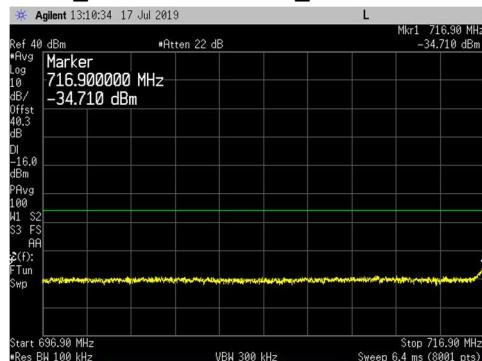
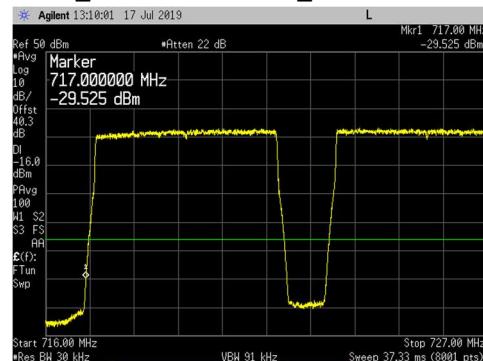
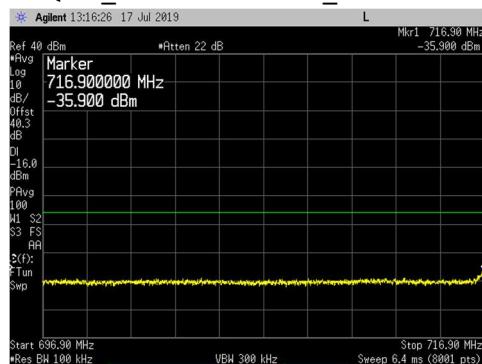
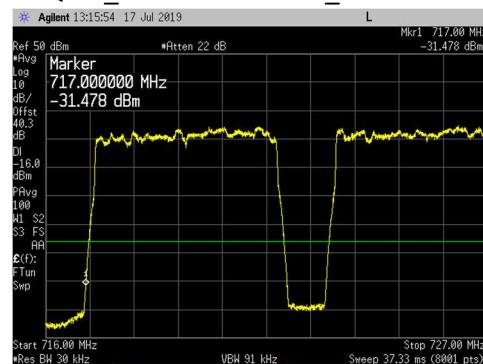
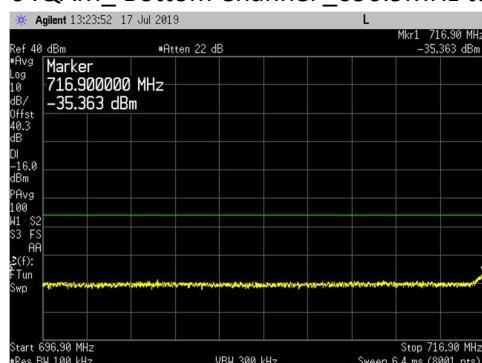
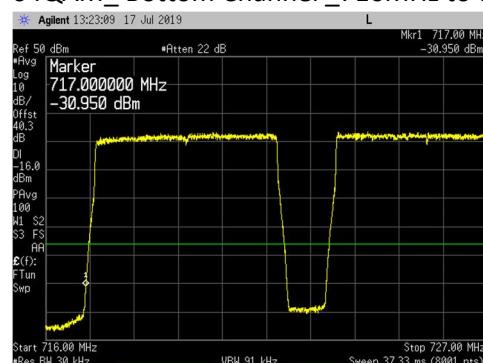
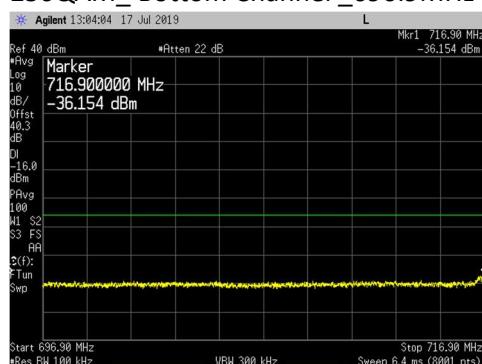
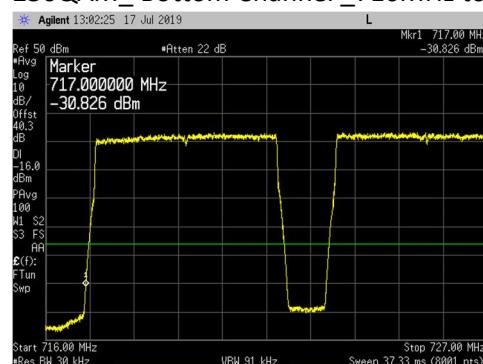
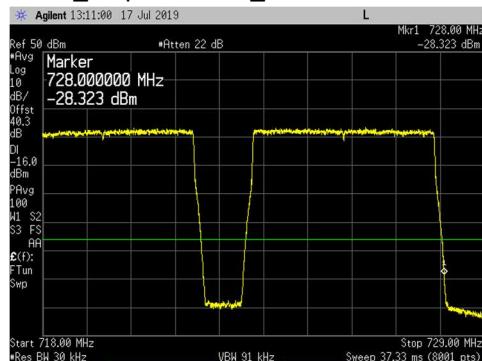
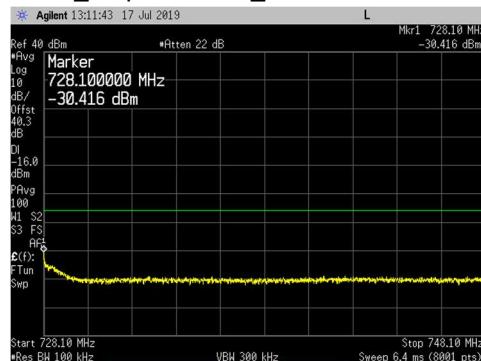
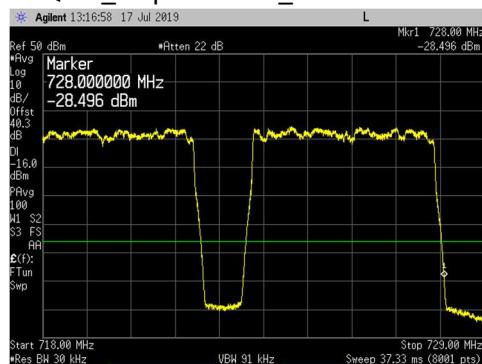
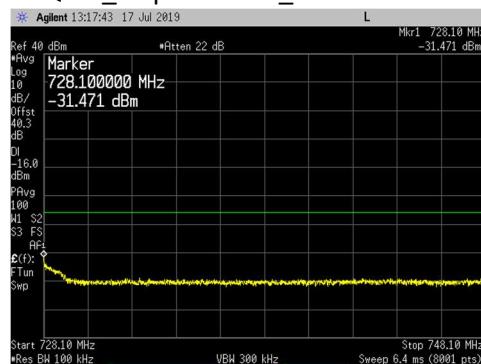
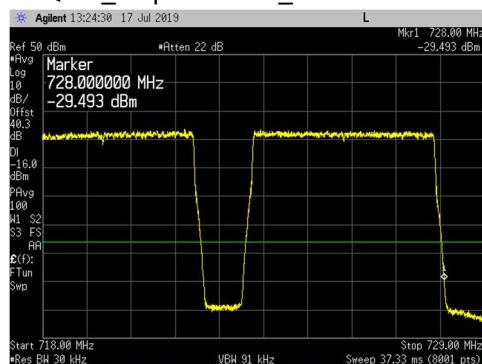
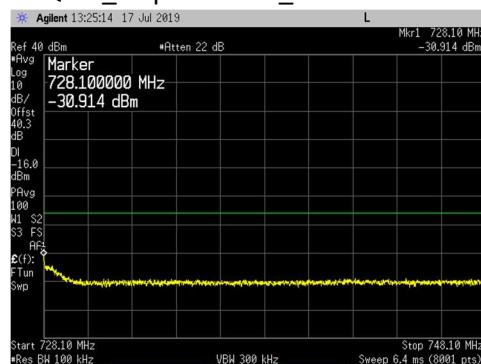
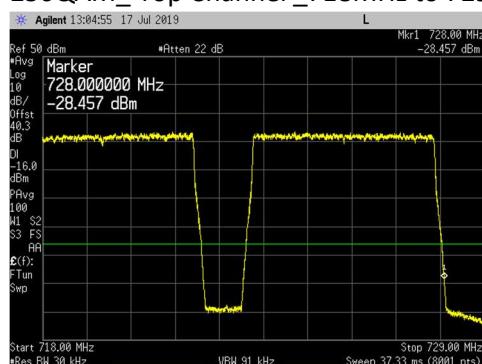
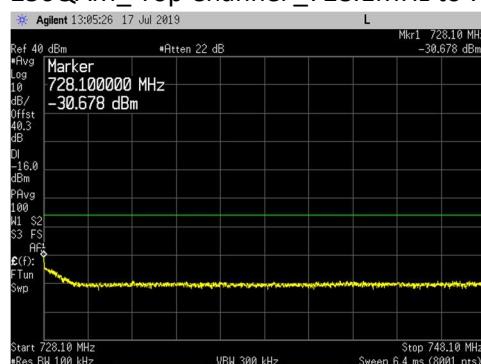


