

Table C-1 Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Base, fixed (ppm)	Mobile >3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	N/A	N/A
929 to 960	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

FCC Part 24.235:
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

RSS-132:
The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations and ±1.5 ppm for base stations.

RSS-133
The carrier frequency shall not depart from the reference frequency, in excess of ±2.5 ppm for mobile stations and ±1.0 ppm for base stations.

FCC 47 CFR Part 27, Clause 27.54:
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

RSS-139, Clause 6.4, RSS-130, Clause 4.5 and RSS-195, Clause 5.4:
The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

2.13.3 Equipment Under Test and Modification State

Serial No: 560311000026 / Test Configuration A and B

2.13.4 Date of Test/Initial of test personnel who performed the test

August 14, 15, 16, 17,18 and October 12, 2023 / MARG

2.13.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.13.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	22.4 °C	22.5 °C
Relative Humidity	42.7 %	44.2 %
ATM Pressure	100.7 kPa	100.8 kPa

2.13.7 Additional Observations

- This is a conducted test.
- The EUT was operated at 120 VAC nominal voltage and was placed in the temperature chamber for the series of temperature variation evaluations performed starting at ambient (20°C) temperature. Voltage variation is performed at 85% and 115% of the nominal voltage at 20 °C only.
- The Temperature is then set to 50°C and allowed to sit for 1 hour to allow the equipment and chamber temperature to stabilize. The measurements on both downlink and uplink were then performed. The temperature was then decreased by 10°C steps and allowed to settle before taking the next set of measurements.
- EUT was injected a CW signal from a Signal Generator and maximum frequency error was monitored using the spectrum analyser.
- 5MHz bandwidth Middle Channel was tested as the representative configuration.

2.13.8 Test Results Summary

LTE B2 Downlink			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	1.0
	-20	-0.01	1.0
	-10	-0.01	1.0
	0	-0.01	1.0
	+10	-0.01	1.0
	+20	-0.01	1.0
	+30	-0.01	1.0
	+40	-0.01	1.0
	+50	-0.01	1.0
102	+20	-0.01	1.0
138		-0.01	1.0

LTE Band 2 Downlink			
Temperature (°C)	***Voltage (VAC)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
20	102	-0.01	1.0
	138	-0.01	1.0

LTE B2 Uplink			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	1.0
	-20	-0.01	1.0
	-10	-0.01	1.0
	0	-0.01	1.0
	+10	-0.01	1.0
	+20	-0.01	1.0
	+30	-0.01	1.0
	+40	-0.01	1.0
	+50	-0.01	1.0
102	+20	-0.01	1.0
138		-0.01	1.0

LTE Band 2 Uplink			
Temperature (°C)	***Voltage (VAC)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
20	102	-0.01	1.0
	138	-0.01	1.0
LTE Band 5 Downlink			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	1.5
	-20	-0.01	1.5
	-10	-0.01	1.5
	0	-0.01	1.5
	+10	-0.01	1.5
	+20	-0.01	1.5
	+30	-0.01	1.5
	+40	-0.01	1.5
	+50	-0.01	1.5
LTE Band 5 Downlink			
Temperature (°C)	***Voltage (VAC)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
20	102	-0.01	1.5
	138	-0.01	1.5

LTE Band 5 Uplink			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	1.5
	-20	-0.01	1.5
	-10	-0.01	1.5
	0	-0.01	1.5
	+10	-0.01	1.5
	+20	-0.01	1.5
	+30	-0.01	1.5
	+40	-0.01	1.5
	+50	-0.01	1.5

LTE Band 5 Uplink			
Temperature (°C)	***Voltage (VAC)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
20	102	-0.01	1.5
	138	-0.01	1.5

LTE Band 25 Downlink			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	1.0
	-20	-0.01	1.0
	-10	-0.01	1.0
	0	-0.01	1.0
	+10	-0.01	1.0
	+20	-0.01	1.0
	+30	-0.01	1.0
	+40	-0.01	1.0
	+50	-0.01	1.0

LTE Band 25 Downlink			
Temperature (°C)	***Voltage (VAC)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
20	102	-0.01	1.0
	138	-0.01	1.0

LTE Band 25 Uplink			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	1.0
	-20	-0.01	1.0
	-10	-0.01	1.0
	0	-0.01	1.0
	+10	-0.01	1.0
	+20	-0.01	1.0
	+30	-0.01	1.0
	+40	-0.01	1.0
	+50	-0.01	1.0

LTE Band 25 Uplink			
Temperature (°C)	***Voltage (VAC)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
20	102	-0.01	1.0
	138	-0.01	1.0

LTE B4 Downlink – 5 MHz BW Middle Channel 2132.5 MHz			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	-
	-20	-0.01	-
	-10	-0.01	-
	0	-0.01	-
	+10	-0.01	-
	+20	-0.01	-
	+30	-0.01	-
	+40	-0.01	-
	+50	-0.01	-
102	+20	-0.01	-
138		-0.01	-

LTE B4 Downlink – 5 MHz BW					
Channel	***Temperature (°C)***	***Voltage (VAC)***	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	-30	120	2110.2925	-	>2110
	+20	102	2110.2852	-	
		120	2110.2861	-	
		138	2110.2882	-	
	+50	120	2110.2844	-	
High Channel	-30	120	-	2154.7243	<2155
	+20	102	-	2154.7919	
		120	-	2154.7819	
		138	-	2154.7865	
	+50	120	-	2154.7308	

The frequency stability of the EUT is sufficient to keep it within the authorized frequency ranges at any temperature interval and voltage variations across the measured range.

LTE B4 Uplink – 5 MHz BW Middle Channel 1732.5 MHz			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	-
	-20	-0.01	-
	-10	-0.01	-
	0	-0.01	-
	+10	-0.01	-
	+20	-0.01	-
	+30	-0.01	-
	+40	-0.01	-
	+50	-0.01	-
102	+20	-0.01	-
138		-0.01	-

LTE B4 Uplink – 5 MHz BW					
Channel	***Temperature (°C)***	***Voltage (VAC)***	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	-30	120	1710.2942	-	>1710
	+20	102	1710.2912	-	
		120	1710.2891	-	
		138	1710.292	-	
	+50	120	1710.2857	-	
High Channel	-30	120	-	1754.7231	<1755
	+20	102	-	1754.7196	
		120	-	1754.7206	
		138	-	1754.7205	
	+50	120	-	1754.7131	

The frequency stability of the EUT is sufficient to keep it within the authorized frequency ranges at any temperature interval and voltage variations across the measured range.

LTE B12 Downlink – 5 MHz BW Middle Channel 737.5 MHz			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	-
	-20	-0.01	-
	-10	-0.01	-
	0	-0.01	-
	+10	-0.01	-
	+20	-0.01	-
	+30	-0.01	-
	+40	-0.01	-
	+50	-0.01	-
102	+20	-0.01	-
138		-0.01	-

LTE B12 Downlink Frequency Range – 5 MHz BW					
Channel	***Temperature (°C)***	***Voltage (VAC)***	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	-30	120	729.2875	-	>729
	+20	102	729.2819	-	
		120	729.2810	-	
		138	729.2843	-	
	+50	120	729.2798	-	
High Channel	-30	120	-	745.7239	<746
	+20	102	-	745.7165	
		120	-	745.7196	
		138	-	745.7190	
	+50	120	-	745.7186	

The frequency stability of the EUT is sufficient to keep it within the authorized frequency ranges at any temperature interval and voltage variations across the measured range.

