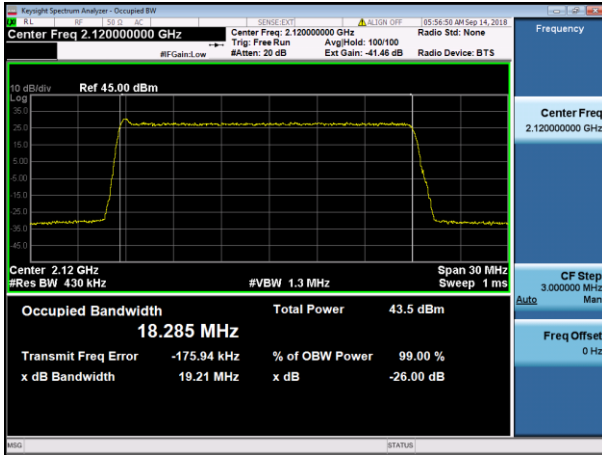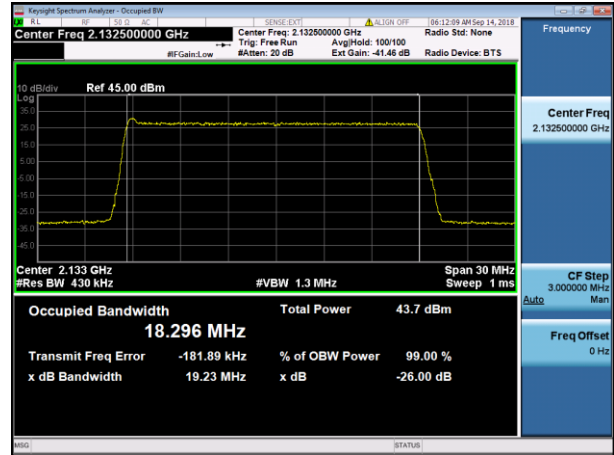**LTE20 plus NB IoT Guard Band Carrier in lower Guard Band (Lower) Bandwidth Plots**:

LTE20_Bottom Channel

LTE20_Middle Channel

LTE20_Top Channel

LTE10 and LTE15 plus NB IoT Guard Band Carrier in lower Guard Band (Upper) Bandwidth Plots:

LTE10_Bottom Channel

LTE15_Bottom Channel

LTE10_Middle Channel

LTE15_Middle Channel

LTE10_Top Channel

LTE15_Top Channel

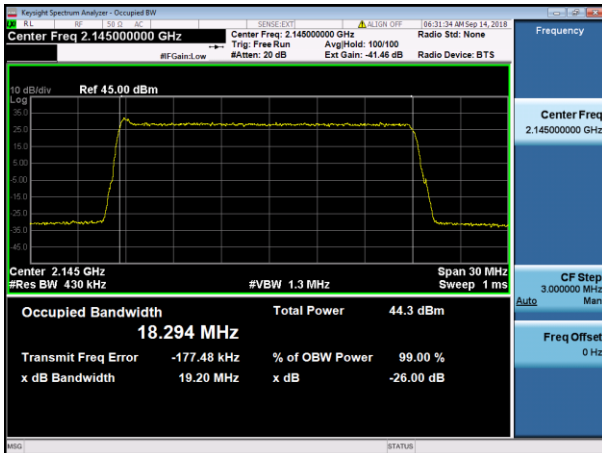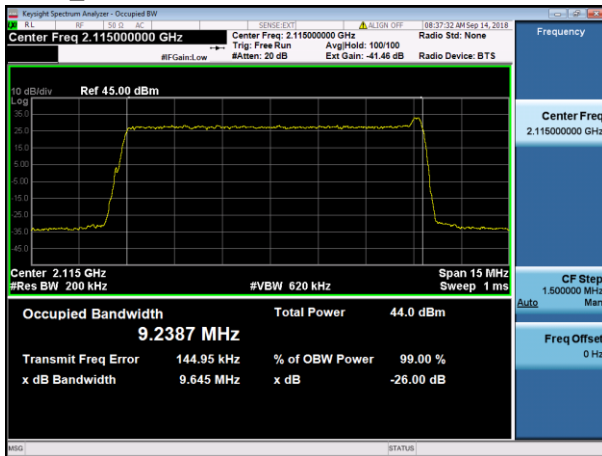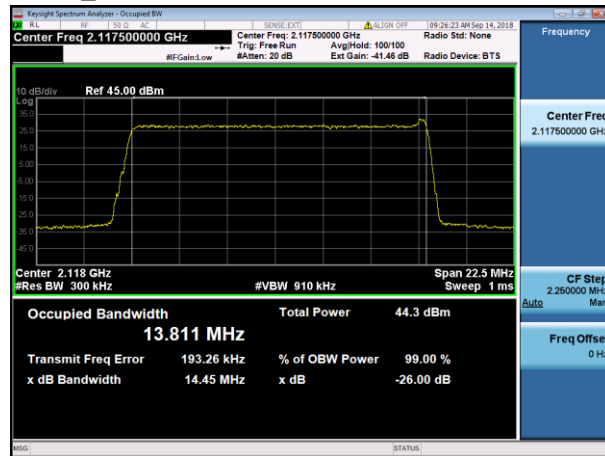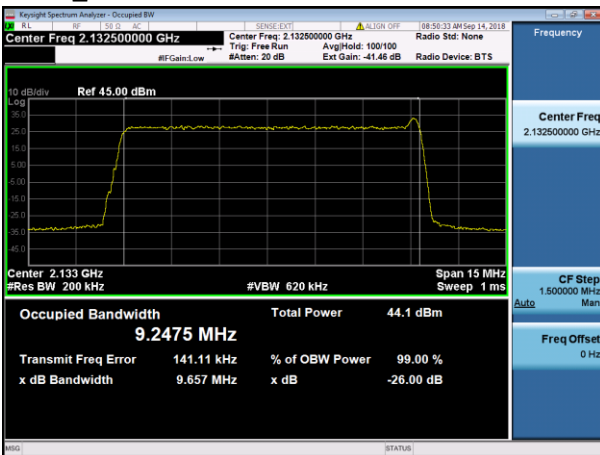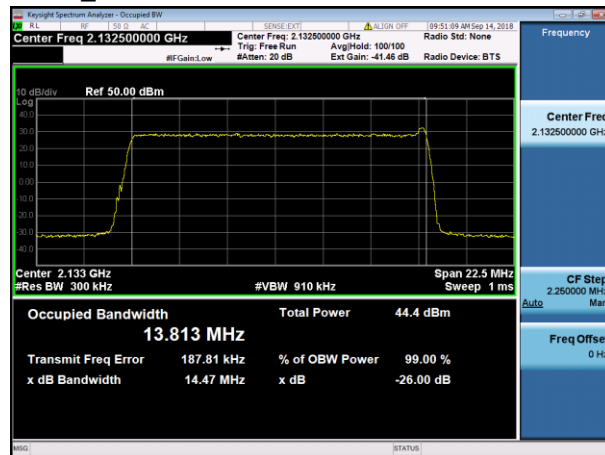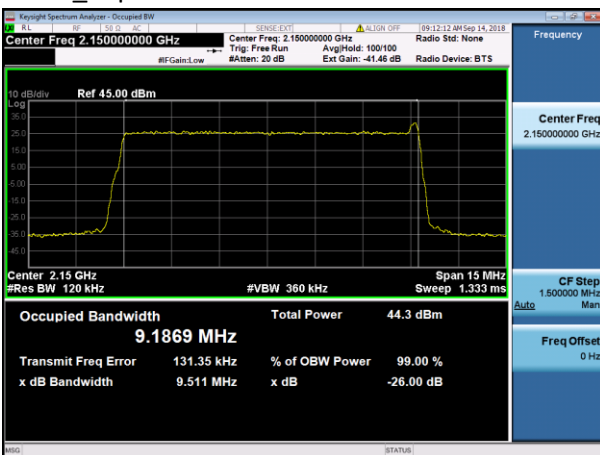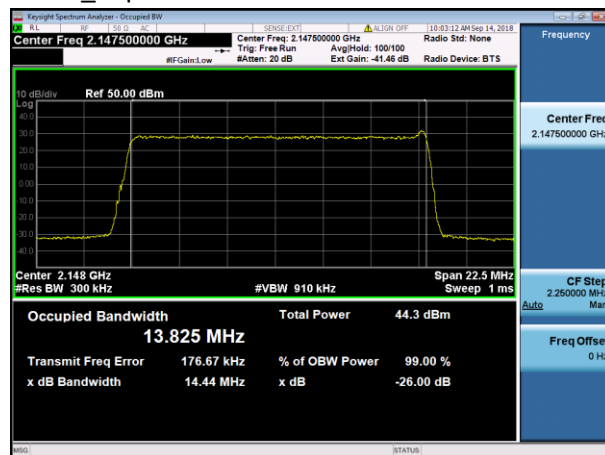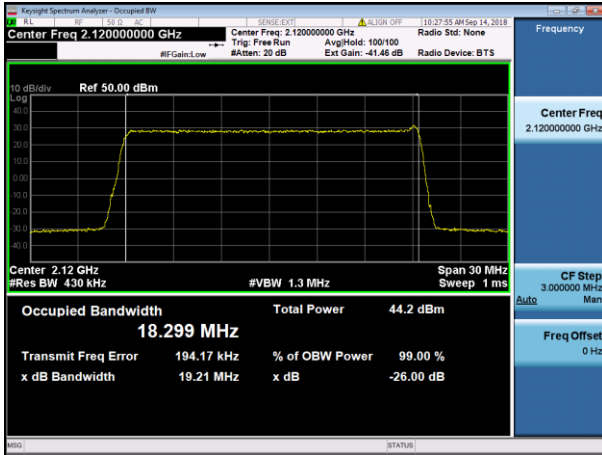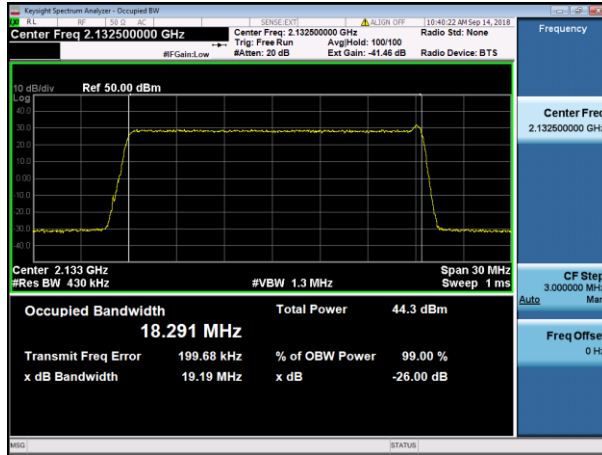**LTE20 plus NB IoT Guard Band Carrier in lower Guard Band (Lower) Bandwidth Plots**:
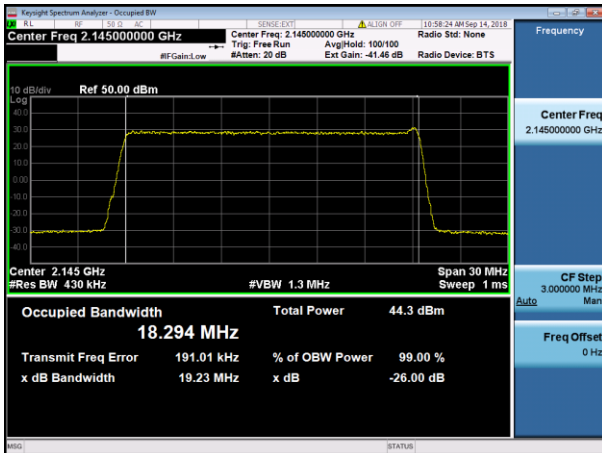
LTE20_Bottom Channel