Band 29 Multicarrier LTE5 Lower Band Edge Plots for Antenna Port 2:
QPSK_Bottom Channel_696.9MHz to 716.9MHz

QPSK_Bottom Channel_716MHz to 727MHz

16QAM_Bottom Channel_696.9MHz to 716.9MHz

16QAM_Bottom Channel_716MHz to 727MHz

64QAM_Bottom Channel_696.9MHz to 716.9MHz

64QAM_Bottom Channel_716MHz to 727MHz

256QAM_Bottom Channel_696.9MHz to 716.9MHz

256QAM_Bottom Channel_716MHz to 727MHz


Band 29 Multicarrier LTE5 Upper Band Edge Plots for Antenna Port 2:
QPSK_Top Channel _718MHz to 729MHz

QPSK_Top Channel _728.1MHz to 748.1MHz

16QAM_Top Channel _718MHz to 729MHz

16QAM_Top Channel _728.1MHz to 748.1MHz

64QAM_Top Channel _718MHz to 729MHz

64QAM_Top Channel _728.1MHz to 748.1MHz

256QAM_Top Channel _718MHz to 729MHz

256QAM_Top Channel _728.1MHz to 748.1MHz


Transmitter Antenna Port Conducted Emissions

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

Single Carrier Test Cases

The RRH was operated on the Band 5 middle channel (881.5MHz) and Band 29 middle channel (722.5MHz) simultaneously with all LTE modulation types (QPSK, 16QAM, 64QAM and 256QAM) for all available LTE bandwidths (Band 5: 1.4MHz, 3MHz, 5MHz and 10MHz; Band 29: 5MHz and 10MHz). The same LTE bandwidth was used for both frequency bands when available. If the same LTE bandwidth for both bands were not available, then the smallest LTE bandwidth was used. The Band 5 and Band 29 carriers were enabled at maximum power (80 watts/port and 40 watts/carrier).

Multicarrier Multiband Test Case

In Band 5_Three LTE1.4 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (EARFCN 2407: 869.7 MHz and EARFCN 2421: 871.1 MHz) and a third carrier with maximum spacing between the other two carrier frequencies (EARFCN 2643: 893.3 MHz) at the upper band edge. In Band 29_Two LTE5 carriers with maximum spacing at the lower and upper band edges (EARFCN 9685: 719.5 & EARFCN 9745: 725.5MHz. Three carrier operation is not available because it exceeds the Band 29 downlink bandwidth. The smallest channel bandwidth was selected to maximize carrier power spectral density. The carriers were operated at maximum power (~13W/Band 5 carrier and ~20W/Band 29 carrier) with a total port power of 80 watts (40W for Band 5 carriers + 40W for Band 29 carriers). The same modulation type was used for both Band 5 and Band 29 carriers.

