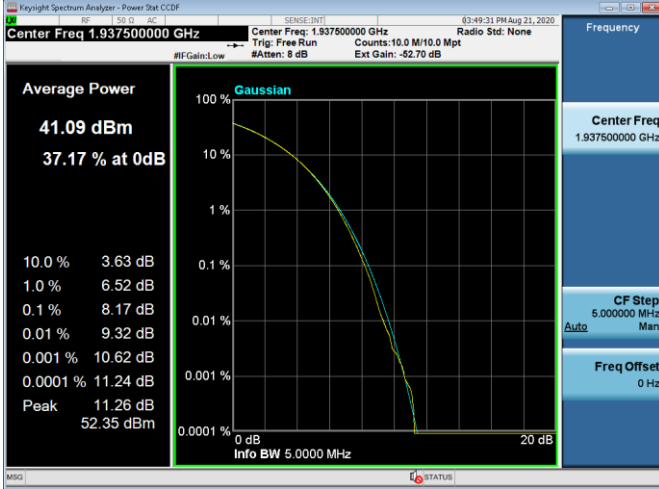
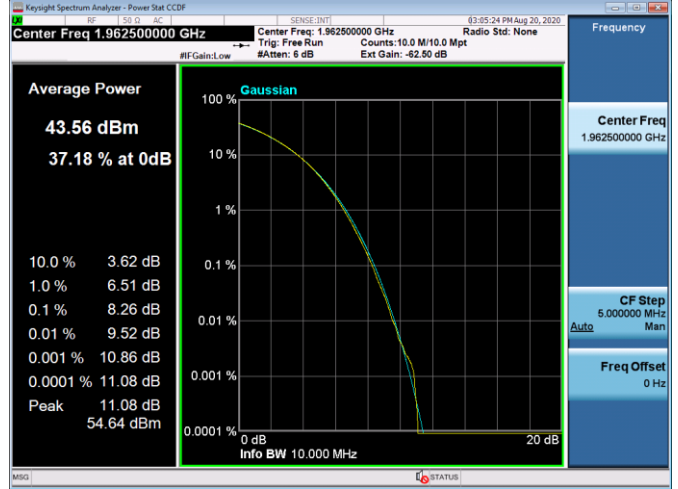


3 Carrier Data

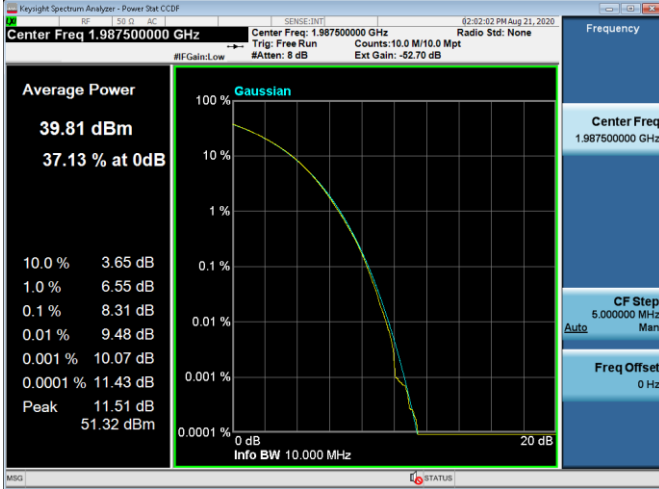
TM3.1a_5+5+5MBW_1932_1937_1992_TX4_LTE+LTE+5G-NR



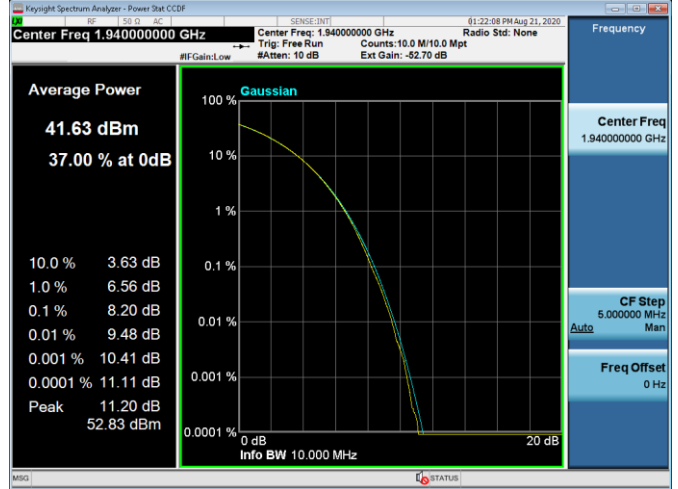
TM3.2_5+5+10MBW_1932_1962_1990_TX1_LTE+LTE+5G-NR



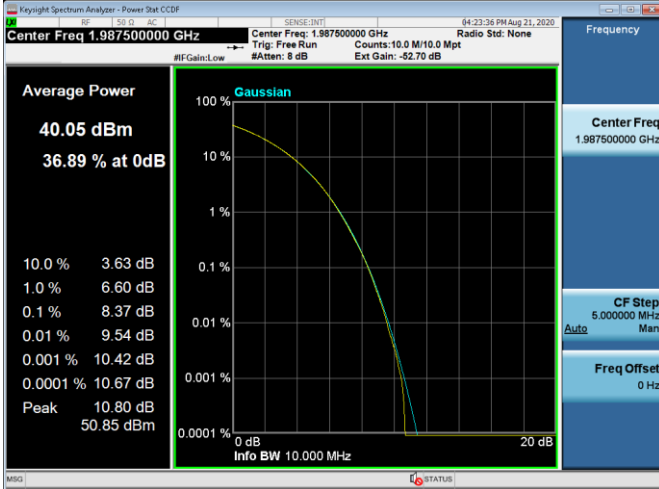
TM3.1_5+5+15MBW_1932_1937_1987_TX4_LTE+LTE+5G-NR



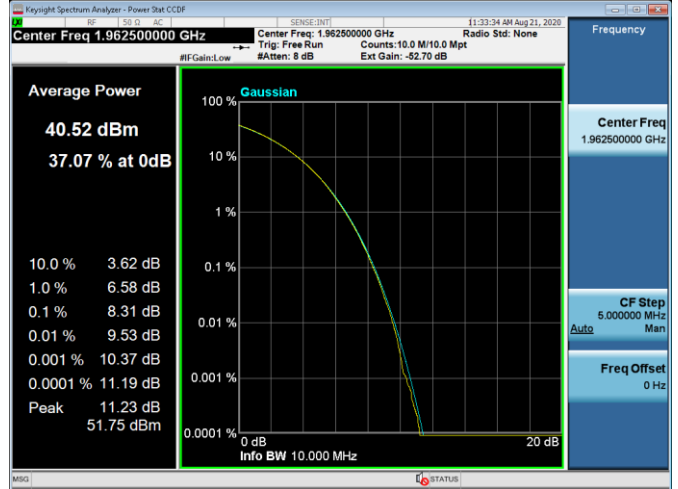
TM3.2_5+10+10MBW_1932_1940_1990_TX4_LTE+LTE+5G-NR



TM3.1_10+5+15MBW_1940_1977_1987_TX4_5G-NR+LTE+LTE



TM3.1a_10+10+10MBW_1935_1962_1990_TX4_LTE+LTE+5G-NR



3. FCC Section 2.1047 - Modulation Characteristics

3.1 Modulation Characteristics

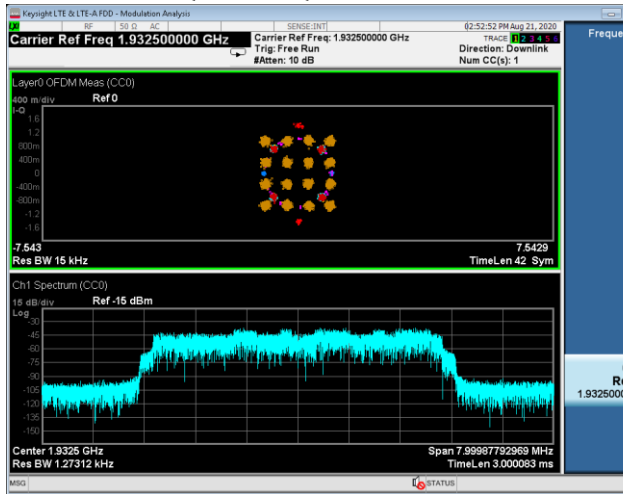
The RF signal at the antenna port was demodulated and verified for correctness of the modulation signal used before each test was performed. For these products the operation with QPSK, 16QAM, 64QAM and 256QAM modulation was evaluated and verified to demonstrate proper operation before testing.

