

LTE Band 41, 5MHz, QPSK, Channel 39675

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5000.02	-59.70	6.60	11.30	-55.00	-25.00	30.00	H
7492.01	-50.28	8.37	10.28	-48.37	-25.00	23.37	V
9996.01	-51.51	9.18	11.91	-48.78	-25.00	23.78	H
12496.01	-47.34	10.18	13.30	-44.22	-25.00	19.22	V
14987.00	-43.86	11.21	14.45	-40.62	-25.00	15.62	H
17494.00	-37.77	12.71	13.02	-37.46	-25.00	12.46	V

LTE Band 41, 5MHz, QPSK, Channel 40620

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5178.02	-60.65	6.93	11.66	-55.92	-25.00	30.92	H
7781.01	-52.41	8.31	10.82	-49.90	-25.00	24.90	V
10379.01	-48.74	9.77	12.08	-46.43	-25.00	21.43	V
12985.01	-45.81	10.47	12.71	-43.57	-25.00	18.57	H
15528.00	-44.40	11.52	15.33	-40.59	-25.00	15.59	H
16842.00	-39.51	12.07	14.04	-37.54	-25.00	12.54	V

LTE Band 41, 5MHz, QPSK, Channel 41565

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5356.02	-60.97	6.92	11.49	-56.40	-25.00	31.40	V
8065.01	-50.96	8.32	11.27	-48.01	-25.00	23.01	V
10763.01	-48.58	9.46	12.16	-45.88	-25.00	20.88	V
13419.01	-41.60	10.58	12.42	-39.76	-25.00	14.76	H
16123.00	-44.07	11.83	15.33	-40.57	-25.00	15.57	H
17444.00	-36.69	12.60	13.22	-36.07	-25.00	11.07	H

LTE Band 66, 1.4MHz, QPSK, Channel 131979

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3476.02	-73.99	5.48	10.50	-68.97	-13.00	55.97	H
5096.02	-69.98	6.76	11.49	-65.25	-13.00	52.25	V
6854.01	-62.41	7.82	10.39	-59.84	-13.00	46.84	V
8592.01	-61.26	8.51	11.38	-58.39	-13.00	45.39	V
10318.01	-58.76	9.67	12.02	-56.41	-13.00	43.41	V
12000.01	-57.26	10.05	13.20	-54.11	-13.00	41.11	V

LTE Band 66, 1.4MHz, QPSK, Channel 132322

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3541.02	-72.77	5.73	10.60	-67.90	-13.00	54.90	V
5196.02	-71.09	6.95	11.69	-66.35	-13.00	53.35	H
6999.01	-62.12	8.29	10.40	-60.01	-13.00	47.01	V
8749.01	-60.99	8.51	11.30	-58.20	-13.00	45.20	V
10454.01	-58.26	9.72	12.15	-55.83	-13.00	42.83	V
12237.01	-57.89	10.04	13.51	-54.42	-13.00	41.42	V

LTE Band 66, 1.4MHz, QPSK, Channel 132665

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3556.02	-72.27	5.88	10.60	-67.55	-13.00	54.55	V
5304.02	-70.98	6.99	11.59	-66.38	-13.00	53.38	V
7161.01	-62.86	8.18	10.43	-60.61	-13.00	47.61	V
8950.01	-60.65	9.02	11.60	-58.07	-13.00	45.07	V
10646.01	-58.71	9.29	12.15	-55.85	-13.00	42.85	V
12459.01	-57.31	10.28	13.34	-54.25	-13.00	41.25	V

LTE Band 71, 5MHz, QPSK, Channel 133147

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1363.01	-59.34	3.19	7.43	2.15	-57.25	-13.00	44.25	H
2027.00	-52.88	4.13	7.44	2.15	-51.72	-13.00	38.72	H
2723.00	-48.35	4.81	9.94	2.15	-45.37	-13.00	32.37	H
3397.02	-62.71	5.36	10.50	2.15	-59.72	-13.00	46.72	V
4094.02	-58.47	6.04	10.40	2.15	-56.26	-13.00	43.26	V
4751.01	-58.24	6.57	11.40	2.15	-55.56	-13.00	42.56	V

LTE Band 71, 5MHz, QPSK, Channel 133297

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1333.01	-58.19	3.15	7.20	2.15	-56.29	-13.00	43.29	H
2016.00	-52.10	4.10	7.50	2.15	-50.85	-13.00	37.85	H
2712.00	-47.46	4.80	9.87	2.15	-44.54	-13.00	31.54	H
3393.02	-62.19	5.36	10.50	2.15	-59.20	-13.00	46.20	V
4111.02	-57.04	6.04	10.40	2.15	-54.83	-13.00	41.83	V
4740.02	-59.06	6.55	11.36	2.15	-56.40	-13.00	43.40	V

LTE Band 71, 5MHz, QPSK, Channel 133447

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.01	-57.95	3.25	7.83	2.15	-55.52	-13.00	42.52	V
2098.00	-52.63	4.19	7.88	2.15	-51.09	-13.00	38.09	V
2791.00	-48.67	4.90	10.43	2.15	-45.29	-13.00	32.29	V
3459.02	-61.36	5.45	10.44	2.15	-58.52	-13.00	45.52	V
4143.02	-57.45	6.08	10.40	2.15	-55.28	-13.00	42.28	V
4892.01	-57.54	6.73	11.40	2.15	-55.02	-13.00	42.02	V

LTE Band CA_7C, 20+20, QPSK, CH 20850+CH21408

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5017.02	-59.52	6.57	11.33	-54.76	-25.00	29.76	V
7517.01	-49.84	8.32	10.30	-47.86	-25.00	22.86	V
10017.01	-50.72	9.23	11.92	-48.03	-25.00	23.03	V
12509.01	-47.02	10.20	13.30	-43.92	-25.00	18.92	V
15009.00	-43.36	11.23	14.51	-40.08	-25.00	15.08	H
17508.00	-37.23	12.75	13.02	-36.96	-25.00	11.96	H

LTE Band CA_7C, 20+20, QPSK, CH 21001+CH21199

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5088.02	-59.54	6.74	11.48	-54.80	-25.00	29.80	V
7615.01	-51.87	8.04	10.43	-49.48	-25.00	24.48	V
10168.01	-50.49	9.35	12.00	-47.84	-25.00	22.84	V
12719.01	-46.72	10.39	13.06	-44.05	-25.00	19.05	H
15278.00	-44.52	11.30	14.98	-40.84	-25.00	15.84	H
17808.00	-37.73	12.74	13.49	-36.98	-25.00	11.98	H

LTE Band CA_7C, 20+20, QPSK, CH 21152+CH21350

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5068.02	-58.96	6.68	11.44	-54.20	-25.00	29.20	H
7609.01	-51.46	8.01	10.42	-49.05	-25.00	24.05	V
10149.01	-51.26	9.38	12.00	-48.64	-25.00	23.64	H
12703.01	-46.98	10.31	13.09	-44.20	-25.00	19.20	V
15250.00	-44.24	11.34	14.95	-40.63	-25.00	15.63	H
17766.00	-38.62	12.55	13.53	-37.64	-25.00	12.64	H

LTE Band CA_41C, 15+15, QPSK, CH 39725+CH39875

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5162.02	-60.11	6.90	11.62	-55.39	-25.00	30.39	V
6462.02	-54.33	7.54	10.78	-51.09	-25.00	26.09	V
7764.01	-52.43	8.34	10.76	-50.01	-25.00	25.01	H
10391.01	-48.80	9.79	12.09	-46.50	-25.00	21.50	V
11697.01	-46.81	9.62	12.70	-43.73	-25.00	18.73	H
14261.00	-42.15	10.94	12.76	-40.33	-25.00	15.33	V

LTE Band CA_41C, 15+15, QPSK, CH 40545+CH40695

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5221.02	-59.65	6.99	11.70	-54.94	-25.00	29.94	V
7770.01	-52.97	8.33	10.78	-50.52	-25.00	25.52	H
10379.01	-47.84	9.77	12.08	-45.53	-25.00	20.53	V
13001.01	-44.45	10.47	12.70	-42.22	-25.00	17.22	V
15596.00	-44.96	11.49	15.40	-41.05	-25.00	16.05	H
16877.00	-39.59	12.02	14.08	-37.53	-25.00	12.53	H

LTE Band CA_41C, 15+15, QPSK, CH 41365+CH41515

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5308.02	-61.03	6.99	11.58	-56.44	-25.00	31.44	V
8008.01	-51.46	8.32	11.22	-48.56	-25.00	23.56	V
10669.01	-48.00	9.30	12.13	-45.17	-25.00	20.17	V
12000.01	-46.55	10.05	13.20	-43.40	-25.00	20.00	H
14679.00	-42.54	11.20	13.44	-40.30	-25.00	15.30	H
17337.00	-36.85	12.42	13.65	-35.62	-25.00	10.62	V

LTE Band CA_66C, 15+15, QPSK, CH 132047+CH132197

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3470.02	-73.79	5.47	10.48	-68.78	-13.00	55.78	H
5102.02	-69.98	6.78	11.50	-65.26	-13.00	52.26	V
6847.01	-62.26	7.83	10.40	-59.69	-13.00	46.69	V
8588.01	-61.13	8.51	11.38	-58.26	-13.00	45.26	V
10338.01	-58.49	9.70	12.04	-56.15	-13.00	43.15	V
12000.01	-57.20	10.05	13.20	-54.05	-13.00	41.05	V

LTE Band CA_66C, 15+15, QPSK, CH132347+CH132497

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3548.02	-72.33	5.80	10.60	-67.53	-13.00	54.53	V
5284.02	-70.88	6.99	11.63	-66.24	-13.00	53.24	V
7000.01	-62.10	8.30	10.40	-60.00	-13.00	47.00	V
8762.01	-60.90	8.55	11.30	-58.15	-13.00	45.15	V
10620.01	-58.83	9.29	12.18	-55.94	-13.00	42.94	V
12369.01	-57.40	10.30	13.49	-54.21	-13.00	41.21	V

LTE Band CA_66C, 15+15, QPSK, CH132447+CH132597

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3551.02	-72.17	5.83	10.60	-67.40	-13.00	54.40	V
5269.02	-70.92	6.99	11.66	-66.25	-13.00	53.25	V
6999.01	-61.98	8.29	10.40	-59.87	-13.00	46.87	V
8748.01	-60.88	8.50	11.30	-58.08	-13.00	45.08	V
10490.01	-58.67	9.67	12.19	-56.15	-13.00	43.15	V
12251.01	-57.88	10.03	13.55	-54.36	-13.00	41.36	V

Sample: 3551.02MHz

Power (EIRP) = P_{Mea} - P_{pl} + G_a

Power (-67.40dBm) = P_{Mea} (-72.17dBm) - P_{pl} (5.83dB) + G_a (10.60dBi)

Note: Expanded measurement uncertainty

Frequency range	Expanded measurement uncertainty
30MHz-1GHz	5.76dB, k=2
1GHz-18GHz	4.69dB, k=2
18GHz-40GHz	3.37dB, k=2

Note: The measurement results showed here are worst cases

A.3 Frequency Stability

A.3.1 Method of Measurement

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage. Two reference points are established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as F_L and F_H respectively.

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of CMW500.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMW500, and in a simulated call on middle channel for each LTE band, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the center channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 °C decrements from +50°C to -30°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of the lower, higher and nominal voltage. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress.

