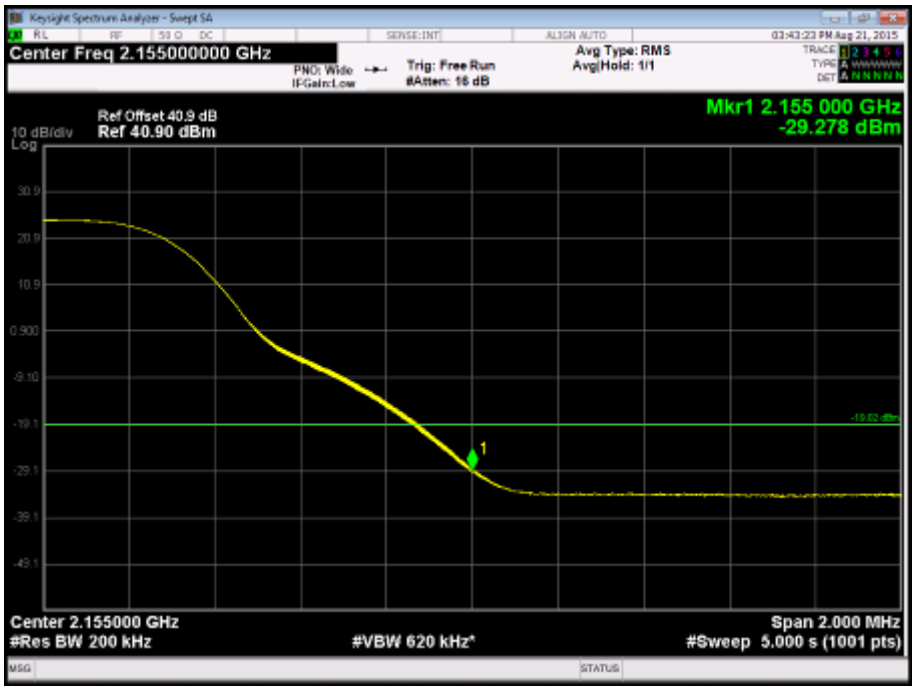
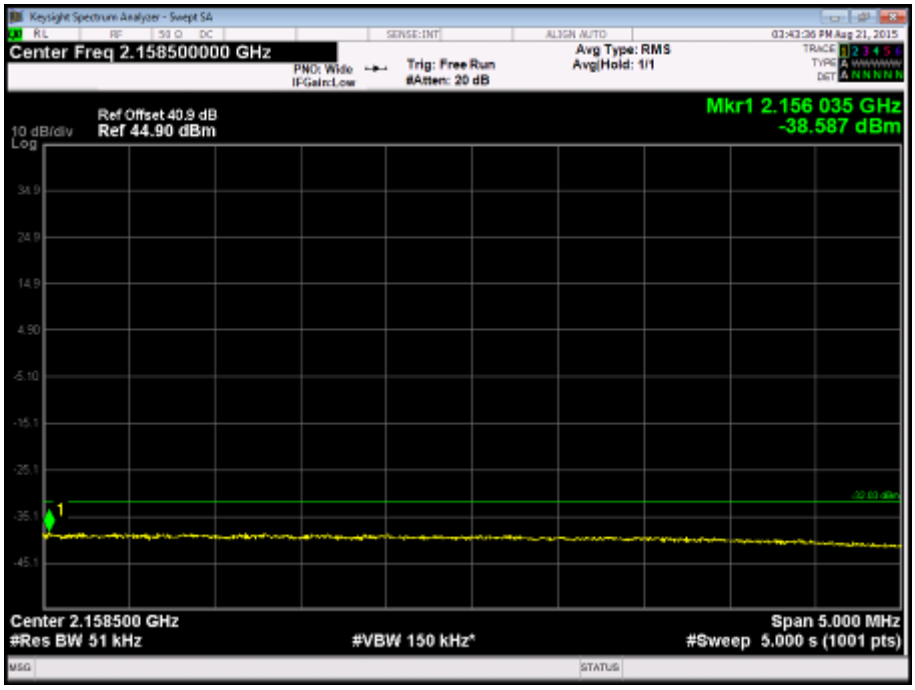
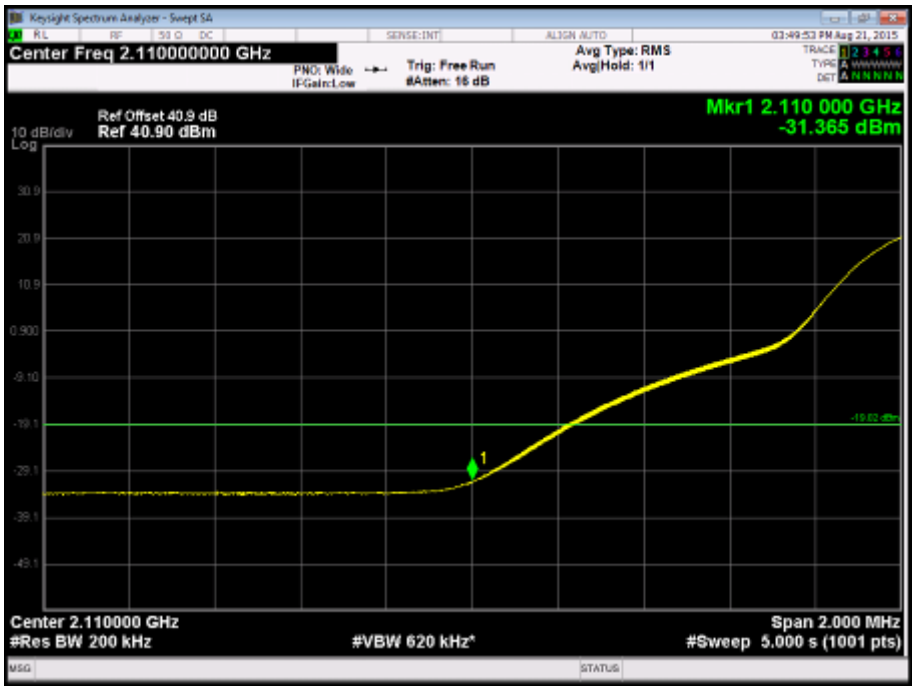
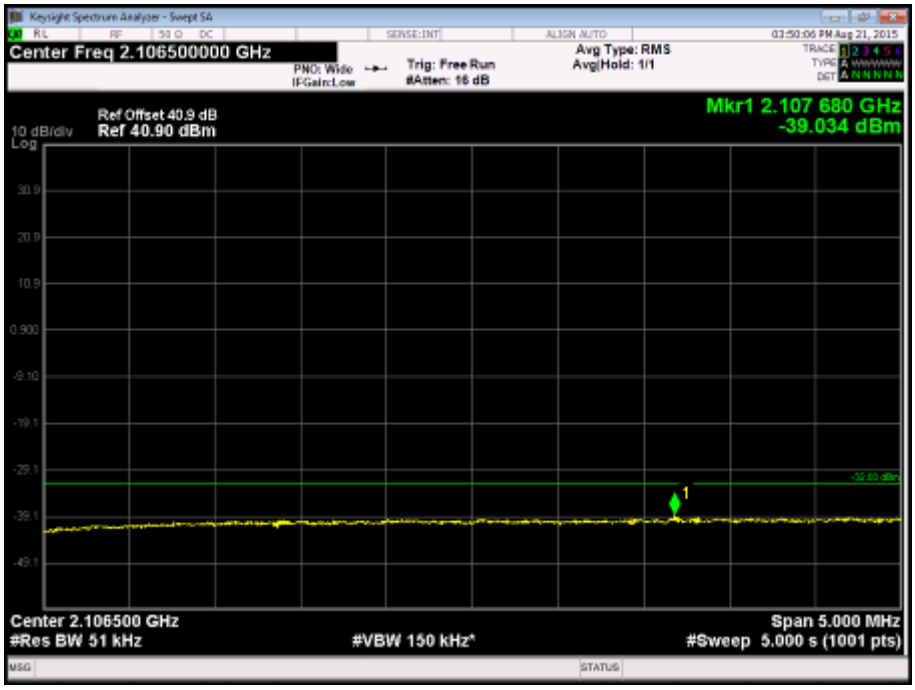
Channel Position T_{RFBW} - QPSK / Bandwidth 15.0 MHz



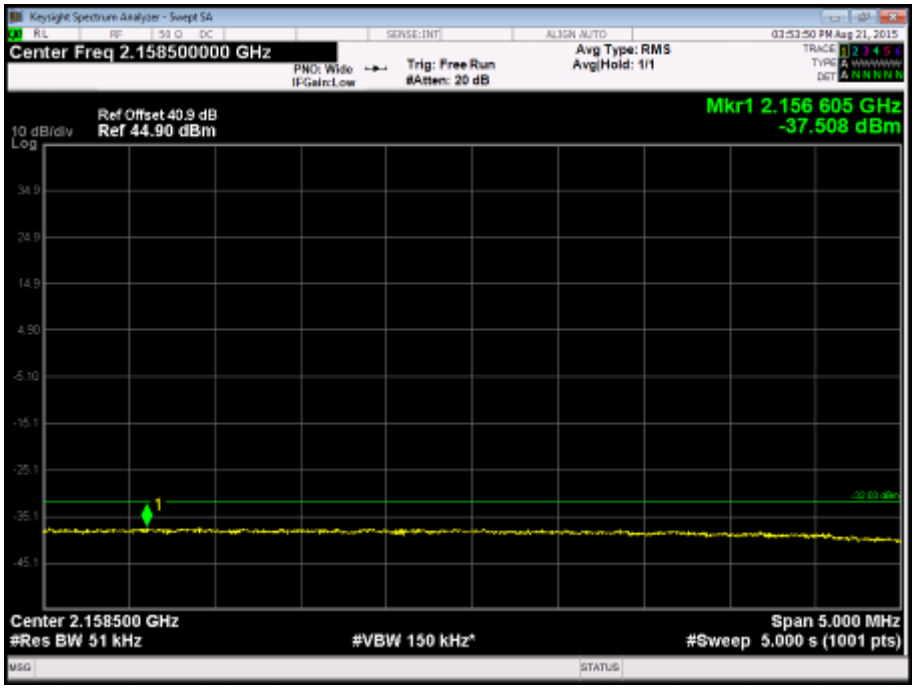


Channel Position B_{RFBW} - QPSK / Bandwidth 20.0 MHz





Channel Position T_{RFBW} - QPSK / Bandwidth 20.0 MHz



Configuration W+L-MIMO-MC 1 (2C)

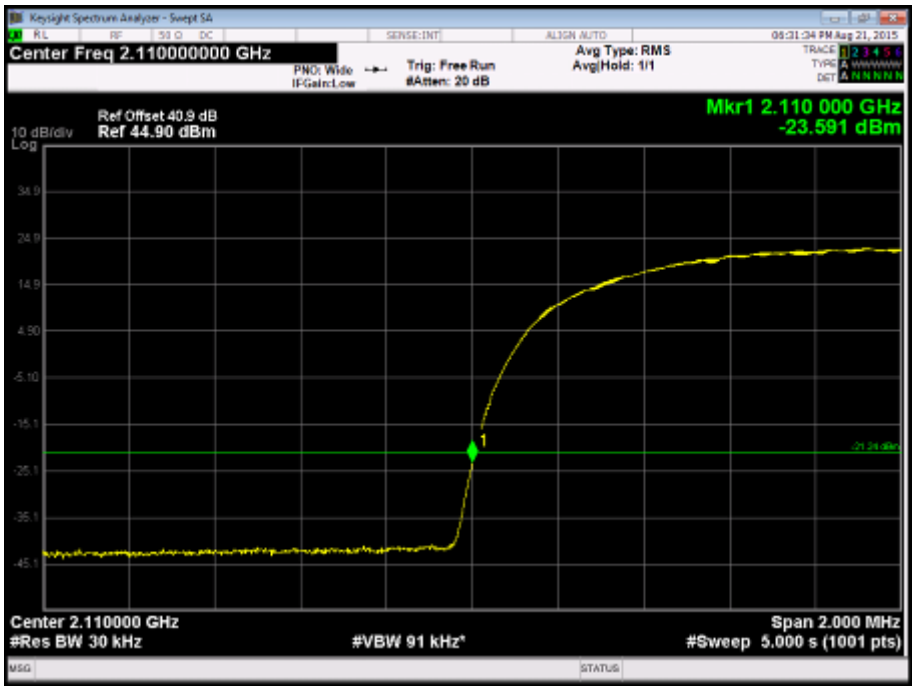
Maximum Output Power 43.0dBm per carrier

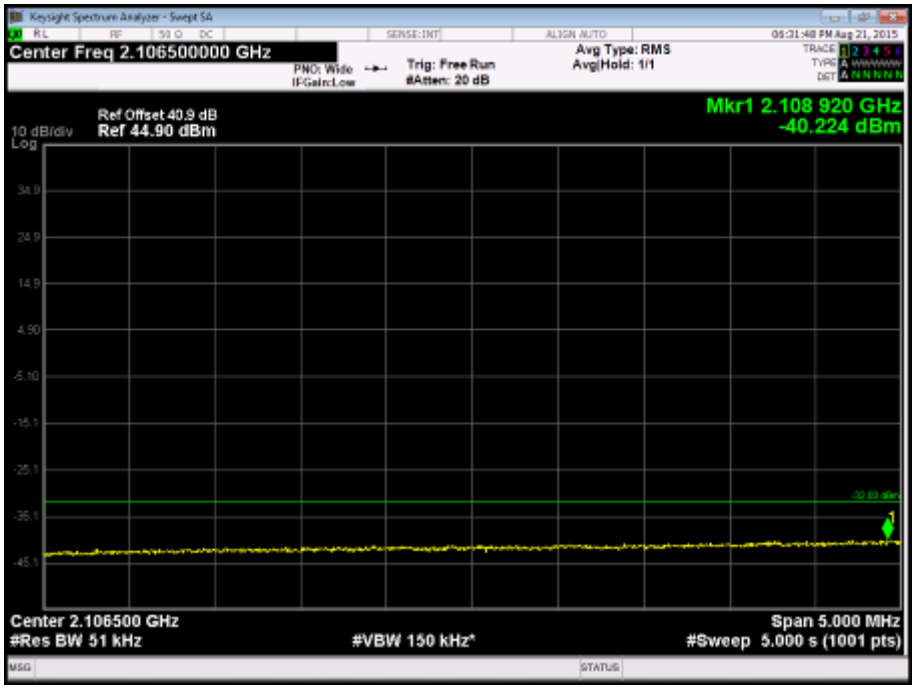
Band Edge Frequency	Channel Bandwidth	Edge Test with modulation (W)16QAM + (L)QPSK Channel Frequencies	RBW (kHz)	Limit (dBm)
Channel Position B_{RFBW} 2110.0 MHz	W: 5.0 MHz L: 5.0 MHz	(W) 2112.4MHz + (L)2117.4MHz	30	-21.24
Channel Position T_{RFBW} 2155.0 MHz	W: 5.0 MHz L: 5.0 MHz	(W) 2152.6MHz + (L)2147.6MHz	30	-21.24

Note 1: For MIMO mode configurations, the limit was adjusted with a correction of -6.02dB [10Log(4)] to -13dBm. For the measurement of 1MHz immediately outside and adjacent to the frequency band edge, a resolution bandwidth of 30kHz was used, and 30kHz is < 50kHz (1% of nominal bandwidth). To compensate for the reduced measurement bandwidth, the limit was adjusted with a correction of -2.22dB [10Log(30/50)] to -19.02dBm.

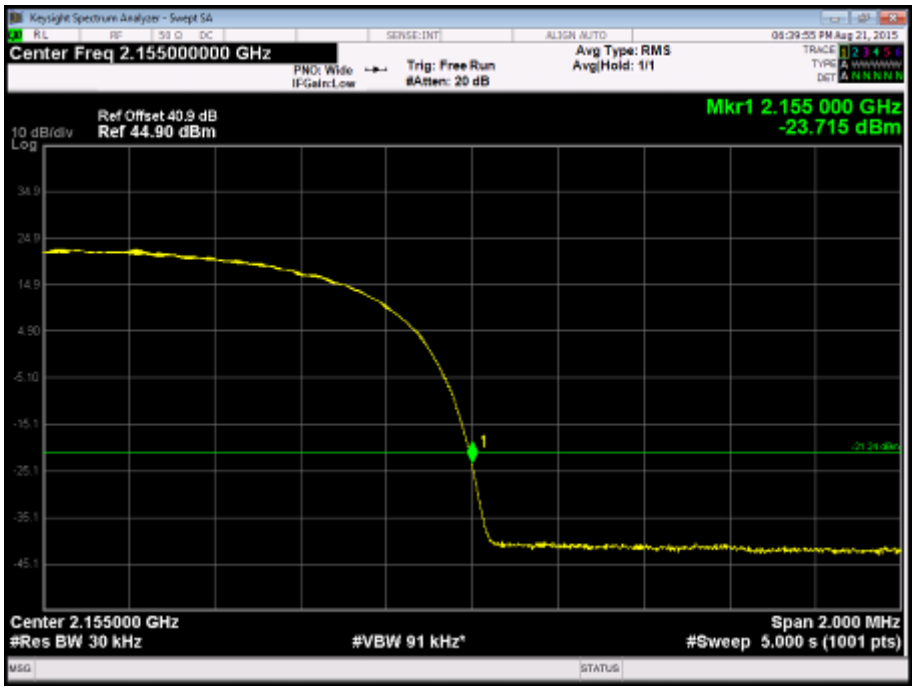
Note 2: The channels shown in the table above are the minimum and maximum channels that can be used in the authorised frequency ranges to maintain compliance. Channels outside of the ranges shown in the above tables shall not be available to the end user.

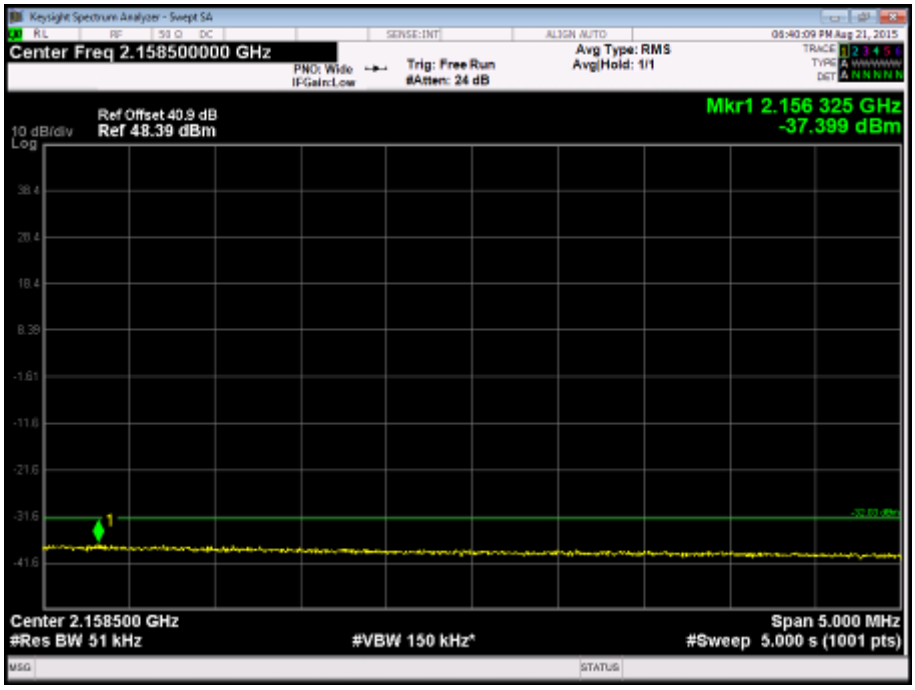
Channel Position B_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz





Channel Position T_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz





Configuration W+L-MIMO-MC 3 (2W+1L)

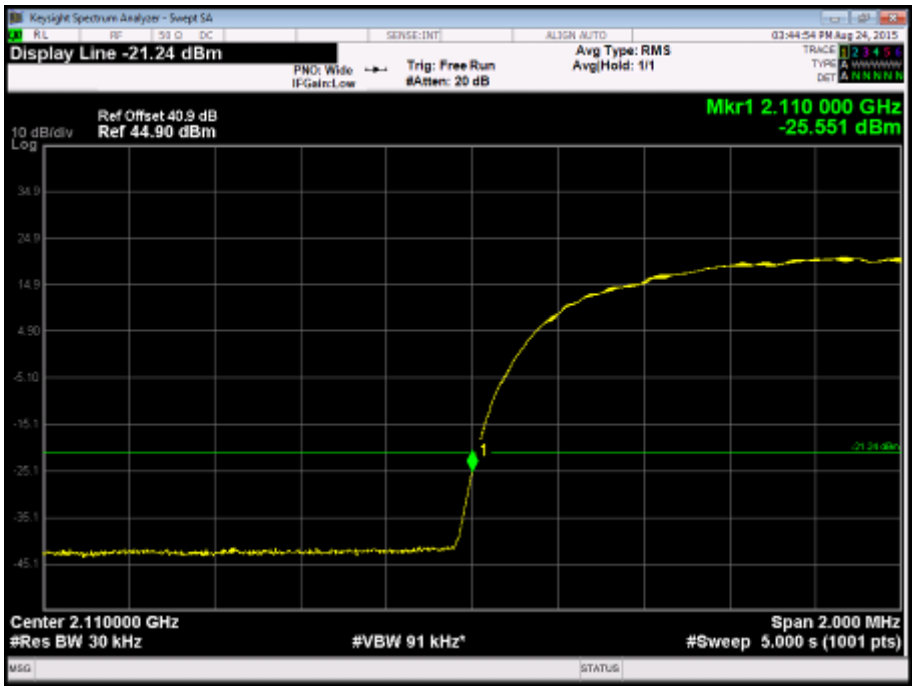
Maximum Output Power 41.2dBm per carrier

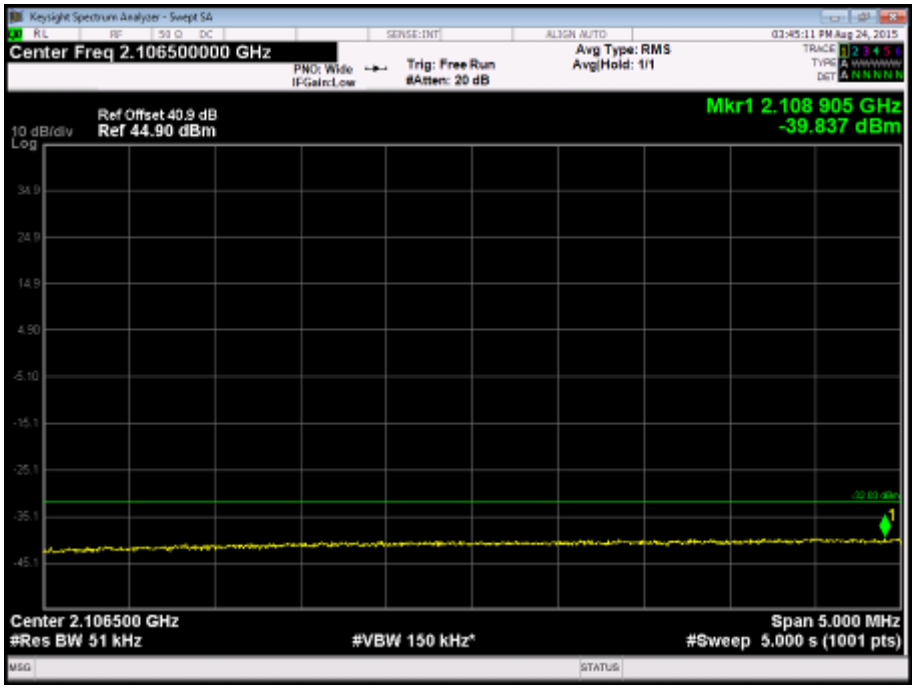
Band Edge Frequency	Channel Bandwidth	Edge Test with modulation (W)16QAM + (L)QPSK Channel Frequencies	RBW (kHz)	Limit (dBm)
Channel Position B_{RFBW} 2110.0 MHz	W: 5.0 MHz L: 5.0 MHz	(W) 2112.4MHz + (W) 2117.4MHz + (L) 2122.4MHz	30	-21.24
Channel Position T_{RFBW} 2155.0 MHz	W: 5.0 MHz L: 5.0 MHz	(W) 2152.6MHz + (W) 2147.6MHz + (L) 2142.6MHz	30	-21.24

Note 1: For MIMO mode configurations, the limit was adjusted with a correction of -6.02dB [10Log(4)] to -13dBm. For the measurement of 1MHz immediately outside and adjacent to the frequency band edge, a resolution bandwidth of 30kHz was used, and 30kHz is < 50kHz (1% of nominal bandwidth). To compensate for the reduced measurement bandwidth, the limit was adjusted with a correction of -2.22dB [10Log(30/50)] to -19.02dBm.