3.1.1 Modulation Characteristics – Plots.

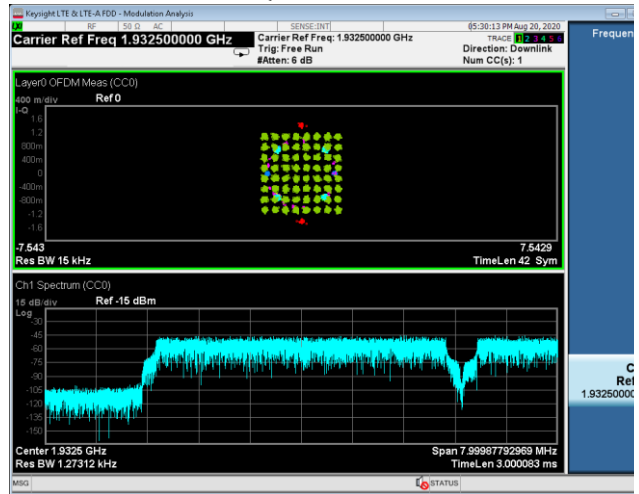
NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

LTE Data

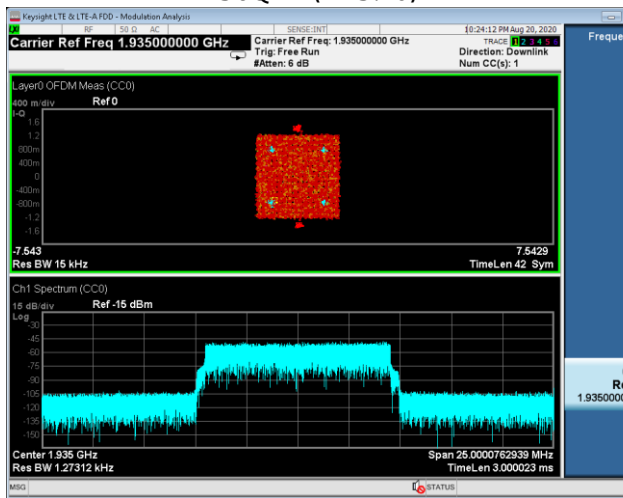
QPSK+16QAM (TM3.2)



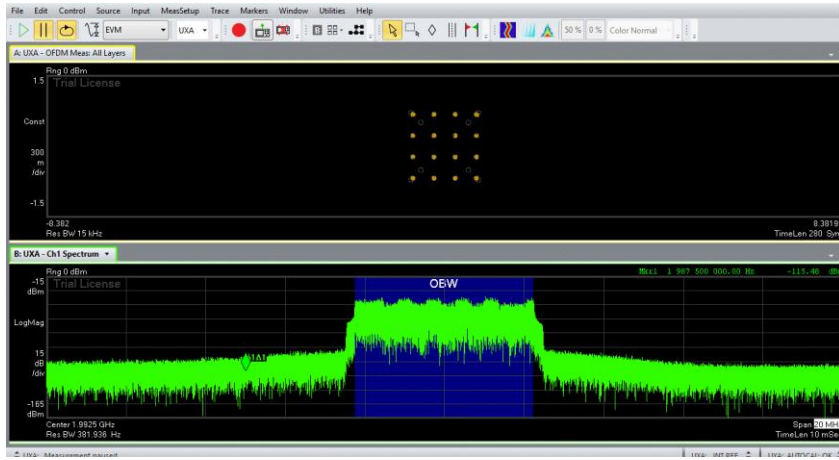
64QAM (TM3.1)



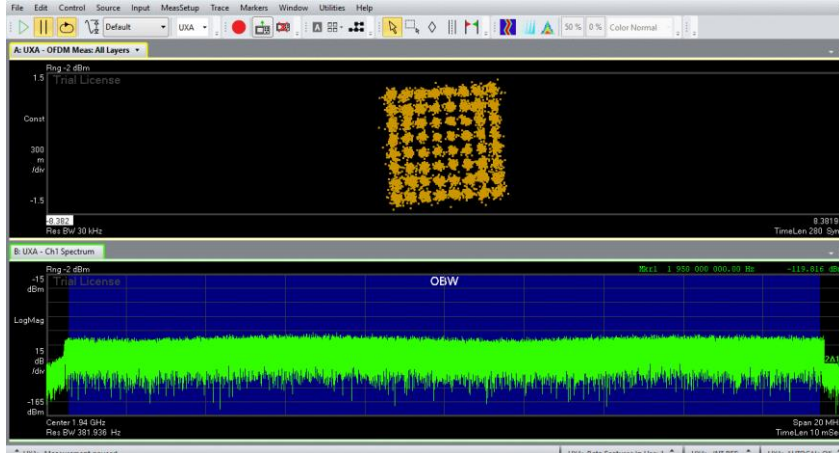
256QAM (TM3.1a)



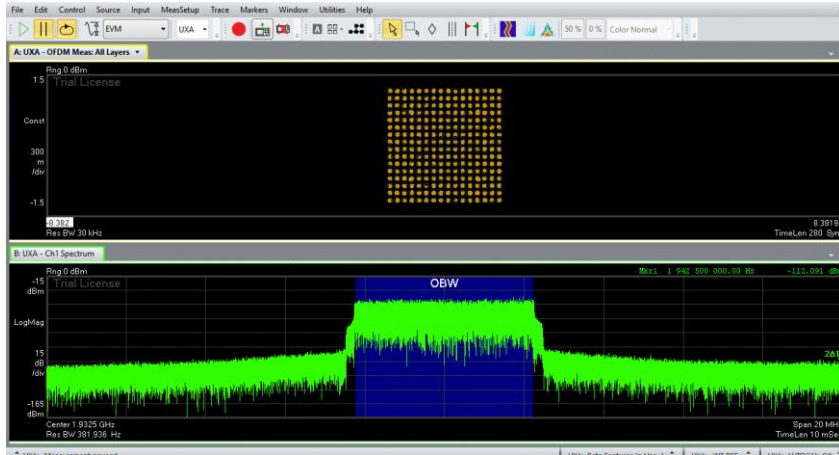
5G-NR Data QPSK+16QAM (TM3.2)



64QAM (TM3.1)



256QAM (TM3.1a)



4. FCC Section 2.1049 – Occupied Bandwidth/Edge of Band Emissions

4.1 Occupied Bandwidth

In 47CFR 2.1049 the FCC requires:

“The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable.”

This required measurement is the 99% Occupied Bandwidth, also called the designated signal bandwidth and needs to be within the parameters of the products specified emissions designator. During these measurements it is customary to evaluate the Edge of Band emissions at block/band edges.

The transmitted signal occupied bandwidth was measured using a Keysight MXA Signal Analyzer. All emissions were within the parameters as required.

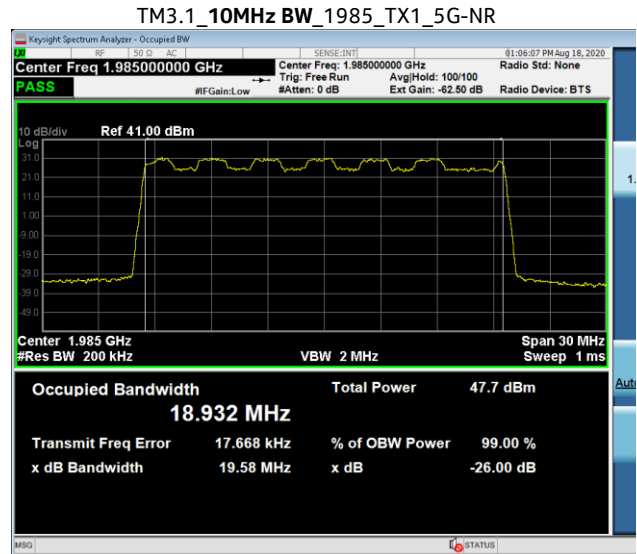
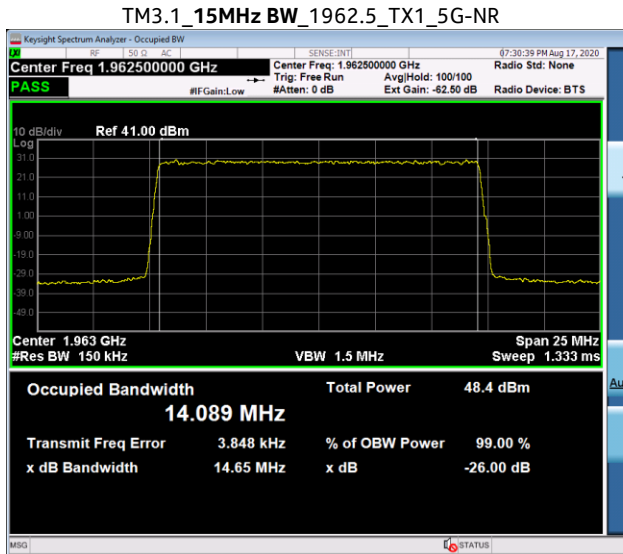
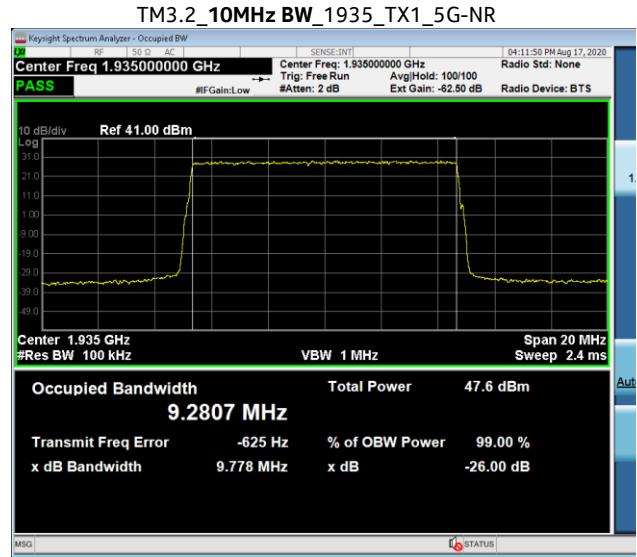
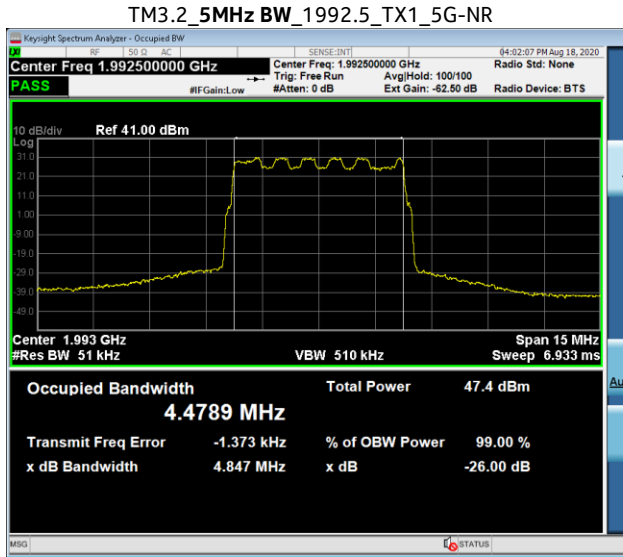
Tabular Data – Occupied Bandwidth