A.3.2 Measurement results

LTE Band 7, 20MHz bandwidth QPSK (worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	2500.609	2569.391		
50				9.88	0.0039
40				10.34	0.0041
30				9.86	0.0039
10				0.13	0.0001
0				0.34	0.0001
-10				1.27	0.0005
-20				-1.13	0.0004
-30				9.97	0.0039

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	2500.609	2569.391	0.43	0.0002
4.4				9.90	0.0039

LTE Band 12, 10MHz bandwidth QPSK (worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	699.481	715.519		
50				0.66	0.0009
40				-4.46	0.0063
30				1.22	0.0017
10				0.83	0.0012
0				-4.31	0.0061
-10				-4.53	0.0064
-20				-4.48	0.0063
-30				-5.34	0.0075

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	699.481	715.519	-4.16	0.0059
4.4				-5.28	0.0075

LTE Band 13, 10MHz bandwidth QPSK (worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	777.465	786.519		
50				1.54	0.0020
40				0.47	0.0006
30				1.70	0.0022
10				0.90	0.0012
0				2.43	0.0031
-10				-4.81	0.0062
-20				0.82	0.0010
-30				1.85	0.0024

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	777.465	786.519	1.50	0.0019
4.4				0.16	0.0002

LTE Band 25, 20MHz bandwidth QPSK (worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	1850.833	1914.199		
50				-0.17	0.0001
40				0.33	0.0002
30				0.17	0.0001
10				-1.27	0.0007
0				0.21	0.0001
-10				-0.77	0.0004
-20				0.39	0.0002
-30				-0.70	0.0004

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	1850.833	1914.199	0.11	0.0001
4.4				-0.01	0.0000

LTE Band 26(814MHz~824MHz), 10MHz bandwidth QPSK (worst case of all bandwidths)
Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	814.389	823.611		
50				-0.41	0.0005
40				0.11	0.0001
30				6.41	0.0078
10				-0.86	0.0011
0				-0.37	0.0005
-10				0.06	0.0001
-20				-0.63	0.0008
-30				-0.46	0.0006

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	814.389	823.611	5.14	0.0063
4.4				-0.93	0.0011

LTE Band 26(824MHz~849MHz), 15MHz bandwidth QPSK (worst case of all bandwidths)
Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	824.577	848.471		
50				-5.56	0.0066
40				-5.97	0.0071
30				-0.27	0.0003
10				0.49	0.0006
0				-6.02	0.0072
-10				-5.92	0.0071
-20				-0.17	0.0002
-30				-6.52	0.0078

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	824.577	848.471	-6.29	0.0075
4.4				-6.11	0.0073

LTE Band 41, 20MHz bandwidth QPSK (worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	2496.417	2689.519		
50				1.02	0.0004
40				0.27	0.0001
30				1.42	0.0005
10				1.59	0.0006
0				-0.17	0.0001
-10				-0.53	0.0002
-20				-2.78	0.0011
-30				1.03	0.0004

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	2496.417	2689.519	1.57	0.0006
4.4				-2.30	0.0009

LTE Band 42, 20MHz bandwidth QPSK (worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	3450.833	3549.103		
50				1.93	0.0006
40				0.46	0.0001
30				1.47	0.0004
10				-0.01	0.0000
0				1.33	0.0004
-10				0.87	0.0002
-20				-0.80	0.0002
-30				0.67	0.0002

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	3450.833	3549.103	1.20	0.0003
4.4				1.93	0.0006

LTE Band 48, 20MHz bandwidth QPSK (worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	3550.833	3699.199		
50				1.43	0.0004
40				1.07	0.0003
30				1.52	0.0004
10				-0.43	0.0001
0				0.87	0.0002
-10				1.16	0.0003
-20				1.89	0.0005
-30				1.52	0.0004

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	3550.833	3699.199	0.67	0.0002
4.4				3.53	0.0010

LTE Band 66, 20MHz bandwidth QPSK (worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	1710.865	1779.199		
50				-0.62	0.0004
40				0.76	0.0004
30				7.64	0.0044
10				0.53	0.0003
0				-0.80	0.0005
-10				-0.97	0.0006
-20				-1.86	0.0011
-30				-1.26	0.0007

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	1710.865	1779.199	6.98	0.0040
4.4				0.80	0.0005

LTE Band 71, 20MHz bandwidth QPSK (worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	663.994	697.006		
50				-5.94	0.0087
40				-4.58	0.0067
30				-0.72	0.0011
10				-6.15	0.0090
0				-5.56	0.0082
-10				-4.86	0.0071
-20				-5.91	0.0087
-30				-5.41	0.0080

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	663.994	697.006	-5.39	0.0079
4.4				-5.41	0.0080

LTE CA Band 7C, 20MHz+20MHz bandwidth QPSK(worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	2500.440	2569.540		
50				1.36	0.0005
40				2.00	0.0008
30				3.19	0.0013
10				3.46	0.0014
0				4.99	0.0020
-10				3.79	0.0015
-20				4.22	0.0017
-30				5.79	0.0023

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	2500.440	2569.540	5.98	0.0024
4.4				6.07	0.0024

LTE CA Band 41C, 20MHz+20MHz bandwidth QPSK(worst case of all bandwidths)
Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	FL(MHz)	FH(MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	2496.940	2689.060		
50				0.59	0.0002
40				0.76	0.0003
30				1.52	0.0006
10				2.73	0.0011
0				2.52	0.0010
-10				3.15	0.0012
-20				3.76	0.0015
-30				2.58	0.0010

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	FL(MHz)	FH(MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	2496.940	2689.060	3.65	0.0014
4.4				3.79	0.0015

LTE CA Band 66C, 20MHz+20MHz bandwidth QPSK(worst case of all bandwidths)
Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	FL(MHz)	FH(MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	1710.520	1779.540		
50				1.03	0.0006
40				0.60	0.0003
30				1.32	0.0007
10				1.09	0.0006
0				1.53	0.0009
-10				1.87	0.0011
-20				1.73	0.0010
-30				1.67	0.0010

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	FL(MHz)	FH(MHz)	Offset(Hz)	Frequency error(ppm)
3.7	20	1710.520	1779.540	2.05	0.0012
4.4				2.40	0.0014

Note: Expanded measurement uncertainty is U = 0.01 PPM, k = 2.

A.4 Occupied Bandwidth

Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the mid frequencies frequency. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

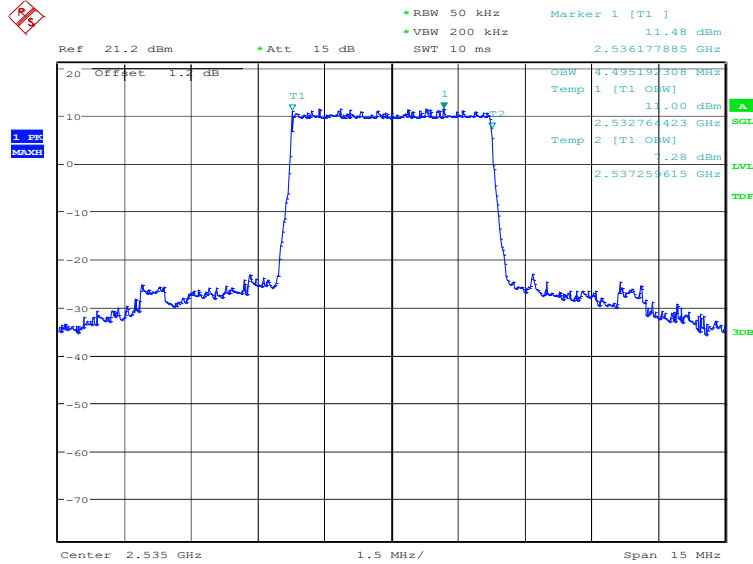
The measurement method is from ANSI C63.26:

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts.
- b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.
- c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
- d) Set the detection mode to peak, and the trace mode to max-hold.

LTE band 7, 5MHz (99%)

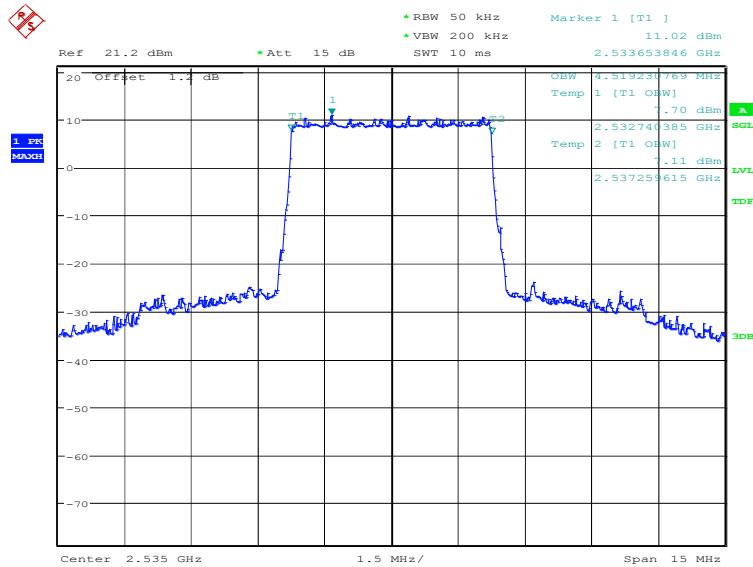
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2535.0	QPSK	16QAM
	4495.19	4519.23

LTE band 7, 5MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 14:45:51

LTE band 7, 5MHz Bandwidth, 16QAM (99% BW)

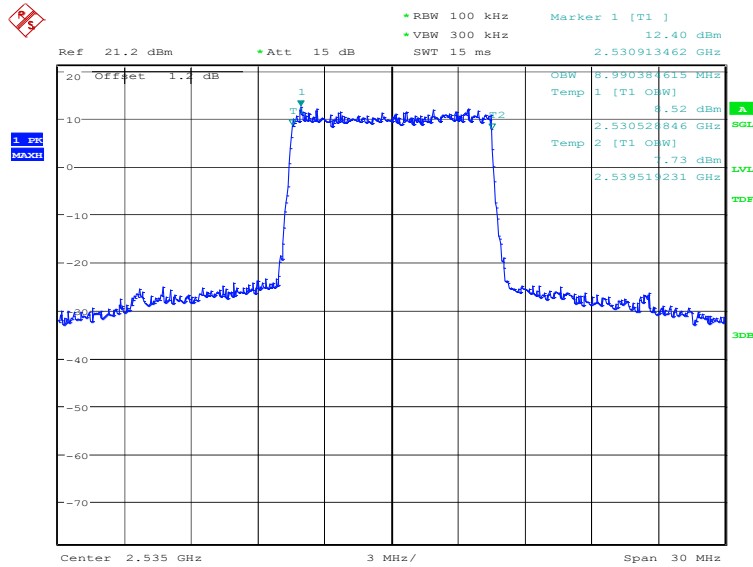


Date: 6.DEC.2022 14:46:32

LTE band 7, 10MHz (99%)

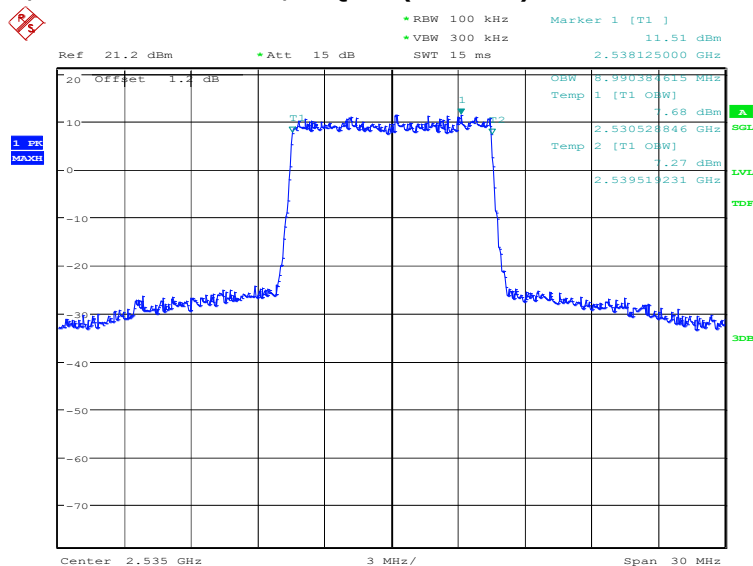
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2535.0	QPSK	16QAM
	8990.38	8990.38

