



Transmitter Radiated Spurious Emissions

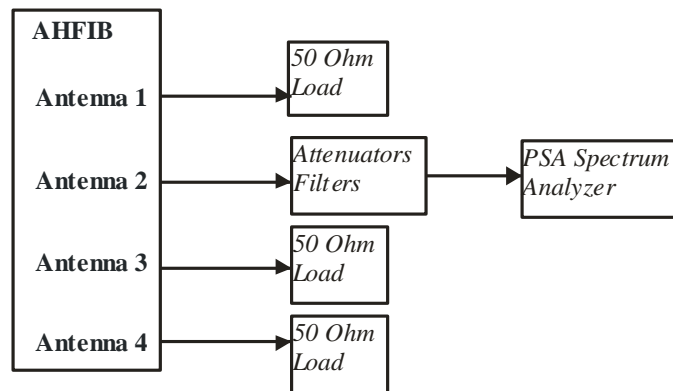
Radiated spurious emission plots/measurement results are in the original FCC and IC radio certification submittal (NTS Test Report Number PR072254 Revision 1 dated March 16, 2018).

Frequency Stability/Accuracy

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

APPENDIX B: ANTENNA PORT WCDMA TEST DATA FOR THE PCS BAND

All conducted RF measurements in this section were made at AHFIB antenna port 2. The testing was performed on the same hardware (EUT) as the original certification test. The same EUT RF port (Ant 2) determined in the original certification testing to be the highest power port was used for all testing in this effort. All testing in this section was performed with WCDMA modulation types. The test setup used is provided below.



Test Setup Used for AHFIB Conducted RF Measurements

RF Output Power

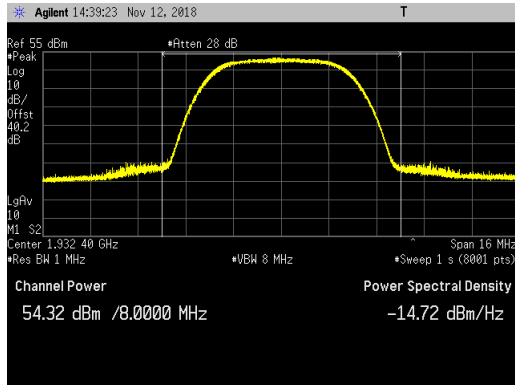
RF output power has been measured in both Peak and RMS Average terms at AHFIB Antenna Port 2 at the bottom, middle and top PCS frequency channels for WCDMA modulation types (QPSK, 16QAM, 64QAM). RMS Average power was measured as described in section 5.2 of KDB 971168 D01v03r01 and ANSI C63.26-2015 sections 5.2.4.4. Peak power was measured as described in section 5.1 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.3.5. The peak to average power ratio (PAPR) has been calculated as described in section 5.7 of KDB971168 D01v03r01 and ANSI C63.26-2015 section 5.2.6. All results are presented in tabular form below. Measurements were rounded off to the nearest tenth. The highest values are highlighted.

Modulation	Frequency _ Channel	Peak (dBm)	Average (dBm)	PAPR (dB)
QPSK	1932.4MHz _ Bottom Channel	54.3	46.3	8.0
	1960.0MHz _ Middle Channel	54.2	46.3	7.9
	1987.6MHz _ Top Channel	54.4	46.3	8.1
16QAM	1932.4MHz _ Bottom Channel	53.9	46.3	7.6
	1960.0MHz _ Middle Channel	53.8	46.3	7.5
	1987.6MHz _ Top Channel	54.0	46.2	7.8
64QAM	1932.4MHz _ Bottom Channel	54.1	46.3	7.8
	1960.0MHz _ Middle Channel	54.1	46.3	7.8
	1987.6MHz _ Top Channel	54.2	46.4	7.8

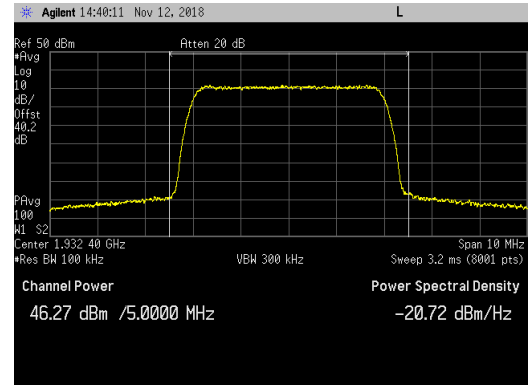
All measurement results are provided in the following pages. The total measurement RF path loss of the test setup (attenuator and test cables) was 40.2 dB and is accounted for by the spectrum analyzer reference level offset.

WCDMA Channel Power Plots for Antenna Port 2 and QPSK Modulation:

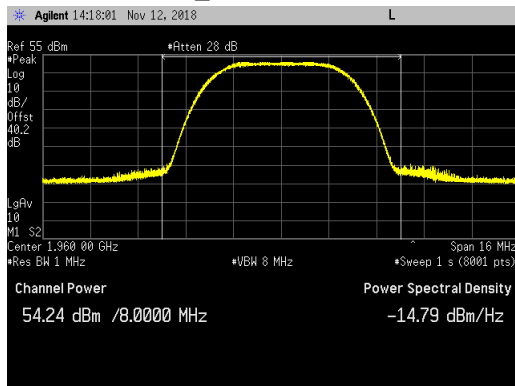
Bottom Channel_ Peak



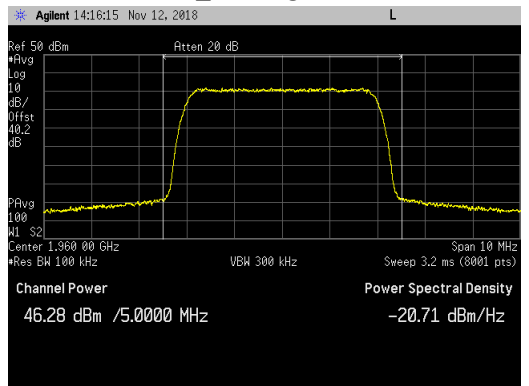
Bottom Channel_ Average



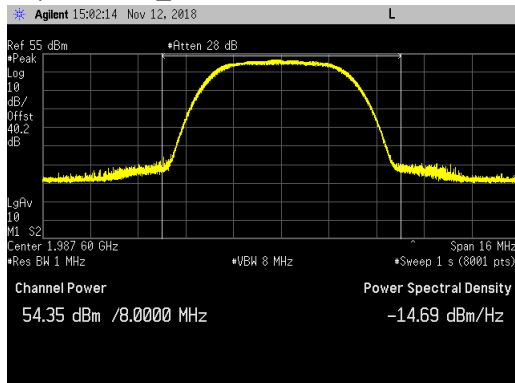
Middle Channel_ Peak



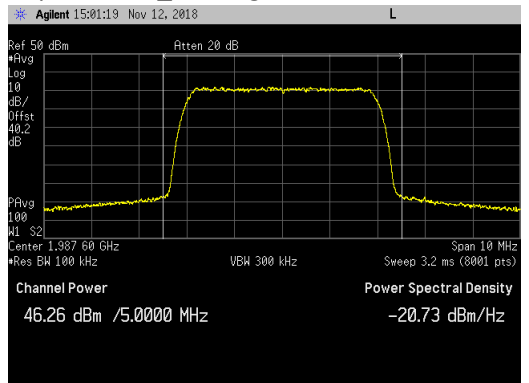
Middle Channel_ Average



Top Channel_ Peak

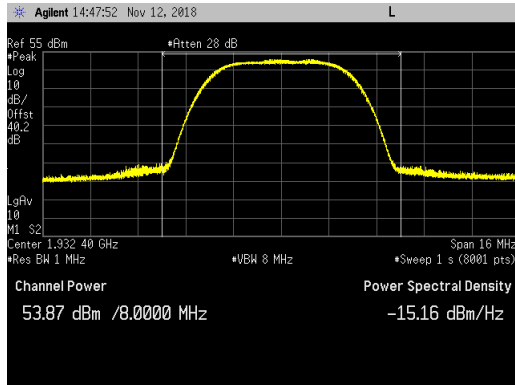


Top Channel_ Average

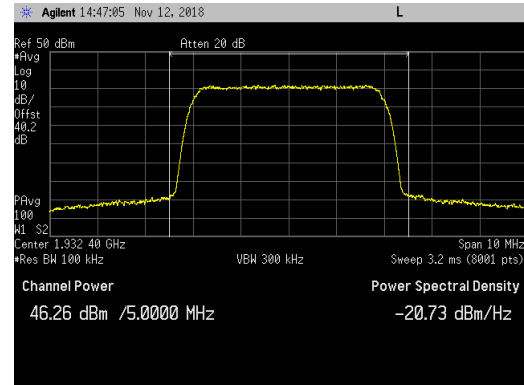


WCDMA Channel Power Plots for Antenna Port 2 and 16QAM Modulation:

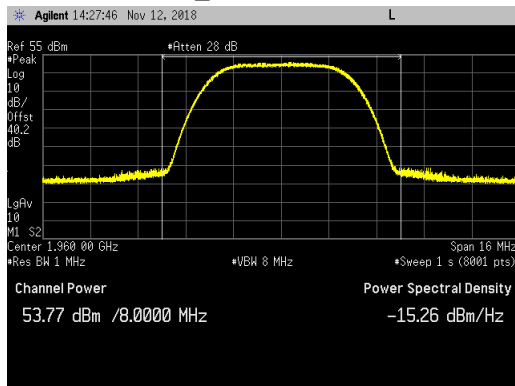
Bottom Channel_ Peak



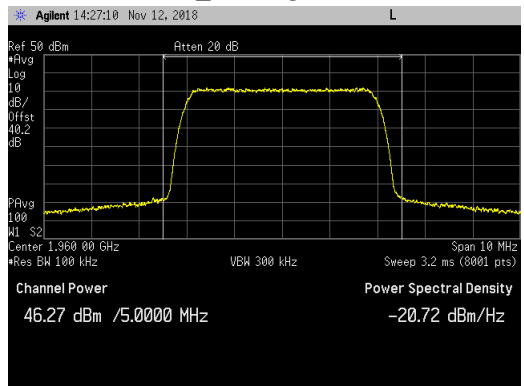
Bottom Channel_ Average



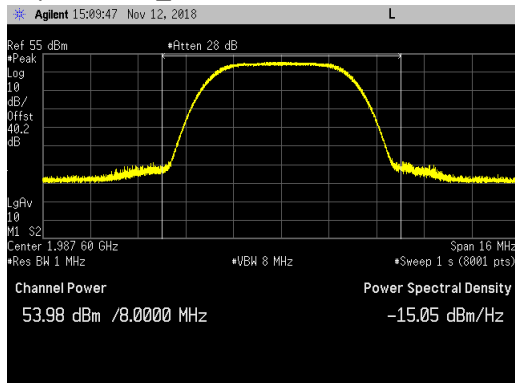
Middle Channel_ Peak



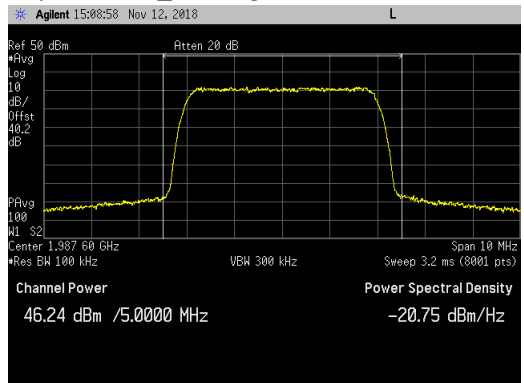
Middle Channel_ Average



Top Channel_ Peak

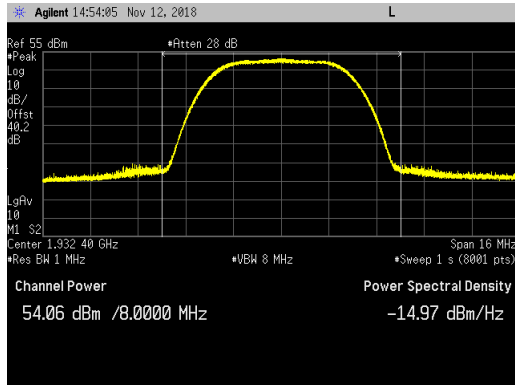


Top Channel_ Average

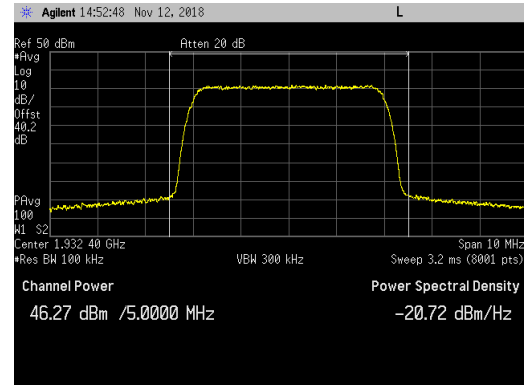


WCDMA Channel Power Plots for Antenna Port 2 and 64QAM Modulation:

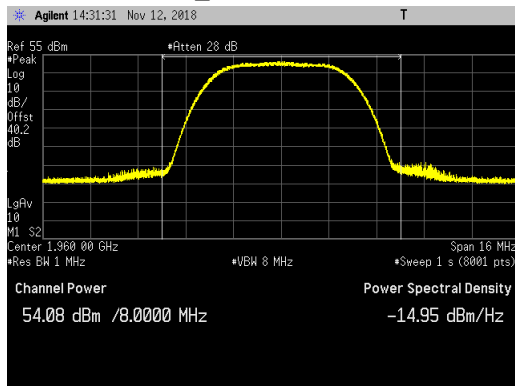
Bottom Channel_ Peak



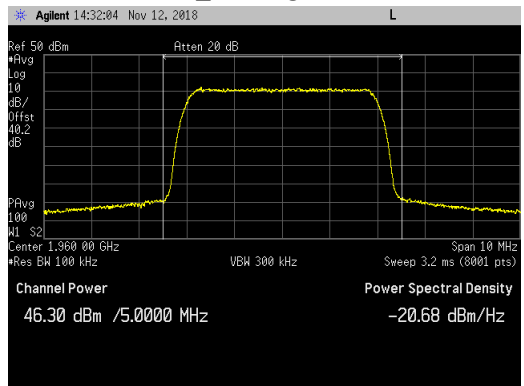
Bottom Channel_ Average



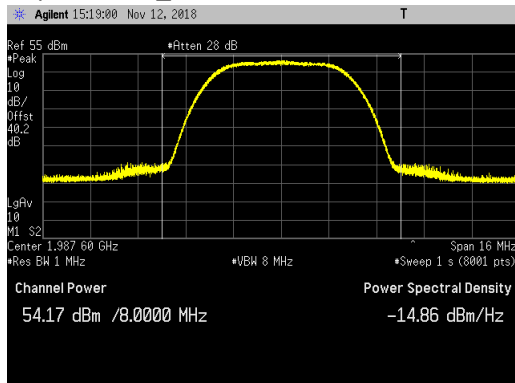
Middle Channel_ Peak



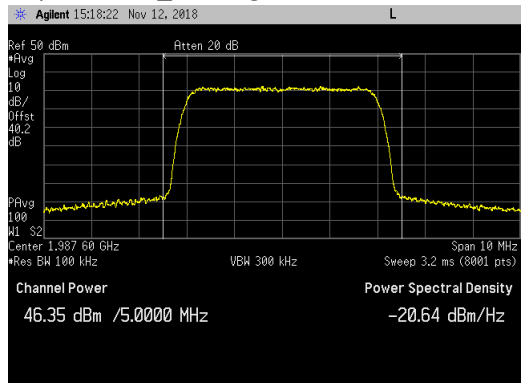
Middle Channel_ Average



Top Channel_ Peak



Top Channel_ Average



Emission Bandwidth (26 dB down and 99%)

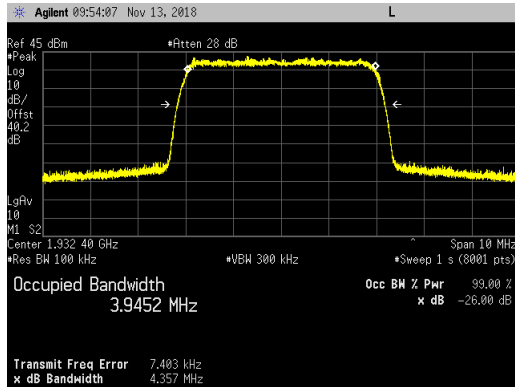
Emission bandwidth measurements were made at antenna port 2 on the bottom, middle and top PCS channels. The AHFIB was operated at maximum RF output power for WCDMA modulation types (QPSK, 16QAM, 64QAM). The 26dB emission bandwidth was measured in accordance with section 4 of FCC KDB 971168 D01v03r01 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 bandwidth is highlighted. Measurements were rounded off to the nearest kHz.

Modulation	Frequency _ Channel	Emission Bandwidth (MHz)	
		26dB	99%
QPSK	1932.4MHz _ Bottom Channel	4.357	3.945
	1960.0MHz _ Middle Channel	4.348	3.947
	1987.6MHz _ Top Channel	4.363	3.939
16QAM	1932.4MHz _ Bottom Channel	4.345	3.942
	1960.0MHz _ Middle Channel	4.371	3.946
	1987.6MHz _ Top Channel	4.374	3.946
64QAM	1932.4MHz _ Bottom Channel	4.359	3.940
	1960.0MHz _ Middle Channel	4.366	3.934
	1987.6MHz _ Top Channel	4.369	3.935

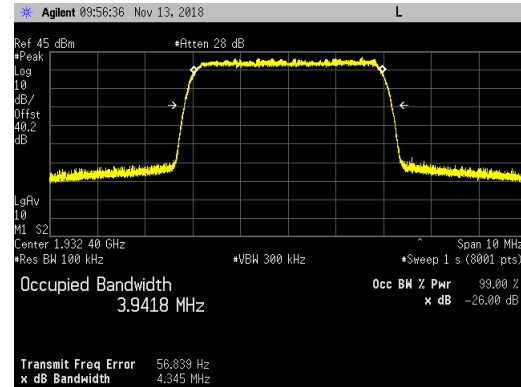
Emission bandwidth measurement data are provided in the following pages.

