

Antenna Port Conducted Band Edge

Conducted band edge measurements were made at RRH antenna port 2/3.

The RRH was operated with a single carrier at the band edge frequencies with all modulation types (QPSK, 16QAM, 64QAM and 256QAM) for all 5G NR channel bandwidths (5MHz, 10MHz, 15MHz and 20MHz) at maximum carrier power (40 watts/carrier).

The limit of -19dBm was used in the certification 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.: 1928 to 1929MHz and 1996 to 1997MHz bands) the RBW was again reduced to 1% of the emission bandwidth and the power integrated over 1MHz. In the 2 to 22MHz frequency range outside the band edge (i.e.: 1908 to 1928MHz and 1997 to 2017MHz 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.

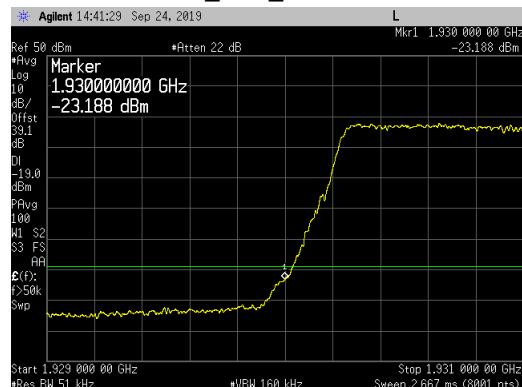
Ch BW, Carrier Freq, Carrier Pwr		QPSK (dBm)		16QAM (dBm)		64QAM (dBm)		256QAM (dBm)	
PCS Band	AWS Band	LBE	UBE	LBE	UBE	LBE	UBE	LBE	UBE
5MHz, BC, 40W	Carrier Off	-22.82	N/A	-21.39	N/A	-22.358	N/A	-22.574	N/A
10MHz, BC, 40W	Carrier Off	-23.537	N/A	-21.533	N/A	-23.72	N/A	-23.70	N/A
15MHz, BC, 40W	Carrier Off	-27.118	N/A	-24.683	N/A	-26.804	N/A	-27.029	N/A
20MHz, BC, 40W	Carrier Off	-23.592	N/A	-23.516	N/A	-23.069	N/A	-23.393	N/A
5MHz, TC, 40W	Carrier Off	N/A	-22.589	N/A	-20.069	N/A	-23.122	N/A	-23.609
10MHz TC, 40W	Carrier Off	N/A	-22.917	N/A	-21.66	N/A	-22.73	N/A	-22.92
15MHz, TC, 40W	Carrier Off	N/A	-25.127	N/A	-24.053	N/A	-26.79	N/A	-27.02
20MHz, TC, 40W	Carrier Off	N/A	-24.048	N/A	-22.063	N/A	-23.319	N/A	-23.632

The total measurement RF path loss of the test setup (attenuator and test cables) was 39.1 dB and is accounted for by the spectrum analyzer reference level offset. The display line on the plots reflects the required limit.

Conducted band edge measurements are provided in the following pages.

5G NR_5MHz Channel Bandwidth_Band Edge Plots_QPSK Modulation for Antenna Port 3:

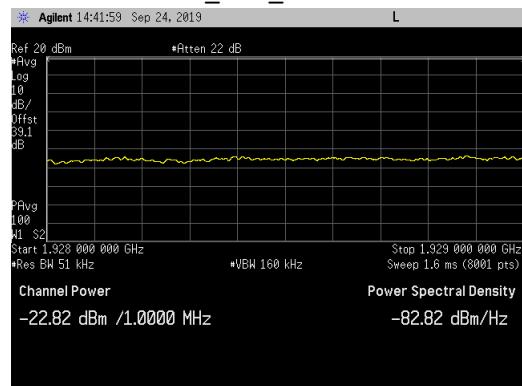
Bottom Channel_LBE_ 1929 to 1931MHz



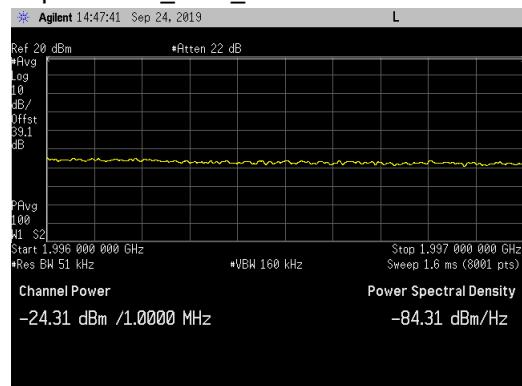
Top Channel_UBE_ 1994 to 1996MHz



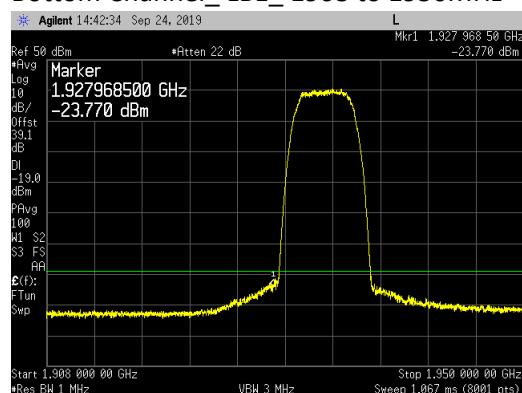
Bottom Channel_LBE_ 1928 to 1929MHz



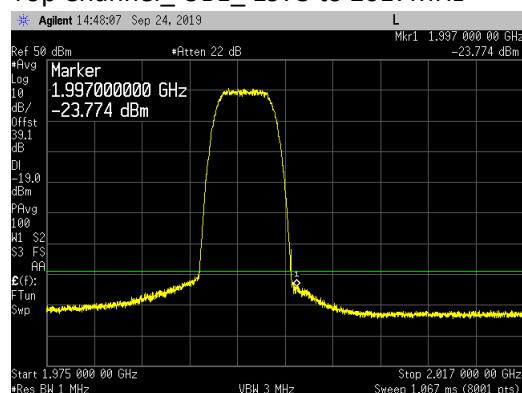
Top Channel_UBE_ 1996 to 1997MHz



Bottom Channel_LBE_ 1908 to 1950MHz



Top Channel_UBE_ 1975 to 2017MHz



5G NR_5MHz Channel Bandwidth_Band Edge Plots_16QAM Modulation for Antenna Port 3:

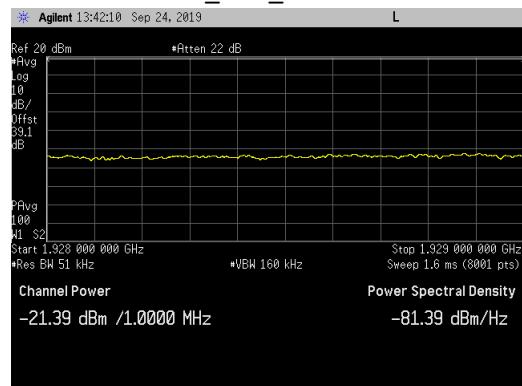
Bottom Channel_LBE_ 1929 to 1931MHz



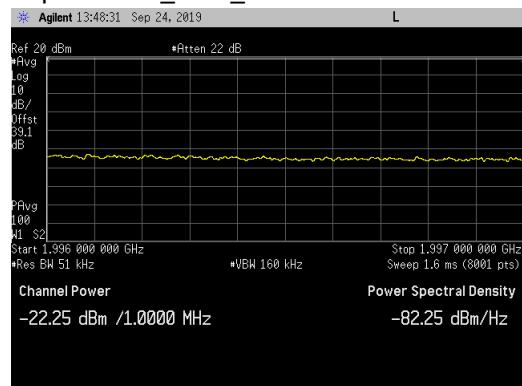
Top Channel_UBE_ 1994 to 1996MHz



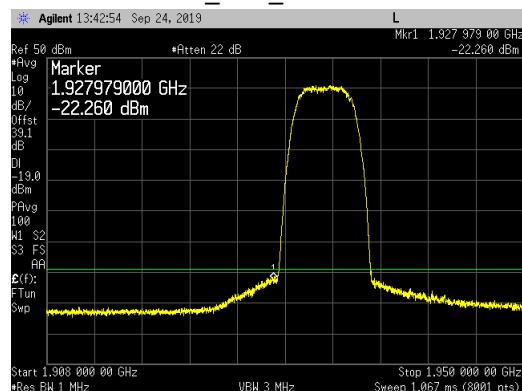
Bottom Channel_LBE_ 1928 to 1929MHz



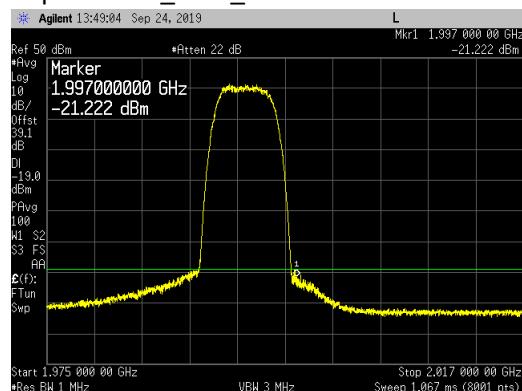
Top Channel_UBE_ 1996 to 1997MHz



Bottom Channel_LBE_ 1908 to 1950MHz

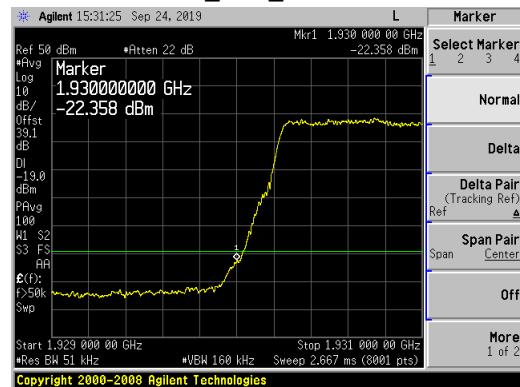


Top Channel_UBE_ 1975 to 2017MHz



5G NR_5MHz Channel Bandwidth_Band Edge Plots_64QAM Modulation for Antenna Port 3:

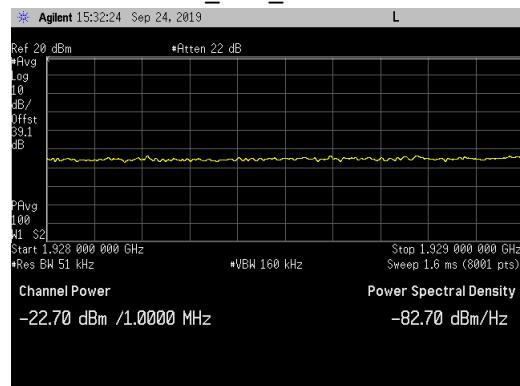
Bottom Channel_LBE_ 1929 to 1931MHz



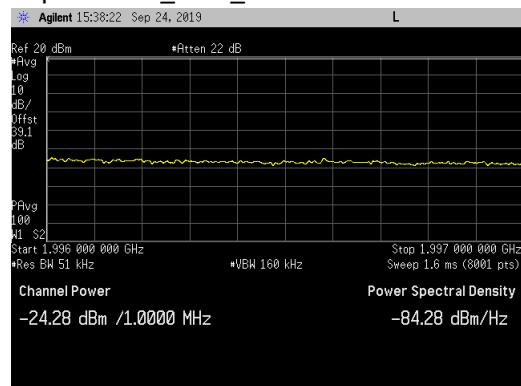
Top Channel_UBE_ 1994 to 1996MHz



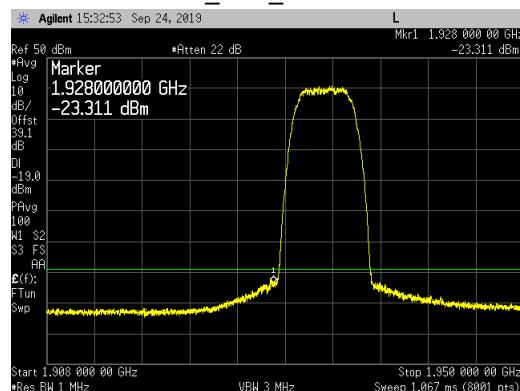
Bottom Channel_LBE_ 1928 to 1929MHz



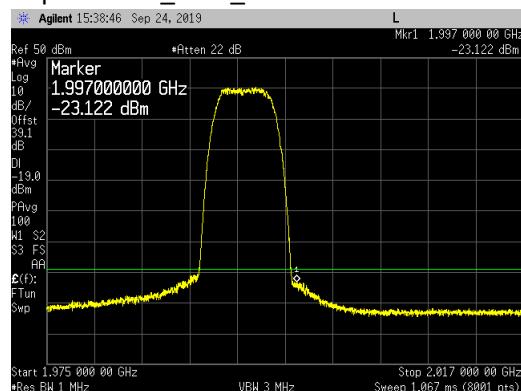
Top Channel_UBE_ 1996 to 1997MHz



Bottom Channel_LBE_ 1908 to 1950MHz

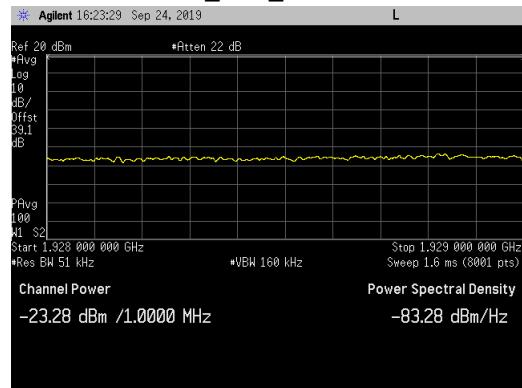
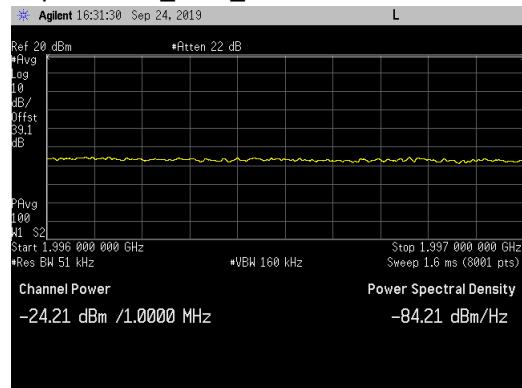
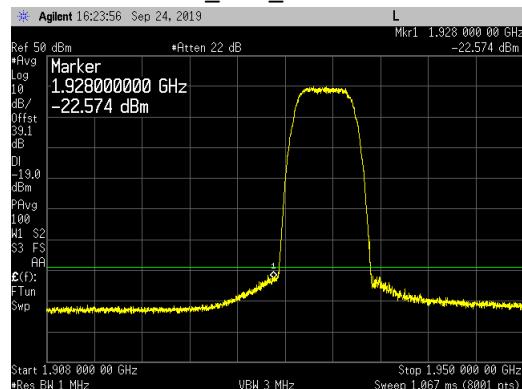
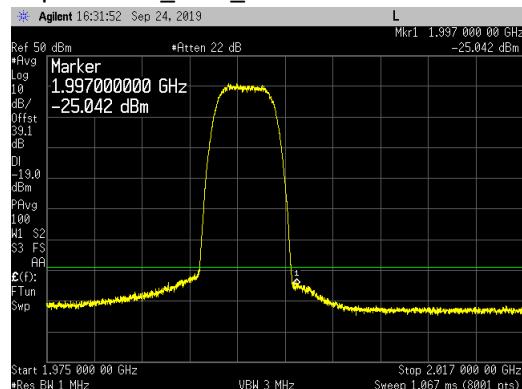


Top Channel_UBE_ 1975 to 2017MHz



5G NR_5MHz Channel Bandwidth_Band Edge Plots_256QAM Modulation for Antenna Port 3:
Bottom Channel_LBE_ 1929 to 1931MHz

Top Channel_UBE_ 1994 to 1996MHz

Bottom Channel_LBE_ 1928 to 1929MHz

Top Channel_UBE_ 1996 to 1997MHz

Bottom Channel_LBE_ 1908 to 1950MHz

Top Channel_UBE_ 1975 to 2017MHz


5G NR_ 10MHz Channel Bandwidth_Band Edge Plots_QPSK Modulation for Antenna Port 2:

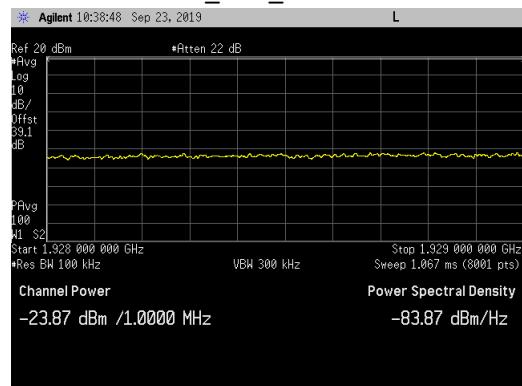
Bottom Channel_LBE_ 1929 to 1931MHz



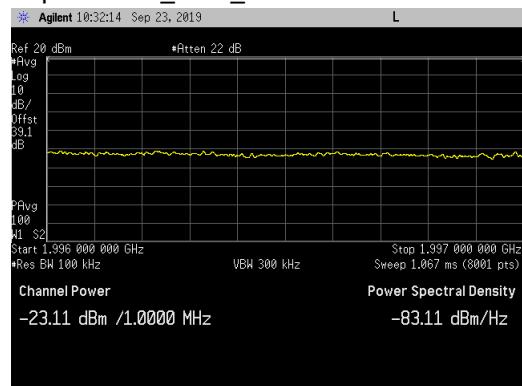
Top Channel_UBE_ 1994 to 1996MHz



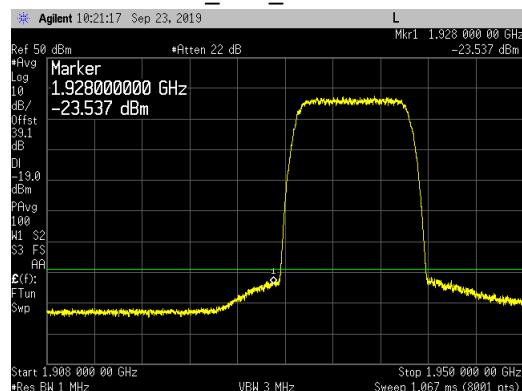
Bottom Channel_LBE_ 1928 to 1929MHz



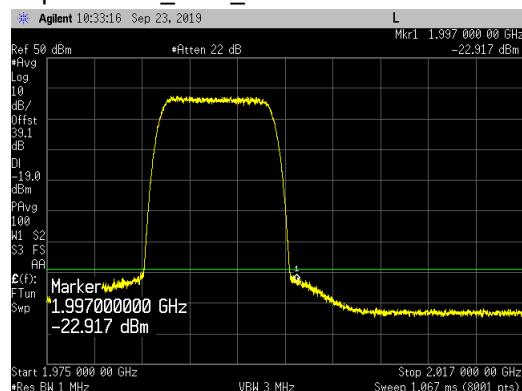
Top Channel_UBE_ 1996 to 1997MHz



Bottom Channel_LBE_ 1908 to 1950MHz

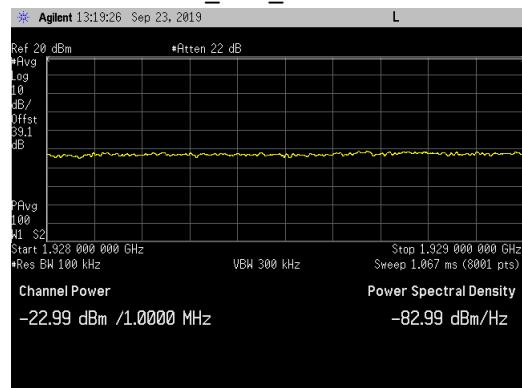
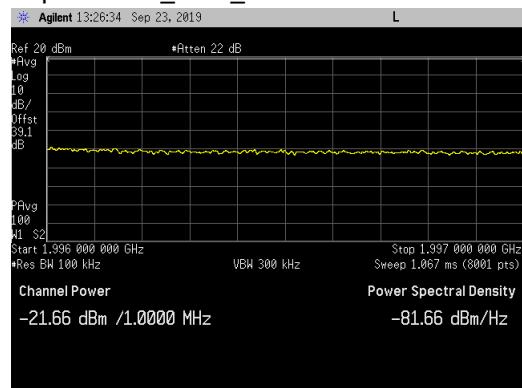
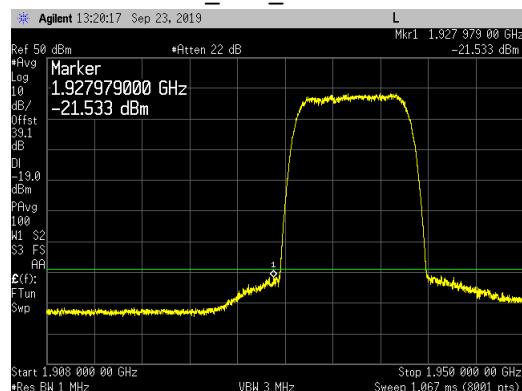
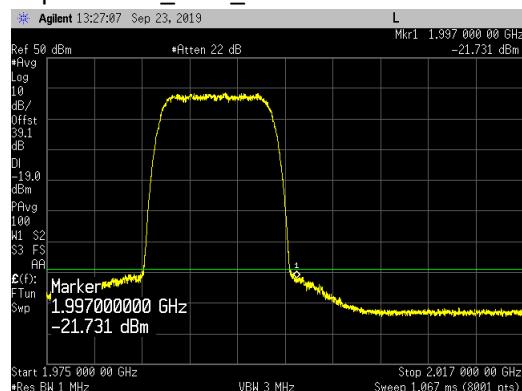