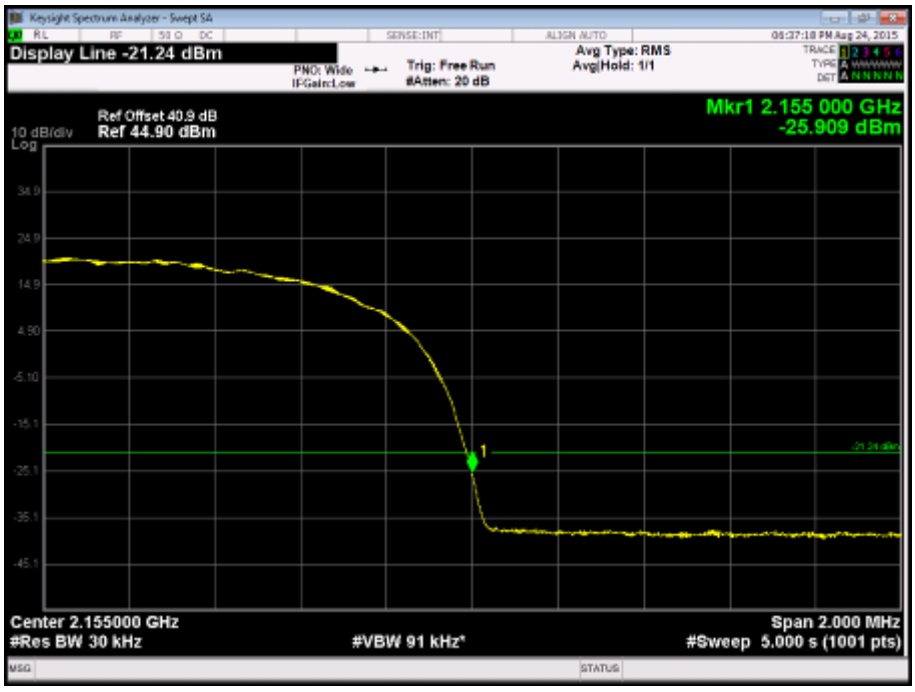
Note 2: The channels shown in the table above are the minimum and maximum channels that can be used in the authorised frequency ranges to maintain compliance. Channels outside of the ranges shown in the above tables shall not be available to the end user.

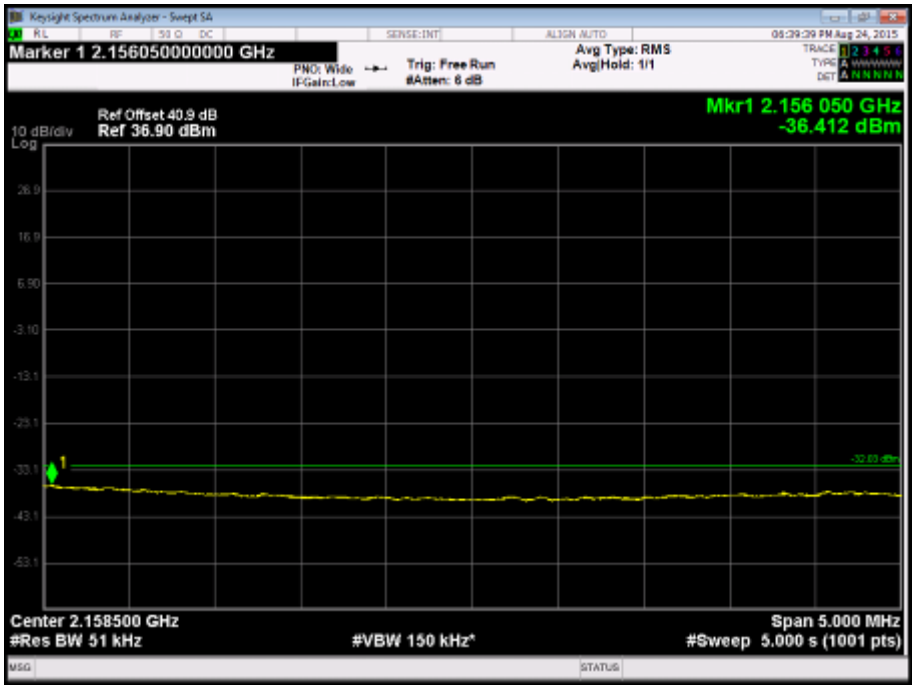
Channel Position B_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz





Channel Position T_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz





Limit

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10logP dB.

2.4 RADIATED SPURIOUS EMISSIONS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1053
FCC CFR 47 Part 27, Clause 27.53 (h)
Industry Canada RSS-139, Clause 6.5

2.4.2 Equipment Under Test

RRUS 32 B4, KRC 161 416/1, S/N: D16Q644897

2.4.3 Date of Test and Modification State

28 August and 01 September 2015 - Modification State 0

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Environmental Conditions

Ambient Temperature	26.5 – 28.0°C
Relative Humidity	57.5 – 59.0%

2.4.6 Test Method

The test was applied in accordance with test method requirements of FCC Part 27 and RSS-139 and ANSI/TIA-603-C-2004.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the measurement antenna in both horizontal and vertical polarisations.

Emissions identified within the range 9kHz to 22GHz were then formally measured using a peak detector as the worst case.

The limits for outside a licensee's frequency band(s) of operation the power of the spurious emissions have been calculated, as shown below using the following formula:

Field Strength of Carrier - (43 + 10Log (P)) dB

Where:
Field Strength is measured in dBµV/m
P is measured Transmitter Power in Watts

The EUT was measured with the antenna height varied between 1 and 4 m with the turntable rotated between 0 and 360 degrees. The emission of any outside a licensee's frequencies within 20dB of the limit were measured with the substitution method used according to the standard.

The measurements were performed at a 3m distance unless otherwise stated.

Determination of Spurious Emission Limit

The field strength of the carrier has been calculated assuming that the power is to be fed to a half-wave tuned dipoles as per 2.1053 (a).

$E_{(v/m)}=(30 \times G_i \times P_o)^{0.5} / d$

Where G_i is the antenna gain of ideal half-wave dipoles,
P_o is the power out of the transceiver in W,
d is the measurement distance in meter.

Therefore at 3m measurement distance the field strength using the lowest transceiver output power would be:

$E_{(v/m)}=(30 \times 1.64 \times 45.85)^{0.5} / 3 = 15.83$ V/m = 143.99 dBµV/m

As per 27.53 (c)(1) the spurious emission must be attenuated by 43 + 10log (P_o) dB this gives:

43 + 10log(45.85) = 59.61 dB

Therefore the limit at 3m measurement distance is:

143.99 – 59.61 = 84.4 dBµV/m

These limits have been used to determine Pass or Fail for the harmonics measured and detailed in the following results.

The results are shown in the plots below.

2.4.7 Test Results

Note: Only the worst case results plots have been included as all of the emissions are greater than 20dB below the limit. A set of plots have been included to show the measurement system noise floor.

Configuration W-MIMO-SC

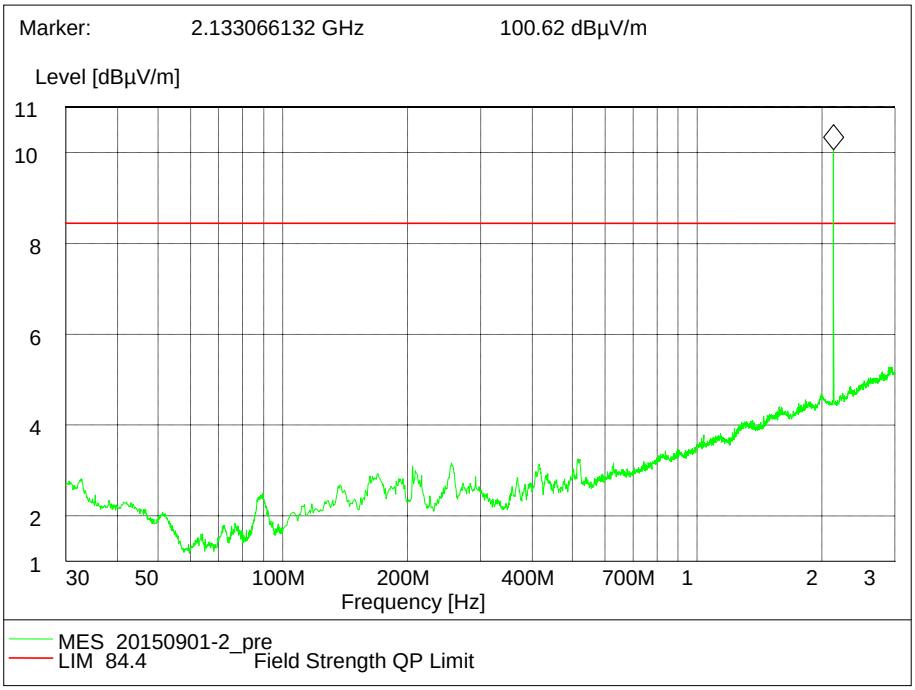
Maximum Output Power 46.0dBm per carrier, WCDMA Bandwidth 5.0MHz

Channel Position	Channel Frequencies
Channel Position B	2112.4MHz
Channel Position M	2132.6MHz
Channel Position T	2152.6MHz

Channel Position B - 16QAM

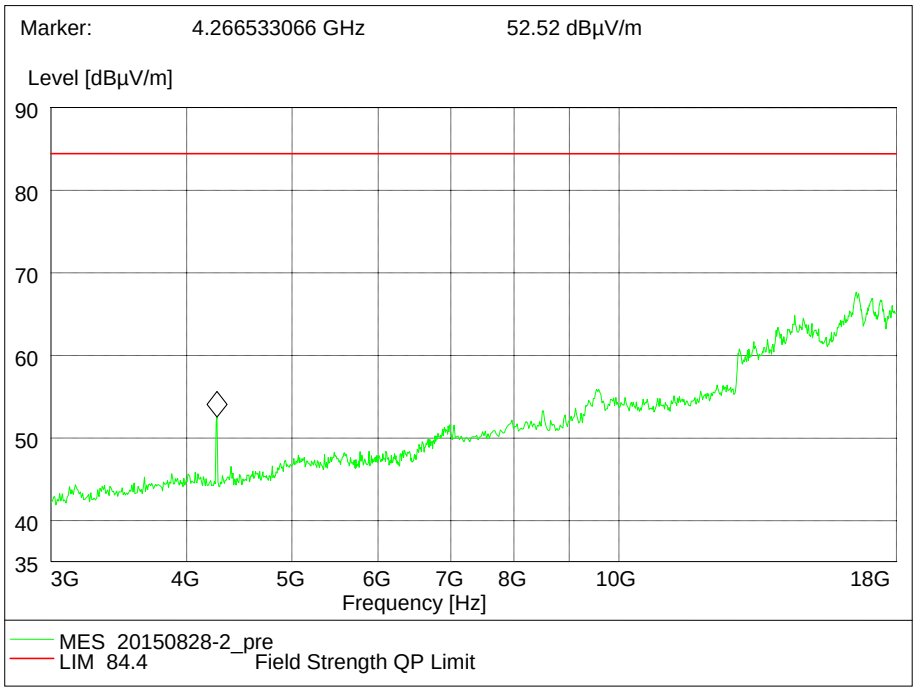
No emissions were detected within 20dB of the limit.

Channel Position M - 16QAM - 30MHz – 3GHz

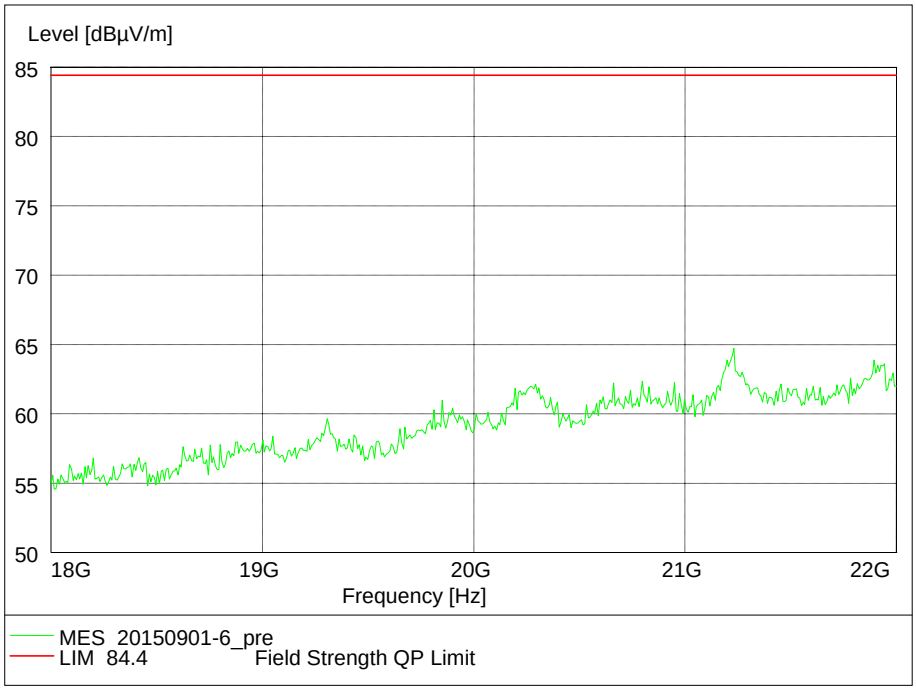


Note: The emission beyond the limit is the operating frequency.

Channel Position M - 16QAM - 1GHz – 18GHz



Channel Position M - 16QAM - 18GHz – 22GHz



Channel Position T - 16QAM

No emissions were detected within 20dB of the limit.
Configuration L-MIMO-MC 1 (2C)

Maximum Output Power 43.0dBm per carrier, LTE Bandwidth 5.0MHz

Channel Position	Channel Frequencies
Channel Position M_{RFBW}	2112.5MHz + 2152.5MHz

Channel Position M_{RFBW} - QPSK

No emissions were detected within 20dB of the limit.

Configuration W+L-MIMO-MC 2 (2W+3L)

Maximum Output Power 39.0dBm per carrier, WCDMA Bandwidth 5.0MHz, LTE Bandwidth 5.0MHz

Channel Position	Channel Frequencies
Channel Position M_{RFBW}	(W) 2112.4MHz + (W) 2117.4MHz + (L) 2142.5MHz + (L) 2147.5MHz + (L) 2152.50MHz

Channel Position M_{RFBW} – WCDMA 16QAM / LTE QPSK

No emissions were detected within 20dB of the limit.

Limit	-13dBm / 84.4dBµV/m.

Remarks

The EUT does not exceed -13dBm / 84.4dBµV/m at the measured frequencies.

2.5 CONDUCTED SPURIOUS EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 27, Clause 27.53 (h)
Industry Canada RSS-139, Clause 6.5

2.5.2 Equipment Under Test

RRUS 32 B4, KRC 161 416/1, S/N: D16Q644897

2.5.3 Date of Test and Modification State

20, 21 and 24 August 2015 - Modification State 0

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Environmental Conditions

Ambient Temperature	22.0 - 24.5°C
Relative Humidity	44.8 - 61.0%

2.5.6 Test Method

The test was applied in accordance with test method requirements of FCC Part 27 and RSS-139.

In accordance with FCC CFR 47 Part 27, Clause 27.53 (h), any emissions outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P)dB, and the measurement should be performed with a resolution bandwidth of 1MHz.

The spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 9kHz to 22GHz. The resolution bandwidth of 1MHz was employed for frequency band 9kHz to 22GHz. The spectrum analyzer detector was set to RMS.

For MIMO mode configurations, the limit was adjusted with a correction of -6.02dB [10Log4] by using the Measure and Add 10Log(N) dB technique according to FCC KDB 662911 D01 Multiple Transmitter Output v02r01 accounting for simultaneous transmission from antenna ports RF A , B, C and RF D. Then the limit was adjust to -19.02dBm.

The measurements were performed on the output connector RF A. Limited complementary measurement were done at output conector RF B to RF D to verify identical performance for both transmitter chains in MIMO mode.

The maximum path loss across the measurement band was used as the reference level offset to ensure worst case.

The worst results are shown in the plots below.

2.5.7 Test Results

Remark:

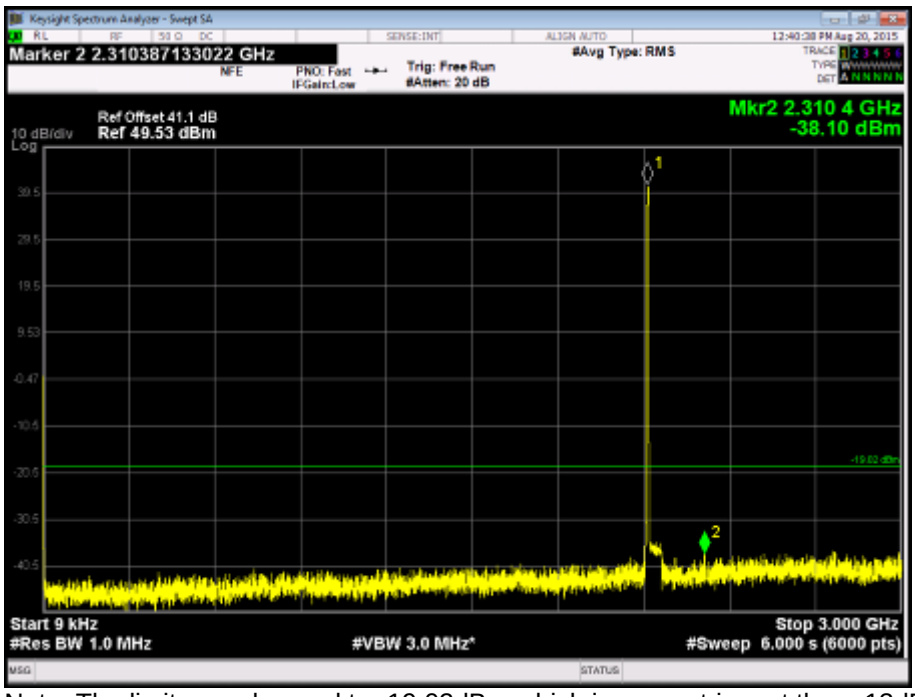
The emissions at 9kHz on the plots was not generated by the test object.

Configuration W-SC

Maximum Output Power 46.0dBm per carrier

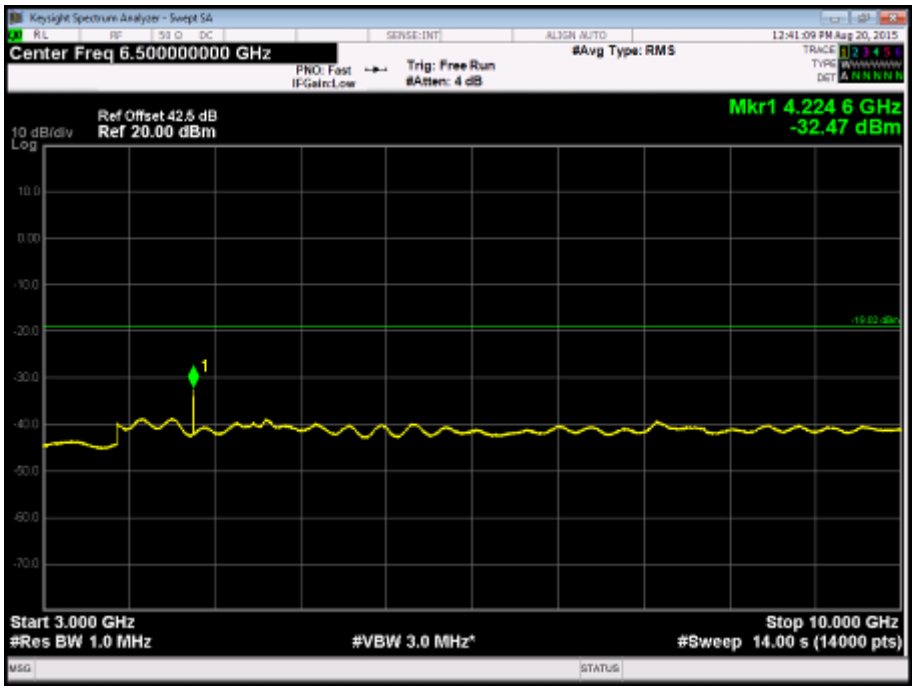
Channel Position	Bandwidth	Channel Frequency
Channel Position B	5.0MHz	2112.4MHz
Channel Position M	5.0MHz	2132.6MHz
Channel Position T	5.0MHz	2152.6MHz

Channel Position B - QPSK / Bandwidth 5.0MHz - 9kHz - 3GHz



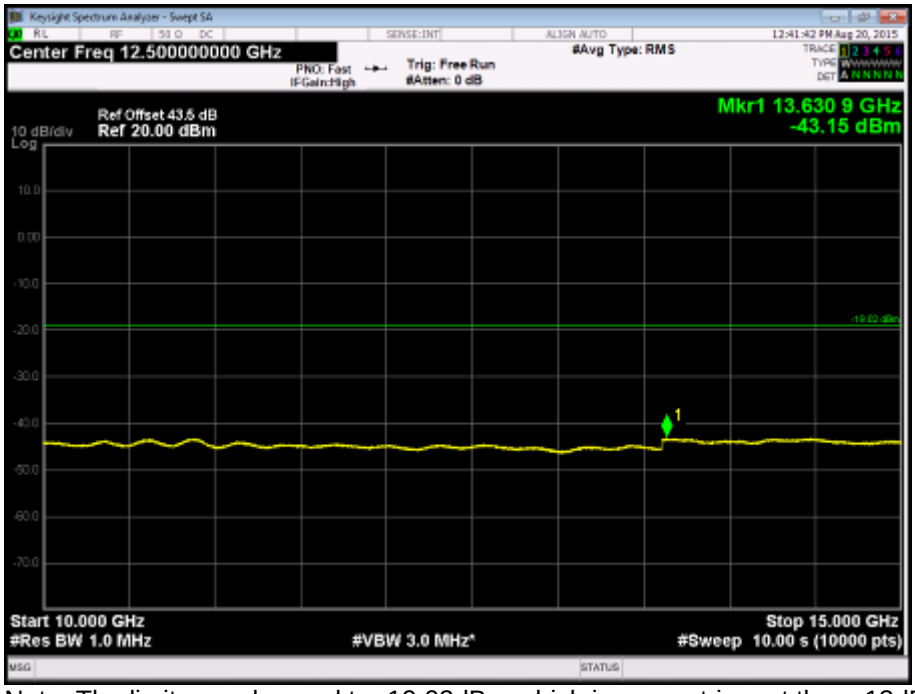
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position B - QPSK / Bandwidth 5.0MHz - 3GHz - 10GHz



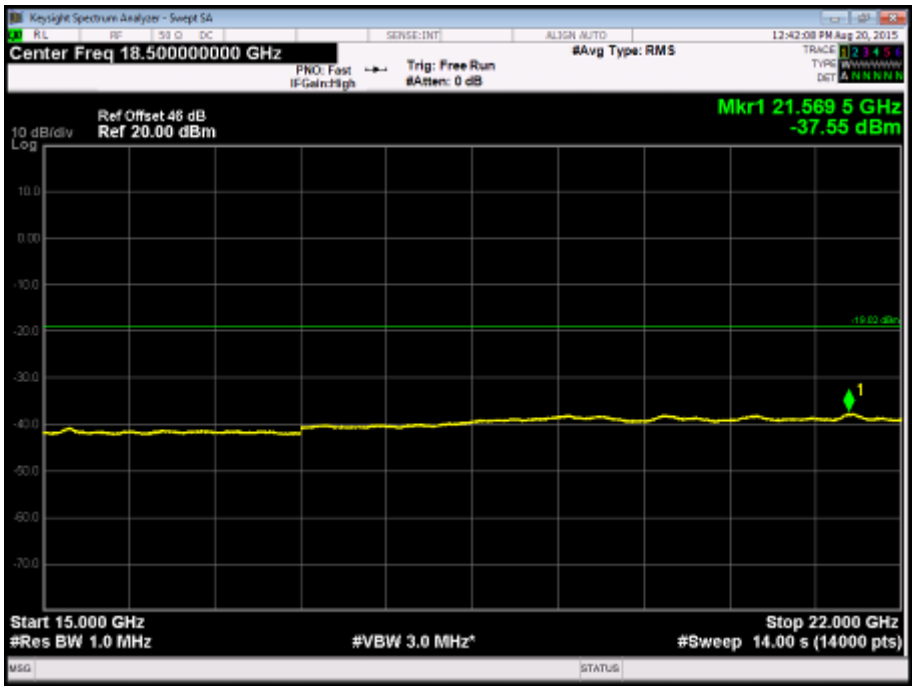
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position B - QPSK / Bandwidth 5.0MHz - 10GHz - 15GHz