LTE20_Middle Channel

LTE20_Top Channel

12.3. Antenna Port Conducted Band Edge

Conducted band edge measurements were made at FRIG RRH antenna port 1. The FRIG was operated at the band edge frequencies with QPSK modulation for 10MHz, 15MHz and 20MHz LTE bandwidths.

The same limit of -19dBm used in the original certification testing is used for this testing. The limit is adjusted to -19dBm [-13dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

Measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces. In the 1MHz bands outside and adjacent to the frequency block, a resolution bandwidth of 1% of the emission bandwidth was used. In the 1 to 2MHz frequency range outside the band edge (i.e.: 2108 to 2109MHz and 2156 to 2157MHz bands) the RBW was again reduced to 1% of the emission bandwidth and the power integrated over 1MHz. In the 2 to 5MHz frequency range outside the band edge (i.e.: 2105 to 2108MHz and 2157 to 2160MHz bands) a 1MHz RBW and 3MHz VBW was used.

The results are summarized in the following table. The highest (worst case) emissions from the measurement data are provided.

LTE Bandwidth	Lower Guard Band Carrier		Limit
	Bottom Channel	Top Channel	
10M	-21.502	-24.802	-19dBm
15M	-24.623	-25.771	-19dBm
20M	-26.133	-26.538	-19dBm

| LTE Bandwidth	Upper Guard Band Carrier		Limit
	Bottom Channel	Top Channel	
10M	-26.35	-19.574	-19dBm
15M	-26.82	-23.776	-19dBm
20M	-26.618	-26.437	-19dBm

The total measurement RF path loss of the test setup (attenuator and test cables) was 41.46 dB and is accounted for by the spectrum analyzer reference level offset.

Conducted band edge measurements are provided in the following pages.

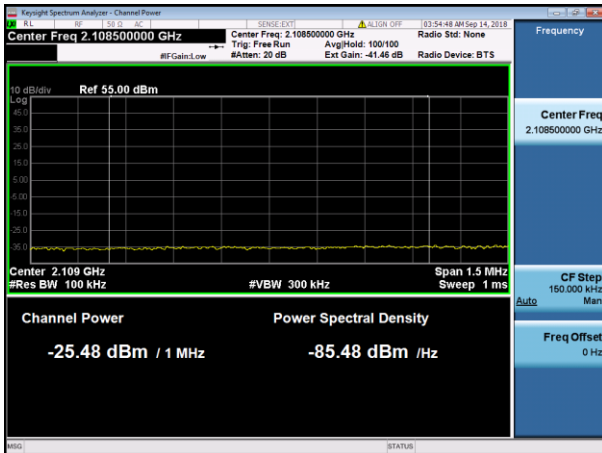**LTE10 + Lower NB IoT GB Carrier Band Edge Plots:**
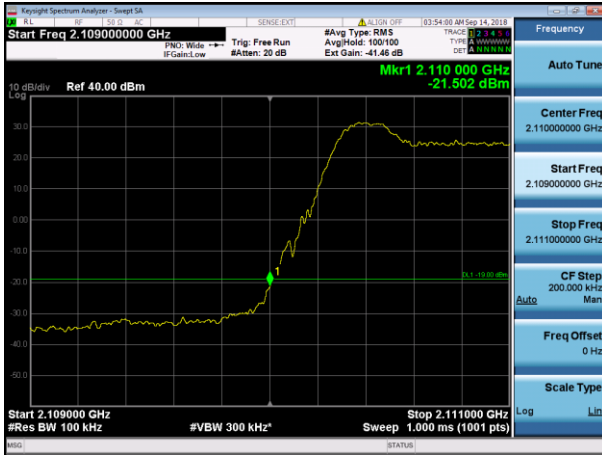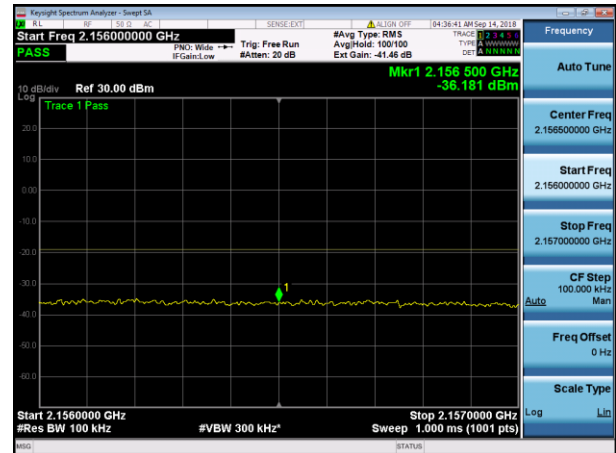
LTE10_Bottom Channel_LBE_2109 to 2111MHz