LTE band 7, 10MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 14:47:17

LTE band 7, 10MHz Bandwidth, 16QAM (99% BW)

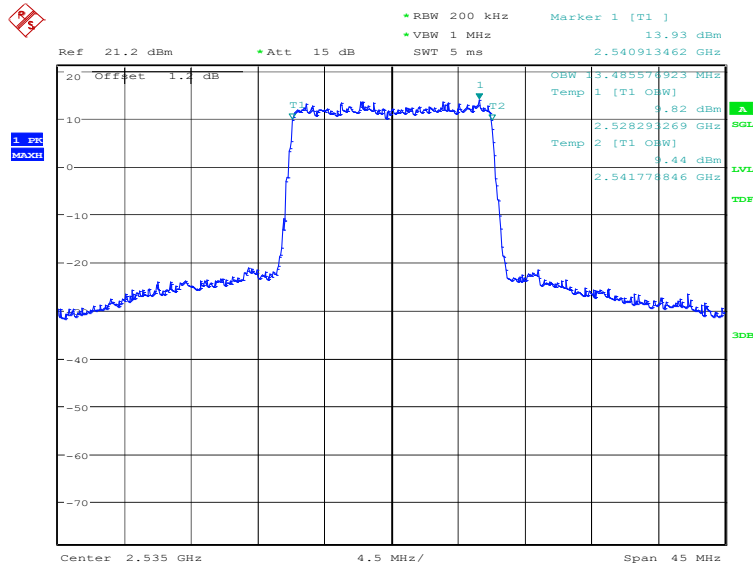


Date: 6.DEC.2022 14:47:57

LTE band 7, 15MHz (99%)

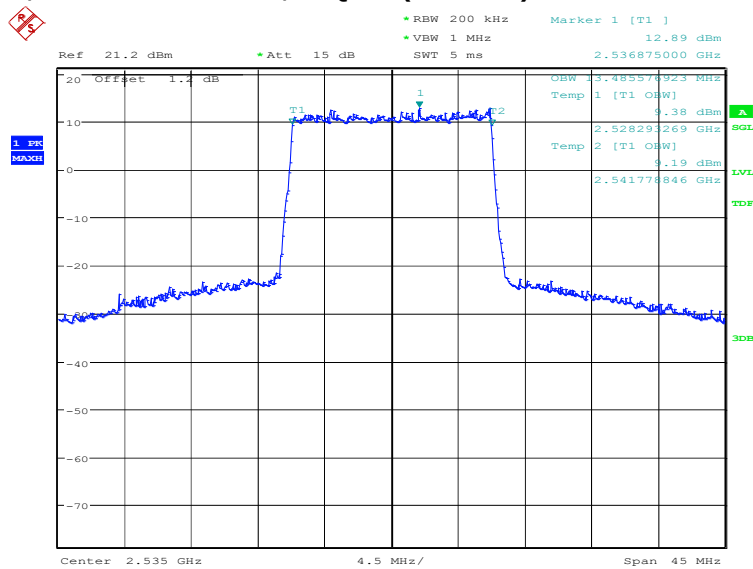
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2535.0	QPSK	16QAM
	13485.58	13485.58

LTE band 7, 15MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 14:48:42

LTE band 7, 15MHz Bandwidth, 16QAM (99% BW)

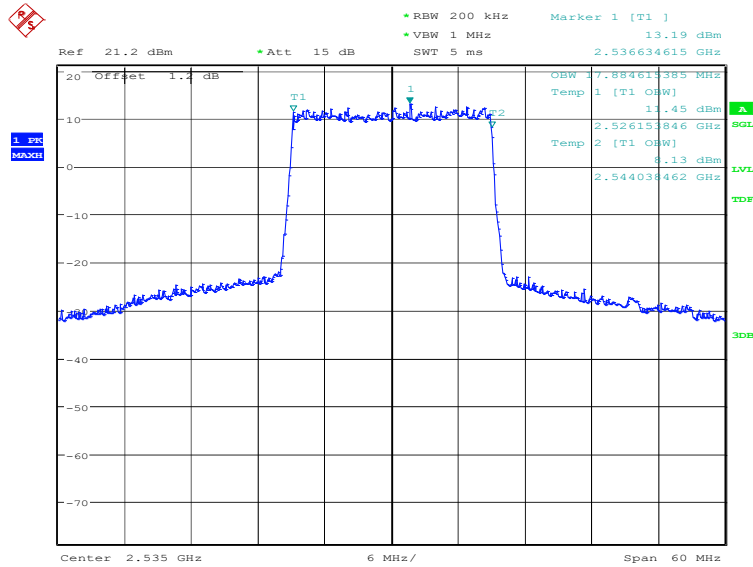


Date: 6.DEC.2022 14:49:22

LTE band 7, 20MHz (99%)

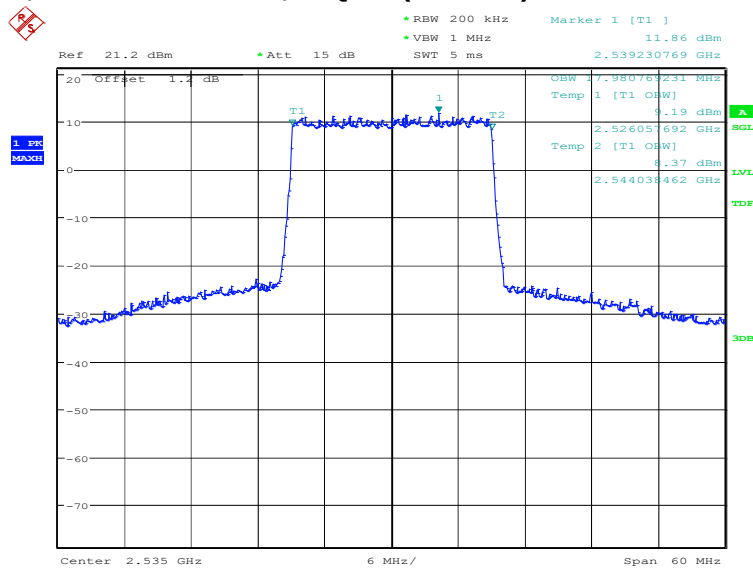
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2535.0	QPSK	16QAM
	17884.62	17980.77

LTE band 7, 20MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 14:50:08

LTE band 7, 20MHz Bandwidth, 16QAM (99% BW)

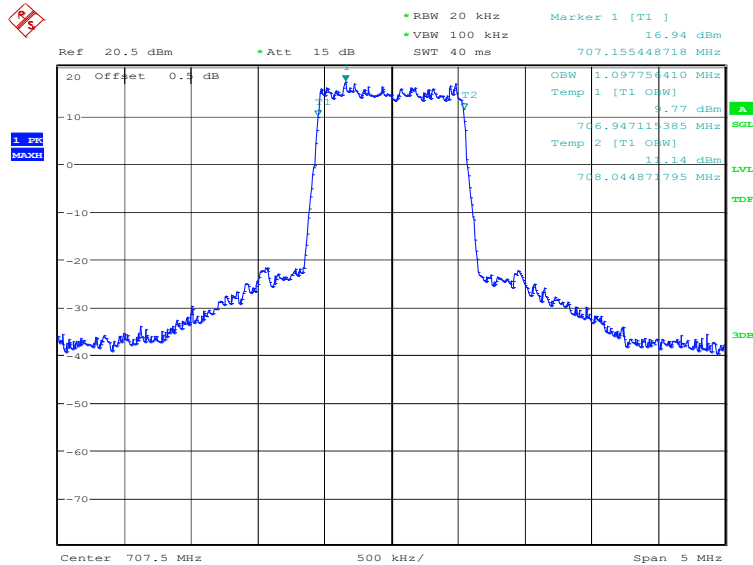


Date: 6.DEC.2022 14:50:48

LTE band 12, 1.4MHz (99%)

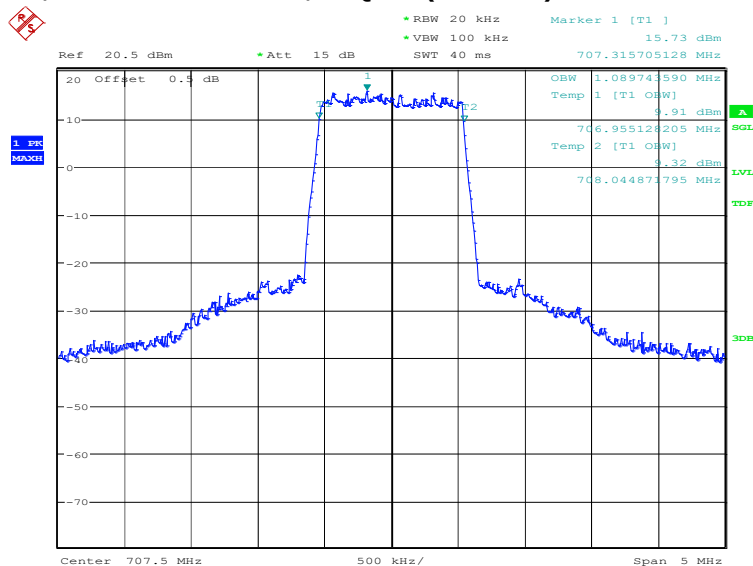
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	1097.76	1089.74

LTE band 12, 1.4MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:38:57

LTE band 12, 1.4MHz Bandwidth, 16QAM (99% BW)

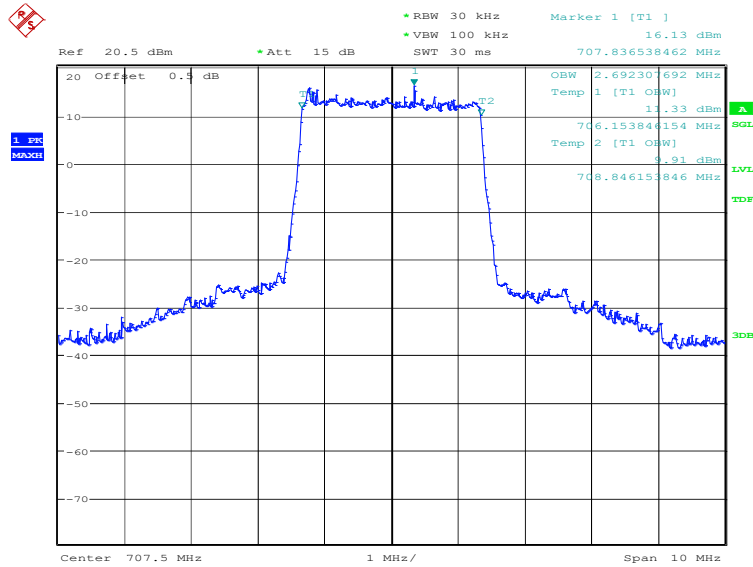


Date: 6.DEC.2022 16:39:38

LTE band 12, 3MHz (99%)

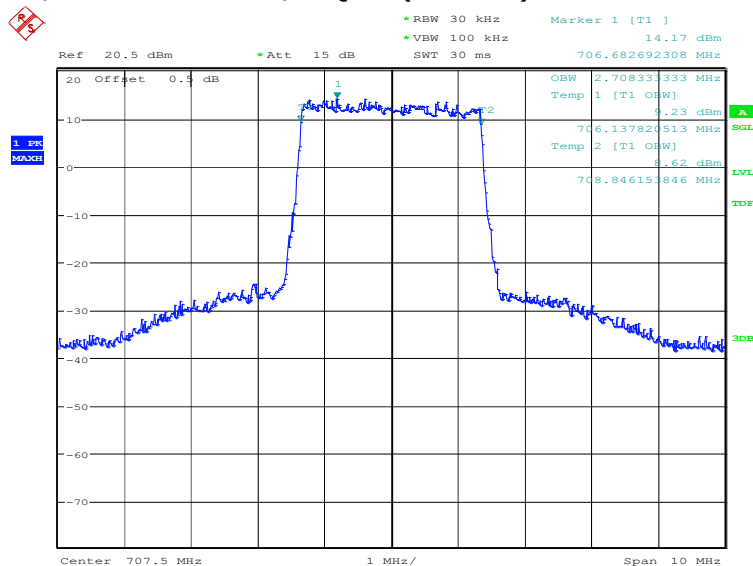
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	2692.31	2708.33