WCDMA Emission Bandwidth Plots at AHFIB Antenna Port 2

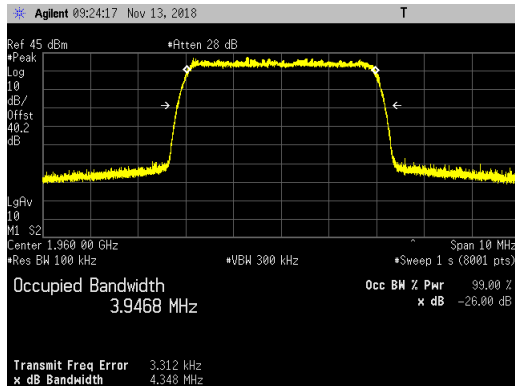
Bottom Channel_ QPSK Modulation



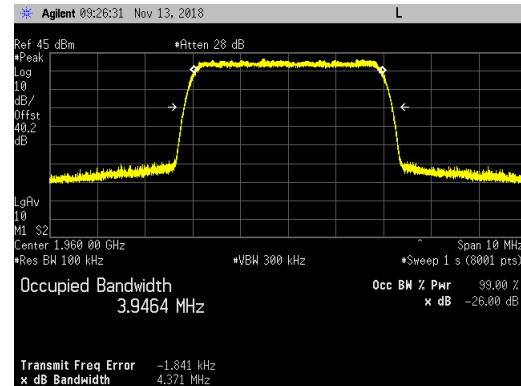
Bottom Channel_ 16QAM Modulation



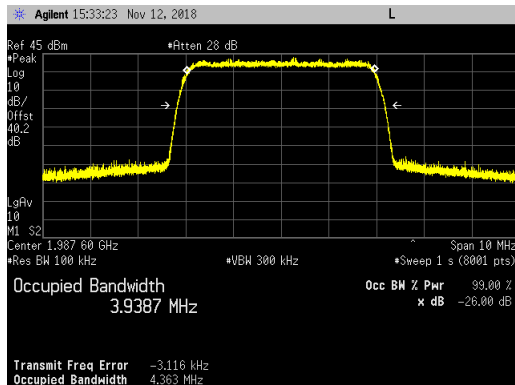
Middle Channel_ QPSK Modulation



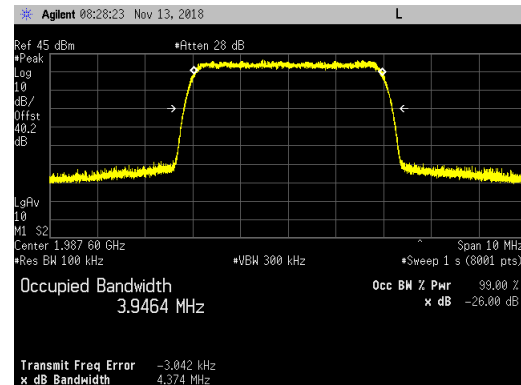
Middle Channel_ 16QAM Modulation



Top Channel_ QPSK Modulation

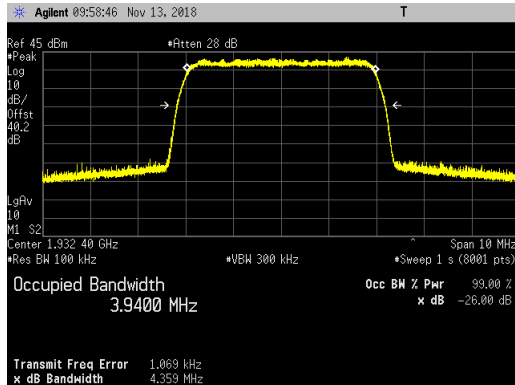


Top Channel_ 16QAM Modulation

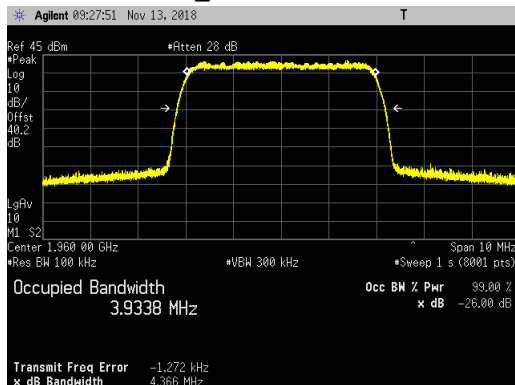


WCDMA Emission Bandwidth Plots at AHFIB Antenna Port 2

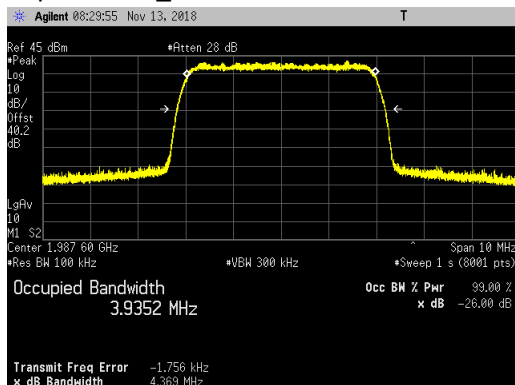
Bottom Channel_ 64QAM Modulation



Middle Channel_ 64QAM Modulation



Top Channel_ 64QAM Modulation



Antenna Port Conducted Band Edge

Conducted band edge measurements were made at RRH antenna port 2. The RRH was operated at the PCS band edge frequencies with WCDMA modulation types (QPSK, 16QAM and 64 QAM).

The single carrier test case was performed with the carrier operating at the at the lower and upper band edge frequencies at maximum power. A multicarrier test case based upon KDB 971168 D03v01 using three carriers (at maximum power) per antenna port was also performed. The multicarrier test case is with two carriers (with minimum spacing between carrier frequencies) at the lower band edge (i.e.: 1932.4 & 1937.4MHz) and a third carrier with maximum spacing between the other two carrier frequencies (1987.6MHz).

The power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm as specified in section 24.238(a) and RSS 133 6.5(i). The limit is adjusted to -16dBm $[-13\text{dBm} -10 \log (2)]$ per FCC KDB 662911D01 v02r01 because the BTS may operate as a 2 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 measured emission bandwidth (51kHz) per 24.238(b) and RSS 133 6.5(i) was used. In the 1 to 2MHz frequency range outside the band edge (i.e.: 1928 to 1929MHz and 1991 to 1992MHz bands) the RBW was set to 1% of the measured emission bandwidth (51kHz) and the power integrated over 1MHz. In the 2MHz to 22MHz frequency range outside the band edge (i.e.: 1908 to 1928MHz and 1992 to 2012MHz 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.

Test Case	QPSK		16QAM		64QAM	
	Bottom Channel	Top Channel	Bottom Channel	Top Channel	Bottom Channel	Top Channel
Single Carrier	-21.778	-20.244	-21.900	-21.996	-21.950	-20.958
Multicarrier	-23.495	-22.414	-22.072	-21.743	-22.657	-21.125

The total measurement RF path loss of the test setup (attenuator and test cables) was 40.2 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.

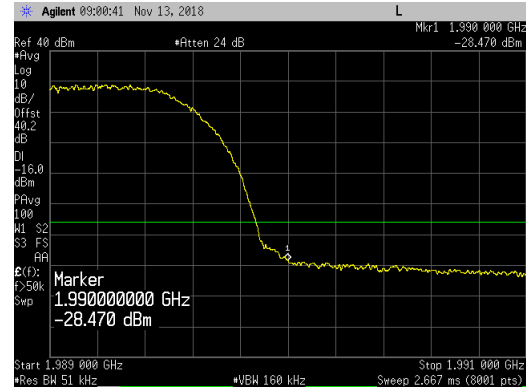
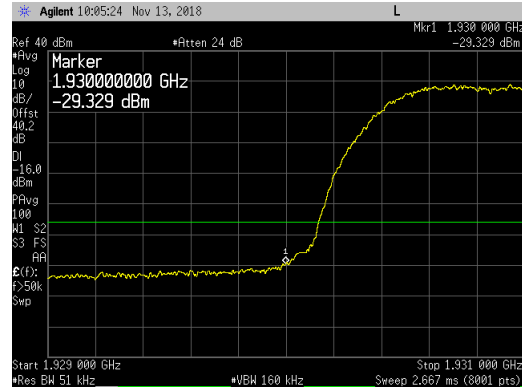
Single Carrier with QPSK Modulation at Maximum Power -Lower and Upper Band Edge Plots:

WCDMA Carrier at BC (1932.4MHz)

WCDMA Carrier at TC (1987.6MHz)

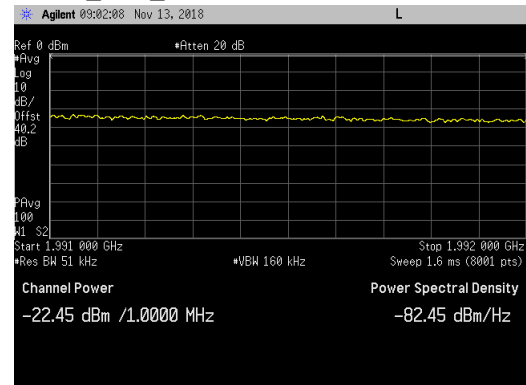
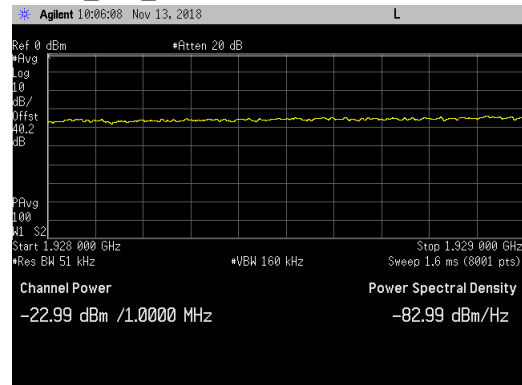
Port 2_LBE_1929 to 1931MHz

Port 2_UBE_1989 to 1991MHz



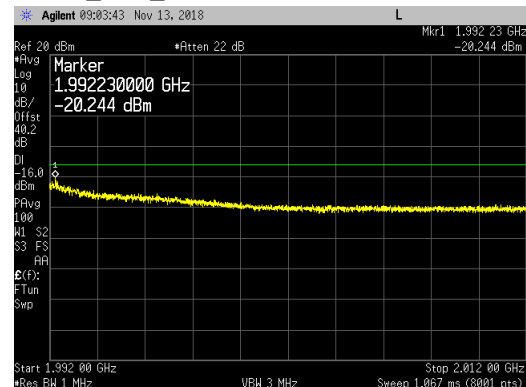
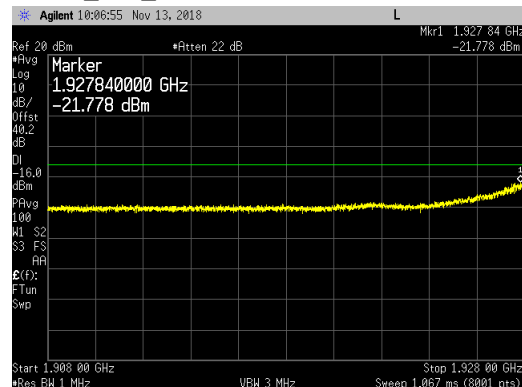
Port 2_LBE_1928 to 1929MHz

Port 2_UBE_1991 to 1992MHz



Port 2_LBE_1908 to 1928MHz

Port 2_UBE_1992 to 2012MHz



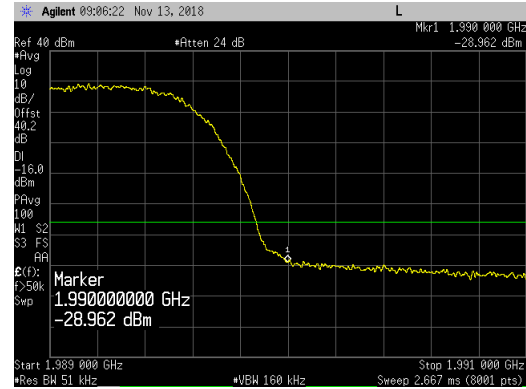
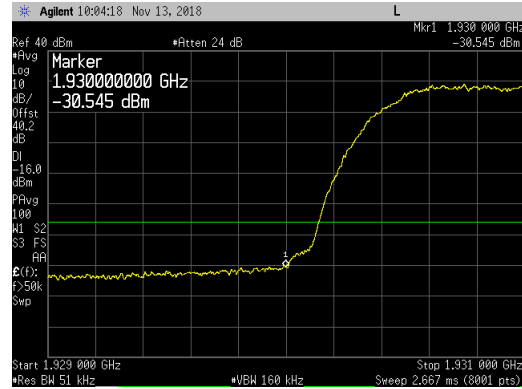
Single Carrier with 16QAM Modulation at Maximum Power -Lower and Upper Band Edge Plots:

WCDMA Carrier at BC (1932.4MHz)

WCDMA Carrier at TC (1987.6MHz)

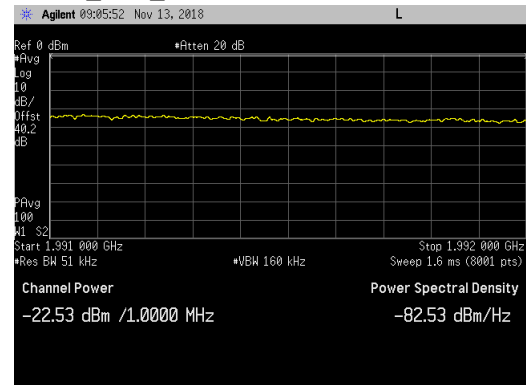
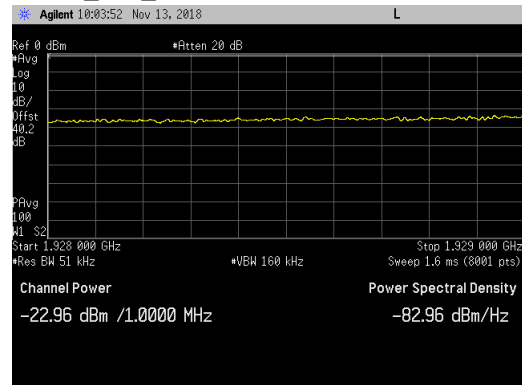
Port 2_LBE_1929 to 1931MHz

Port 2_UBE_1989 to 1991MHz



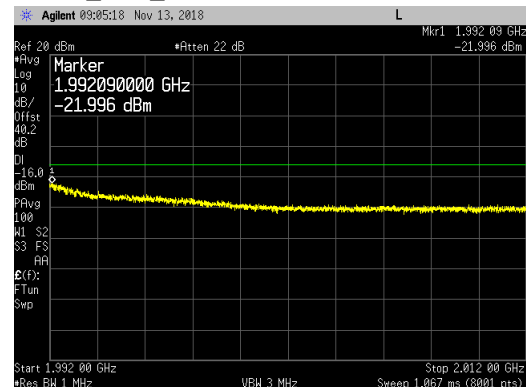
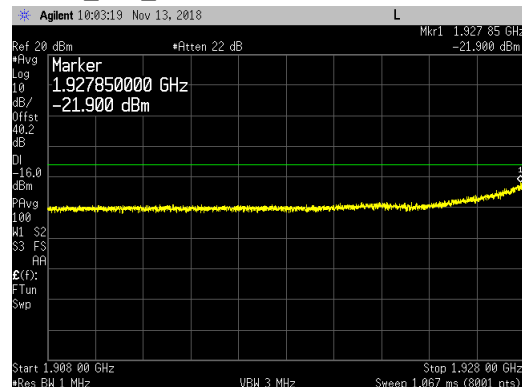
Port 2_LBE_1928 to 1929MHz

Port 2_UBE_1991 to 1992MHz



Port 2_LBE_1908 to 1928MHz

Port 2_UBE_1992 to 2012MHz



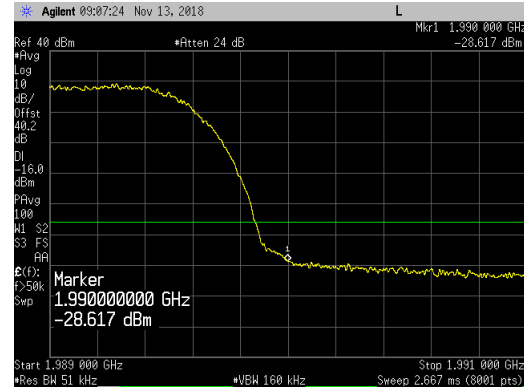
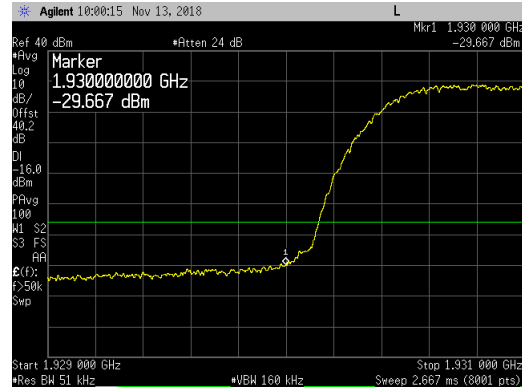
Single Carrier with 64QAM Modulation at Maximum Power -Lower and Upper Band Edge Plots:

WCDMA Carrier at BC (1932.4MHz)

WCDMA Carrier at TC (1987.6MHz)

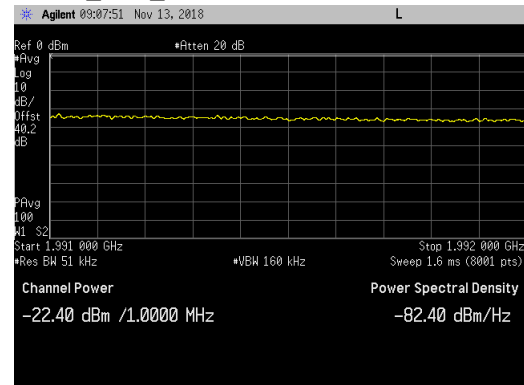
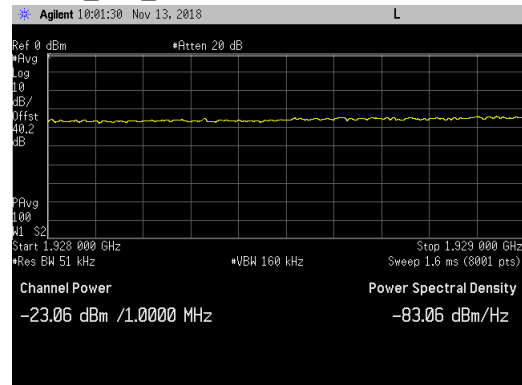
Port 2_LBE_1929 to 1931MHz