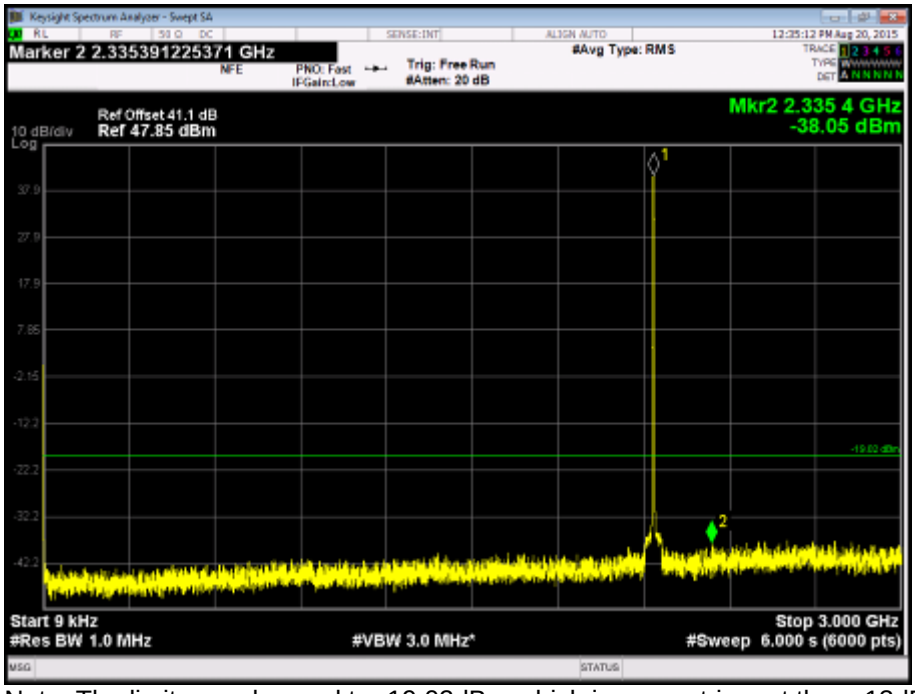
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position B - QPSK / Bandwidth 5.0MHz - 15GHz - 22GHz



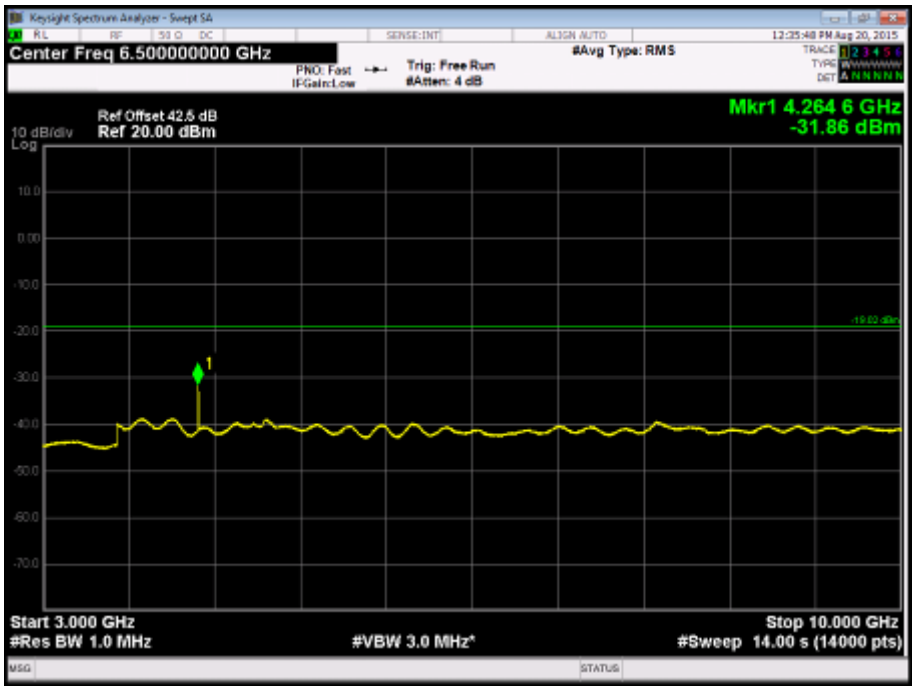
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position M - QPSK / Bandwidth 5.0MHz - 9kHz - 3GHz



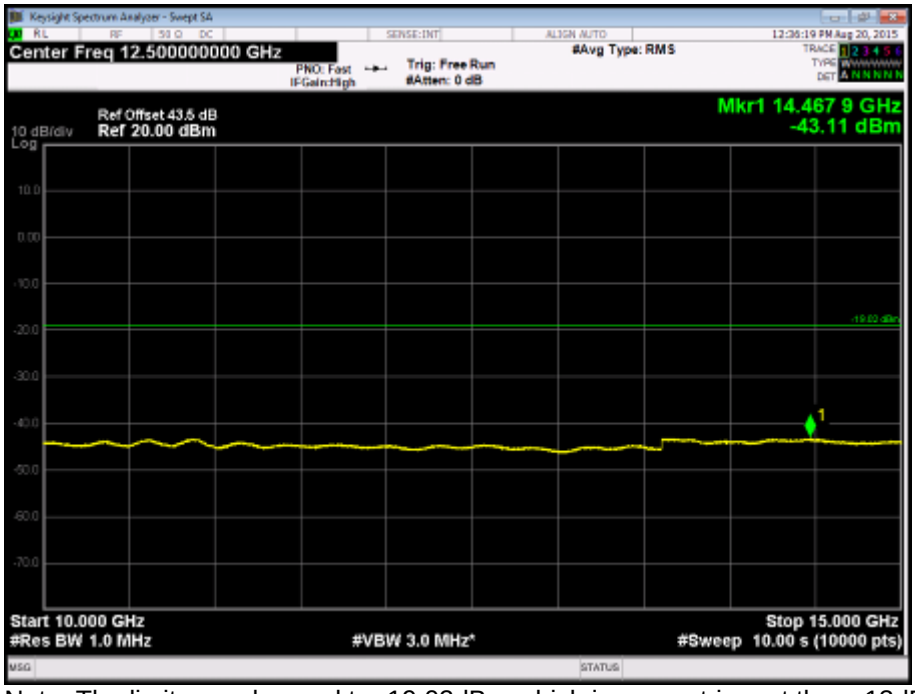
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position M - QPSK / Bandwidth 5.0MHz - 3GHz – 10GHz



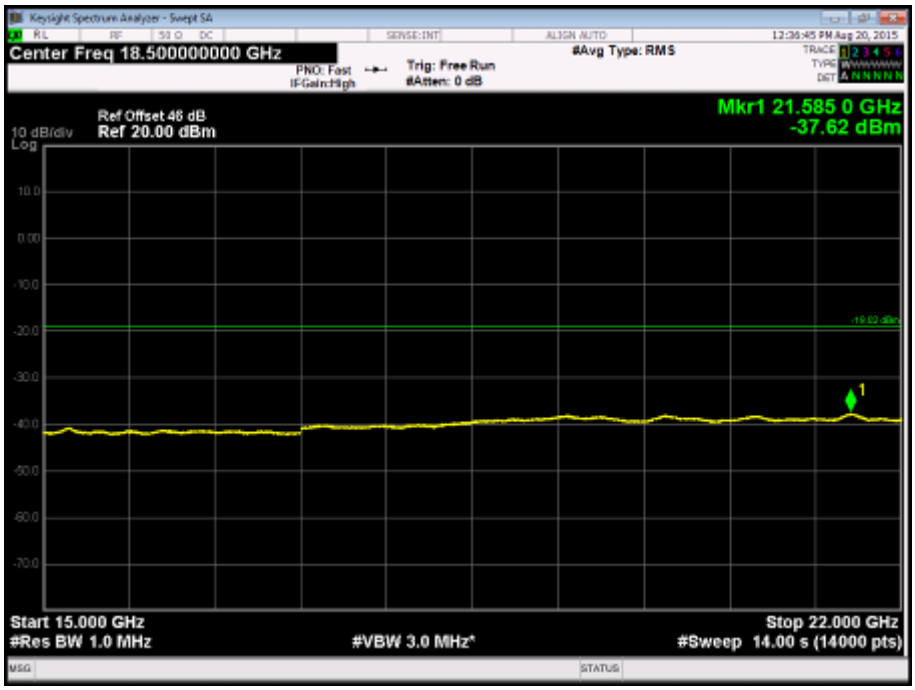
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position M - QPSK / Bandwidth 5.0MHz - 10GHz - 15GHz



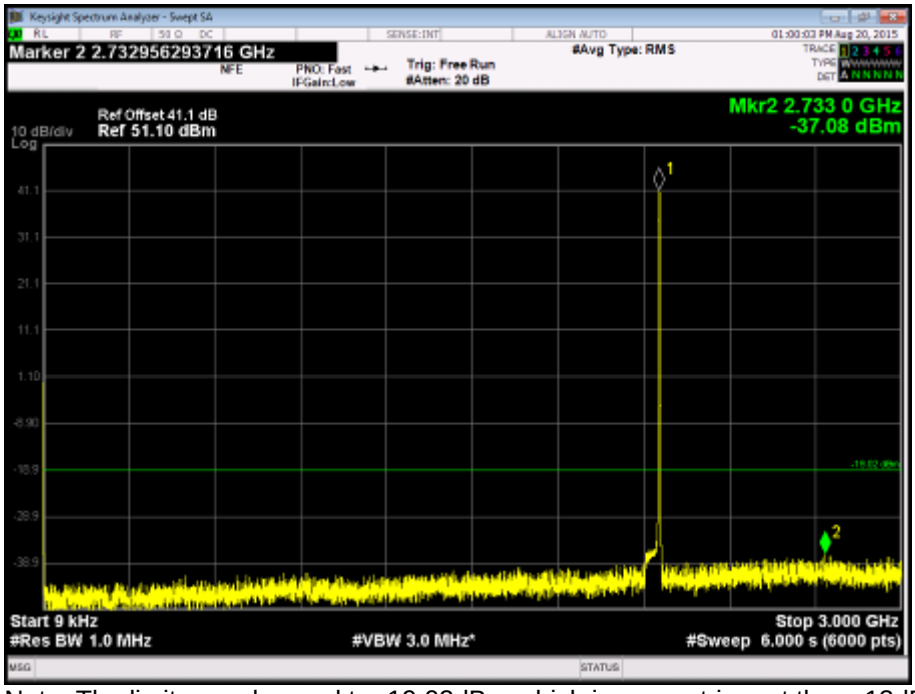
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position M - QPSK / Bandwidth 5.0MHz - 15GHz - 22GHz



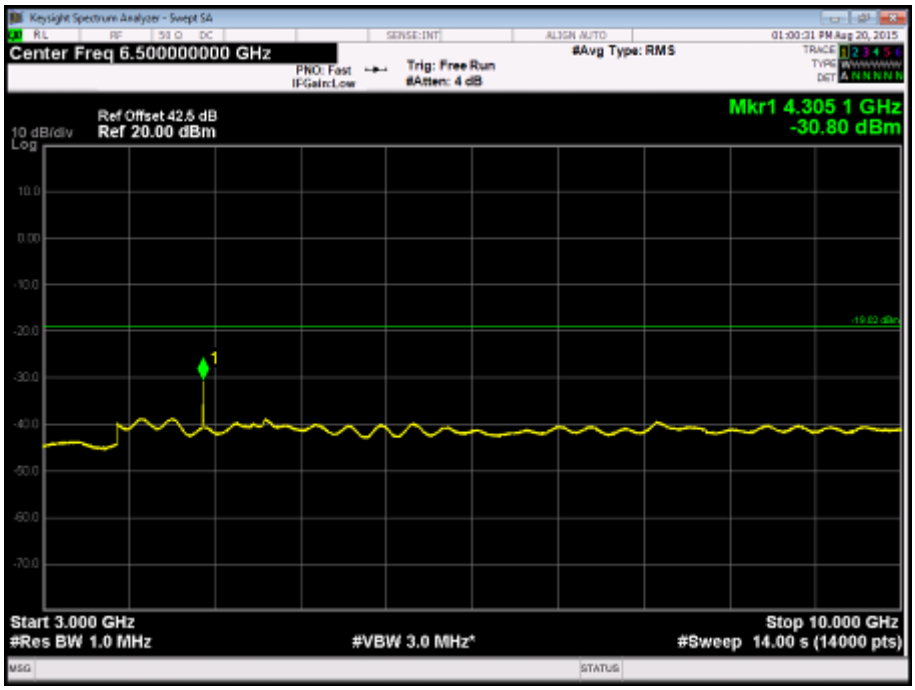
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position T - QPSK / Bandwidth 5.0MHz - 9kHz - 3GHz



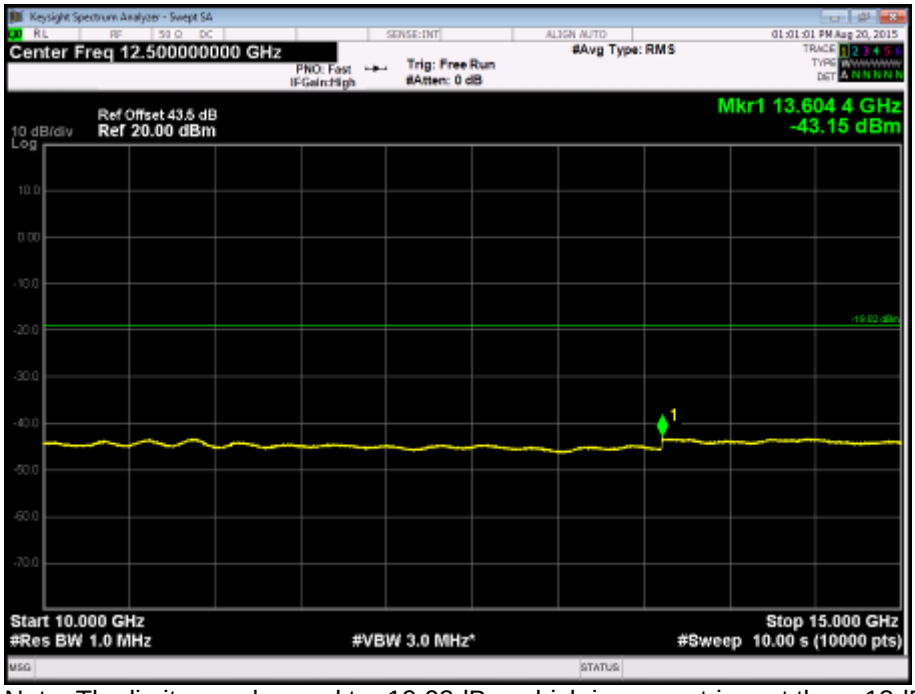
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position T - QPSK / Bandwidth 5.0MHz - 3GHz – 10GHz



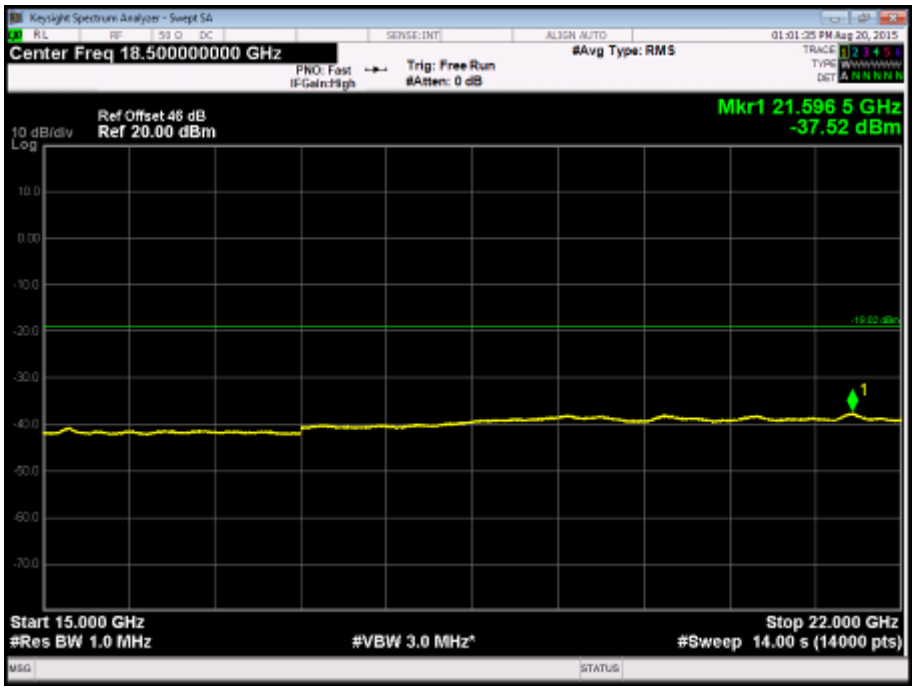
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position T - QPSK / Bandwidth 5.0MHz - 10GHz - 15GHz



Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Channel Position T - QPSK / Bandwidth 5.0MHz - 15GHz - 22GHz



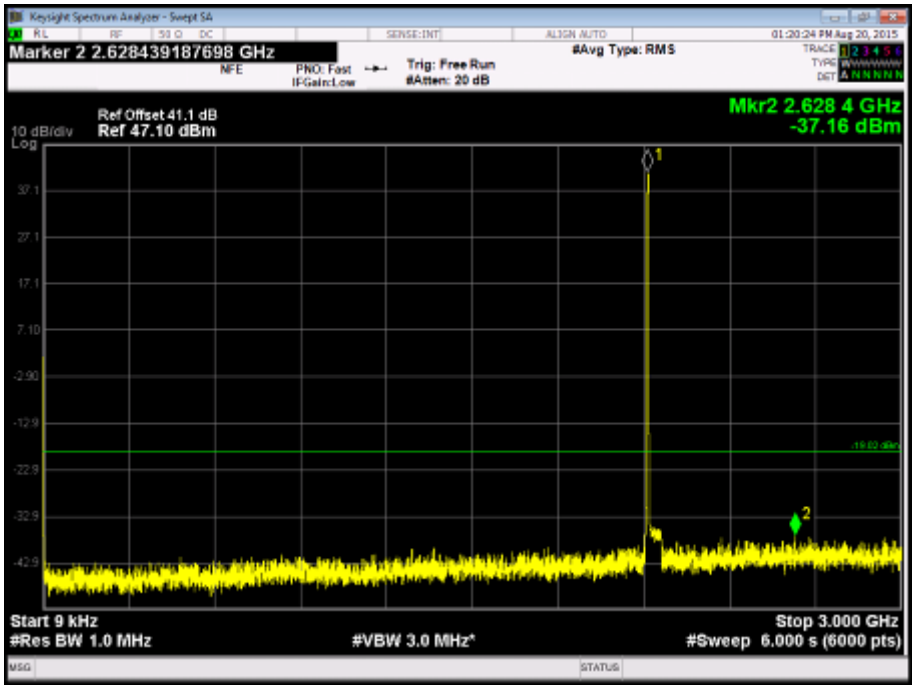
Note: The limit was changed to -19.02dBm which is more stringent than -13dBm.

Configuration W-MIMO-SC

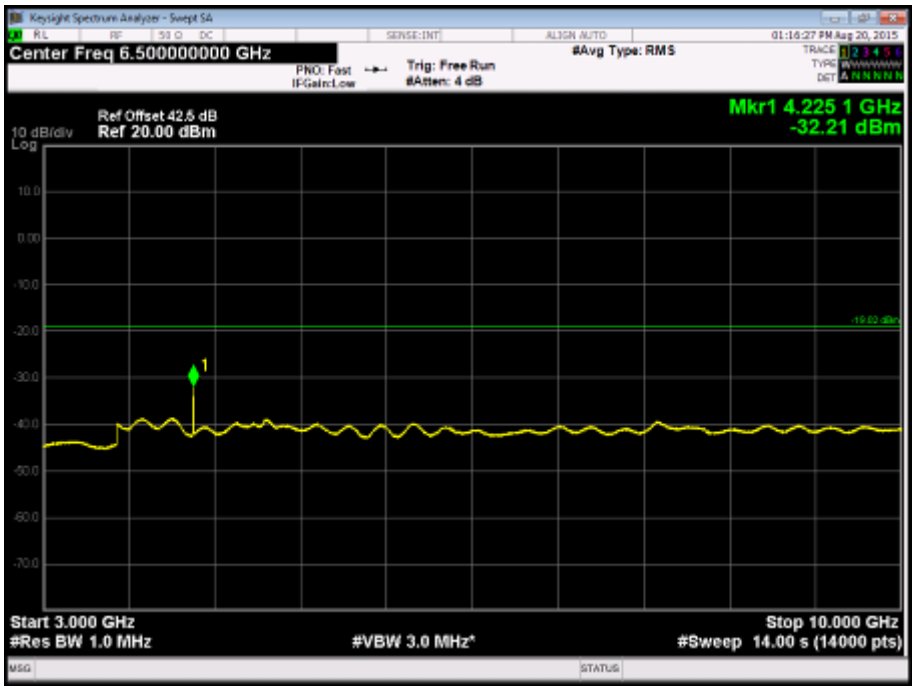
Maximum Output Power 46.0dBm per carrier

Channel Position	Bandwidth	Channel Frequency
Channel Position B	5.0MHz	2112.4MHz
Channel Position M	5.0MHz	2132.6MHz
Channel Position T	5.0MHz	2152.6MHz

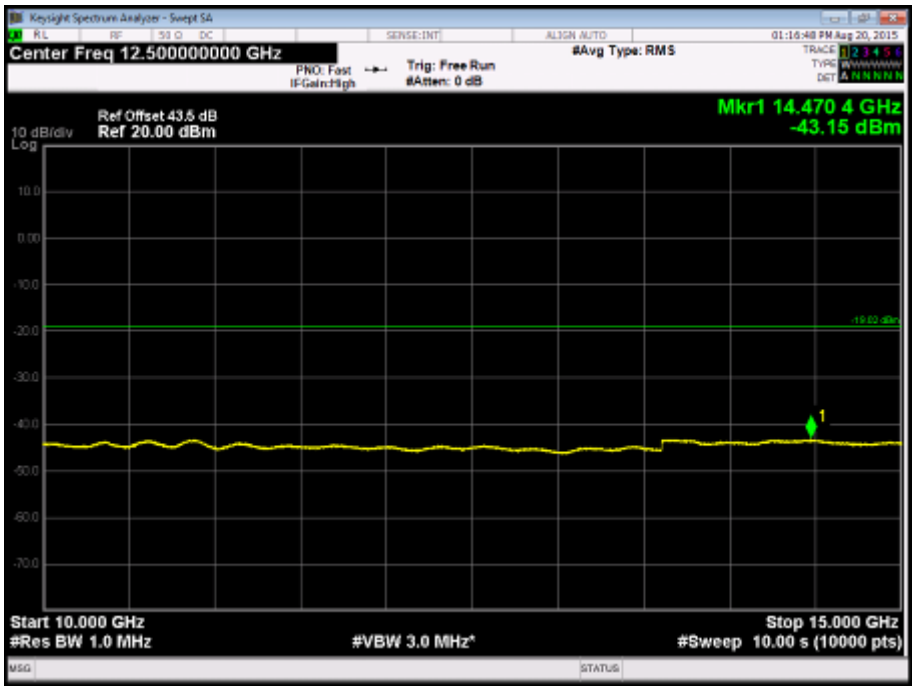
Channel Position B - 16QAM / Bandwidth 5.0MHz - 9kHz - 3GHz



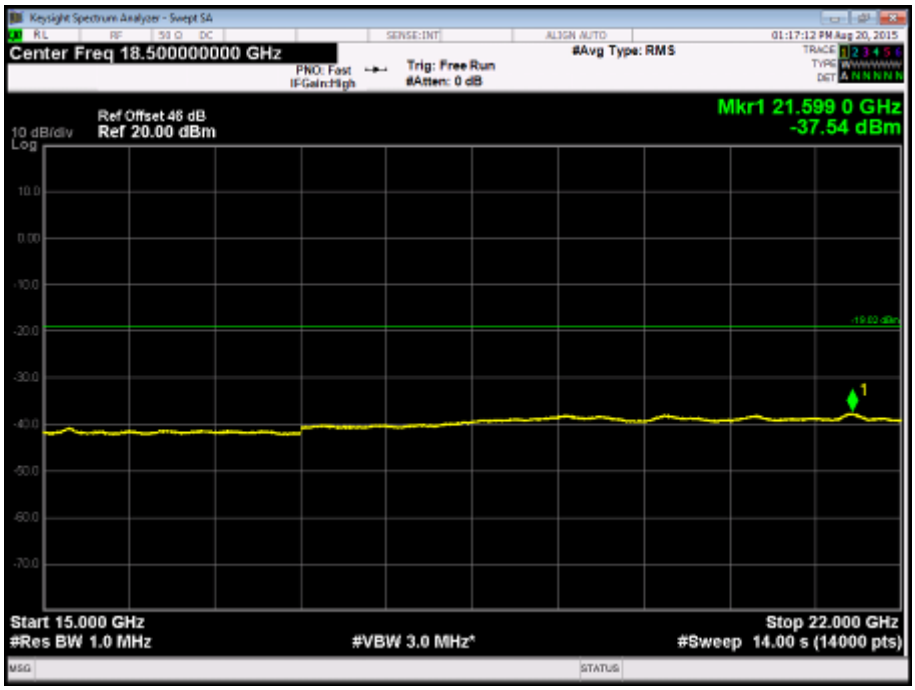
Channel Position B - 16QAM / Bandwidth 5.0MHz - 3GHz - 10GHz