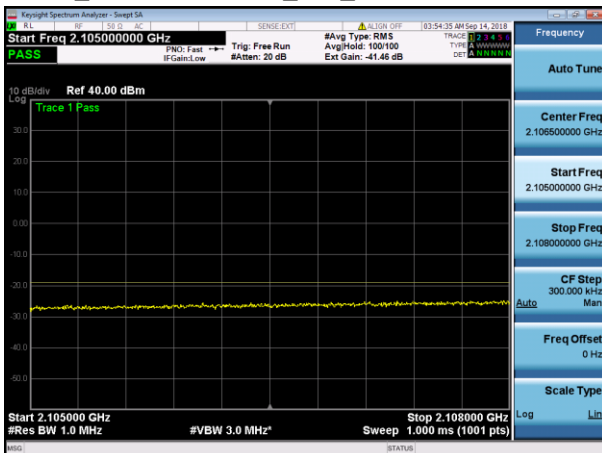LTE10_Top Channel_UBE_2154 to 2156MHz

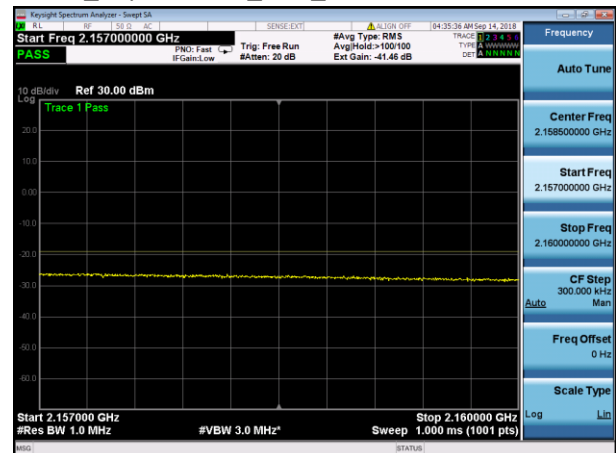

LTE10_Bottom Channel_LBE_2108 to 2109MHz

LTE10_Top Channel_UBE_2156 to 2157MHz

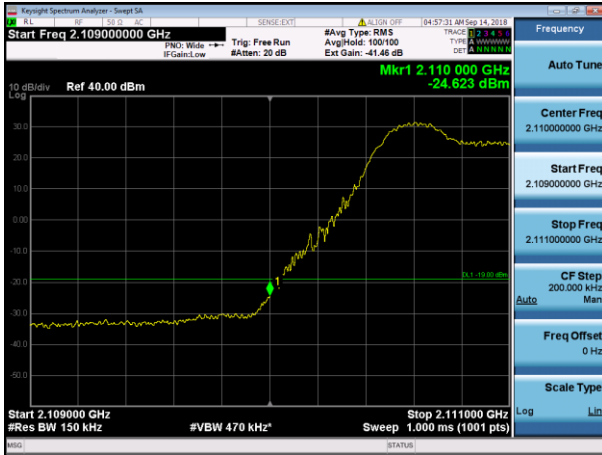LTE10_Bottom Channel_LBE_2105 to 2108MHz

LTE10_Top Channel_UBE_2157 to 2160MHz

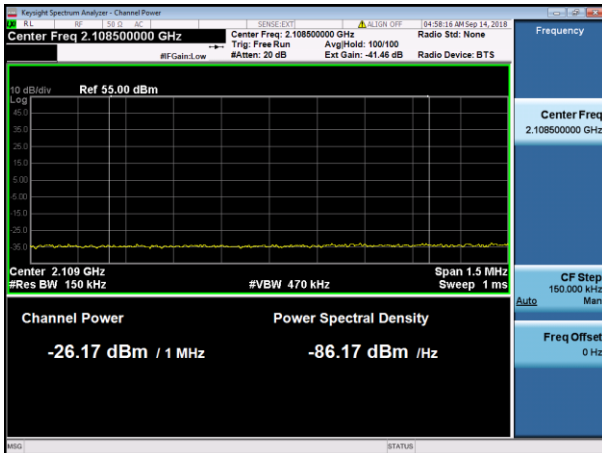**LTE15 + Lower NB IoT GB Carrier Band Edge Plots:**
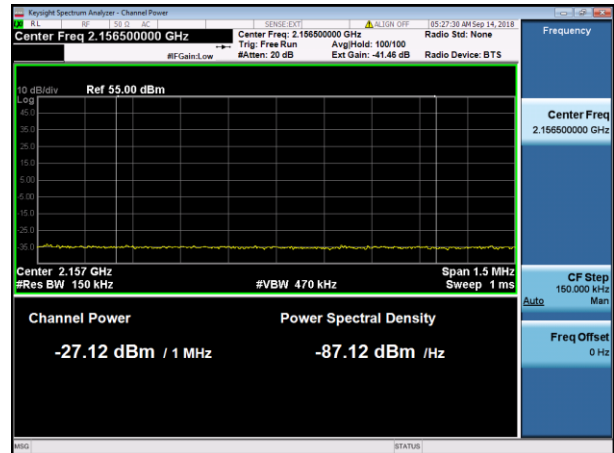
LTE15_Bottom Channel_LBE_2109 to 2111MHz
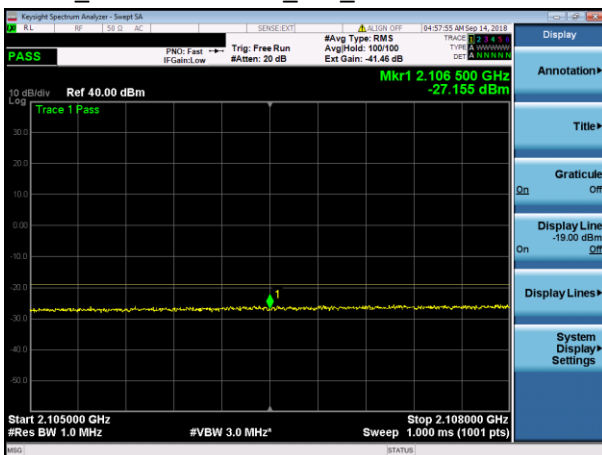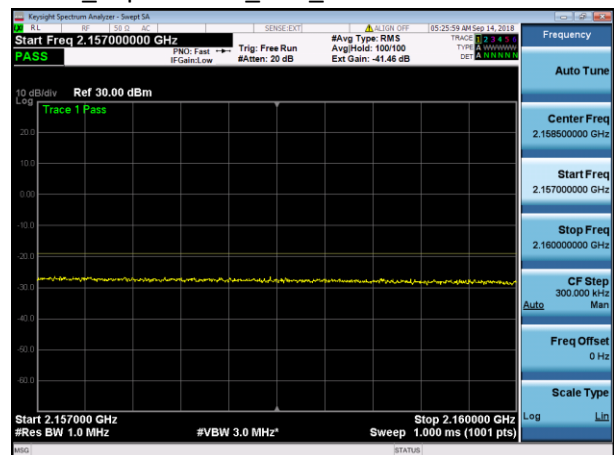

LTE15_Top Channel_UBE_2154 to 2156MHz

LTE15_Bottom Channel_LBE_2108 to 2109MHz

Channel Power: -26.17 dBm / 1 MHz

Power Spectral Density: -86.17 dBm /Hz

LTE15_Top Channel_UBE_2156 to 2157MHz

Channel Power: -27.12 dBm / 1 MHz

Power Spectral Density: -87.12 dBm /Hz

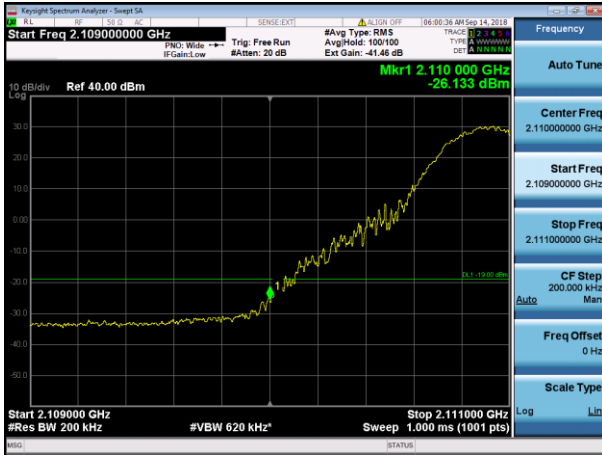LTE15_Bottom Channel_LBE_2105 to 2108MHz
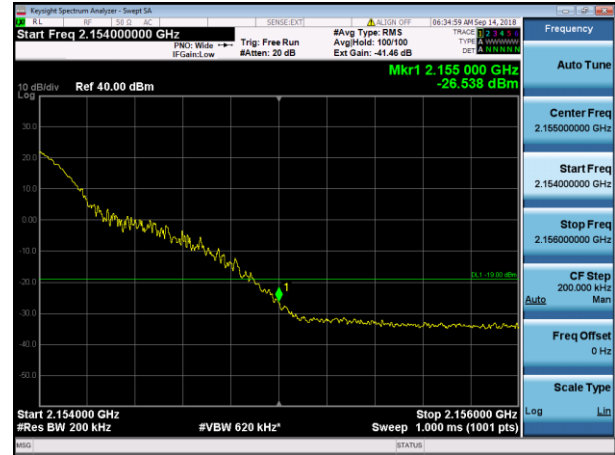

LTE15_Top Channel_UBE_2157 to 2160MHz

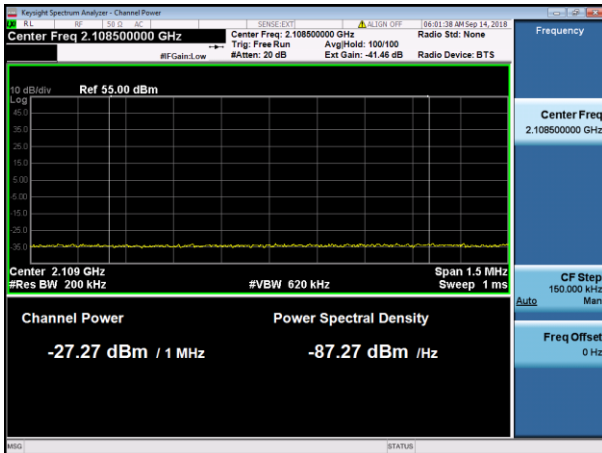**LTE20 + Lower NB IoT GB Carrier Band Edge Plots:**
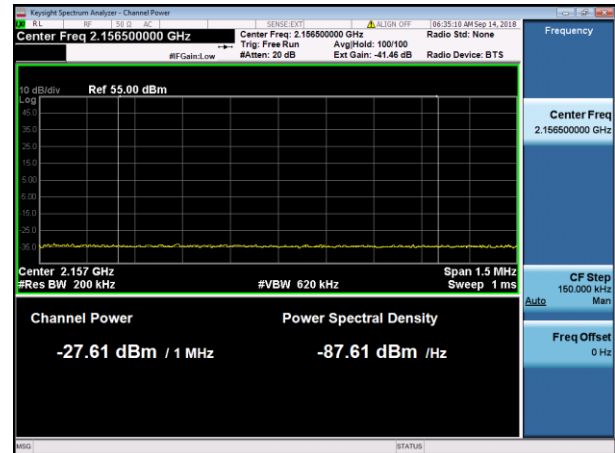
LTE20_Bottom Channel_LBE_2109 to 2111MHz

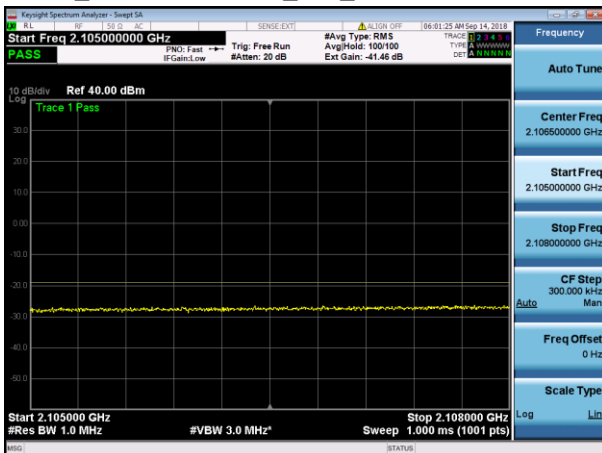LTE20_Top Channel_UBE_2154 to 2156MHz

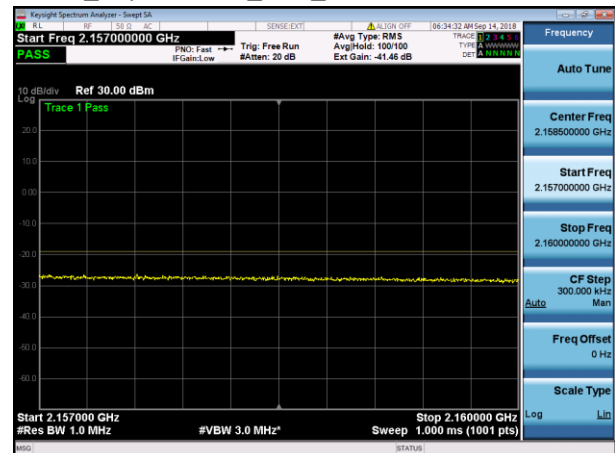LTE20_Bottom Channel_LBE_2108 to 2109MHz

LTE20_Top Channel_UBE_2156 to 2157MHz

LTE20_Bottom Channel_LBE_2105 to 2108MHz

LTE20_Top Channel_UBE_2157 to 2160MHz

LTE10 + Upper NB IoT GB Carrier Band Edge Plots:

LTE10_Bottom Channel_LBE_2109 to 2111MHz

LTE10_Top Channel_UBE_2154 to 2156MHz

LTE10_Bottom Channel_LBE_2108 to 2109MHz

LTE10_Top Channel_UBE_2156 to 2157MHz

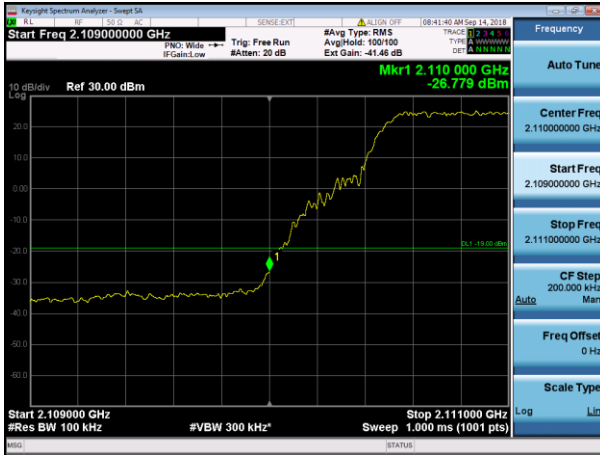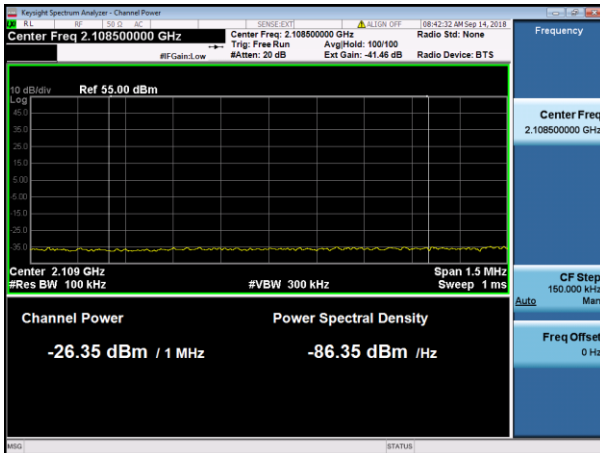LTE10_Bottom Channel_LBE_2105 to 2108MHz

LTE10_Top Channel_UBE_2157 to 2160MHz

LTE15 + Upper NB IoT GB Carrier Band Edge Plots:

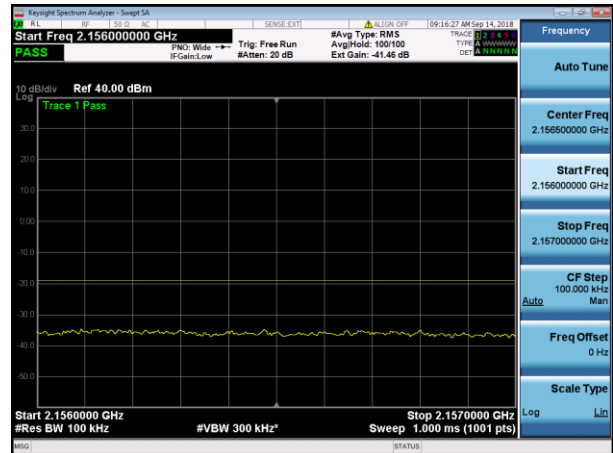LTE15_Bottom Channel_LBE_2109 to 2111MHz

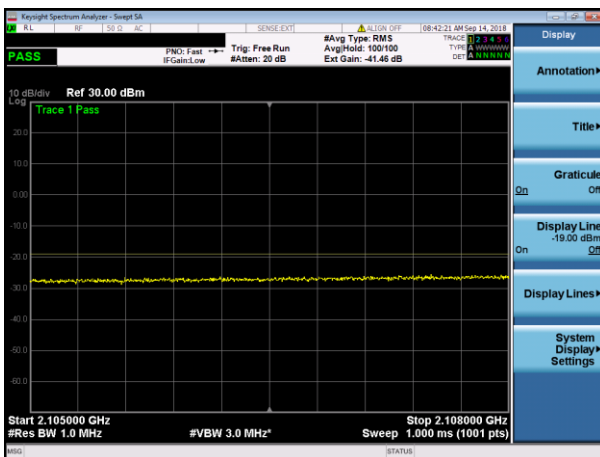LTE15_Top Channel_UBE_2154 to 2156MHz

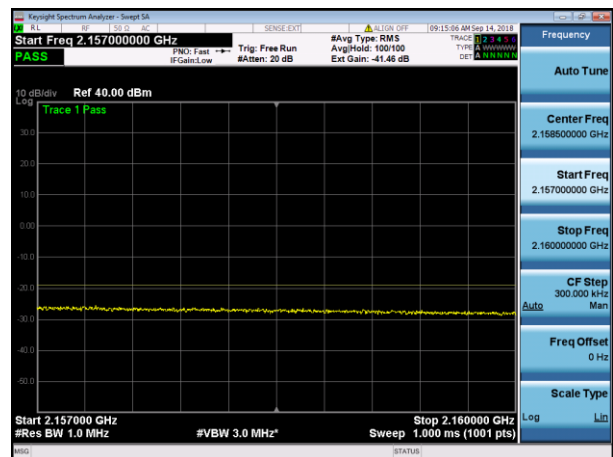LTE15_Bottom Channel_LBE_2108 to 2109MHz

LTE15_Top Channel_UBE_2156 to 2157MHz

LTE15_Bottom Channel_LBE_2105 to 2108MHz

LTE15_Top Channel_UBE_2157 to 2160MHz

LTE20 + Upper NB IoT GB Carrier Band Edge Plots:

LTE20_Bottom Channel_LBE_2109 to 2111MHz

LTE20_Top Channel_UBE_2154 to 2156MHz

LTE20_Bottom Channel_LBE_2108 to 2109MHz

LTE20_Top Channel_UBE_2156 to 2157MHz

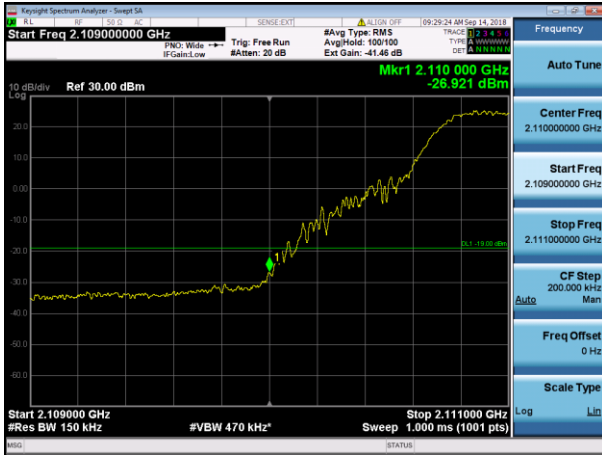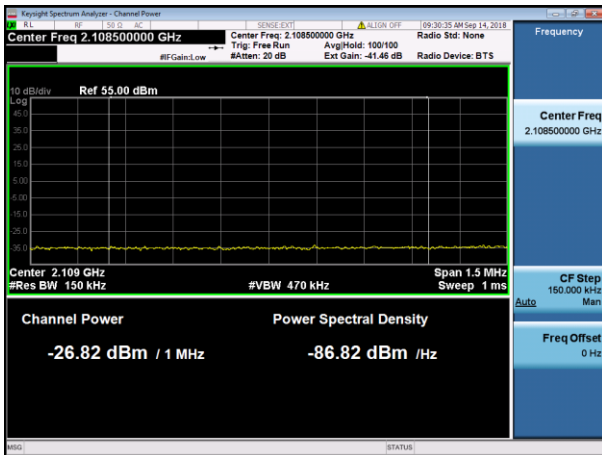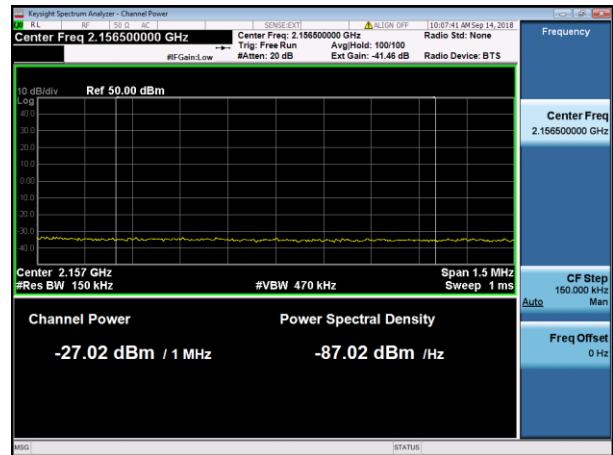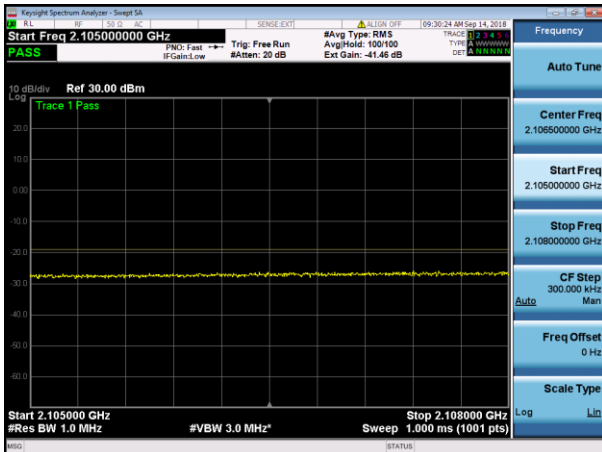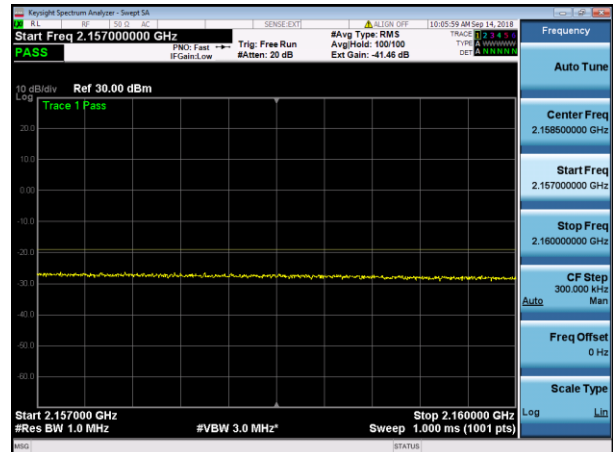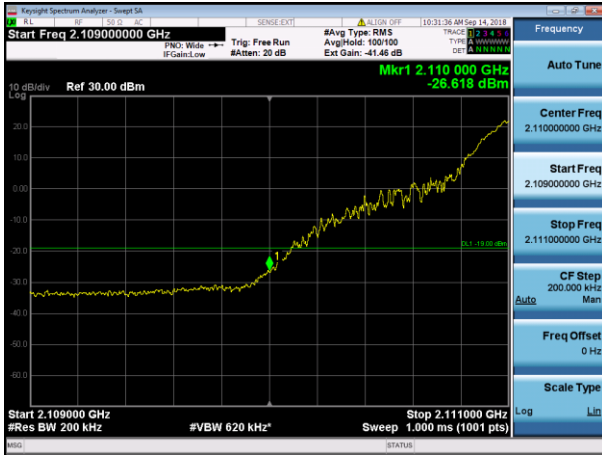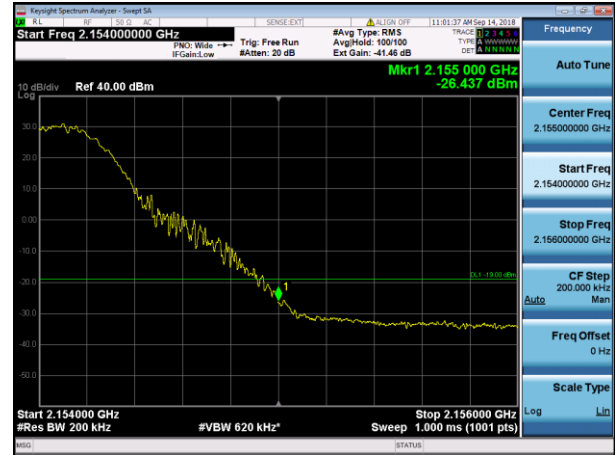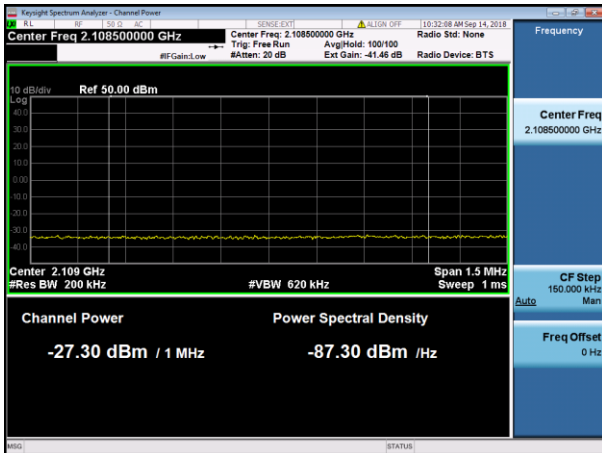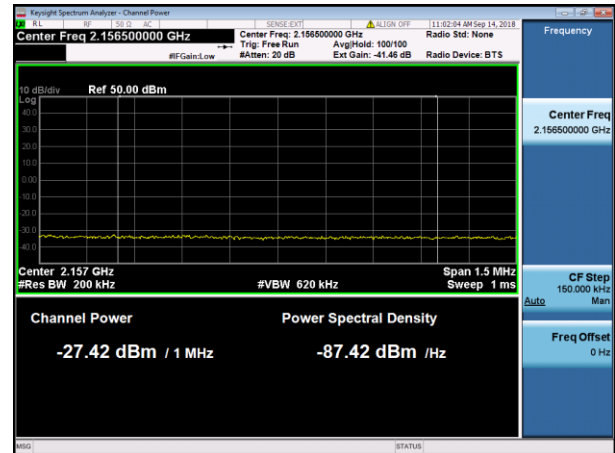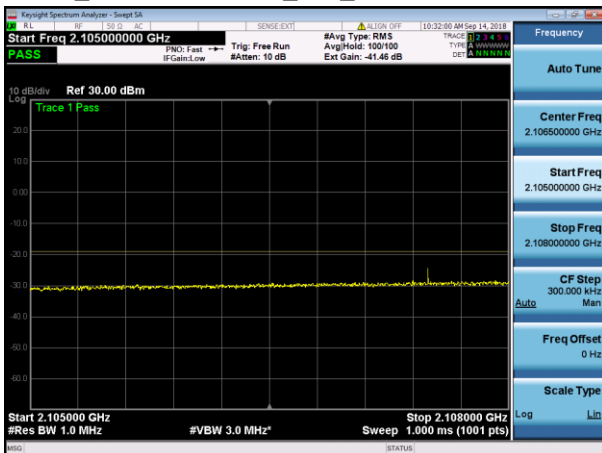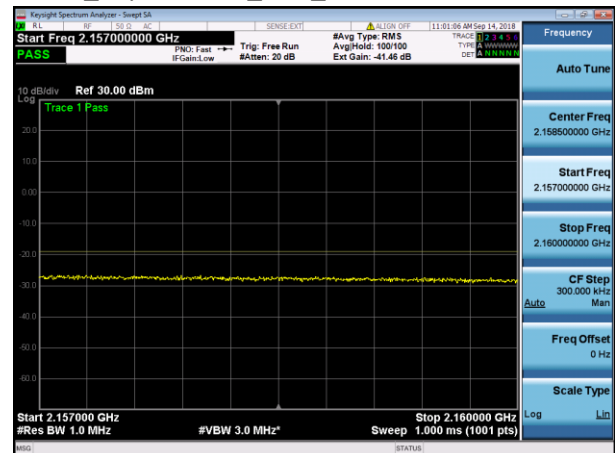LTE20_Bottom Channel_LBE_2105 to 2108MHz

LTE20_Top Channel_UBE_2157 to 2160MHz

12.4. Transmitter Antenna Port Conducted Emissions

Transmitter conducted emission measurements were made at FRIG RRH antenna port #1. Measurements were performed over the 9kHz to 22GHz frequency range. The FRIG was operated on the bottom, middle and top channels with a single NB IoT Guard band carrier with LTE bandwidths of 10MHz, 15MHz and 20MHz.

The same limit of -13dBm used in the original certification testing is used for this testing. The limit is adjusted to -19dBm [-13dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. The required measurement parameters include a 1MHz bandwidth with power measured in average value (since transmitter power was measured in average value).

Measurements were performed with a spectrum analyzer using a peak detector with either max hold over 50 sweeps or RMS average mode over 100 traces (see table below).

The limit for the 9kHz to 150kHz frequency range was adjusted to –49dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -49dBm = -19dBm -10log(1MHz/1kHz)]. The limit for the 150kHz to 10MHz frequency range was adjusted to –29dBm to correct for a spectrum analyzer RBW of 100kHz versus required RBW of 1MHz [i.e.: -29dBm = -19dBm -10log(1MHz/100kHz)]. The required limit of -19dBm with a RBW of 1MHz was used for all other frequency ranges.

The spectrum analyzer settings that were used for this test are summarized in the following table.

| TABLE OF ANALYZER SETTINGS FOR CONDUCTED SPURIOUS EMISSIONS							
Frequency Range	**RBW**	**VBW**	**Number of Data Points**	**Detector/ Avg type**	**Sweep Time**	**Max Hold over**	**Path Loss Note (1)**
9kHz to 150kHz	1kHz	3kHz	201	RMS Avg	Auto	Note (2)	18.78dB
150kHz to 10MHz	100kHz	300kHz	201	RMS Avg	Auto	Note (2)	18.78dB
10MHz to 100MHz	1MHz	3MHz	201	RMS Avg	Auto	Note (2)	37.81dB
100MHz to 2090MHz	1MHz	3MHz	1991	Max Peak	Auto	50 Sweeps	39.7dB
2090MHz to 2200MHz	1MHz	3MHz	521	RMS Avg	Auto	Note (2)	41.46dB
2200GHz to 6GHz	1MHz	3MHz	4001	Max Peak	Auto	50 Sweeps	41.56dB
6GHz to 10GHz	1MHz	3MHz	4001	Max Peak	Auto	50 Sweeps	42.45dB
10GHz to 14GHz	1MHz	3MHz	4001	Max Peak	Auto	50 Sweeps	42.31dB
14GHz to 18GHz	1MHz	3MHz	8001	RMS Avg	Auto	Note (2)	44.04dB
18GHz to 22GHz	1MHz	3MHz	8001	RMS Avg	Auto	Note (2)	44.16dB
Note 1: The total measurement RF path loss of the test setup (attenuators, test cables and filters) is accounted for by the spectrum analyzer external gain offset. Note 2: Max Hold not used and instead measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces.							