LTE band 12, 3MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:40:23

LTE band 12, 3MHz Bandwidth, 16QAM (99% BW)

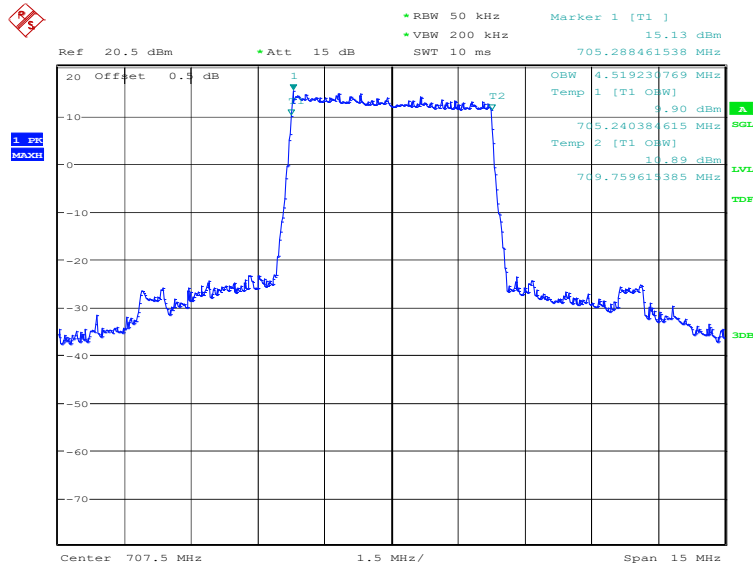


Date: 6.DEC.2022 16:41:03

LTE band 12, 5MHz (99%)

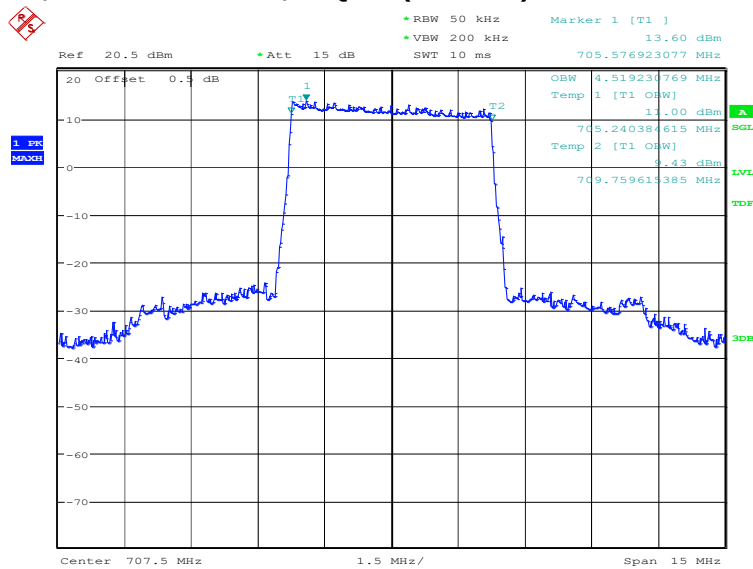
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	4519.23	4519.23

LTE band 12, 5MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:41:48

LTE band 12, 5MHz Bandwidth, 16QAM (99% BW)

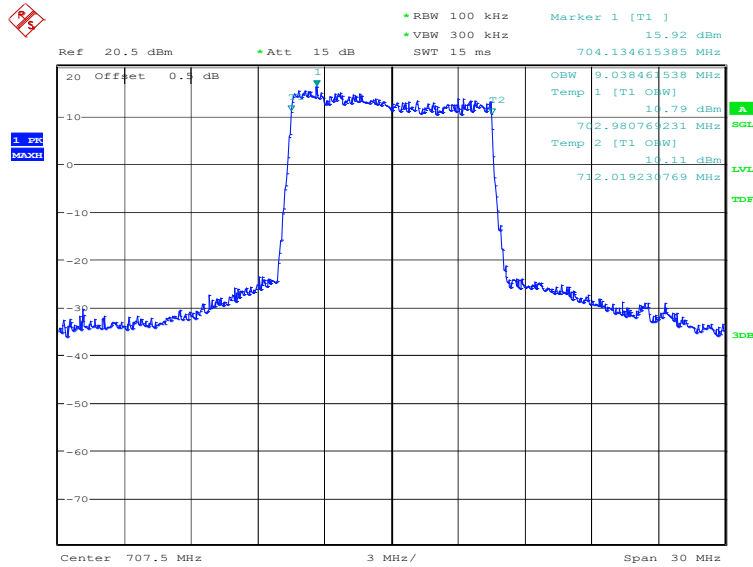


Date: 6.DEC.2022 16:42:28

LTE band 12, 10MHz (99%)

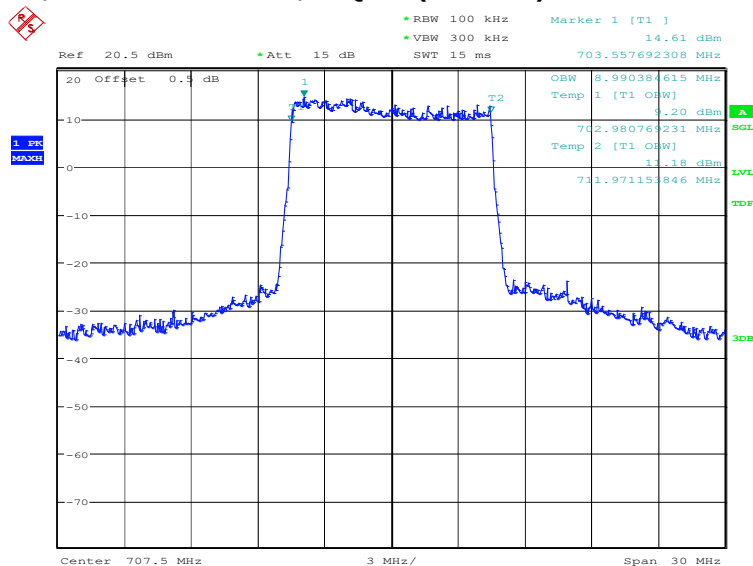
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	9038.46	8990.38

LTE band 12, 10MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:43:14

LTE band 12, 10MHz Bandwidth, 16QAM (99% BW)

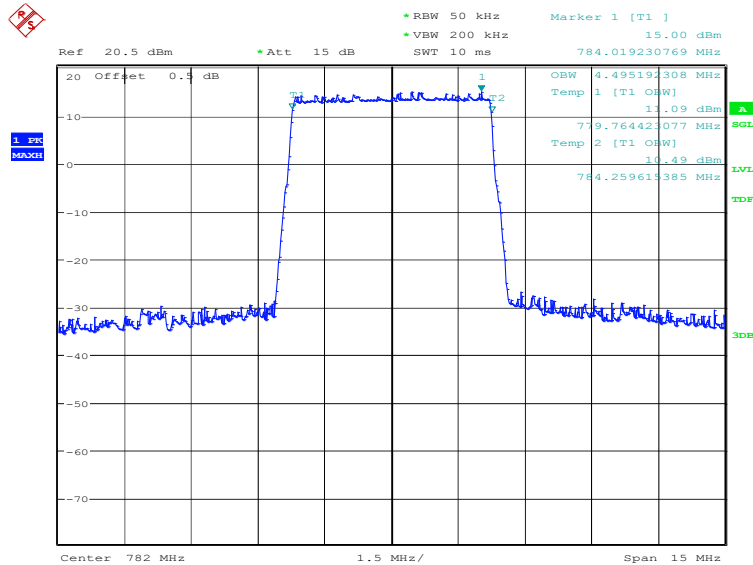


Date: 6.DEC.2022 16:43:54

LTE band 13, 5MHz (99%)

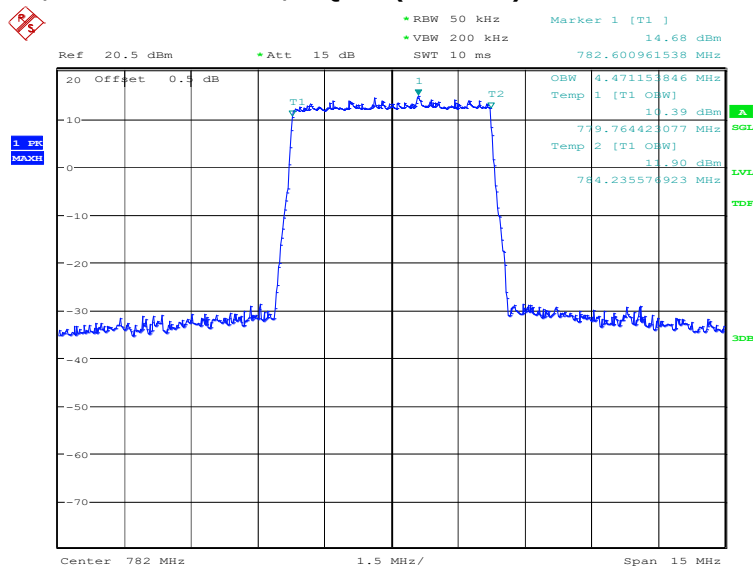
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
782.0	QPSK	16QAM
	4495.19	4471.15

LTE band 13, 5MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:44:53

LTE band 13, 5MHz Bandwidth,16QAM (99% BW)

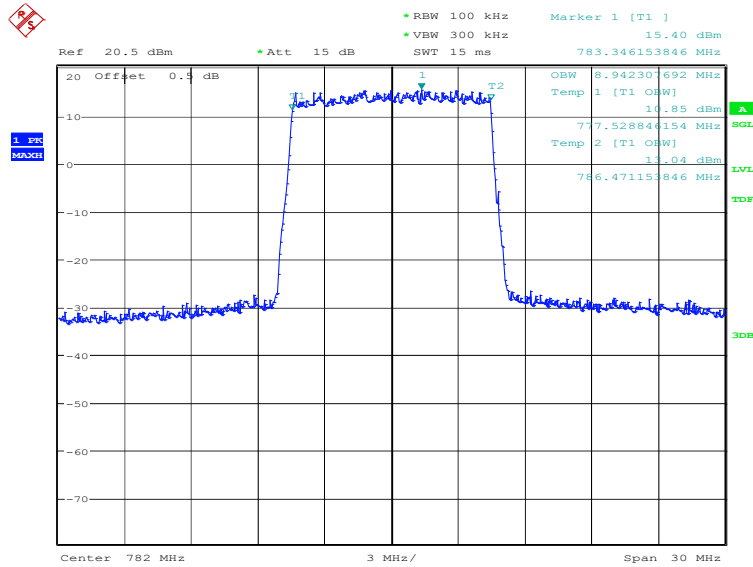


Date: 6.DEC.2022 16:45:34

LTE band 13, 10MHz (99%)