Port 2_UBE_1989 to 1991MHz



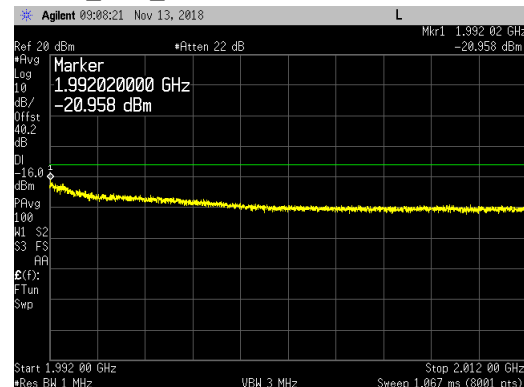
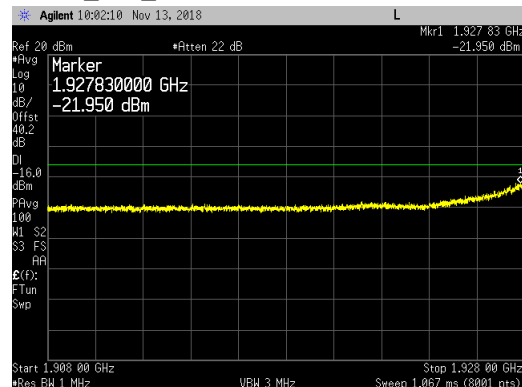
Port 2_LBE_1928 to 1929MHz

Port 2_UBE_1991 to 1992MHz



Port 2_LBE_1908 to 1928MHz

Port 2_UBE_1992 to 2012MHz

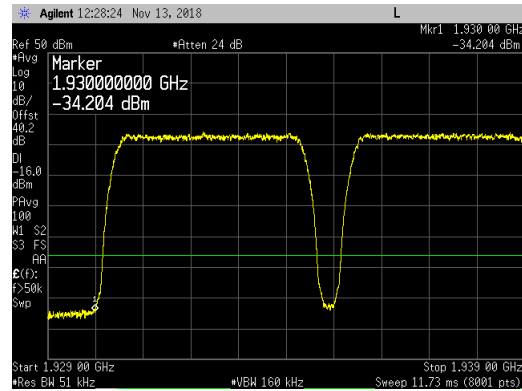


Three Carriers with QPSK Modulation at Max Power at Bottom Chs and at Top Ch -LBE & UBE Plots:

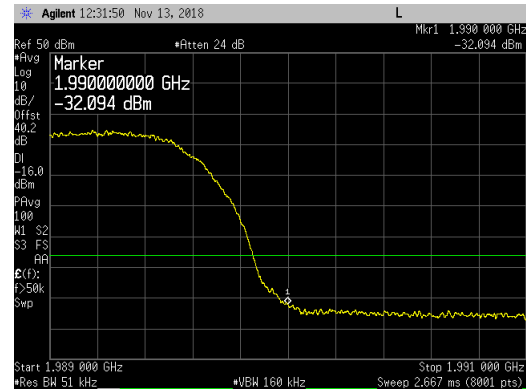
WCDMA Carriers at 1932.4, 1937.4 & 1987.6MHz

WCDMA Carriers at 1932.4, 1937.4 & 1987.6MHz

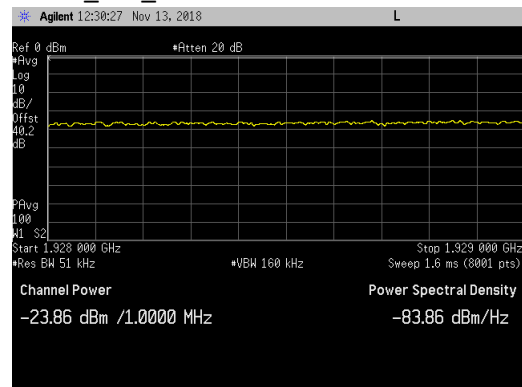
Port 2_LBE_1929 to 1939MHz



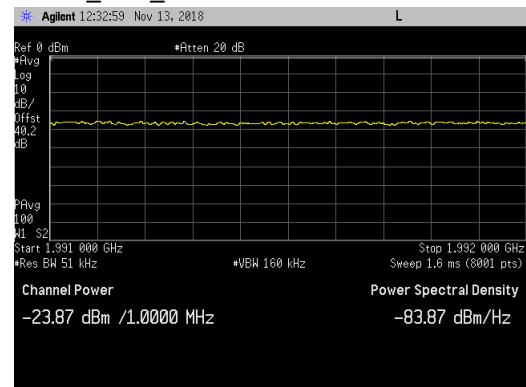
Port 2_UBE_1989 to 1991MHz



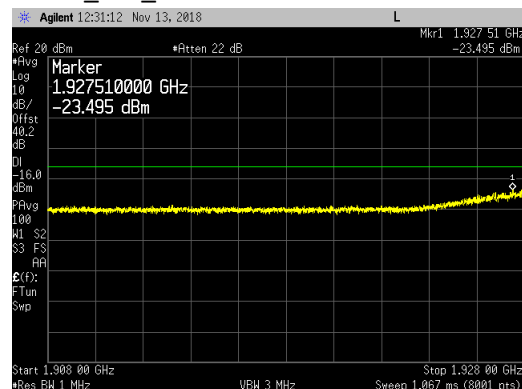
Port 2_LBE_1928 to 1929MHz



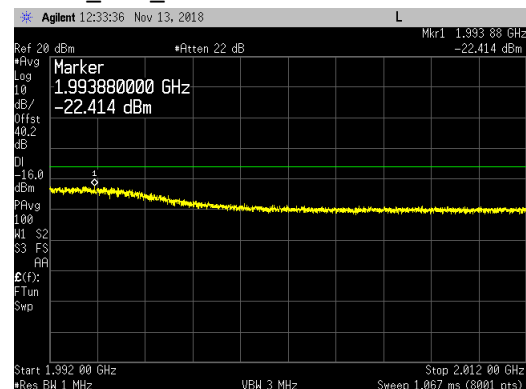
Port 2_UBE_1991 to 1992MHz



Port 2_LBE_1908 to 1928MHz



Port 2_UBE_1992 to 2012MHz

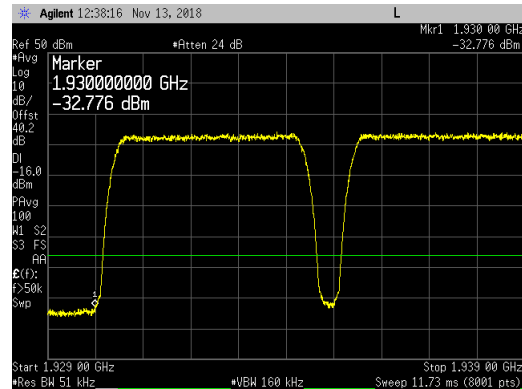


Three Carriers with 16QAM Modulation at Max Power at Bottom Chs and at Top Ch -LBE & UBE Plots:

WCDMA Carriers at 1932.4, 1937.4 & 1987.6MHz

WCDMA Carriers at 1932.4, 1937.4 & 1987.6MHz

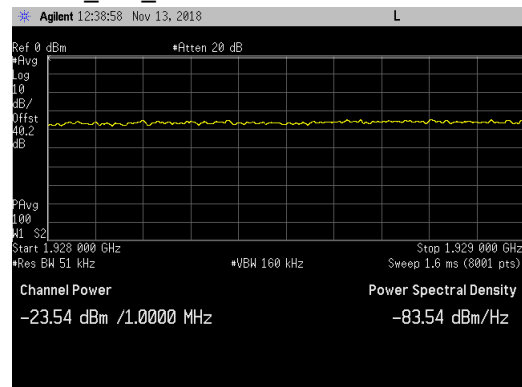
Port 2_LBE_1929 to 1939MHz



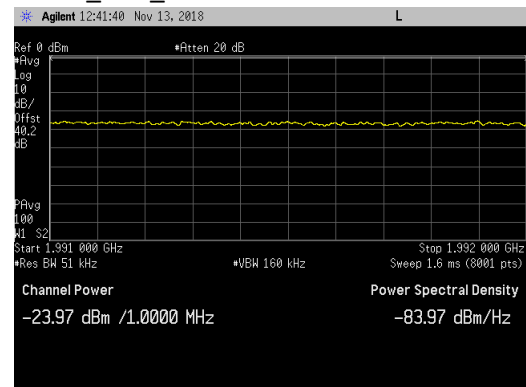
Port 2_UBE_1989 to 1991MHz



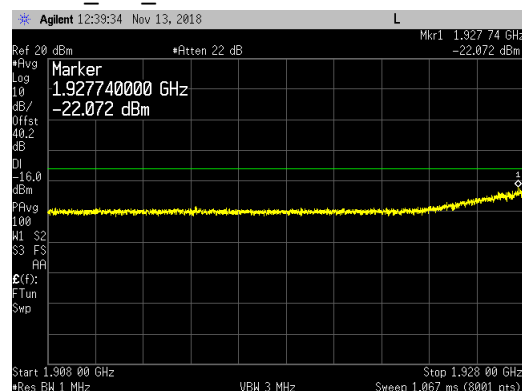
Port 2_LBE_1928 to 1929MHz



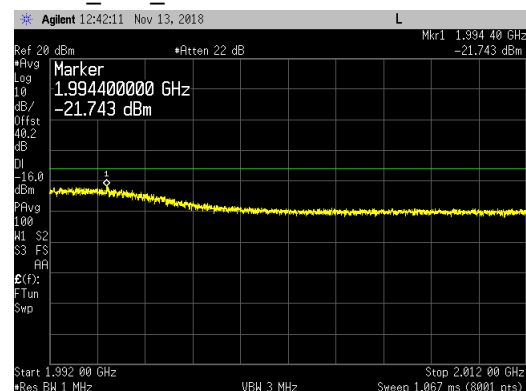
Port 2_UBE_1991 to 1992MHz



Port 2_LBE_1908 to 1928MHz



Port 2_UBE_1992 to 2012MHz

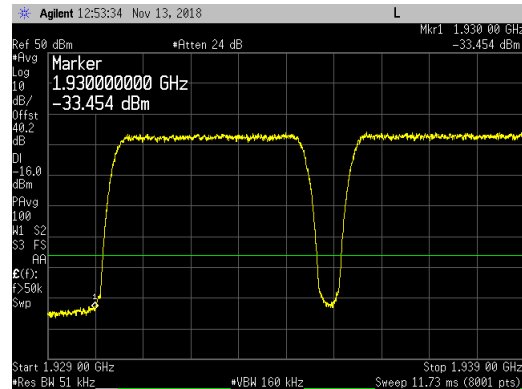


Three Carriers with 64QAM Modulation at Max Power at Bottom Chs and at Top Ch -LBE & UBE Plots:

WCDMA Carriers at 1932.4, 1937.4 & 1987.6MHz

WCDMA Carriers at 1932.4, 1937.4 & 1987.6MHz

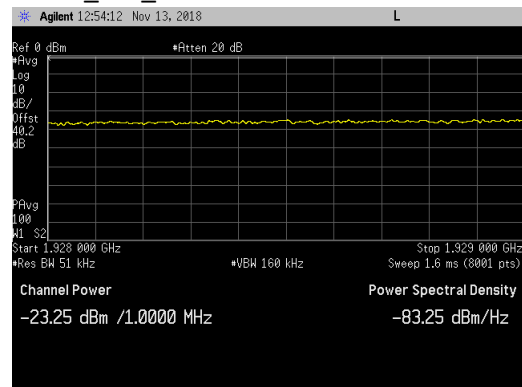
Port 2_LBE_1929 to 1939MHz



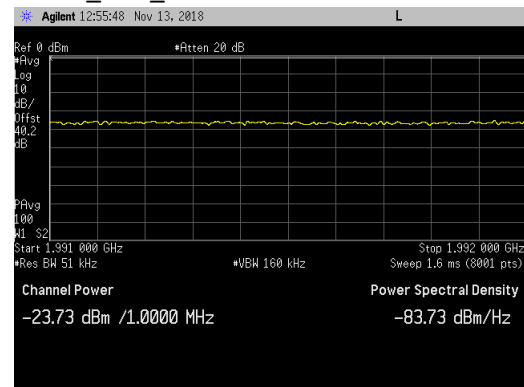
Port 2_UBE_1989 to 1991MHz



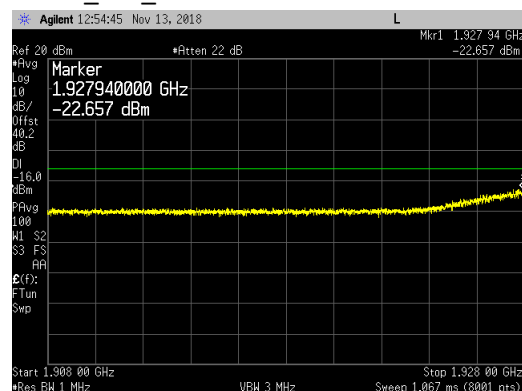
Port 2_LBE_1928 to 1929MHz



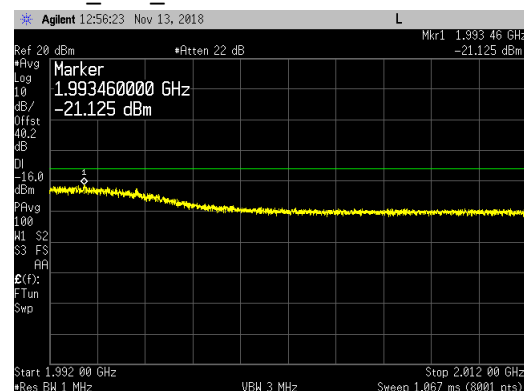
Port 2_UBE_1991 to 1992MHz



Port 2_LBE_1908 to 1928MHz



Port 2_UBE_1992 to 2012MHz



Transmitter Antenna Port Conducted Emissions

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

The single carrier test case was performed with the RRH was operated on the PCS middle channel (1960.0MHz) and AWS middle channel (2140.0MHz) simultaneously at maximum power with all WCDMA modulation types (QPSK, 16QAM, and 64QAM). The same modulation type was used for both PCS and AWS carriers.

Multicarrier test cases based upon KDB 971168 D03v01 using three carriers (at maximum power) per antenna port was also performed. A PCS multicarrier test case with two carriers (with minimum spacing between carrier frequencies) at the lower band edge (i.e.: 1932.4 & 1937.4MHz) and a third carrier at the upper band edge (1987.6MHz) was performed. The AWS carrier was operating simultaneously at the middle channel (2140MHz) for the PCS multi carrier test case. A AWS multicarrier test case with two carriers (with minimum spacing between carrier frequencies) at the lower band edge (i.e.: 2112.4 & 2117.4MHz) and a third carrier at the upper band edge (2167.6MHz) was performed. The PCS carrier was operating simultaneously at the middle channel (1960.0MHz) for the AWS multicarrier test case. The same modulation type was used for both PCS and AWS carriers.

The test configuration parameters are provided below:

PCS Band Transmission Parameters			AWS Band Transmission Parameters		
Carrier Frequency	Channel BW	Carrier Power	Carrier Frequency	Channel BW	Carrier Power
1960.0MHz (Mid Ch)	WCDMA 5M	40 Watts	2140.0MHz (Mid Ch)	WCDMA 5M	40 Watts
1932.4, 1937.4 & 1987.6MHz (BC, BC+1, and TC)	WCDMA 5M	13+13+13 Watts	2140.0MHz (Mid Ch)	WCDMA 5M	40 Watts
1960.0MHz (Mid Ch)	WCDMA 5M	40 Watts	2112.4, 2117.4 & 2167.6MHz (BC, BC+1, and TC)	WCDMA 5M	13+13+13 Watts

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 -16dBm was used in the certification testing. The limit is adjusted to -16dBm [-13dBm -10 log (2)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 2 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 was 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 -46dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -46dBm = -16dBm -10log(1000kHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -36dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -36dBm = -16dBm -10log(1000kHz/10kHz)].

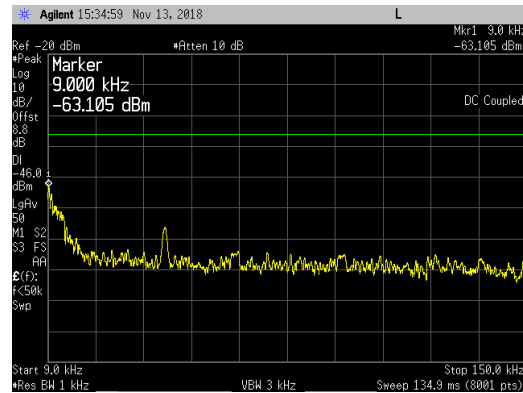
The required limit of -16dBm with a RBW of $\geq 1\text{MHz}$ was used for all other frequency ranges. The spectrum analyzer settings that were used for this test are summarized in the following table.

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	8.8dB
150kHz to 20MHz	10kHz	30kHz	8001	Peak	Auto	50 Sweeps	8.9dB
20MHz to 3000MHz	1MHz	3MHz	8001	Average	Auto	Note 2	40.2dB
3GHz to 6GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	40.1dB
6GHz to 18GHz	2MHz	6MHz	8192	Peak	Auto	50 Sweeps	33.4dB
18GHz to 22GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	40.0dB
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.							