LTE B12 Uplink – 5 MHz BW Middle Channel 707.5 MHz			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	-
	-20	-0.01	-
	-10	-0.01	-
	0	-0.01	-
	+10	-0.01	-
	+20	-0.01	-
	+30	-0.01	-
	+40	-0.01	-
	+50	-0.01	-
102	+20	-0.01	-
138		-0.01	-

LTE B12 Uplink Frequency Range – 5 MHz BW					
Channel	***Temperature (°C)***	***Voltage (VAC)***	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	-30	120	699.3006	-	>699
	+20	102	699.2648	-	
		120	699.3785	-	
		138	699.7894	-	
	+50	120	699.2953	-	
High Channel	-30	120	-	715.7030	<716
	+20	102	-	715.7247	
		120	-	715.7284	
		138	-	715.7290	
	+50	120	-	715.7221	

The frequency stability of the EUT is sufficient to keep it within the authorized frequency ranges at any temperature interval and voltage variations across the measured range.

LTE B13 Downlink – 5 MHz BW Middle Channel 751 MHz			
Voltage (VAC)	***Temperature (°C)***	***Frequency Deviation (ppm)***	***Limit (ppm)***
120	-30	-0.01	-
	-20	-0.01	-
	-10	-0.01	-
	0	-0.01	-
	+10	-0.01	-
	+20	-0.01	-
	+30	-0.01	-
	+40	-0.01	-
	+50	-0.01	-
102	+20	-0.01	-
138		-0.01	-

LTE B13 Downlink Frequency Range – 5 MHz BW					
Channel	***Temperature (°C)***	***Voltage (VAC)***	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	-30	120	746.2884	-	>746
	+20	102	746.2805	-	
		120	746.2809	-	
		138	746.2813	-	
	+50	120	746.2738	-	
High Channel	-30	120	-	755.7297	<756
	+20	102	-	755.7274	
		120	-	755.7244	
		138	-	755.7255	
	+50	120	-	755.7107	

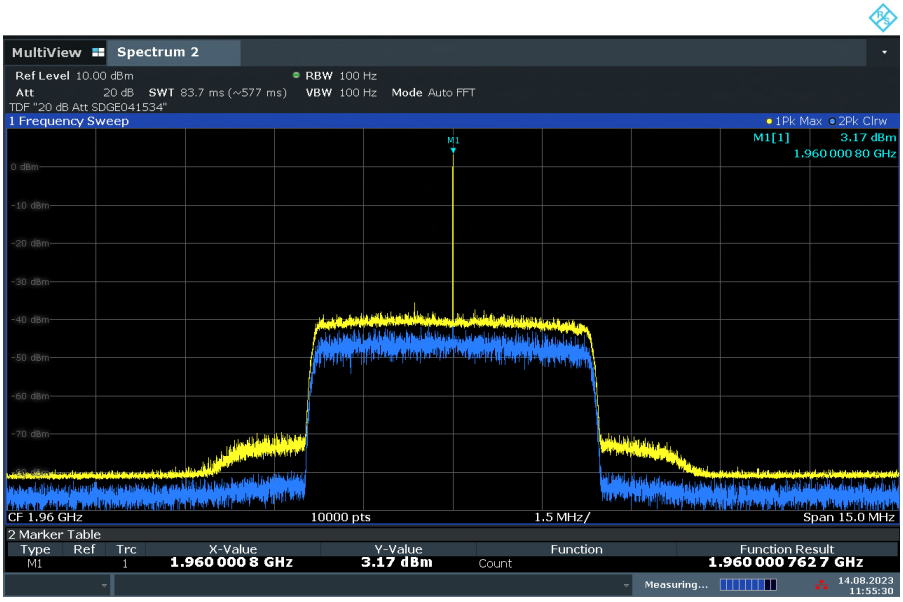
The frequency stability of the EUT is sufficient to keep it within the authorized frequency ranges at any temperature interval and voltage variations across the measured range.

LTE B13 Uplink – 5 MHz BW Middle Channel 782 MHz				
Voltage (VAC)	***Temperature (°C)***	***Frequency Error (Hz)***	***Frequency Error (ppm)***	***Limit (ppm)***
120	-30	4.8	-0.01	-
	-20	4.8	-0.01	-
	-10	4.7	-0.01	-
	0	5.0	-0.01	-
	+10	5.0	-0.01	-
	+20	5.0	-0.01	-
	+30	5.0	-0.01	-
	+40	7.0	-0.01	-
	+50	4.0	-0.01	-
102	+20	5.0	-0.01	-
138		5.2	-0.01	-

LTE B13 Uplink Frequency Range – 5 MHz BW					
Channel	***Temperature (°C)***	***Voltage (VAC)***	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	-30	120	777.2753	-	>777
	+20	102	777.2719	-	
		120	777.2739	-	
		138	777.2723	-	
	+50	120	777.2735	-	
High Channel	-30	120	-	786.7158	<787
	+20	102	-	786.7242	
		120	-	786.7212	
		138	-	786.7242	
	+50	120	-	786.7218	

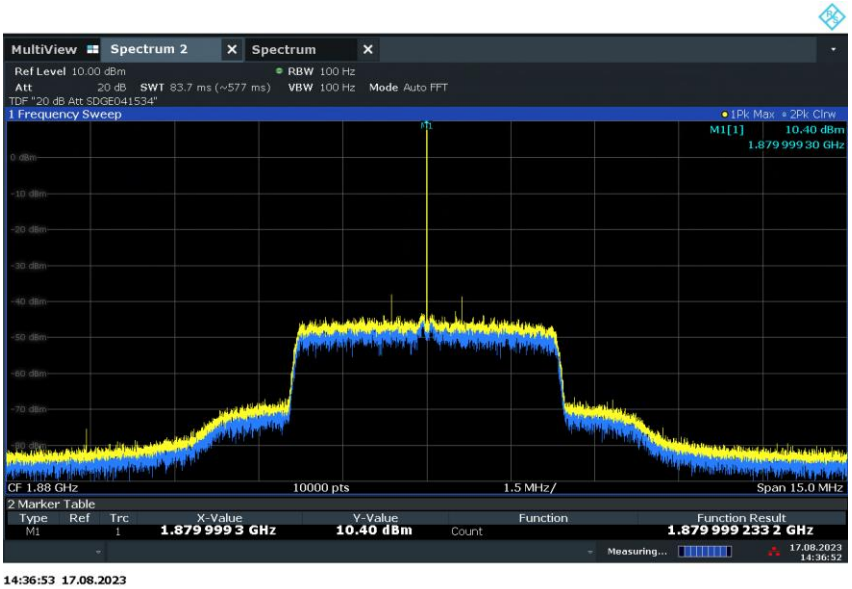
The frequency stability of the EUT is sufficient to keep it within the authorized frequency ranges at any temperature interval and voltage variations across the measured range.