The test configuration parameters are provided below:

| Band 5 Transmission Parameters | | | Band 29 Transmission Parameters | | |
|--|-------------------|----------------|---------------------------------|-------------------|---------------|
| Carrier Frequency | Channel Bandwidth | Carrier Power | Carrier Frequency | Channel Bandwidth | Carrier Power |
| 881.5MHz (Mid Ch) | LTE1.4 – LTE10 | 40 Watts | 722.5MHz (Mid Ch) | LTE5 & LTE 10 | 40 Watts |
| 869.7, 871.1 & 893.3MHz (BC, BC+1, and TC) | LTE1.4 | 13+13+13 Watts | 719.5 & 725.5MHz (BC & TC) | LTE5 | 20 + 20 Watts |

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 Band 5 transmitter. The required measurement parameters include a 100kHz 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 maximum hold over 50 sweeps (except for the 700MHz to 1100MHz frequency range). The measurements for the 700MHz to 1.1GHz 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 -39dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 100kHz [i.e.: -39dBm = -19dBm -10log(100kHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -29dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 100kHz [i.e.: -29dBm = -19dBm -10log(100kHz/10kHz)]. The required limit of -19dBm with a RBW of \geq 100kHz 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 | 40.0dB |
| 150kHz to 20MHz | 10kHz | 30kHz | 8001 | Peak | Auto | 50 Sweeps | 39.9dB |
| 20MHz to 700MHz | 200kHz | 600kHz | 8001 | Peak | Auto | 50 Sweeps | 40.3dB |
| 700MHz to 1.1GHz | 100kHz | 300kHz | 8192 | Average | Auto | Note 2 | 40.3dB |
| 1.1GHz to 9GHz | 2MHz | 6MHz | 8192 | Peak | Auto | 50 Sweeps | 25.0dB |

Note 1: The total measurement RF path loss of the test setup (attenuators, filters and test cables) 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 high pass filter was used to reduce measurement instrumentation noise floor for the frequency ranges above 1100MHz. The total measurement RF path loss of the test setup (attenuators, 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 Appendix A.

Transmitter Radiated Spurious Emissions

Radiated emission measurement results are in Appendix A.

Frequency Stability/Accuracy

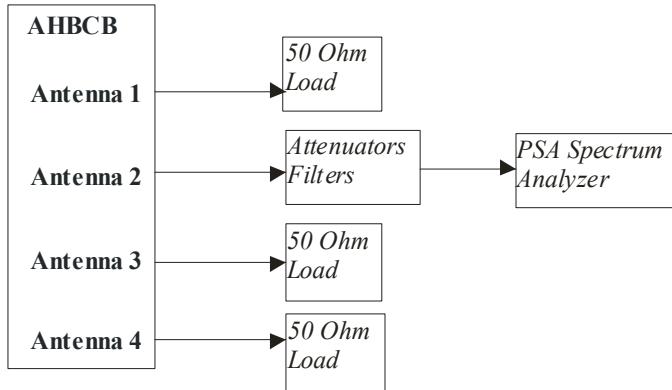
Frequency Stability/Accuracy measurement results are in Appendix A.

APPENDIX C: ANTENNA PORT 5G NR TEST DATA FOR BAND 5 (869-894MHZ)

All conducted RF measurements in this section were made at AHBCB antenna port 2. Based on the RF power measurement results shown in Appendix A & B, Port 2 has the highest LTE RMS average power for Band 5 (869 to 894MHz) and Band 29 (717 to 728MHz). Therefore, antenna port 2 represents worst case and was selected for the remaining antenna port conducted emission tests.

All testing in this section was performed with 5G NR modulation types on Band n5 (869 to 894MHz). The 5G NR carrier bandwidths of 5MHz and 10MHz 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.



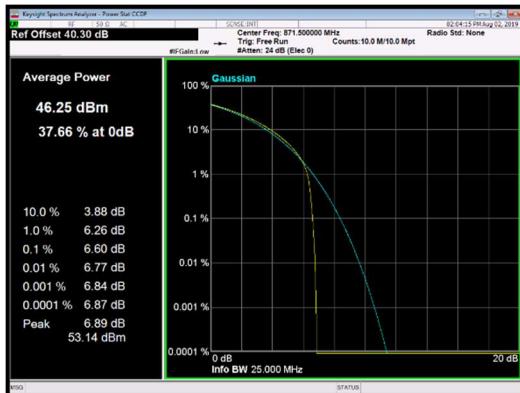
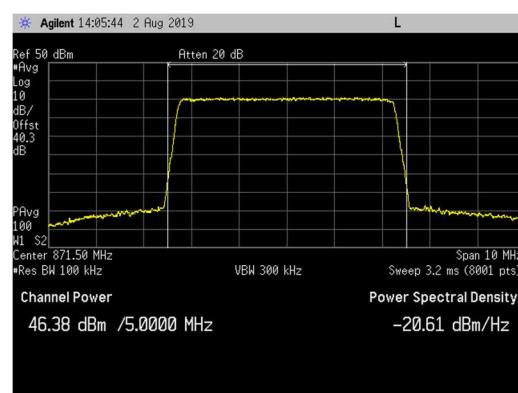
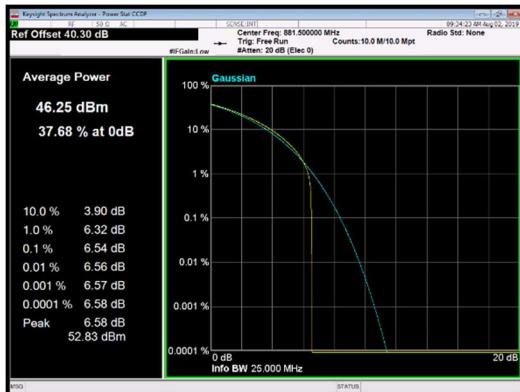
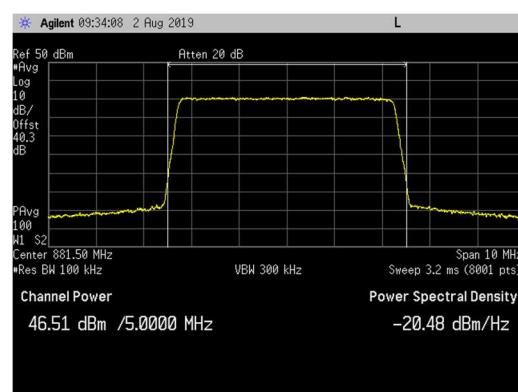
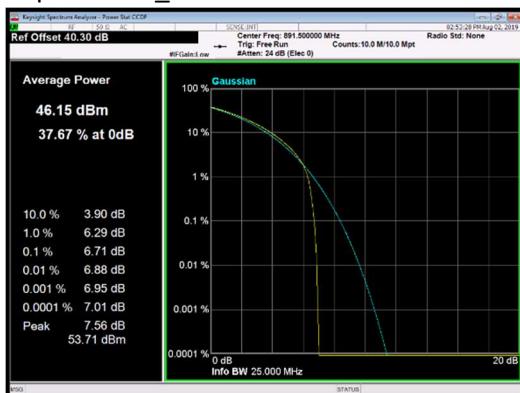
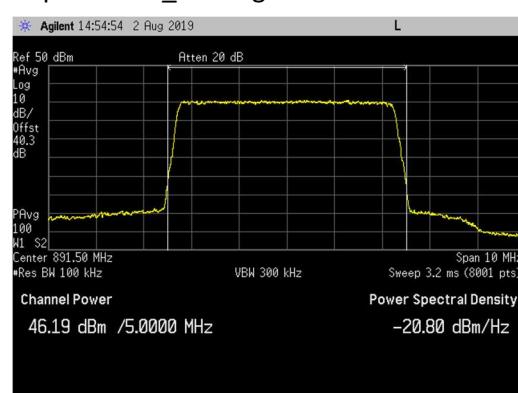
Test Setup Used for Conducted RF Measurements on AHBCB