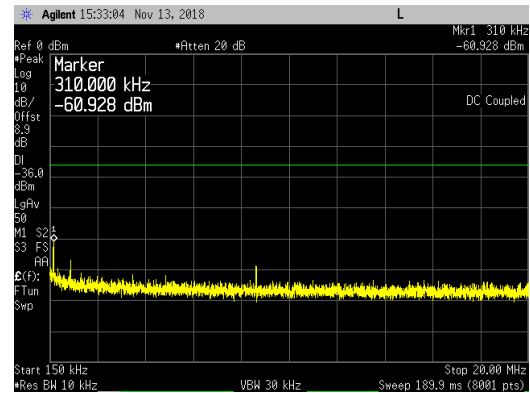
A low pass filter was used to reduce the measurement instrumentation noise floor for the frequency ranges below 20MHz. A high pass filter was used to reduce the measurement instrumentation noise floor for the frequency range above 6GHz. The total measurement RF path loss of the test setup (attenuators,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

Single PCS & AWS Carriers_ QPSK_ Middle Channels (1960.0MHz & 2140.0MHz) Simultaneously:

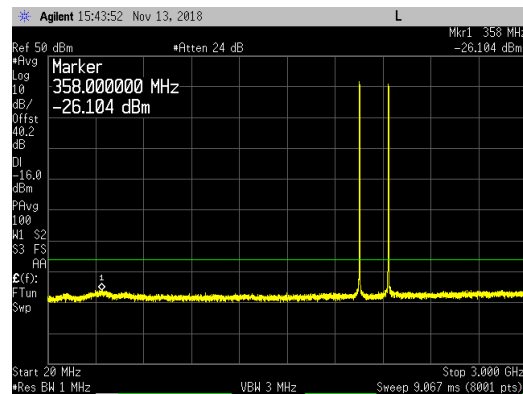
9kHz to 150kHz



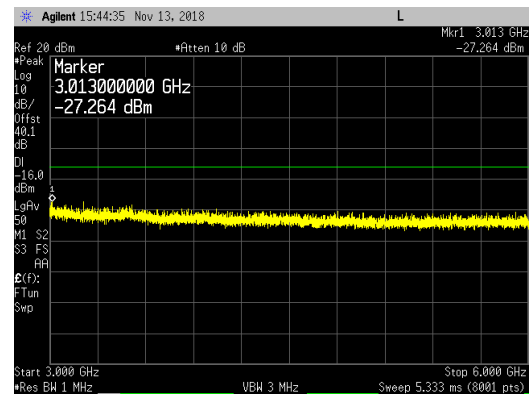
150kHz to 20MHz



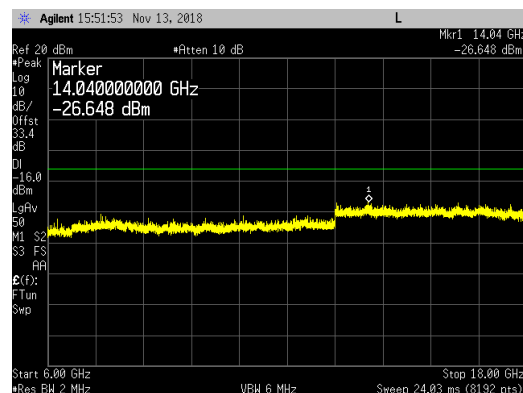
20MHz to 3GHz



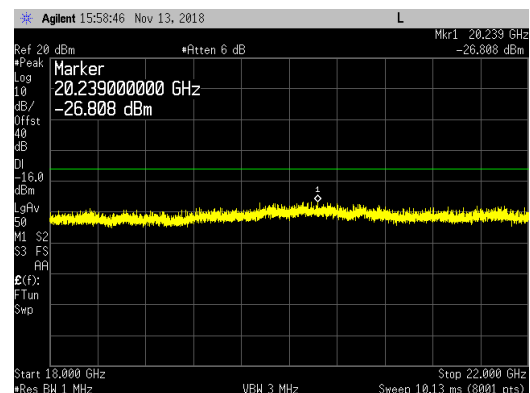
3GHz to 6GHz



6GHz to 18GHz

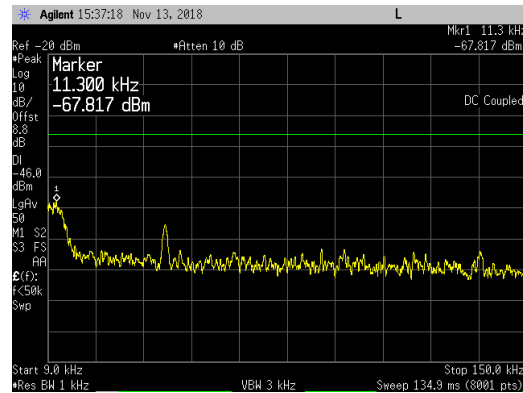


18GHz to 22GHz

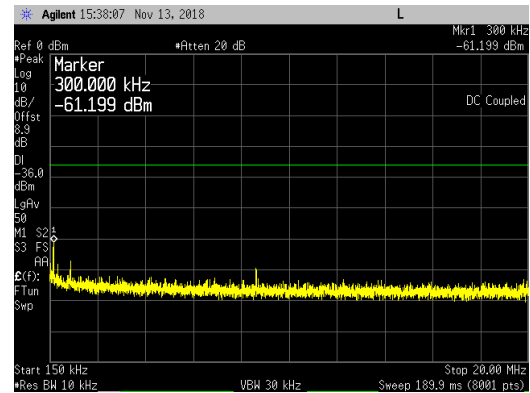


Single PCS & AWS Carriers_ 16QAM _ Middle Channels (1960.0MHz & 2140.0MHz) Simultaneously:

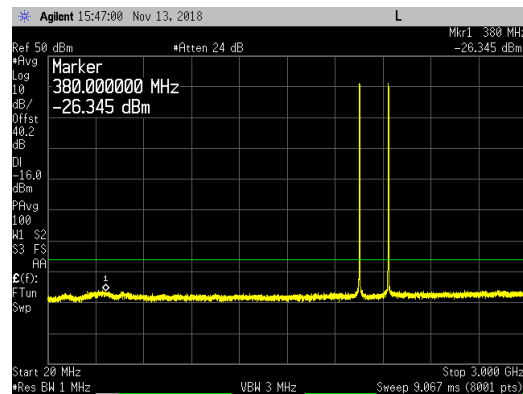
9kHz to 150kHz



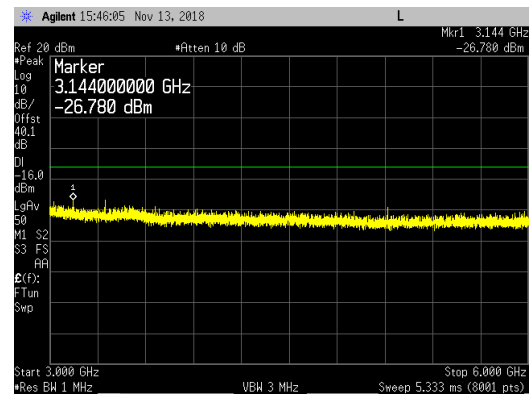
150kHz to 20MHz



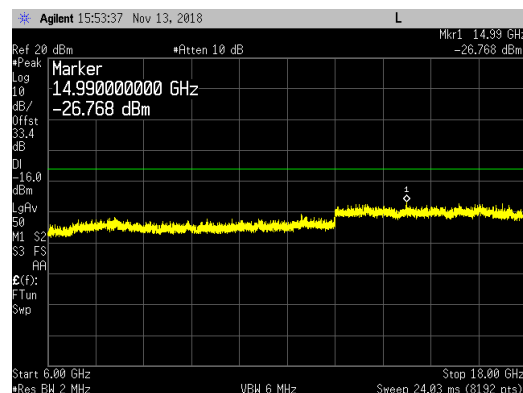
20MHz to 3GHz



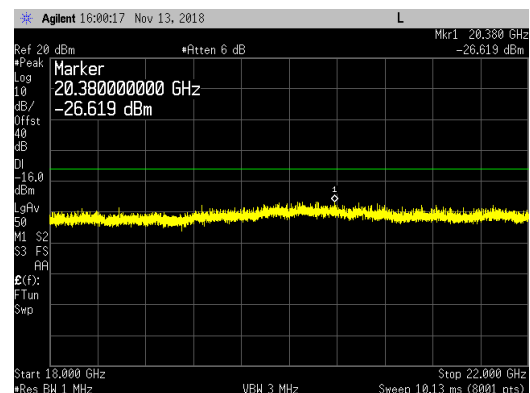
3GHz to 6GHz



6GHz to 18GHz

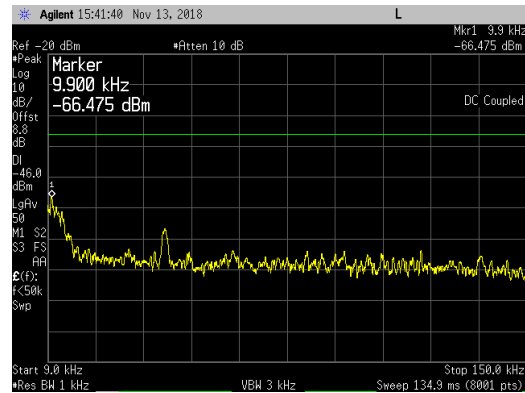


18GHz to 22GHz

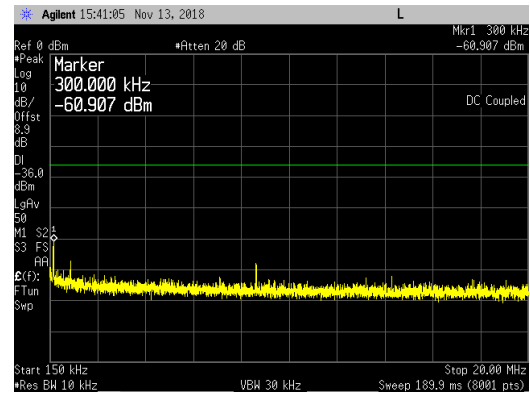


Single PCS & AWS Carriers_ 64QAM _ Middle Channels (1960.0MHz & 2140.0MHz) Simultaneously:

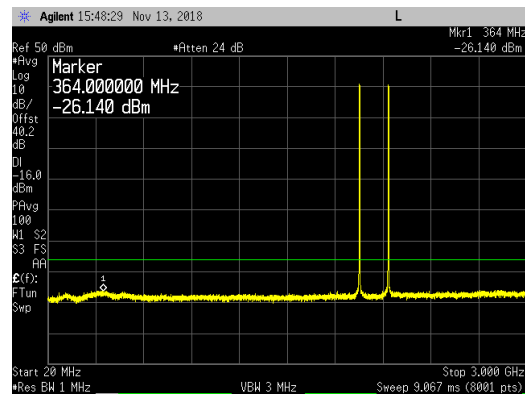
9kHz to 150kHz



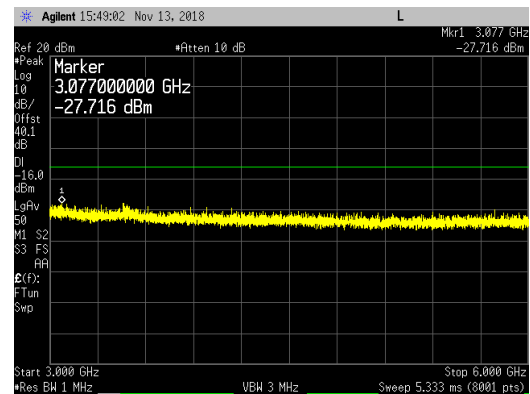
150kHz to 20MHz



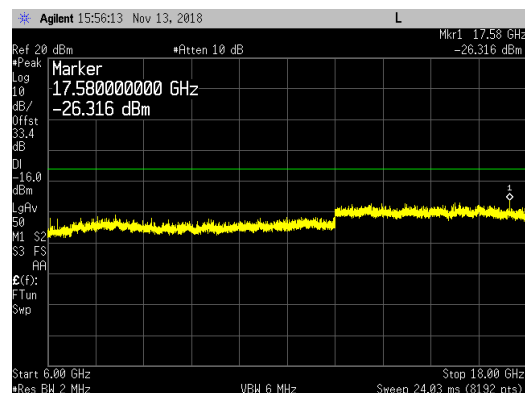
20MHz to 3GHz



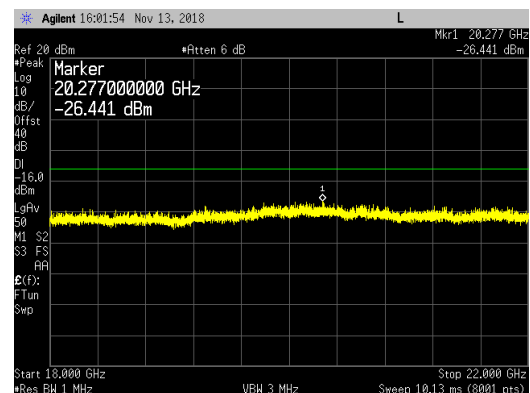
3GHz to 6GHz



6GHz to 18GHz

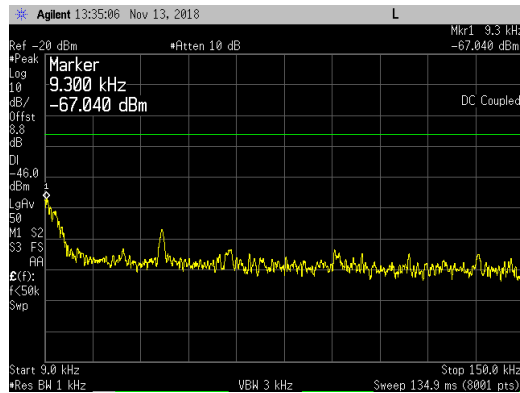


18GHz to 22GHz

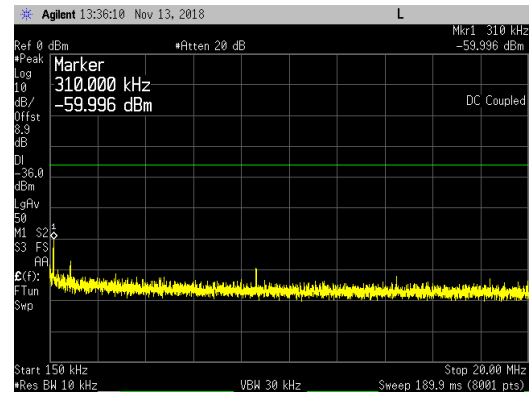


Three PCS (BCs & TC) Carriers & One AWS Carrier (MC)_ QPSK _ 1932.4, 1937.4, 1987.6 & 2140.0MHz:

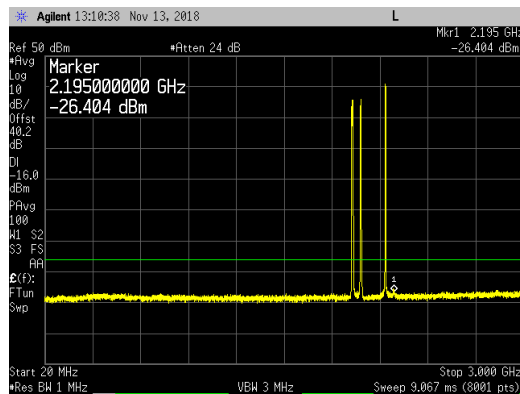
9kHz to 150kHz



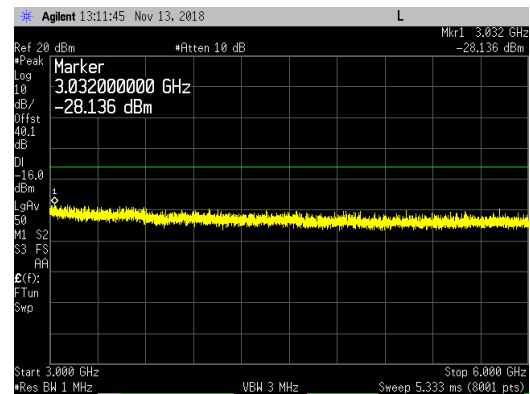
150kHz to 20MHz



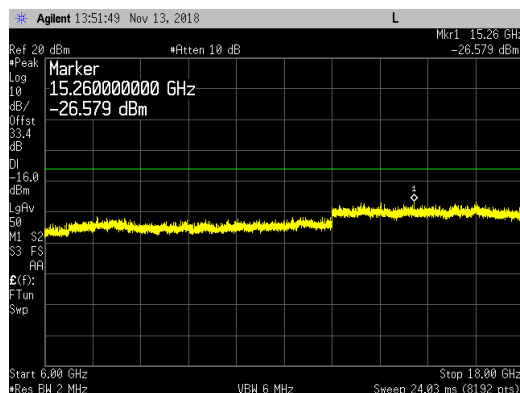
20MHz to 3GHz



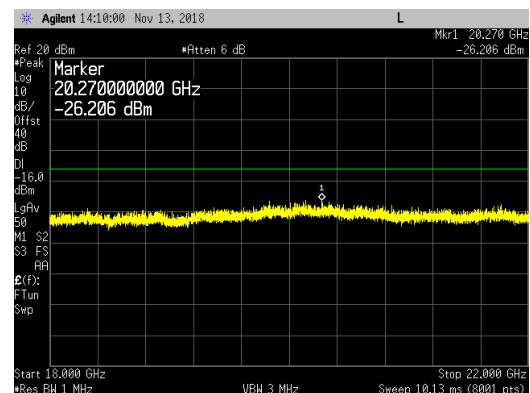
3GHz to 6GHz



6GHz to 18GHz

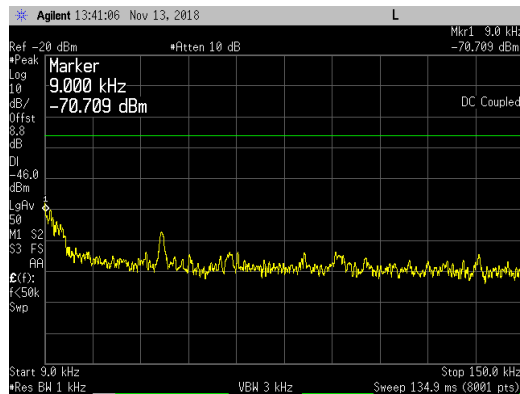


18GHz to 22GHz

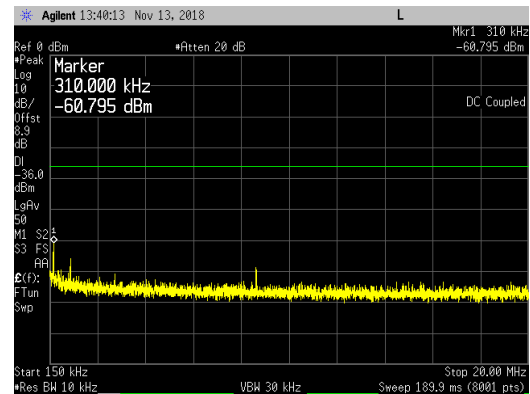


Three PCS (BCs & TC) Carriers & One AWS Carrier (MC)_ 16QAM _ 1932.4, 1937.4, 1987.6 & 2140.0MHz:

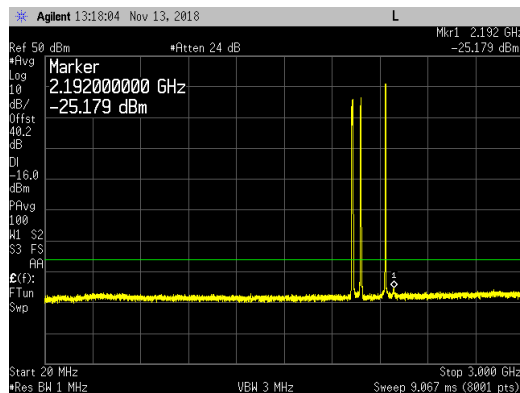
9kHz to 150kHz



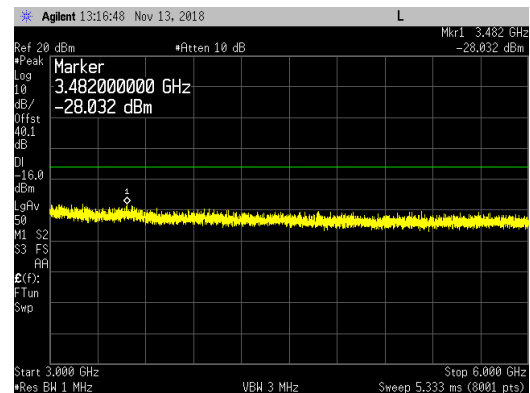
150kHz to 20MHz



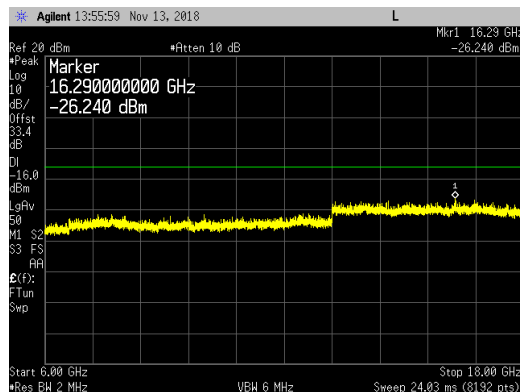
20MHz to 3GHz



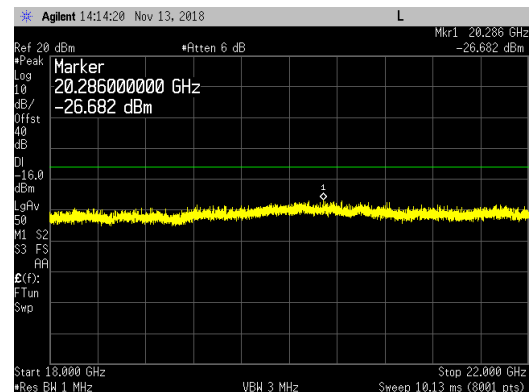
3GHz to 6GHz



6GHz to 18GHz

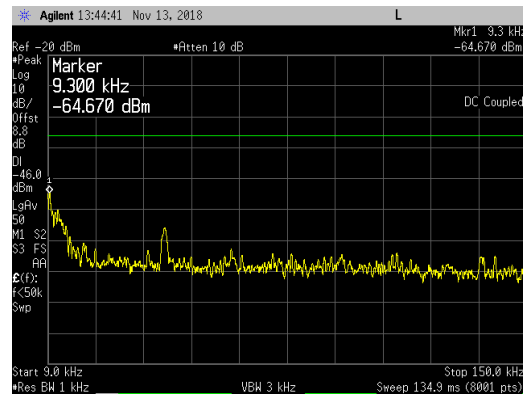


18GHz to 22GHz

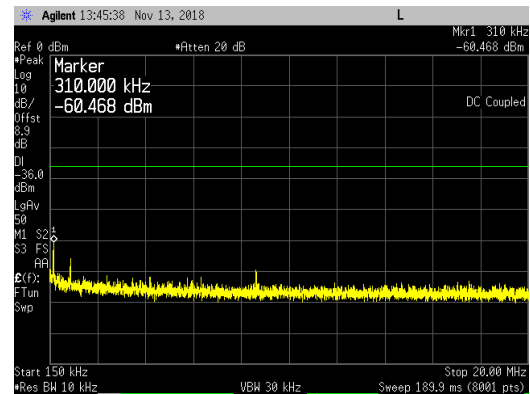


Three PCS (BCs & TC) Carriers & One AWS Carrier (MC)_ 64QAM _ 1932.4, 1937.4, 1987.6 & 2140.0MHz:

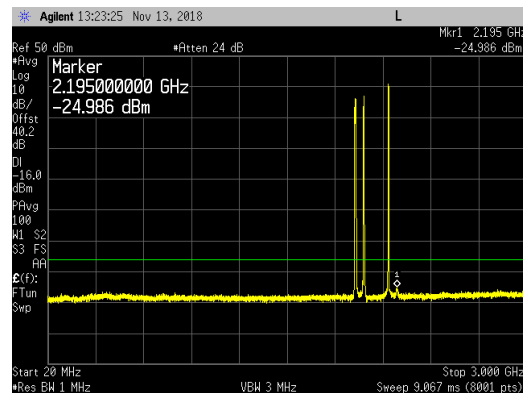
9kHz to 150kHz



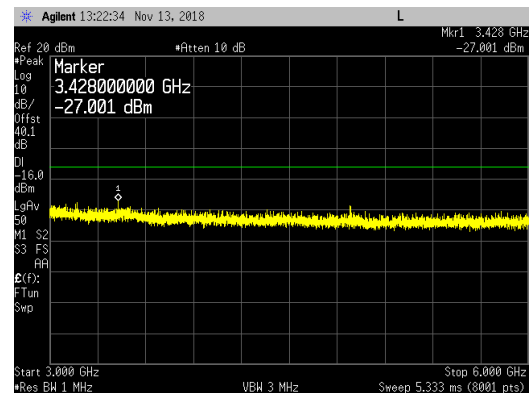
150kHz to 20MHz



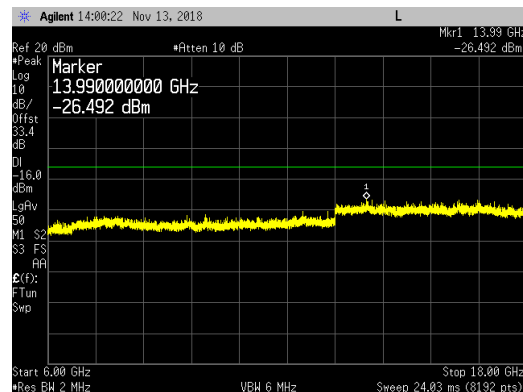
20MHz to 3GHz



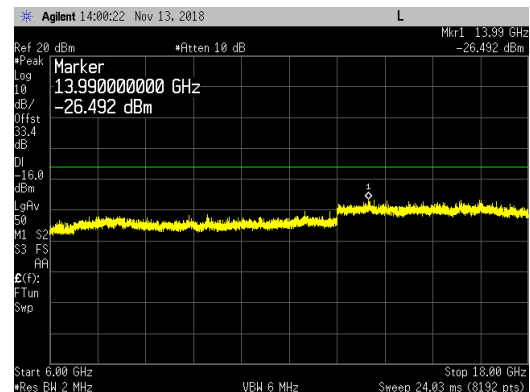
3GHz to 6GHz



6GHz to 18GHz

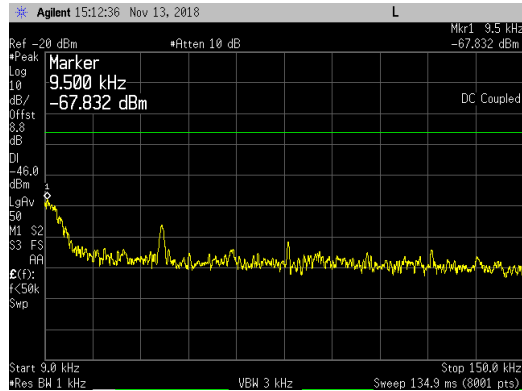


18GHz to 22GHz

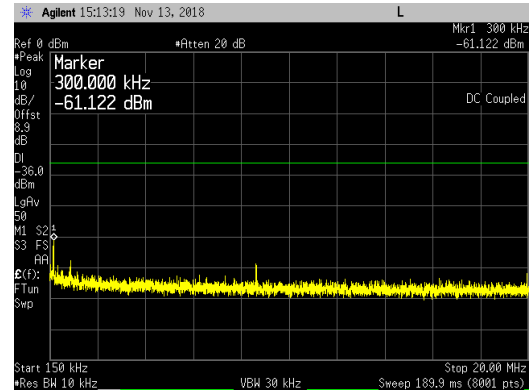


Three AWS (BCs & TC) Carriers & One PCS Carrier (MC)_ QPSK _ 2112.4, 2117.4, 2167.6 & 1960.0MHz:

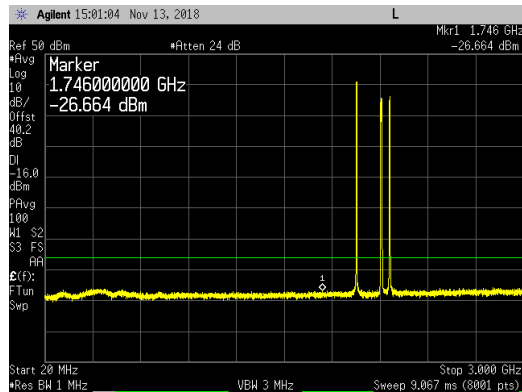
9kHz to 150kHz



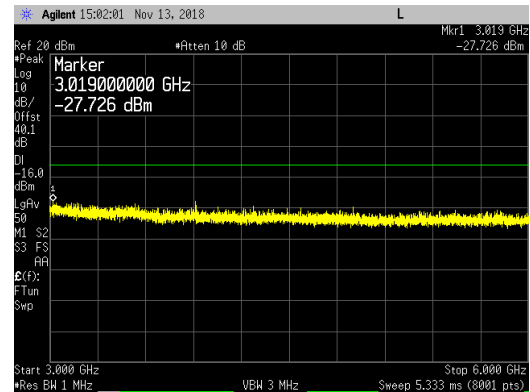
150kHz to 20MHz



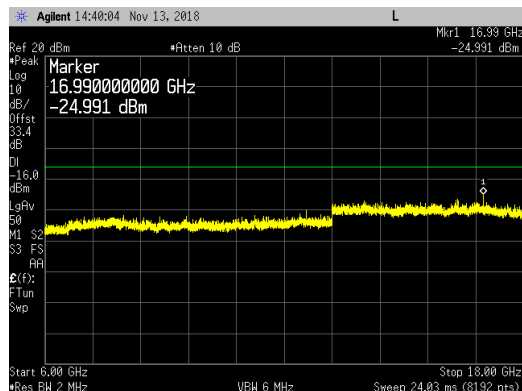
20MHz to 3GHz



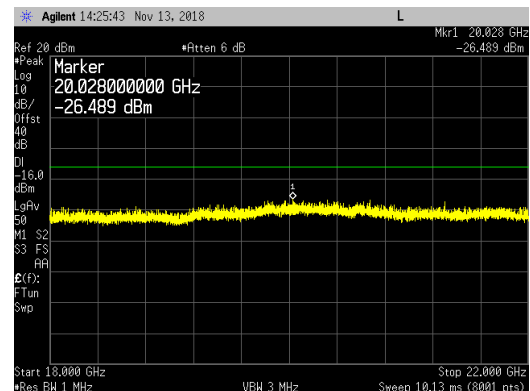
3GHz to 6GHz



6GHz to 18GHz



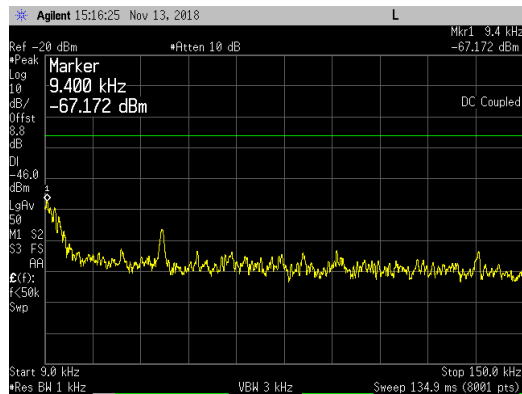
18GHz to 22GHz



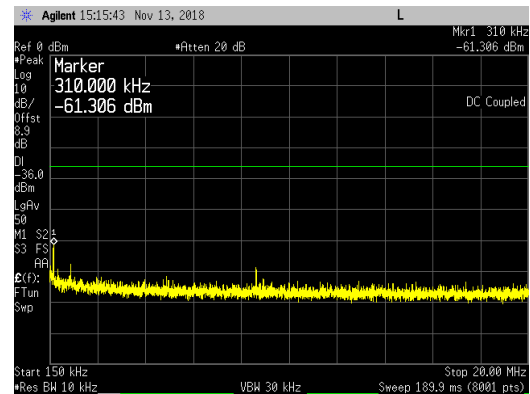


Three AWS (BCs & TC) Carriers & One PCS Carrier (MC)_ 16QAM _ 2112.4, 2117.4, 2167.6 & 1960.0MHz:

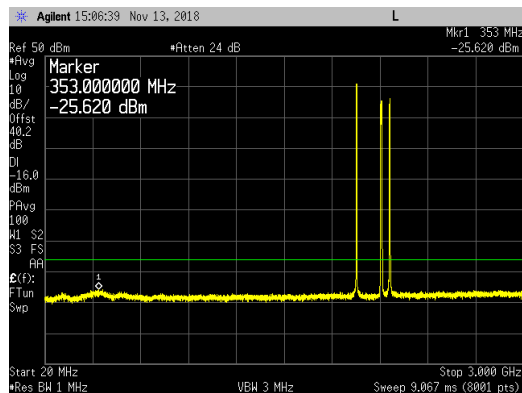
9kHz to 150kHz



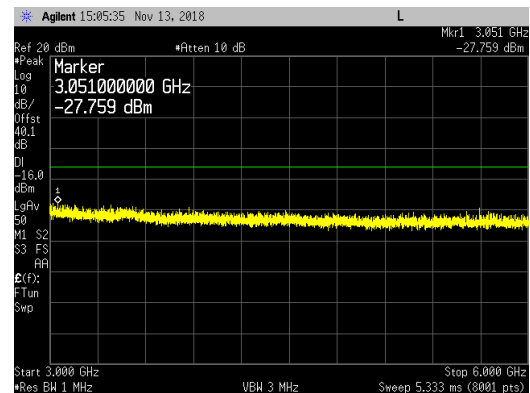
150kHz to 20MHz



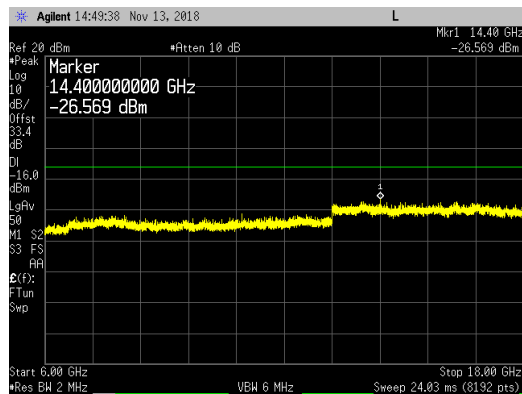
20MHz to 3GHz



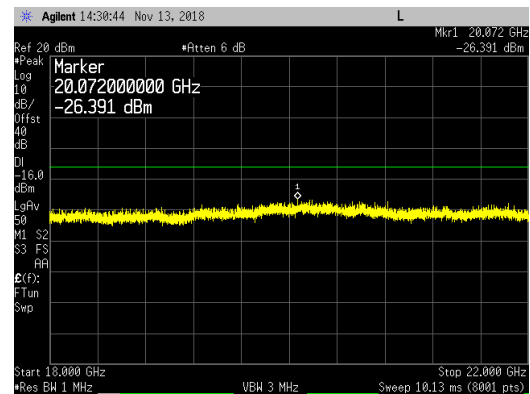
3GHz to 6GHz



6GHz to 18GHz



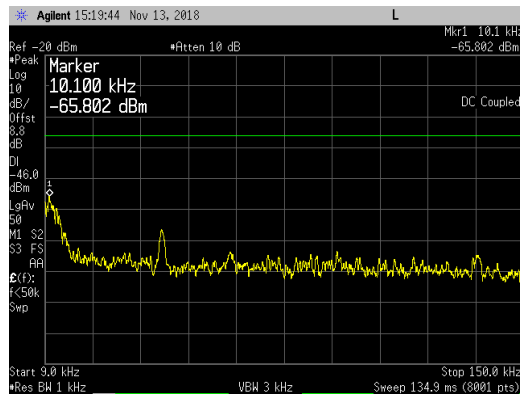
18GHz to 22GHz



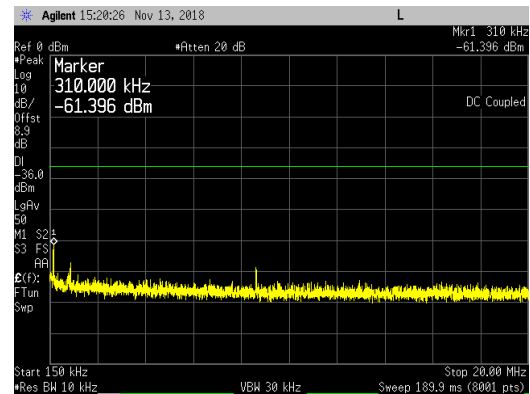


Three AWS (BCs & TC) Carriers & One PCS Carrier (MC)_ 64QAM _ 2112.4, 2117.4, 2167.6 & 1960.0MHz:

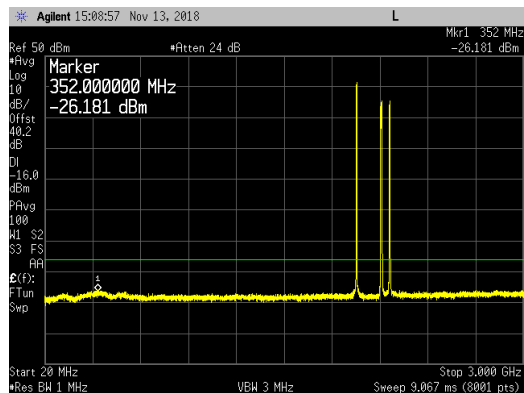
9kHz to 150kHz



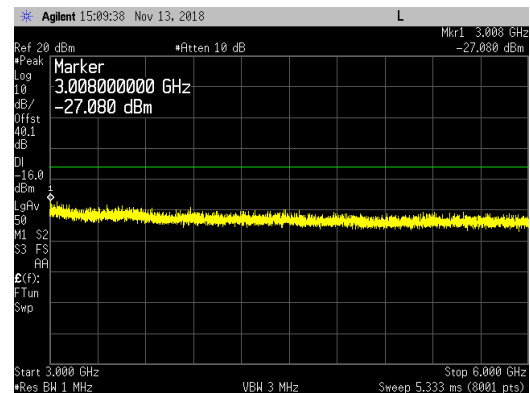
150kHz to 20MHz



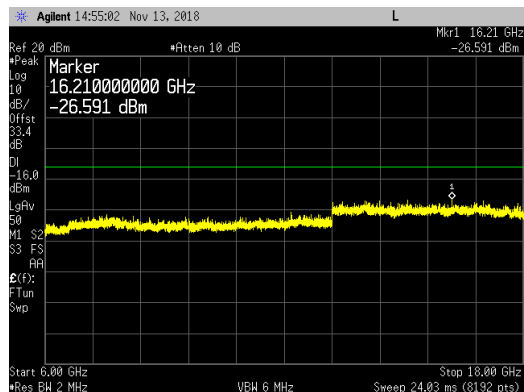
20MHz to 3GHz



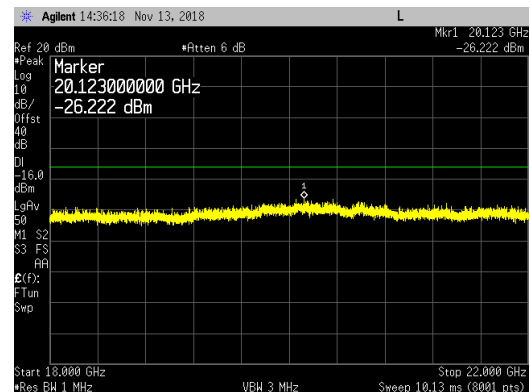
3GHz to 6GHz



6GHz to 18GHz



18GHz to 22GHz





Transmitter Radiated Spurious Emissions

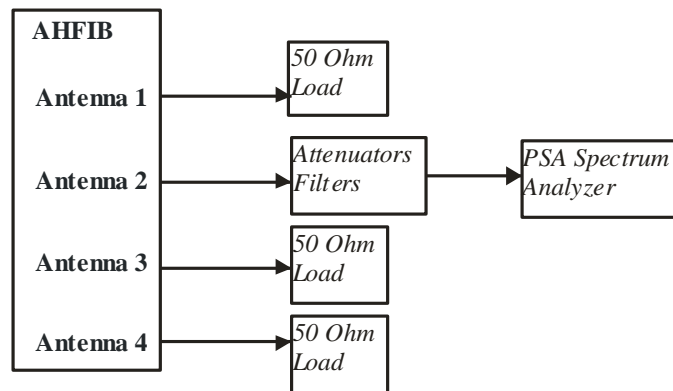
Radiated spurious emission plots/measurement results are in the original FCC and IC radio certification submittal (NTS Test Report Number PR072254 Revision 1 dated March 16, 2018).