2.13.9 Sample Test Plots



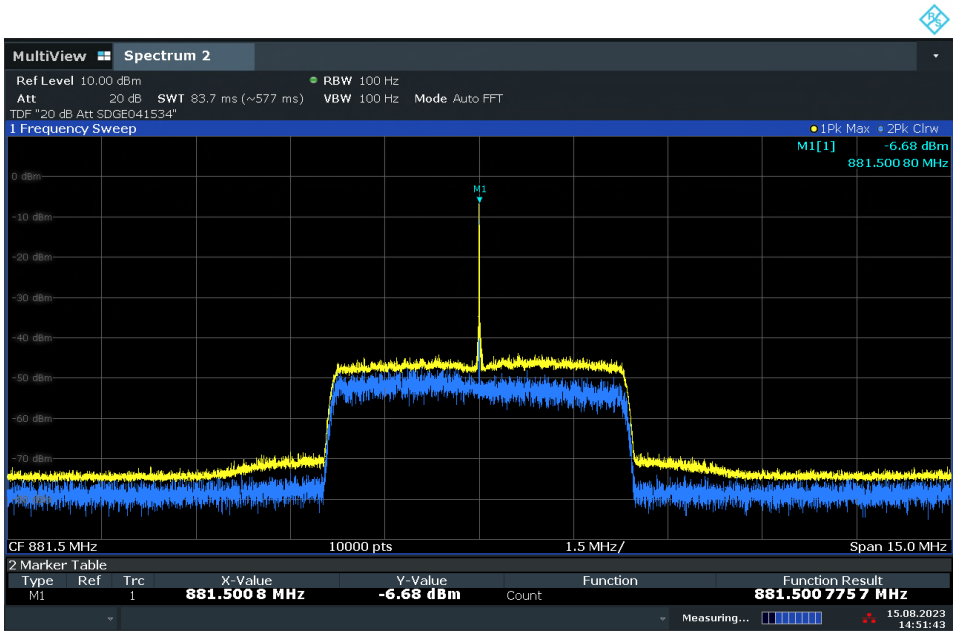
11:55:31 14.08.2023

LTE B2 Downlink Middle Channel 120VAC @ 20°C



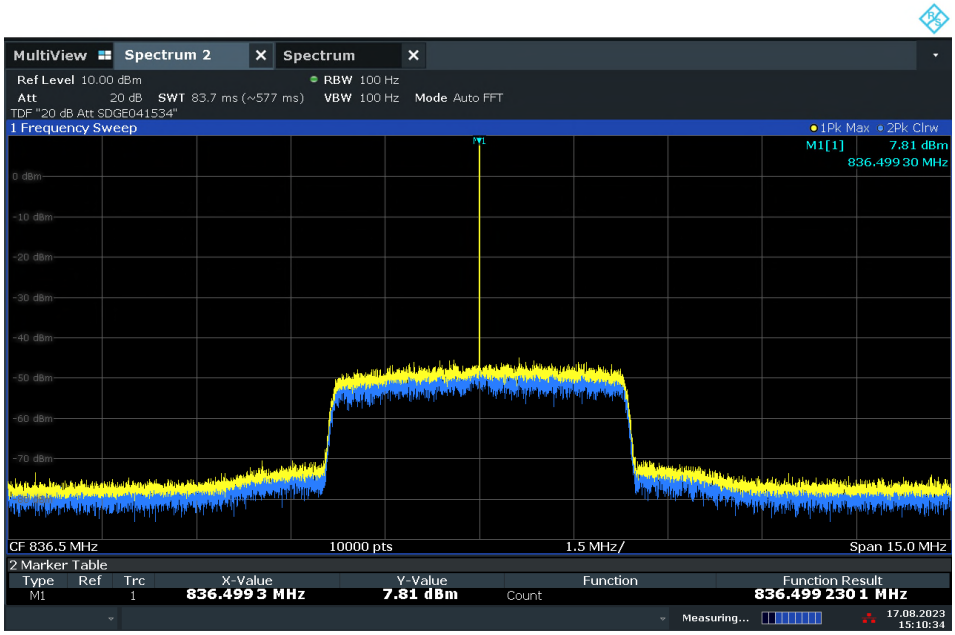
14:36:53 17.08.2023

LTE B2 Uplink Middle Channel 120VAC @ -30°C



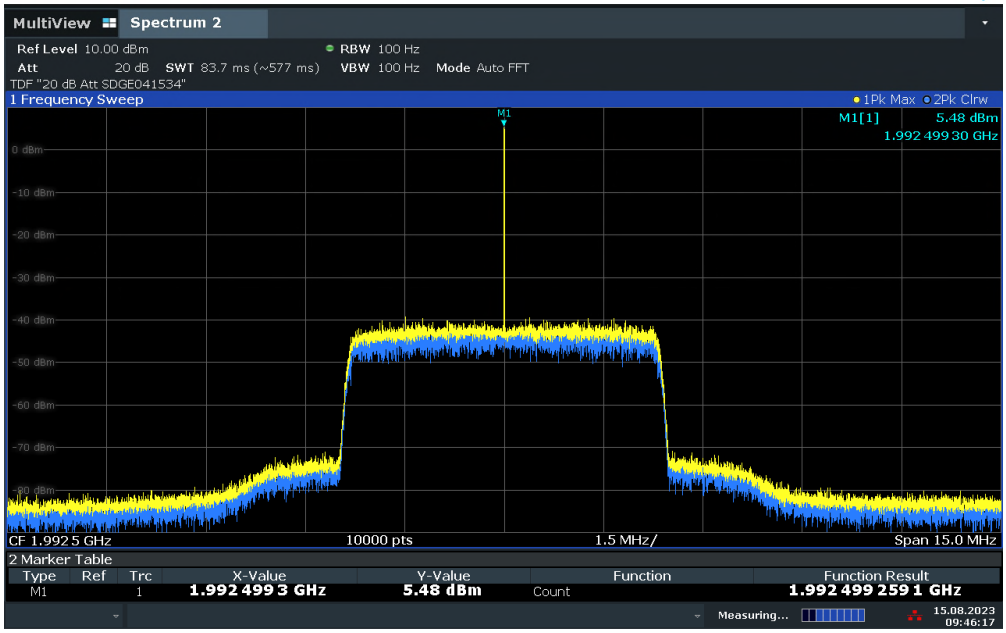
14:51:43 15.08.2023

LTE B5 Downlink Middle Channel 120VAC @ 20°C



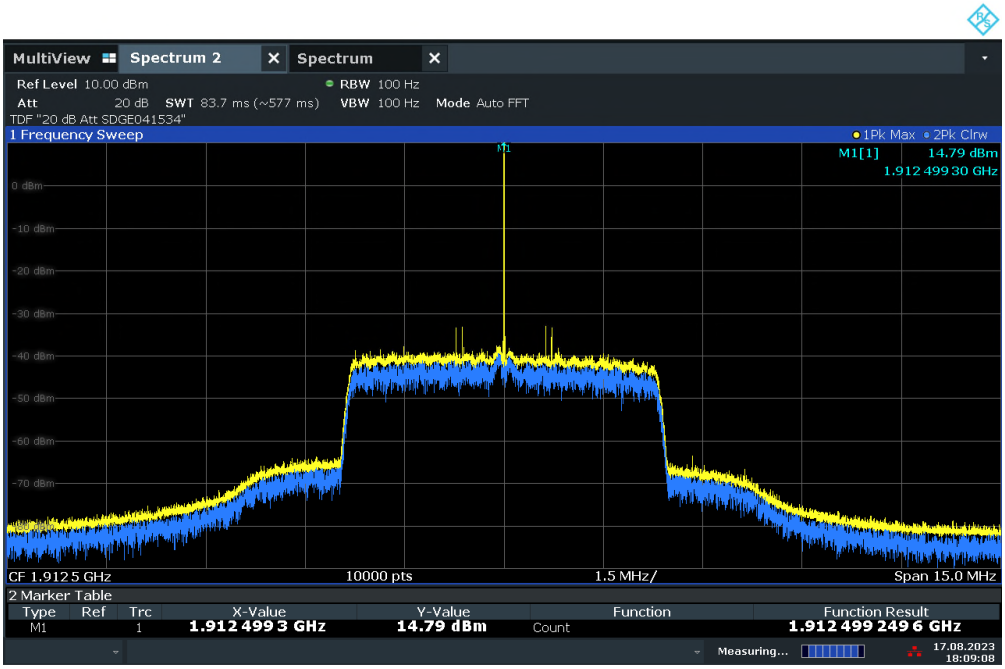
15:10:35 17.08.2023

LTE B5 Uplink Middle Channel 120VAC @ -30°C



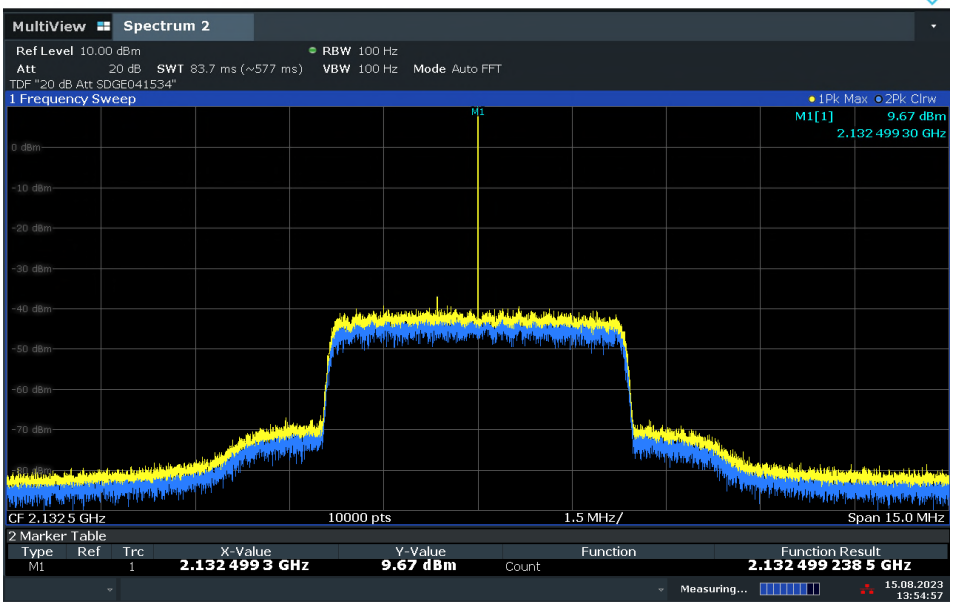
09:46:18 15.08.2023

LTE B25 Downlink Middle Channel 120VAC @ 20°C



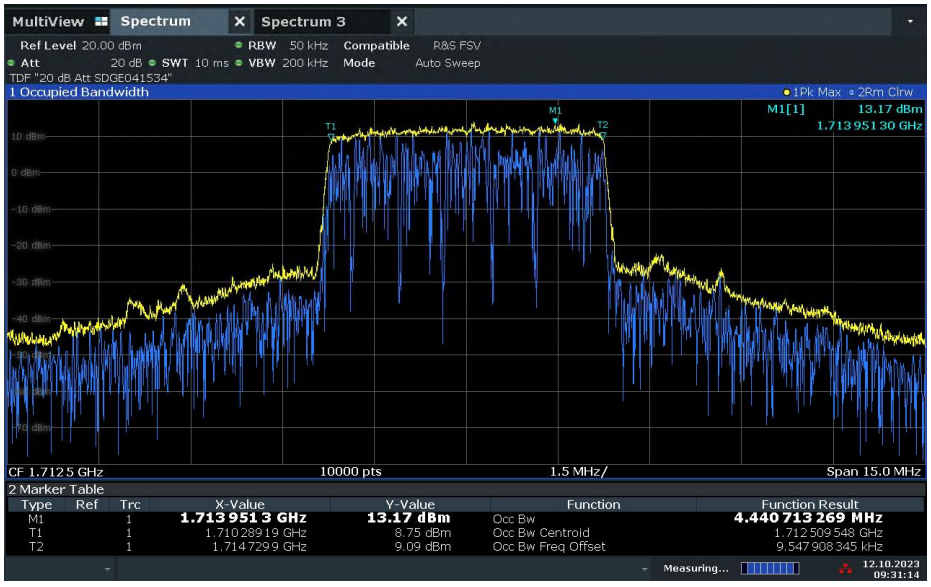
18:09:09 17.08.2023

LTE B25 Uplink Middle Channel 120VAC @ -30°C



13:54:57 15.08.2023

LTE Band 4 Downlink Middle Channel 120VAC @ 20°C

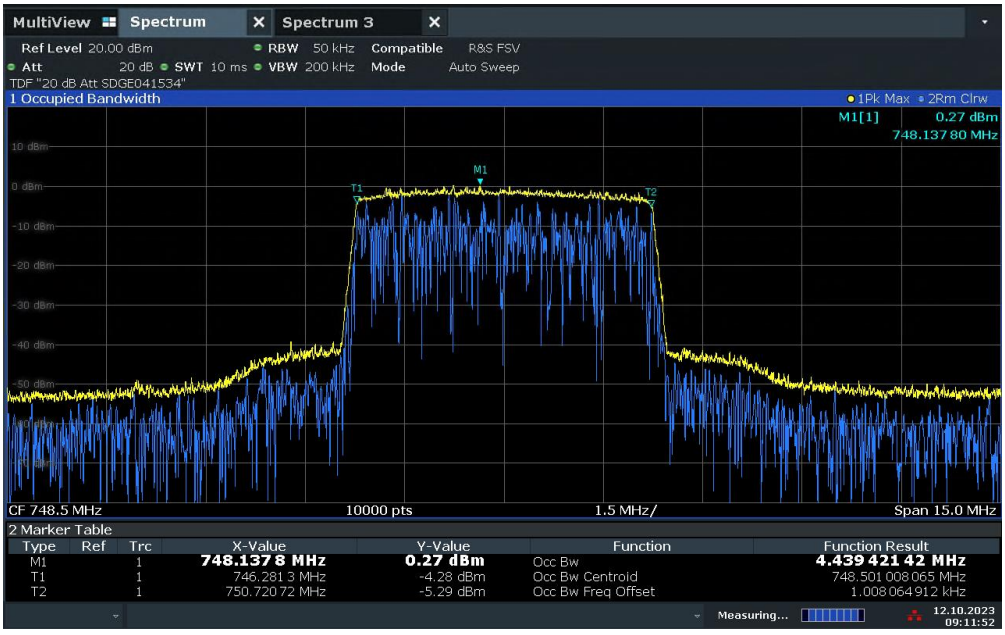


09:31:15 12.10.2023

LTE Band 4 Uplink Low Channel OBW 120VAC @ 20°C

09:29:38 12.10.2023

LTE B12 Uplink High Channel OBW @ 20°C Nominal Voltage



09:11:53 12.10.2023

LTE B13 Downlink Low Channel OBW @ 20°C Nominal Voltage

2.14 Field Strength of Spurious Emissions

2.14.1 Specification Reference

§ 2.1053 Measurements required: Field strength of spurious radiation.

2.14.2 Standard Applicable

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

RSS-130:
4.7.1 General unwanted emissions limits
The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

RSS-132
5.5 Transmitter unwanted emissions
Equipment shall meet the unwanted emission limits specified below:
In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB.
After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB. If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

RSS-139
5.6 Unwanted emission limits
Unwanted emissions shall be measured in terms of average values.
For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table:

Unwanted emission limits	
Offset from the edge of the frequency block or frequency block group	**Unwanted emission limits**
1 MHz	-13 dBm/(1% of OB*)
>1MHz	-13 dBm/MHz

*OB is the occupied bandwidth.

RSS 140
4.4 Transmitter unwanted emission limits
The power of any unwanted emission outsidethe bands 758-768 MHz and 788-798 MHz shall be attenuated below the transmitteroutput power P in dBW as follows, where p is the transmitter output power in watts:
For any frequency between 769-775 MHz and 799-806 MHz:
76 + 10 log (p), dB in a 6.25 kHz band for fixed and base station equipment
65 + 10 log (p), dB in a 6.25 kHz band for mobile and portable/hand-held equipment
For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz: 43 + 10 log (p), dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.
In addition, the equivalent isotropically radiated power (e.i.r.p.) of all emissions, including harmonics in the band 1559-1610 MHz, shall not exceed −70 dBW/MHz for wideband emissions, and −80 dBW/kHz for discrete emissions ofless than 700 Hz bandwidth.