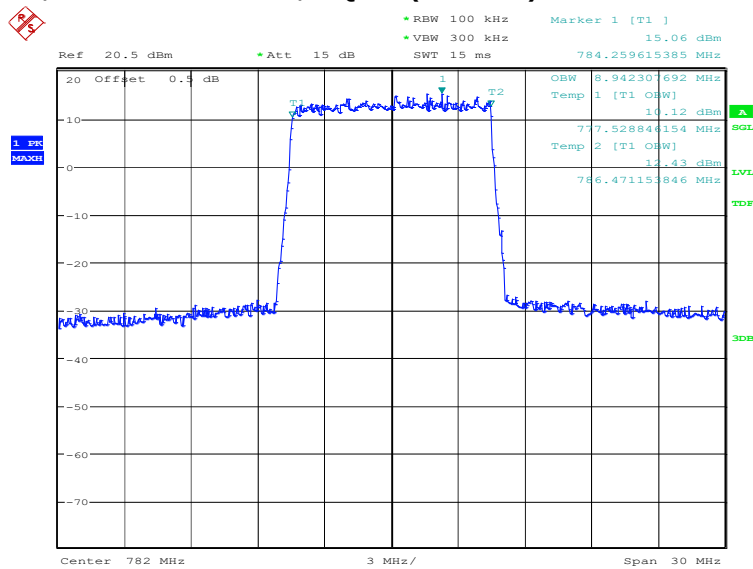
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
782.0	QPSK	16QAM
	8942.31	8942.31

LTE band 13, 10MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:46:19

LTE band 13, 10MHz Bandwidth,16QAM (99% BW)

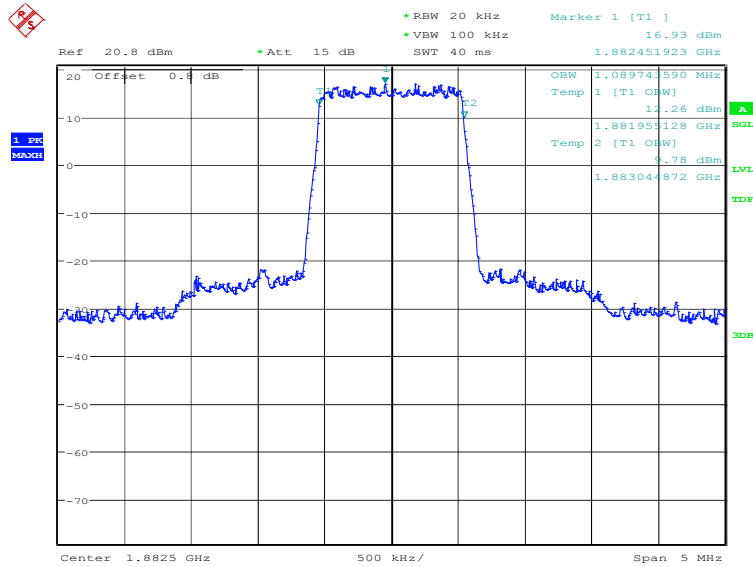


Date: 6.DEC.2022 16:46:59

LTE band 25, 1.4MHz (99%)

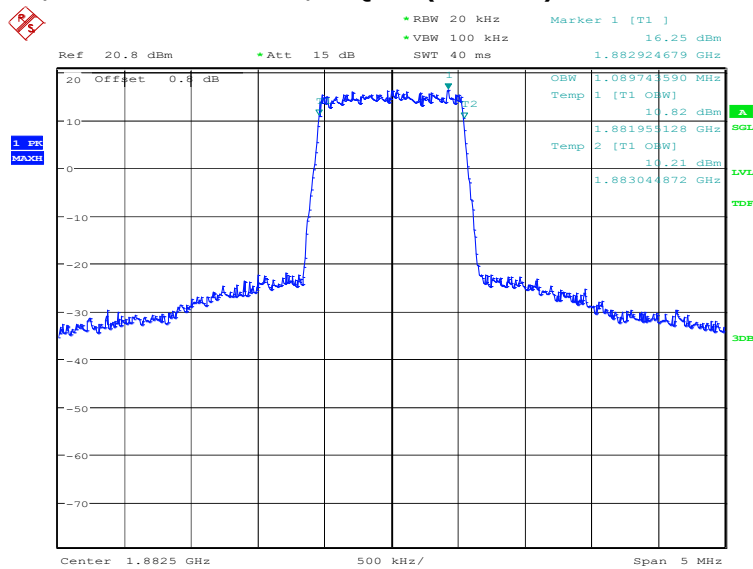
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	1089.74	1089.74

LTE band 25, 1.4MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 14:51:37

LTE band 25, 1.4MHz Bandwidth, 16QAM (99% BW)

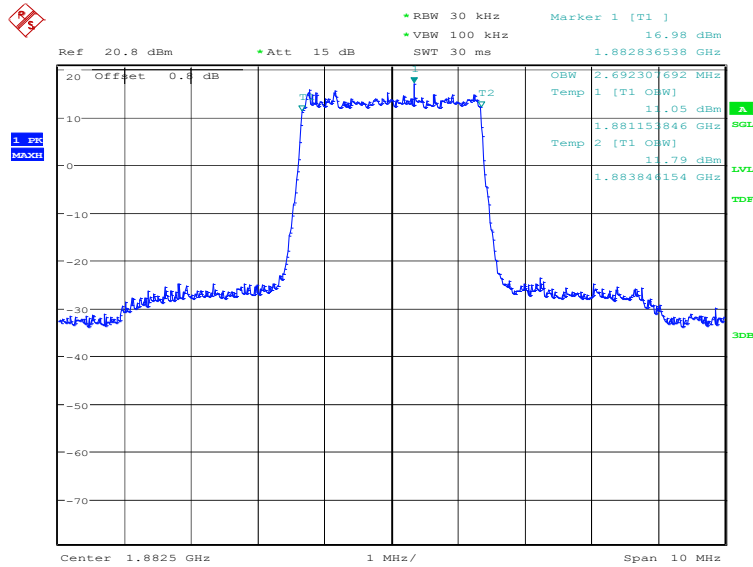


Date: 6.DEC.2022 14:52:17

LTE band 25, 3MHz (99%)

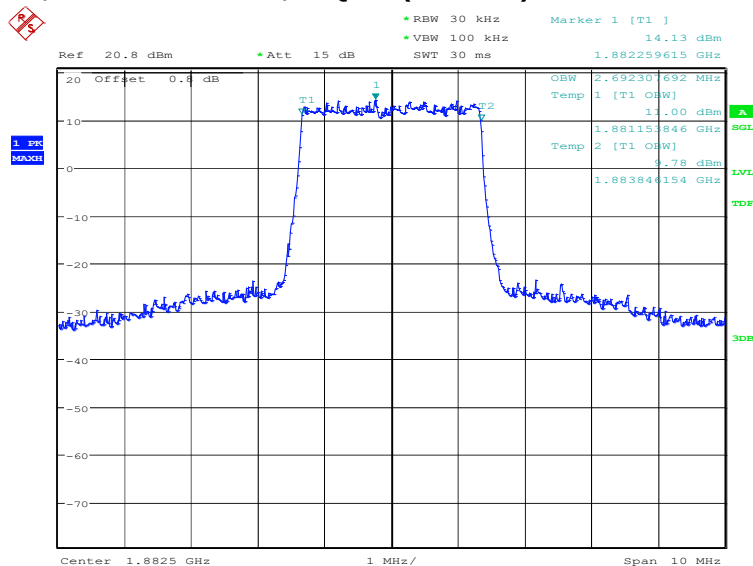
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	2692.31	2692.31

LTE band 25, 3MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 14:53:03

LTE band 25, 3MHz Bandwidth, 16QAM (99% BW)

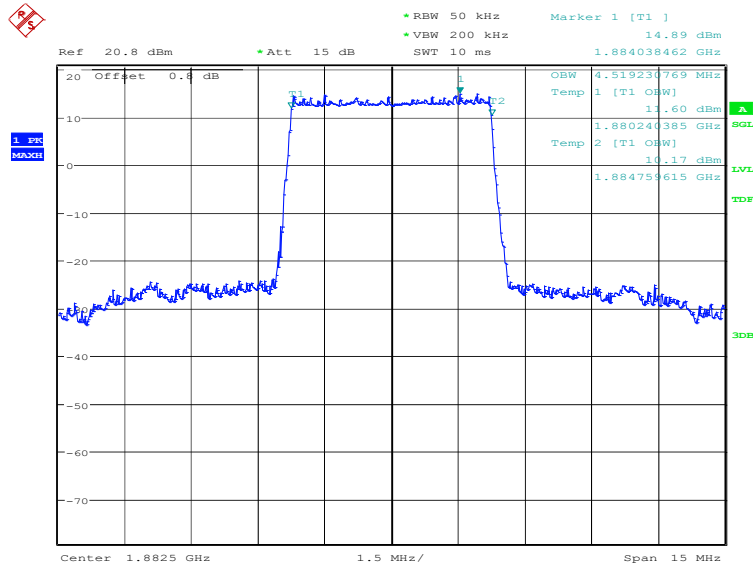


Date: 6.DEC.2022 14:53:43

LTE band 25, 5MHz (99%)

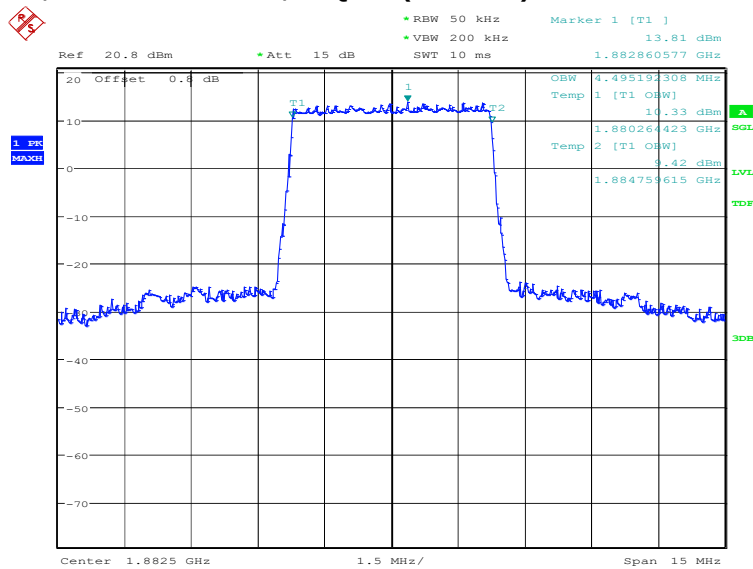
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	4519.23	4495.19

LTE band 25, 5MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 14:54:28

LTE band 25, 5MHz Bandwidth, 16QAM (99% BW)

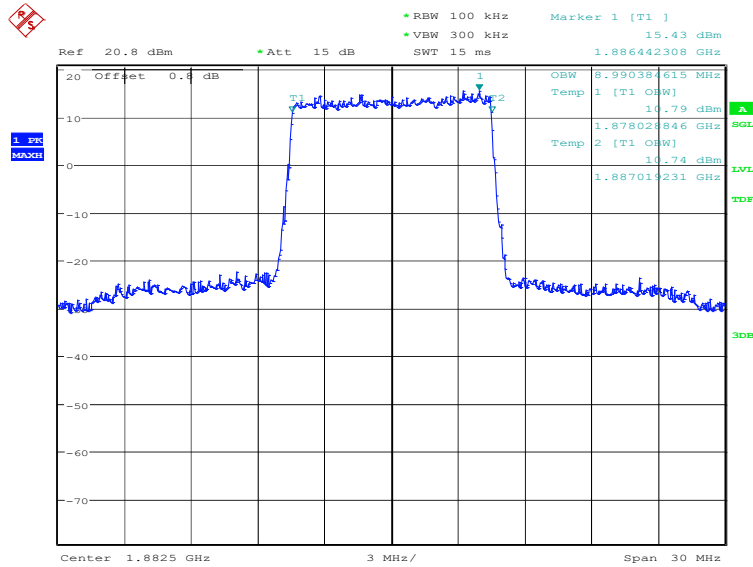


Date: 6.DEC.2022 14:55:08

LTE band 25, 10MHz (99%)