Frequency Stability/Accuracy

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

APPENDIX C: ANTENNA PORT WCDMA TEST DATA FOR THE AWS BAND

All conducted RF measurements in this section were made at AHFIB antenna port 2. The testing was performed on the same hardware (EUT) as the original certification test. The same EUT RF port (Ant 2) determined in the original certification testing to be the highest power port was used for all testing in this effort. All testing in this section was performed with WCDMA modulation types. The test setup used is provided below.



Test Setup Used for AHFIB Conducted RF Measurements

RF Output Power

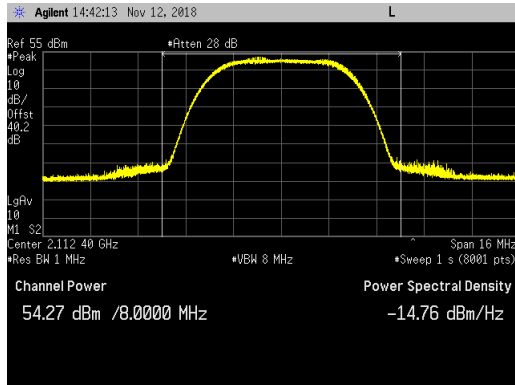
RF output power has been measured in both Peak and RMS Average terms at AHFIB Antenna Port 2 at the bottom, middle and top AWS frequency channels for WCDMA modulation types (QPSK, 16QAM, 64QAM). RMS Average power was measured as described in section 5.2 of KDB 971168 D01v03r01 and ANSI C63.26-2015 sections 5.2.4.4. Peak power was measured as described in section 5.1 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.3.5. The peak to average power ratio (PAPR) has been calculated as described in section 5.7 of KDB971168 D01v03r01 and ANSI C63.26-2015 section 5.2.6. All results are presented in tabular form below. Measurements were rounded off to the nearest tenth. The highest values are highlighted.

Modulation	Frequency _ Channel	Peak (dBm)	Average (dBm)	PAPR (dB)
QPSK	2112.4MHz _ Bottom Channel	54.3	46.3	8.0
	2140.0MHz _ Middle Channel	54.3	46.3	8.0
	2167.6MHz _ Top Channel	54.3	46.4	7.9
16QAM	2112.4MHz _ Bottom Channel	53.9	46.2	7.7
	2140.0MHz _ Middle Channel	53.9	46.3	7.6
	2167.6MHz _ Top Channel	53.9	46.3	7.6
64QAM	2112.4MHz _ Bottom Channel	54.0	46.2	7.8
	2140.0MHz _ Middle Channel	54.2	46.4	7.8
	2167.6MHz _ Top Channel	54.1	46.3	7.8

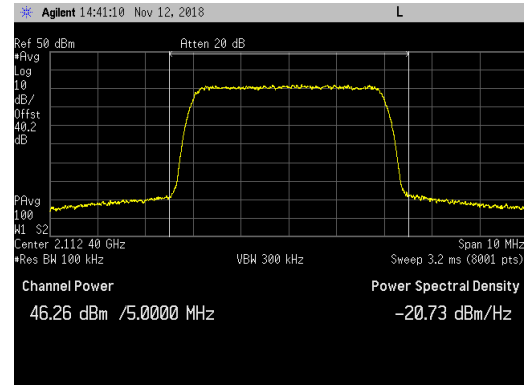
All measurement results are provided in the following pages. The total measurement RF path loss of the test setup (attenuator and test cables) was 40.2 dB and is accounted for by the spectrum analyzer reference level offset.

WCDMA Channel Power Plots for Antenna Port 2 and QPSK Modulation:

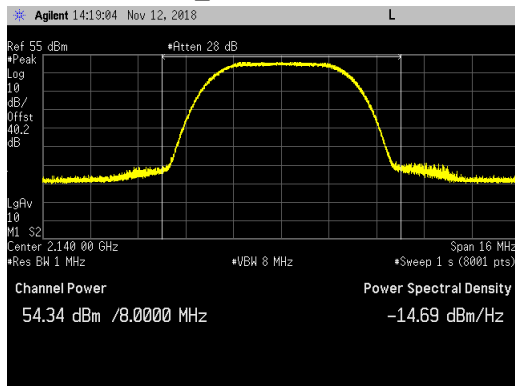
Bottom Channel_ Peak



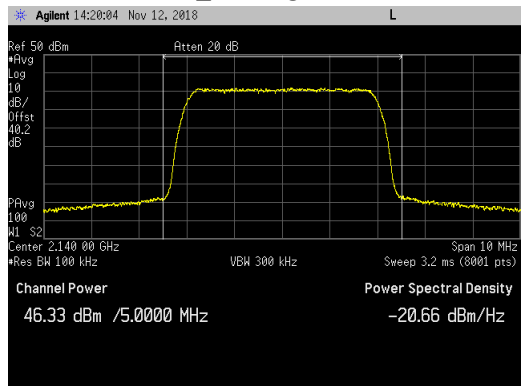
Bottom Channel_ Average



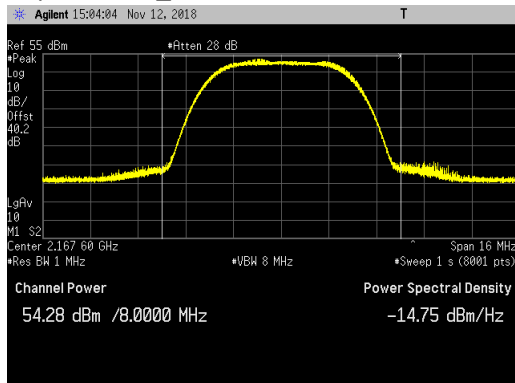
Middle Channel_ Peak



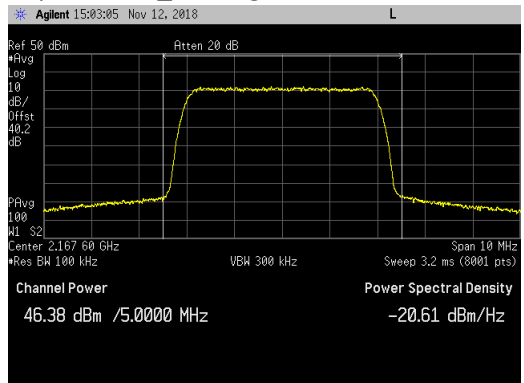
Middle Channel_ Average



Top Channel_ Peak

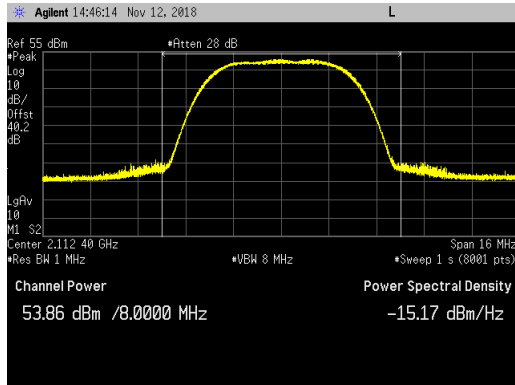


Top Channel_ Average

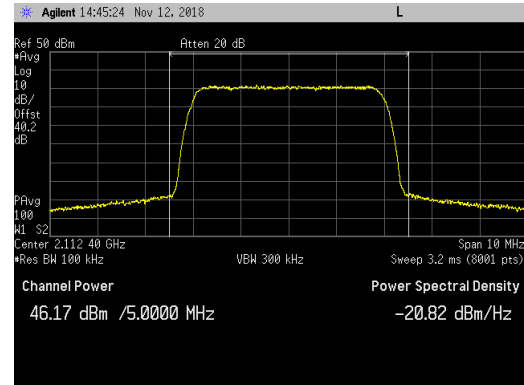


WCDMA Channel Power Plots for Antenna Port 2 and 16QAM Modulation:

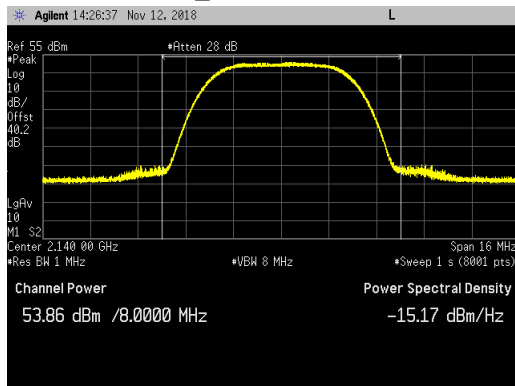
Bottom Channel_ Peak



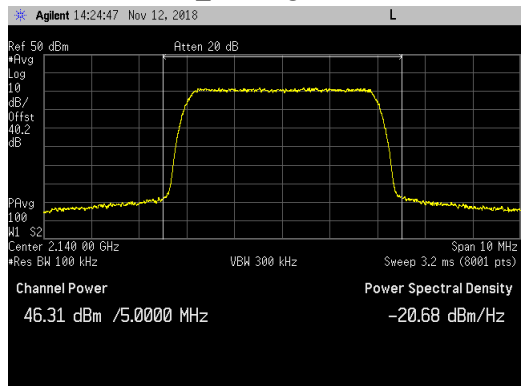
Bottom Channel_ Average



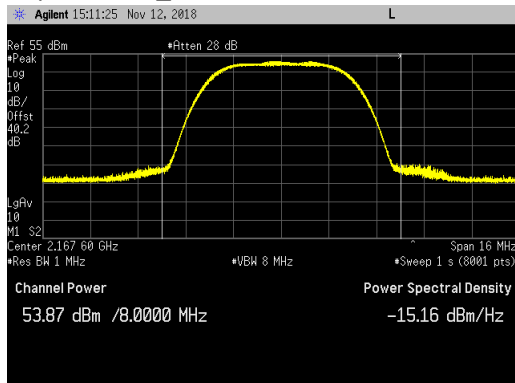
Middle Channel_ Peak



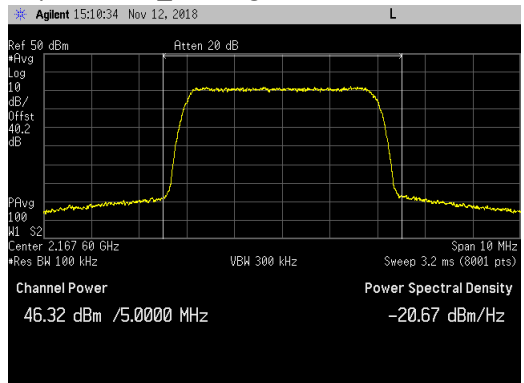
Middle Channel_ Average



Top Channel_ Peak

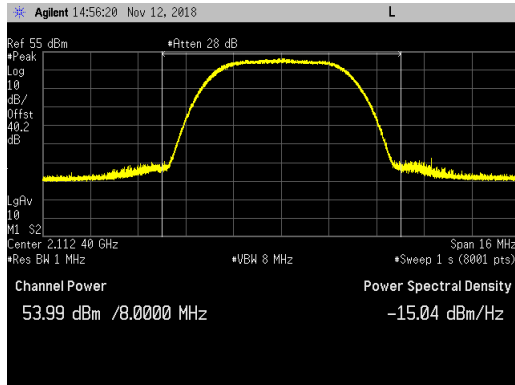


Top Channel_ Average

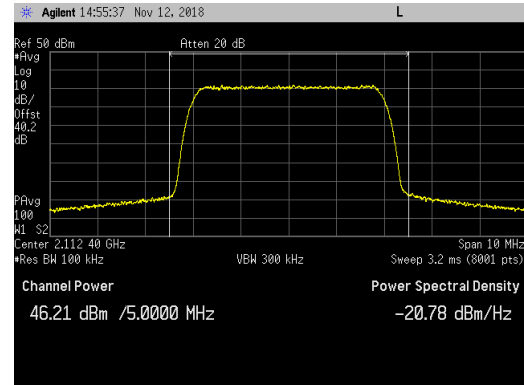


WCDMA Channel Power Plots for Antenna Port 2 and 64QAM Modulation:

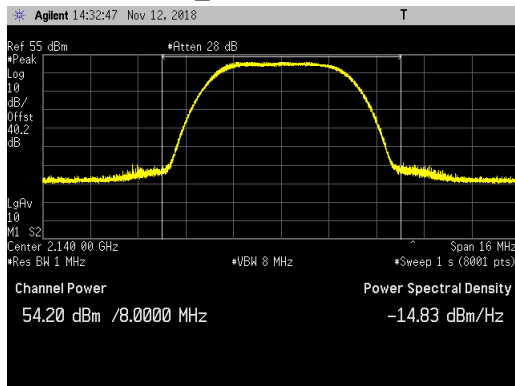
Bottom Channel_Peak



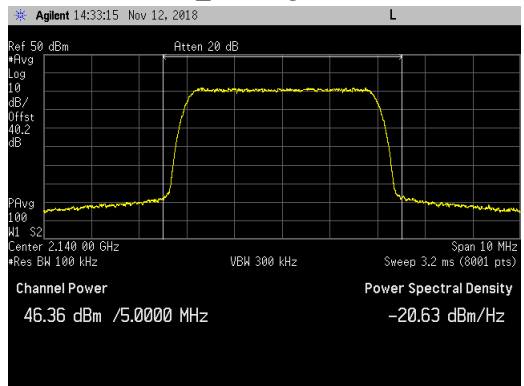
Bottom Channel_Average



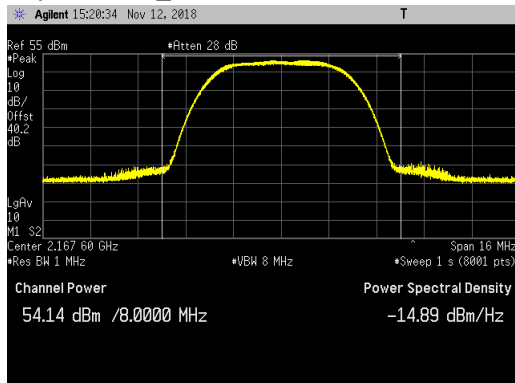
Middle Channel_Peak



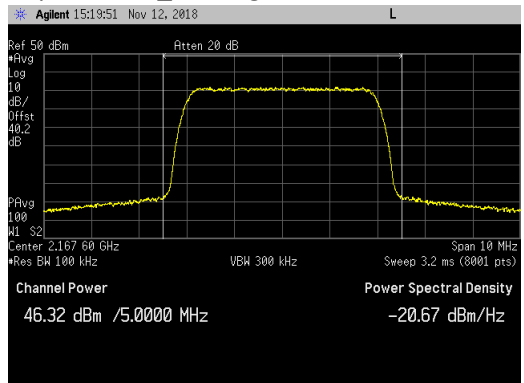
Middle Channel_Average



Top Channel_Peak



Top Channel_Average



Emission Bandwidth (26 dB down and 99%)

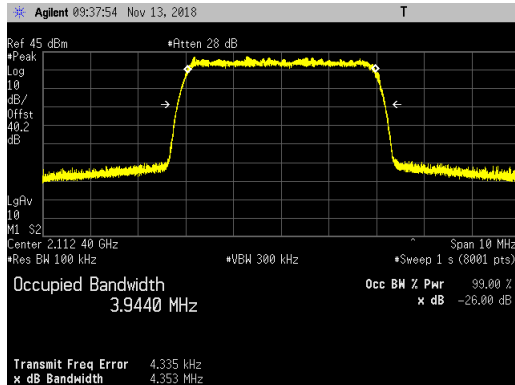
Emission bandwidth measurements were made at antenna port 2 on the bottom, middle and top AWS channels. The AHFIB was operated at maximum RF output power for WCDMA modulation types (QPSK, 16QAM, 64QAM). The 26dB emission bandwidth was measured in accordance with section 4 of FCC KDB 971168 D01v03r01 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 bandwidth is highlighted. Measurements were rounded off to the nearest kHz.

Modulation	Frequency _ Channel	Emission Bandwidth (MHz)	
		26dB	99%
QPSK	2112.4MHz _ Bottom Channel	4.353	3.944
	2140.0MHz _ Middle Channel	4.341	3.946
	2167.6MHz _ Top Channel	4.355	3.947
16QAM	2112.4MHz _ Bottom Channel	4.369	3.940
	2140.0MHz _ Middle Channel	4.354	3.943
	2167.6MHz _ Top Channel	4.374	3.946
64QAM	2112.4MHz _ Bottom Channel	4.361	3.937
	2140.0MHz _ Middle Channel	4.357	3.938
	2167.6MHz _ Top Channel	4.372	3.935

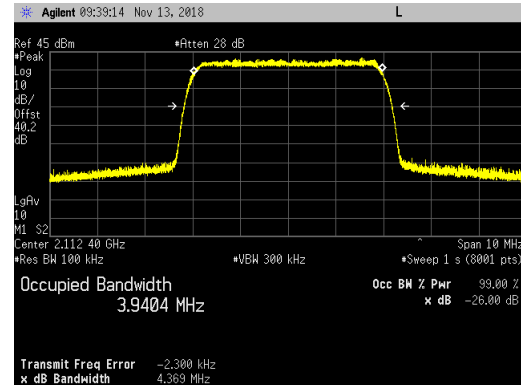
Emission bandwidth measurement data are provided in the following pages.