2.14.3 Equipment Under Test and Modification State

Serial No: 8643000039 / Burn-in Mode, EUT is transmitting (Both Uplink and Downlink paths) at all supported bands simultaneously.

2.14.4 Date of Test

October 04, 2023

2.14.5 EUT Test Voltage

120V 60Hz

2.14.6 Environmental Conditions

Ambient Temperature	24.2 °C
Relative Humidity	98.6 %
Atmospheric Pressure	49.9 kPa

2.14.7 Additional Observations

- The spectrum was searched from 30MHz to 18GHz (Only noise floor observed above 18GHz).
- Verifications performed at 3 meters for both below 1GHz and above 1GHz.
- Fundamental for BLE and LTE frequencies were ignored for this test.
- Notch filter was used for BLE fundamental.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.2.8 for sample computation.

2.14.8 Limit conversion example

-13dBm erp to Field strength at 3m

Using equation: E (dBµV/m) = ERP (dBm) - 20log(D) + 104.8 + 2.15; where D is the measurement distance (in the far field region) in m.

-13dBm ERP = 84.4 dBµV/m at 3m distance

2.14.9 Sample Computation (Radiated Emissions – 30MHz to 1GHz)

Measuring equipment raw measurement (dbµV) @ 30 MHz			24.4
Correction Factor (dB/m)	Asset# 1026 (cable)	0.8	-7.0
	Asset# 1057 (cable)	0.2	
	Asset# 1016 (preamplifier)	-30.8	
	Asset# 8850 (cable)	0.2	
	Asset# 1033 (antenna)	17.2	
	Asset# 8771 (6-dB attenuator)	5.4	
Reported QuasiPeak Final Measurement (dbµV/m) @ 30MHz			**17.4**

1.1.1 Sample Computation (Radiated Emissions –above 1GHz)

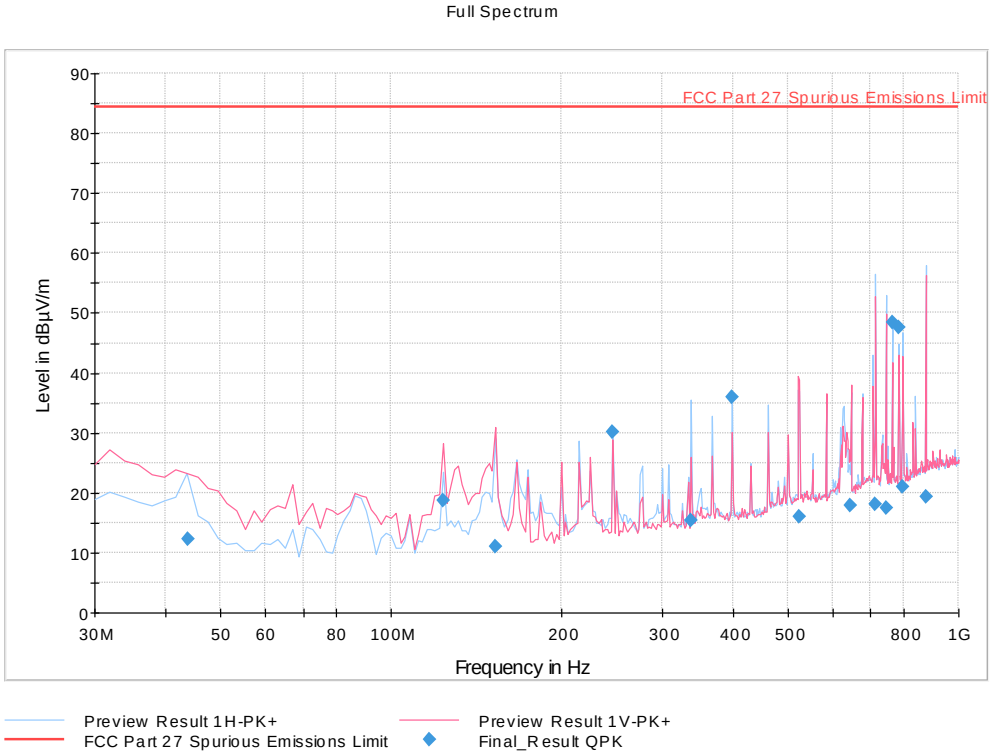
Measuring equipment raw measurement (dbµV) @ 2629 MHz			37.59
Correction Factor (dB/m)	Asset# 1016 (preamplifier)	-31.9	3
	Asset# 1175(cable)	2.5	
	Asset# 7631 (antenna)	32.4	
Reported Peak Final Measurement (dbµV/m) @ 30MHz			**40.59**

1.1.2 Test Results

Performance assessment of the EUT made during this test: Pass

Detailed results are shown below.

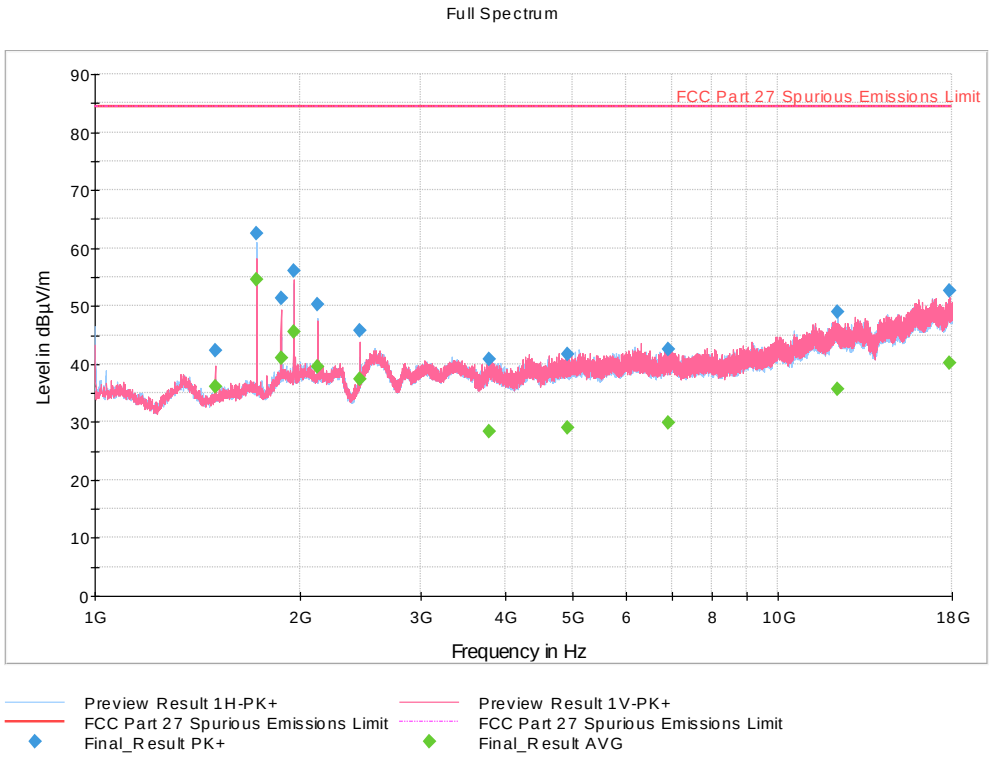
1.1.3 FCC Class B Below 1GHz Radiated Emissions – 120V 60Hz