A low pass/carrier blocking filter was used to reduce measurement instrumentation noise floor for the frequency ranges less than 10 MHz. The total measurement RF path loss of the test setup (attenuators, low pass filter, high pass filter and test cables) as shown in the table is accounted for by the spectrum analyzer reference level offset. The display line on the plots reflects the required limit.
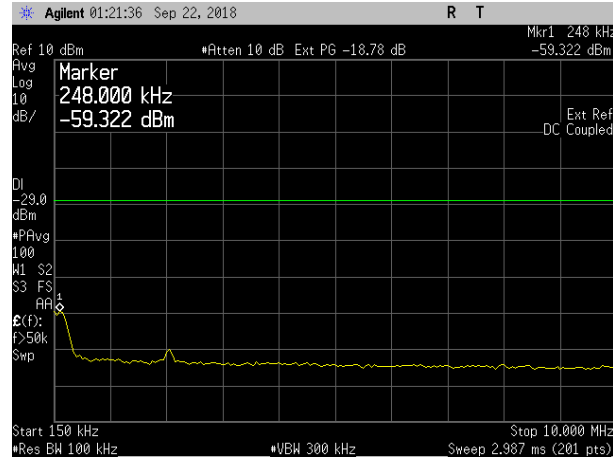
Conducted spurious emission plots/measurements are provided in the following pages.

10MHz Bottom Channel (2115MHz) NB IoT at lower Guard Band

LTE10 Bottom+NB IoT GB (Lower) 0.009-0.15Mhz
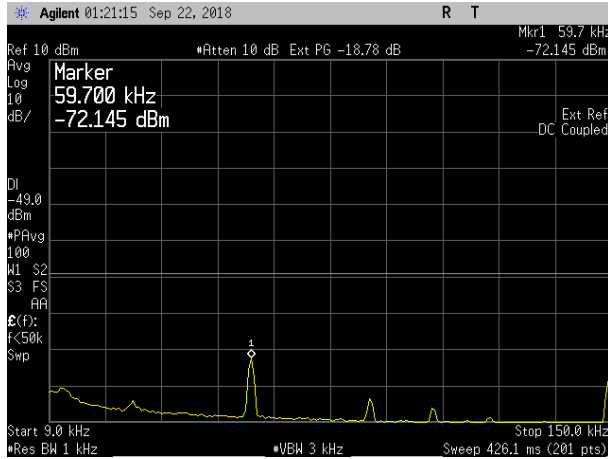
LTE10 Bottom+NB IoT GB (Lower) 0.15MHz – 10MHz

LTE10 Bottom+NB IoT GB (Lower) 10-100Mhz
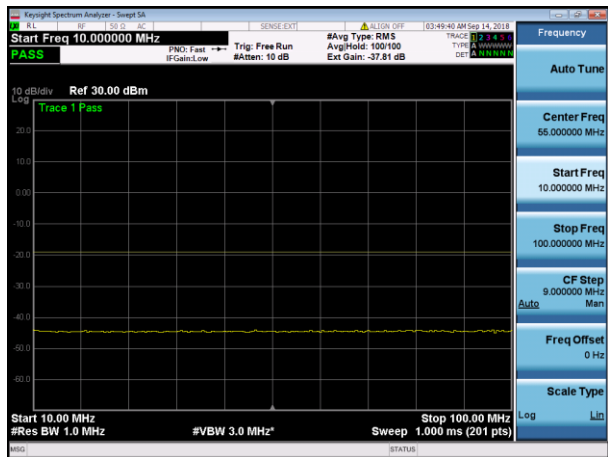
LTE10 Bottom+NB IoT GB (Lower) 100MHz – 2090MHz
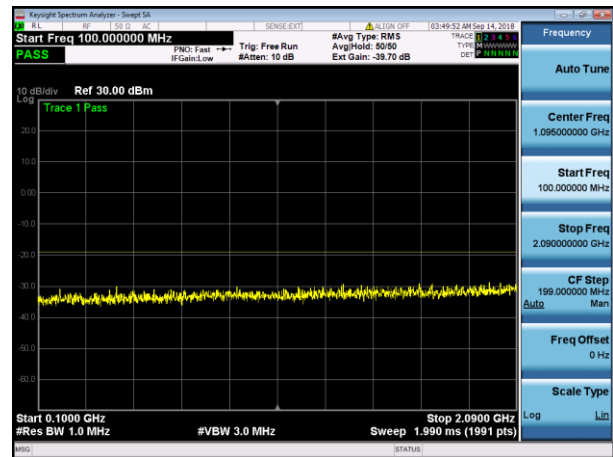
LTE10 BOTTOM+NB IoT GB (Lower) 2090MHz – 2220MHz
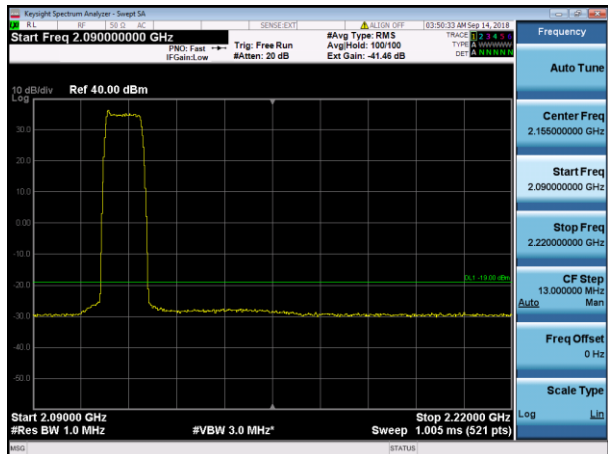
LTE10 BOTTOM+NB IoT GB (Lower) 2220MHz-6000Mhz
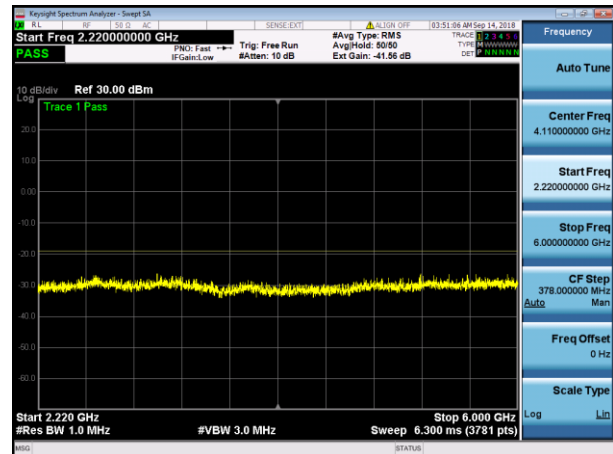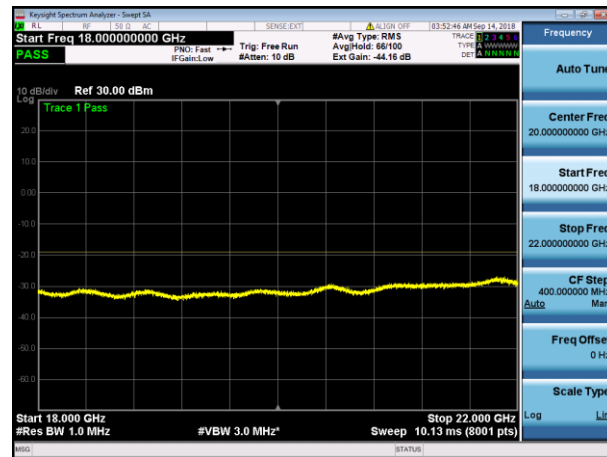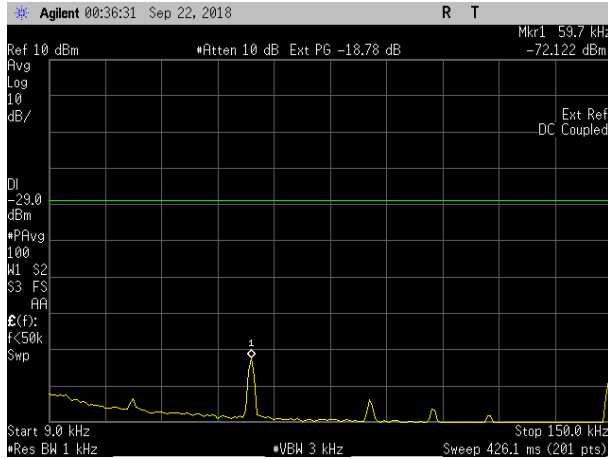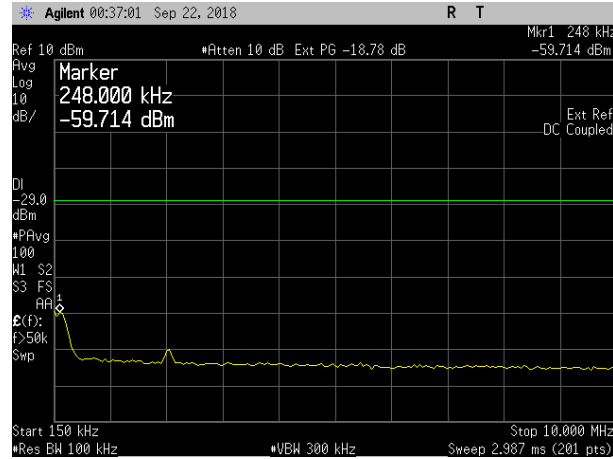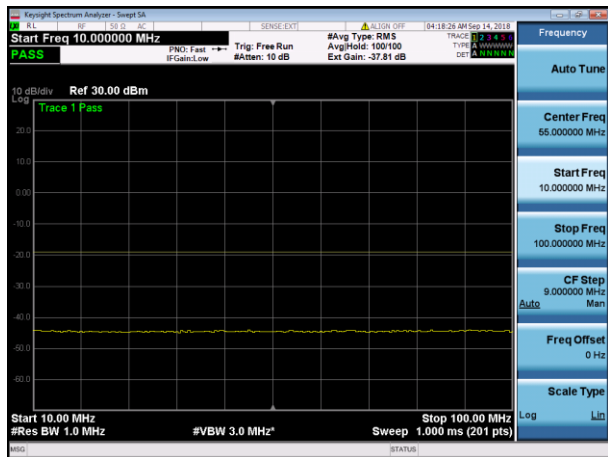
LTE10 BOTTOM+NB IoT GB (Lower) 6000MHz-10000MHz
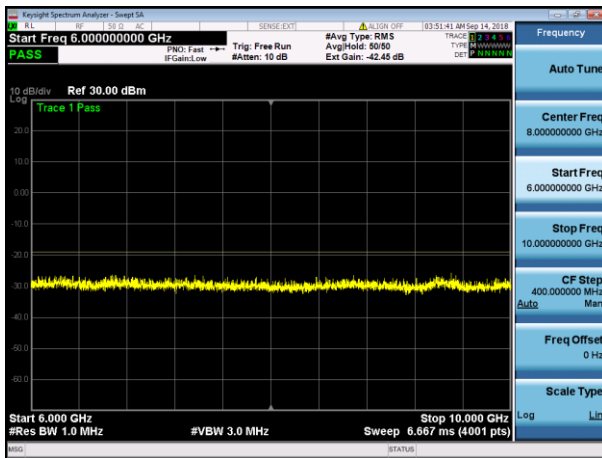
LTE10 BOTTOM+NB IoT GB (Lower) 10000-14000MHz
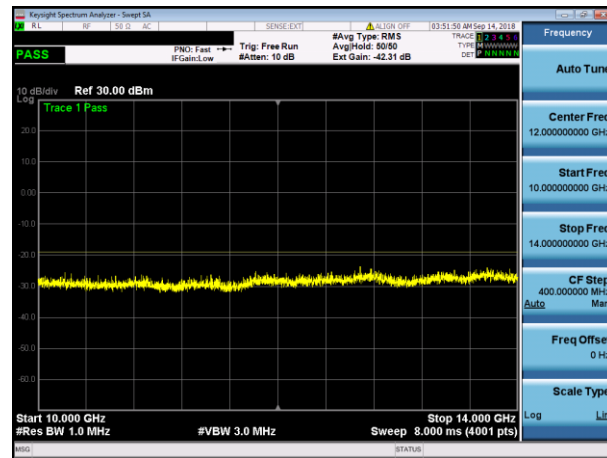
LTE10 BOTTOM+NB IoT GB (Lower) 14000MHz – 18000MHz
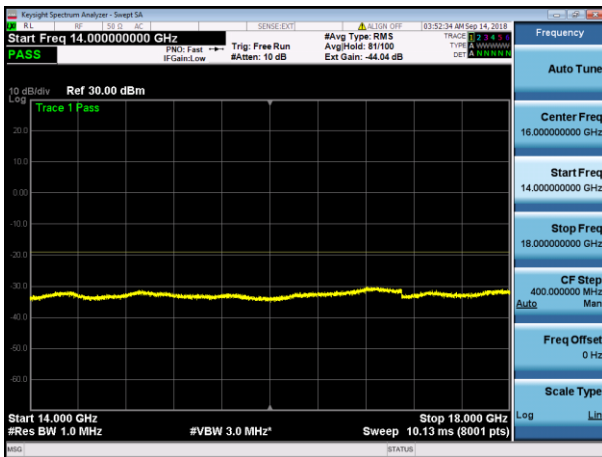
LTE10 BOTTOM+NB IoT GB (Lower) 18000MHz – 22000MHz