WCDMA Emission Bandwidth Plots at AHFIB Antenna Port 2

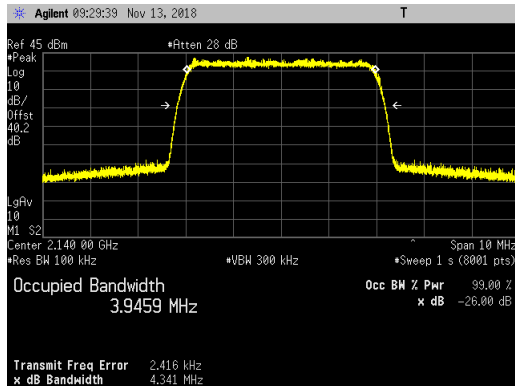
Bottom Channel_2112.4MHz_QPSK Modulation



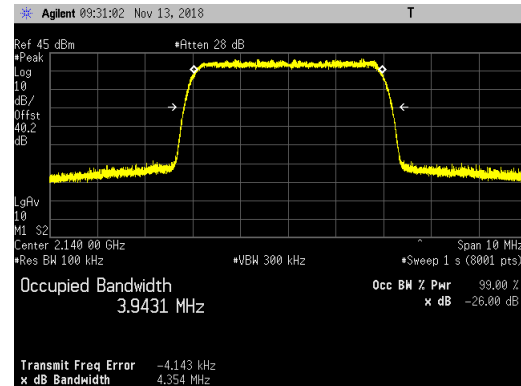
Bottom Channel_2112.4MHz_16QAM Modulation



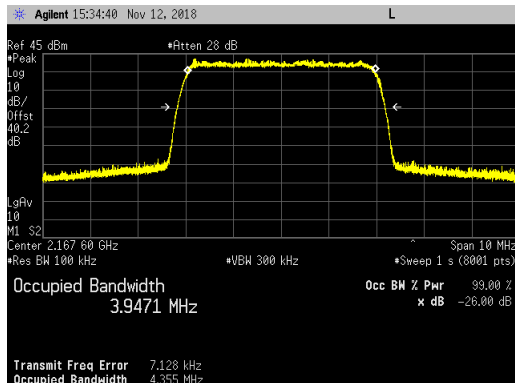
Middle Channel_2140.0MHz_QPSK Modulation



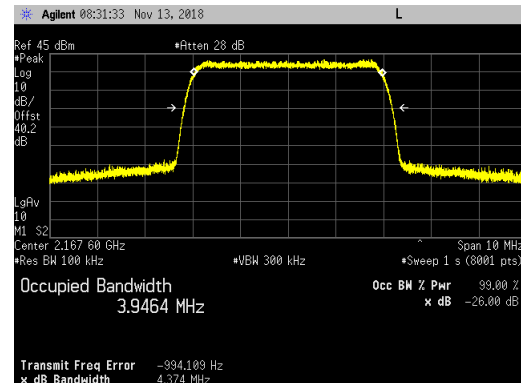
Middle Channel_2140.0MHz_16QAM Modulation



Top Channel_2167.6MHz_QPSK Modulation

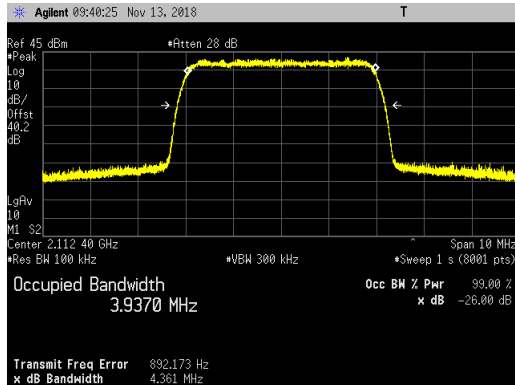


Top Channel_2167.6MHz_16QAM Modulation

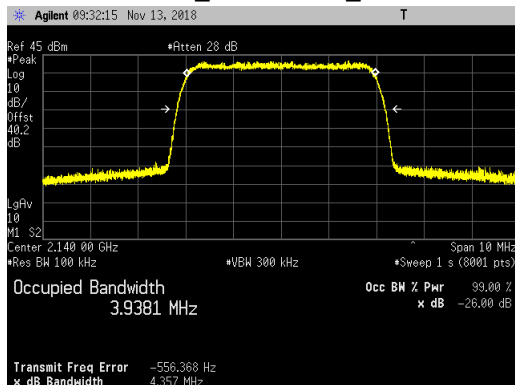


WCDMA Emission Bandwidth Plots at AHFIB Antenna Port 2

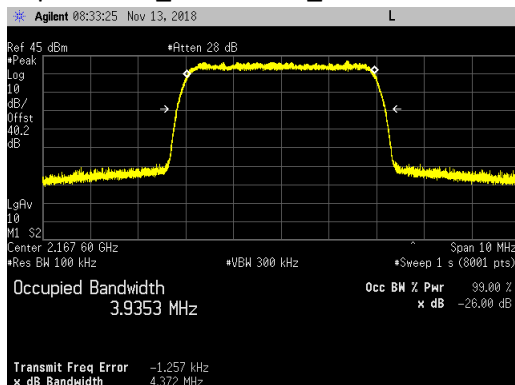
Bottom Channel_2112.4MHz_64QAM Modulation



Middle Channel_2140.0MHz_64QAM Modulation



Top Channel_2167.6MHz_64QAM Modulation



Antenna Port Conducted Band Edge

Conducted band edge measurements were made at RRH antenna port 2. The RRH was operated at the AWS band edge frequencies with WCDMA modulation types (QPSK, 16QAM and 64 QAM).

The single carrier test case was performed with the carrier operating at the at the lower and upper band edge frequencies at maximum power. A multicarrier test case based upon KDB 971168 D03v01 using three carriers (at maximum power) per antenna port was also performed. The multicarrier test case is with two carriers (with minimum spacing between carrier frequencies) at the lower band edge (i.e.: 2112.4 & 2117.4MHz) and a third carrier with maximum spacing between the other two carrier frequencies (2167.6MHz).

The power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm as specified in section 27.53(h)(1) and RSS 139 6.6. The limit is adjusted to -16dBm $[-13\text{dBm} - 10 \log(2)]$ per FCC KDB 662911D01 v02r01 because the BTS may operate as a 2 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 measured emission bandwidth (51kHz) per 27.53(h)(1) and RSS 139 6.6 was used. In the 1 to 2MHz frequency range outside the band edge (i.e.: 2108 to 2109MHz and 2171 to 2172MHz bands) the RBW was set to 1% of the measured emission bandwidth (51kHz) and the power integrated over 1MHz. In the 2MHz to 22MHz frequency range outside the band edge (i.e.: 2088 to 2108MHz and 2172 to 2192MHz 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.

Test Case	QPSK		16QAM		64QAM	
	Bottom Channel	Top Channel	Bottom Channel	Top Channel	Bottom Channel	Top Channel
Single Carrier	-21.053	-21.549	-20.759	-21.470	-21.199	-21.012
Multicarrier	-22.809	-21.055	-23.788	-21.907	-23.302	-22.384

The total measurement RF path loss of the test setup (attenuator and test cables) was 40.2 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.

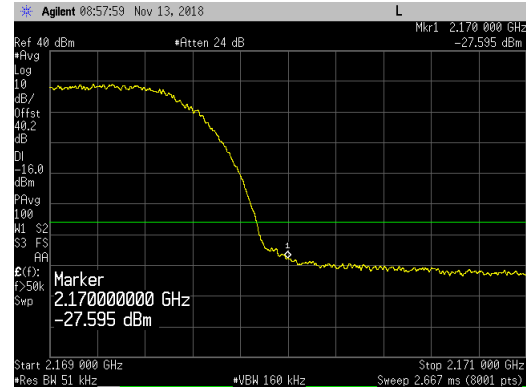
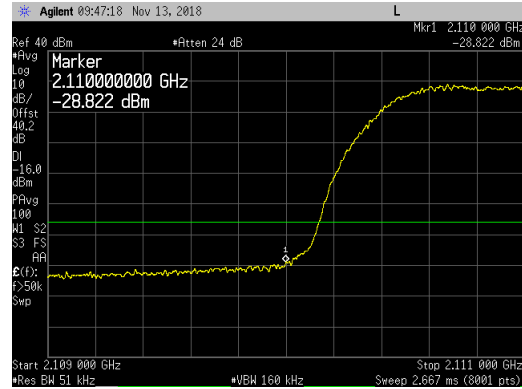
Single Carrier with QPSK Modulation at Maximum Power -Lower and Upper Band Edge Plots:

WCDMA Carrier at BC (2112.4MHz)

WCDMA Carrier at TC (2167.6MHz)

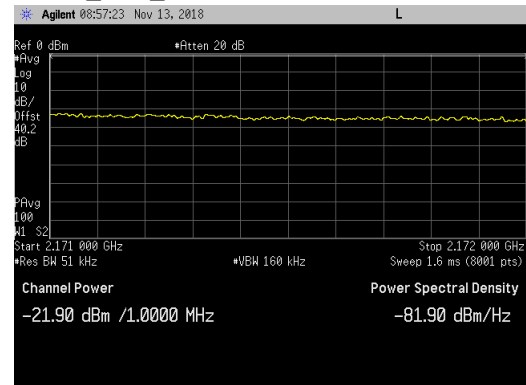
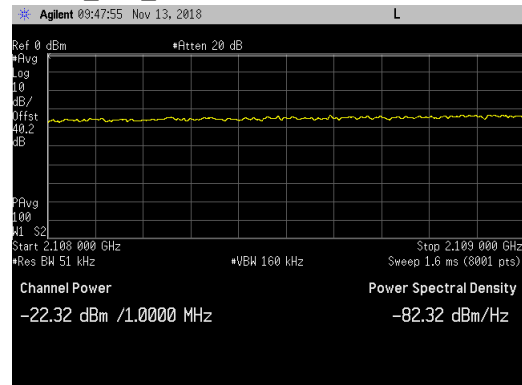
Port 2_LBE_2109 to 2111MHz

Port 2_UBE_2169 to 2171MHz



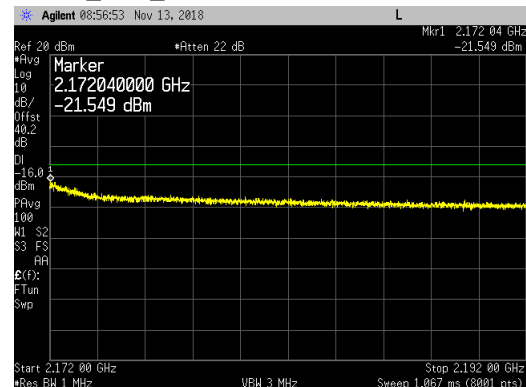
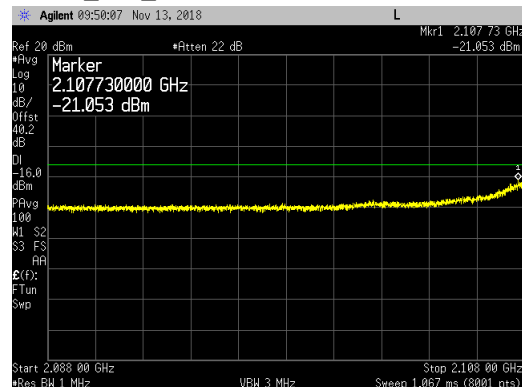
Port 2_LBE_2108 to 2109MHz

Port 2_UBE_2171 to 2172MHz



Port 2_LBE_2088 to 2108MHz

Port 2_UBE_2172 to 2192MHz



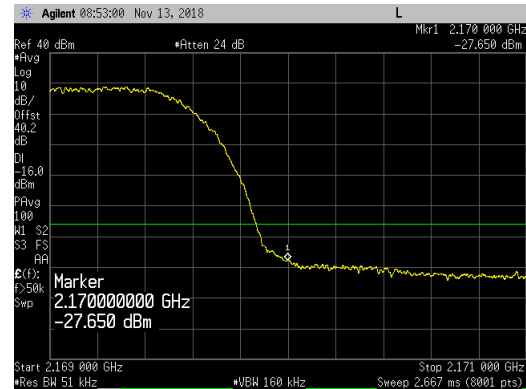
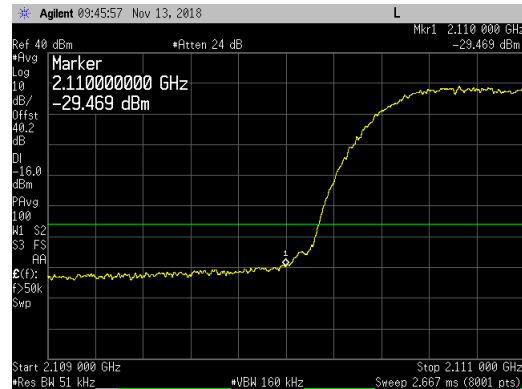
Single Carrier with 16QAM Modulation at Maximum Power -Lower and Upper Band Edge Plots:

WCDMA Carrier at BC (2112.4MHz)

WCDMA Carrier at TC (2167.6MHz)

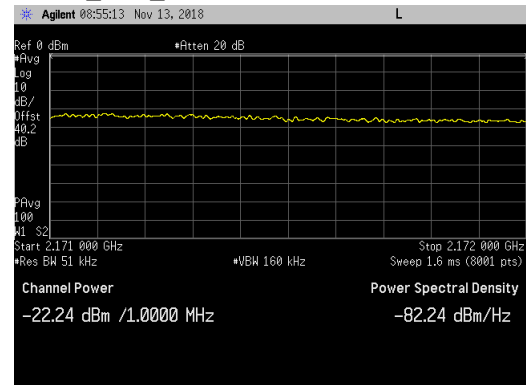
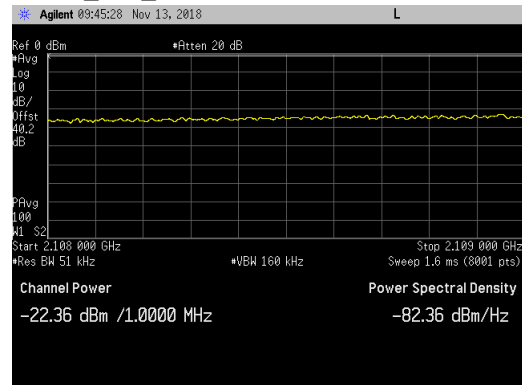
Port 2_LBE_2109 to 2111MHz

Port 2_UBE_2169 to 2171MHz



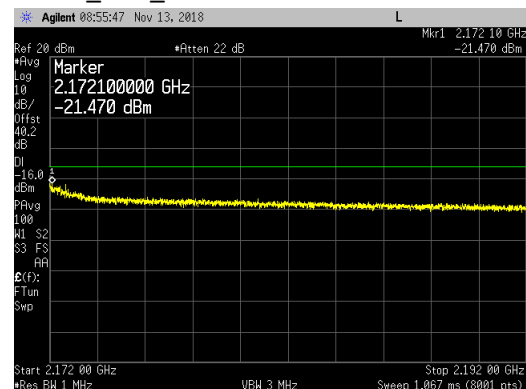
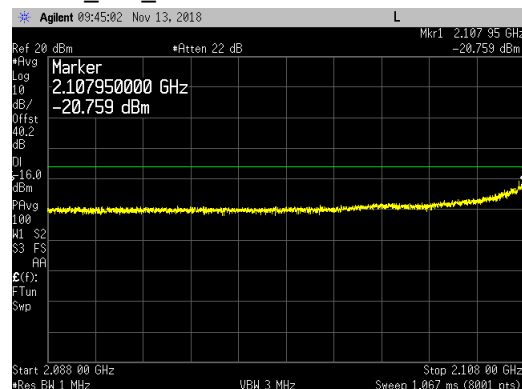
Port 2_LBE_2108 to 2109MHz

Port 2_UBE_2171 to 2172MHz



Port 2_LBE_2088 to 2108MHz

Port 2_UBE_2172 to 2192MHz



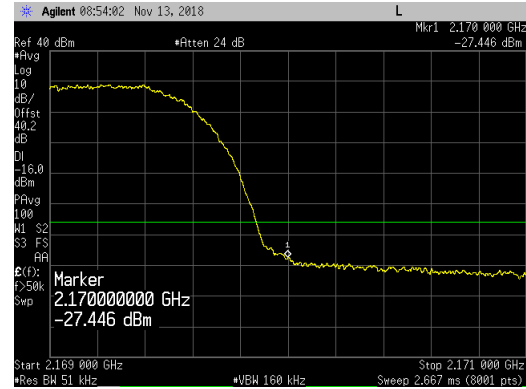
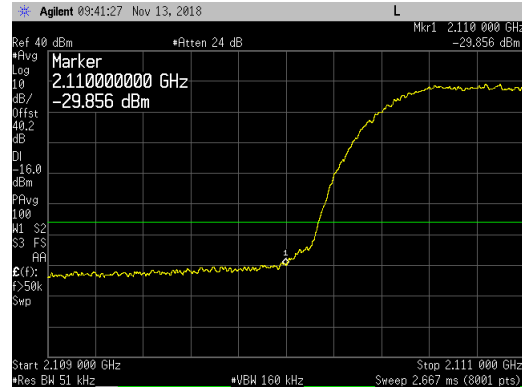
Single Carrier with 64QAM Modulation at Maximum Power -Lower and Upper Band Edge Plots:

WCDMA Carrier at BC (2112.4MHz)

WCDMA Carrier at TC (2167.6MHz)

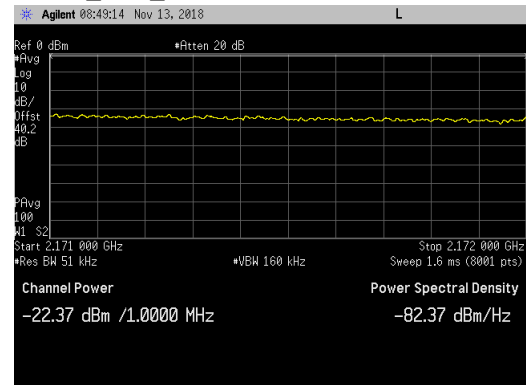
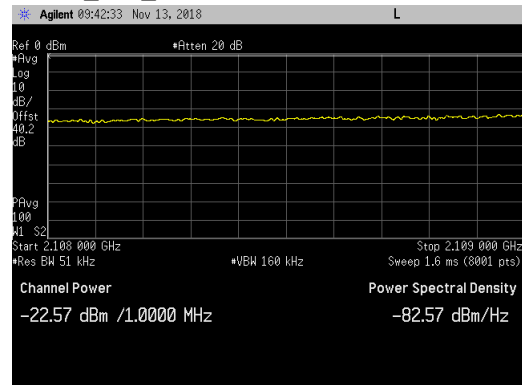
Port 2_LBE_2109 to 2111MHz