Top Channel_UBE_ 1975 to 2017MHz



5G NR_ 10MHz Channel Bandwidth_Band Edge Plots_ 16QAM Modulation for Antenna Port 2:
Bottom Channel_LBE_ 1929 to 1931MHz

Top Channel_UBE_ 1994 to 1996MHz

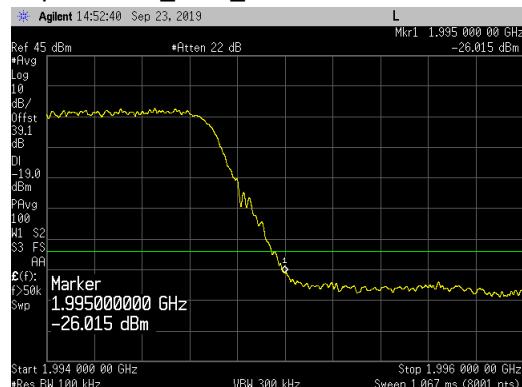
Bottom Channel_LBE_ 1928 to 1929MHz

Top Channel_UBE_ 1996 to 1997MHz

Bottom Channel_LBE_ 1908 to 1950MHz

Top Channel_UBE_ 1975 to 2017MHz


5G NR_ 10MHz Channel Bandwidth_Band Edge Plots_ 64QAM Modulation for Antenna Port 2:

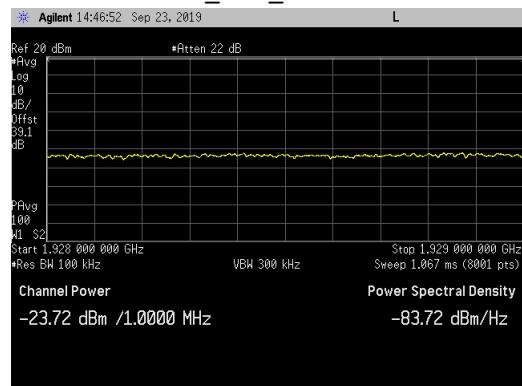
Bottom Channel_LBE_ 1929 to 1931MHz



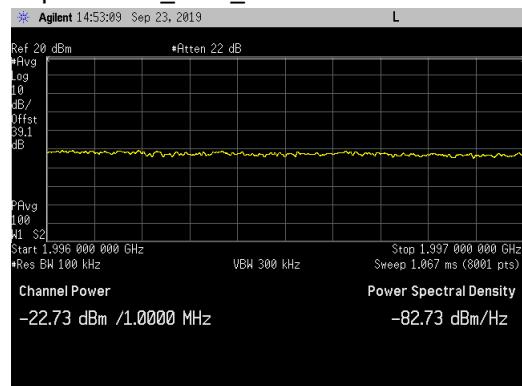
Top Channel_UBE_ 1994 to 1996MHz



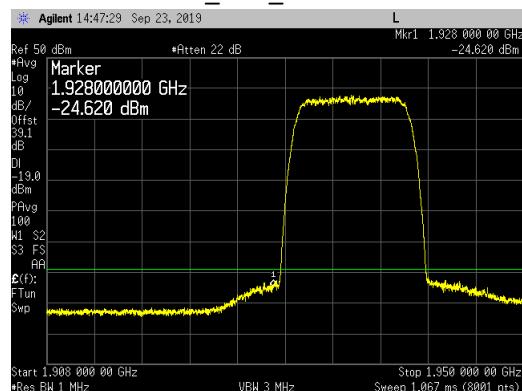
Bottom Channel_LBE_ 1928 to 1929MHz



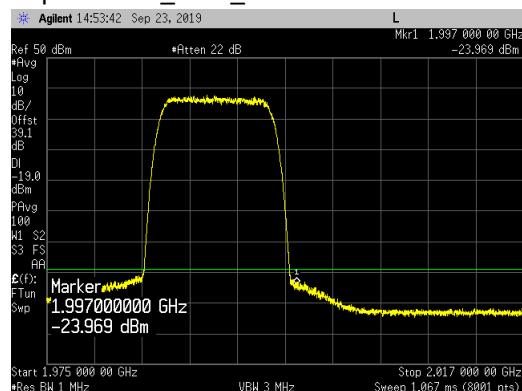
Top Channel_UBE_ 1996 to 1997MHz



Bottom Channel_LBE_ 1908 to 1950MHz

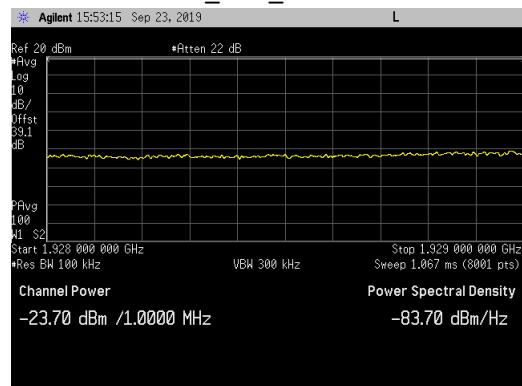
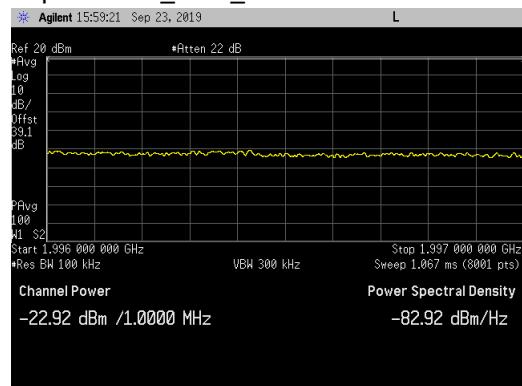
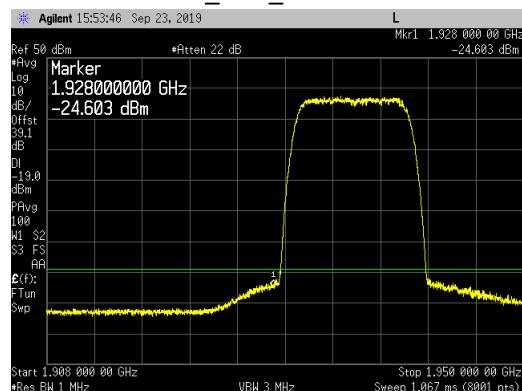
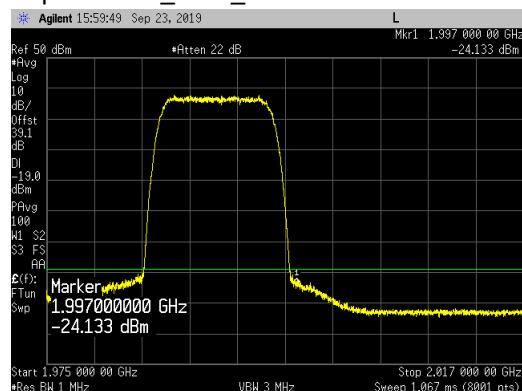


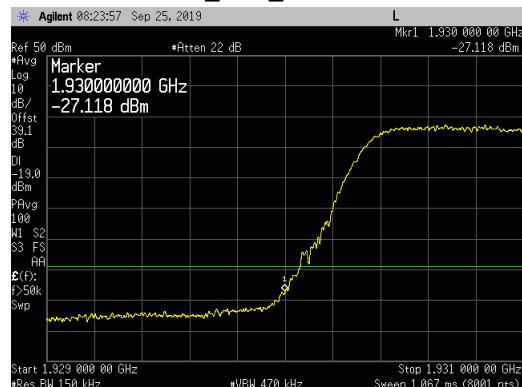
Top Channel_UBE_ 1975 to 2017MHz

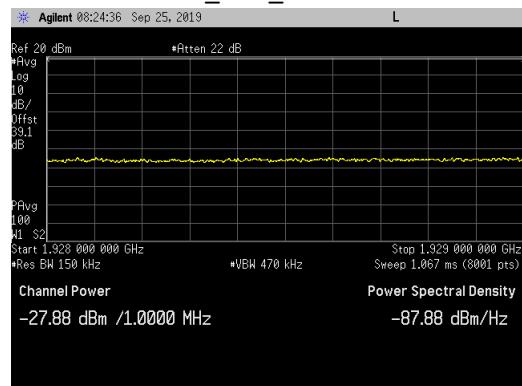
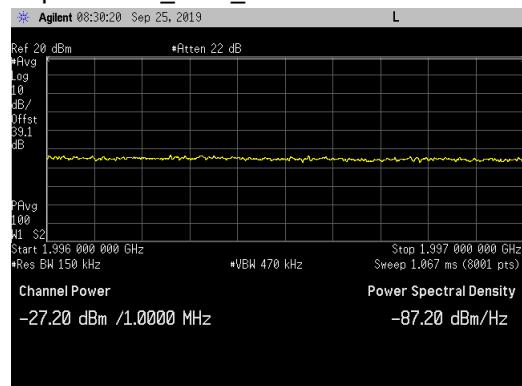
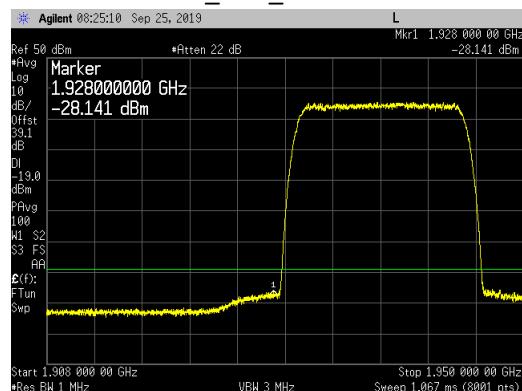
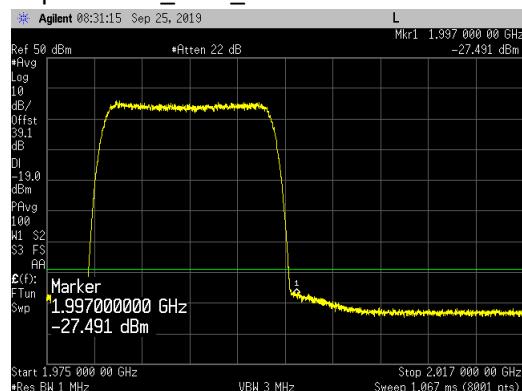


5G NR_ 10MHz Channel Bandwidth_Band Edge Plots_ 256QAM Modulation for Antenna Port 2:
Bottom Channel_LBE_ 1929 to 1931MHz

Top Channel_UBE_ 1994 to 1996MHz

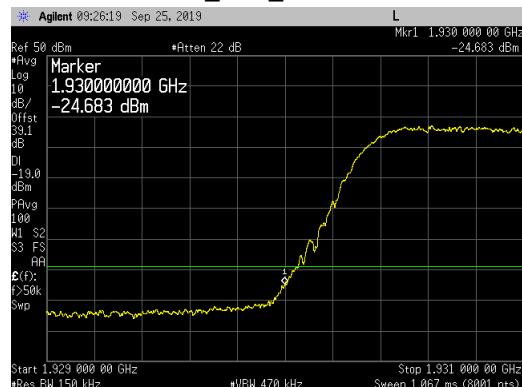
Bottom Channel_LBE_ 1928 to 1929MHz

Top Channel_UBE_ 1996 to 1997MHz

Bottom Channel_LBE_ 1908 to 1950MHz

Top Channel_UBE_ 1975 to 2017MHz


5G NR_ 15MHz Channel Bandwidth_Band Edge Plots_QPSK Modulation for Antenna Port 3:
Bottom Channel_LBE_ 1929 to 1931MHz

Top Channel_UBE_ 1994 to 1996MHz

Bottom Channel_LBE_ 1928 to 1929MHz

Top Channel_UBE_ 1996 to 1997MHz

Bottom Channel_LBE_ 1908 to 1950MHz

Top Channel_UBE_ 1975 to 2017MHz


5G NR_ 15MHz Channel Bandwidth_Band Edge Plots_ 16QAM Modulation for Antenna Port 3:

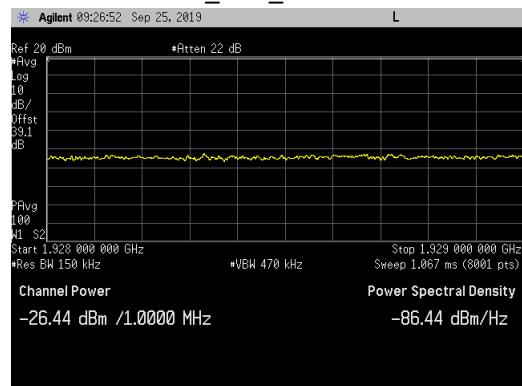
Bottom Channel_LBE_ 1929 to 1931MHz



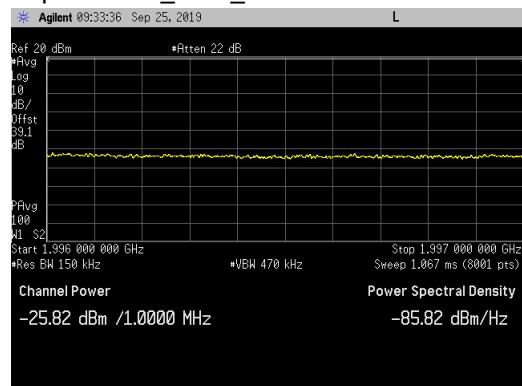
Top Channel_UBE_ 1994 to 1996MHz



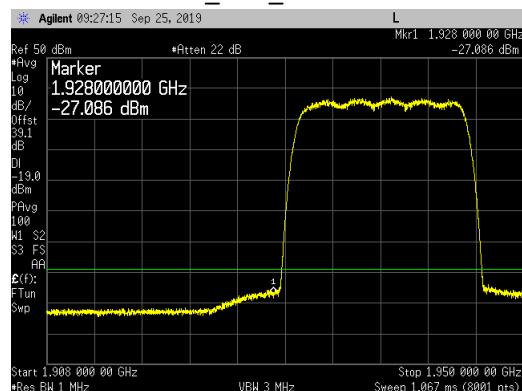
Bottom Channel_LBE_ 1928 to 1929MHz



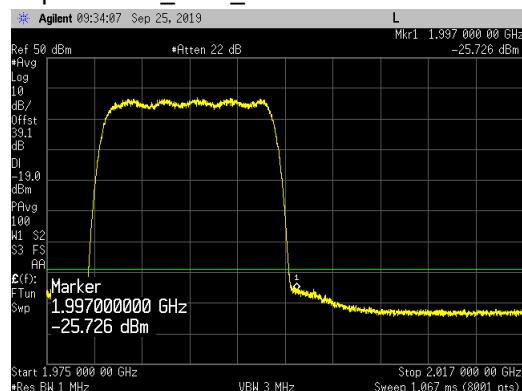
Top Channel_UBE_ 1996 to 1997MHz



Bottom Channel_LBE_ 1908 to 1950MHz

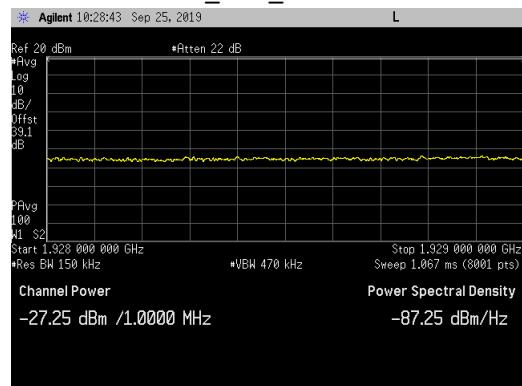
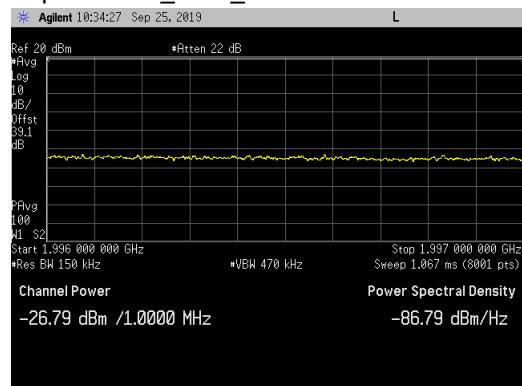
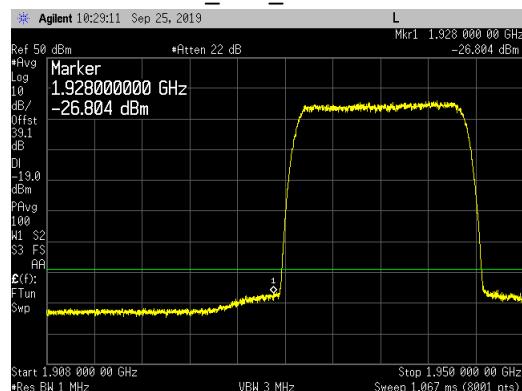
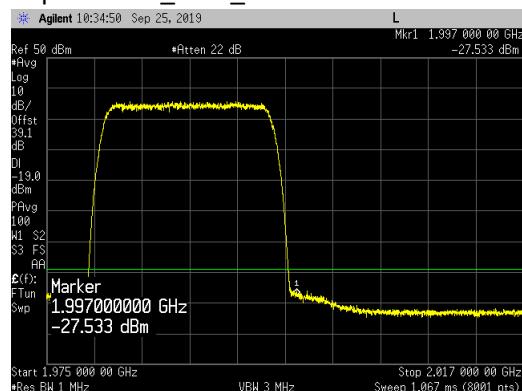