1.1.4 Quasi-Peak Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
43.807214	12.36	84.40	72.04	1000.0	120.000	388.0	H	29.0	-15.6
123.266613	18.76	84.40	65.64	1000.0	120.000	111.0	V	335.0	-16.5
152.464930	10.98	84.40	73.42	1000.0	120.000	101.0	V	37.0	-14.3
245.771543	30.23	84.40	54.17	1000.0	120.000	122.0	H	267.0	-10.8
337.254268	15.28	84.40	69.12	1000.0	120.000	104.0	H	190.0	-8.3
399.378677	35.94	84.40	48.46	1000.0	120.000	98.0	H	332.0	-6.8
523.667495	15.99	84.40	68.41	1000.0	120.000	188.0	V	65.0	-3.2
645.892425	17.78	84.40	66.62	1000.0	120.000	163.0	V	153.0	-1.9
714.248497	18.06	84.40	66.34	1000.0	120.000	102.0	H	273.0	0.4
745.190701	17.45	84.40	66.95	1000.0	120.000	129.0	H	281.0	0.2
764.549579	48.38	84.40	36.02	1000.0	120.000	103.0	H	277.0	0.0
784.268457	47.65	84.40	36.75	1000.0	120.000	100.0	H	133.0	0.4
798.035671	21.01	84.40	63.39	1000.0	120.000	106.0	H	131.0	0.6
875.431182	19.33	84.40	65.07	1000.0	120.000	250.0	H	96.0	2.4

1.1.5 FCC Class B Above 1GHz Radiated Emissions – 120V 60Hz



Peak Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1500.033333	42.26	84.40	42.14	1000.0	1000.000	161.0	V	142.0	-6.2
1725.733333	62.61	84.40	21.79	1000.0	1000.000	296.0	H	273.0	-4.5
1873.066667	51.35	84.40	33.05	1000.0	1000.000	300.0	V	217.0	-2.8
1953.533333	56.13	84.40	28.27	1000.0	1000.000	143.0	V	21.0	-2.6
2118.033333	50.25	84.40	34.15	1000.0	1000.000	250.0	H	69.0	-1.7
2439.900000	45.77	84.40	38.63	1000.0	1000.000	240.0	V	21.0	-0.6
3786.133333	40.91	84.40	43.49	1000.0	1000.000	212.0	V	228.0	2.5
4932.900000	41.70	84.40	42.70	1000.0	1000.000	273.0	V	91.0	4.2
6930.666667	42.60	84.40	41.80	1000.0	1000.000	112.0	V	277.0	7.2
12249.00000	48.93	84.40	35.47	1000.0	1000.000	326.0	H	147.0	16.1
17883.83333	52.61	84.40	31.79	1000.0	1000.000	278.0	V	92.0	22.1

Average Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1500.033333	36.06	84.40	48.34	1000.0	1000.000	161.0	V	142.0	-6.2
1725.733333	54.48	84.40	29.92	1000.0	1000.000	296.0	H	273.0	-4.5
1873.066667	40.94	84.40	43.46	1000.0	1000.000	300.0	V	217.0	-2.8
1953.533333	45.56	84.40	38.84	1000.0	1000.000	143.0	V	21.0	-2.6
2118.033333	39.57	84.40	44.83	1000.0	1000.000	250.0	H	69.0	-1.7
2439.900000	37.32	84.40	47.08	1000.0	1000.000	240.0	V	21.0	-0.6
3786.133333	28.42	84.40	55.98	1000.0	1000.000	212.0	V	228.0	2.5
4932.900000	29.01	84.40	55.39	1000.0	1000.000	273.0	V	91.0	4.2
6930.666667	29.84	84.40	54.56	1000.0	1000.000	112.0	V	277.0	7.2
12249.00000	35.76	84.40	48.64	1000.0	1000.000	326.0	H	147.0	16.1
17883.83333	40.22	84.40	44.19	1000.0	1000.000	278.0	V	92.0	22.1

3 Test Equipment Used

3.1 List of absolute measuring and other principal items of test equipment

Asset ID Number	Test Equipment	Type	Serial Number	Manufacturer	Cal Due Date
Antenna Conducted Port Setup					
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	10-03-2025
7582	Signal/Spectrum Analyzer	FSW26	101614	Rohde & Schwarz	12-21-2023
-	Power Splitter	ZN2PD2-50-S+	SUU27701207	Mini Circuits	Verified with (7608) and (7582)
7610	DFS Radar Simulator and Analyzer*	Aeroflex 3005	30050A/09L	Aeroflex	NCR (for signaling purposes only)
-	20dB Attenuator	5W DC-18GHz 20dB (ATX3518-20)	N/A	MCL	Verified by 7608 and 7582
7662	Power Meter	N1911A	MY451000951	Agilent	04-04-2024
7605	Wideband Power Meter	N1921A	MY51100054	Agilent	04-14-2024
8848	Step Attenuator	RSP	834500/009	Rhode & Schwarz	Verified by 7608 and 7582
-	Directional Coupler	4226-20	N/A	Narda	Verified by 7608 and 7582
Electromagnetic Radiation Disturbance					
1002	BiConiLog Antenna	3142C	00044556	ETS Lindgren	10/21/23
1040	EMI Test Receiver	ESIB40	00058717	Rohde & Schwarz	10/02/24
51235	RF Pre-Amp (9kHz to 1GHz)	310	412802	Sonoma	08/21/24
1049	EMI Test Receiver	ESU40	100133	Rohde & Schwarz	04/03/24
7575	1-18GHz DRG Horn	3117	155511	ETS Lindgren	08/08/24
8628	Pre Amplifier	QLJ-01182835-JO	8986002	Qinstar	03/22/24
-	Test Software	EMC32	V811.50,0	Rhode & Schwarz	N/A
Miscellaneous					
43003	True RMS Multimeter	85 III	96880143	Fluke	01-09-2024
7579	Temperature Chamber	115	151617	TestQuity	12-21-23

4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

4.1 Conducted Antenna Port Measurement

	Input Quantity (Contribution) Xi	Value		Prob. Dist.	Divisor	ui(x)	ui(x)^2
1	Receiver reading	0.10	dB	Normal, k=1	1.000	0.10	0.01
2	Cable attenuation	1.00	dB	Normal, k=2	2.000	0.50	0.25
3	Receiver sinewave accuracy	0.08	dB	Normal, k=2	2.000	0.04	0.00
4	Receiver pulse amplitude	0.00	dB	Rectangular	1.732	0.00	0.00
5	Receiver pulse repetition rate	0.00	dB	Rectangular	1.732	0.00	0.00
6	Noise floor proximity	0.00	dB	Rectangular	1.732	0.00	0.00
7	Frequency interpolation	0.10	dB	Rectangular	1.732	0.06	0.00
8	Mismatch	0.07	dB	U-shaped	1.414	0.05	0.00

Combined standard uncertainty	Normal	0.52	dB
Expanded uncertainty	**Normal, k=2**	**1.03**	**dB**