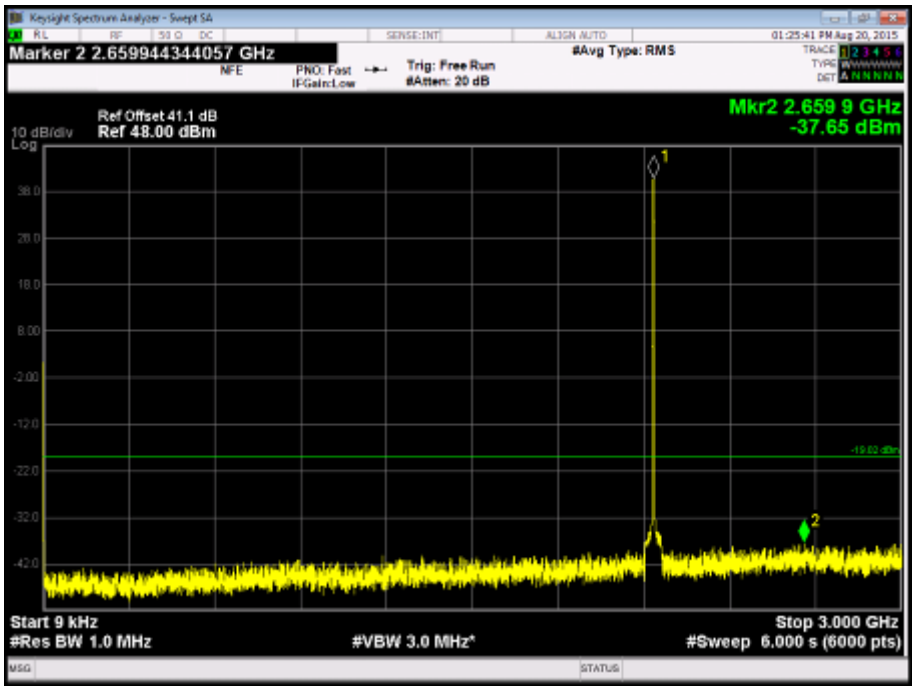
Channel Position B - 16QAM / Bandwidth 5.0MHz - 10GHz - 15GHz



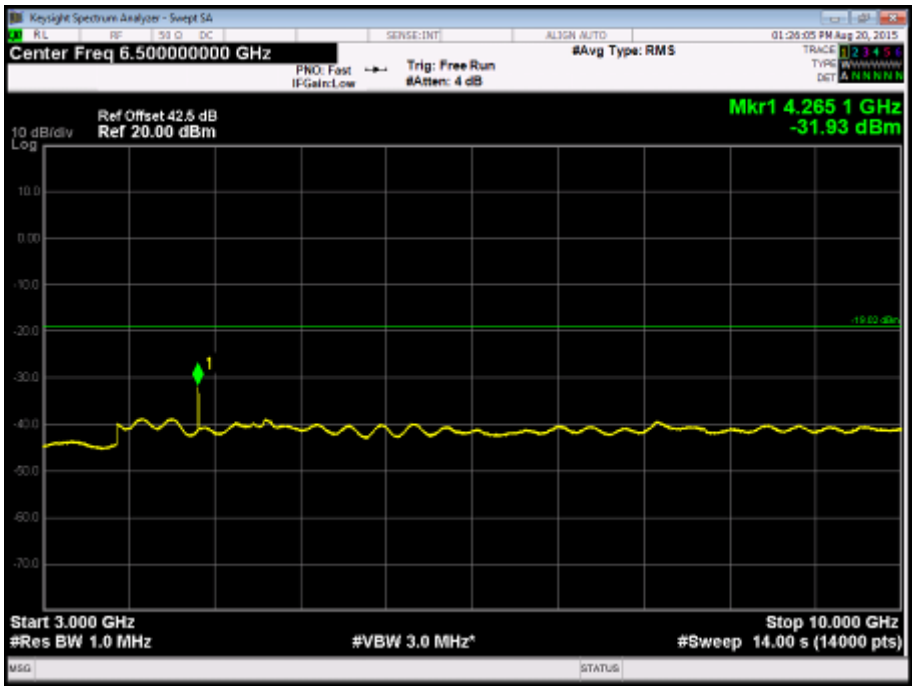
Channel Position B - 16QAM / Bandwidth 5.0MHz - 15GHz - 22GHz



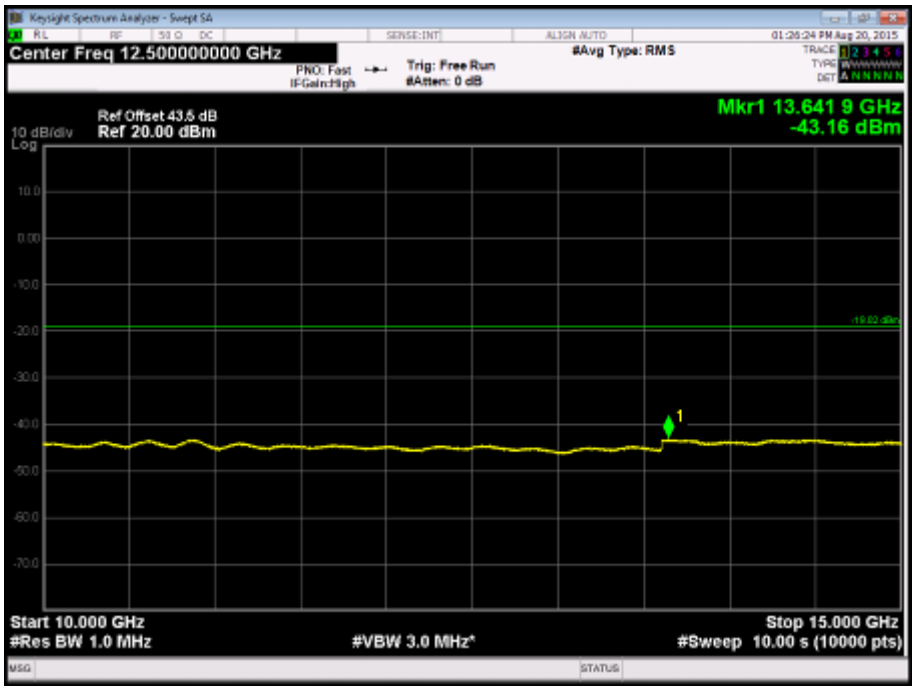
Channel Position M - 16QAM / Bandwidth 5.0MHz - 9kHz - 3GHz



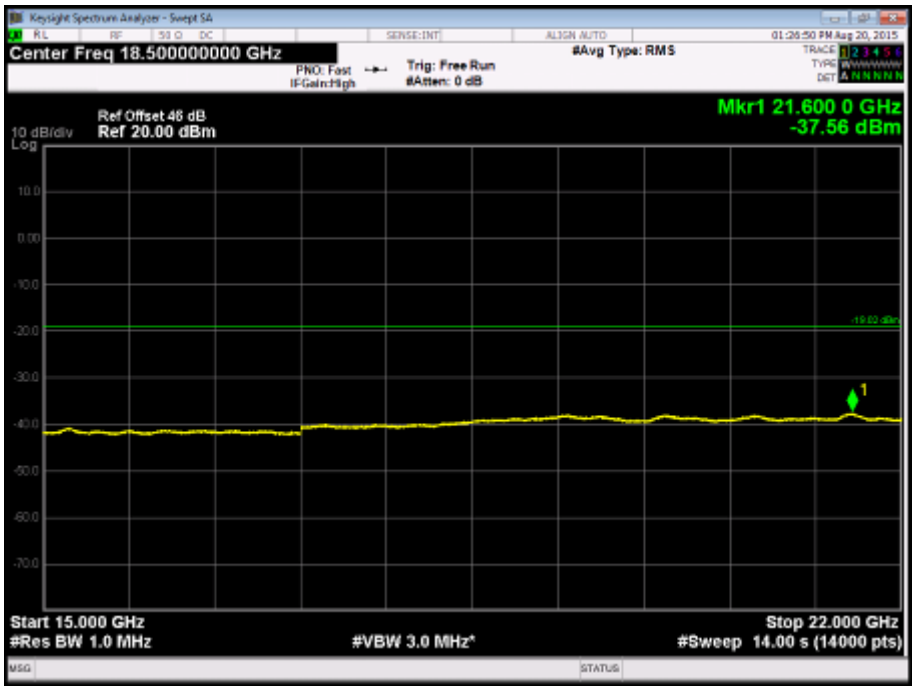
Channel Position M - 16QAM / Bandwidth 5.0MHz - 3GHz - 10GHz



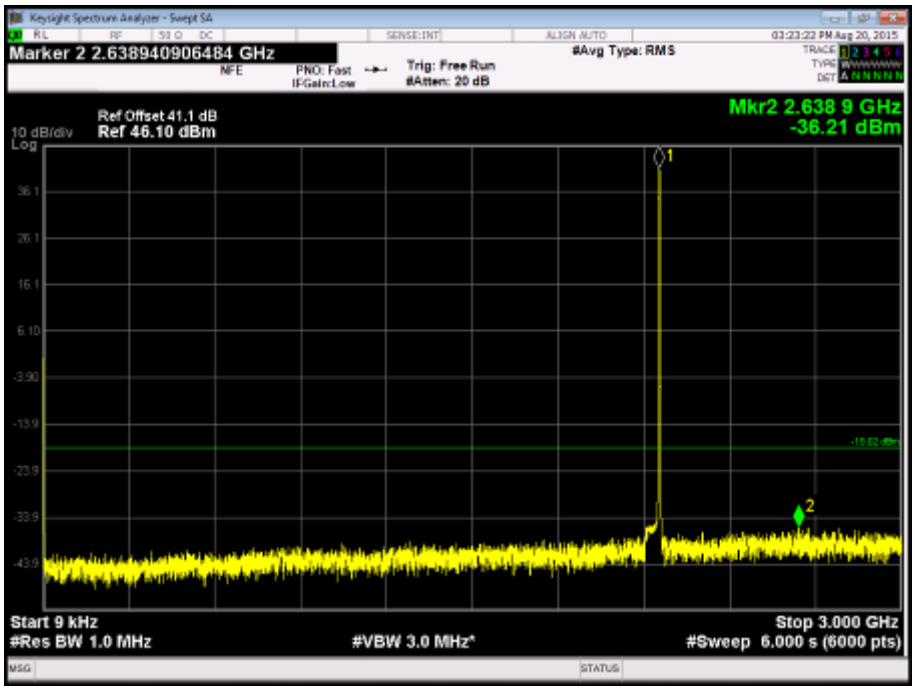
Channel Position M - 16QAM / Bandwidth 5.0MHz - 10GHz - 15GHz



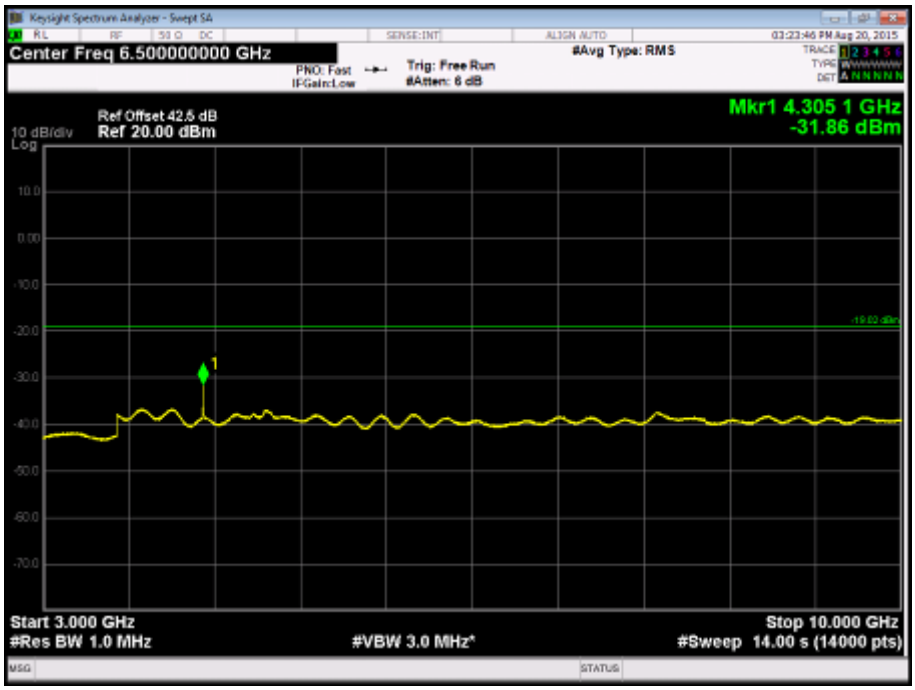
Channel Position M - 16QAM / Bandwidth 5.0MHz - 15GHz - 22GHz



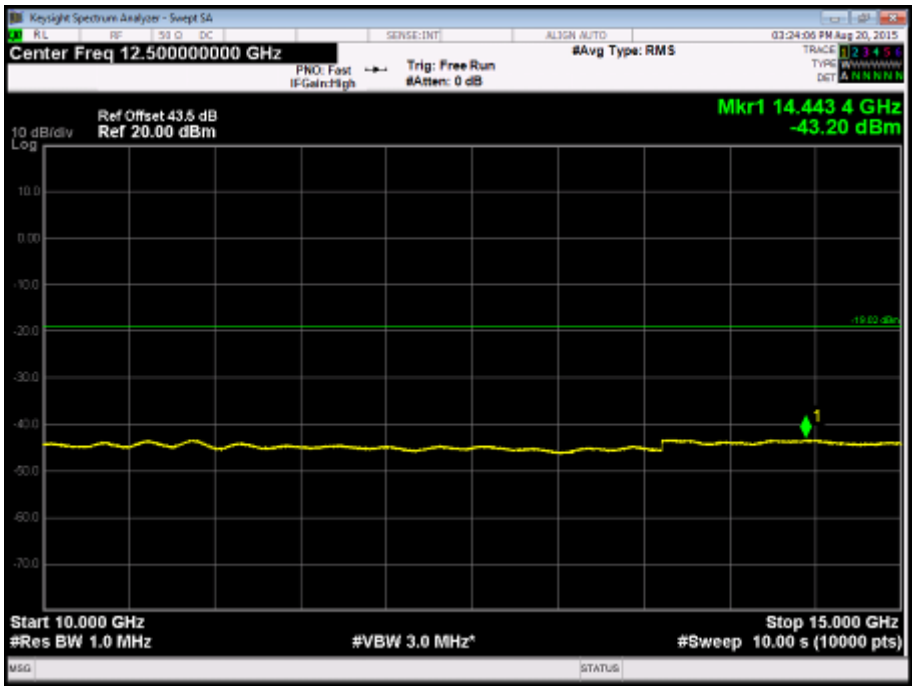
Channel Position T - 16QAM / Bandwidth 5.0MHz - 9kHz - 3GHz



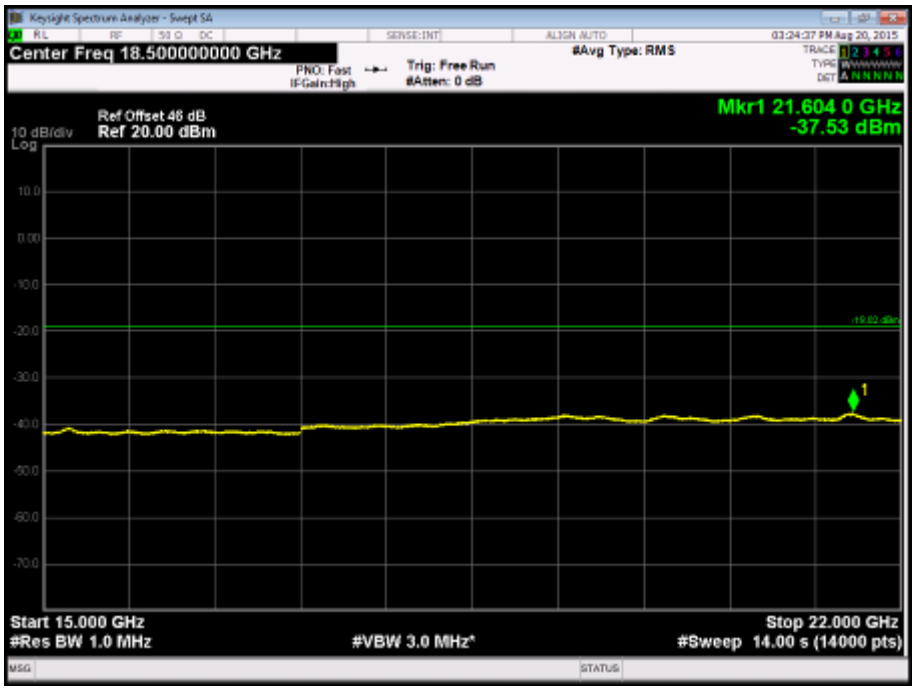
Channel Position T - 16QAM / Bandwidth 5.0MHz - 3GHz - 10GHz



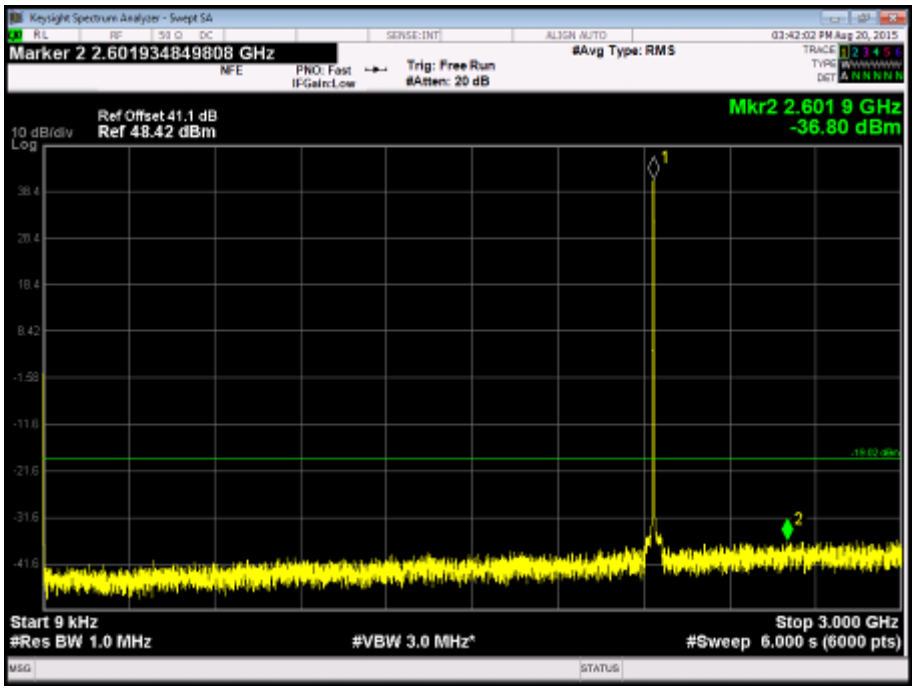
Channel Position T - 16QAM / Bandwidth 5.0MHz - 10GHz - 15GHz



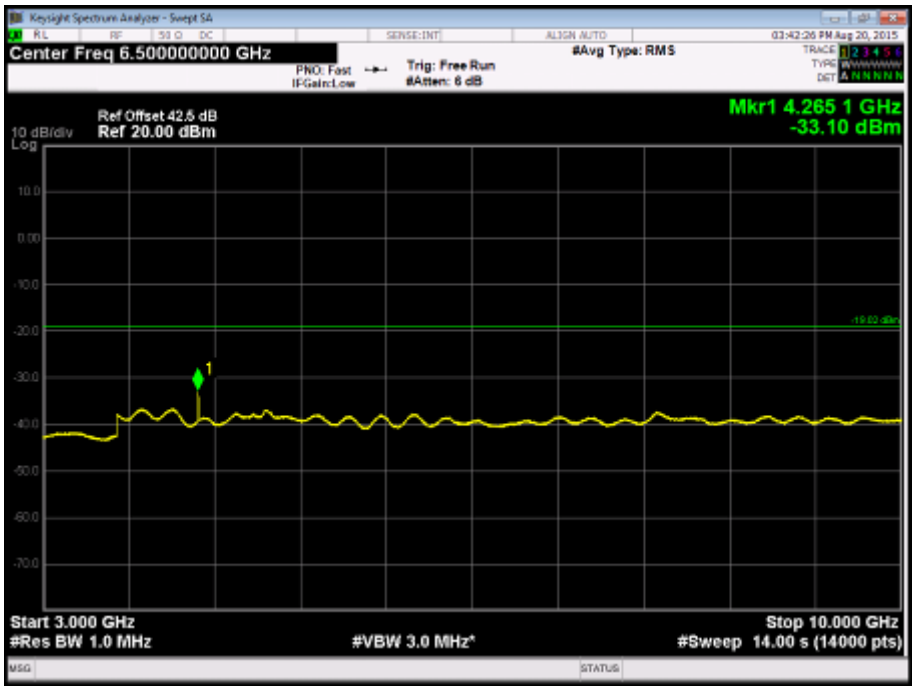
Channel Position T - 16QAM / Bandwidth 5.0MHz - 15GHz - 22GHz



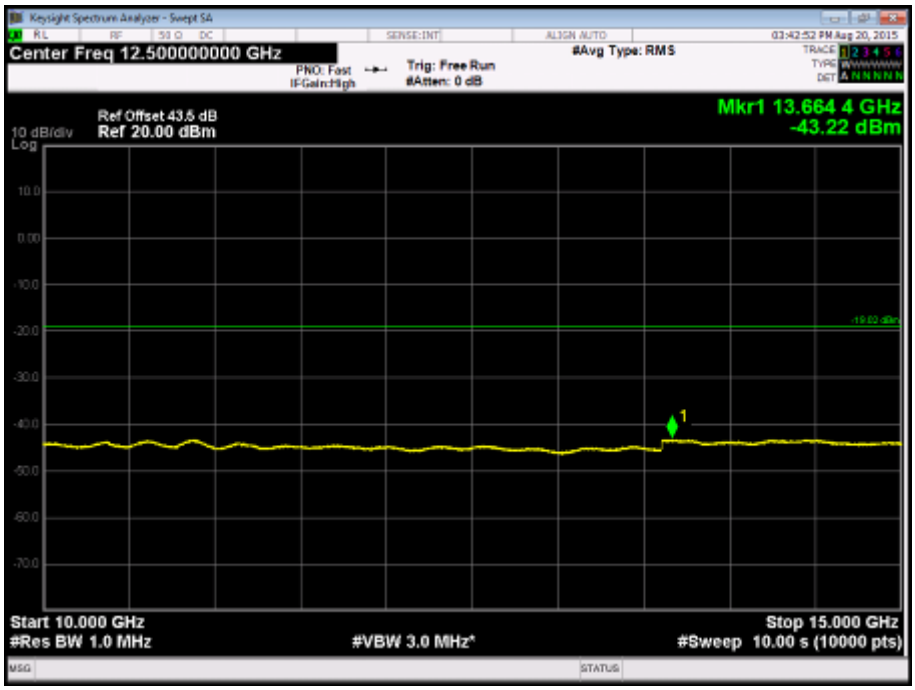
Channel Position M - 64QAM / Bandwidth 5.0MHz - 9kHz - 3GHz