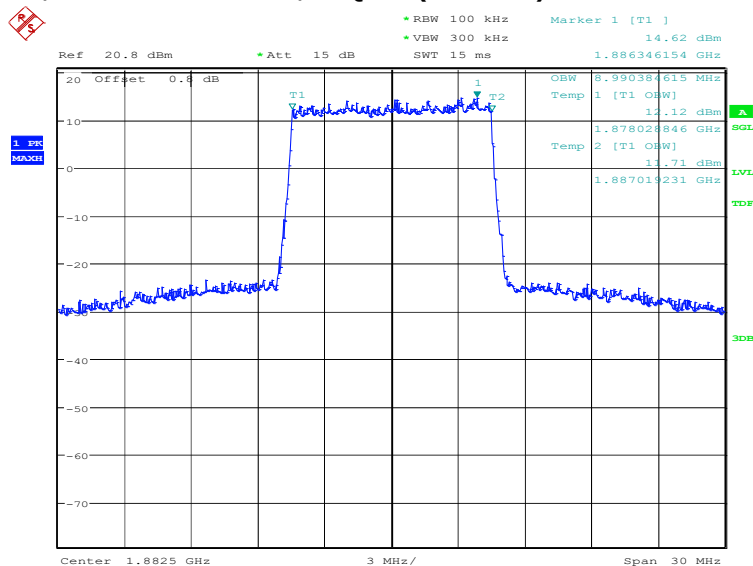
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	8990.38	8990.38

LTE band 25, 10MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 14:55:53

LTE band 25, 10MHz Bandwidth, 16QAM (99% BW)

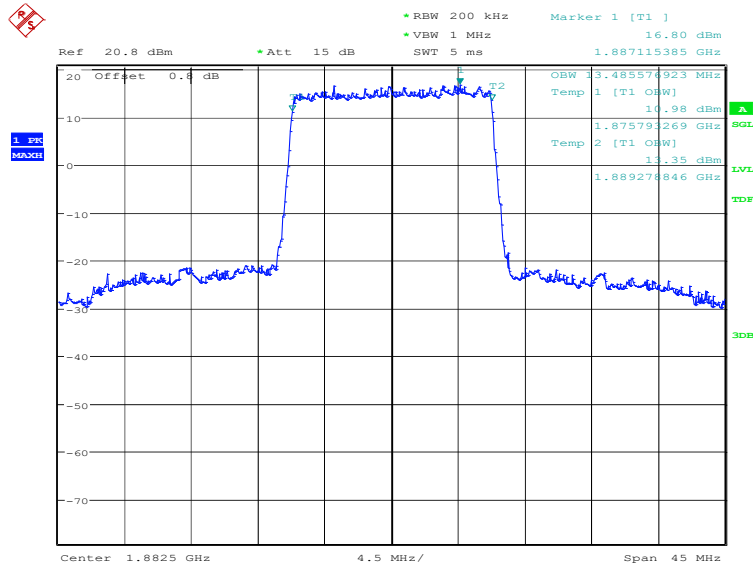


Date: 6.DEC.2022 14:56:34

LTE band 25, 15MHz (99%)

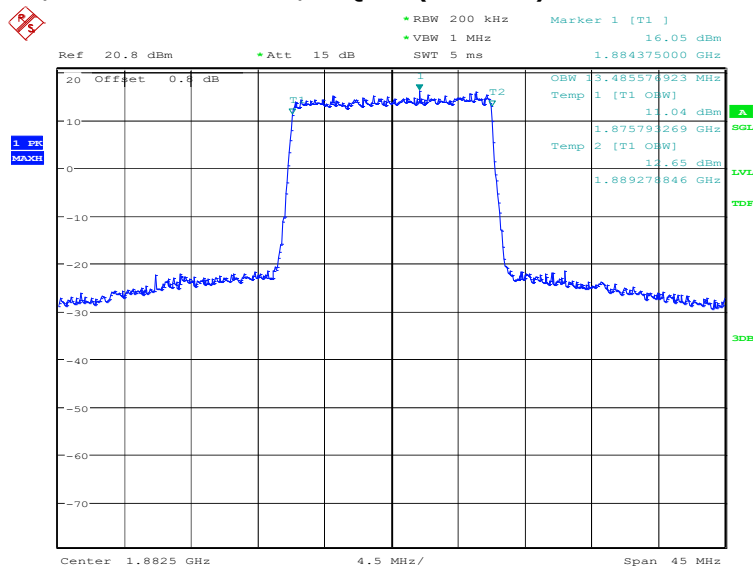
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	13485.58	13485.58

LTE band 25, 15MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 14:57:19

LTE band 25, 15MHz Bandwidth, 16QAM (99% BW)

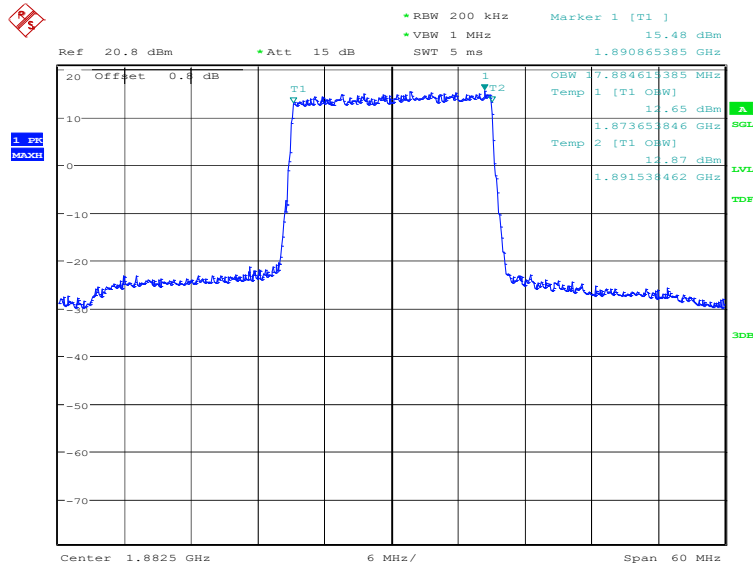


Date: 6.DEC.2022 14:57:59

LTE band 25, 20MHz (99%)

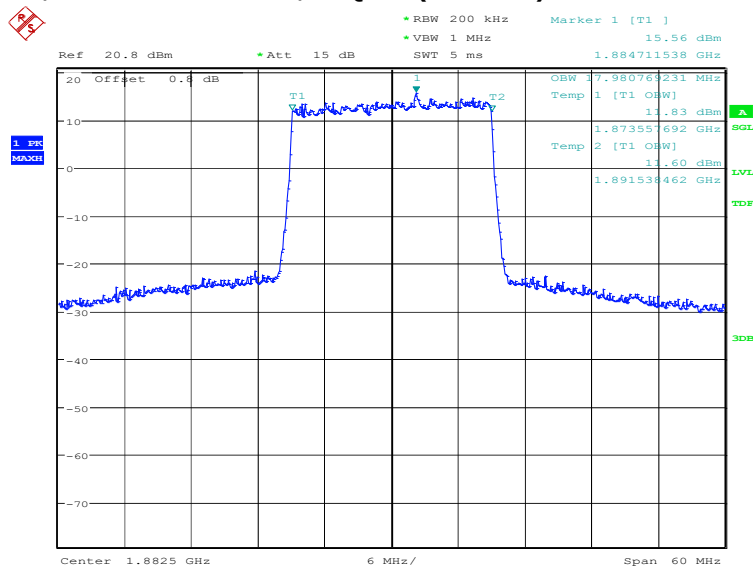
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	17884.62	17980.77

LTE band 25, 20MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 14:58:44

LTE band 25, 20MHz Bandwidth, 16QAM (99% BW)

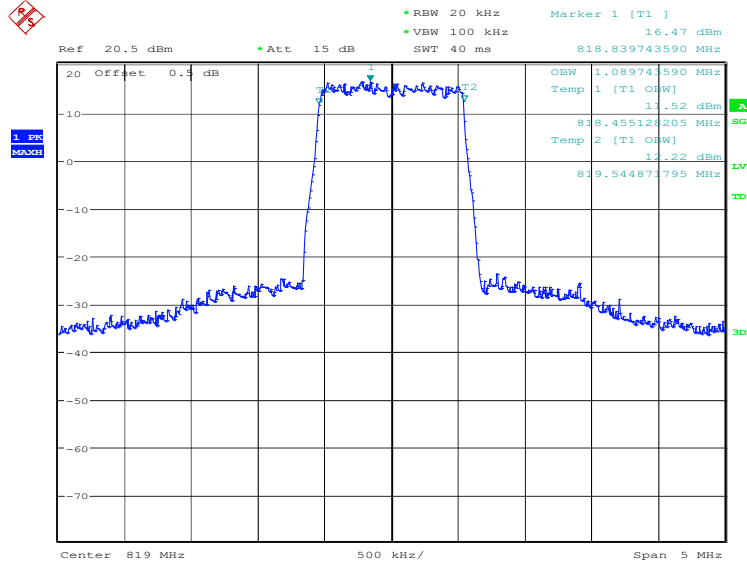


Date: 6.DEC.2022 14:59:25

LTE band 26(814MHz~824MHz), 1.4MHz (99%)

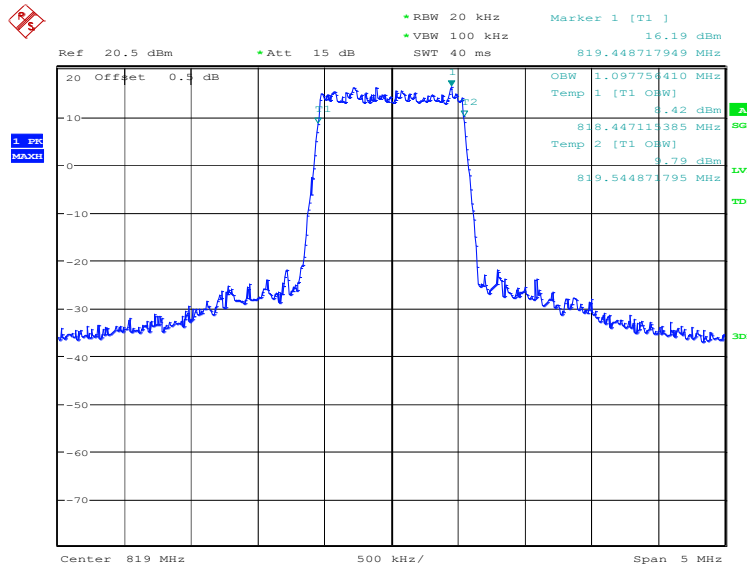
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
819.0	QPSK	16QAM
	1089.74	1097.76

LTE band 26(814MHz~824MHz), 1.4MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:55:37

LTE band 26(814MHz~824MHz), 1.4MHz Bandwidth, 16QAM (99% BW)

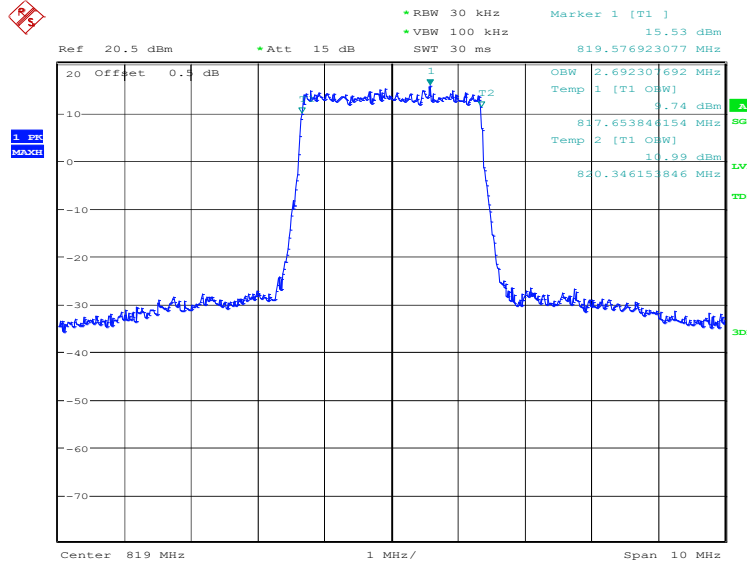


Date: 6.DEC.2022 16:56:17

LTE band 26(814MHz~824MHz), 3MHz (99%)