4.2 Radiated Measurement (30MHz to 1GHz)

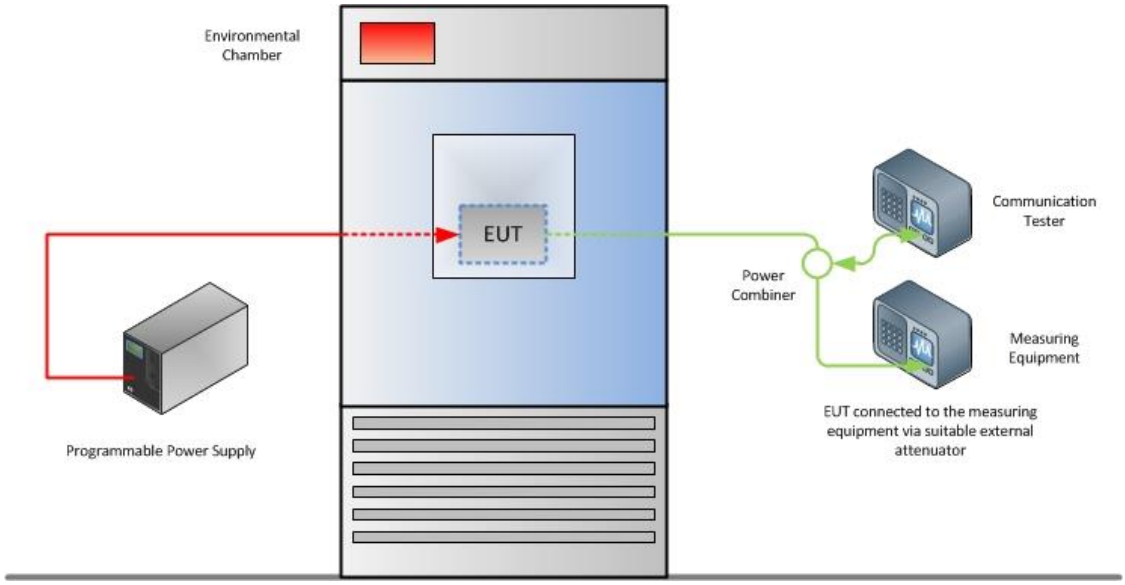
Input Quantity (Contribution) Xi	Value		Prob. Dist.	Divisor	ui(x)	ui(x)2
Receiver reading	0.10	dB	Normal, k=1	1.000	0.10	0.01
Attenuation: antenna-receiver	0.20	dB	Normal, k=2	2.000	0.10	0.01
Antenna factor AF	0.75	dB	Normal, k=2	2.000	0.38	0.14
Receiver sinewave accuracy	1.10	dB	Normal, k=2	2.000	0.55	0.30
Receiver pulse amplitude	1.50	dB	Rectangular	1.732	0.87	0.75
Receiver pulse repetition rate	1.50	dB	Rectangular	1.732	0.87	0.75
Noise floor proximity	0.50	dB	Rectangular	1.732	0.29	0.08
Mismatch: antenna-receiver	0.95	dB	U-shaped	1.414	0.67	0.45
AF frequency interpolation	0.30	dB	Rectangular	1.732	0.17	0.03
AF height deviations	0.10	dB	Rectangular	1.732	0.06	0.00
Directivity difference at 3 m	3.12	dB	Rectangular	1.732	1.80	3.24
Phase center location at 3 m	1.00	dB	Rectangular	1.732	0.58	0.33
Cross-polarisation	0.90	dB	Rectangular	1.732	0.52	0.27
Balance	0.00	dB	Rectangular	1.732	0.00	0.00
Site imperfections	3.64	dB	Triangular	2.449	1.49	2.21
Separation distance at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
Effect of setup table material	0.40	dB	Rectangular	1.732	0.23	0.05
Table height at 3 m	0.10	dB	Normal, k=2	2.000	0.05	0.00
Near-field effects	0.00	dB	Triangular	2.449	0.00	0.00
Effect of ambient noise on OATS	0.00	dB				0.00

Combined standard uncertainty	Normal	2.95	dB
Expanded uncertainty	Normal, k=2	5.89	dB

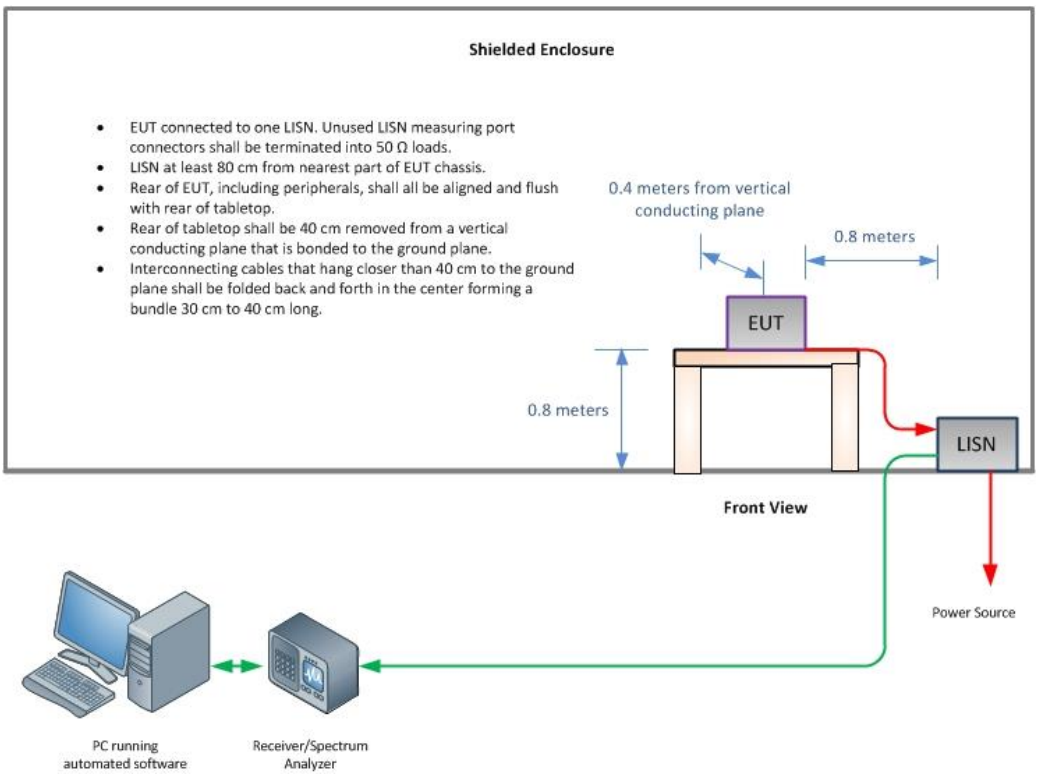
4.3 Radiated Measurement (Above 1GHz)

Input Quantity (Contribution) X_i	Value		Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
Receiver reading	0.10	dB	Normal, k=1	1.000	0.10	0.01
Attenuation: antenna-receiver	0.30	dB	Normal, k=2	2.000	0.15	0.02
Preamplifier Gain	0.20	dB	Normal, k=2	2.000	0.10	0.01
Antenna factor AF	0.37	dB	Normal, k=2	2.000	0.19	0.03
Sinewave accuracy	0.57	dB	Normal, k=2	2.000	0.29	0.08
Instability of preamp gain	1.21	dB	Rectangular	1.732	0.70	0.49
Noise floor proximity	0.70	dB	Rectangular	1.732	0.40	0.16
Mismatch: antenna-preamplifier	1.41	dB	U-shaped	1.414	1.00	0.99
Mismatch: preamplifier-receiver	1.30	dB	U-shaped	1.414	0.92	0.85
AF frequency interpolation	0.30	dB	Rectangular	1.732	0.17	0.03
Directivity difference at 3 m	1.50	dB	Rectangular	1.732	0.87	0.75
Phase center location at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
Cross-polarisation	0.90	dB	Rectangular	1.732	0.52	0.27
Site imperfections VSWR (Method 2)	4.16	dB	Triangular	2.449	1.70	2.89
Effect of setup table material	1.15	dB	Rectangular	1.732	0.66	0.44
Separation distance at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
Table height at 3 m	0.00	dB	Normal, k=1	2.000	0.00	0.00
Combined standard uncertainty			Normal	2.66	dB	
Expanded uncertainty			Normal, k=2	5.32	dB	