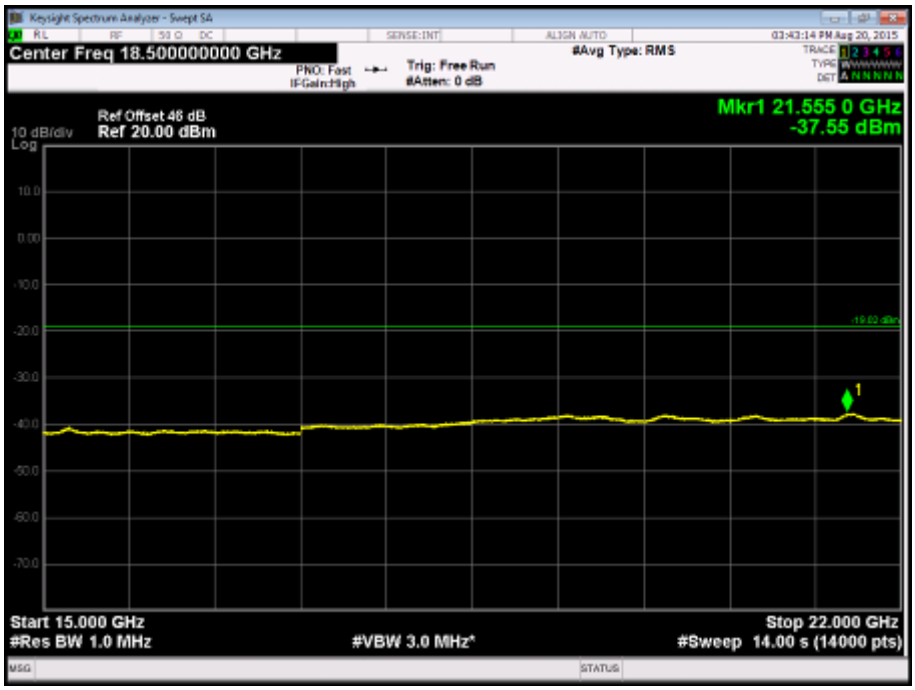
Channel Position M - 64QAM / Bandwidth 5.0MHz - 3GHz - 10GHz



Channel Position M - 64QAM / Bandwidth 5.0MHz - 10GHz - 15GHz



Channel Position M - 64QAM / Bandwidth 5.0MHz - 15GHz - 22GHz

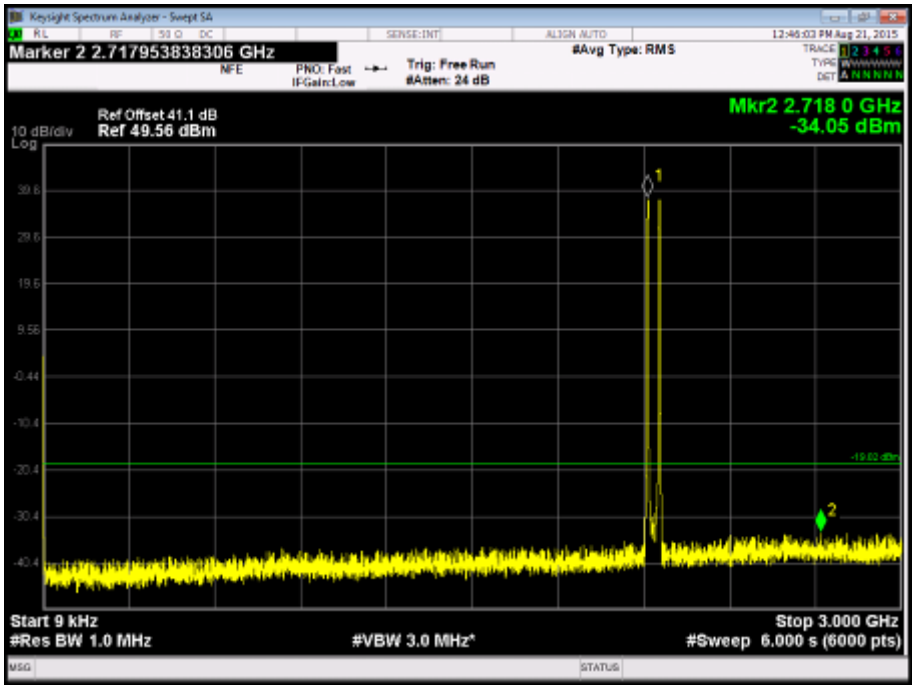


Configuration W-MIMO-MC (2C)

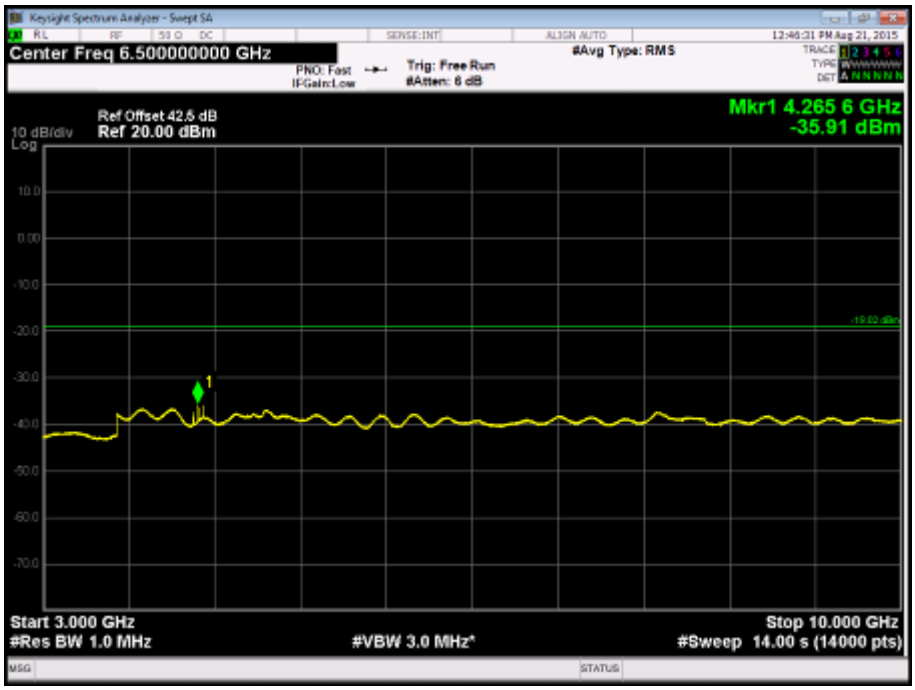
Maximum Output Power 43.0dBm per carrier

Channel Position	Bandwidth	Channel Frequency
Channel Position M_{RFBW}	5.0MHz	2112.4MHz + 2152.6MHz

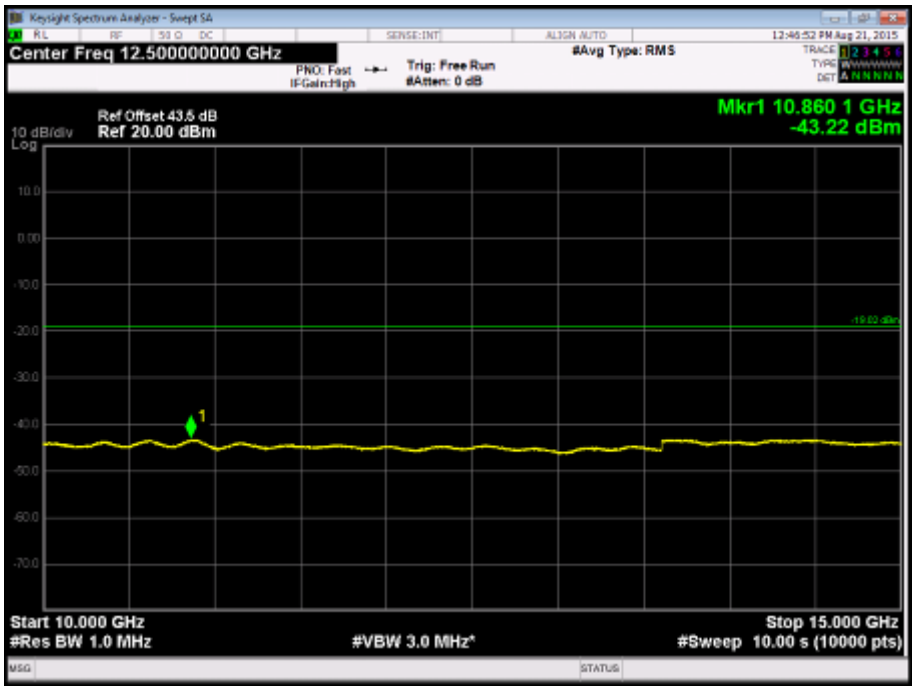
Channel Position M_{RFBW} - 16QAM / Bandwidth 5.0MHz - 9kHz - 3GHz



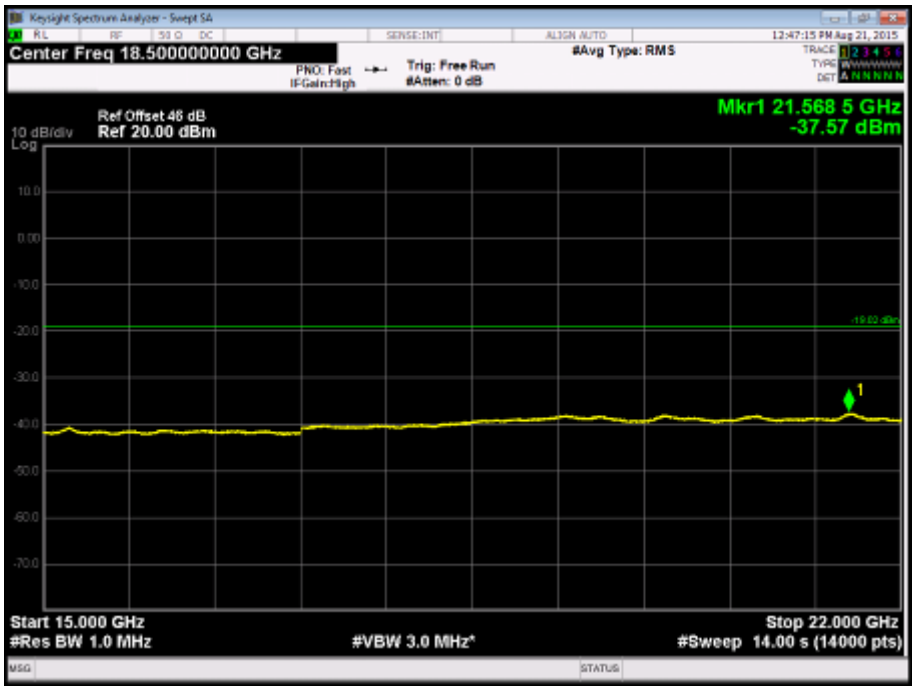
Channel Position M_{RFBW} - 16QAM / Bandwidth 5.0MHz - 3GHz - 10GHz



Channel Position M_{RFBW} - 16QAM / Bandwidth 5.0MHz - 10GHz - 15GHz



Channel Position M_{RFBW} - 16QAM / Bandwidth 5.0MHz - 15GHz - 22GHz



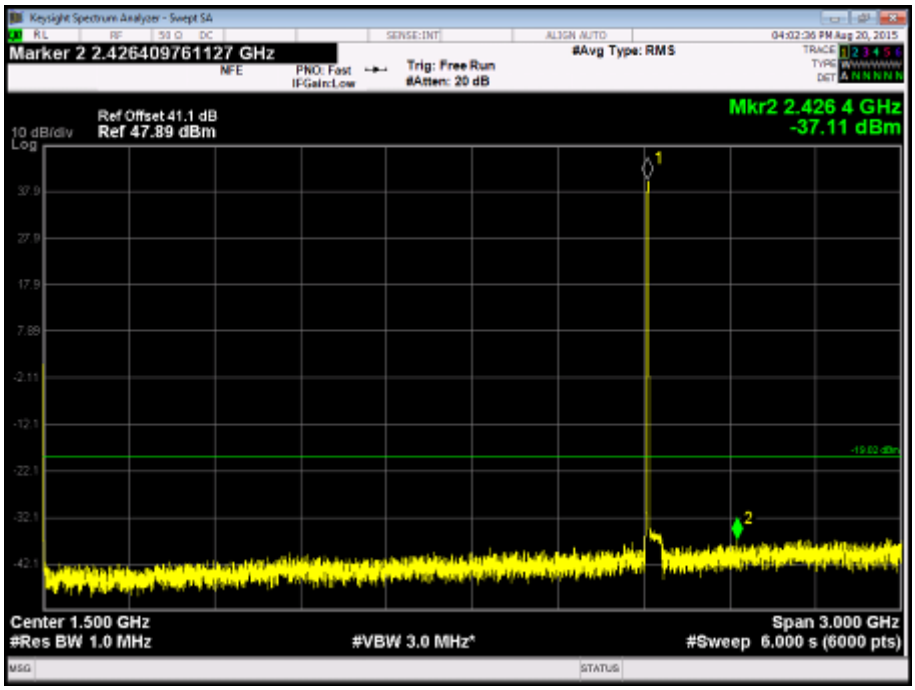
Configuration L-MIMO-SC

Maximum Output Power 46.0dBm per carrier

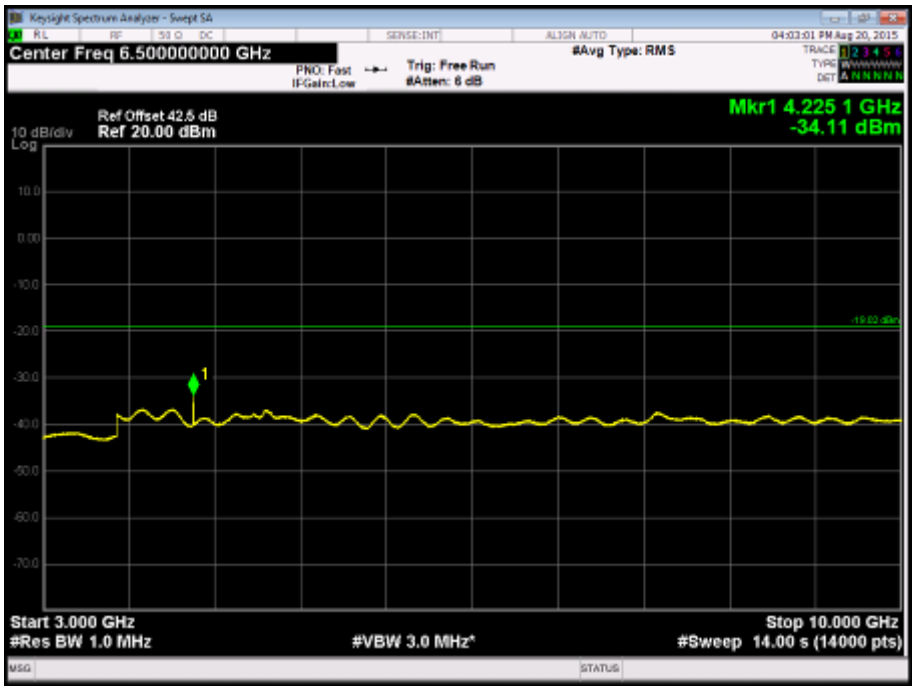
Channel Position	Bandwidth	Channel Frequency
Channel Position B	5.0MHz	2112.5MHz
Channel Position M	5.0MHz	2132.5MHz
Channel Position T	5.0MHz	2152.5MHz

Channel Position	Bandwidth	Channel Frequency
Channel Position B	20.0MHz	2120.0MHz
Channel Position M	20.0MHz	2132.5MHz
Channel Position T	20.0MHz	2145.0MHz

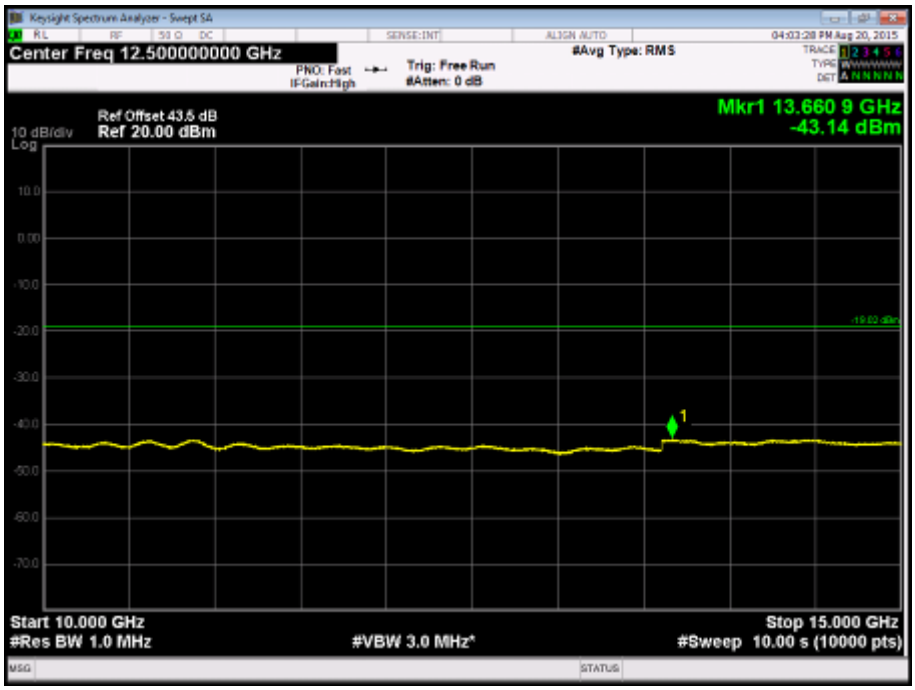
Channel Position B - QPSK / Bandwidth 5.0MHz - 9kHz - 3GHz



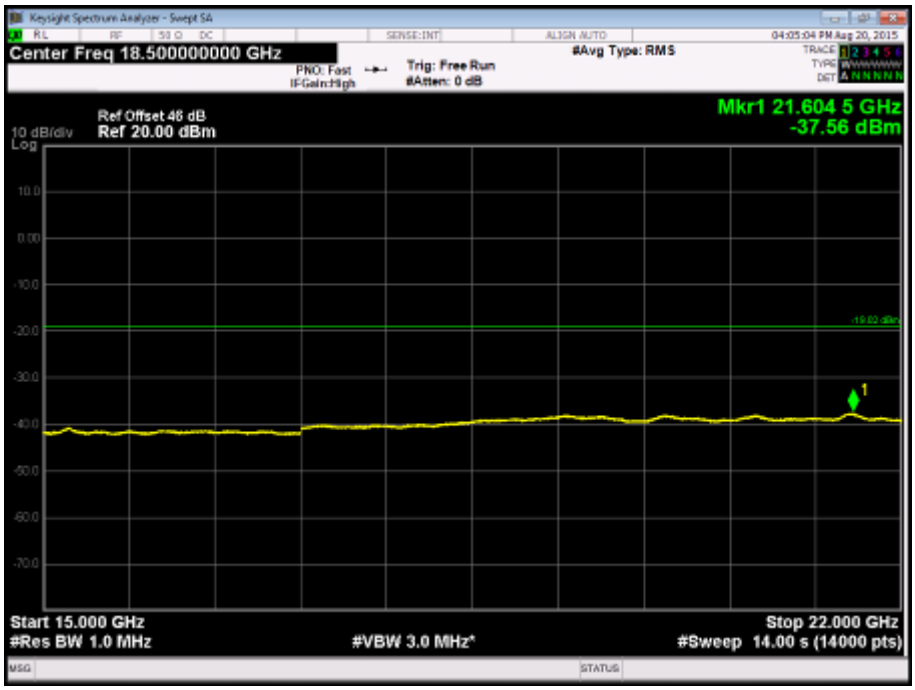
Channel Position B - QPSK / Bandwidth 5.0MHz - 3GHz - 10GHz



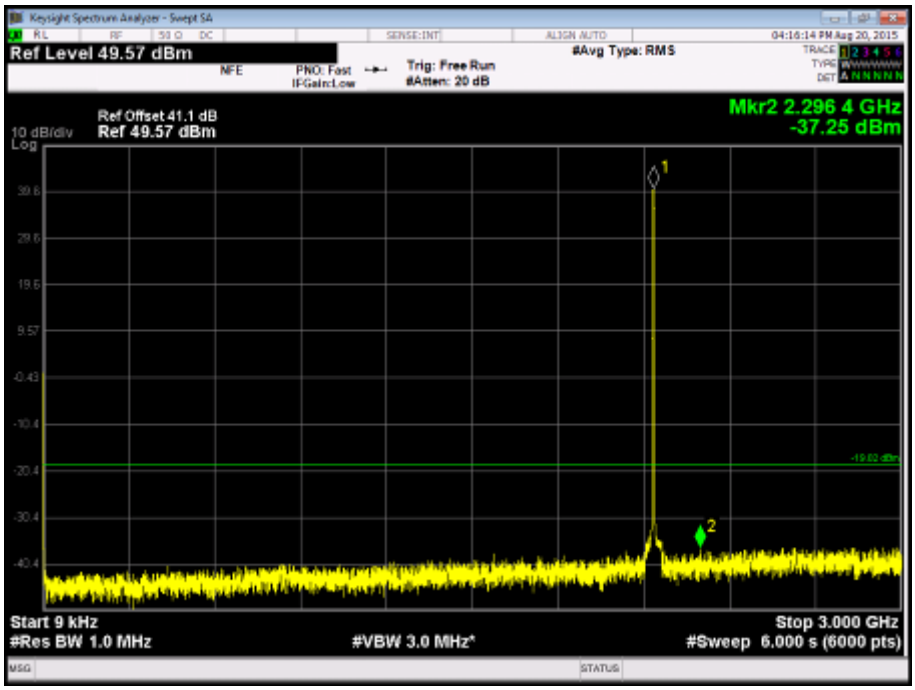
Channel Position B - QPSK / Bandwidth 5.0MHz - 10GHz - 15GHz



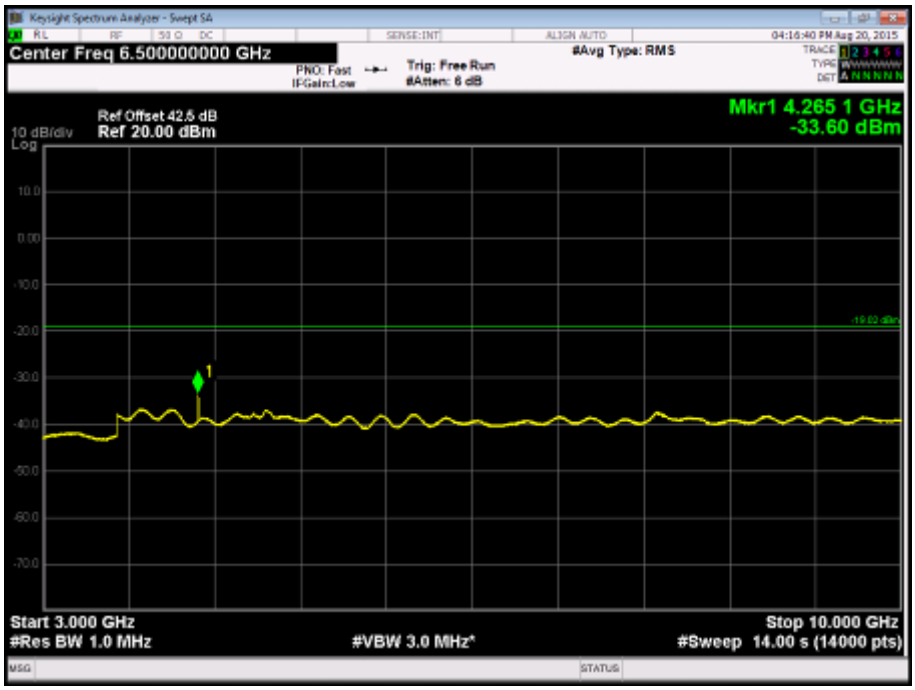
Channel Position B - QPSK / Bandwidth 5.0MHz - 15GHz - 22GHz



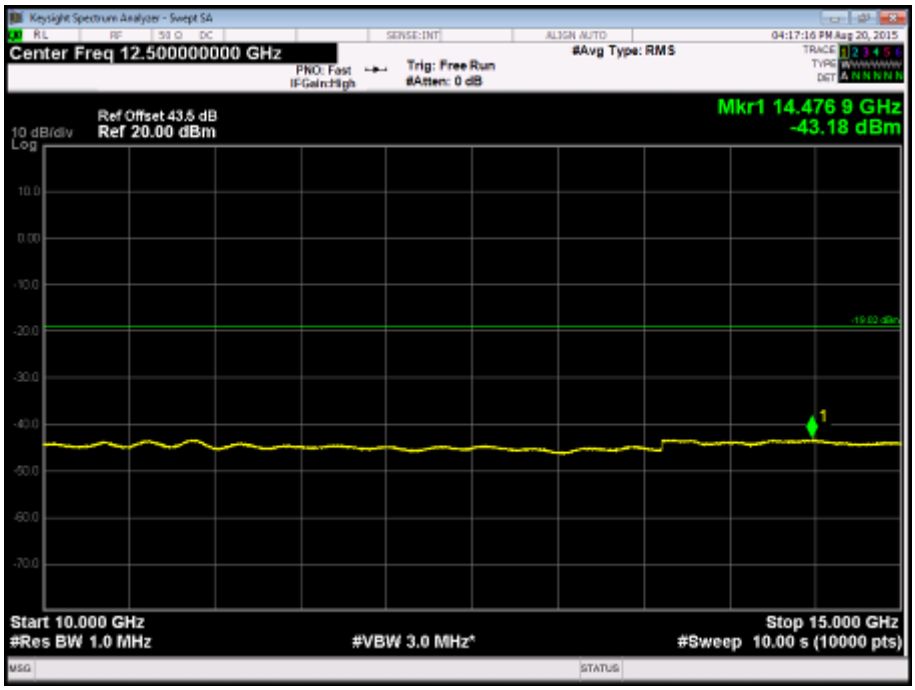
Channel Position M - QPSK / Bandwidth 5.0MHz - 9kHz - 3GHz