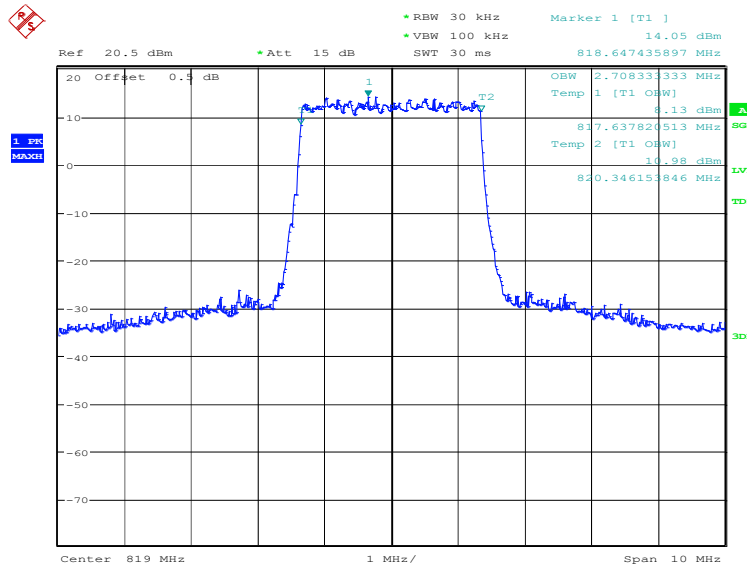
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
819.0	QPSK	16QAM
	2692.31	2708.33

LTE band 26(814MHz~824MHz), 3MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:57:02

LTE band 26(814MHz~824MHz), 3MHz Bandwidth, 16QAM (99% BW)

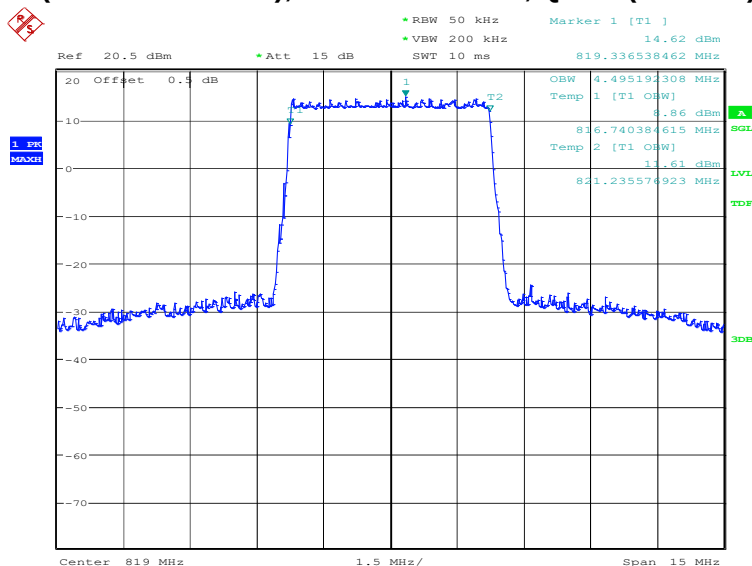


Date: 6.DEC.2022 16:57:43

LTE band 26(814MHz~824MHz), 5MHz (99%)

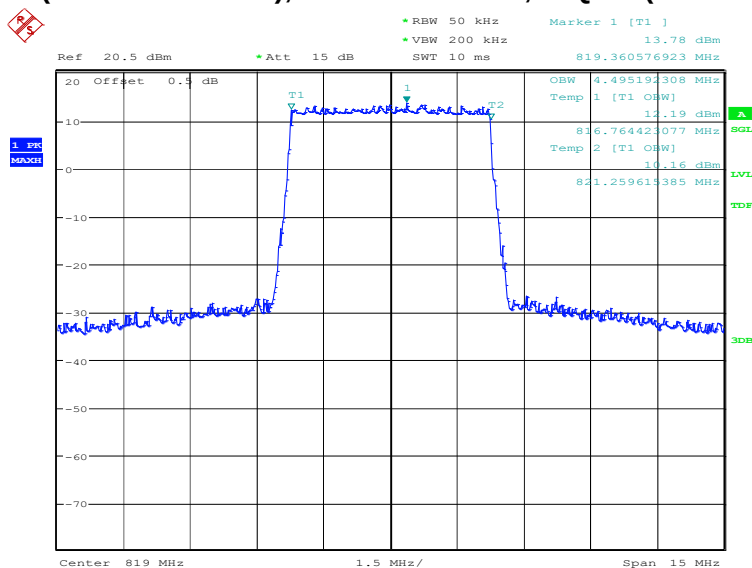
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
819.0	QPSK	16QAM
	4495.19	4495.19

LTE band 26(814MHz~824MHz), 5MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:58:28

LTE band 26(814MHz~824MHz), 5MHz Bandwidth, 16QAM (99% BW)

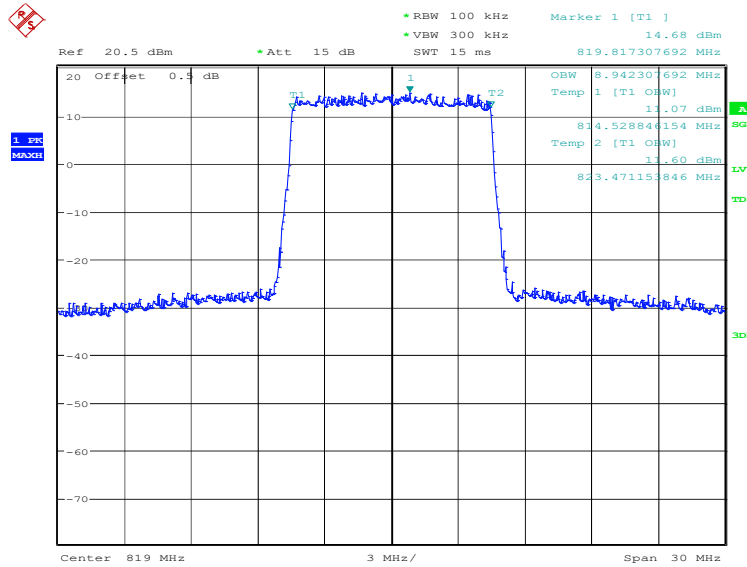


Date: 6.DEC.2022 16:59:08

LTE band 26(814MHz~824MHz), 10MHz (99%)

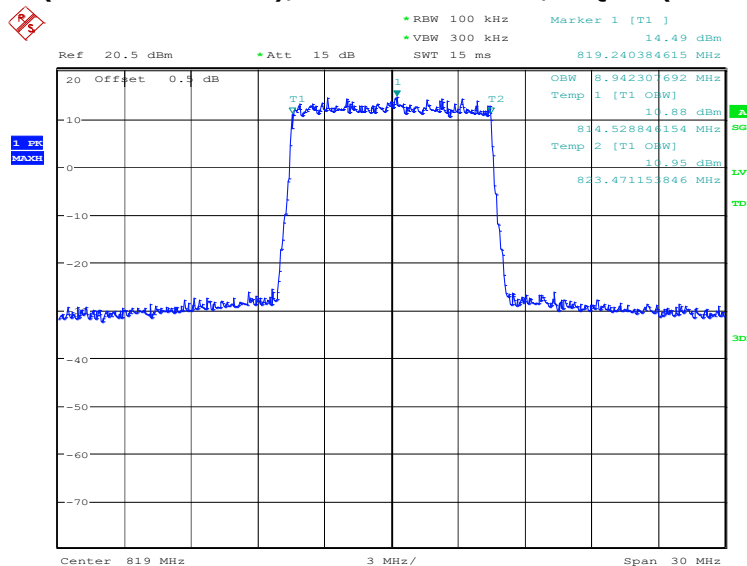
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
819.0	QPSK	16QAM
	8942.31	8942.31

LTE band 26(814MHz~824MHz), 10MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:59:53

LTE band 26(814MHz~824MHz), 10MHz Bandwidth, 16QAM (99% BW)

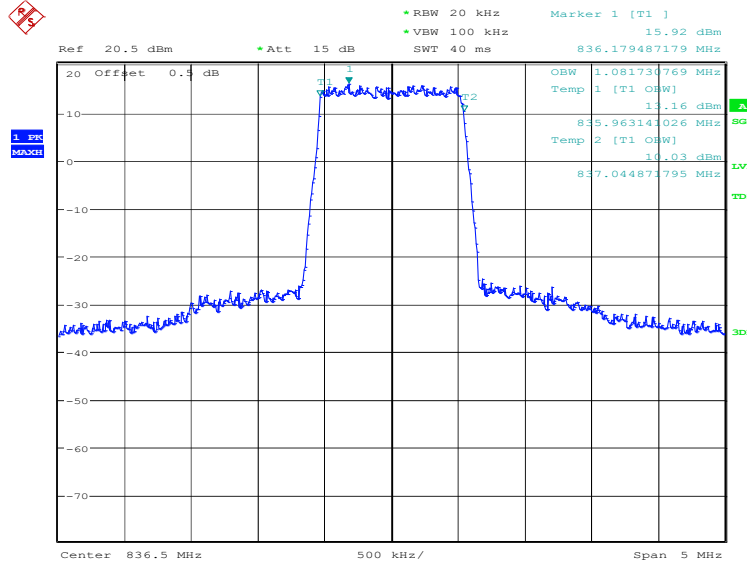


Date: 6.DEC.2022 17:00:33

LTE band 26(824MHz~849MHz), 1.4MHz (99%)

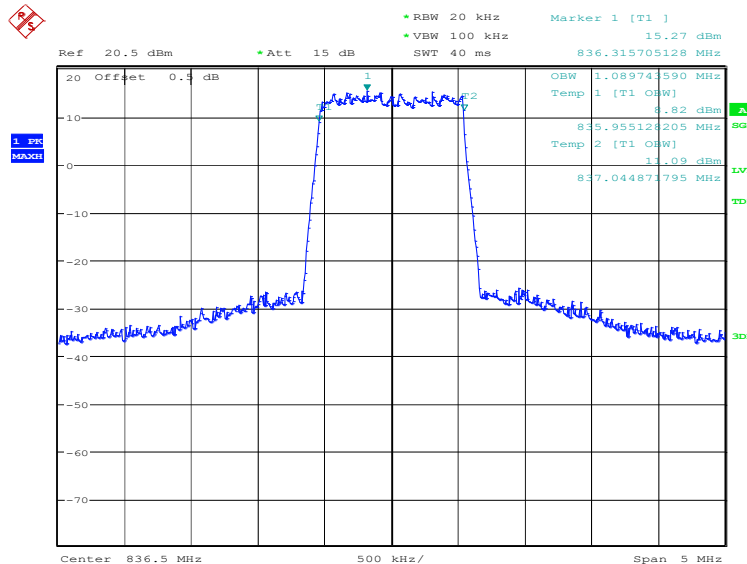
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	1081.73	1089.74

LTE band 26(824MHz~849MHz), 1.4MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:47:49

LTE band 26(824MHz~849MHz), 1.4MHz Bandwidth, 16QAM (99% BW)