# of Carriers	Test Model	Modulation	TX Port	Channel Frequency MHz	Signal BW MHz	Radio Access Technology	Occupied BW MHz
1	3.1	64QAM	1	1932.5	5	5G-NR	4.4622
1	3.1	64QAM	1	1962.5	5	5G-NR	4.4646
1	3.2	QPSK/16QAM	1	1992.5	5	5G-NR	4.4789
1	3.2	QPSK/16QAM	1	1935	10	5G-NR	9.2807
1	3.1a	256QAM	1	1962.5	10	5G-NR	9.2643
1	3.1	64QAM	1	1990	10	5G-NR	9.2596
1	3.1a	256QAM	1	1937.5	15	5G-NR	14.074
1	3.1	64QAM	1	1962.5	15	5G-NR	14.089
1	3.2	QPSK/16QAM	1	1987.5	15	5G-NR	14.077
1	3.1a	256QAM	1	1940	20	5G-NR	18.901
1	3.1	64QAM	1	1962.5	20	5G-NR	18.904
1	3.1	64QAM	1	1985	20	5G-NR	18.932
2	3.1a	256QAM	4	1932+1992	5+5	5G-NR+LTE	4.4625+4.4787
2	3.1a	256QAM	1	1932+1992	5+5	5G-NR+LTE	4.4560+4.4795
2	3.1	64QAM	4	1932+1990	5+10	LTE+5G-NR	4.5096+9.2741
2	3.1	64QAM	1	1932+1990	5+10	LTE+5G-NR	4.4997+9.2729
2	3.1	64QAM	4	1935+1990	10+10	LTE+5G-NR	8.9396+9.2721
2	3.1	64QAM	1	1935+1990	10+10	LTE+5G-NR	8.9402+9.2653
2	3.1	64QAM	4	1935+1987	10+15	LTE+5G-NR	8.9399+14.076
2	3.1	64QAM	1	1935+1987	10+15	LTE+5G-NR	8.9546+14.087
2	3.2	QPSK/16QAM	4	1937+1992	15+5	5G-NR+LTE	14.122+4.5015
2	3.2	QPSK/16QAM	1	1937+1992	15+5	5G-NR+LTE	14.157+4.5166
2	3.2	QPSK/16QAM	4	1940+1992	20+5	5G-NR+LTE	18.941+4.4943
2	3.2	QPSK/16QAM	1	1940+1992	20+5	5G-NR+LTE	18.954+4.5242
3	3.1a	256QAM	4	1932+1937+1992	5+5+5	LTE+LTE+5G-NR	9.4310+4.4582
3	3.1a	256QAM	1	1932+1937+1992	5+5+5	LTE+LTE+5G-NR	9.4269+4.4609
3	3.2	QPSK/16QAM	4	1932+1962+1990	5+5+10	LTE+LTE+5G-NR	4.4861+4.4911+9.2219
3	3.2	QPSK/16QAM	1	1932+1962+1990	5+5+10	LTE+LTE+5G-NR	4.4572+4.4816+9.2292
3	3.2	QPSK/16QAM	1	1932+1937+1990	5+5+10	LTE+LTE+5G-NR	9.4061+9.2205
3	3.1	64QAM	4	1932+1937+1987	5+5+15	LTE+LTE+5G-NR	9.4652+14.077
3	3.1	64QAM	1	1932+1937+1987	5+5+15	LTE+LTE+5G-NR	9.4587+14.091
3	3.2	QPSK/16QAM	4	1932+1940+1990	5+10+10	LTE+LTE+5G-NR	14.132+9.2235
3	3.2	QPSK/16QAM	1	1932+1940+1990	5+10+10	LTE+LTE+5G-NR	14.125+9.3336
3	3.1	64QAM	4	1940+1977+1987	10+5+15	5G-NR+LTE+LTE	9.2622+18.824
3	3.1	64QAM	1	1940+1977+1985	10+5+15	5G-NR+LTE+LTE	9.3009+9.7087+16.66
3	3.1a	256QAM	4	1935+1962+1990	10+10+10	LTE+LTE+5G-NR	8.9422+8.9368+9.2767
3	3.1a	256QAM	1	1935+1962+1990	10+10+10	LTE+LTE+5G-NR	8.9364+8.9340+9.2659

4.1.1 Occupied Bandwidth – Plots.

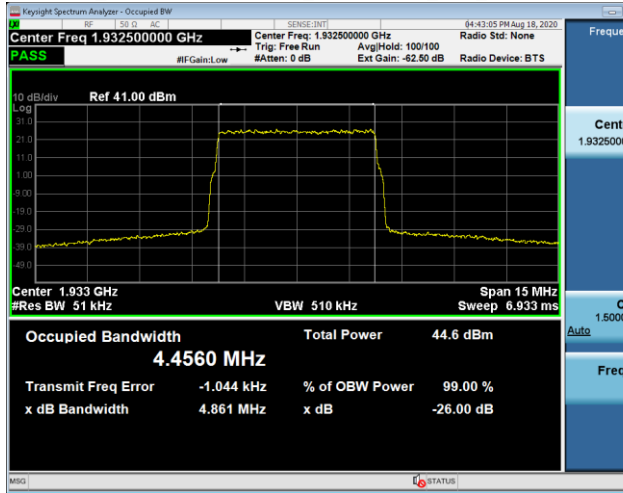
NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

1 Carrier Data

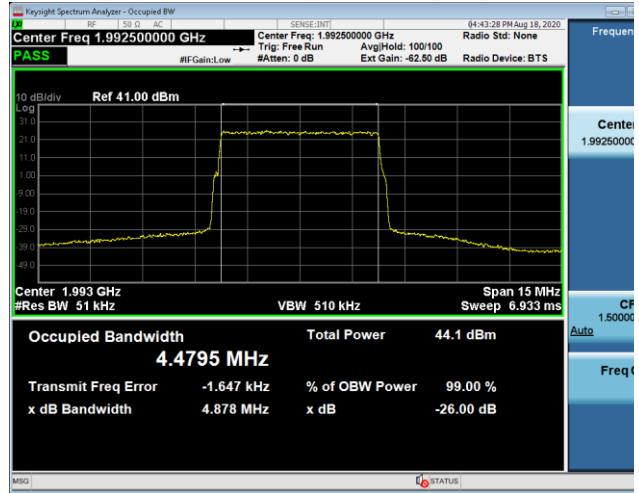


2 Carrier Data

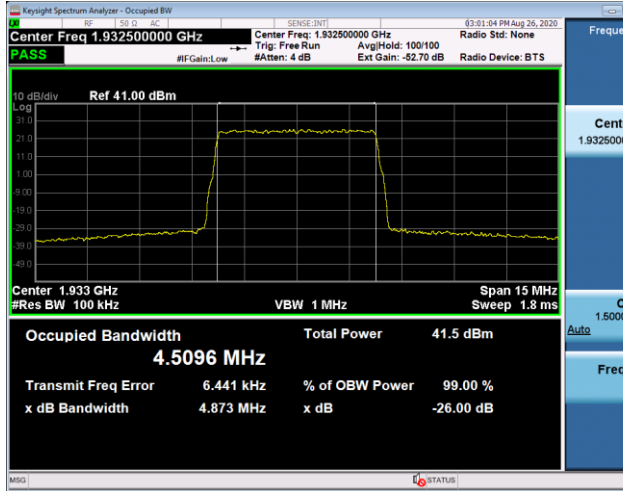
TM3.1a_5+5 MHz BW (1932)_1932+1992_TX1_5G-NR+LTE



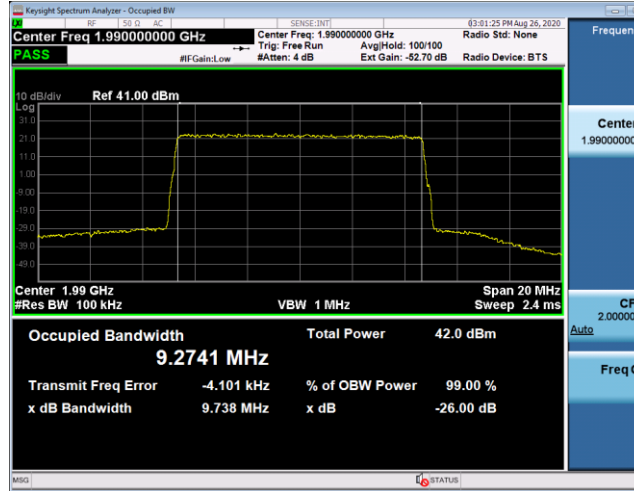
TM3.1a_5+5 MHz BW (1992)_1932+1992_TX1_5G-NR+LTE