Port 2_UBE_2169 to 2171MHz



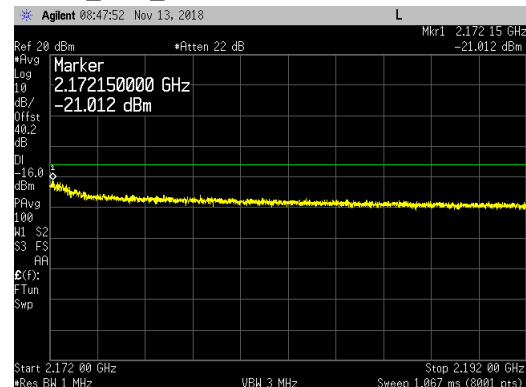
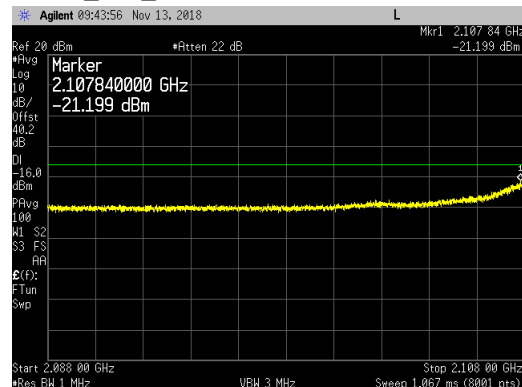
Port 2_LBE_2108 to 2109MHz

Port 2_UBE_2171 to 2172MHz



Port 2_LBE_2088 to 2108MHz

Port 2_UBE_2172 to 2192MHz

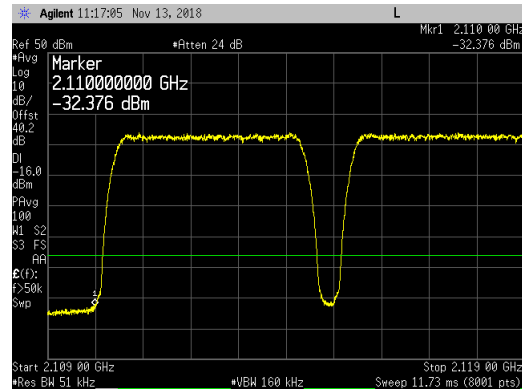


Three Carriers with QPSK Modulation at Max Power at Bottom Chs and at Top Ch -LBE & UBE Plots:

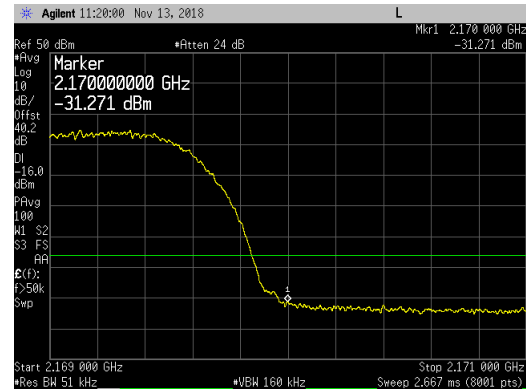
WCDMA Carriers at 2112.4, 2117.4 & 2167.6MHz

WCDMA Carriers at 2112.4, 2117.4 & 2167.6MHz

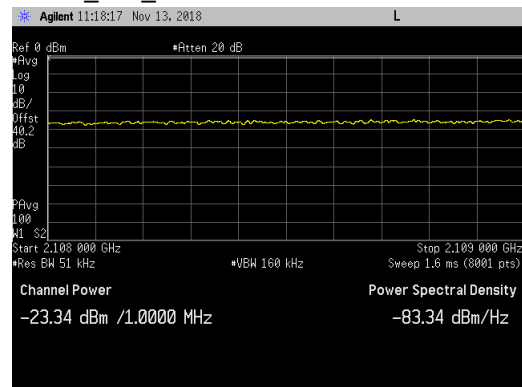
Port 2_LBE_2109 to 2119MHz



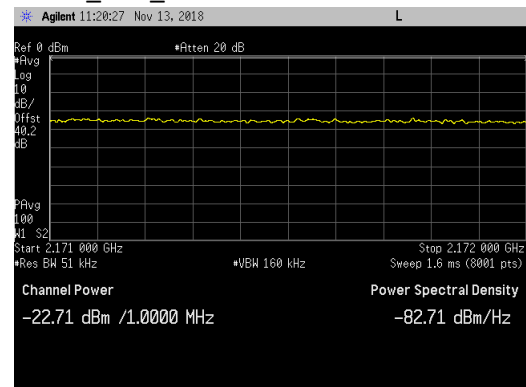
Port 2_UBE_2169 to 2171MHz



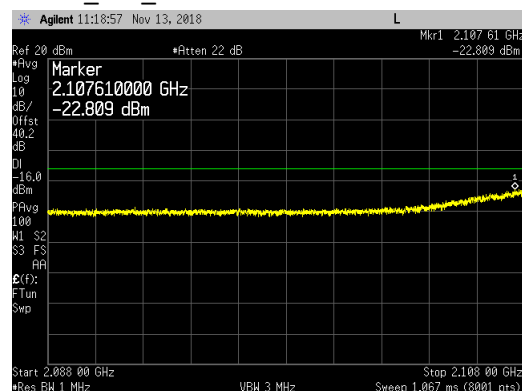
Port 2_LBE_2108 to 2109MHz



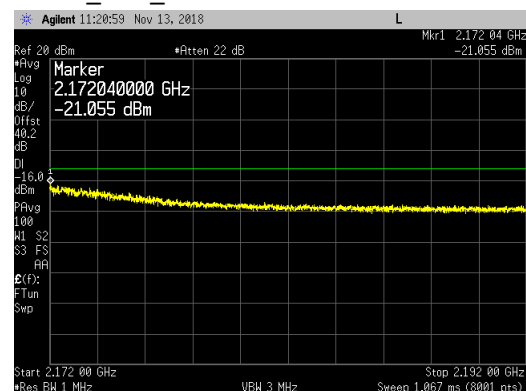
Port 2_UBE_2171 to 2172MHz



Port 2_LBE_2088 to 2108MHz



Port 2_UBE_2172 to 2192MHz

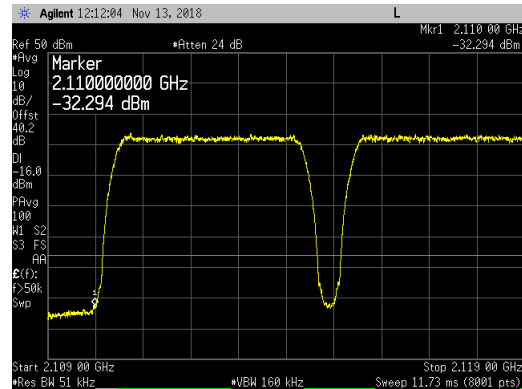


Three Carriers with 16QAM Modulation at Max Power at Bottom Chs and at Top Ch -LBE & UBE Plots:

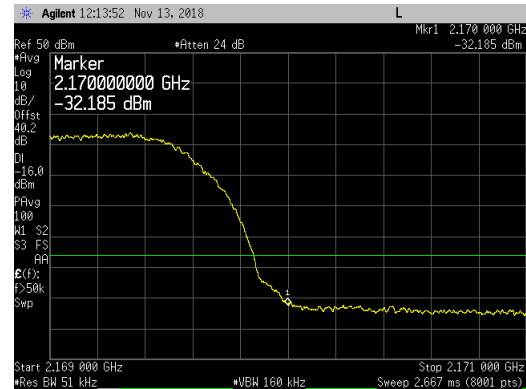
WCDMA Carriers at 2112.4, 2117.4 & 2167.6MHz

WCDMA Carriers at 2112.4, 2117.4 & 2167.6MHz

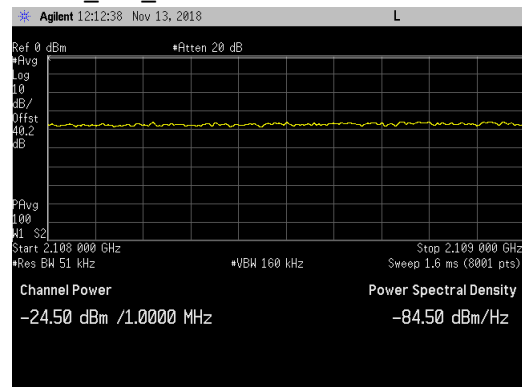
Port 2_LBE_2109 to 2119MHz



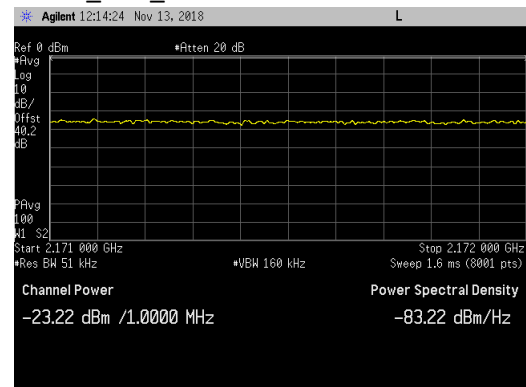
Port 2_UBE_2169 to 2171MHz



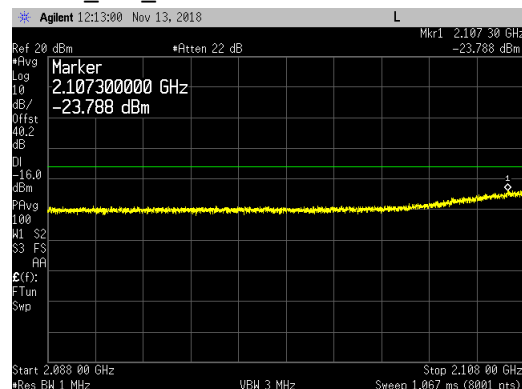
Port 2_LBE_2108 to 2109MHz



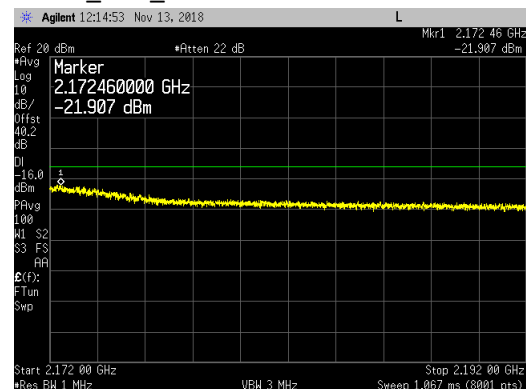
Port 2_UBE_2171 to 2172MHz



Port 2_LBE_2088 to 2108MHz



Port 2_UBE_2172 to 2192MHz

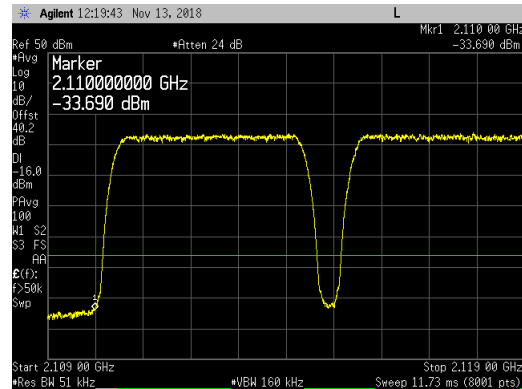


Three Carriers with 64QAM Modulation at Max Power at Bottom Chs and at Top Ch -LBE & UBE Plots:

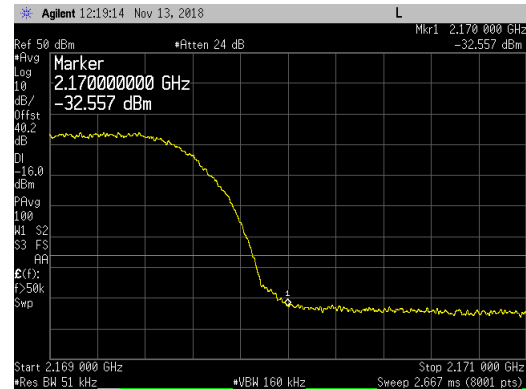
WCDMA Carriers at 2112.4, 2117.4 & 2167.6MHz

WCDMA Carriers at 2112.4, 2117.4 & 2167.6MHz

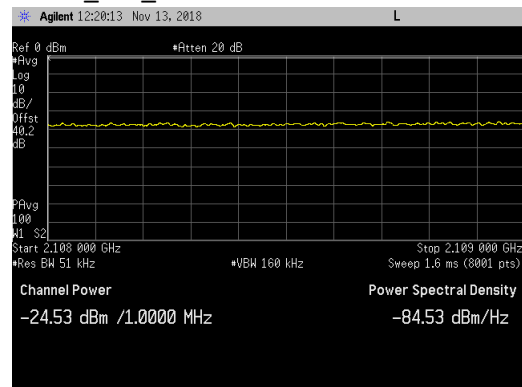
Port 2_LBE_2109 to 2119MHz



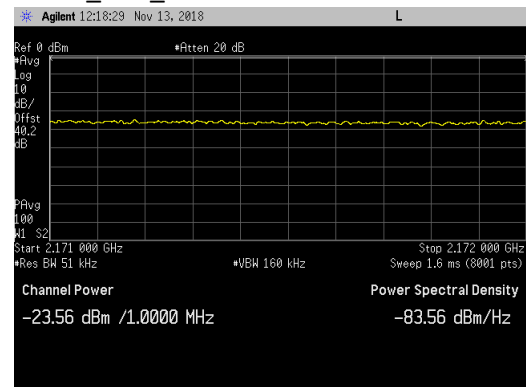
Port 2_UBE_2169 to 2171MHz



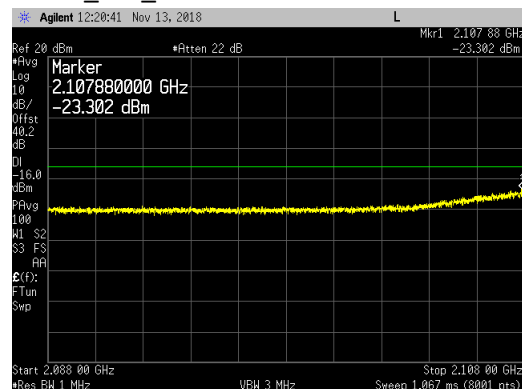
Port 2_LBE_2108 to 2109MHz



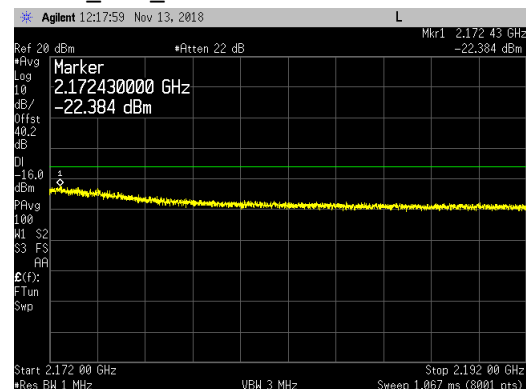
Port 2_UBE_2171 to 2172MHz



Port 2_LBE_2088 to 2108MHz



Port 2_UBE_2172 to 2192MHz



Transmitter Antenna Port Conducted Emissions

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

The single carrier test case was performed with the RRH was operated on the PCS middle channel (1960.0MHz) and AWS middle channel (2140.0MHz) simultaneously at maximum power with all WCDMA modulation types (QPSK, 16QAM, and 64QAM). The same modulation type was used for both PCS and AWS carriers.

Multicarrier test cases based upon KDB 971168 D03v01 using three carriers (at maximum power) per antenna port was also performed. A PCS multicarrier test case with two carriers (with minimum spacing between carrier frequencies) at the lower band edge (i.e.: 1932.4 & 1937.4MHz) and a third carrier at the upper band edge (1987.6MHz) was performed. The AWS carrier was operating simultaneously at the middle channel (2140MHz) for the PCS multi carrier test case. A AWS multicarrier test case with two carriers (with minimum spacing between carrier frequencies) at the lower band edge (i.e.: 2112.4 & 2117.4MHz) and a third carrier at the upper band edge (2167.6MHz) was performed. The PCS carrier was operating simultaneously at the middle channel (1960.0MHz) for the AWS multicarrier test case. The same modulation type was used for both PCS and AWS carriers.

The test configuration parameters are provided below:

PCS Band Transmission Parameters			AWS Band Transmission Parameters		
Carrier Frequency	Channel BW	Carrier Power	Carrier Frequency	Channel BW	Carrier Power
1960.0MHz (Mid Ch)	WCDMA 5M	40 Watts	2140.0MHz (Mid Ch)	WCDMA 5M	40 Watts
1932.4, 1937.4 & 1987.6MHz (BC, BC+1, and TC)	WCDMA 5M	13+13+13 Watts	2140.0MHz (Mid Ch)	WCDMA 5M	40 Watts
1960.0MHz (Mid Ch)	WCDMA 5M	40 Watts	2112.4, 2117.4 & 2167.6MHz (BC, BC+1, and TC)	WCDMA 5M	13+13+13 Watts

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 -16dBm was used in the certification testing. The limit is adjusted to -16dBm [-13dBm -10 log (2)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 2 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 was 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 -46dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -46dBm = -16dBm -10log(1000kHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -36dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -36dBm = -16dBm -10log(1000kHz/10kHz)].

The required limit of -16dBm with a RBW of ≥ 1 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	8.8dB
150kHz to 20MHz	10kHz	30kHz	8001	Peak	Auto	50 Sweeps	8.9dB
20MHz to 3000MHz	1MHz	3MHz	8001	Average	Auto	Note 2	40.2dB
3GHz to 6GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	40.1dB
6GHz to 18GHz	2MHz	6MHz	8192	Peak	Auto	50 Sweeps	33.4dB
18GHz to 22GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	40.0dB
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 low pass filter was used to reduce the measurement instrumentation noise floor for the frequency ranges below 20MHz. A high pass filter was used to reduce the measurement instrumentation noise floor for the frequency range 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 Appendix B of this report.

Transmitter Radiated Spurious Emissions

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

End of Report