10MHz Middle Channel (2132.5MHz) NB IoT at lower Guard Band
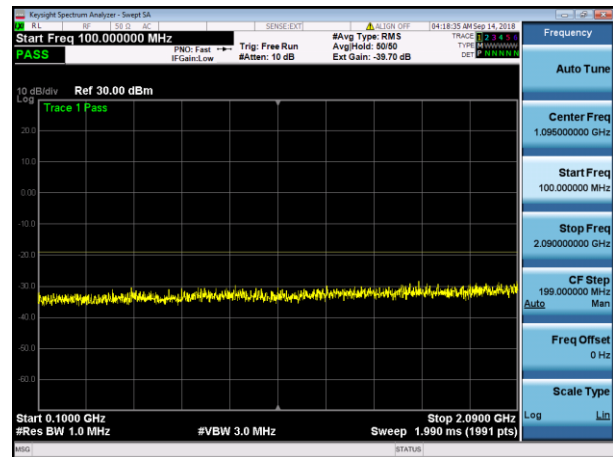
LTE10 Mid+NB IoT GB (Lower) 0.009-0.15Mhz
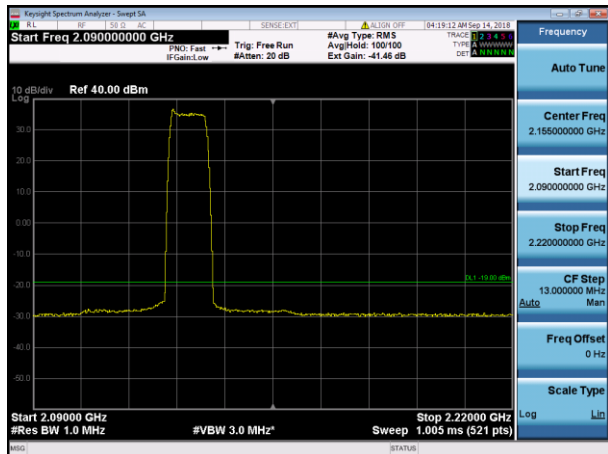

LTE10 Mid+NB IoT GB (Lower) 0.15MHz – 10MHz
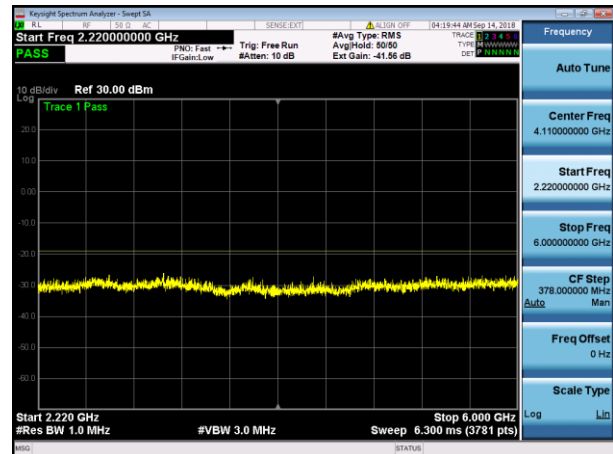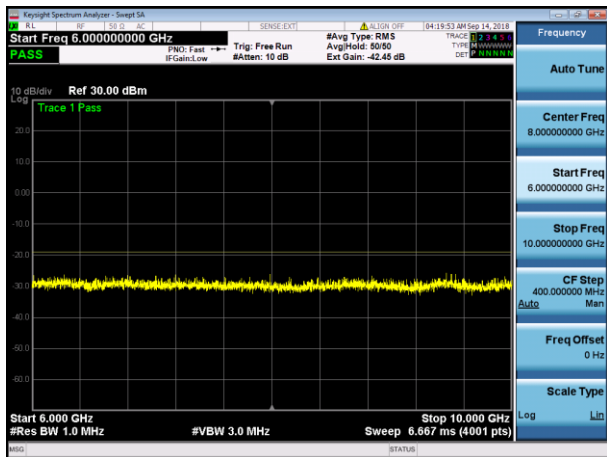

LTE10 Mid+NB IoT GB (Lower) 10MHz-100MHz

LTE10 Mid+NB IoT GB (Lower) 100MHz-2090MHz

LTE10 Mid+NB IoT GB (Lower) 2090MHz-2220MHz

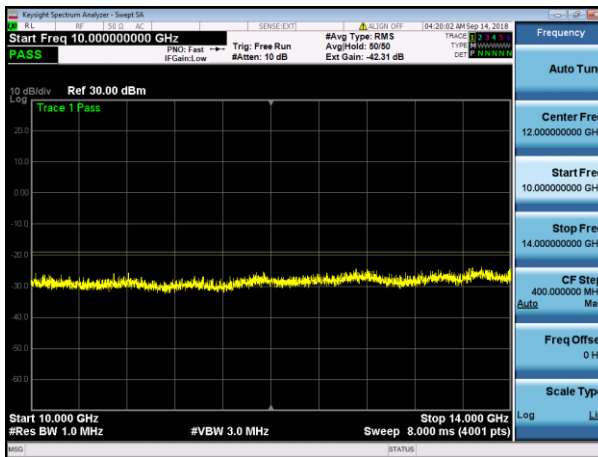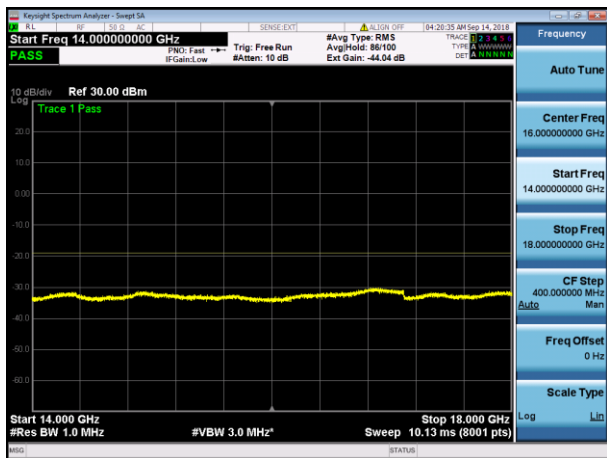LTE10 Mid+NB IoT GB (Lower) 2220MHz-6000MHz
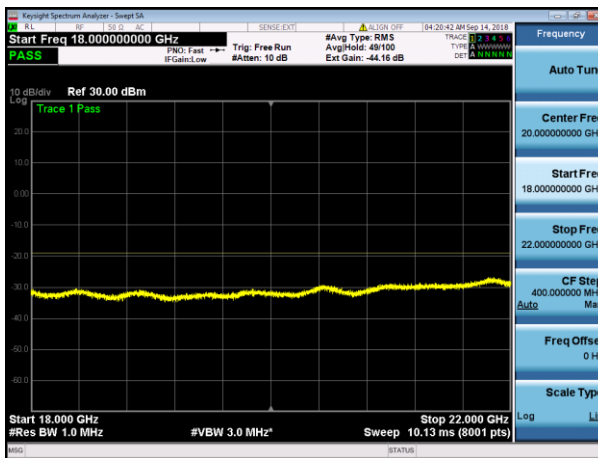
LTE10 Mid+NB IoT GB (Lower) 6000MHz-10000MHz