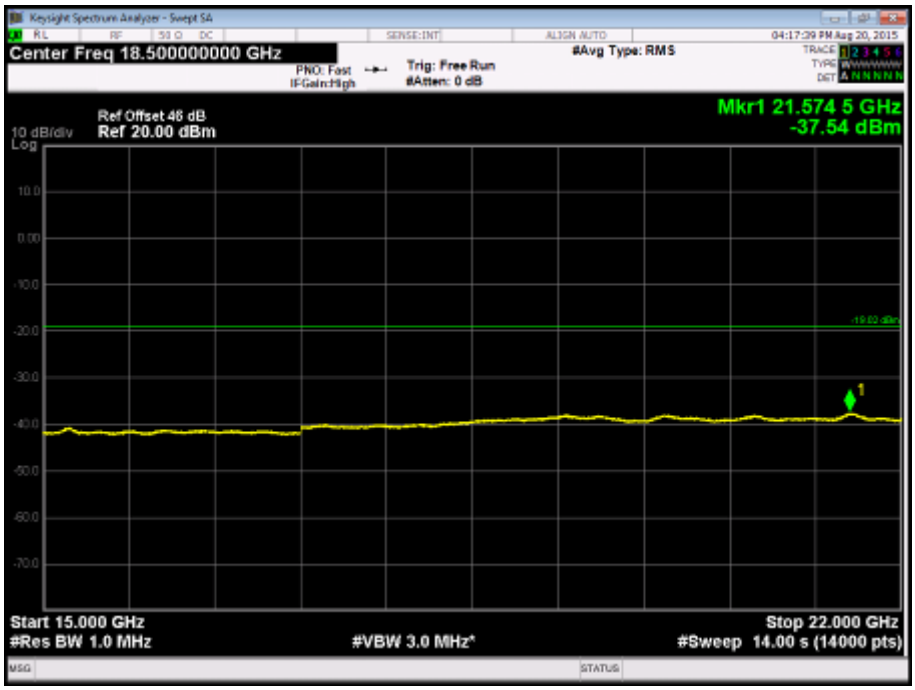
Channel Position M - QPSK / Bandwidth 5.0MHz - 3GHz - 10GHz



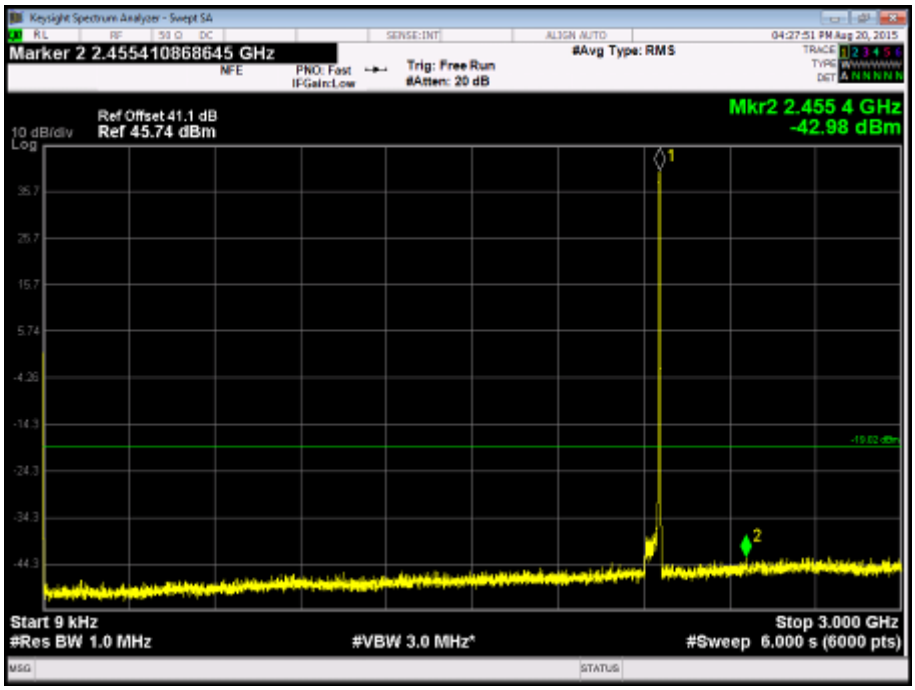
Channel Position M - QPSK / Bandwidth 5.0MHz - 10GHz - 15GHz



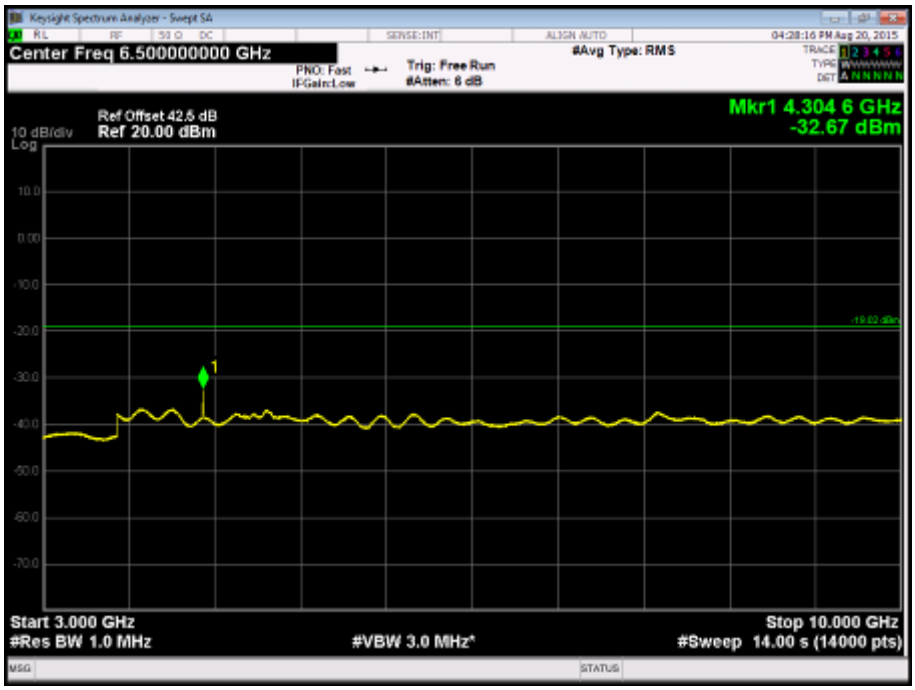
Channel Position M - QPSK / Bandwidth 5.0MHz - 15GHz - 22GHz



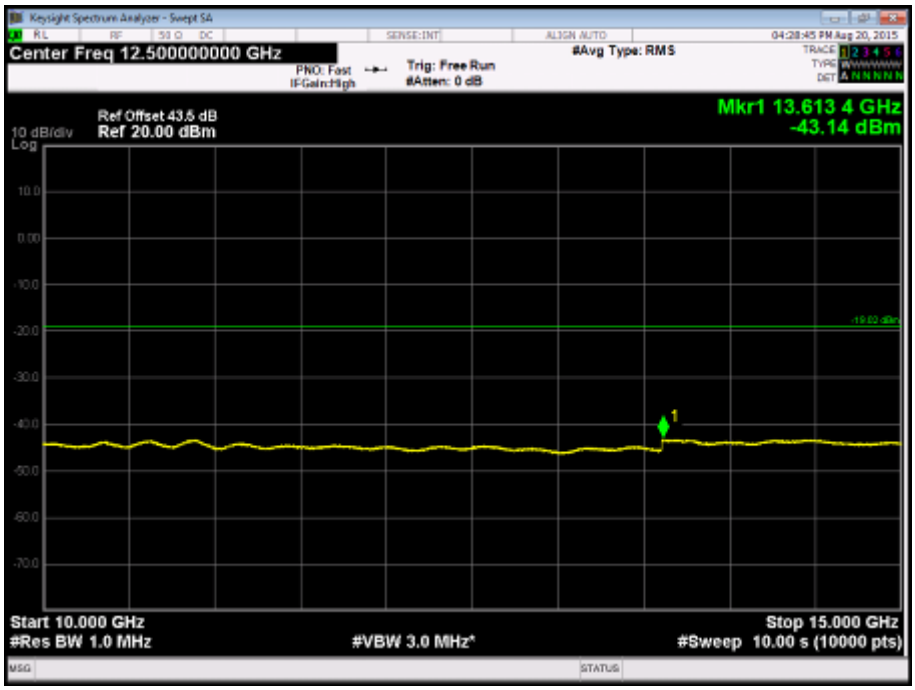
Channel Position T - QPSK / Bandwidth 5.0MHz - 9kHz - 3GHz



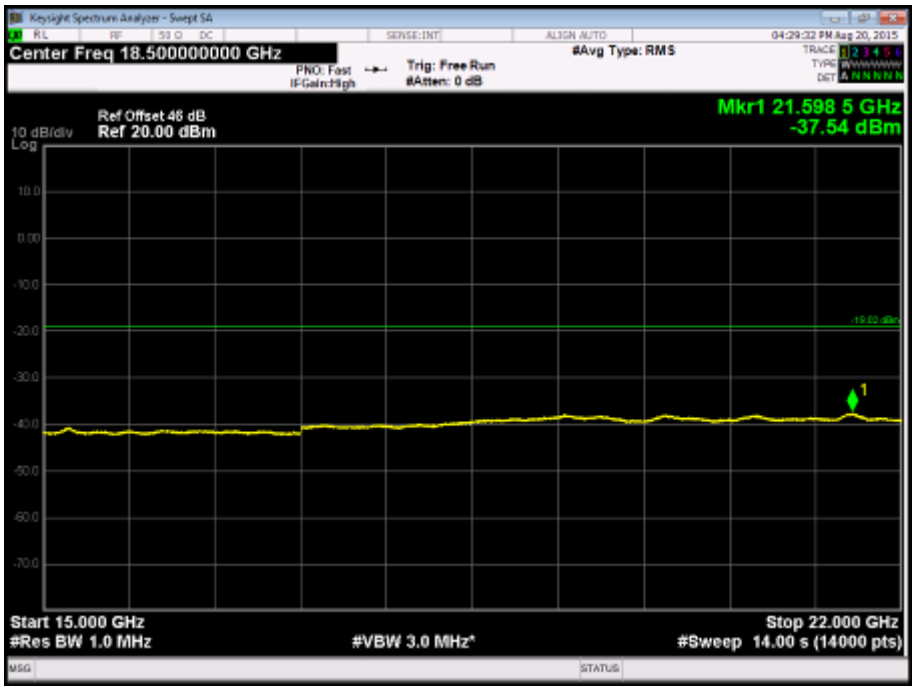
Channel Position T - QPSK / Bandwidth 5.0MHz - 3GHz - 10GHz



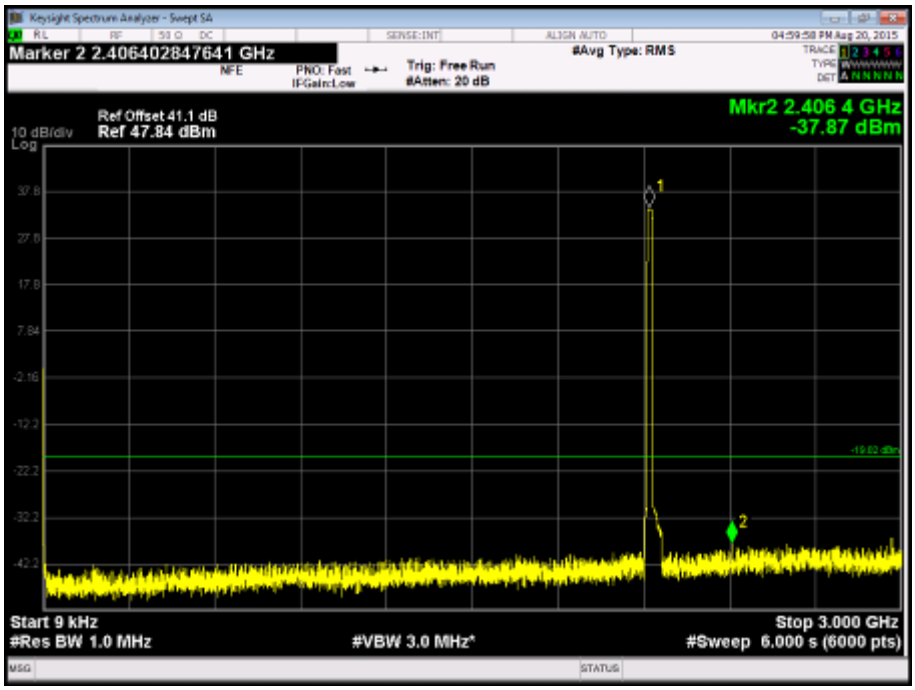
Channel Position T - QPSK / Bandwidth 5.0MHz - 10GHz - 15GHz



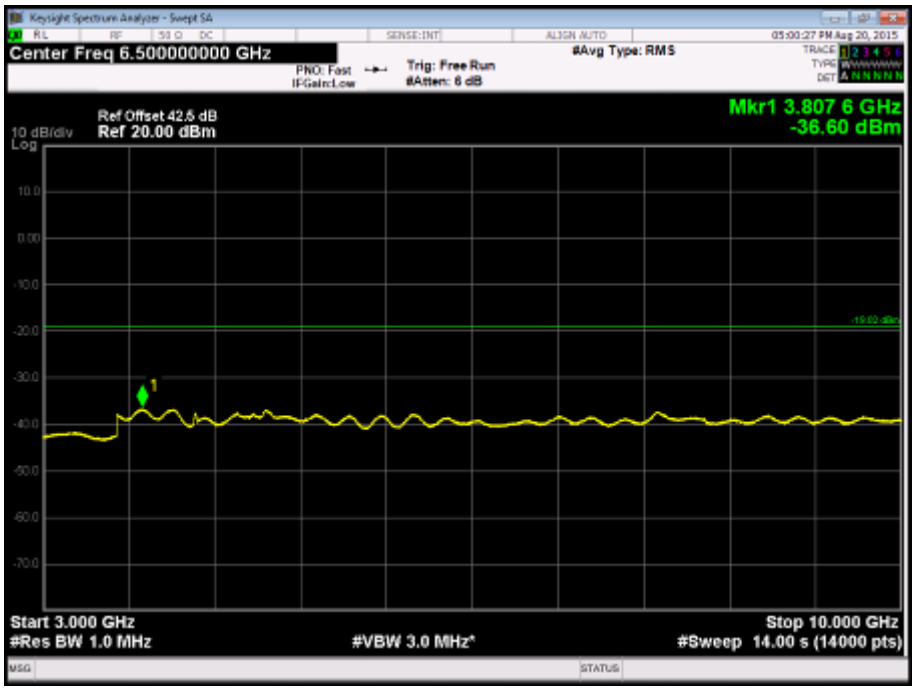
Channel Position T - QPSK / Bandwidth 5.0MHz - 15GHz - 22GHz



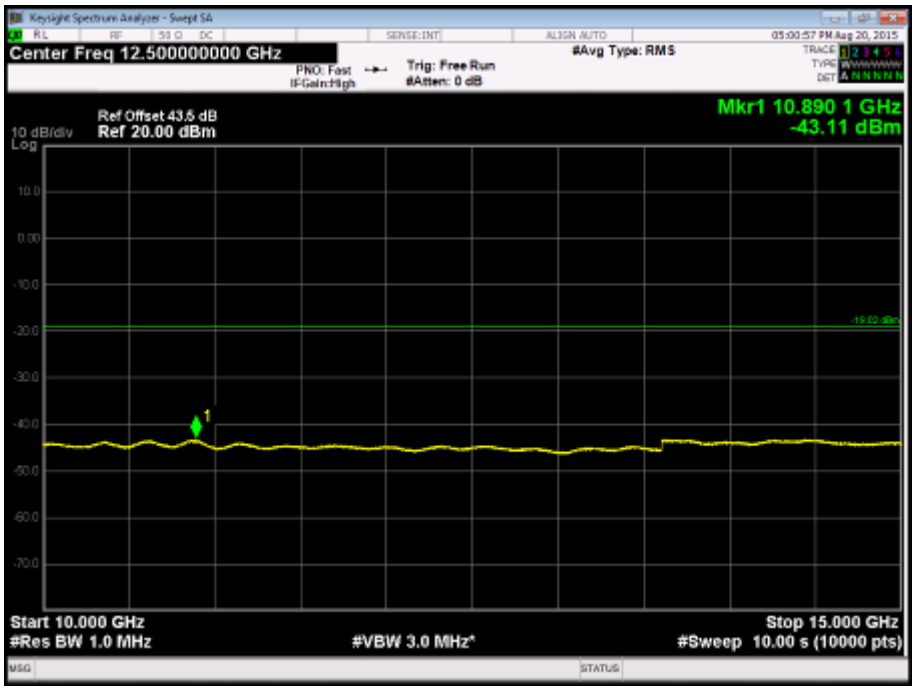
Channel Position B - QPSK / Bandwidth 20.0MHz - 9kHz - 3GHz



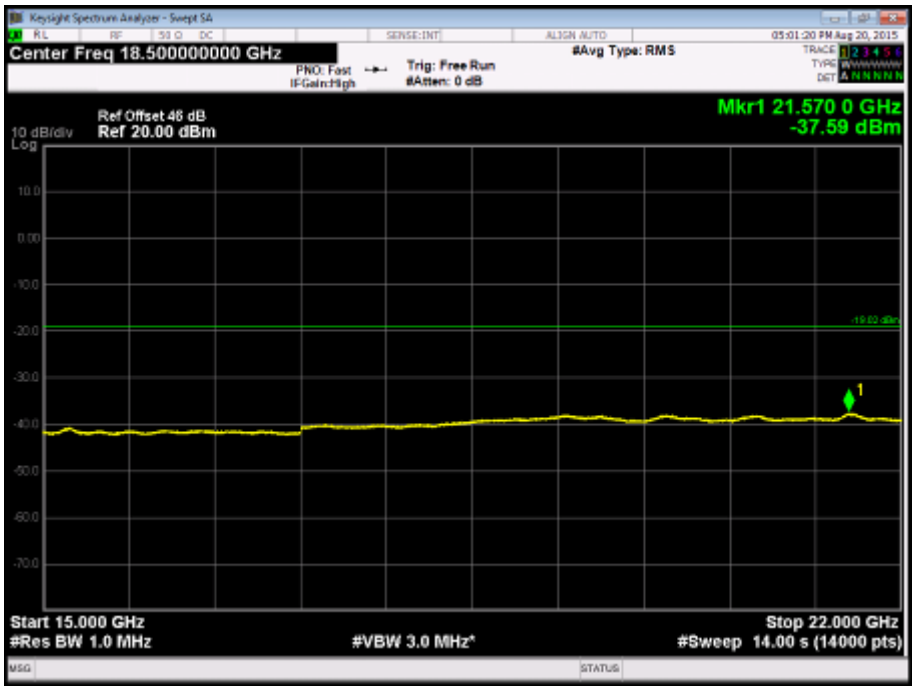
Channel Position B - QPSK / Bandwidth 20.0MHz - 3GHz - 10GHz



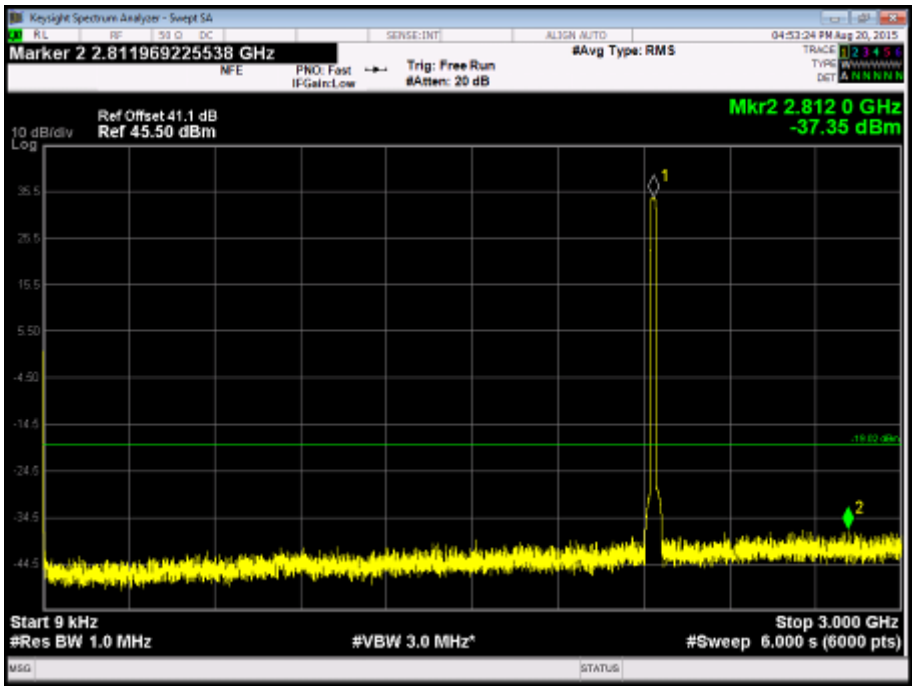
Channel Position B - QPSK / Bandwidth 20.0MHz - 10GHz - 15GHz



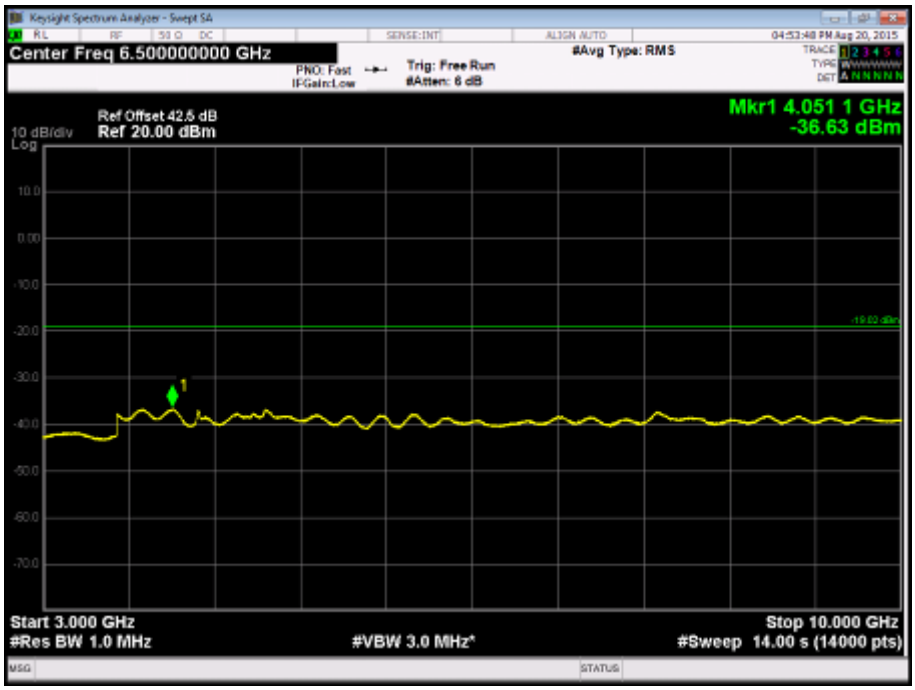
Channel Position B - QPSK / Bandwidth 20.0MHz - 15GHz - 22GHz



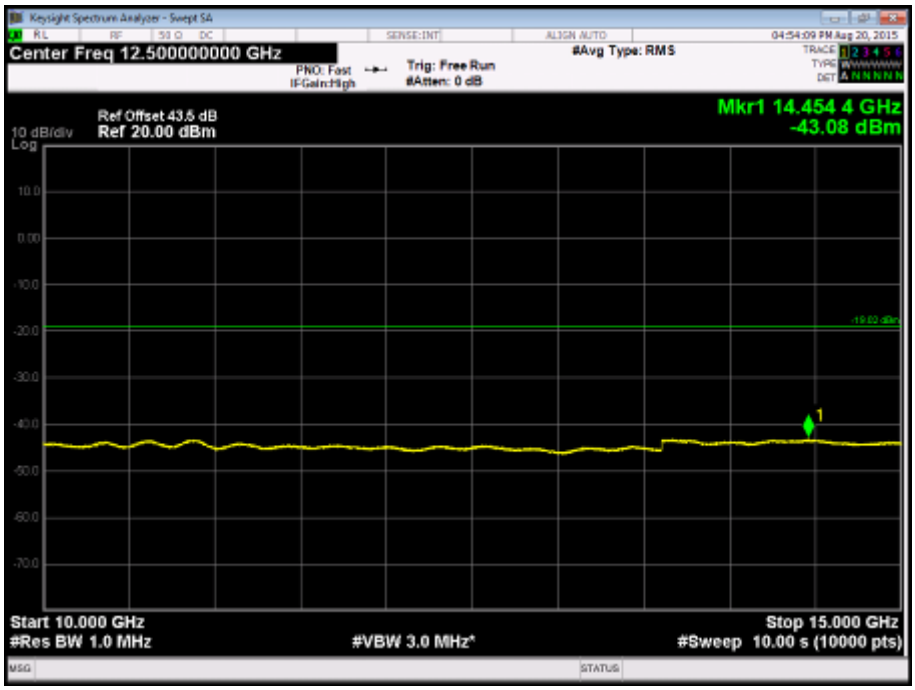
Channel Position M - QPSK / Bandwidth 20.0MHz - 9kHz - 3GHz