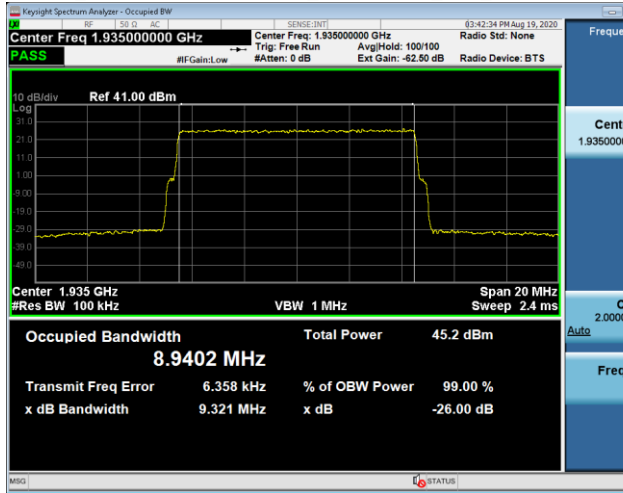
TM3.1_5+10 MHz BW (1932)_1932+1990_TX4_LTE+5G-NR



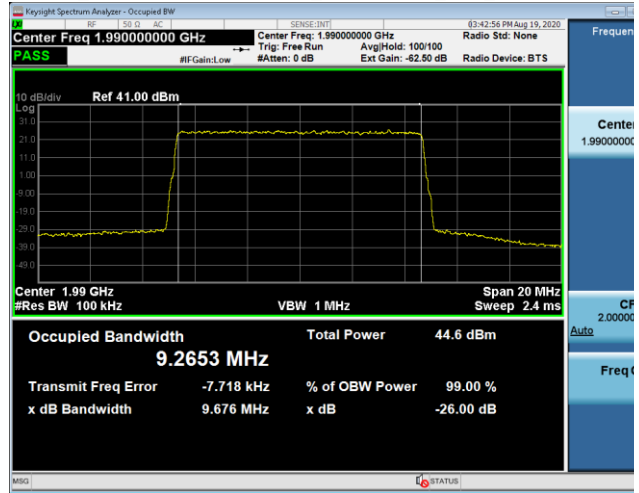
TM3.1_5+10 MHz BW (1990)_1932+1990_TX4_LTE+5G-NR



TM3.1_10+10 MHz BW (1935)_1935+1990_TX1_LTE+5G-NR

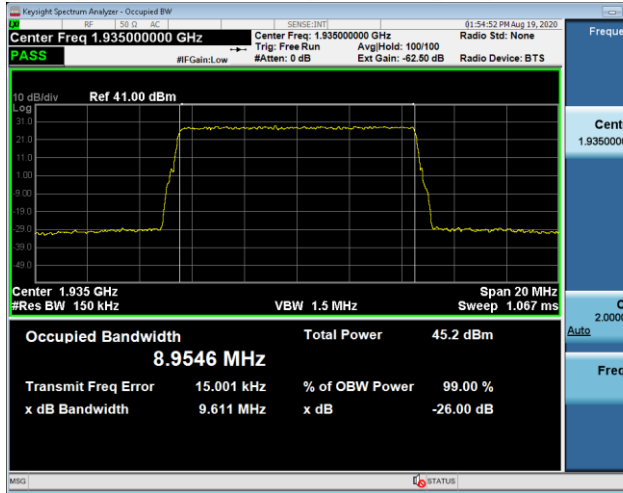


TM3.1_10+10 MHz BW (1990)_1935+1990_TX1_LTE+5G-NR

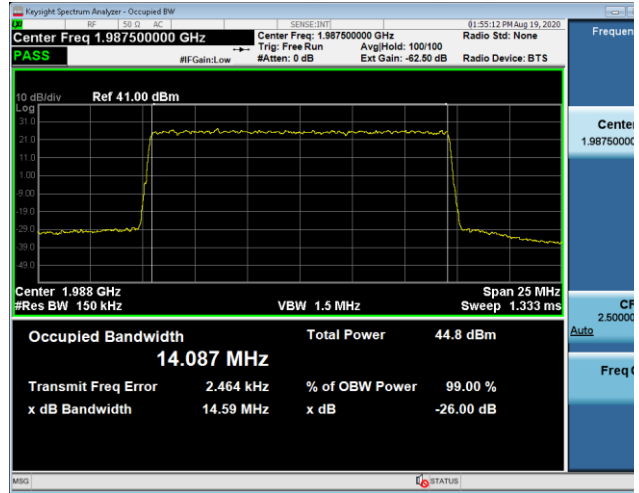


2 Carrier Data

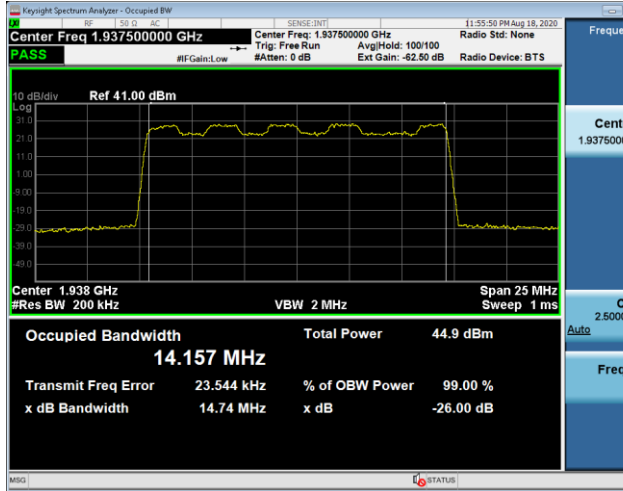
TM3.1_10+15 MHz BW (1935)_1935+1987_TX1_LTE+5G-NR



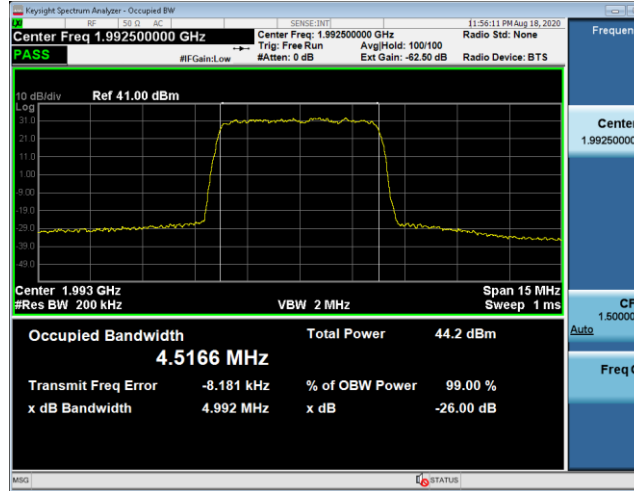
TM3.1_10+15 MHz BW (1987)_1935+1987_TX1_LTE+5G-NR



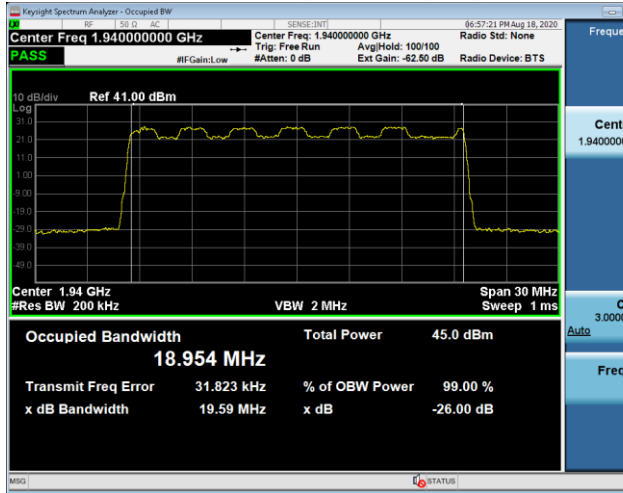
TM3.2_15+5 MHz BW (1937)_1937+1992_TX1_5G-NR+LTE



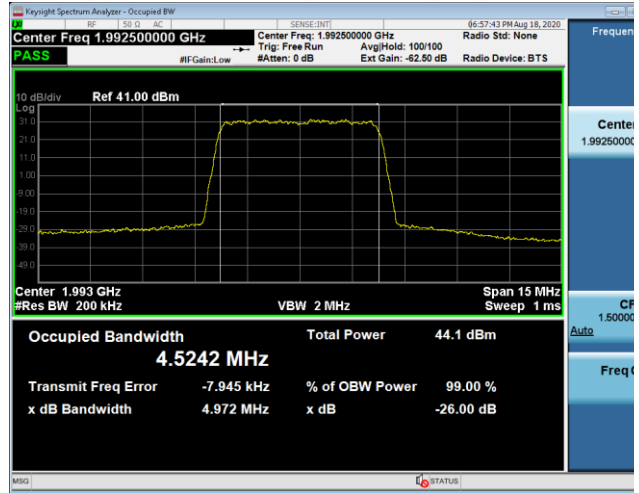
TM3.2_15+5 MHz BW (1992)_1937+1992_TX1_5G-NR+LTE