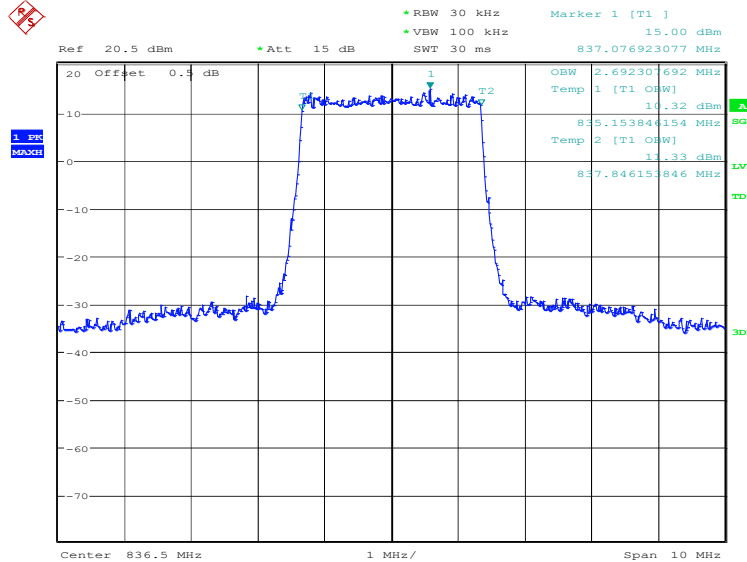


Date: 6.DEC.2022 16:48:29

LTE band 26(824MHz~849MHz), 3MHz (99%)

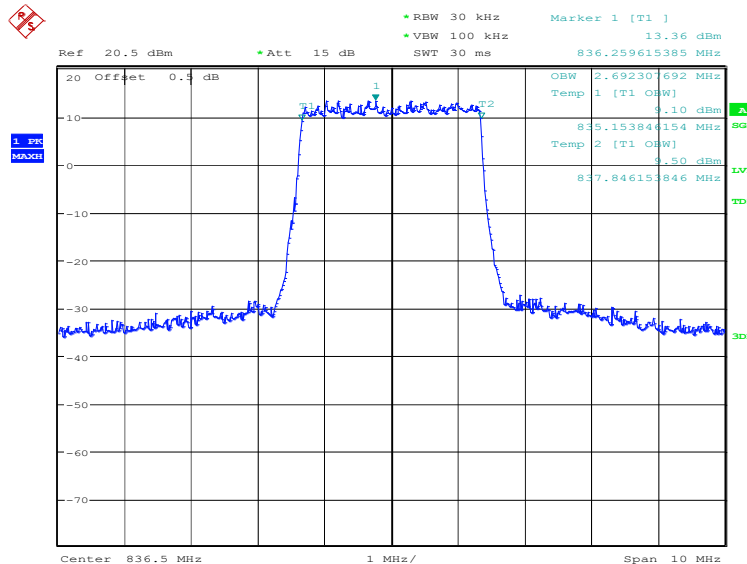
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	2692.31	2692.31

LTE band 26(824MHz~849MHz), 3MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:49:15

LTE band 26(824MHz~849MHz), 3MHz Bandwidth, 16QAM (99% BW)

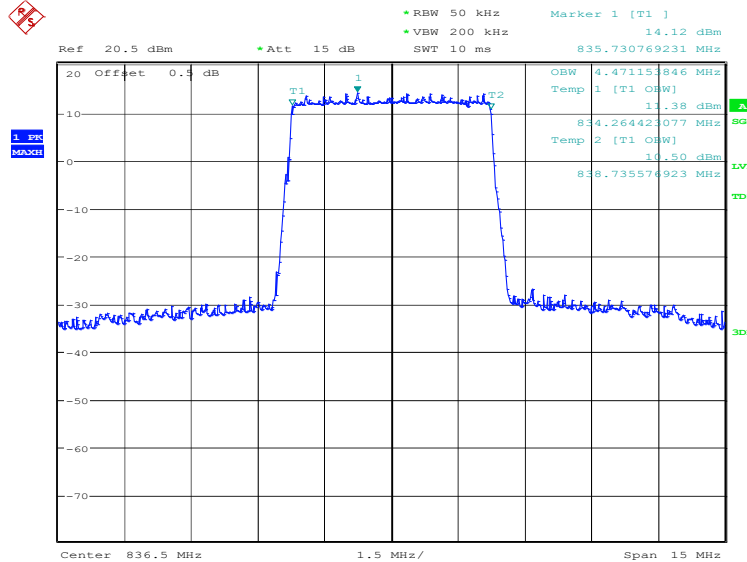


Date: 6.DEC.2022 16:49:55

LTE band 26(824MHz~849MHz), 5MHz (99%)

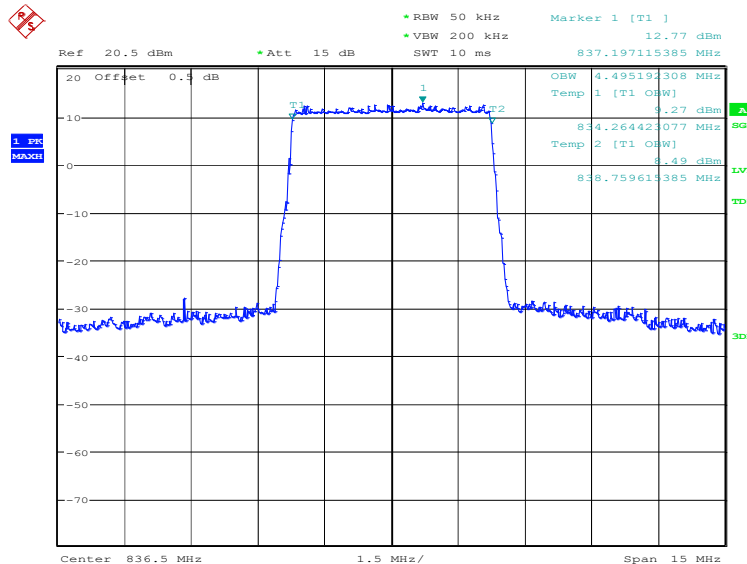
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	4471.15	4495.19

LTE band 26(824MHz~849MHz), 5MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:50:40

LTE band 26(824MHz~849MHz), 5MHz Bandwidth, 16QAM (99% BW)

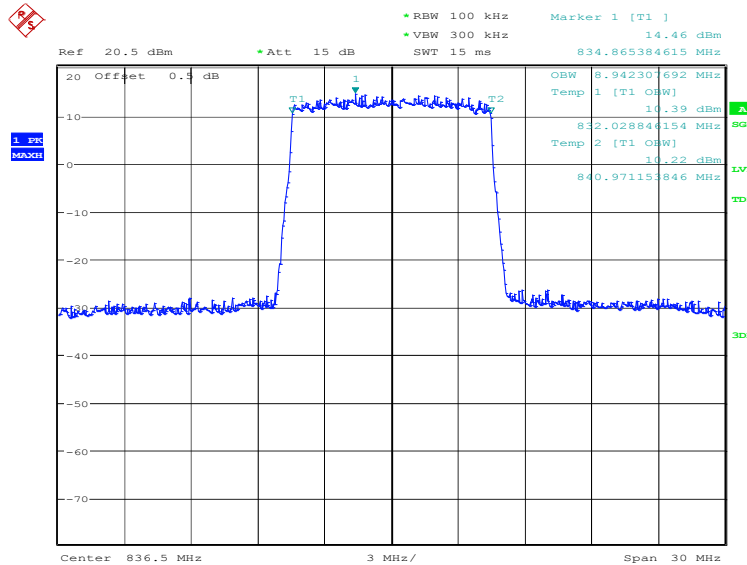


Date: 6.DEC.2022 16:51:20

LTE band 26(824MHz~849MHz), 10MHz (99%)

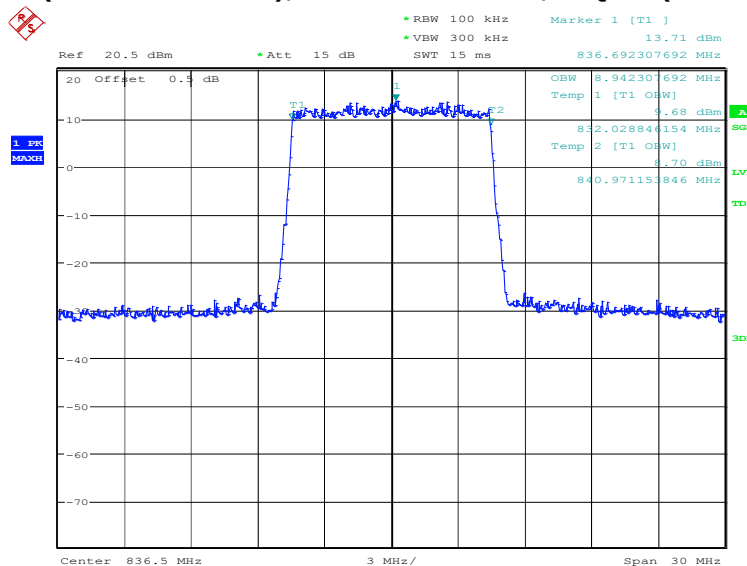
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	8942.31	8942.31

LTE band 26(824MHz~849MHz), 10MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:52:05

LTE band 26(824MHz~849MHz), 10MHz Bandwidth, 16QAM (99% BW)

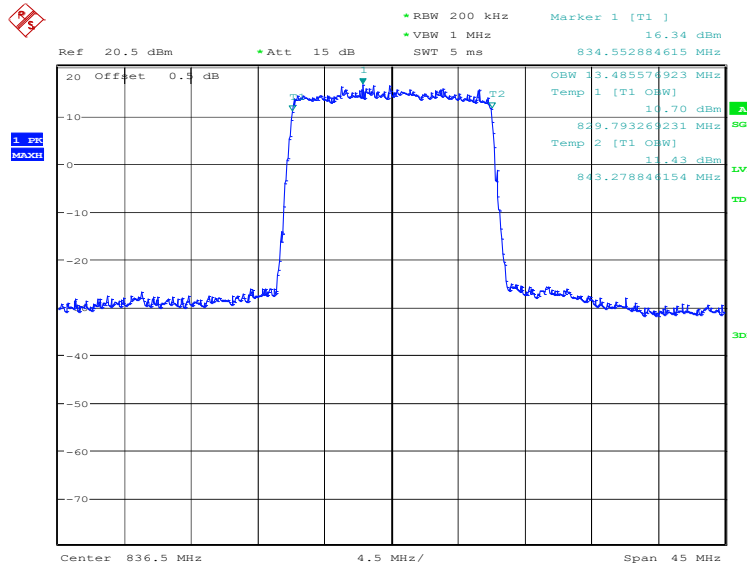


Date: 6.DEC.2022 16:52:45

LTE band 26(824MHz~849MHz), 15MHz (99%)

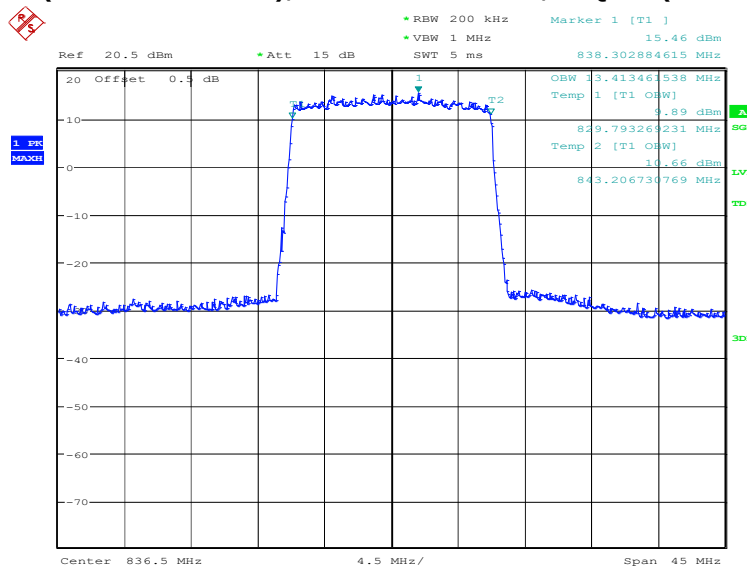
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	13485.58	13413.46

LTE band 26(824MHz~849MHz), 15MHz Bandwidth, QPSK (99% BW)



Date: 6.DEC.2022 16:53:30

LTE band 26(824MHz~849MHz), 15MHz Bandwidth, 16QAM (99% BW)



Date: 6.DEC.2022 16:54:10