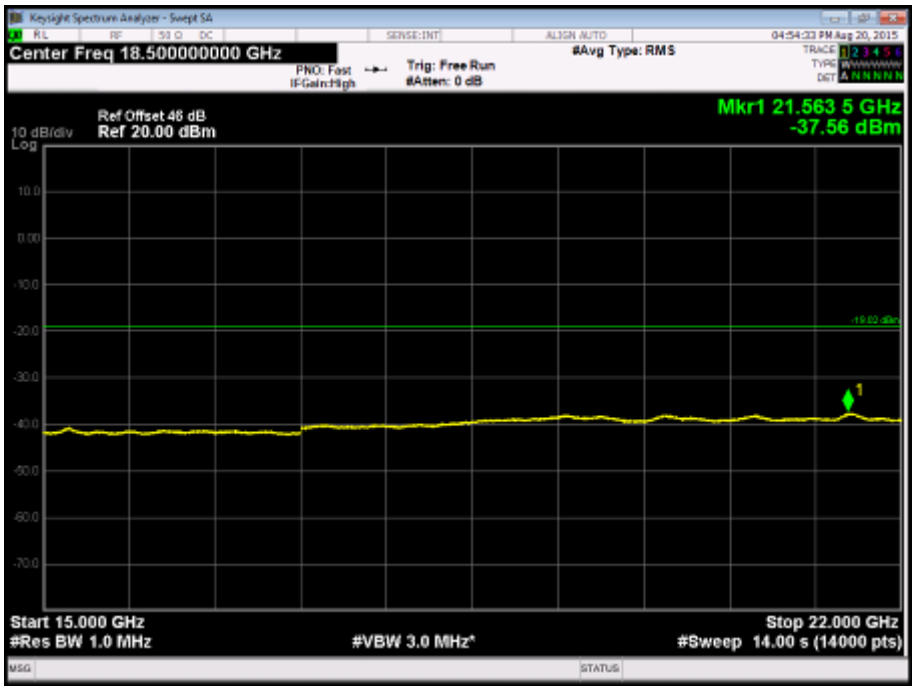
Channel Position M - QPSK / Bandwidth 20.0MHz - 3GHz - 10GHz



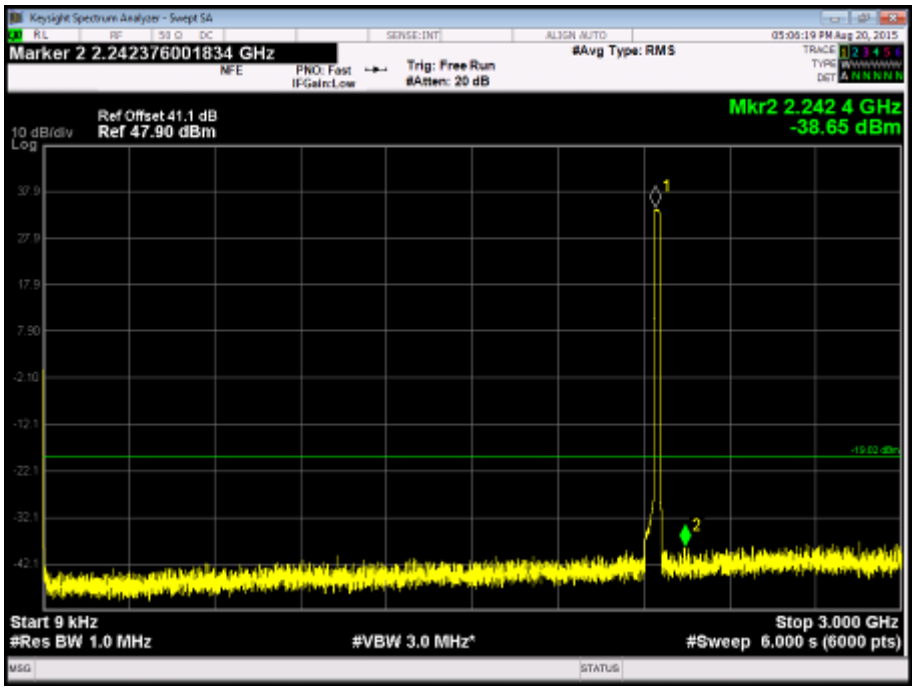
Channel Position M - QPSK / Bandwidth 20.0MHz - 10GHz - 15GHz



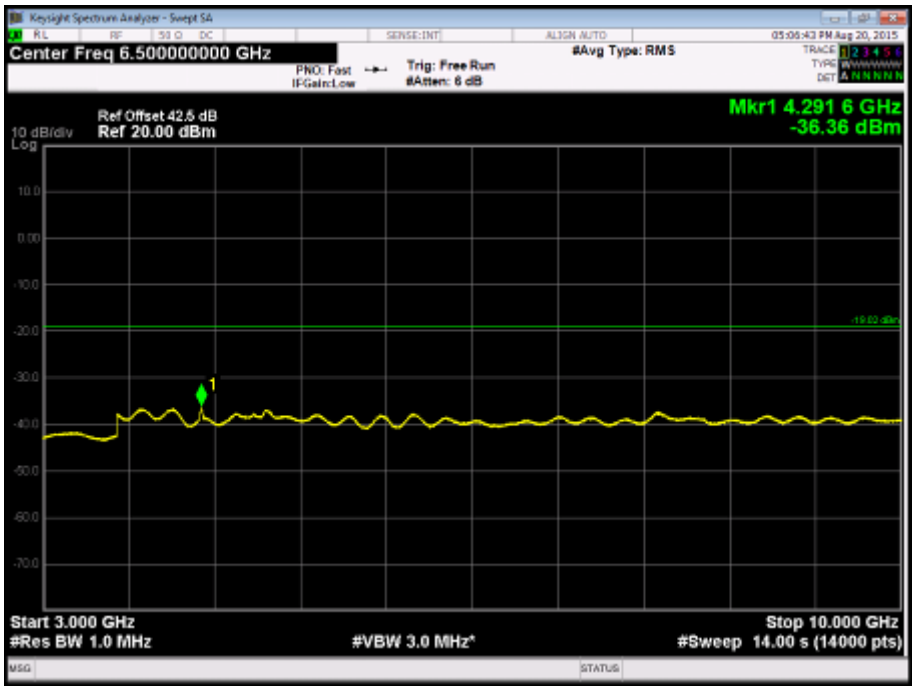
Channel Position M - QPSK / Bandwidth 20.0MHz - 15GHz - 22GHz



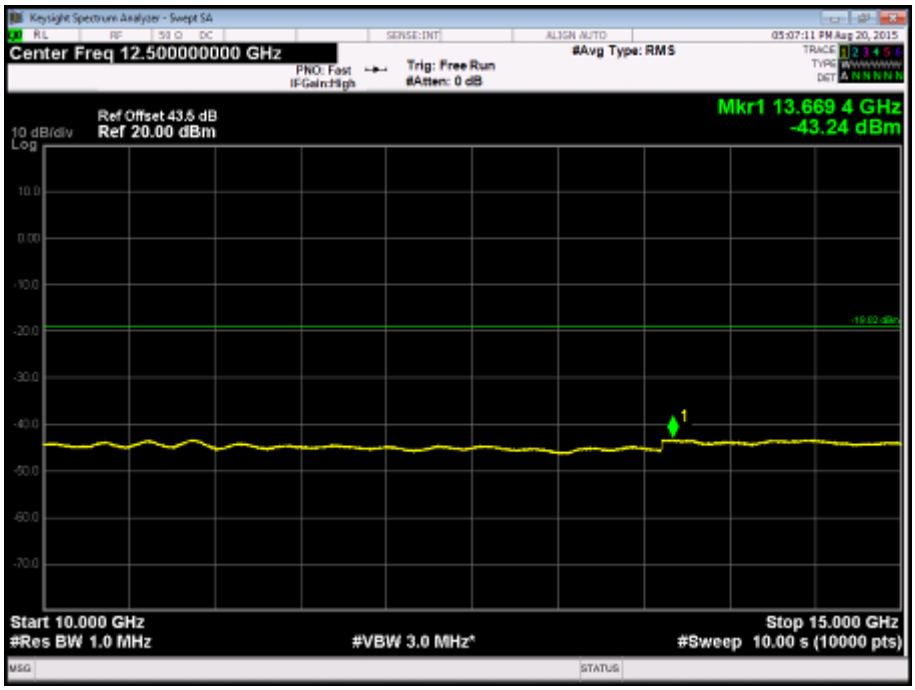
Channel Position T - QPSK / Bandwidth 20.0MHz - 9kHz - 3GHz



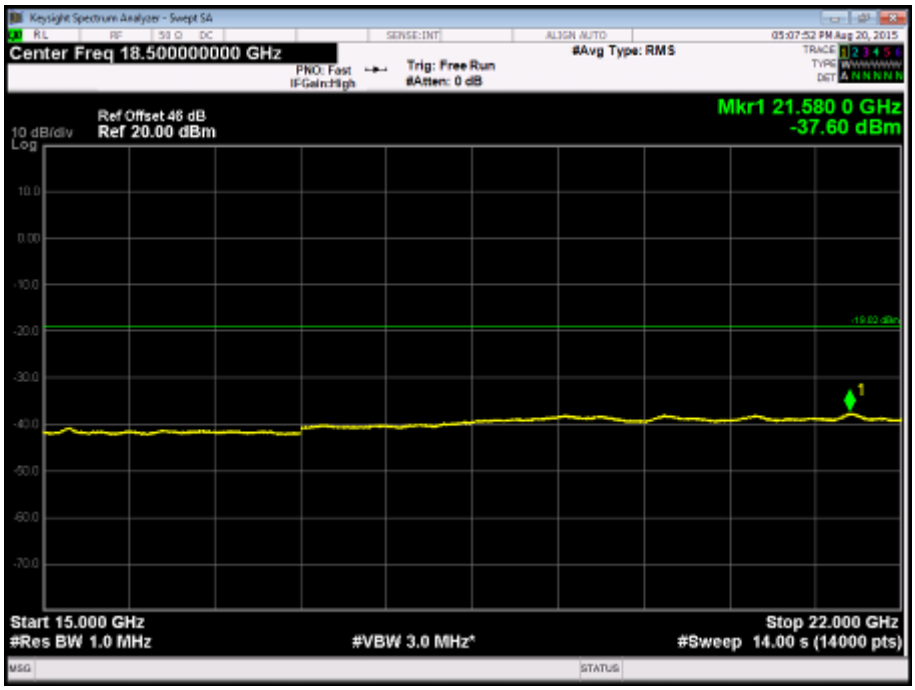
Channel Position T - QPSK / Bandwidth 20.0MHz - 3GHz - 10GHz



Channel Position T - QPSK / Bandwidth 20.0MHz - 10GHz - 15GHz



Channel Position T - QPSK / Bandwidth 20.0MHz - 15GHz - 22GHz

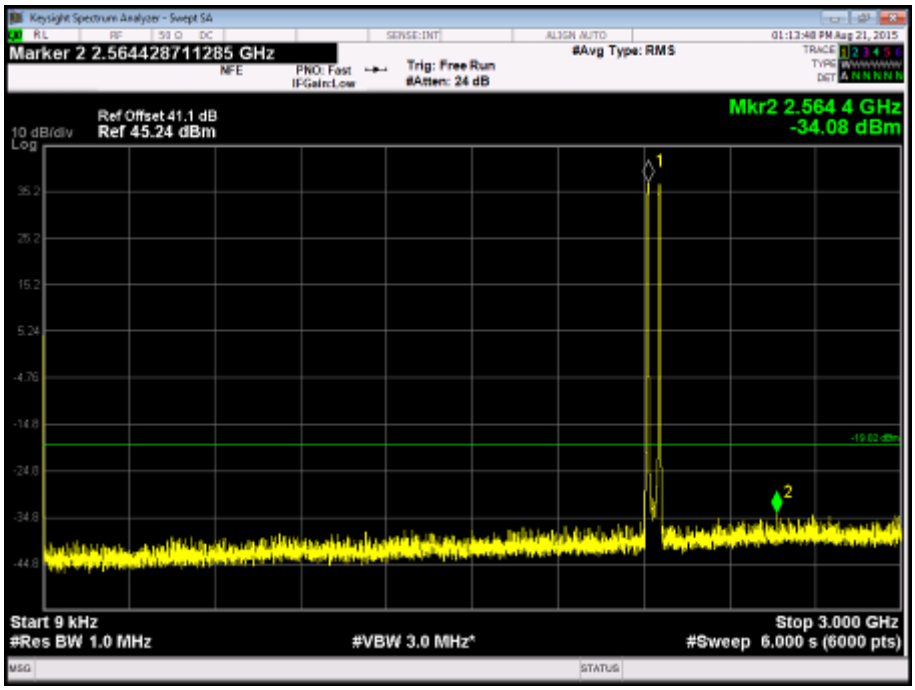


Configuration L-MIMO-MC 1 (2C)

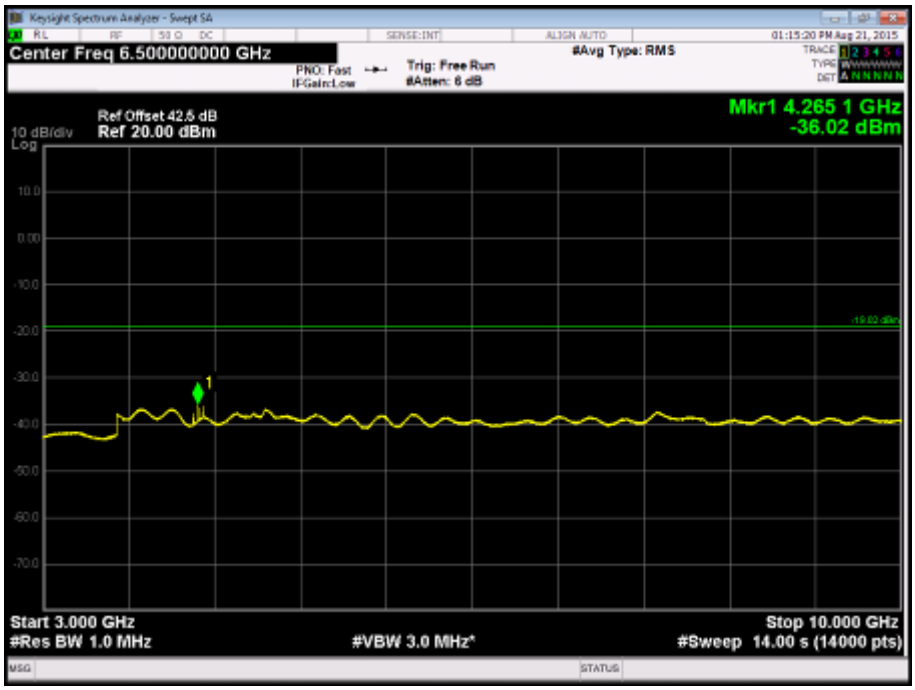
Maximum Output Power 43.0dBm per carrier

Channel Position	Bandwidth	Channel Frequency
Channel Position M_{RFBW}	5.0MHz	2112.5MHz + 2152.5MHz
Channel Position M_{RFBW}	20.0MHz	2120.0MHz + 2145.0MHz

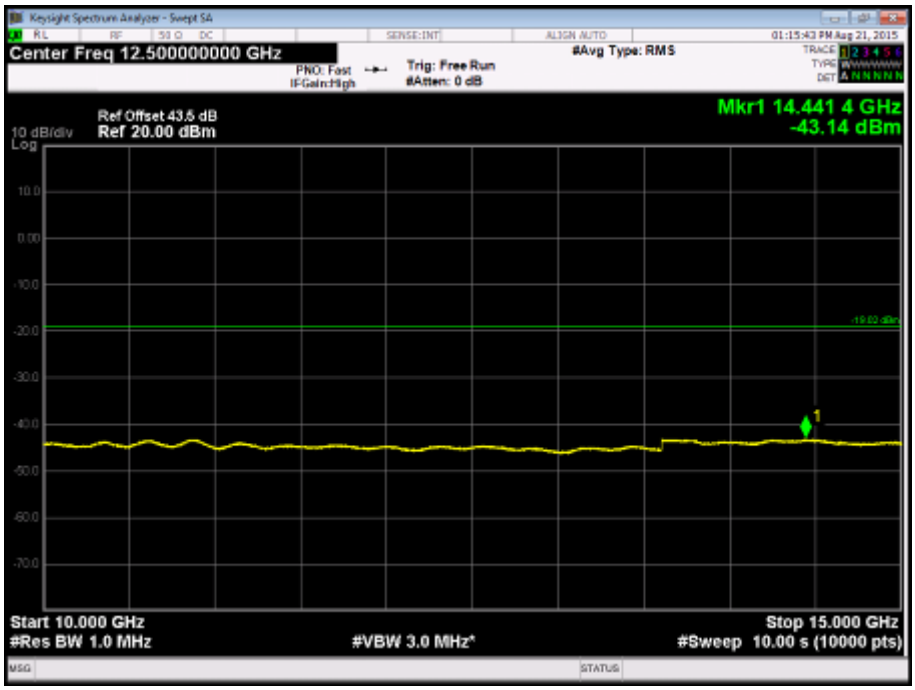
Channel Position M_{RFBW} - QPSK / Bandwidth 5.0MHz - 9kHz - 3GHz



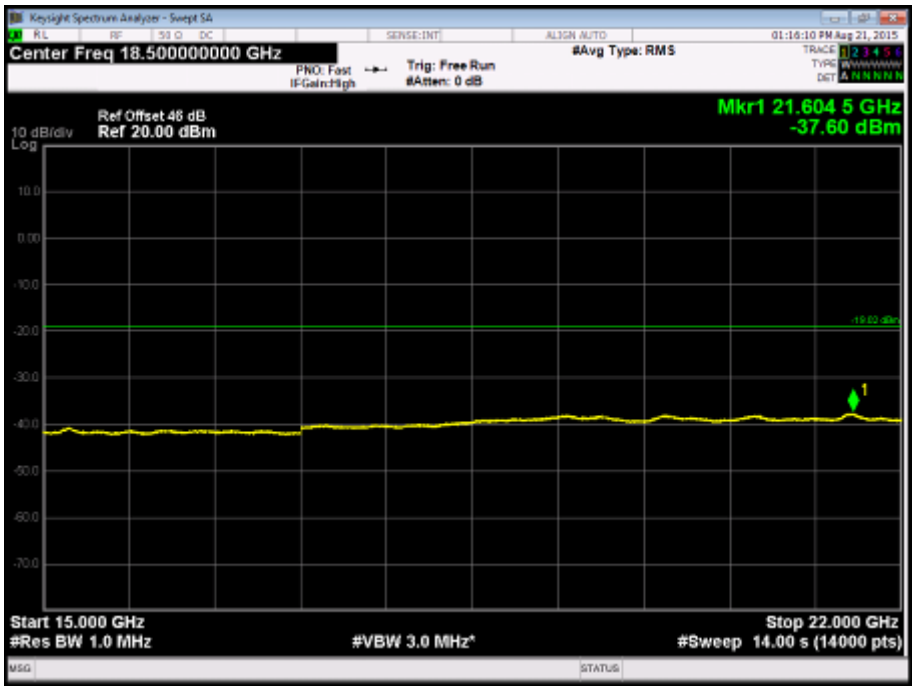
Channel Position M_{RFBW} - QPSK / Bandwidth 5.0MHz - 3GHz - 10GHz



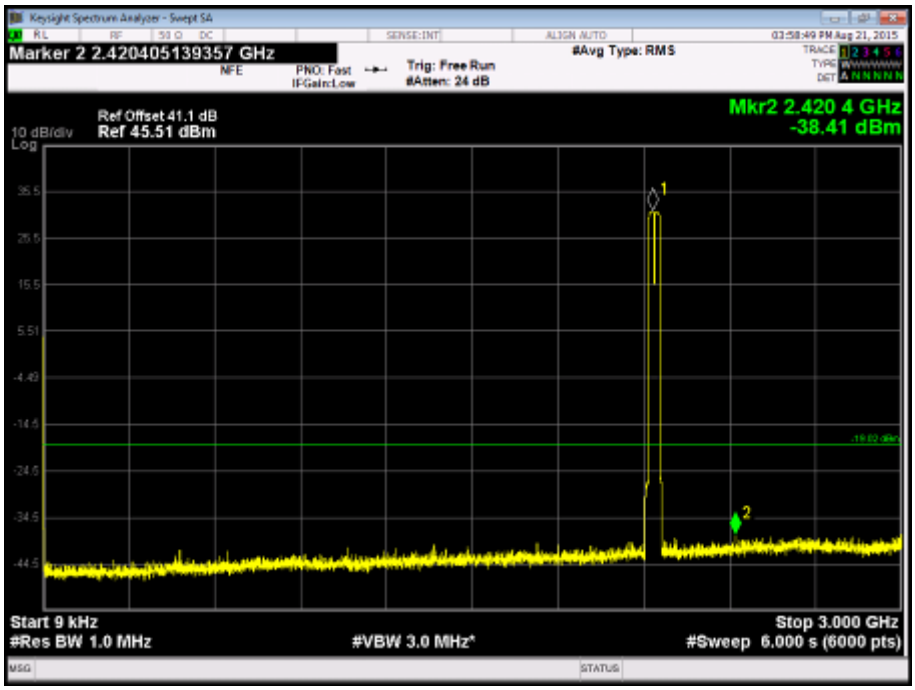
Channel Position M_{RFBW} - QPSK / Bandwidth 5.0MHz - 10GHz - 15GHz



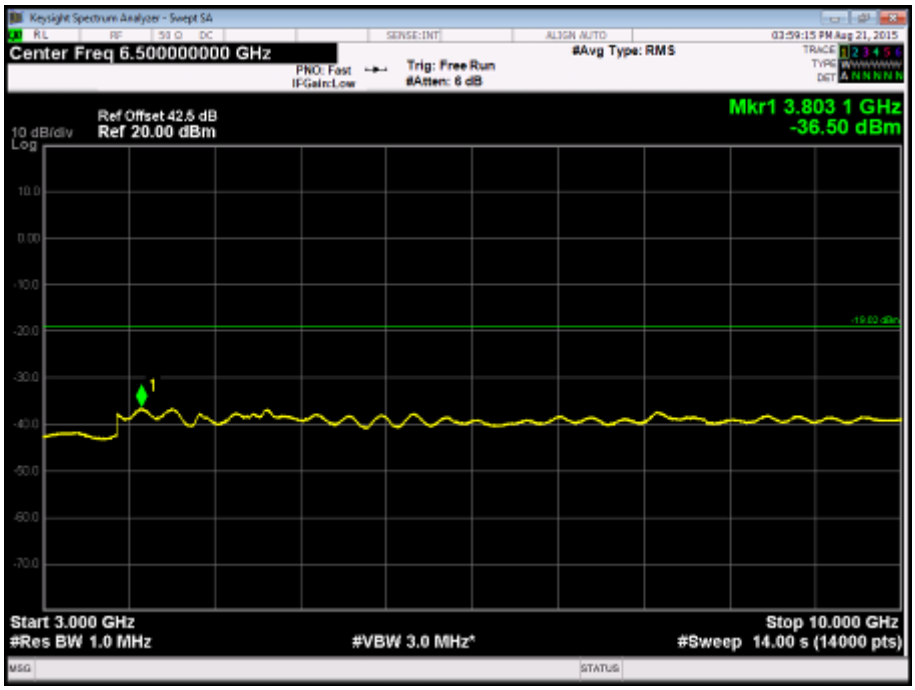
Channel Position M_{RFBW} - QPSK / Bandwidth 5.0MHz - 15GHz - 22GHz