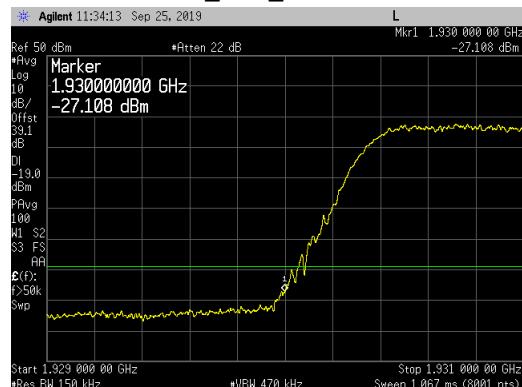
Top Channel_UBE_ 1975 to 2017MHz

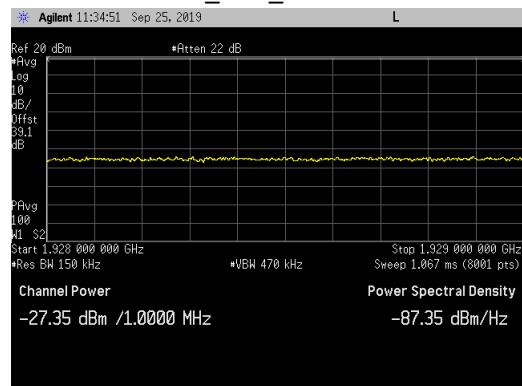
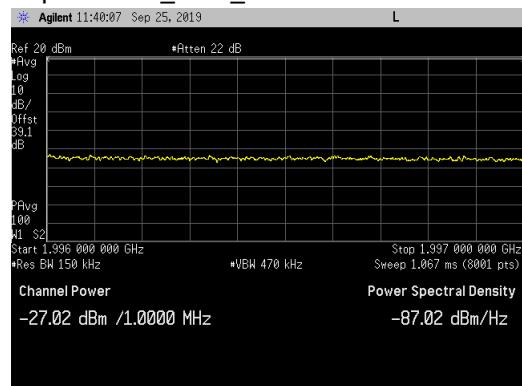
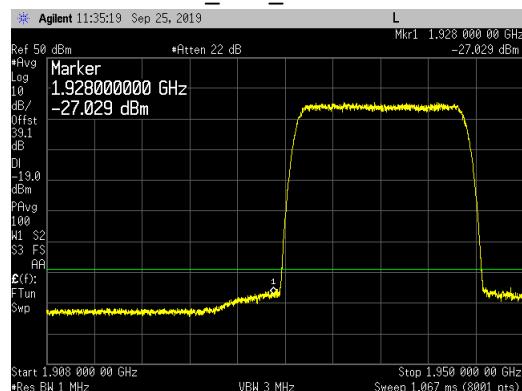
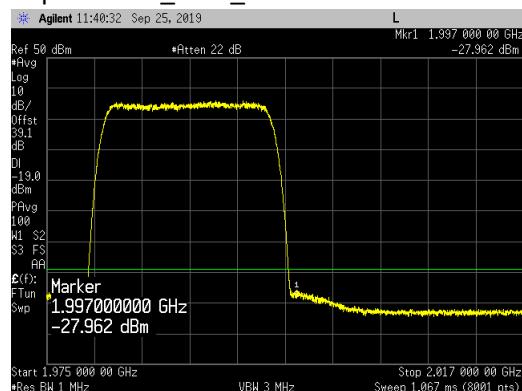


5G NR_ 15MHz Channel Bandwidth_Band Edge Plots_64QAM Modulation for Antenna Port 3:
Bottom Channel_LBE_ 1929 to 1931MHz

Top Channel_UBE_ 1994 to 1996MHz

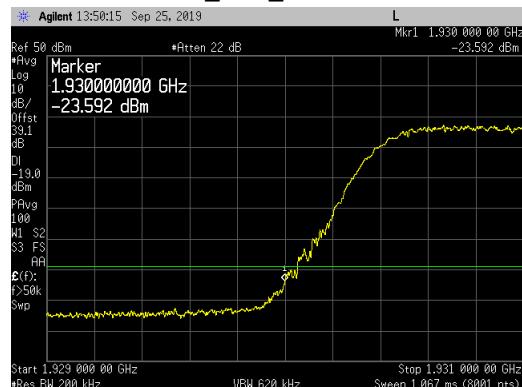
Bottom Channel_LBE_ 1928 to 1929MHz

Top Channel_UBE_ 1996 to 1997MHz

Bottom Channel_LBE_ 1908 to 1950MHz

Top Channel_UBE_ 1975 to 2017MHz


5G NR_ 15MHz Channel Bandwidth_Band Edge Plots_ 256QAM Modulation for Antenna Port 3:
Bottom Channel_LBE_ 1929 to 1931MHz

Top Channel_UBE_ 1994 to 1996MHz

Bottom Channel_LBE_ 1928 to 1929MHz

Top Channel_UBE_ 1996 to 1997MHz

Bottom Channel_LBE_ 1908 to 1950MHz

Top Channel_UBE_ 1975 to 2017MHz


5G NR_ 20MHz Channel Bandwidth_Band Edge Plots_QPSK Modulation for Antenna Port 3:

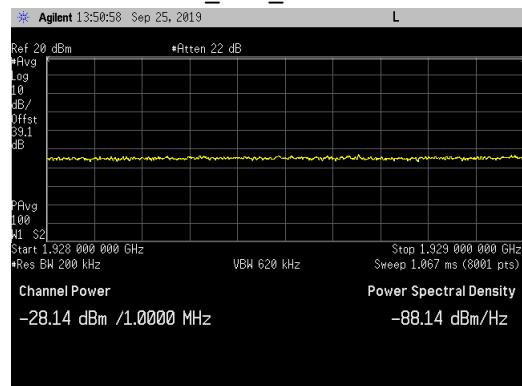
Bottom Channel_LBE_ 1929 to 1931MHz



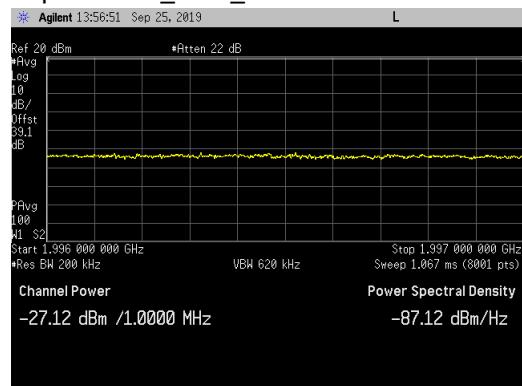
Top Channel_UBE_ 1994 to 1996MHz



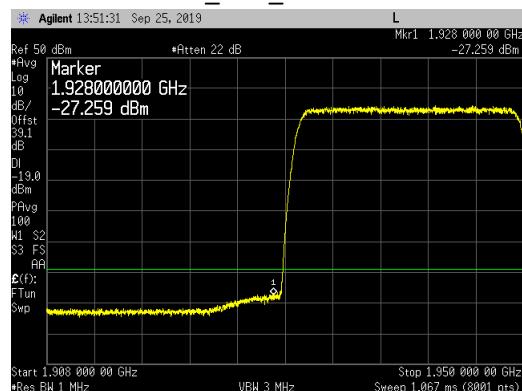
Bottom Channel_LBE_ 1928 to 1929MHz



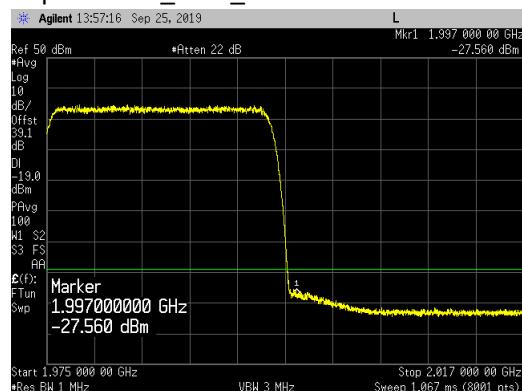
Top Channel_UBE_ 1996 to 1997MHz

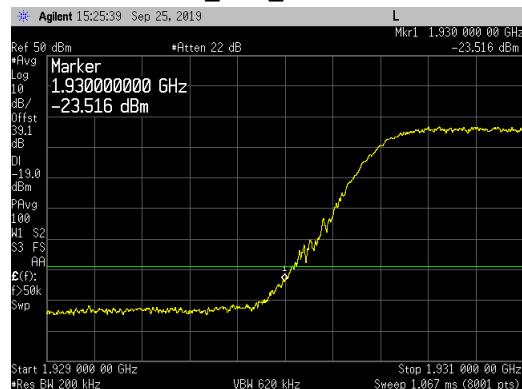
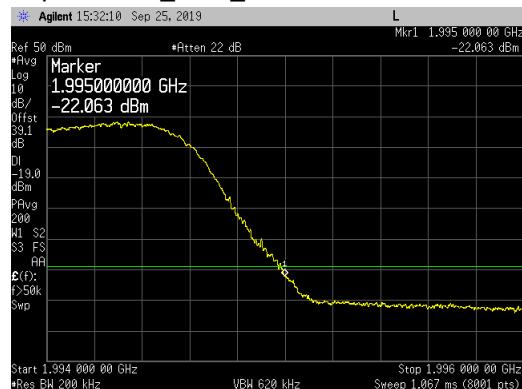
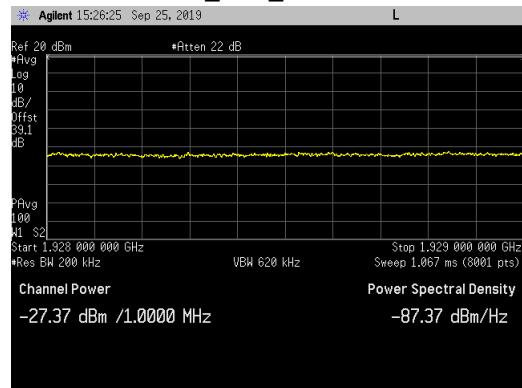
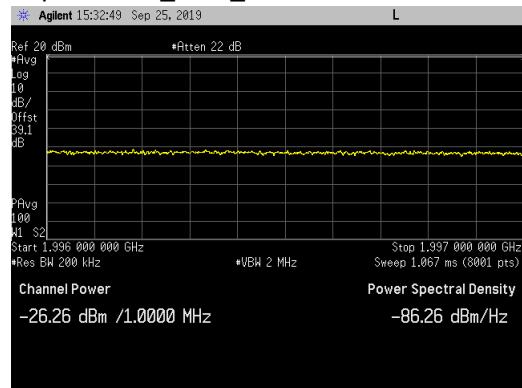
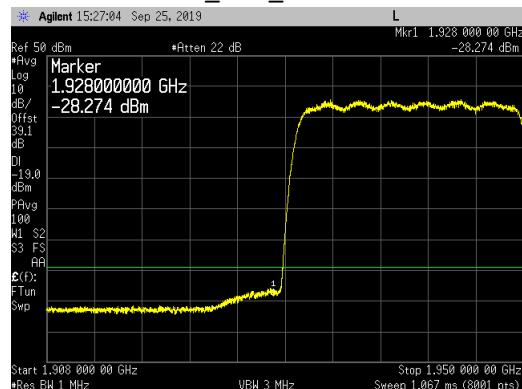
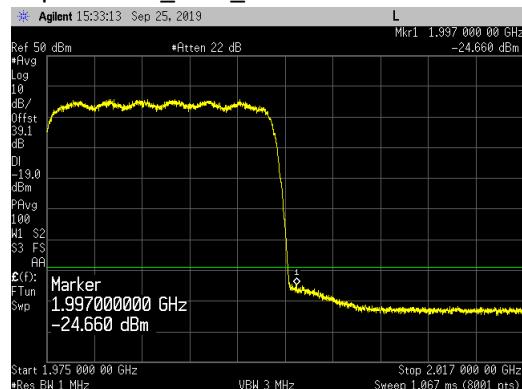


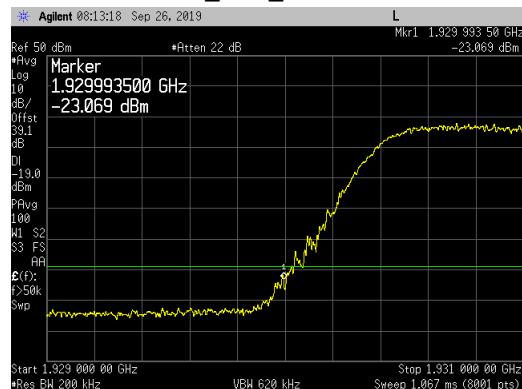
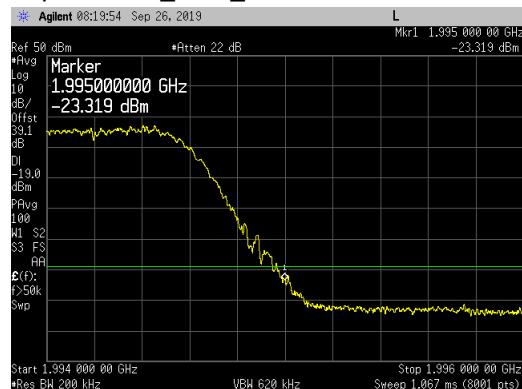
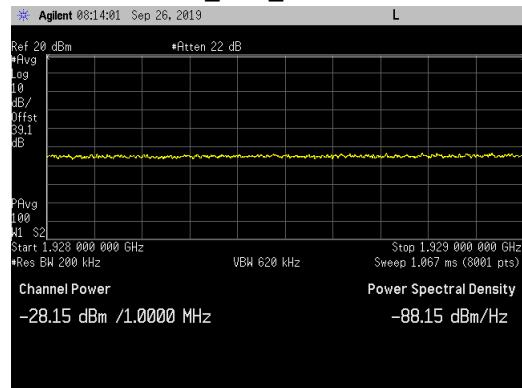
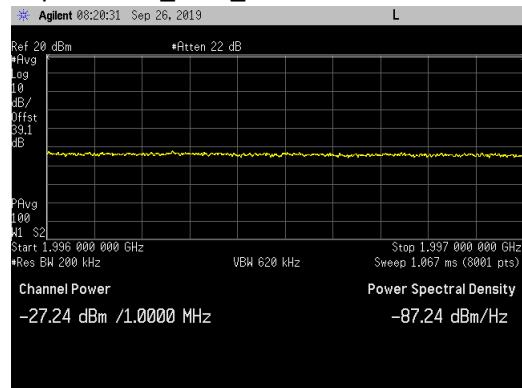
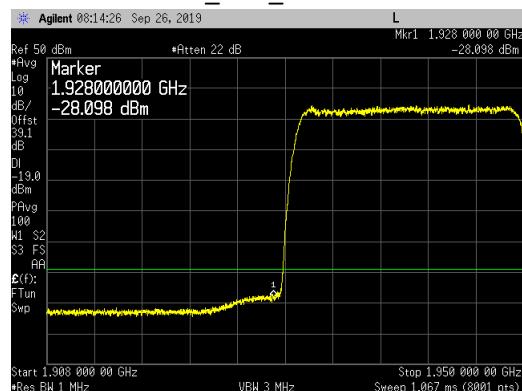
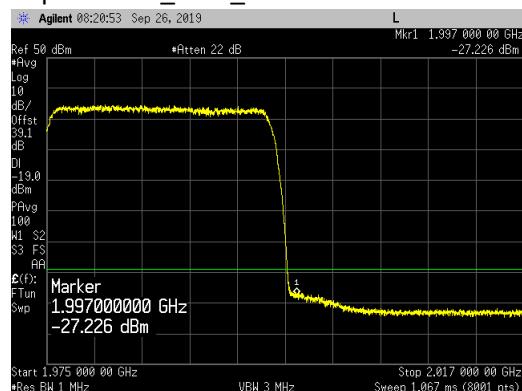
Bottom Channel_LBE_ 1908 to 1950MHz



Top Channel_UBE_ 1975 to 2017MHz

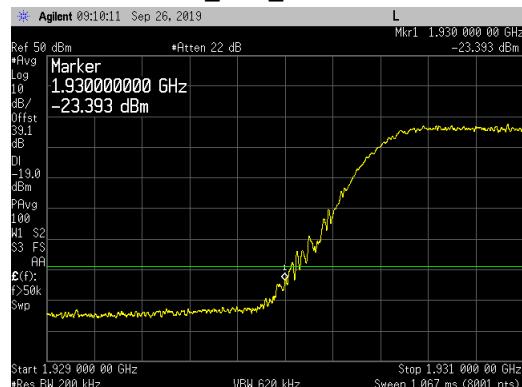


5G NR_ 20MHz Channel Bandwidth_Band Edge Plots_ 16QAM Modulation for Antenna Port 3:
Bottom Channel_LBE_ 1929 to 1931MHz

Top Channel_UBE_ 1994 to 1996MHz

Bottom Channel_LBE_ 1928 to 1929MHz

Top Channel_UBE_ 1996 to 1997MHz

Bottom Channel_LBE_ 1908 to 1950MHz

Top Channel_UBE_ 1975 to 2017MHz


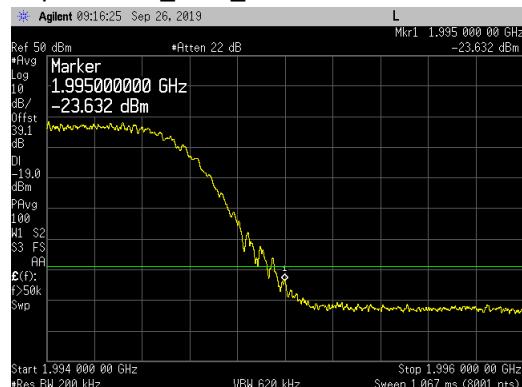
5G NR_ 20MHz Channel Bandwidth_Band Edge Plots_64QAM Modulation for Antenna Port 3:
Bottom Channel_LBE_ 1929 to 1931MHz

Top Channel_UBE_ 1994 to 1996MHz

Bottom Channel_LBE_ 1928 to 1929MHz

Top Channel_UBE_ 1996 to 1997MHz

Bottom Channel_LBE_ 1908 to 1950MHz

Top Channel_UBE_ 1975 to 2017MHz


5G NR_ 20MHz Channel Bandwidth_Band Edge Plots_ 256QAM Modulation for Antenna Port 3:

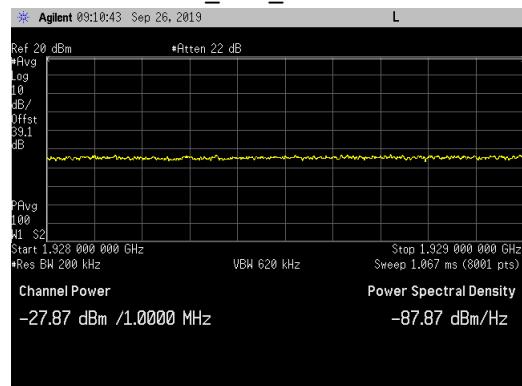
Bottom Channel_LBE_ 1929 to 1931MHz



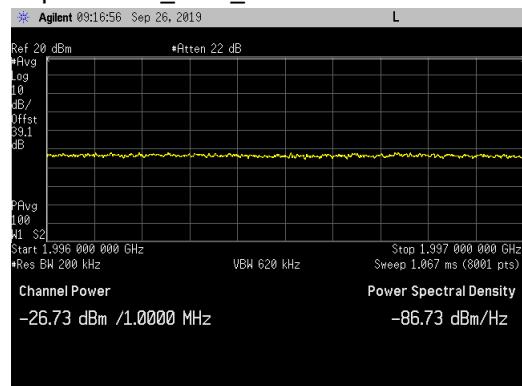
Top Channel_UBE_ 1994 to 1996MHz



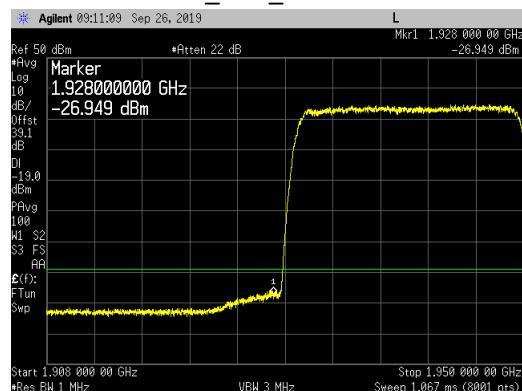
Bottom Channel_LBE_ 1928 to 1929MHz



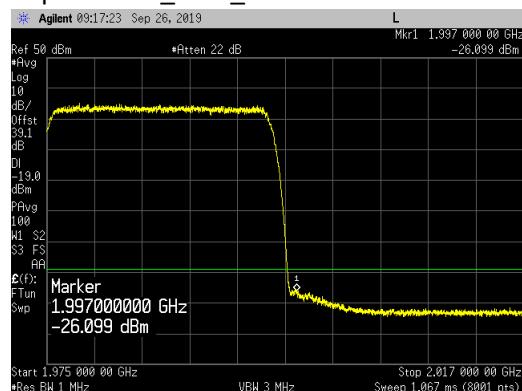
Top Channel_UBE_ 1996 to 1997MHz



Bottom Channel_LBE_ 1908 to 1950MHz



Top Channel_UBE_ 1975 to 2017MHz



Transmitter Antenna Port Conducted Emissions

Transmitter conducted emission measurements were made at RRH antenna port 2/3. Measurements were performed over the 9 kHz to 22GHz frequency range.