LTE10 Mid+NB IoT GB (Lower) 10000MHz-14000MHz

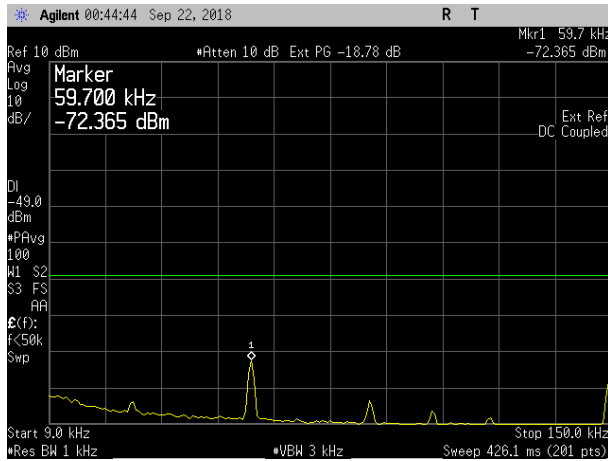LTE10 Mid+NB IoT GB (Lower) 14000MHz-18000MHz
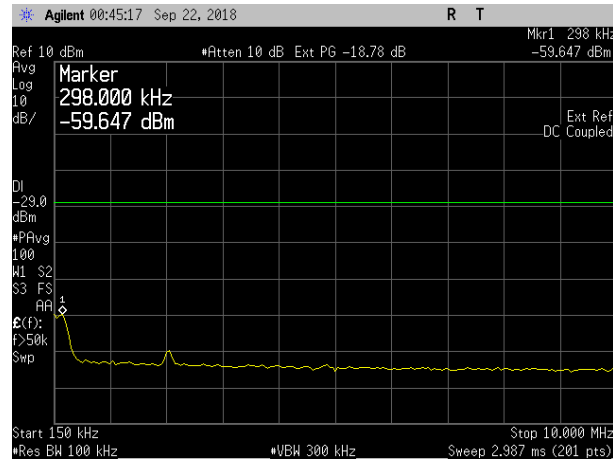

LTE10 Mid+NB IoT GB (Lower) 18000MHz-22000MHz

10MHz Top Channel (2150MHz) NB IoT at lower Guard Band
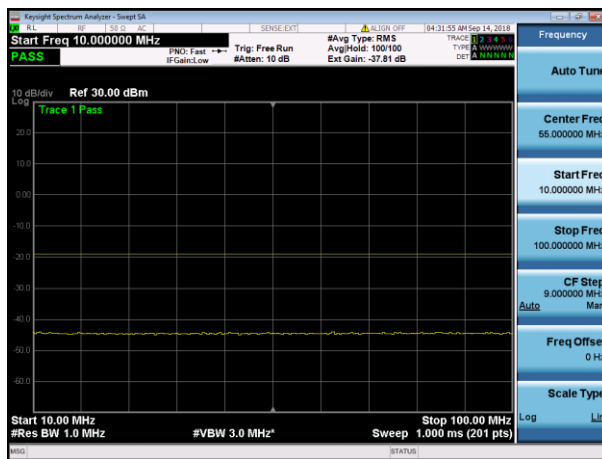
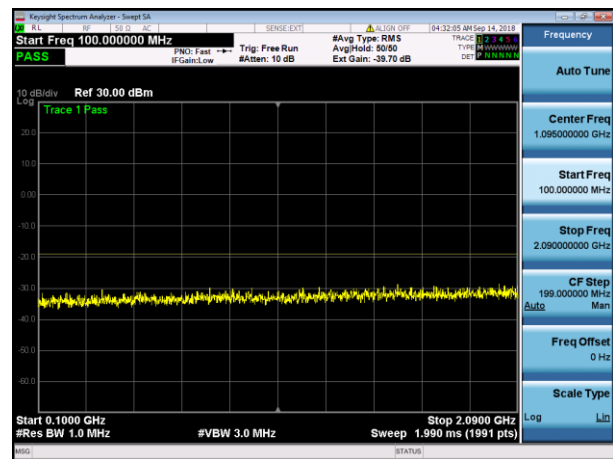LTE10 Top+NB IoT GB (Lower) 0.009-0.15Mhz

LTE10 Top+NB IoT GB (Lower) 0.15MHz – 10MHz
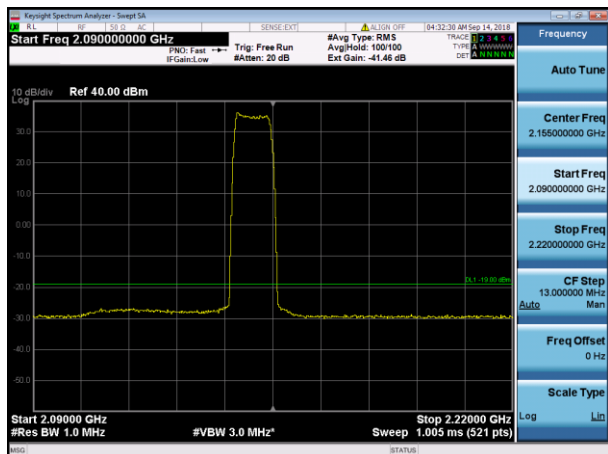

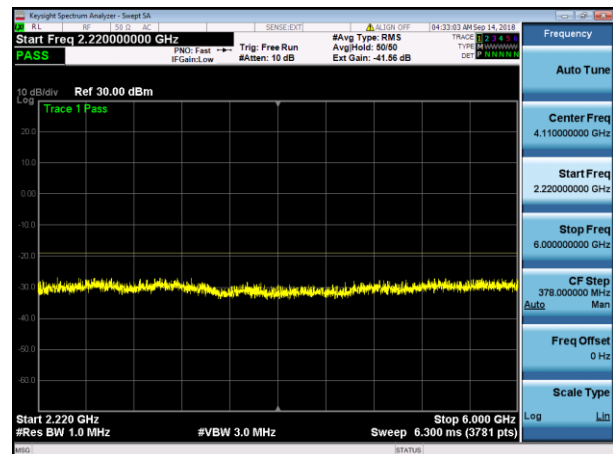LTE10 Top+NB IoT GB (Lower) 10MHz-100MHz

LTE10 Top+NB IoT GB (Lower) 100MHz-2090MHz

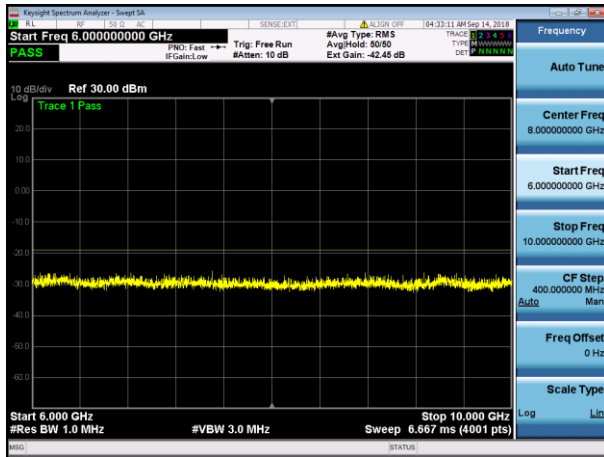LTE10 Top+NB IoT GB (Lower) 2090MHz-2220MHz

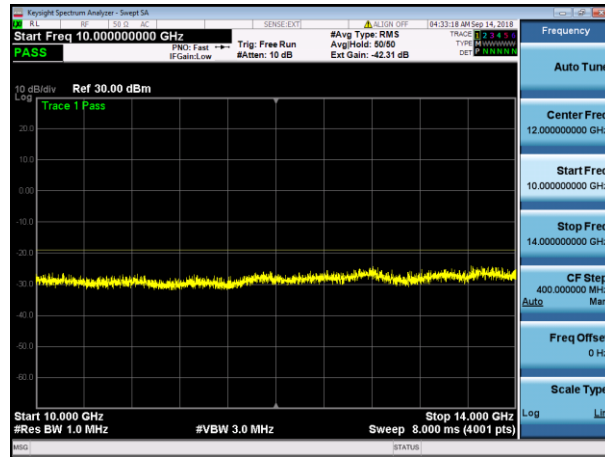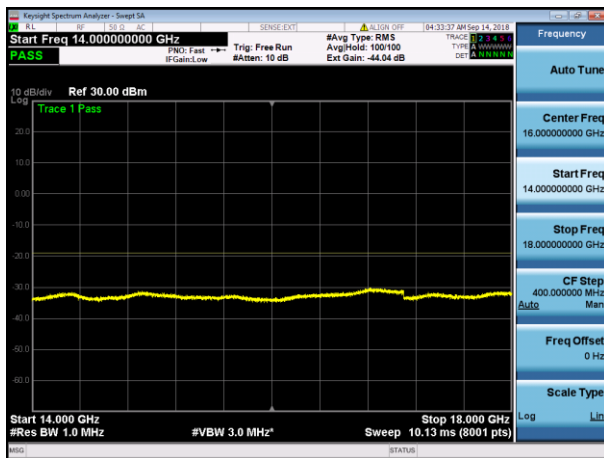LTE10 Top+NB IoT GB (Lower) 2220MHz-6000MHz

LTE10 Top+NB IoT GB (Lower) 6000MHz-10000MHz

LTE10 Top+NB IoT GB (Lower) 10000MHz-14000MHz

LTE10 Top+NB IoT GB (Lower) 14000MHz-18000MHz

LTE10 Top+NB IoT GB (Lower) 18000MHz-22000MHz