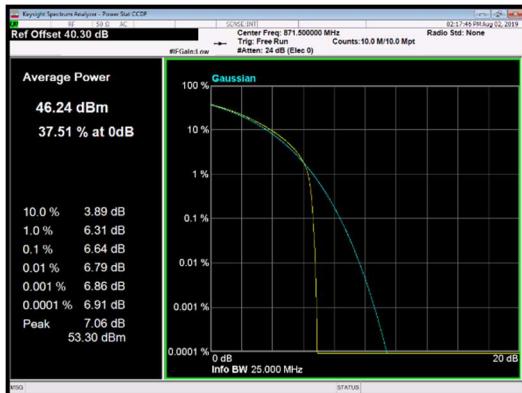
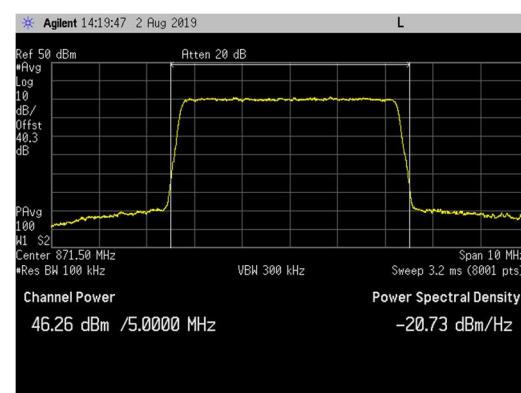
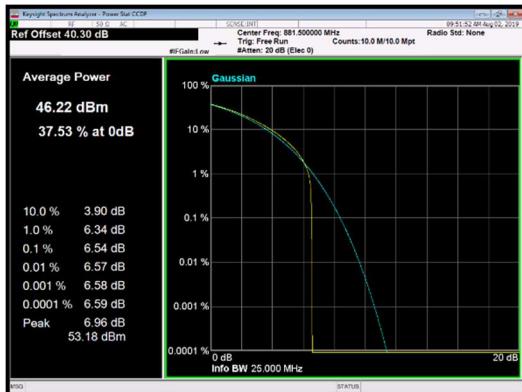
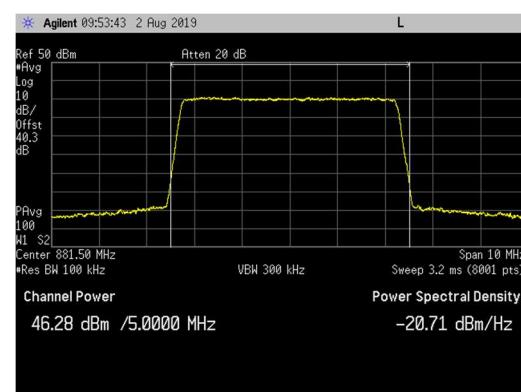
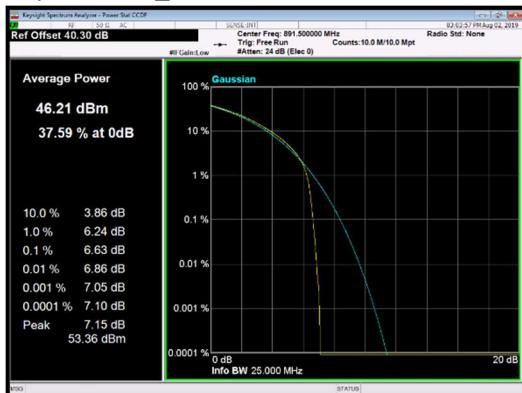
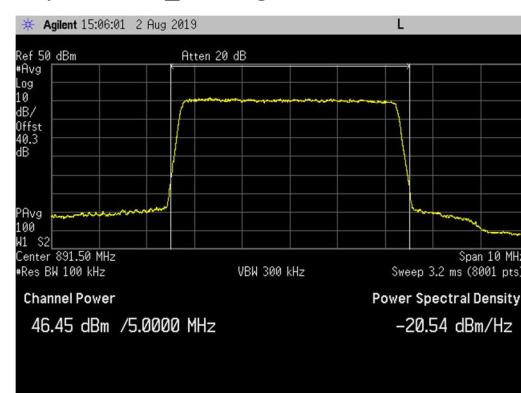
RF Output Power

The AHBCB was operated at maximum RF output power. RF output power has been measured in RMS Average terms at the AHBCB Antenna Port 2 transmit chain [5G NR Band n5 (869 to 894MHz)] at the bottom, middle and top frequency channels for all 5G NR modulation types (QPSK, 16QAM, 64QAM and 256QAM) and channel bandwidths (5 and 10MHz) 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.