TM3.2_20+5 MHz BW (1940)_1940+1992_TX1_5G-NR+LTE

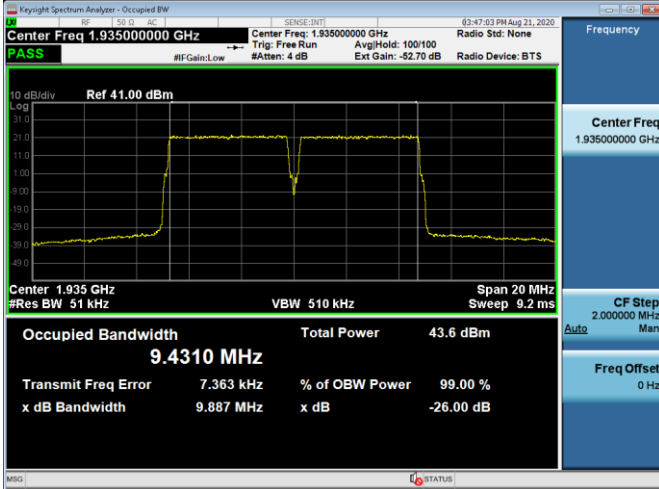


TM3.2_20+5 MHz BW (1992)_1940+1992_TX1_5G-NR+LTE

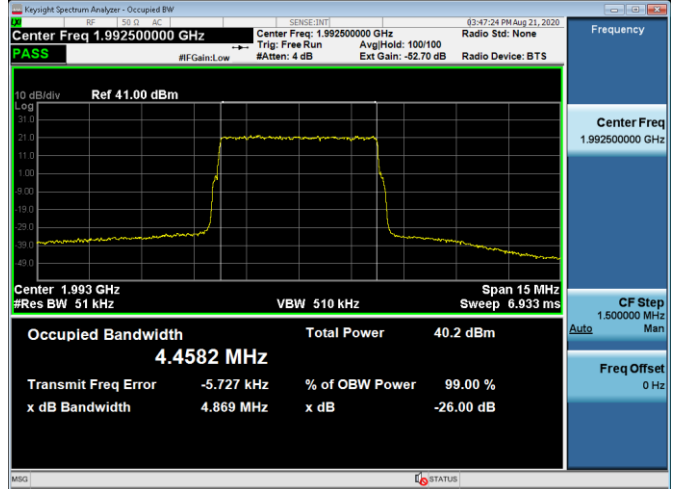


3 Carrier Data

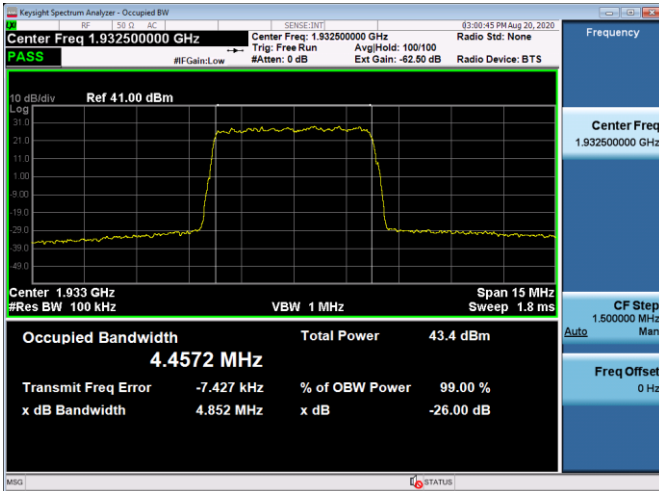
TM3.1a_5+5+5 MHz BW (1935)_1932+1937+1992_TX4_LTE+LTE+ 5G-NR



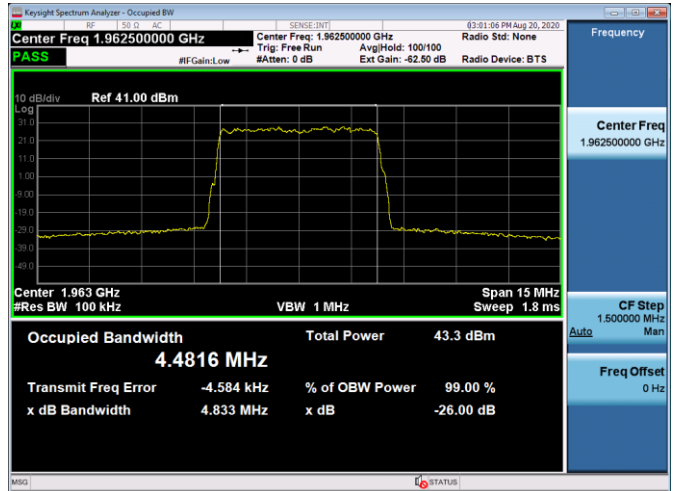
TM3.1a_5+5+5 MHz BW (1992)_1932+1937+1992_TX4_LTE+LTE+ 5G-NR



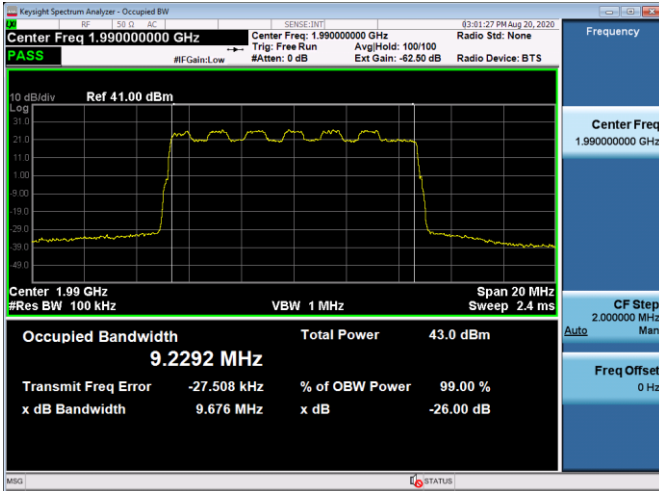
TM3.2_5+5+10 MHz BW (1932)_1932+1962+1990_TX1_LTE+LTE+ 5G-NR



TM3.2_5+5+10 MHz BW (1962)_1932+1962+1990_TX1_LTE+LTE+ 5G-NR

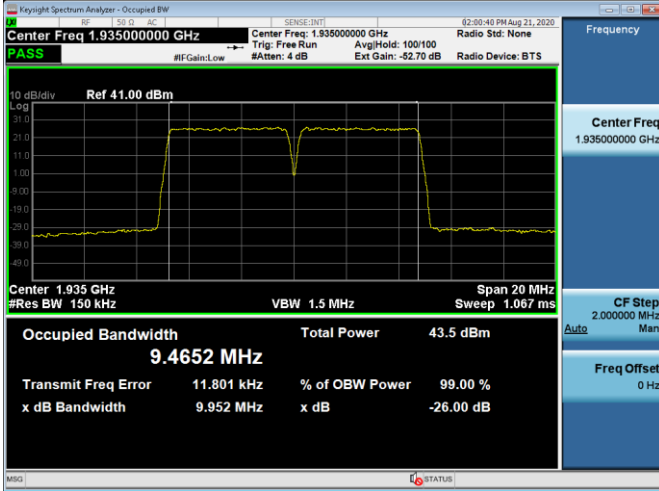


TM3.2_5+5+10 MHz BW (1990)_1932+1962+1990_TX1_LTE+LTE+ 5G-NR

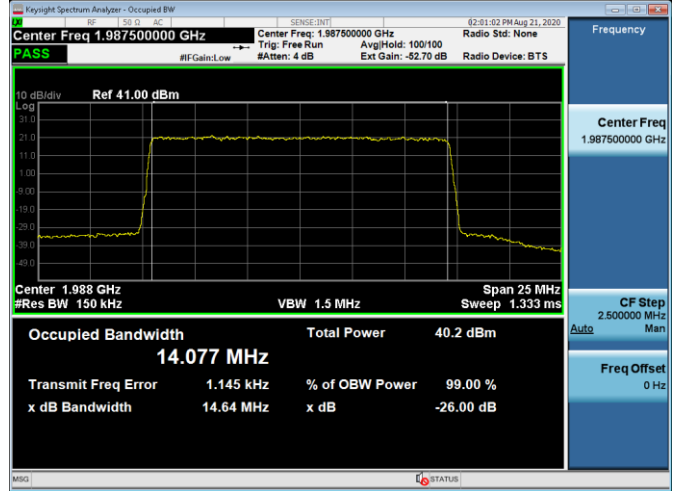


3 Carrier Data

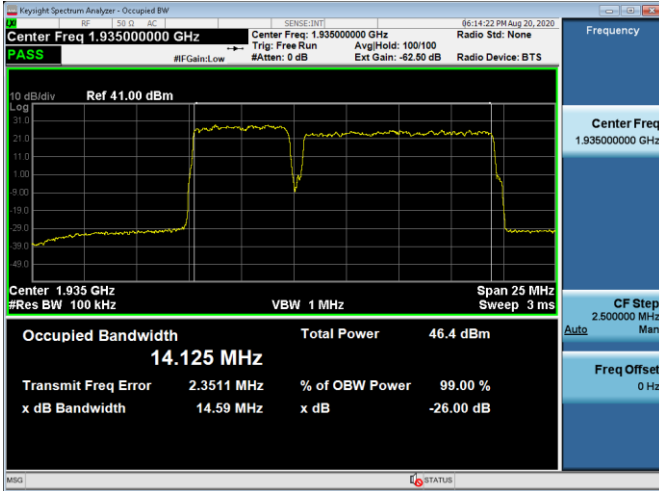
TM3.1_5+5+15 MHz BW (1935)_1932+1937+1987_TX4_LTE+LTE+ 5G-NR



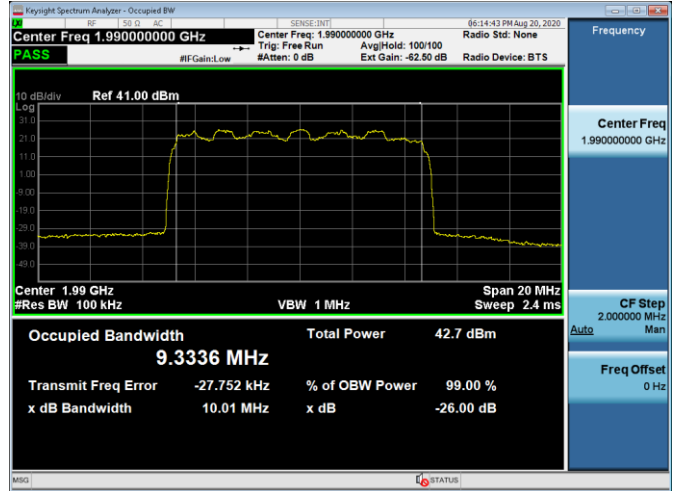
TM3.1_5+5+15 MHz BW (1987)_1932+1937+1987_TX4_LTE+LTE+ 5G-NR