The testing was performed with the RRH operating on the PCS middle channel (1962.5MHz) with all modulation types (QPSK, 16QAM, 64QAM and 256QAM) for all 5G NR channel bandwidths (5MHz, 10MHz, 15MHz and 20MHz) at maximum carrier power (40 watts/cARRIER).

The power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm as specified in section 24.238(a), 27.53(h)(1), RSS 133 6.5(i) and RSS 139 6.6. The limit of -19dBm was used in the certification 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 max hold over 50 sweeps (except for the 20MHz to 3GHz frequency range). Measurements for the 20MHz to 3GHz frequency range were performed with the spectrum analyzer in the RMS average mode over 100 traces.

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.: $-49\text{dBm} = -19\text{dBm} - 10\log(1\text{MHz}/1\text{kHz})$]. The limit for the 150kHz to 20MHz frequency range was adjusted to -39dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: $-39\text{dBm} = -19\text{dBm} - 10\log(1\text{MHz}/10\text{kHz})$]. The required limit of -19dBm with a RBW of $\geq 1\text{MHz}$ was used for all other frequency ranges.

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

Frequency Range	RBW	VBW	Number of Data Points	Detector	Sweep Time	Max Hold over	Offset Note (1)
9kHz to 150kHz	1kHz	3kHz	8001	Peak	Auto	50 Sweeps	18.8dB
150kHz to 20MHz	10kHz	30kHz	8001	Peak	Auto	50 Sweeps	18.9dB
20MHz to 3GHz	1MHz	3MHz	8001	Average	Auto	Note (2)	39.1dB
3GHz to 6GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	39.3dB
6GHz to 18GHz	2MHz	6MHz	8192	Peak	Auto	50 Sweeps	27.3dB
18GHz to 22GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	33.6dB

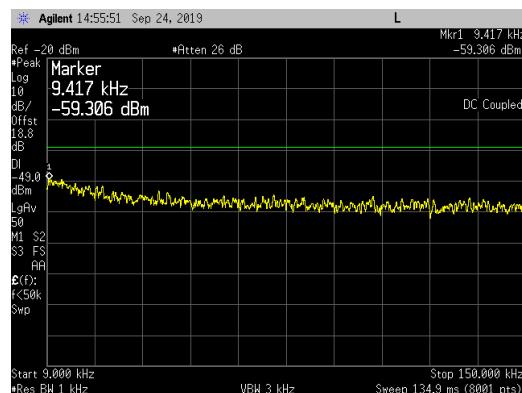
Note 1: The total measurement RF path loss of the test setup (attenuators, test cables and filters) is accounted for by the spectrum analyzer reference level offset.

Note 2: Max Hold not used and instead measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces.

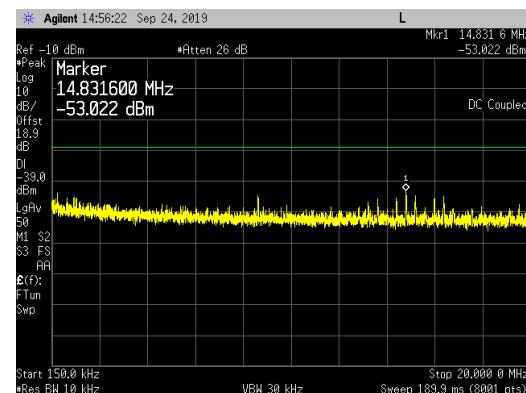
A low pass filter was used to reduce measurement instrumentation noise floor for the frequency ranges less than 20MHz. A high pass filter was used to reduce measurement instrumentation noise floor for the frequency ranges above 6GHz. The total measurement RF path loss of the test setup (attenuators, 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.

5G NR_ 5MHz Channel Bandwidth _ QPSK _ PCS Middle Channel (1962.5MHz) _ Ant 3:

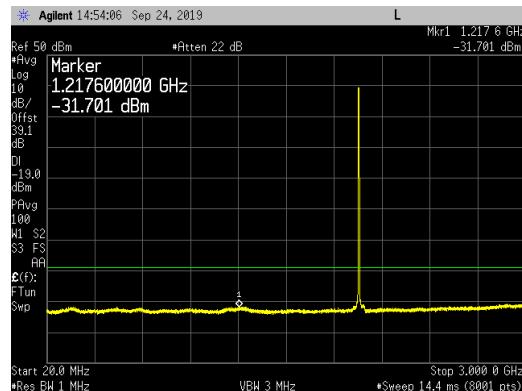
9 kHz to 150 kHz



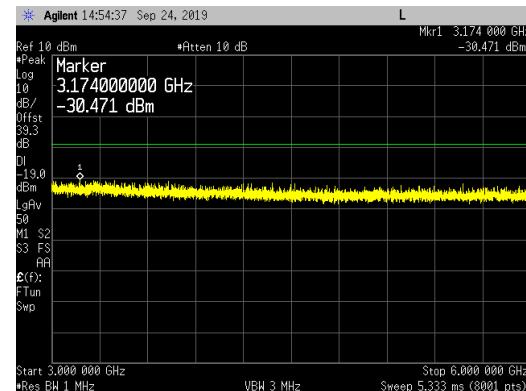
150 kHz to 20MHz



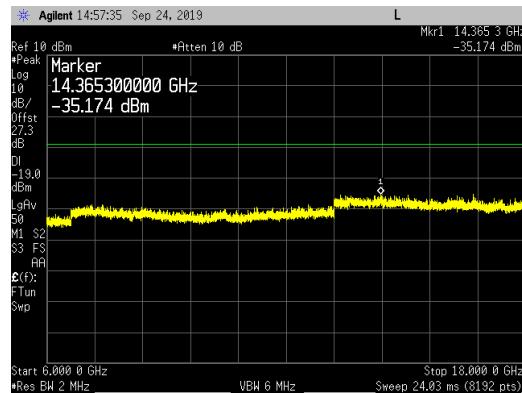
20MHz to 3GHz



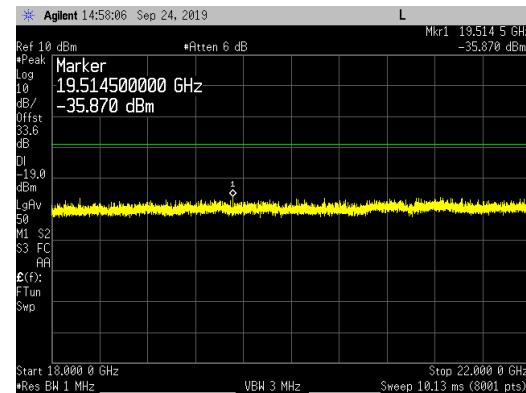
3GHz to 6GHz



6GHz to 18GHz

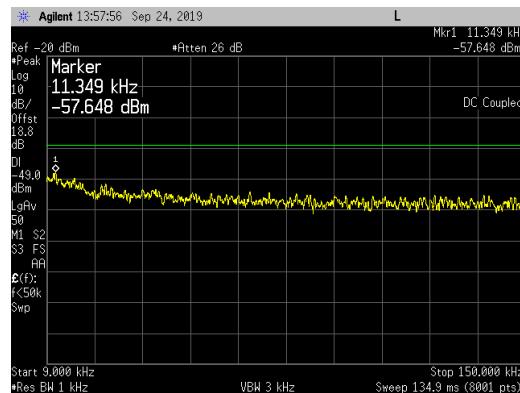


18GHz to 22GHz

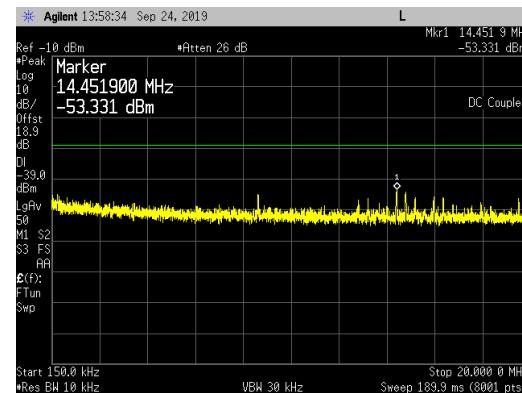


5G NR_ 5MHz Channel Bandwidth _ 16QAM _ PCS Middle Channel (1962.5MHz) _ Ant 3:

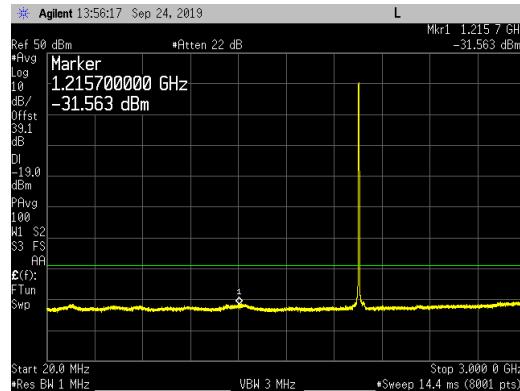
9 kHz to 150 kHz



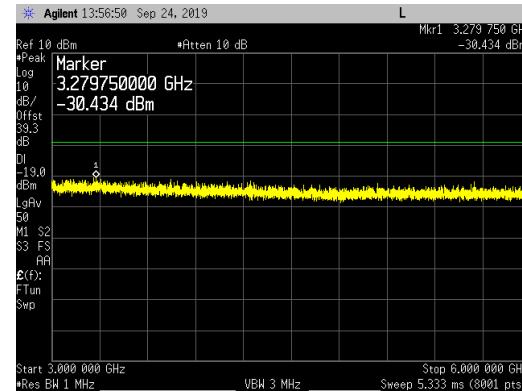
150 kHz to 20MHz



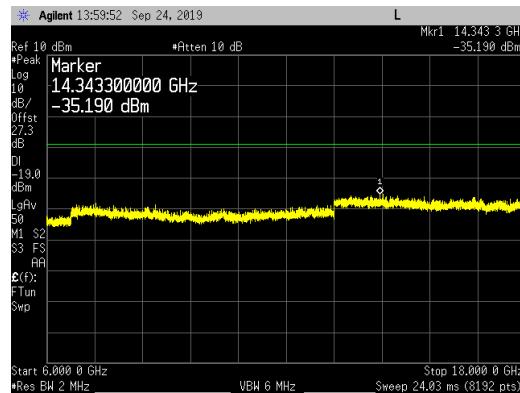
20MHz to 3GHz



3GHz to 6GHz



6GHz to 18GHz

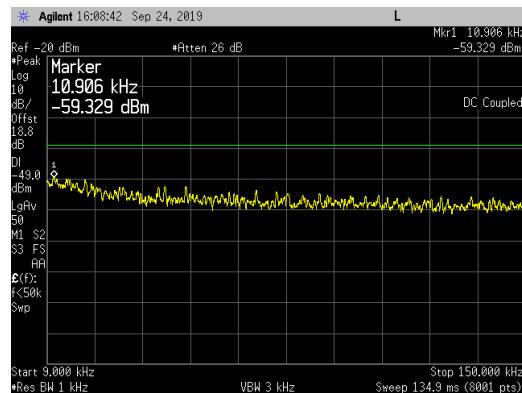


18GHz to 22GHz

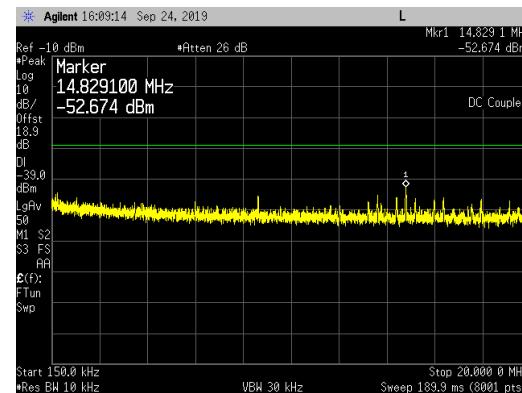


5G NR_ 5MHz Channel Bandwidth_ 64QAM_ PCS Middle Channel (1962.5MHz) _ Ant 3:

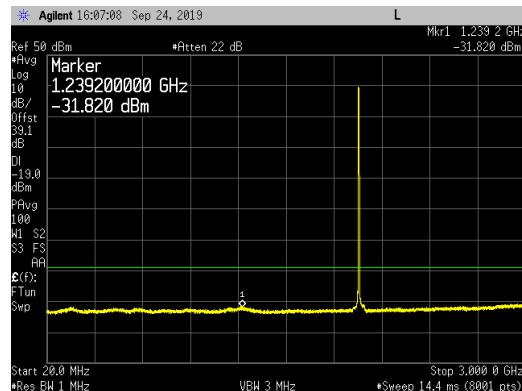
9 kHz to 150 kHz



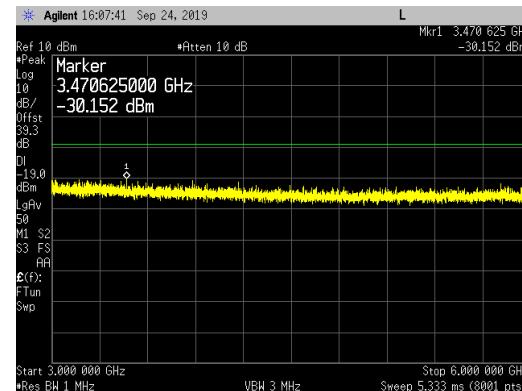
150 kHz to 20MHz



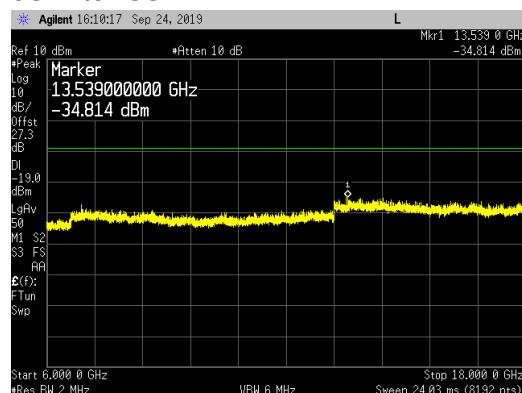
20MHz to 3GHz



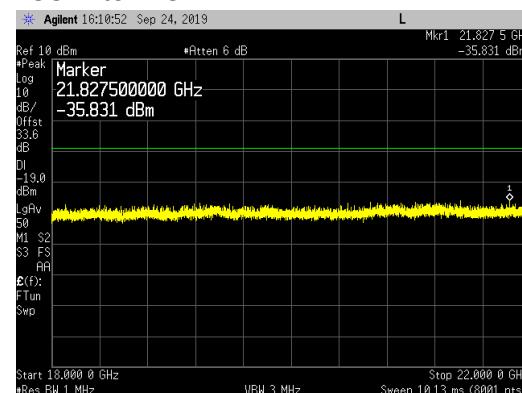
3GHz to 6GHz



6GHz to 18GHz

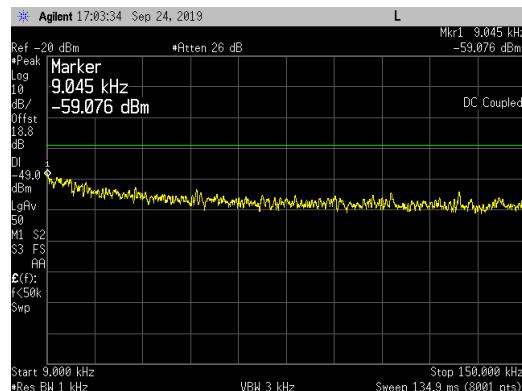


18GHz to 22GHz

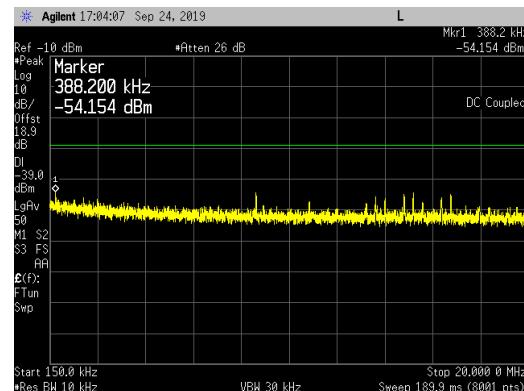


5G NR_ 5MHz Channel Bandwidth _ 256QAM _ PCS Middle Channel (1962.5MHz) _ Ant 3:

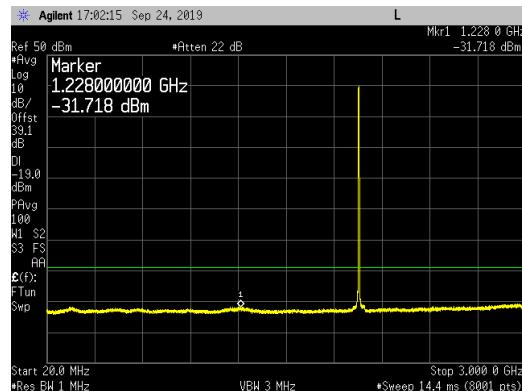
9 kHz to 150 kHz



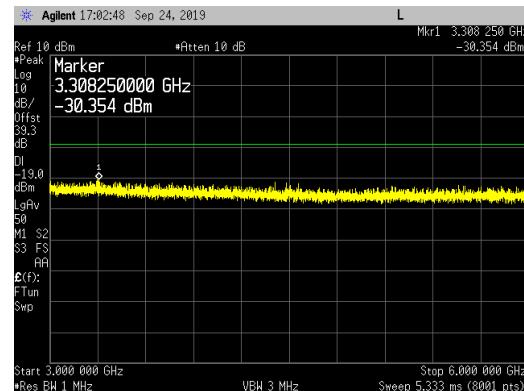
150 kHz to 20MHz



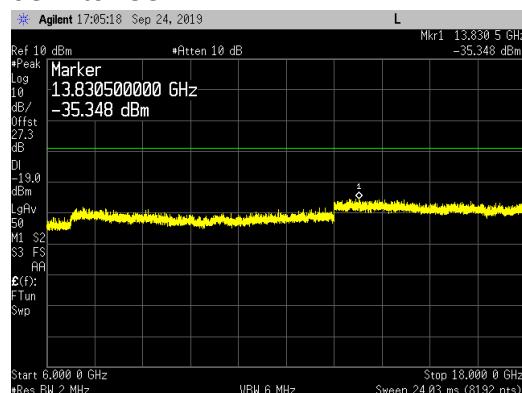
20MHz to 3GHz



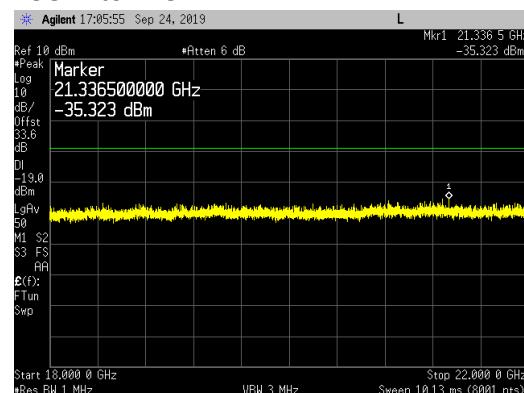
3GHz to 6GHz



6GHz to 18GHz

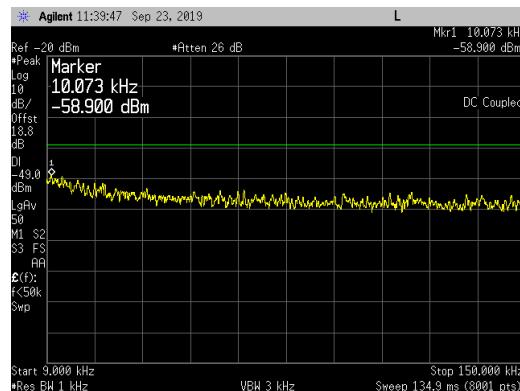


18GHz to 22GHz

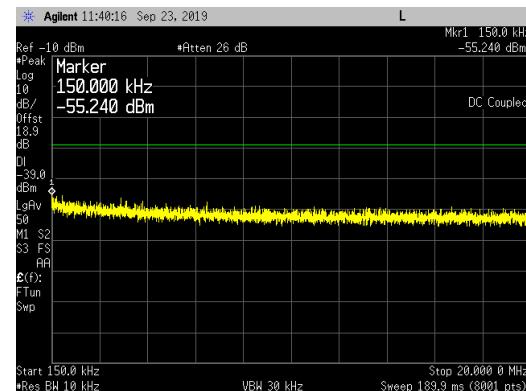


5G NR_ 10MHz Channel Bandwidth _ QPSK_ PCS Middle Channel (1962.5MHz) _ Ant 2:

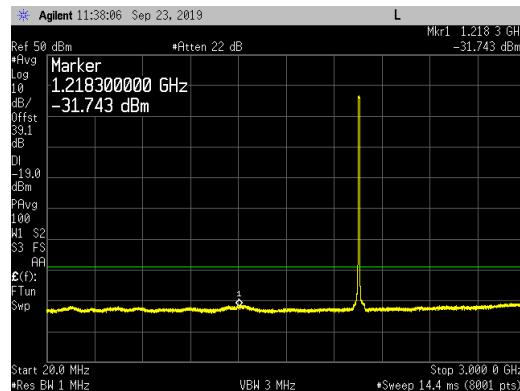
9 kHz to 150 kHz



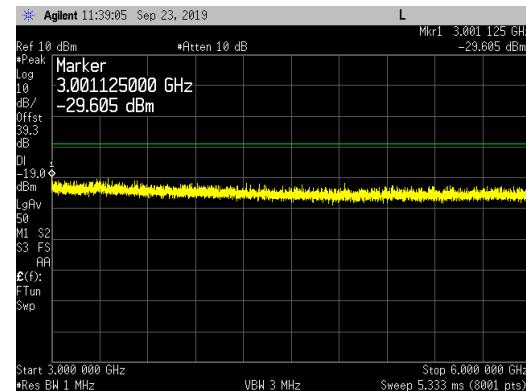
150 kHz to 20MHz



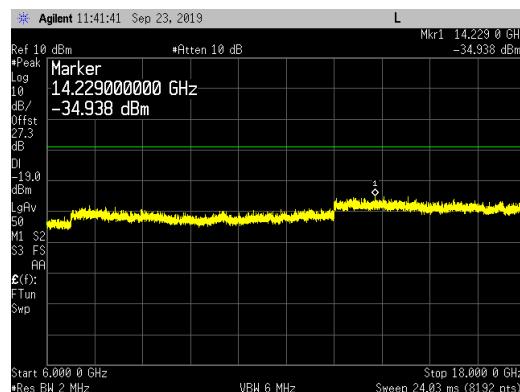
20MHz to 3GHz



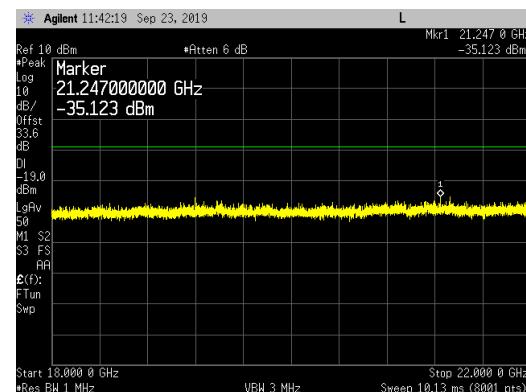
3GHz to 6GHz



6GHz to 18GHz

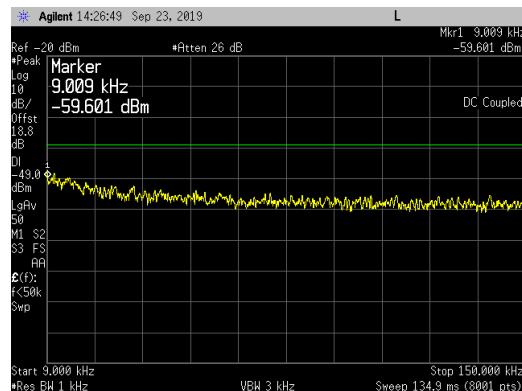


18GHz to 22GHz

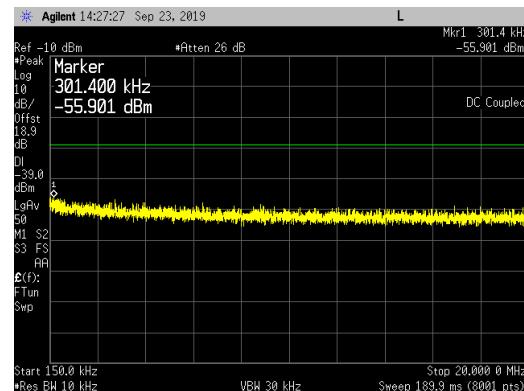


5G NR_ 10MHz Channel Bandwidth _ 16QAM _ PCS Middle Channel (1962.5MHz) _ Ant 2:

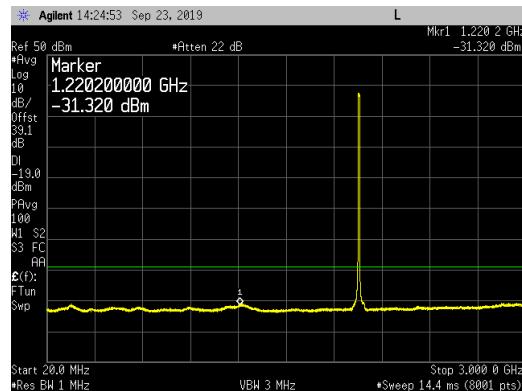
9 kHz to 150 kHz



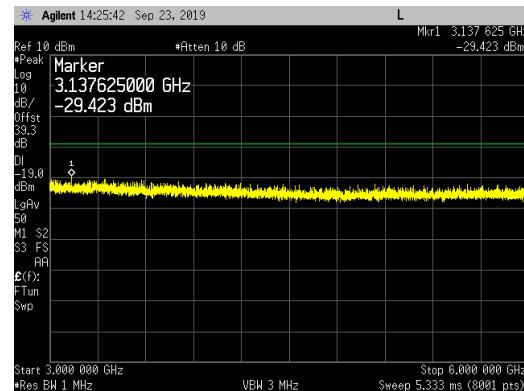
150 kHz to 20MHz



20MHz to 3GHz



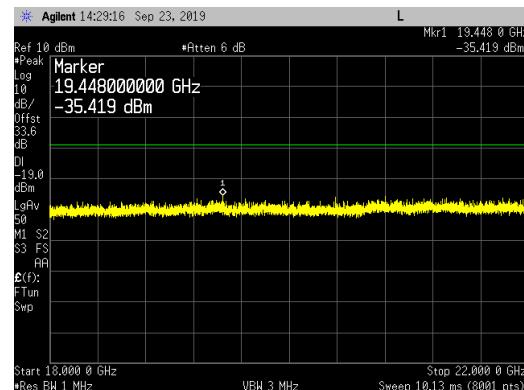
3GHz to 6GHz



6GHz to 18GHz

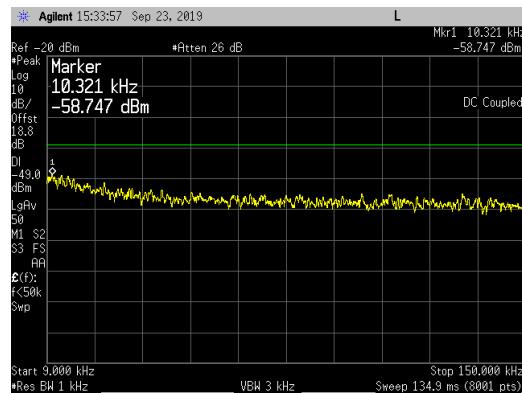


18GHz to 22GHz

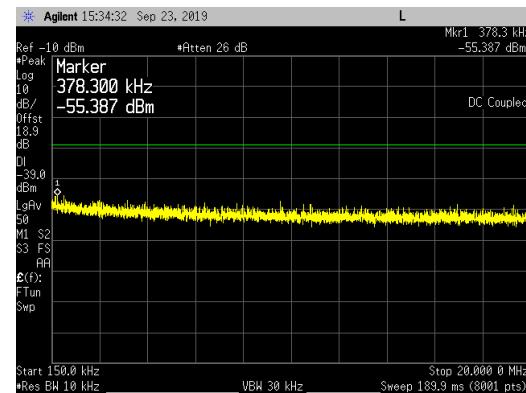


5G NR_ 10MHz Channel Bandwidth _ 64QAM _ PCS Middle Channel (1962.5MHz) _ Ant 2:

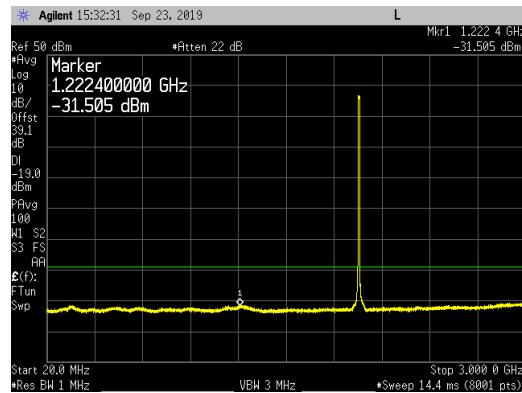
9 kHz to 150 kHz



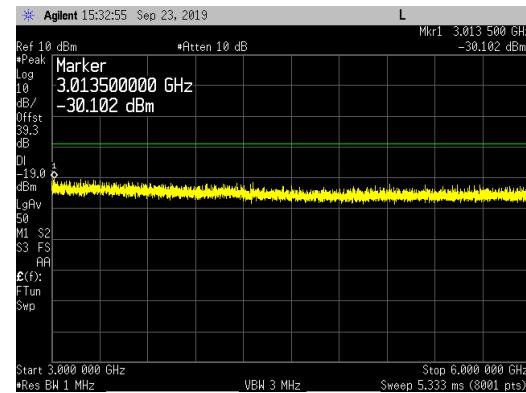
150 kHz to 20MHz



20MHz to 3GHz



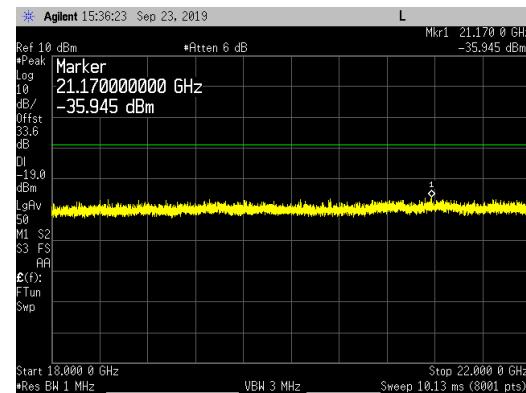
3GHz to 6GHz



6GHz to 18GHz

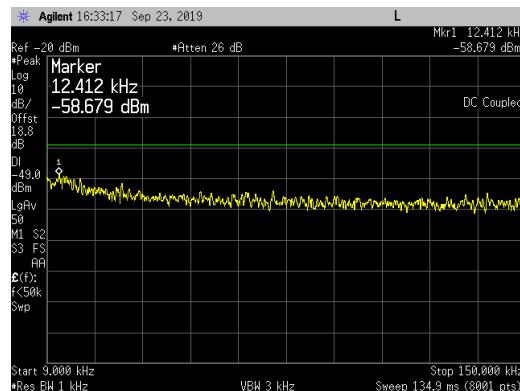


18GHz to 22GHz

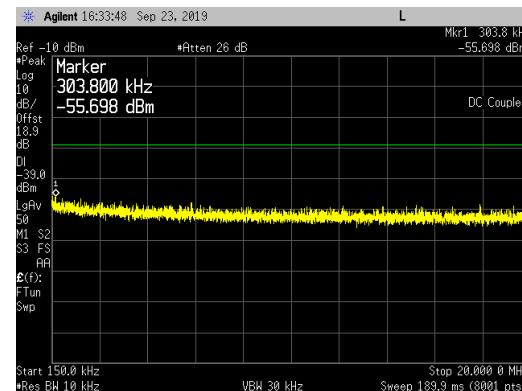


5G NR_ 10MHz Channel Bandwidth _ 256QAM _ PCS Middle Channel (1962.5MHz) _ Ant 2:

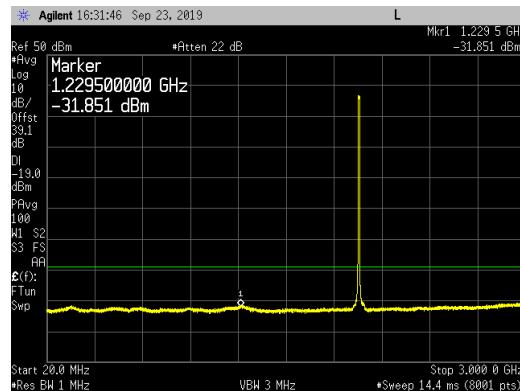
9 kHz to 150 kHz



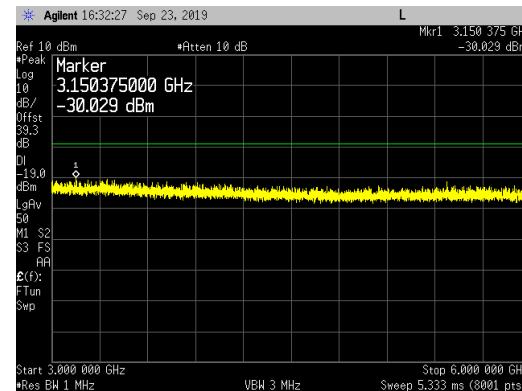
150 kHz to 20MHz



20MHz to 3GHz



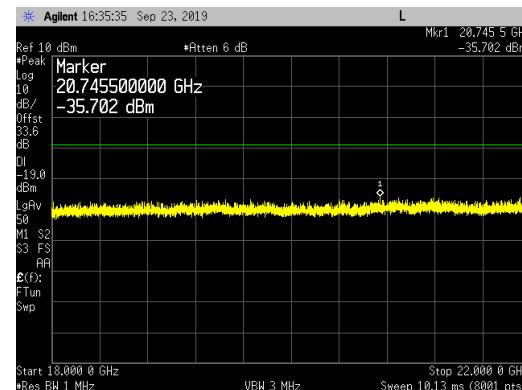
3GHz to 6GHz



6GHz to 18GHz

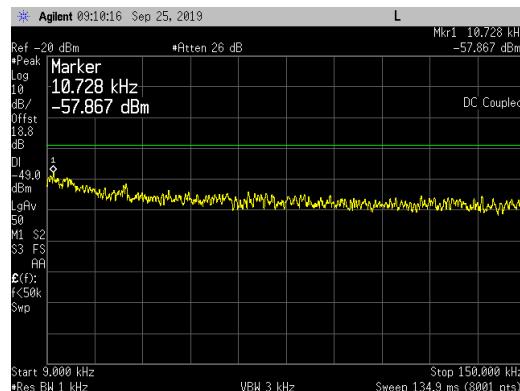


18GHz to 22GHz

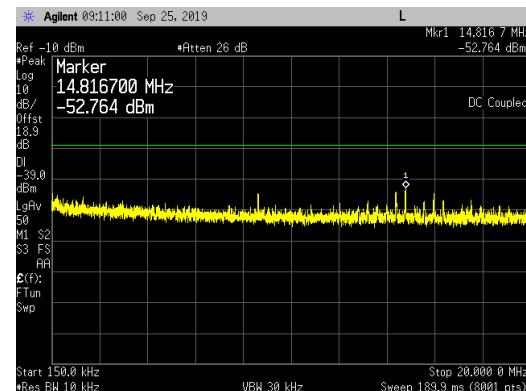


5G NR_ 15MHz Channel Bandwidth _ QPSK_ PCS Middle Channel (1962.5MHz) _ Ant 3:

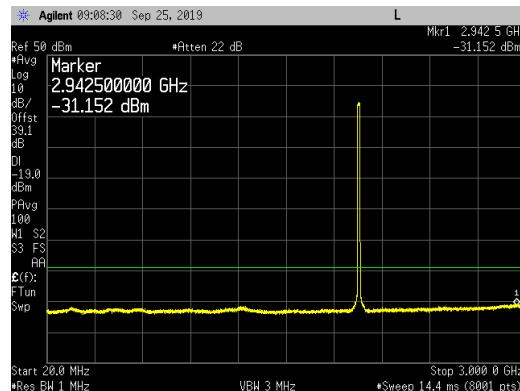
9 kHz to 150 kHz



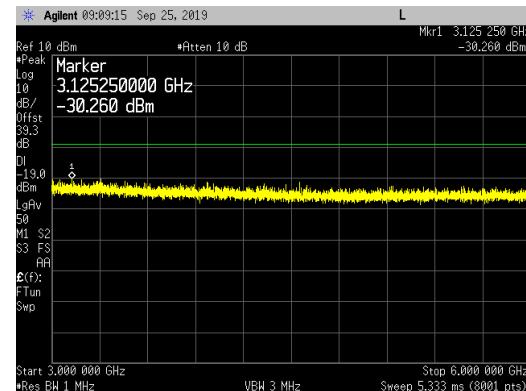
150 kHz to 20MHz



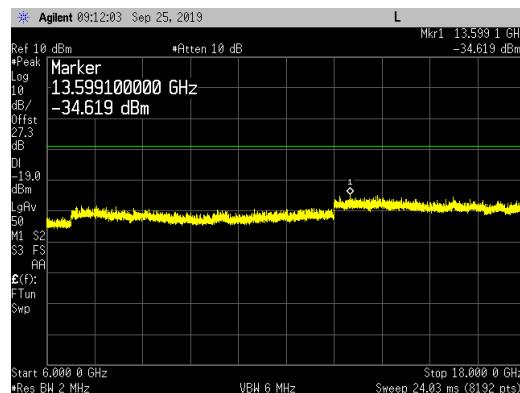
20MHz to 3GHz



3GHz to 6GHz



6GHz to 18GHz

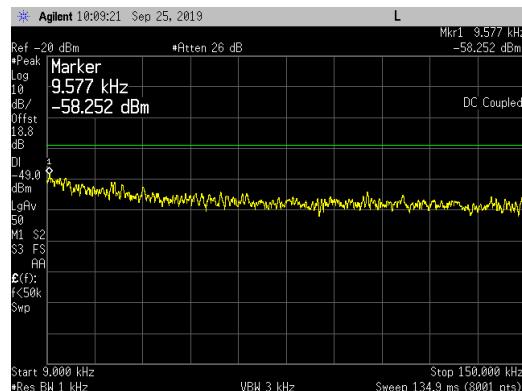


18GHz to 22GHz

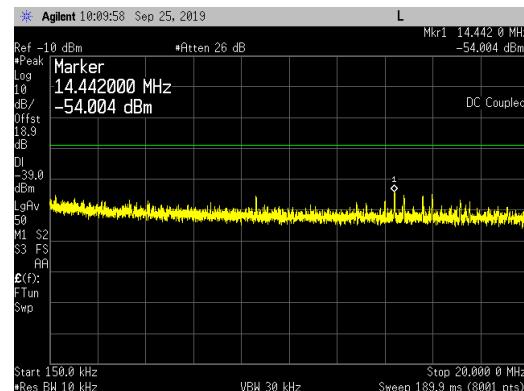


5G NR_ 15MHz Channel Bandwidth _ 16QAM _ PCS Middle Channel (1962.5MHz) _ Ant 3:

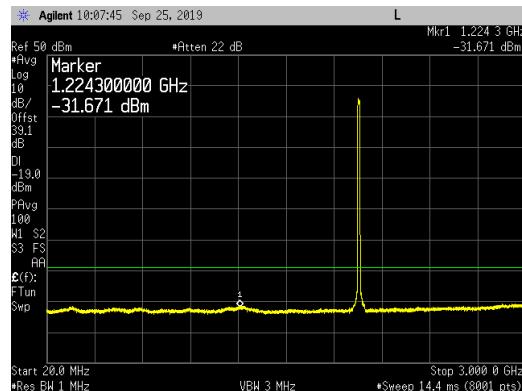
9 kHz to 150 kHz



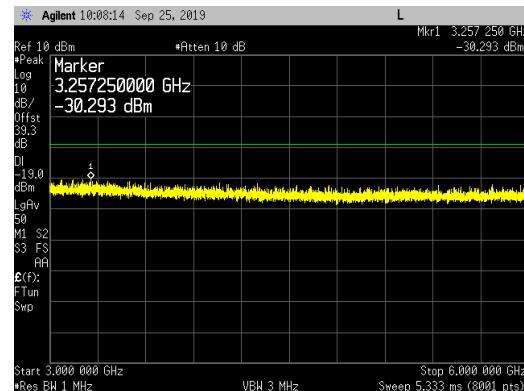
150 kHz to 20MHz



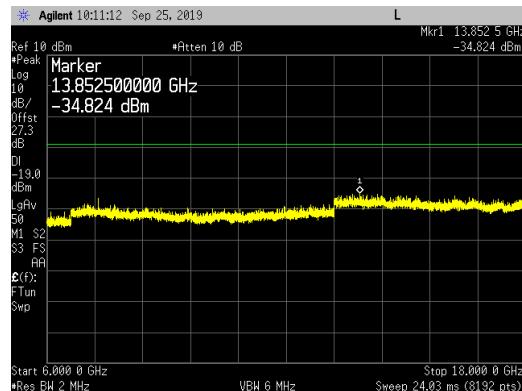
20MHz to 3GHz



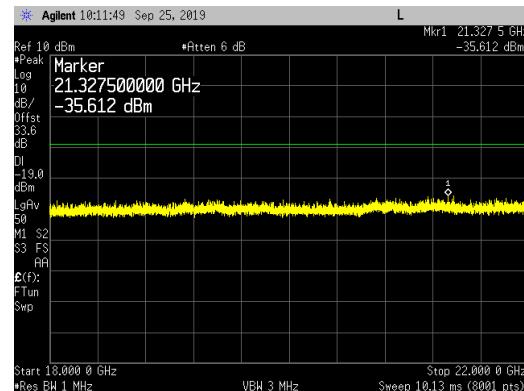
3GHz to 6GHz



6GHz to 18GHz

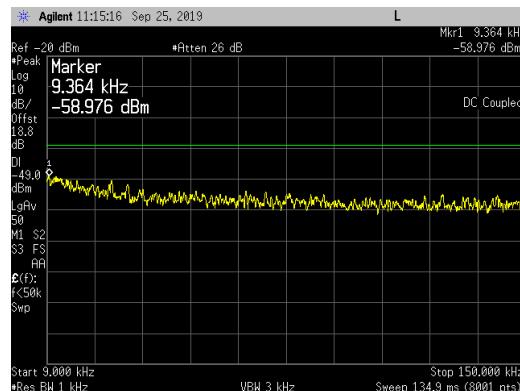


18GHz to 22GHz

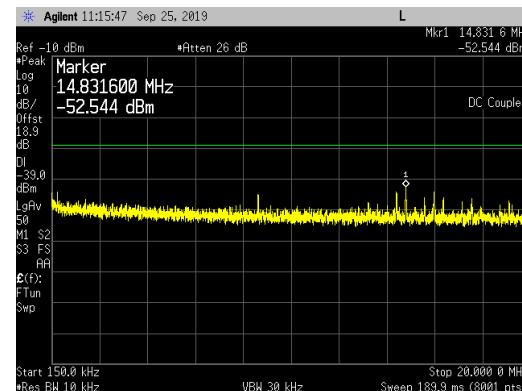


5G NR_ 15MHz Channel Bandwidth _ 64QAM _ PCS Middle Channel (1962.5MHz) _ Ant 3:

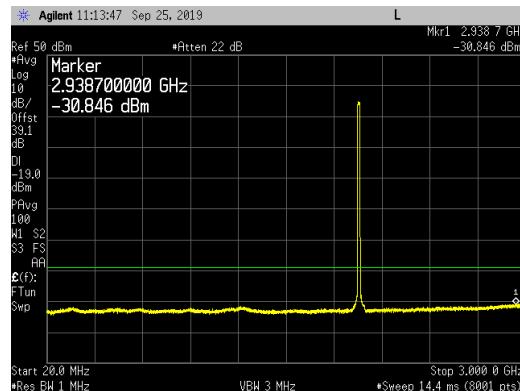
9 kHz to 150 kHz



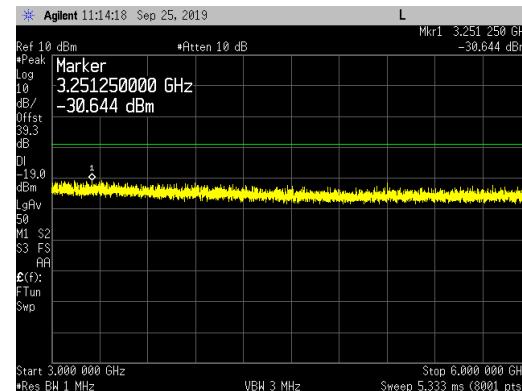
150 kHz to 20MHz



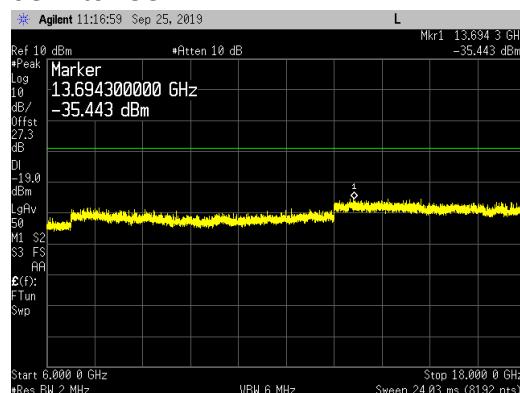
20MHz to 3GHz



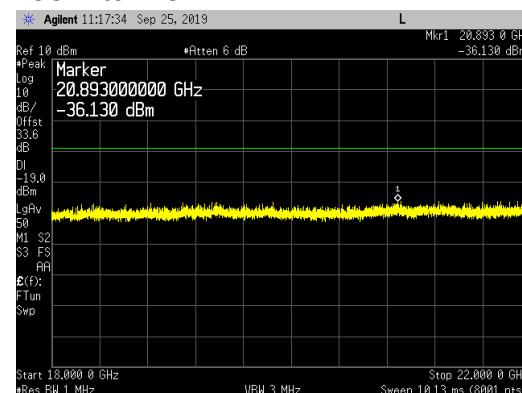
3GHz to 6GHz



6GHz to 18GHz

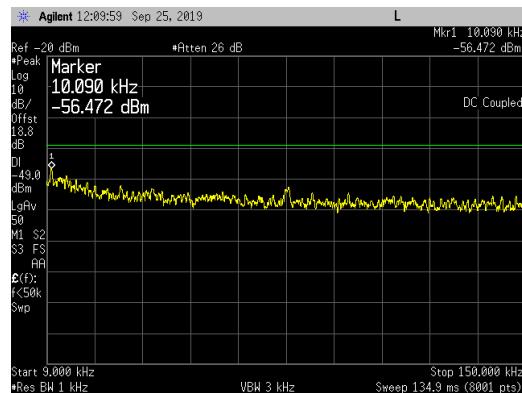


18GHz to 22GHz

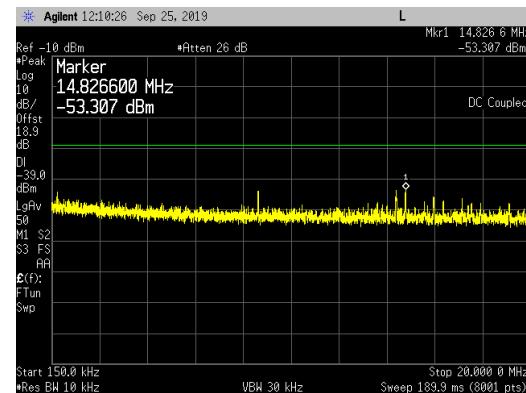


5G NR_ 15MHz Channel Bandwidth _ 256QAM _ PCS Middle Channel (1962.5MHz) _ Ant 3:

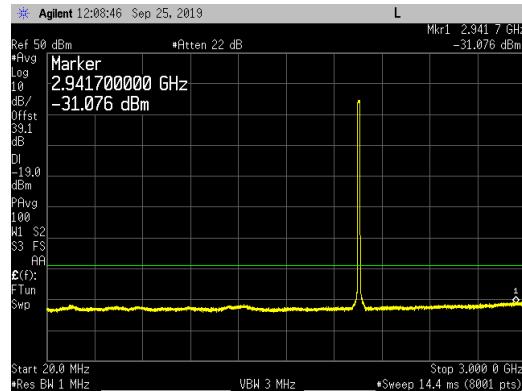
9 kHz to 150 kHz



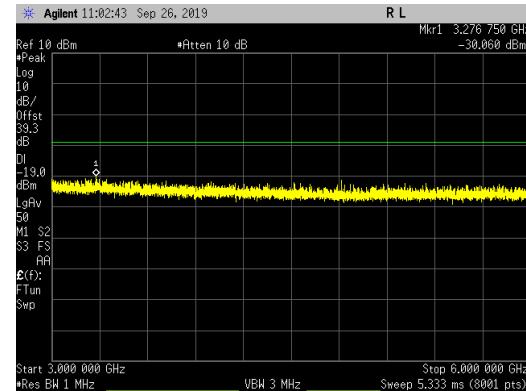
150 kHz to 20MHz



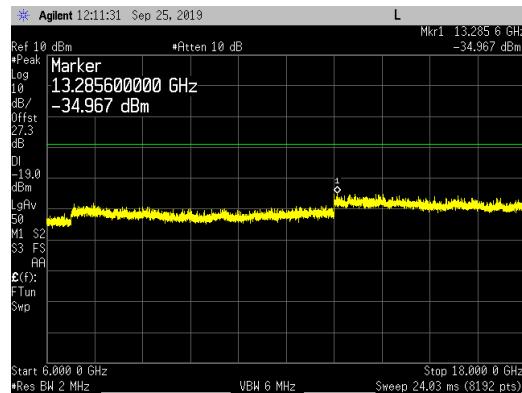
20MHz to 3GHz



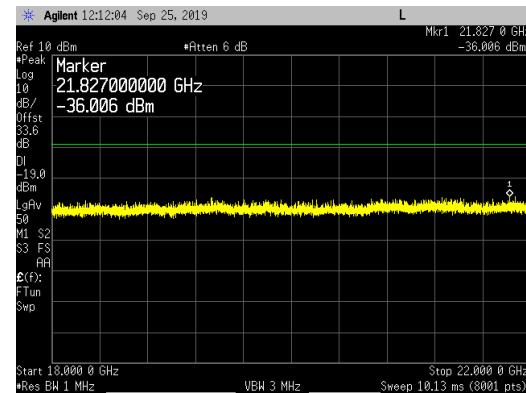
3GHz to 6GHz



6GHz to 18GHz

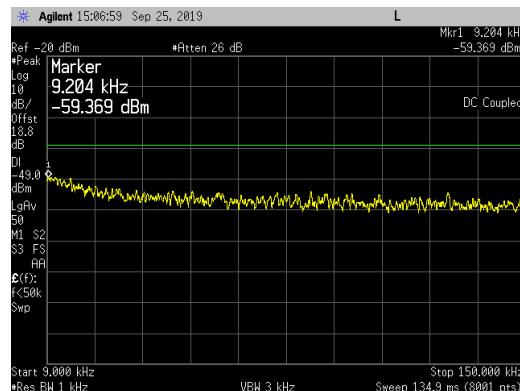


18GHz to 22GHz

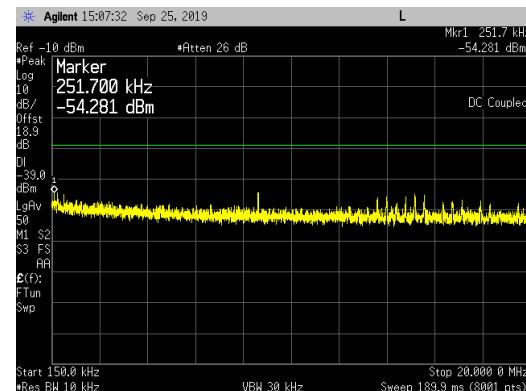


5G NR_ 20MHz Channel Bandwidth _ QPSK_ PCS Middle Channel (1962.5MHz) _ Ant 3:

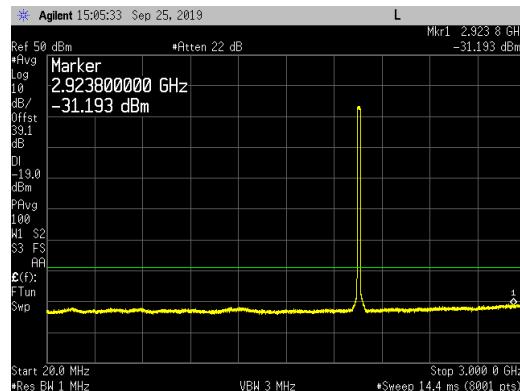
9 kHz to 150 kHz



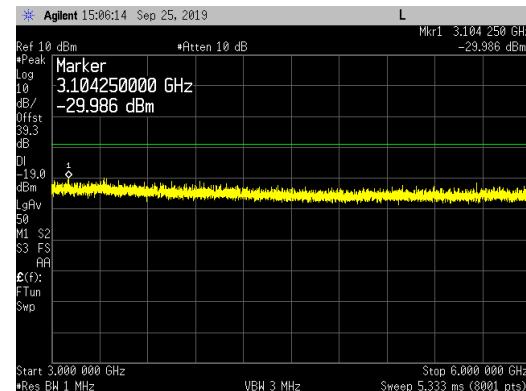
150 kHz to 20MHz



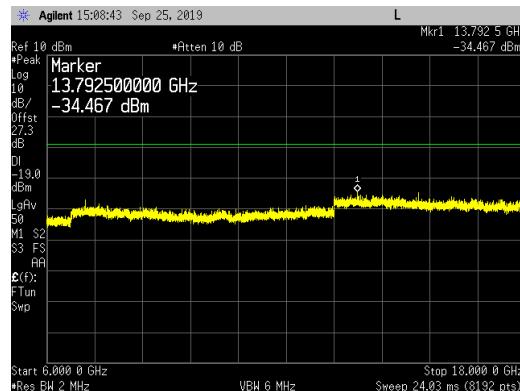
20MHz to 3GHz



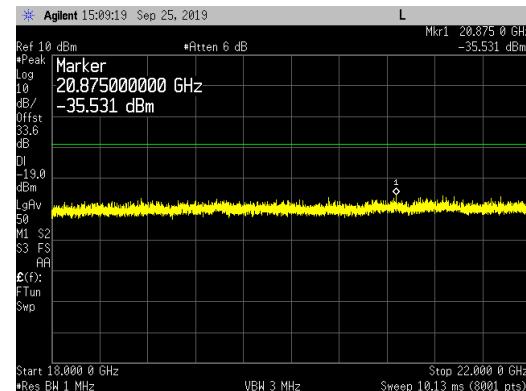
3GHz to 6GHz



6GHz to 18GHz

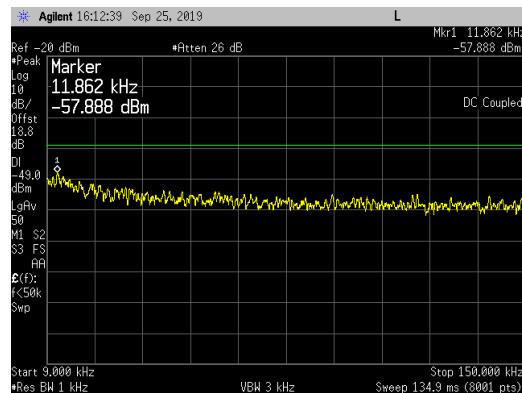


18GHz to 22GHz

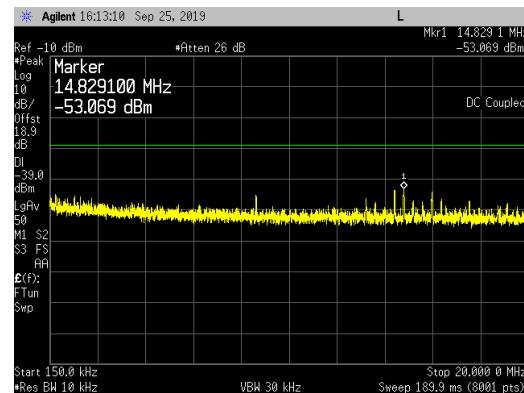


5G NR_ 20MHz Channel Bandwidth _ 16QAM _ PCS Middle Channel (1962.5MHz) _ Ant 3:

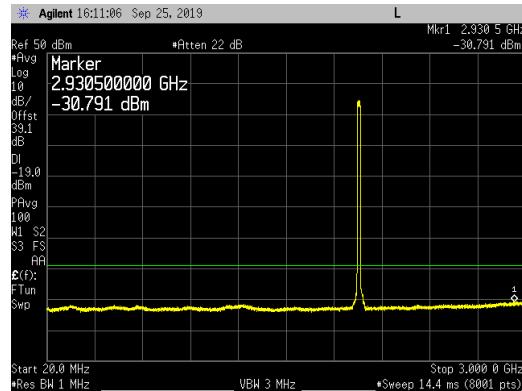
9 kHz to 150 kHz



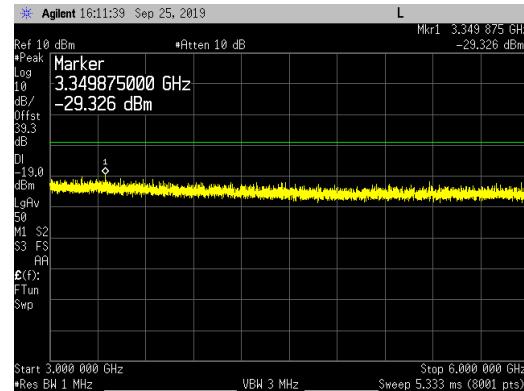
150 kHz to 20MHz



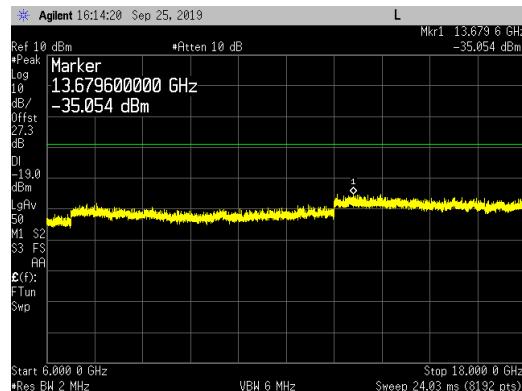
20MHz to 3GHz



3GHz to 6GHz



6GHz to 18GHz

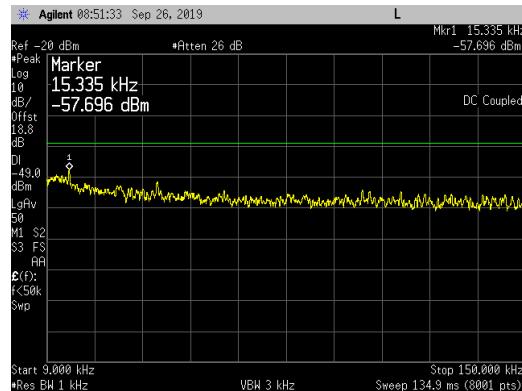


18GHz to 22GHz

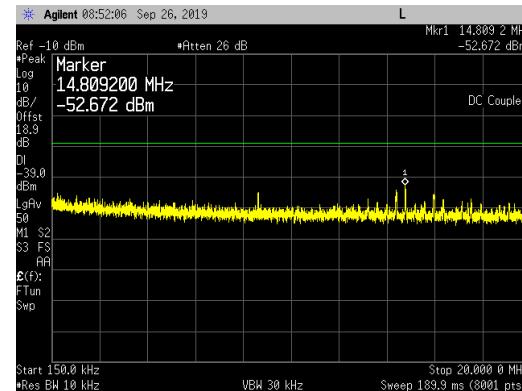


5G NR_ 20MHz Channel Bandwidth _ 64QAM _ PCS Middle Channel (1962.5MHz) _ Ant 3:

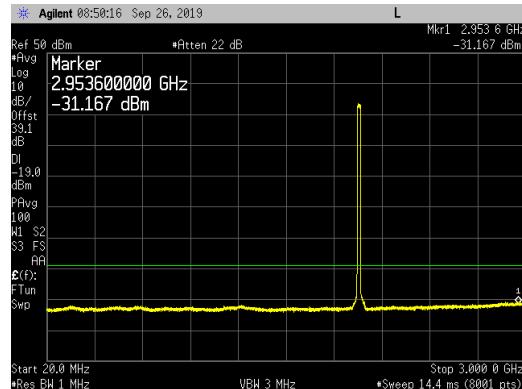
9 kHz to 150 kHz



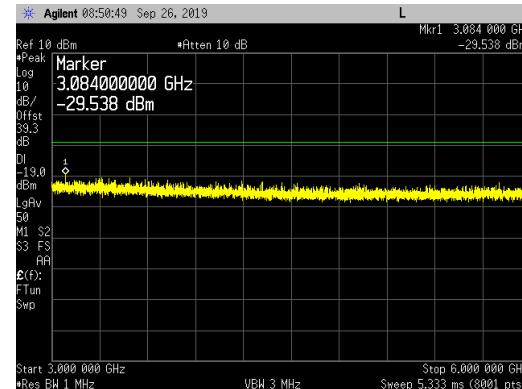
150 kHz to 20MHz



20MHz to 3GHz



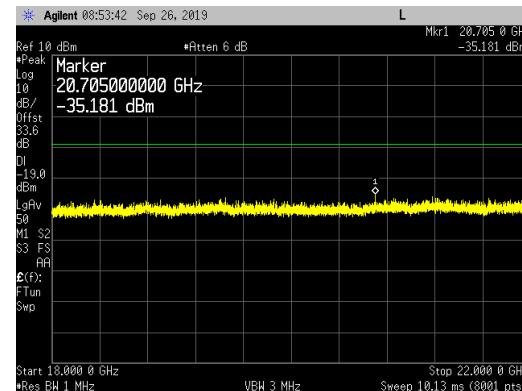
3GHz to 6GHz



6GHz to 18GHz

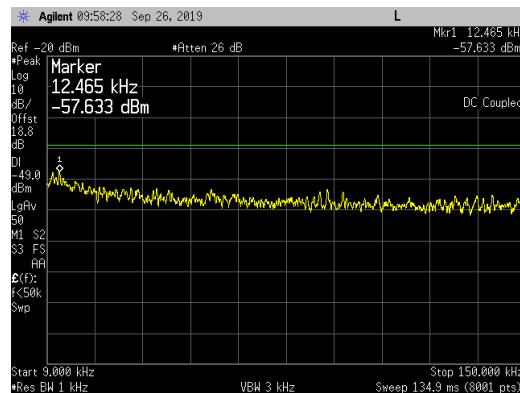


18GHz to 22GHz

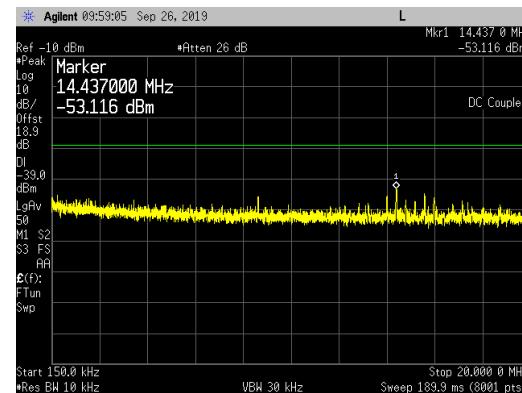


5G NR_ 20MHz Channel Bandwidth _ 256QAM _ PCS Middle Channel (1962.5MHz) _ Ant 3:

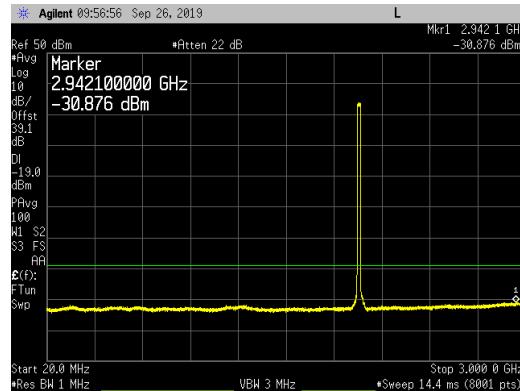
9 kHz to 150 kHz



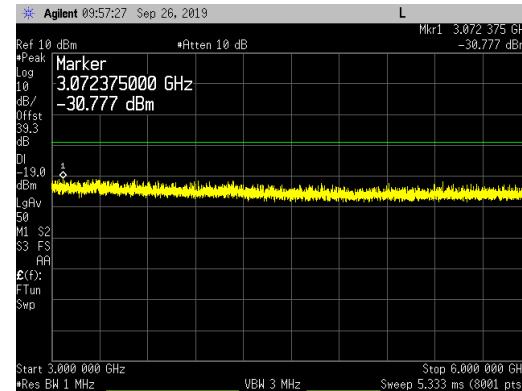
150 kHz to 20MHz



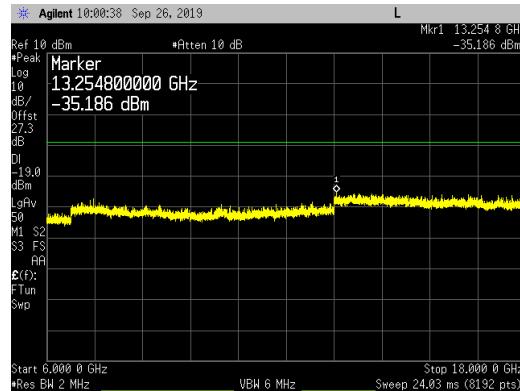
20MHz to 3GHz



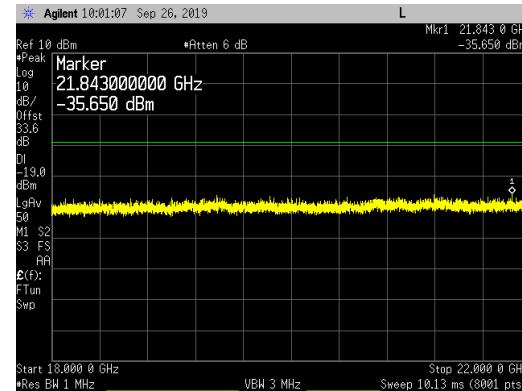
3GHz to 6GHz



6GHz to 18GHz



18GHz to 22GHz





Transmitter Radiated Spurious Emissions

Radiated spurious emission plots/measurement results are in the original FCC radio certification submittal (NTS Test Report Number PR072254 Revision 1 dated March 16, 2018).

Frequency Stability/Accuracy

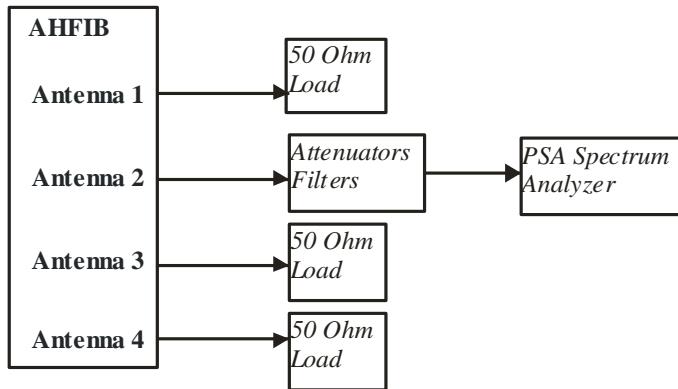
Frequency Stability/Accuracy measurement results are in the original FCC radio certification submittal (NTS Test Report Number PR072254 Revision 1 dated March 16, 2018).

APPENDIX B: ANTENNA PORT 5G NR TEST DATA FOR AWS BAND

All conducted RF measurements in this section were made at AHFIB antenna port 2/3. The testing was performed on the same hardware (EUT) as the original certification test. The antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original certification testing). All testing in this section was performed with 5G NR modulation types.

The 5G NR carrier bandwidths of 5MHz, 10MHz, 15MHz and 20MHz with QPSK, 16QAM, 64QAM and 256QAM modulation types were measured. The 5G NR carriers/modulation types for this testing are based upon 3GPP TS 38.141-1 Test Models and are NR-FR1-TM 1.1 (QPSK modulation type), NR-FR1-TM 3.2 (16QAM modulation type), NR-FR1-TM 3.1 (64QAM modulation type), and NR-FR1-TM 3.1a (256QAM modulation type).

The test setup used is provided below.



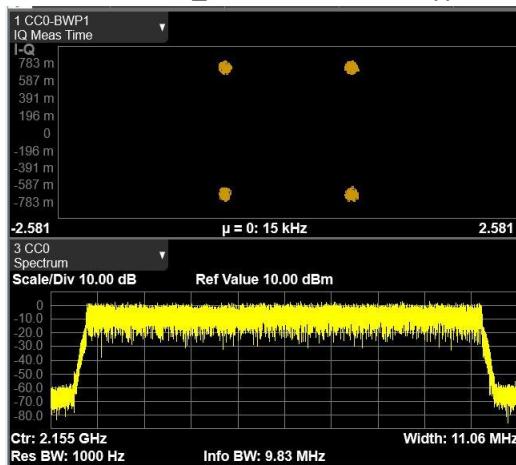
Test Setup Used for AHFIB Conducted RF Measurements

Modulation Characteristics of the 5G-NR Modulation Types

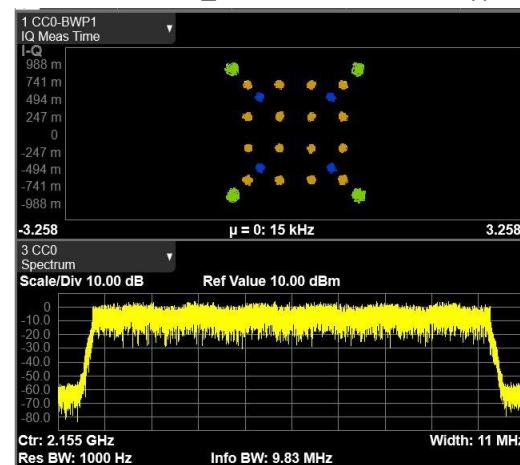
The 5G NR carriers/modulation types for this testing are based upon 3GPP TS 38.141-1 Test Models and are NR-FR1-TM 1.1 (QPSK modulation type), NR-FR1-TM 3.2 (16QAM modulation type), NR-FR1-TM 3.1 (64QAM modulation type), and NR-FR1-TM 3.1a (256QAM modulation type). The 5G NR test models for a 10MHz channel bandwidth at the Band n66 middle channel (2155.0MHz) were demodulated with a signal analyser at the AHFIB antenna ports. This measurement is for informational purposes to show that the test models correspond to the appropriate modulation types.

Demodulation of 5G NR Test Models (Constellation Patterns and Channel Bandwidth Plots) Using a 10MHz Channel Bandwidth at the AWS Band Middle Channel (2155.0MHz):

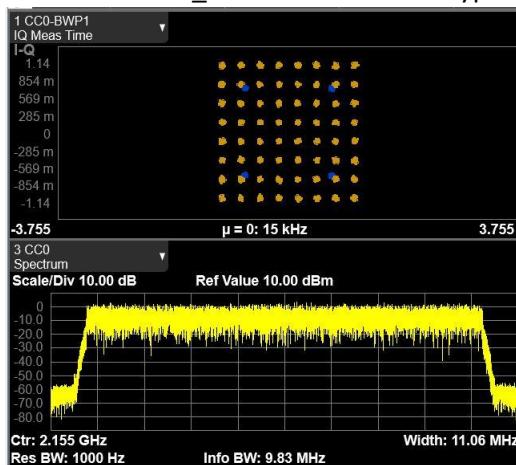
NR-FR1-TM 1.1 _QPSK modulation type



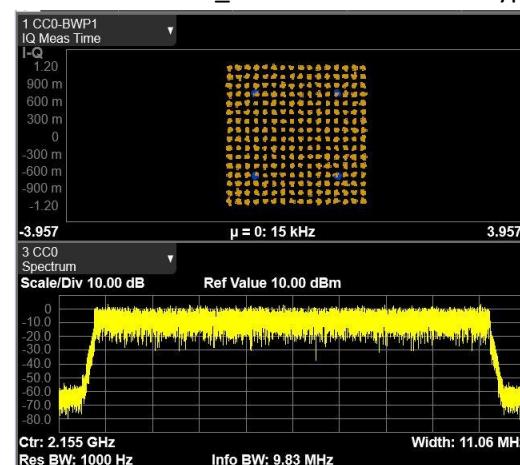
NR-FR1-TM 3.2 _16QAM modulation type



NR-FR1-TM 3.1 _64QAM modulation type



NR-FR1-TM 3.1a _256QAM modulation type

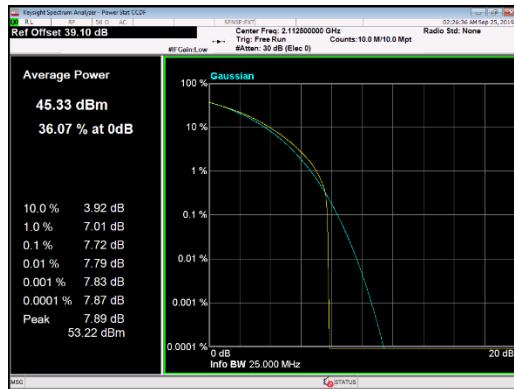
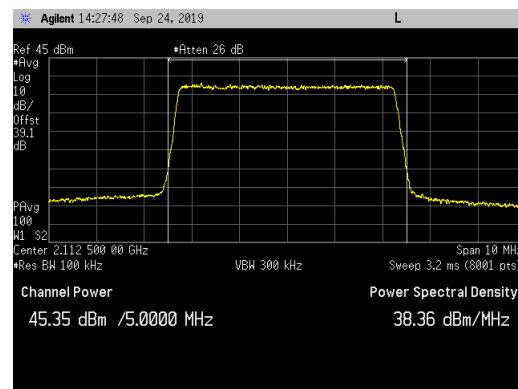


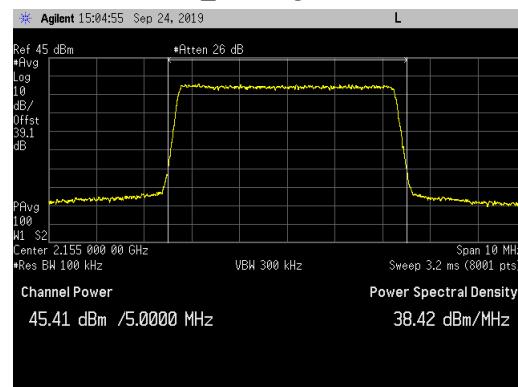
RF Output Power

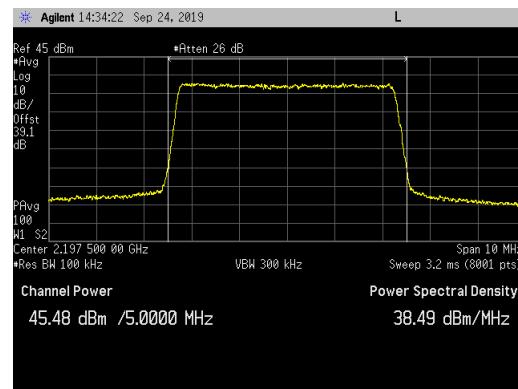
The AHFIB was operated at maximum RF output power. RF output power has been measured in RMS Average terms at the AHFIB Antenna Port transmit chain [5G NR Band n66 (2110 to 2200MHz)] at the bottom, middle and top frequency channels for all 5G NR modulation types (QPSK, 16QAM, 64QAM and 256QAM) and channel bandwidths (5, 10, 15 and 20MHz) as described in section 5.2 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.4.4. The peak to average power ratio (PAPR) has been measured using the signal analyzer complementary cumulative distribution function (CCDF) for a probability of 0.1% as described in section 5.7.2 of KDB971168 D01v03r01 and ANSI C63.26-2015 section 5.2.3.4. All results are presented in tabular form below. The highest measured values are highlighted.

All measurement results are provided in the following pages. The total measurement RF path loss of the test setup (attenuator and test cables) was 39.1 dB and is accounted for by the spectrum analyzer reference level offset.

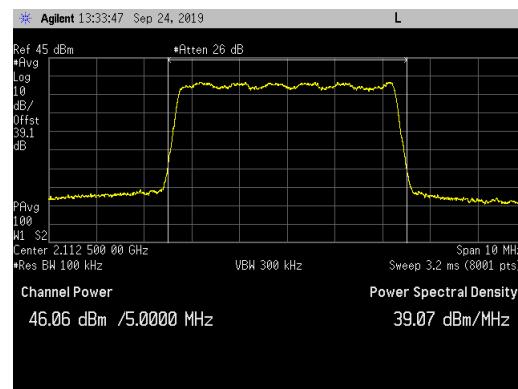
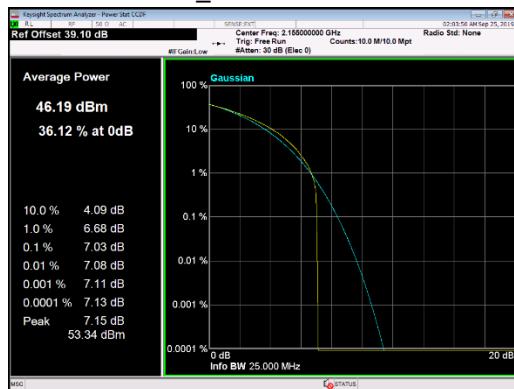
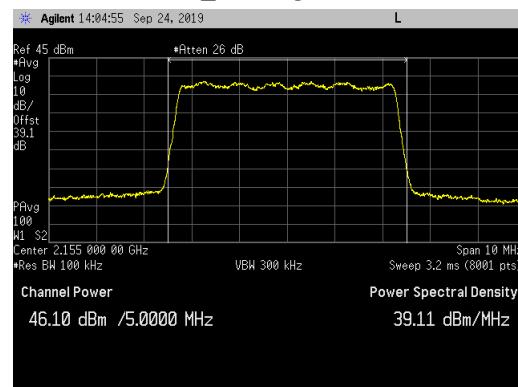
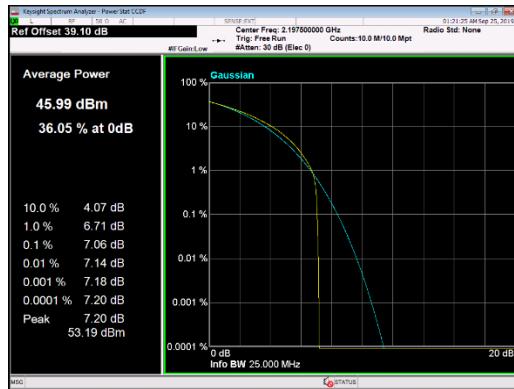
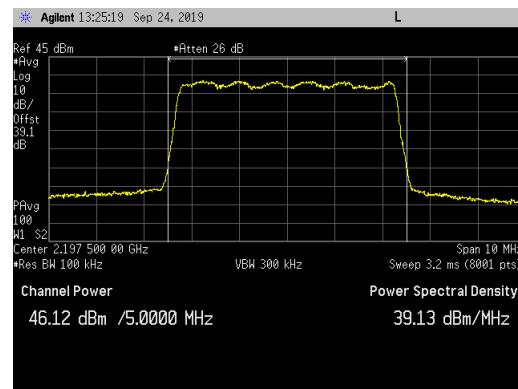
5G NR Channel BW	Modulation	Frequency _ Channel	PAPR (dB)	Ave (dBm)
5MHz	QPSK	2112.5MHz _ Bottom Channel	7.72	45.35
		2155.0MHz _ Middle Channel	7.70	45.41
		2197.5MHz _ Top Channel	7.70	45.48
	16QAM	2112.5MHz _ Bottom Channel	7.04	46.06
		2155.0MHz _ Middle Channel	7.03	46.10
		2197.5MHz _ Top Channel	7.06	46.12
	64QAM	2112.5MHz _ Bottom Channel	7.68	45.39
		2155.0MHz _ Middle Channel	7.68	45.44
		2197.5MHz _ Top Channel	7.66	45.41
	256QAM	2112.5MHz _ Bottom Channel	7.71	45.36
		2155.0MHz _ Middle Channel	7.73	45.37
		2197.5MHz _ Top Channel	7.72	45.35
10MHz	QPSK	2115.0MHz _ Bottom Channel	7.76	45.55
		2155.0MHz _ Middle Channel	7.76	45.40
		2195.0MHz _ Top Channel	7.75	45.56
	16QAM	2115.0MHz _ Bottom Channel	7.07	46.25
		2155.0MHz _ Middle Channel	7.04	46.09
		2195.0MHz _ Top Channel	7.06	46.23
	64QAM	2115.0MHz _ Bottom Channel	7.79	45.33
		2155.0MHz _ Middle Channel	7.77	45.28
		2195.0MHz _ Top Channel	7.80	45.42
	256QAM	2115.0MHz _ Bottom Channel	7.79	45.42
		2155.0MHz _ Middle Channel	7.80	45.36
		2195.0MHz _ Top Channel	7.79	45.48
15MHz	QPSK	2117.5MHz _ Bottom Channel	7.79	45.40
		2155.0MHz _ Middle Channel	7.73	45.41
		2192.5MHz _ Top Channel	7.77	45.39
	16QAM	2117.5MHz _ Bottom Channel	7.14	46.13
		2155.0MHz _ Middle Channel	7.03	46.19
		2192.5MHz _ Top Channel	7.08	46.30
	64QAM	2117.5MHz _ Bottom Channel	7.80	45.38
		2155.0MHz _ Middle Channel	7.76	45.41
		2192.5MHz _ Top Channel	7.74	45.46
	256QAM	2117.5MHz _ Bottom Channel	7.78	45.52
		2155.0MHz _ Middle Channel	7.74	45.34
		2192.5MHz _ Top Channel	7.77	45.49
20MHz	QPSK	2120.0MHz _ Bottom Channel	7.73	45.50
		2155.0MHz _ Middle Channel	7.62	45.47
		2190.0MHz _ Top Channel	7.75	45.44
	16QAM	2120.0MHz _ Bottom Channel	7.15	46.11
		2155.0MHz _ Middle Channel	6.97	46.11
		2190.0MHz _ Top Channel	7.14	46.25
	64QAM	2120.0MHz _ Bottom Channel	7.72	45.74
		2155.0MHz _ Middle Channel	7.66	45.49
		2190.0MHz _ Top Channel	7.71	45.60
	256QAM	2120.0MHz _ Bottom Channel	7.73	45.82
		2155.0MHz _ Middle Channel	7.65	45.56
		2190.0MHz _ Top Channel	7.75	45.66