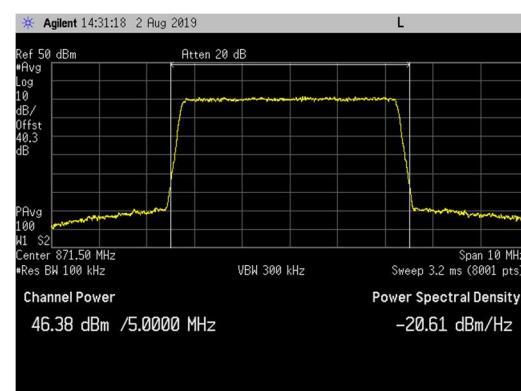
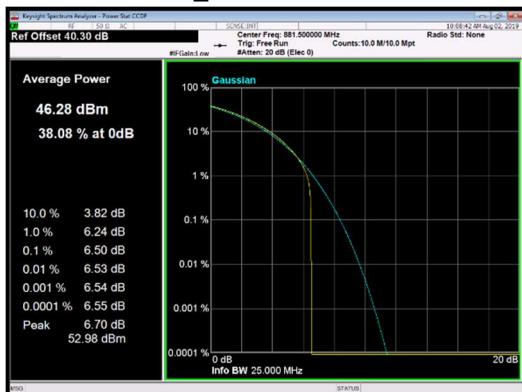
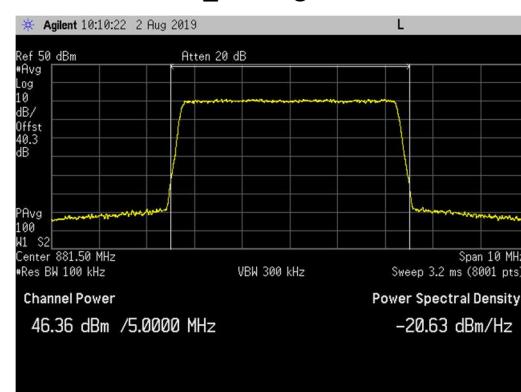
| 5G NR Channel BW | Modulation | Frequency _ Channel | PAPR (dB) | Ave (dBm) |
|------------------|------------|---------------------------|-------------|--------------|
| 5MHz | QPSK | 871.5MHz _ Bottom Channel | 6.60 | 46.38 |
| | | 881.5MHz _ Middle Channel | 6.54 | 46.51 |
| | | 891.5MHz _ Top Channel | 6.71 | 46.19 |
| | 16QAM | 871.5MHz _ Bottom Channel | 6.64 | 46.26 |
| | | 881.5MHz _ Middle Channel | 6.54 | 46.28 |
| | | 891.5MHz _ Top Channel | 6.63 | 46.45 |
| | 64QAM | 871.5MHz _ Bottom Channel | 6.60 | 46.38 |
| | | 881.5MHz _ Middle Channel | 6.50 | 46.36 |
| | | 891.5MHz _ Top Channel | 6.74 | 46.31 |
| | 256QAM | 871.5MHz _ Bottom Channel | 6.62 | 46.45 |
| | | 881.5MHz _ Middle Channel | 6.56 | 46.44 |
| | | 891.5MHz _ Top Channel | 6.69 | 46.38 |
| 10MHz | QPSK | 874.0MHz _ Bottom Channel | 6.70 | 46.49 |
| | | 881.5MHz _ Middle Channel | 6.41 | 46.61 |
| | | 889.0MHz _ Top Channel | 6.86 | 46.62 |
| | 16QAM | 874.0MHz _ Bottom Channel | 6.64 | 46.66 |
| | | 881.5MHz _ Middle Channel | 6.38 | 46.68 |
| | | 889.0MHz _ Top Channel | 6.80 | 46.52 |
| | 64QAM | 874.0MHz _ Bottom Channel | 6.74 | 46.55 |
| | | 881.5MHz _ Middle Channel | 6.35 | 46.58 |
| | | 889.0MHz _ Top Channel | 6.79 | 46.59 |
| | 256QAM | 874.0MHz _ Bottom Channel | 6.69 | 46.57 |
| | | 881.5MHz _ Middle Channel | 6.34 | 46.58 |
| | | 889.0MHz _ Top Channel | 6.73 | 46.64 |

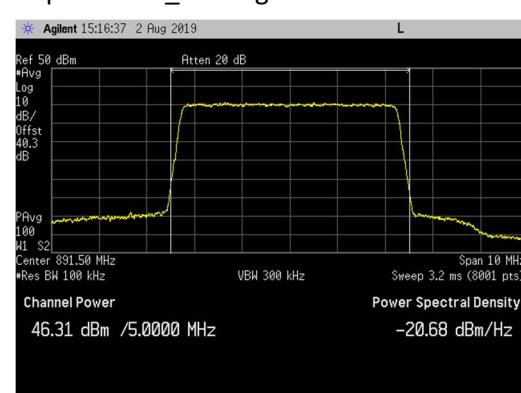
The total measurement RF path loss of the test setup (attenuator and test cables) was 40.3 dB and is accounted for by the spectrum analyzer reference level offset. All measurement results are provided in the following pages.

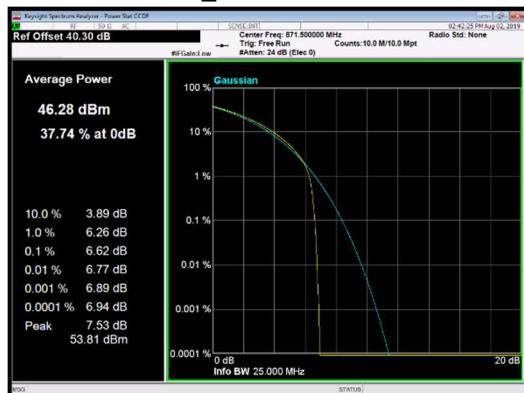
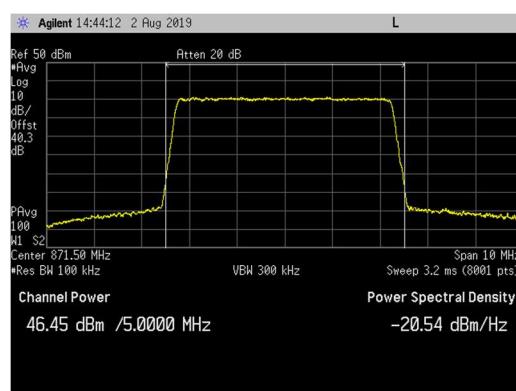
5G NR 5MHz Channel Power Plots for QPSK Modulation at Antenna Port 2:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


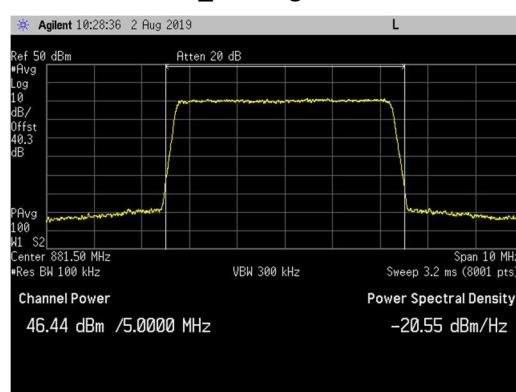
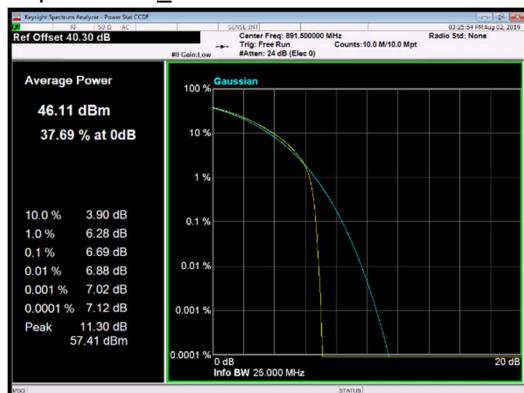
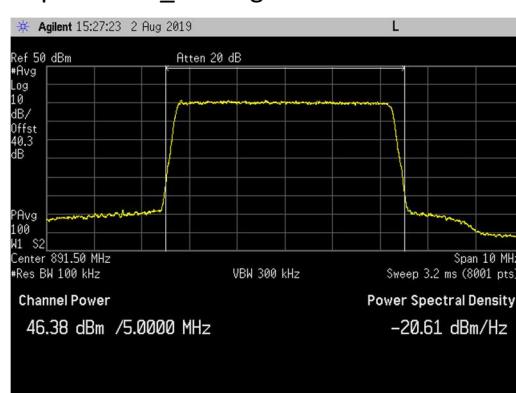
5G NR 5MHz Channel Power Plots for 16QAM Modulation at Antenna Port 2:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