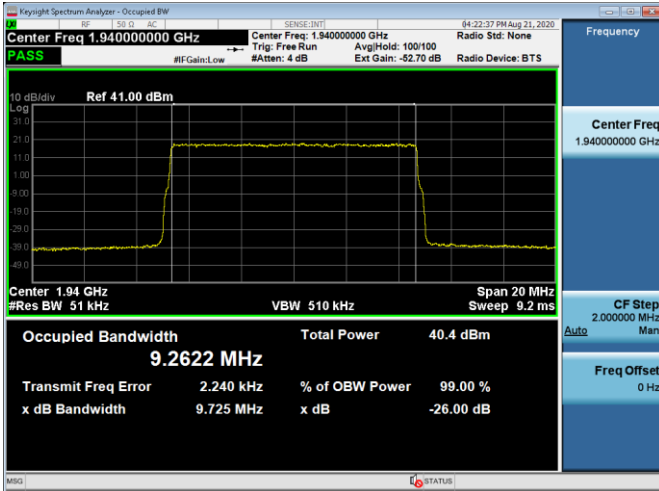
TM3.2_5+10+10 MHz BW (1935)_1932+1940+1990_TX1_LTE+LTE+ 5G-NR



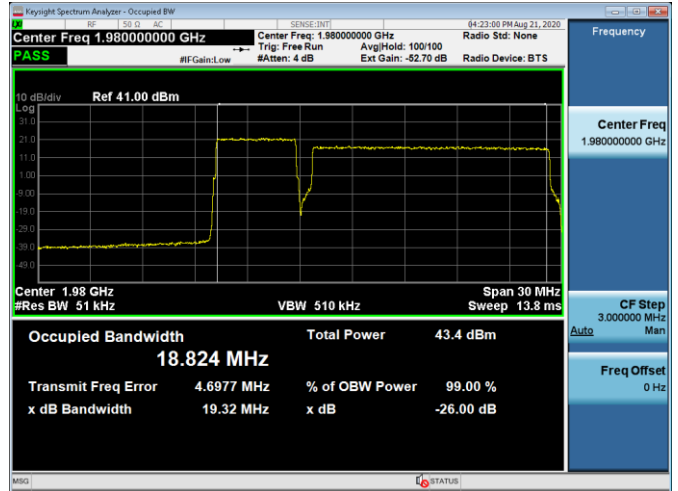
TM3.2_5+10+10 MHz BW (1990)_1932+1940+1990_TX1_LTE+LTE+ 5G-NR



TM3.1_10+5+15 MHz BW (1940)_1940+1977+1987_TX4_5G-NR+LTE+LTE

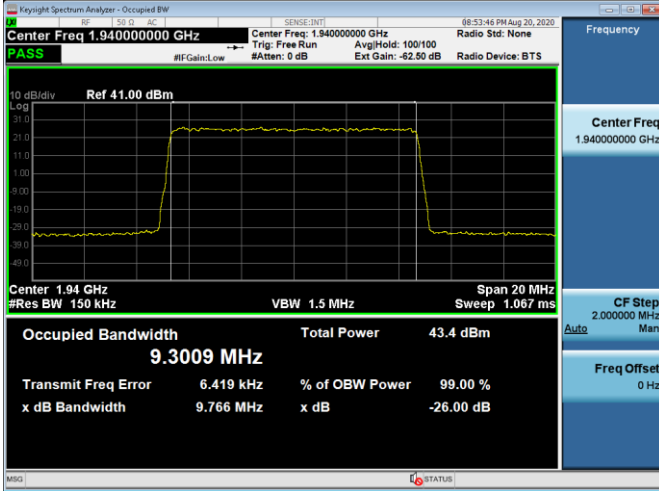


TM3.1_10+5+15 MHz BW (1980)_1940+1977+1987_TX4_5G-NR+LTE+LTE

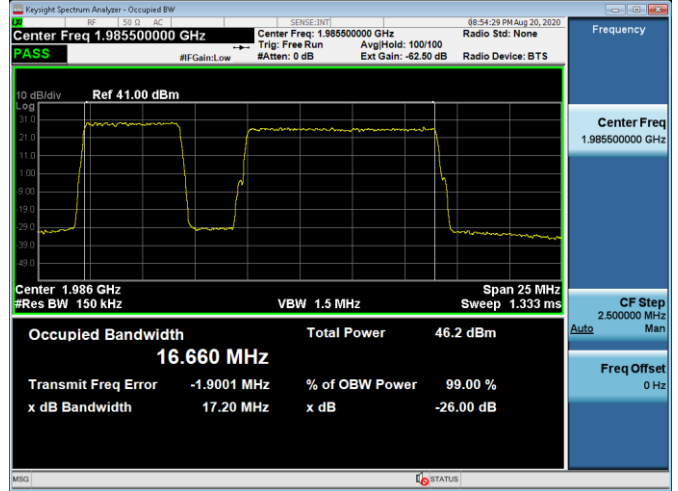


3 Carrier Data

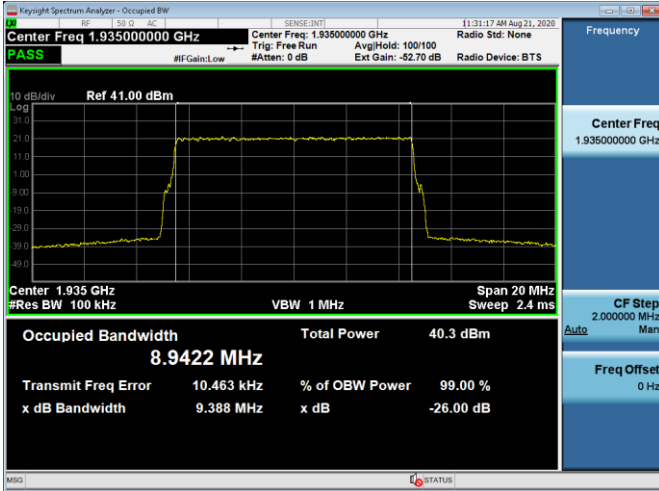
TM3.1_10+5+15 MHz BW (1940)_1940+1977+1985_TX1_5G-NR+LTE+LTE



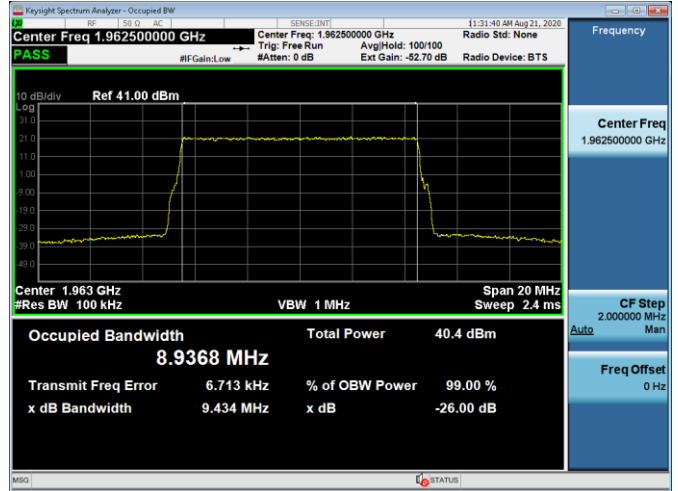
TM3.1_10+5+15 MHz BW (1985)_1940+1977+1985_TX1_5G-NR+LTE+LTE



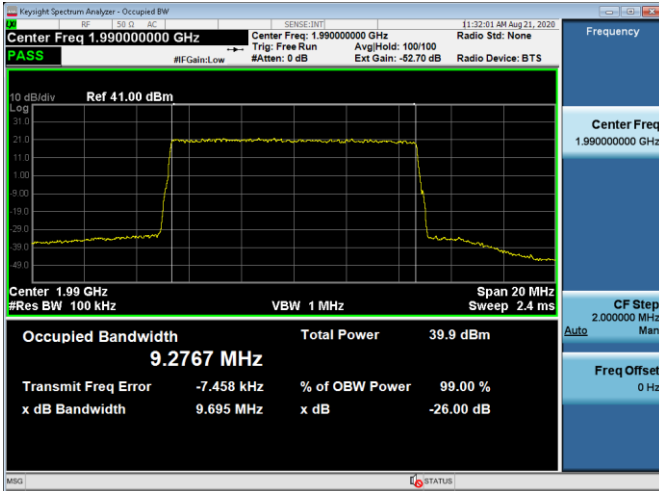
TM3.1a_10+10+10 MHz BW (1935)_1935+1962+1990_TX4_LTE+LTE+5G-NR