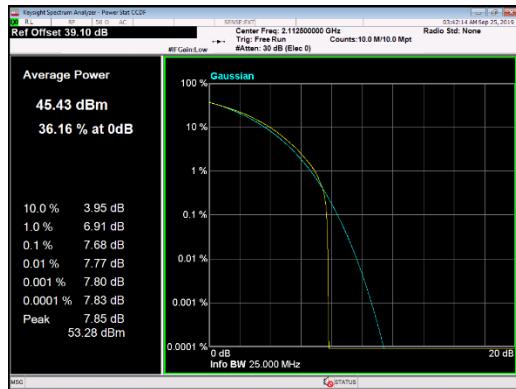
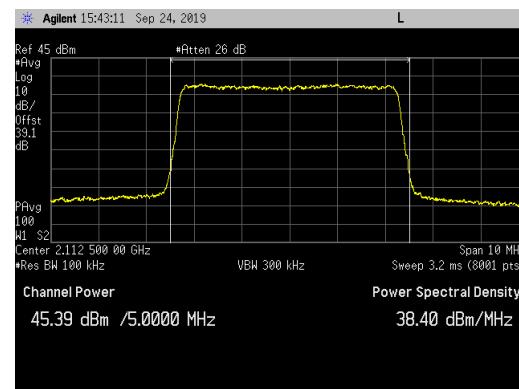
5G NR 5MHz Channel Power Plots for the QPSK Modulation Type for Antenna Port 3:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

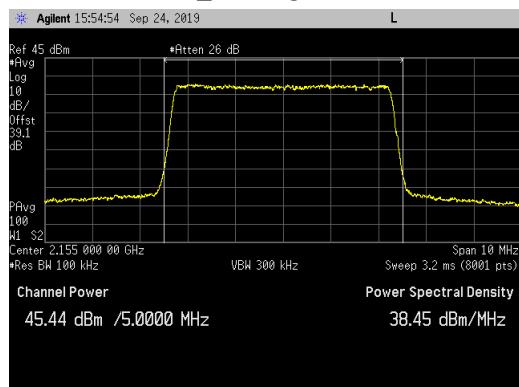
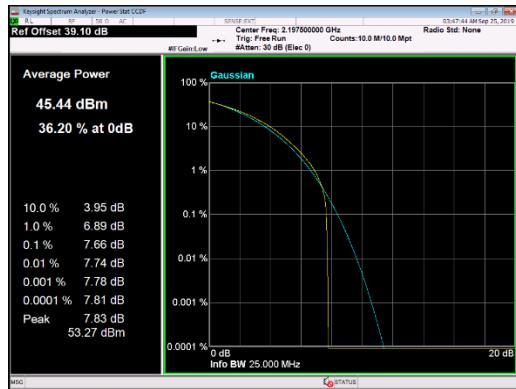
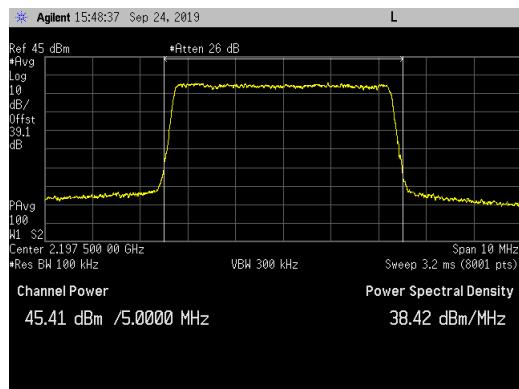
Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


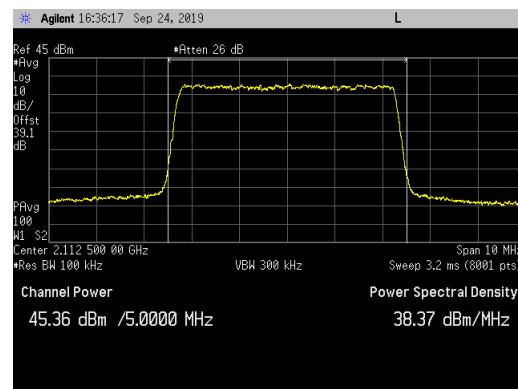
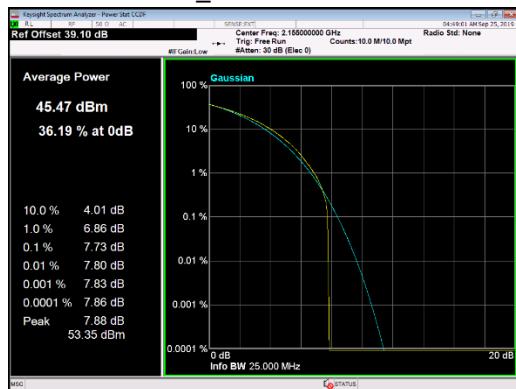
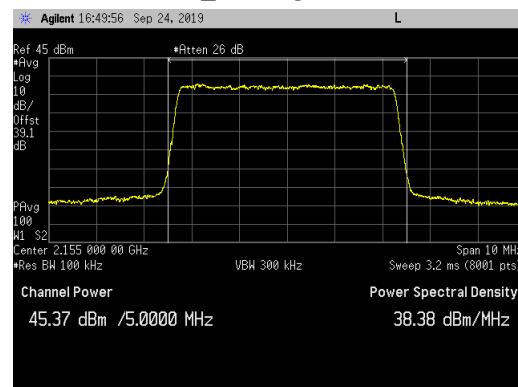
5G NR 5MHz Channel Power Plots for the 16QAM Modulation Type for Antenna Port 3:
Bottom Channel_CCDF

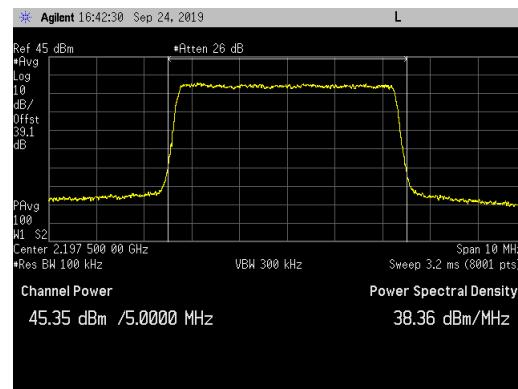
Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


5G NR 5MHz Channel Power Plots for the 64QAM Modulation Type for Antenna Port 3:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

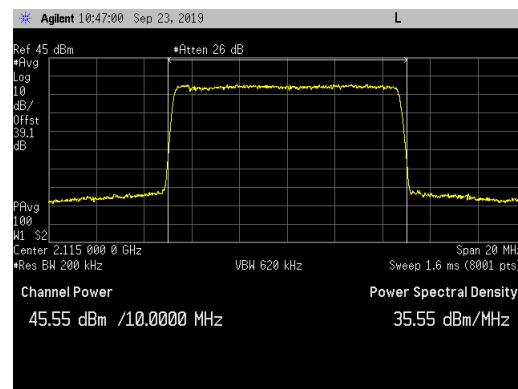
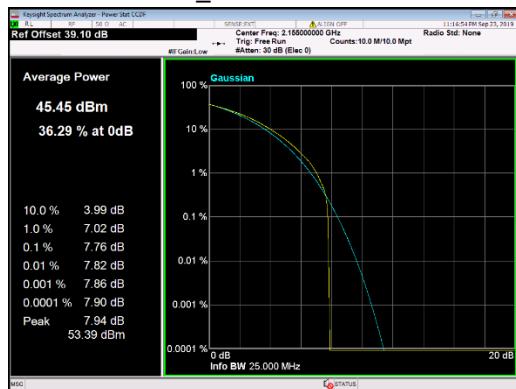
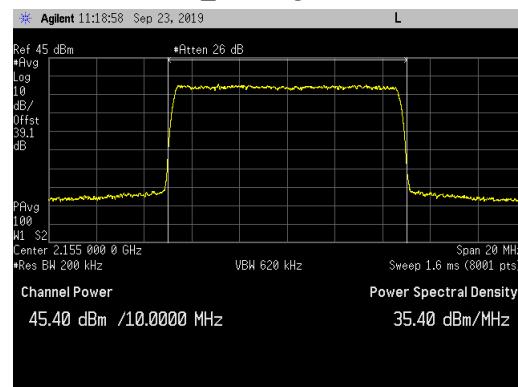
Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


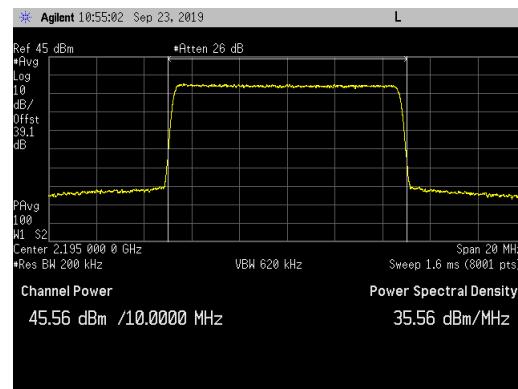
5G NR 5MHz Channel Power Plots for the 256QAM Modulation Type for Antenna Port 3:
Bottom Channel_CCDF

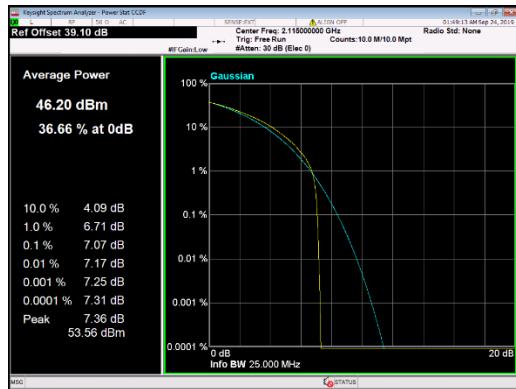
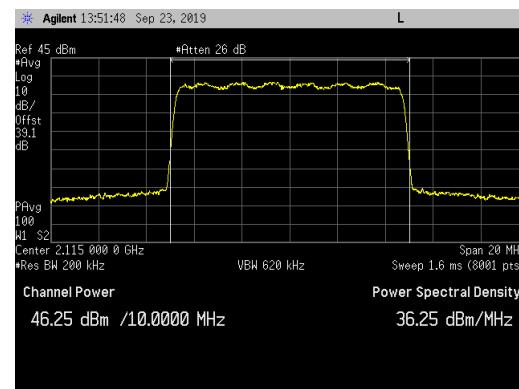
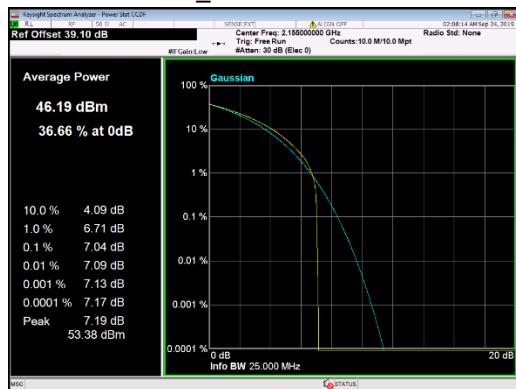
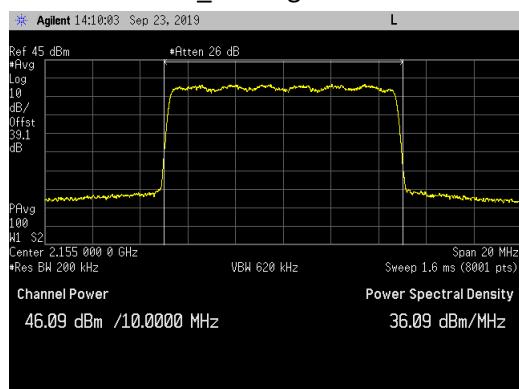
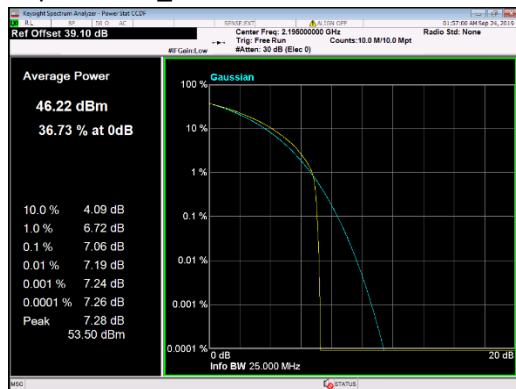
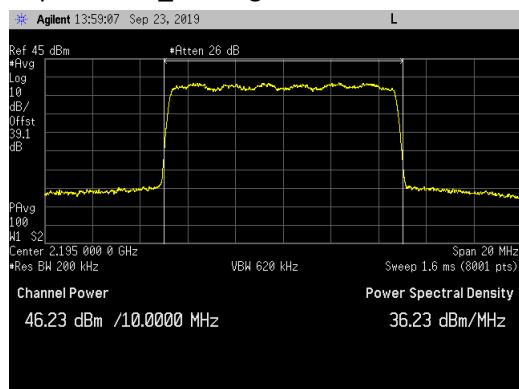
Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


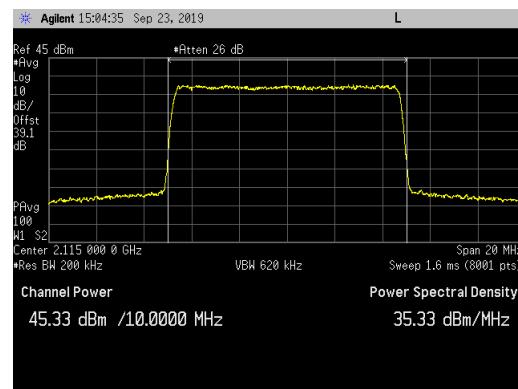
5G NR 10MHz Channel Power Plots for the QPSK Modulation Type for Antenna Port 2:
Bottom Channel_CCDF

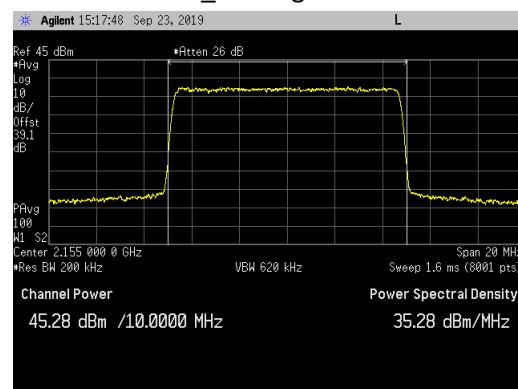
Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

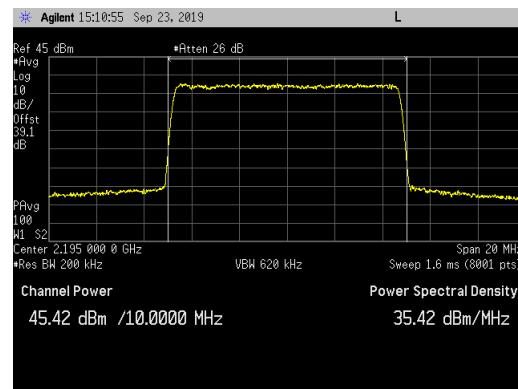
Top Channel_Average


5G NR 10MHz Channel Power Plots for the 16QAM Modulation Type for Antenna Port 2:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


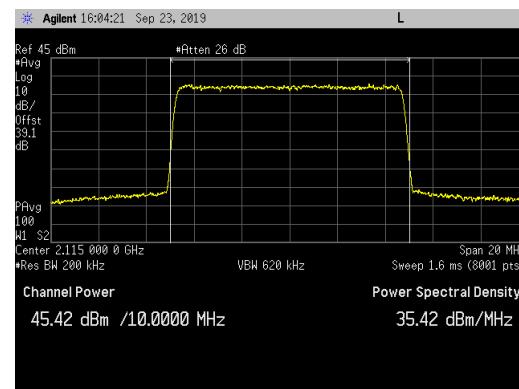
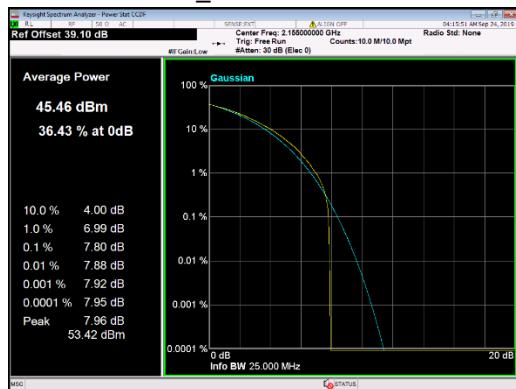
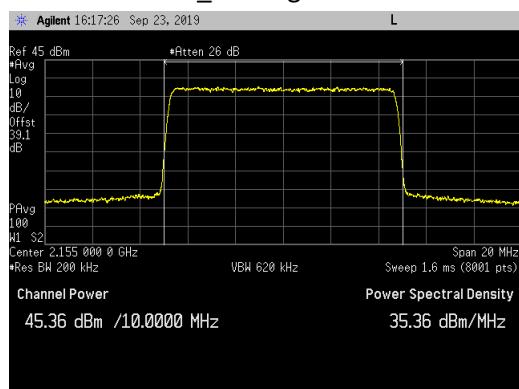
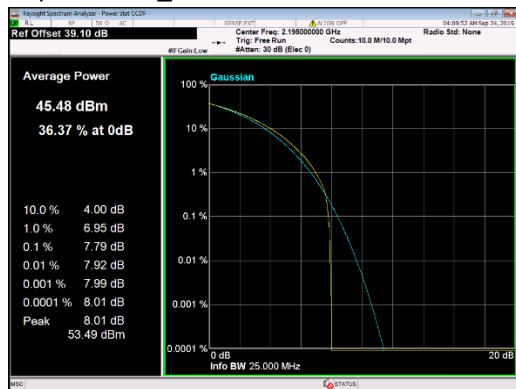
5G NR 10MHz Channel Power Plots for the 64QAM Modulation Type for Antenna Port 2:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


5G NR 10MHz Channel Power Plots for the 256QAM Modulation Type for Antenna Port 2:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

Top Channel_Average