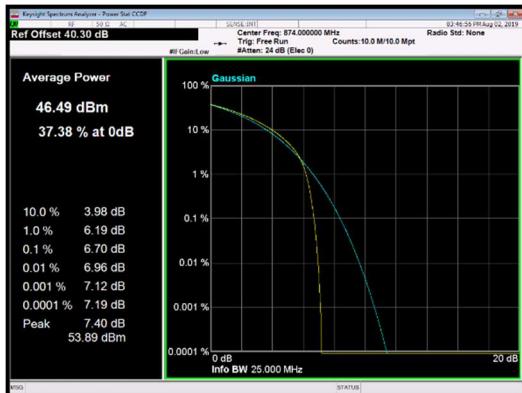
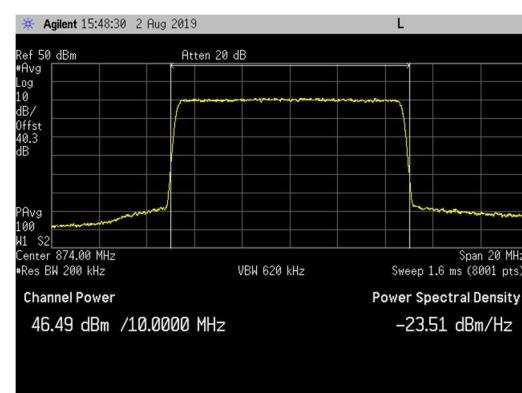
5G NR 5MHz Channel Power Plots for 64QAM Modulation at Antenna Port 2:
Bottom Channel_CCDF

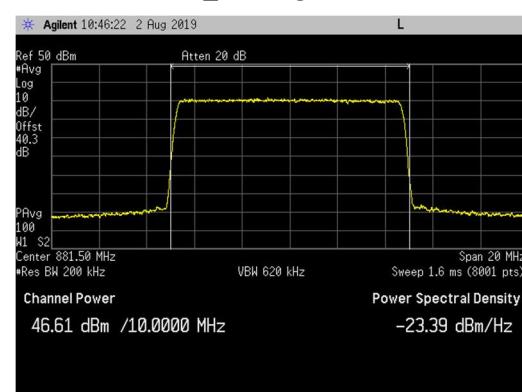
Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

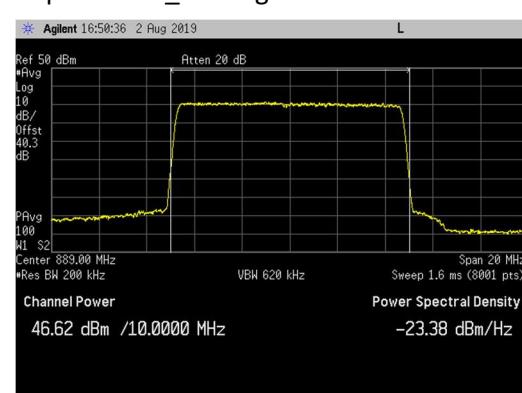
Top Channel_Average


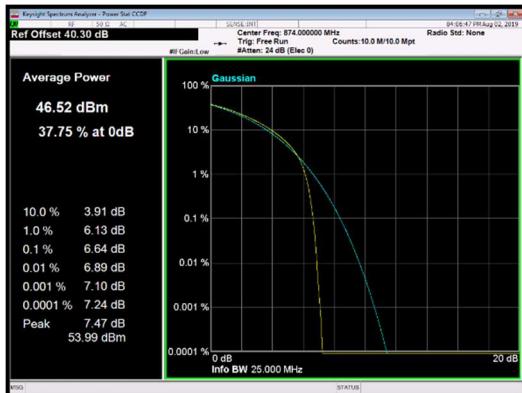
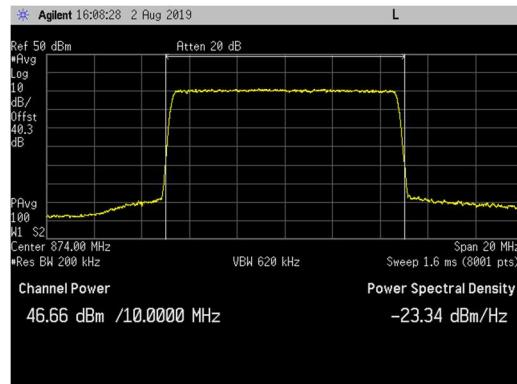
5G NR 5MHz Channel Power Plots for 256QAM Modulation at Antenna Port 2:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

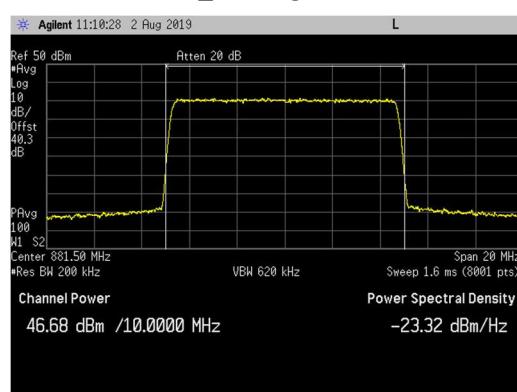
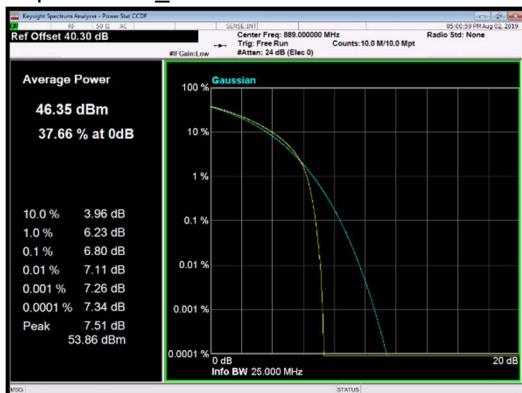
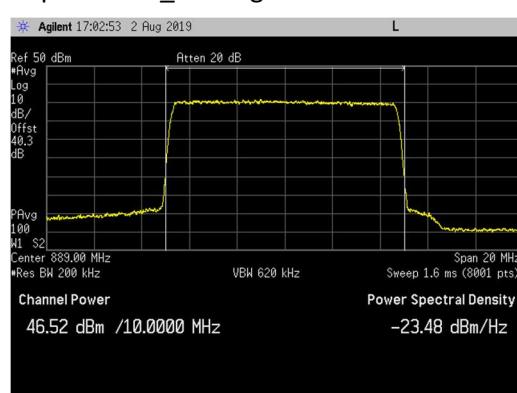
Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