TM3.1a_10+10+10 MHz BW (1962)_1935+1962+1990_TX4_LTE+LTE+5G-NR



TM3.1a_10+10+10 MHz BW (1990)_1935+1962+1990_TX4_LTE+LTE+5G-NR



4.2 Edge of band Emissions

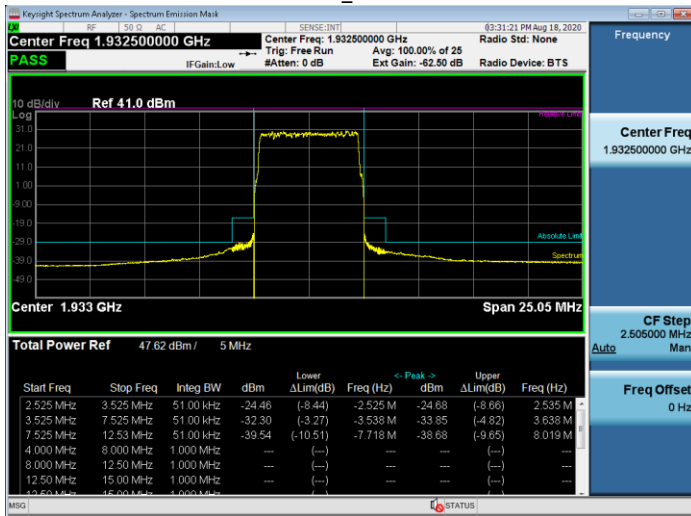
The Edge of Band emissions of the EUT at the external antenna connector (EAC) were measured using a Keysight MXA Signal Analyzer. The RF power level was continuously measured using a RF broadband power meter. The RF output from the EAC port to spectrum analyzer was reduced (to an amplitude usable by the spectrum analyzer) by using a calibrated attenuator and test coupler. The path attenuation was offset on the display and the signal for single carrier was adjusted to the corrected RF power level for the resolution bandwidth used for the transmit signal. All mask values were adjusted based upon the designated signal bandwidth and measurement bandwidths. The Top of Mask corresponds to the set rated power level as confirmed by the RF power meter.

4.2.1 Edge of Band Emissions - Plots.

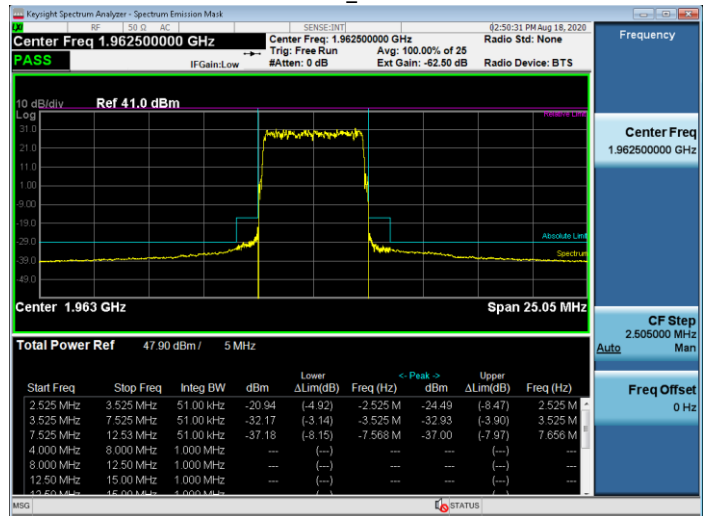
All of the measurements met the requirements of Part 24.238 when measured per Part 2.1049.