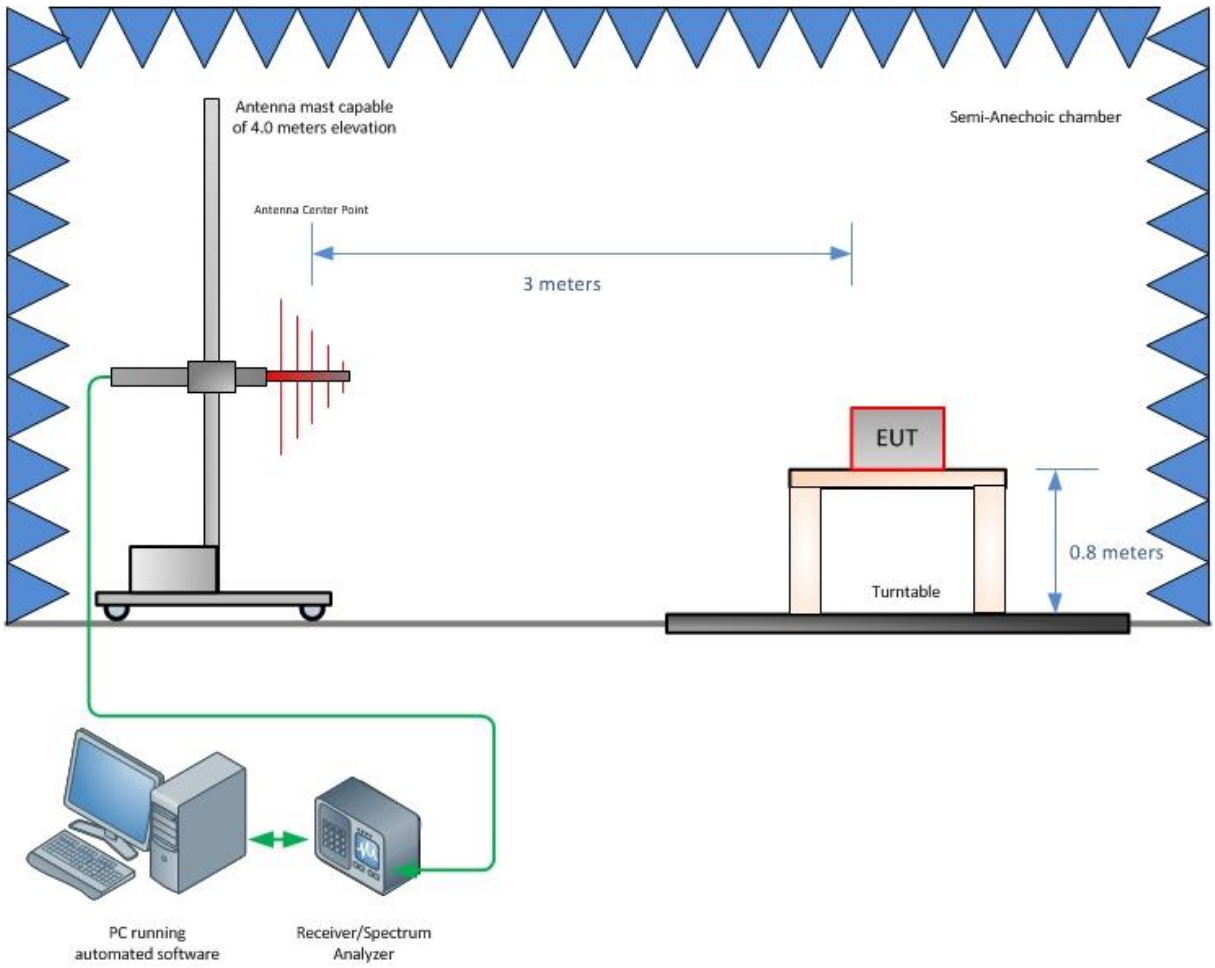
5 Test Setup Diagrams



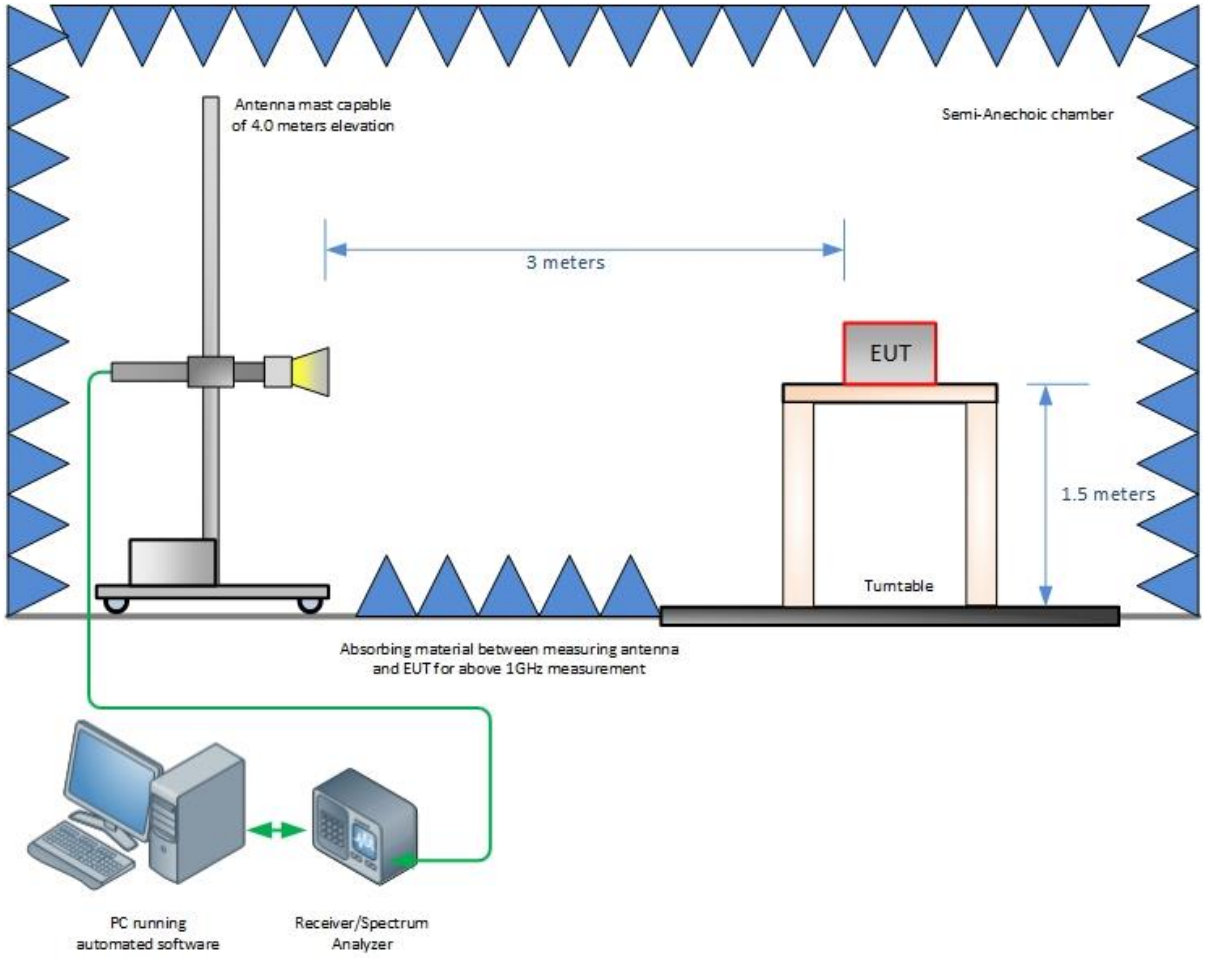
Frequency Stability Test Configuration



Conducted Emissions Test Configuration (if applicable)



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)

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