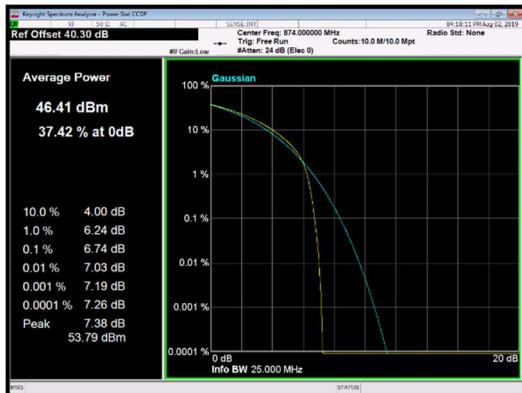
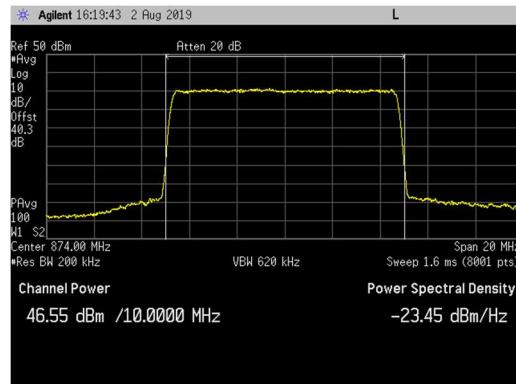
5G NR 10MHz Channel Power Plots for QPSK Modulation at Antenna Port 2:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

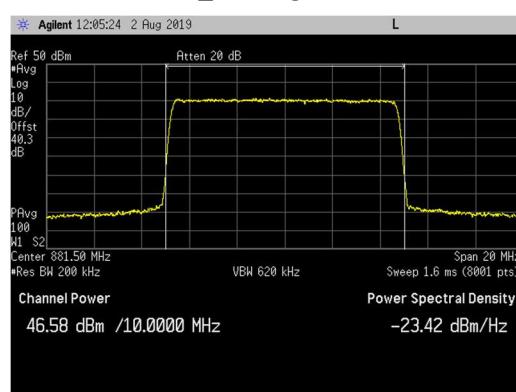
Middle Channel_Average

Top Channel_CCDF

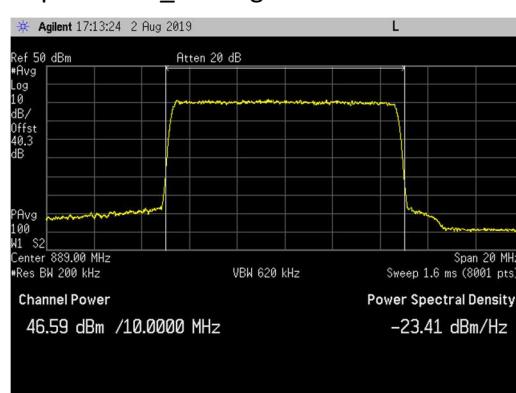
Top Channel_Average


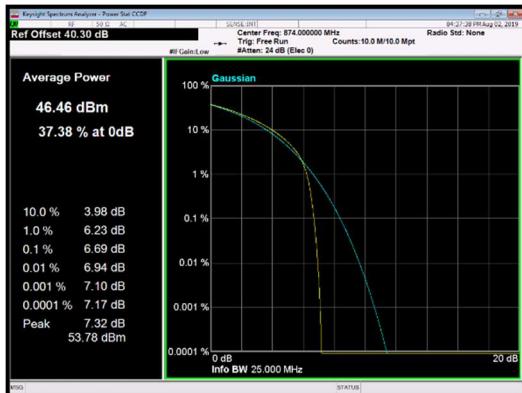
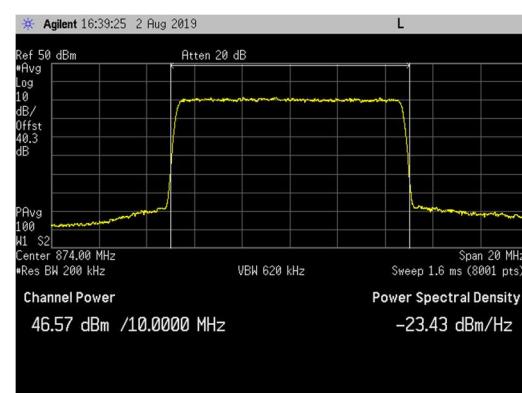
5G NR 10MHz Channel Power Plots for 16QAM Modulation at Antenna Port 2:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

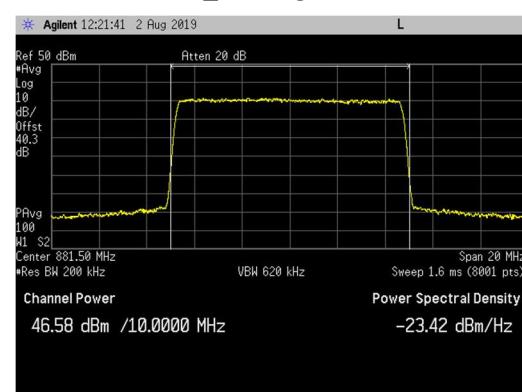
Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


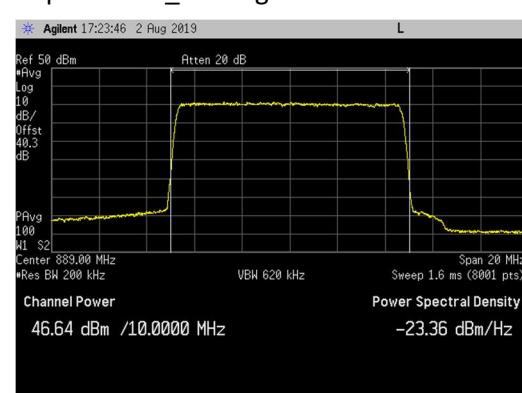
5G NR 10MHz Channel Power Plots for 64QAM Modulation at Antenna Port 2:
Bottom Channel_CCDF

Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


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

Bottom Channel_Average

Middle Channel_CCDF

Middle Channel_Average

Top Channel_CCDF

Top Channel_Average


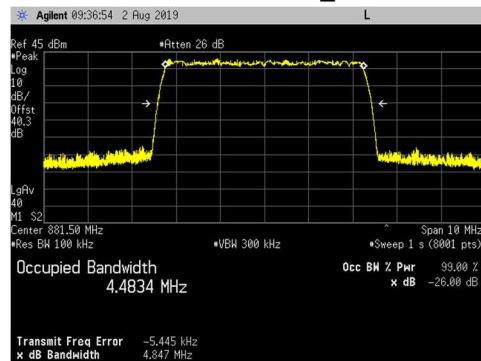
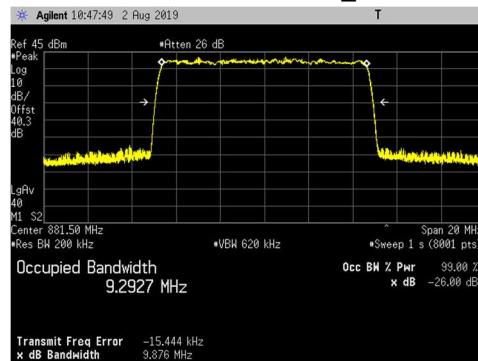
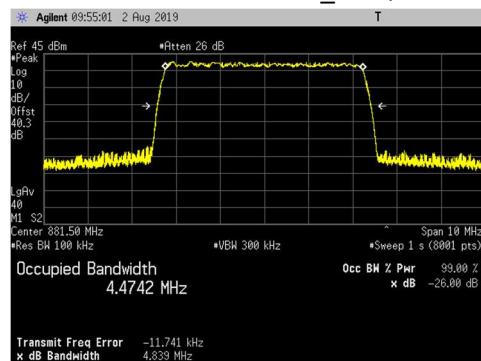
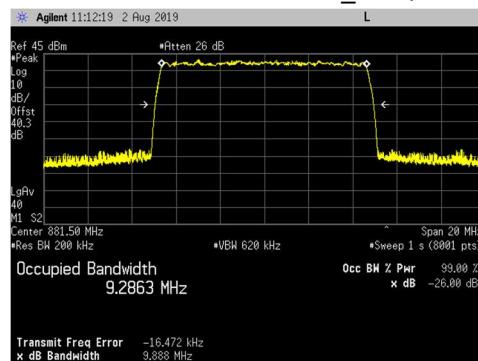
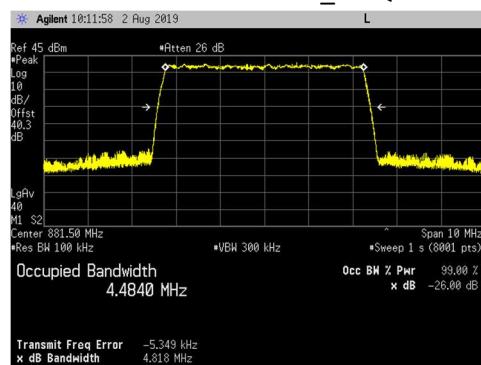
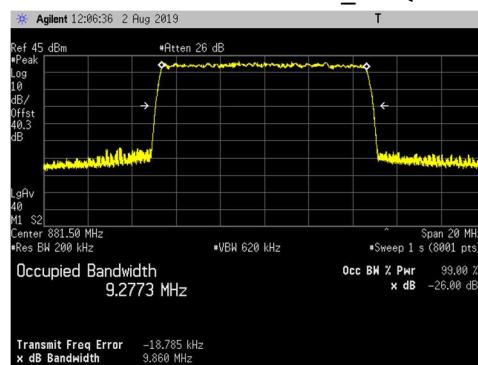
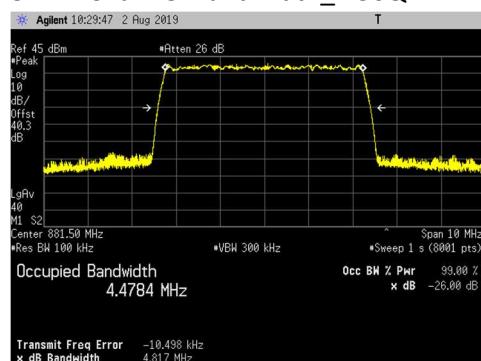
Emission Bandwidth (26 dB down and 99%)

Emission bandwidth measurements were made at antenna port 2 on the middle channel (881.5MHz) with maximum RF output power. All available 5G NR modulations (QPSK, 16QAM, 64QAM and 256QAM) were used. All available 5G NR channel bandwidths (5MHz and 10MHz) were used.

The 26dB emission bandwidth was measured in accordance with section 4 of FCC KDB 971168 D01v03r01 and ANSI C63.26 section 5.4. The 99% occupied bandwidth was measured in accordance with section 6.7 of RSS-Gen Issue 5. For both measurements, an occupied bandwidth built-in function in the spectrum analyzer was used. The results are provided in the following table. The largest emission bandwidths in each channel type are highlighted.

| 5G NR Channel Bandwidth | 5G NR Modulation Type | | | | | | | |
|-------------------------------|-----------------------|--------------|---------------|--------------|---------------|--------------|---------------|--------------|
| | QPSK | | 16QAM | | 64QAM | | 256QAM | |
| | 26dB (MHz) | 99% (MHz) | 26dB (MHz) | 99% (MHz) | 26dB (MHz) | 99% (MHz) | 26dB (MHz) | 99% (MHz) |
| 5 MHz | 4.847 | 4.4834 | 4.839 | 4.4742 | 4.818 | 4.4840 | 4.817 | 4.4784 |
| 10 MHz | 9.876 | 9.2927 | 9.888 | 9.2963 | 9.860 | 9.2773 | 9.841 | 9.2987 |

Emission bandwidth measurement data are provided in the following pages.

5G NR Emission Bandwidth Plots on the Middle Channel (881.5MHz) for Antenna Port 2:
5MHz Channel Bandwidth_QPSK

10MHz Channel Bandwidth_QPSK

5MHz Channel Bandwidth_16QAM

10MHz Channel Bandwidth_16QAM

5MHz Channel Bandwidth_64QAM

10MHz Channel Bandwidth_64QAM

5MHz Channel Bandwidth_256QAM

10MHz Channel Bandwidth_256QAM