1 Carrier Data – 5MHz BW, TX1, 5G-NR

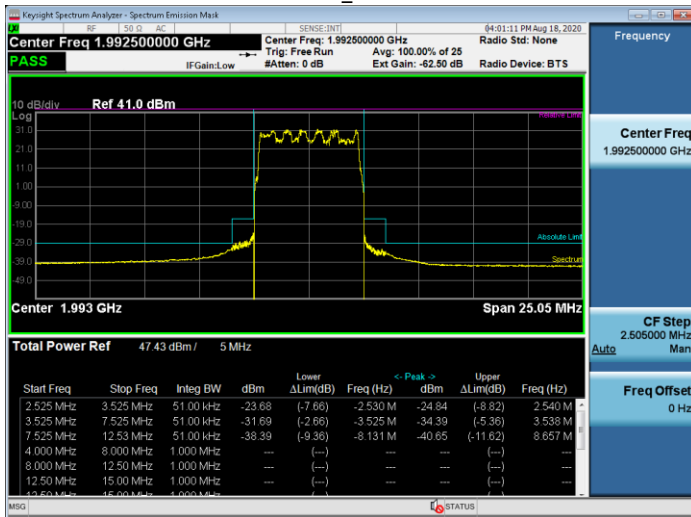
TM3.1_1932.5



TM3.1_1962.5

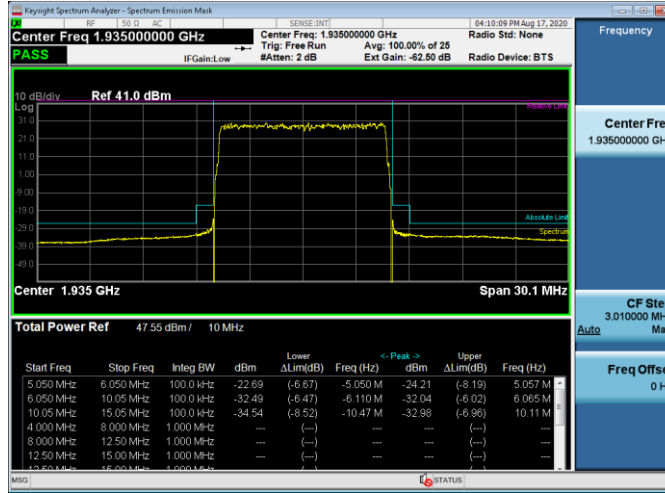


TM3.2_1992.5



1 Carrier Data – 10MHz BW, TX1, 5G-NR

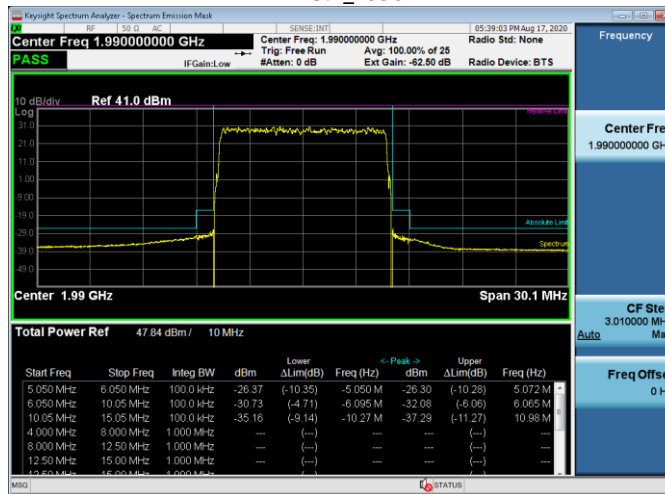
TM3.2_1935



TM3.1a_1962.5

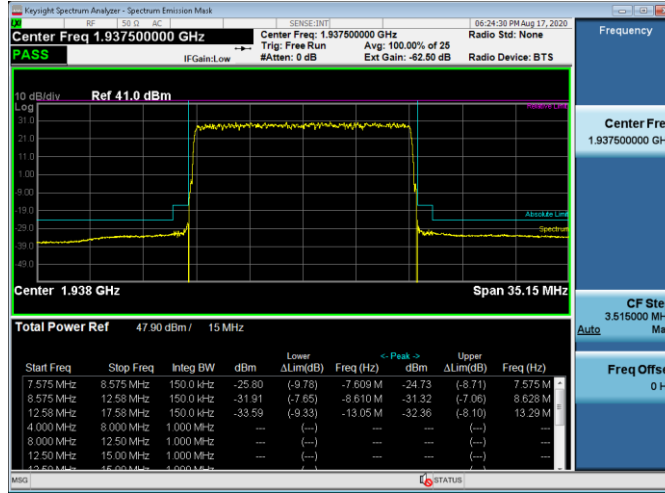


TM3.1_1990

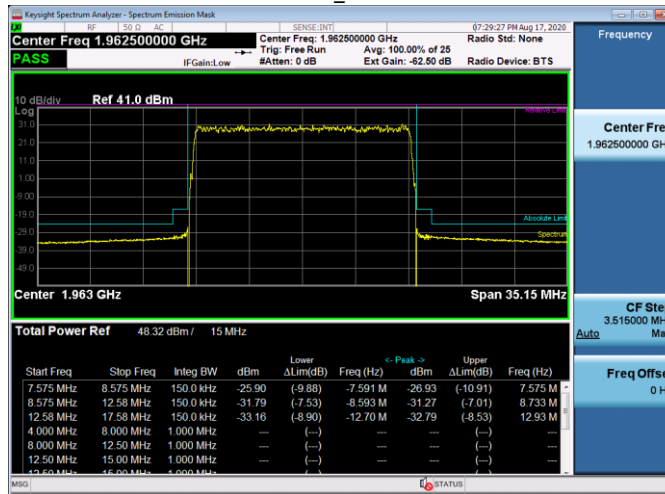


1 Carrier Data – 15MHz BW, TX1, 5G-NR

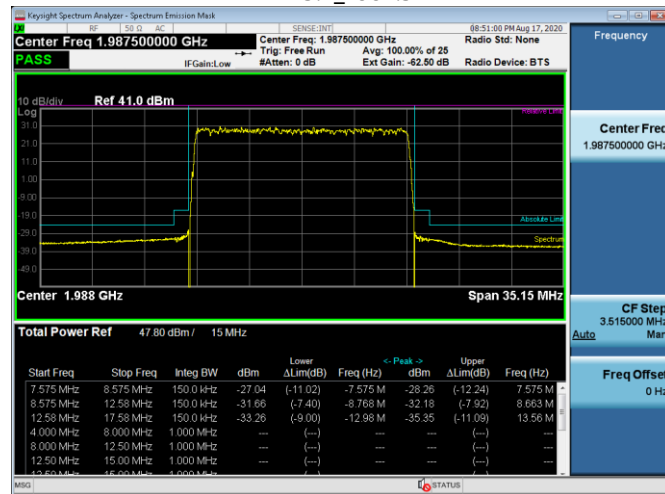
TM3.1a_1937.5



TM3.1_1962.5

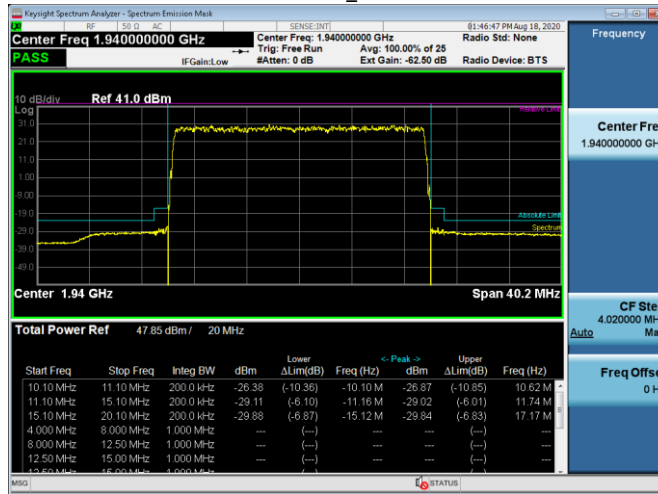


TM3.2_1987.5

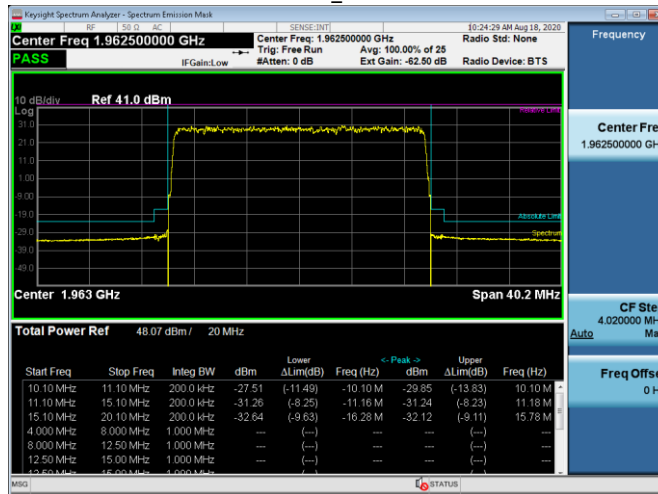


1 Carrier Data – 20MHz BW, TX1, 5G-NR

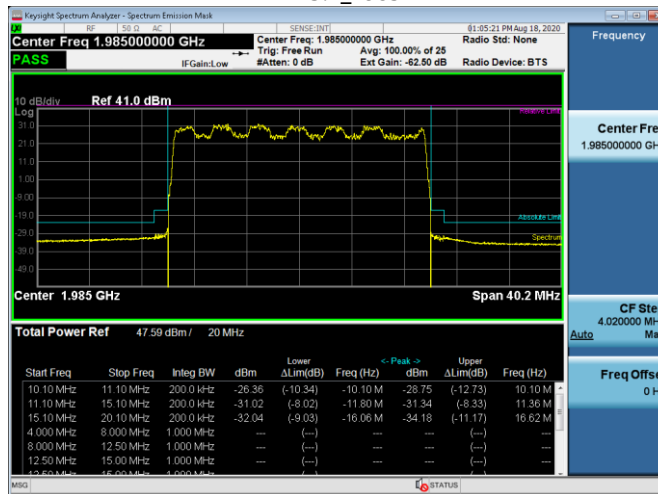
TM3.1a_1940



TM3.1_1962.5

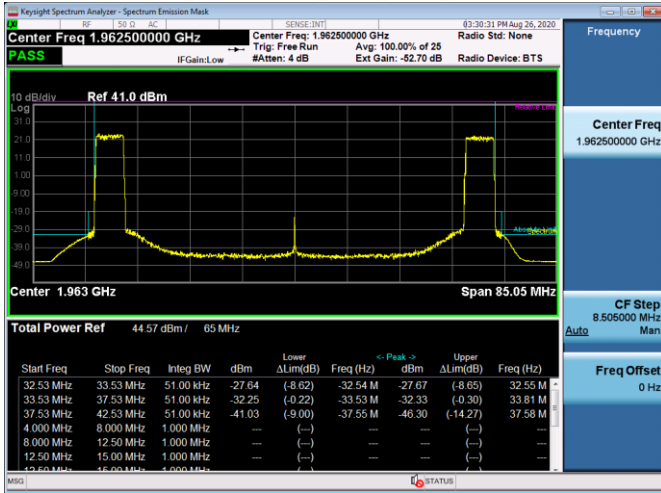


TM3.1_1985

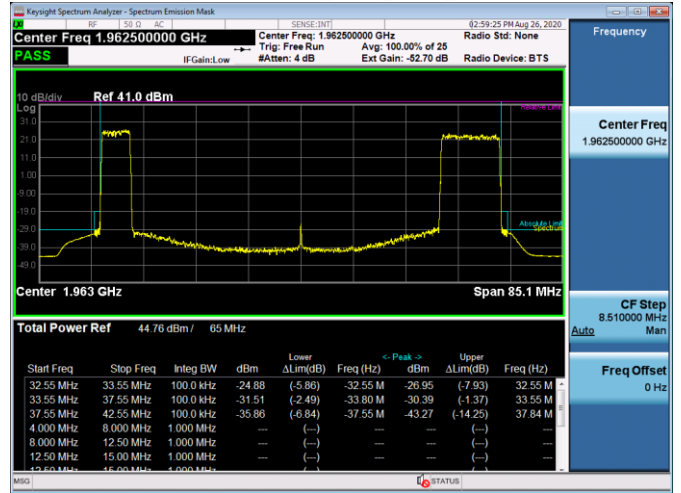


2 Carrier Data – TX4

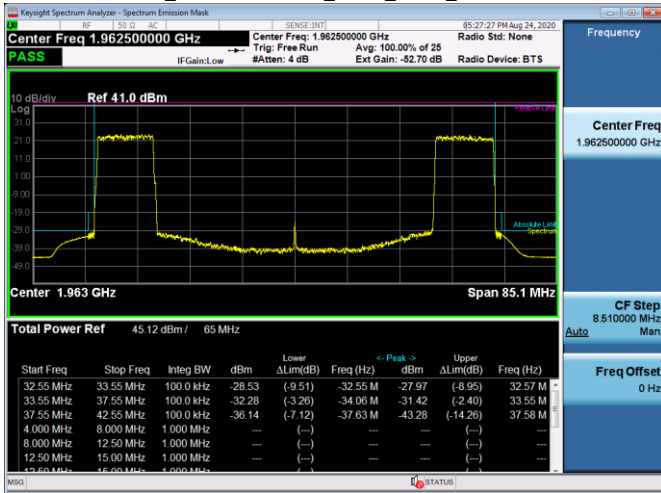
TM3.1a_5+5 MHz BW_1932_1992_5G-NR+LTE



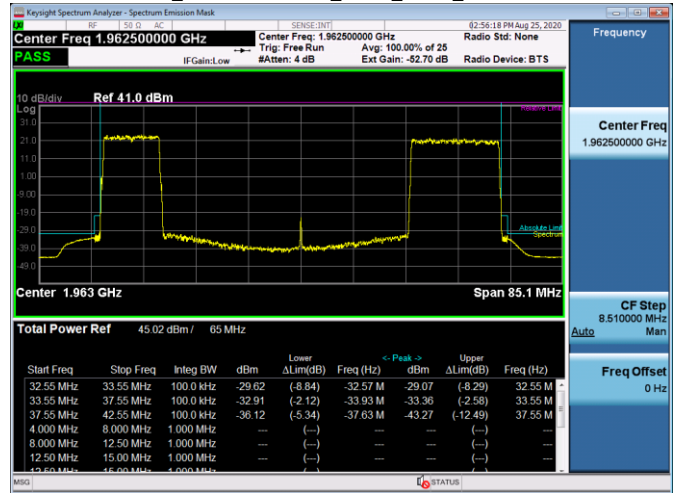
TM3.1_5+10MHz BW_1932_1990_LTE+5G-NR



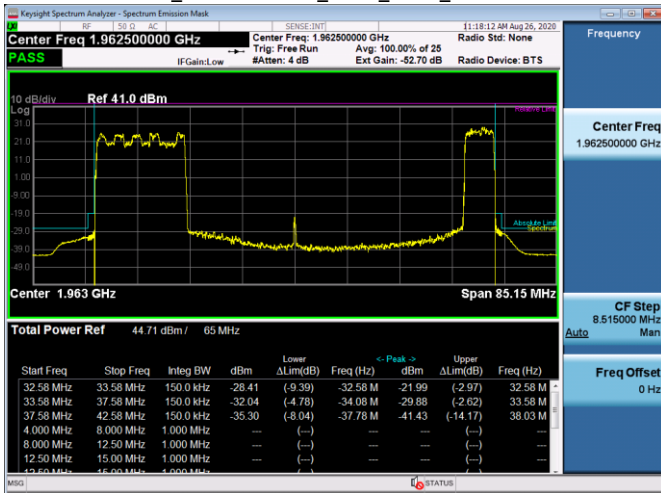
TM3.1_10+10 MHz BW_1935_1990_LTE+5G-NR



TM3.1_10+15 MHz BW_1935_1987_LTE+5G-NR



TM3.2_15+5 MHz BW_1937_1992_5G-NR+LTE



TM3.2_20+5 MHz BW_1940_1992_5G-NR+LTE