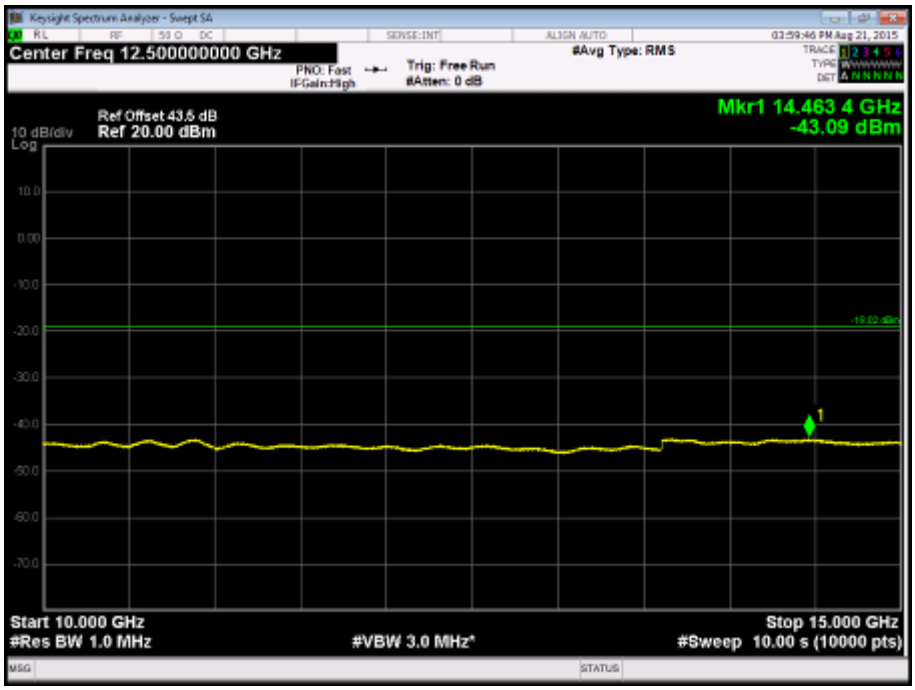
Channel Position M_{RFBW} - QPSK / Bandwidth 20.0MHz - 9kHz - 3GHz



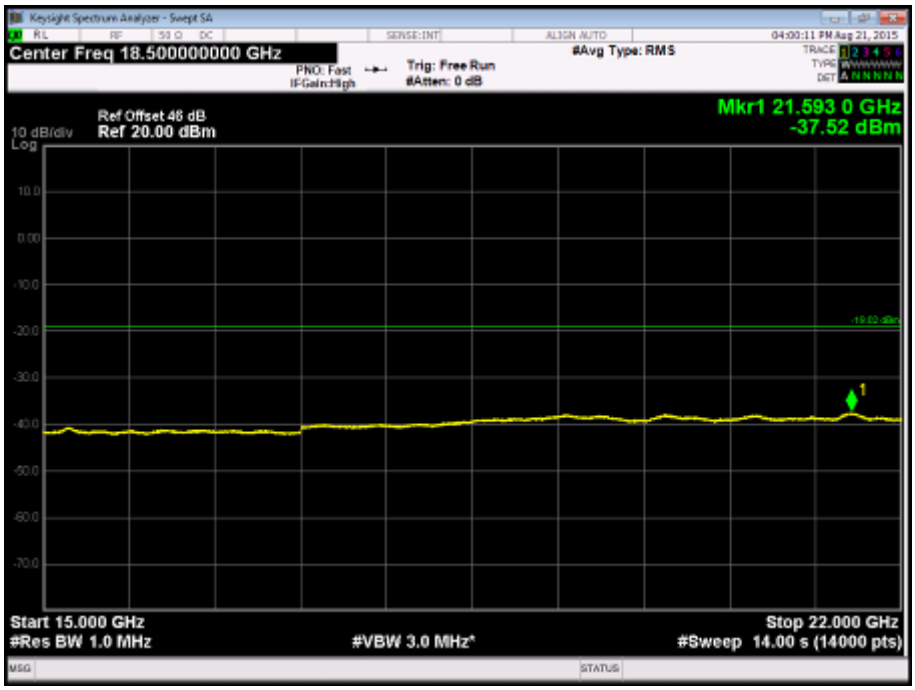
Channel Position M_{RFBW} - QPSK / Bandwidth 20.0MHz - 3GHz - 10GHz



Channel Position M_{RFBW} - QPSK / Bandwidth 20.0MHz - 10GHz - 15GHz



Channel Position M_{RFBW} - QPSK / Bandwidth 20.0MHz - 15GHz - 22GHz

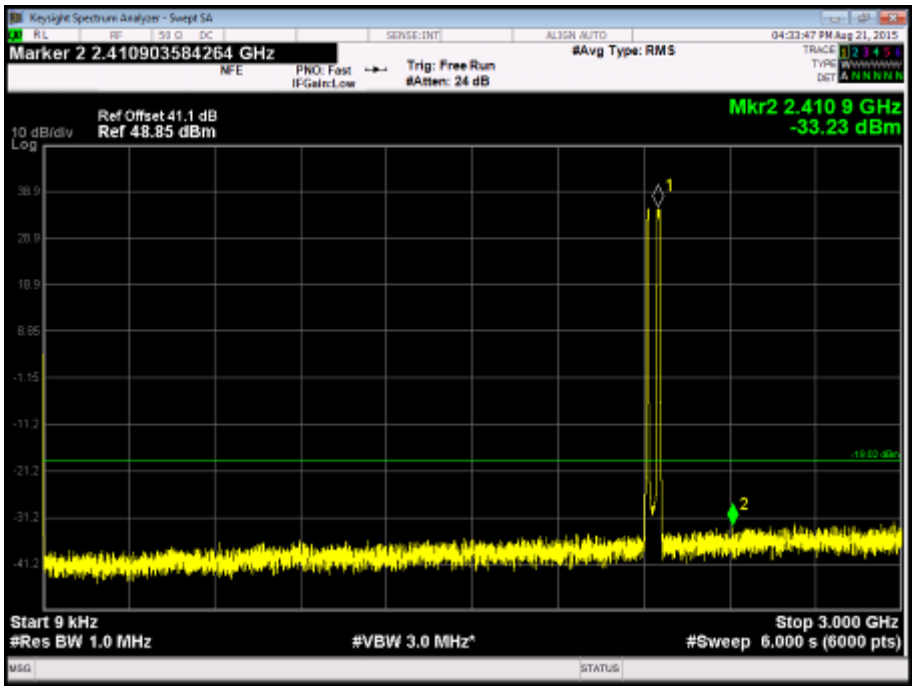


Configuration L-MIMO-MC 2 (3C)

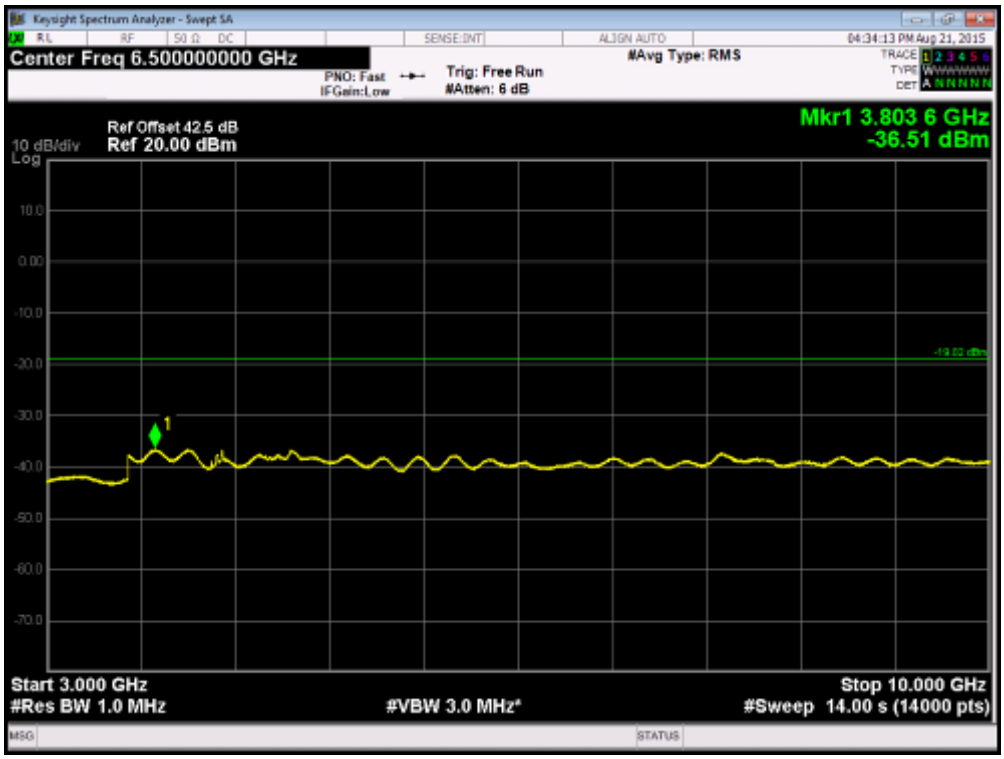
Maximum Output Power 41.2dBm per carrier

Channel Position	Bandwidth	Channel Frequency
Channel Position M_{RFBW}	5.0MHz	2112.5MHz + 2147.5MHz + 2152.5MHz
Channel Position M_{RFBW}	15.0MHz	2117.5MHz + 2132.5MHz + 2147.5MHz

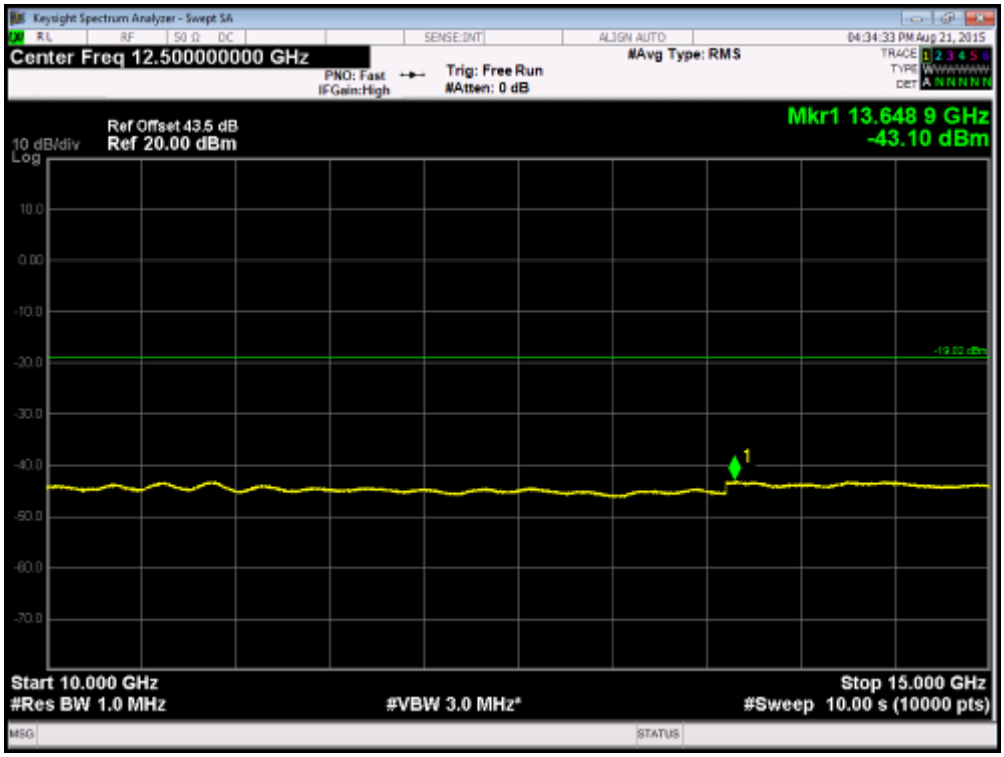
Channel Position M_{RFBW} - QPSK / Bandwidth 5.0MHz - 9kHz - 3GHz



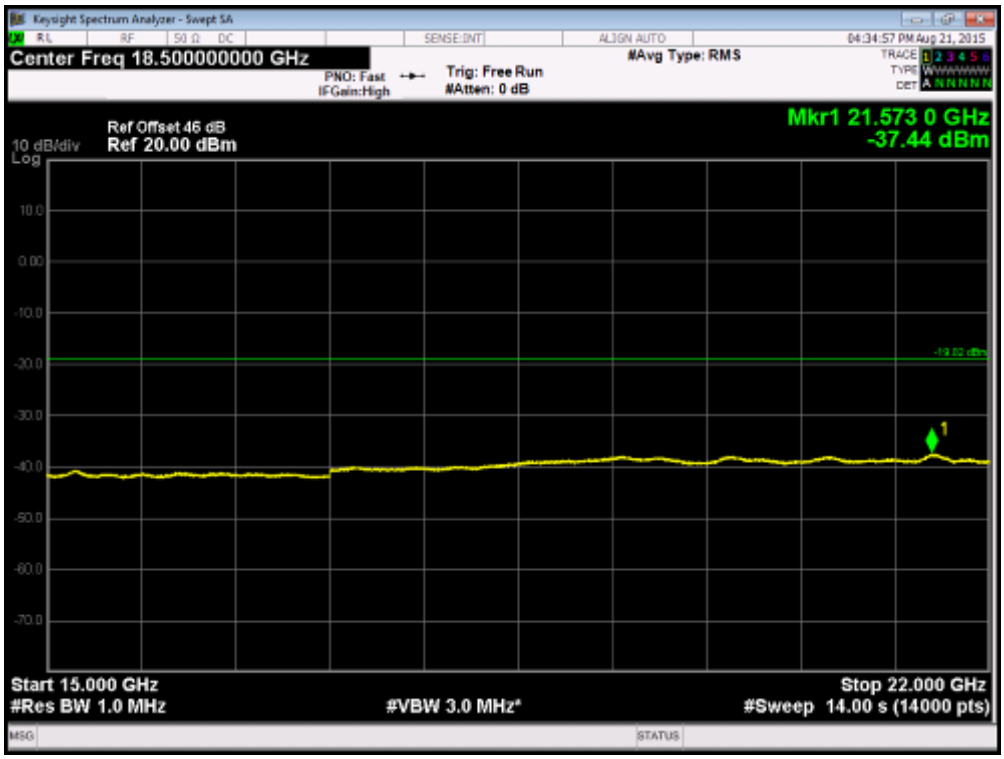
Channel Position M_{RFBW} - QPSK / Bandwidth 5.0MHz - 3GHz - 10GHz



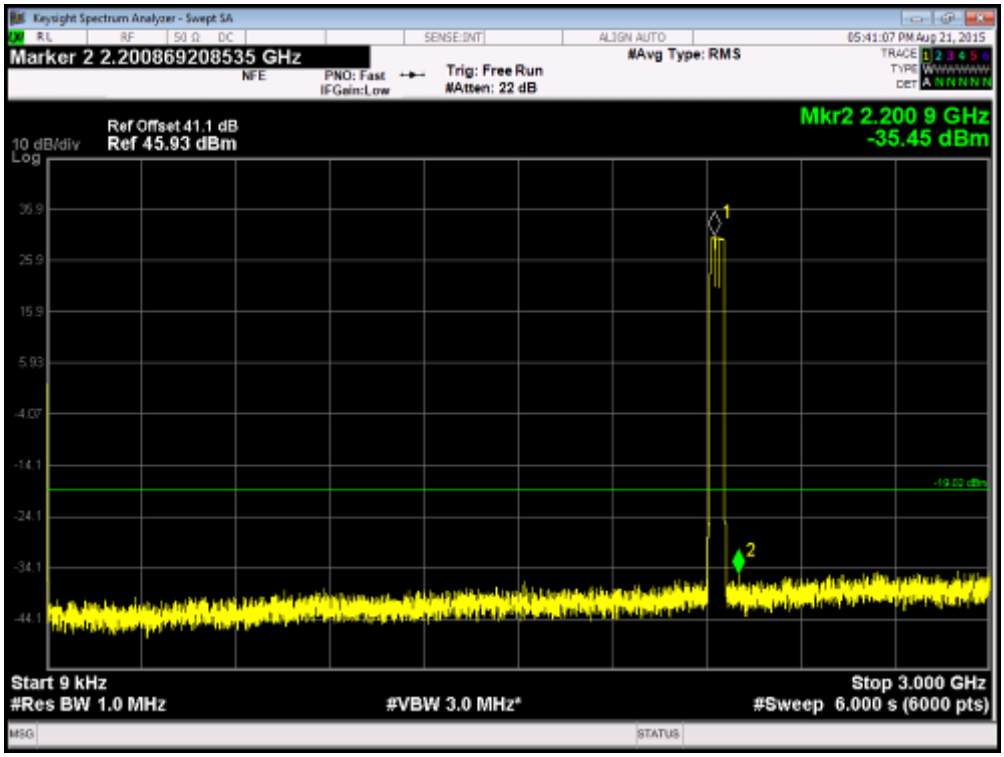
Channel Position M_{RFBW} - QPSK / Bandwidth 5.0MHz - 10GHz - 15GHz



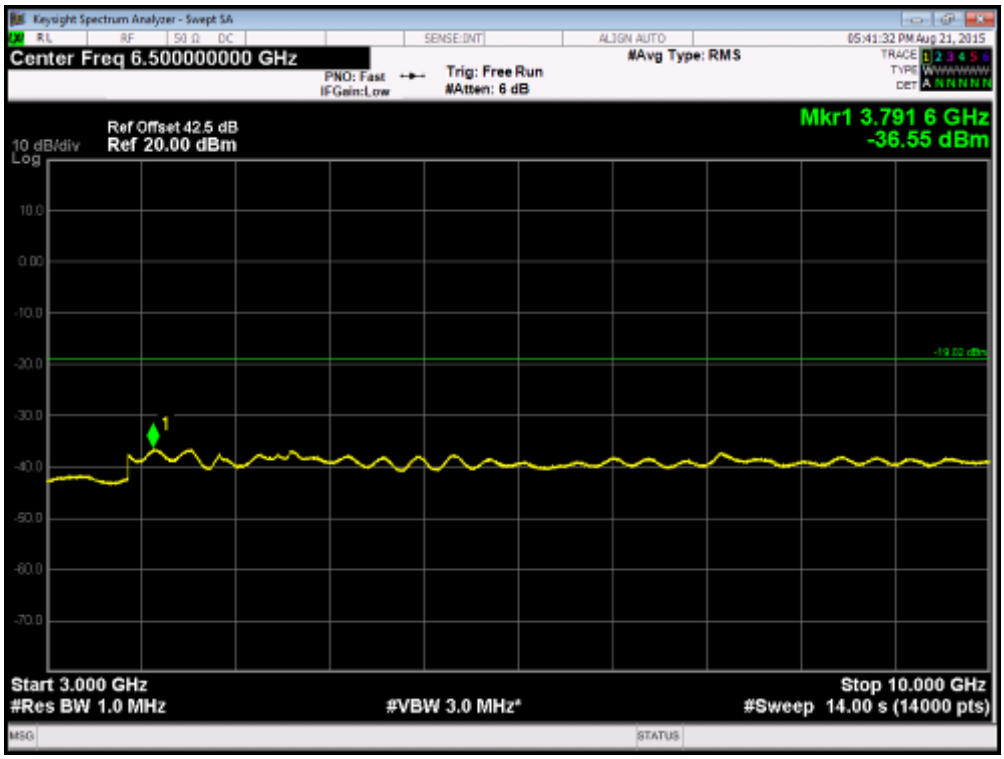
Channel Position M_{RFBW} - QPSK / Bandwidth 5.0MHz - 15GHz - 22GHz



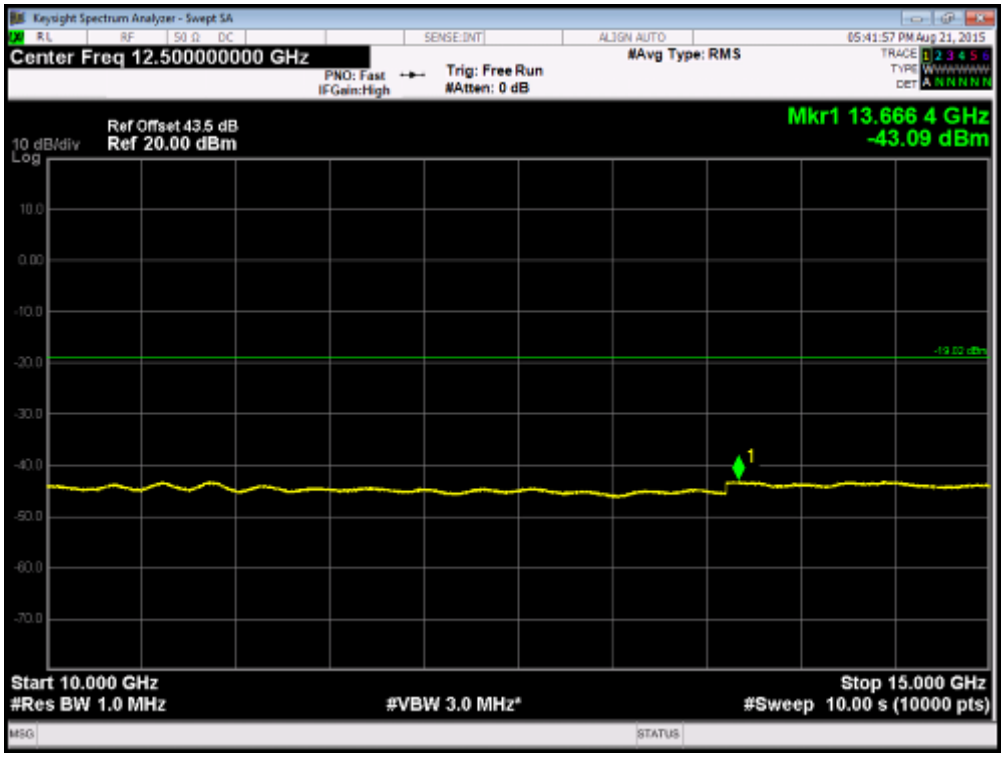
Channel Position M_{RFBW} - QPSK / Bandwidth 15.0MHz - 9kHz - 3GHz



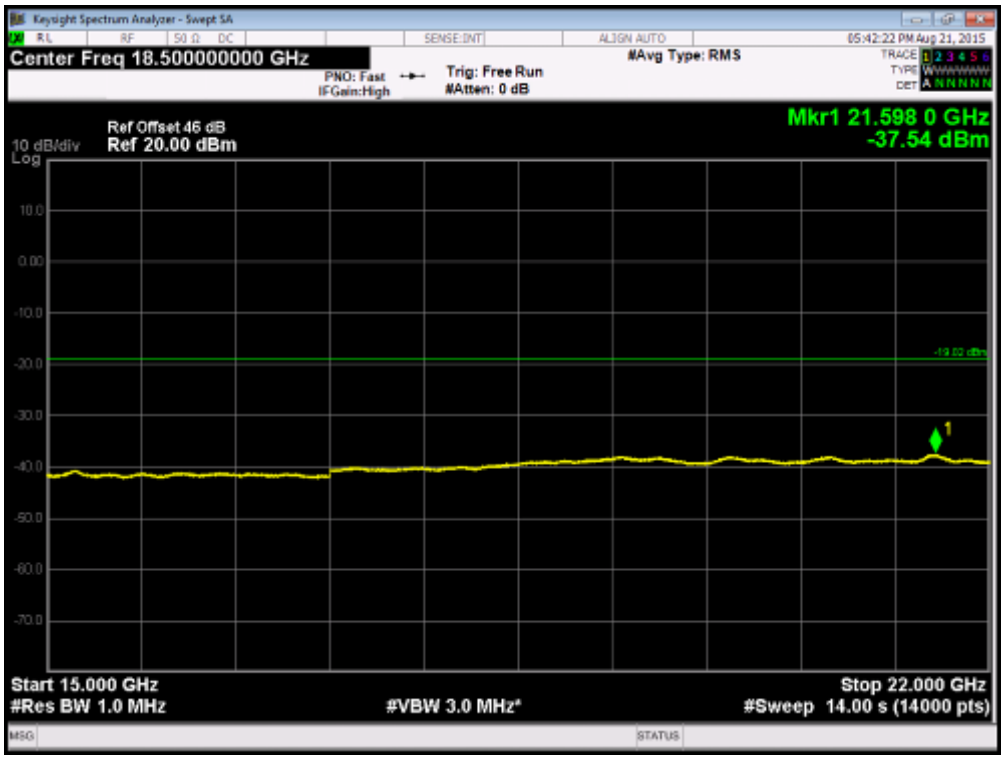
Channel Position M_{RFBW} - QPSK / Bandwidth 15.0MHz - 3GHz - 10GHz



Channel Position M_{RFBW} - QPSK / Bandwidth 15.0MHz - 10GHz - 15GHz



Channel Position M_{RFBW} - QPSK / Bandwidth 15.0MHz - 15GHz - 22GHz



Configuration W+L-MIMO-MC 1 (1W+1L)

Maximum Output Power 43.0dBm per carrier

Channel Position	Bandwidth	Channel Frequency
Channel Position M_{RFBW}	5.0MHz	(W) 2112.4MHz + (L) 2152.5MHz

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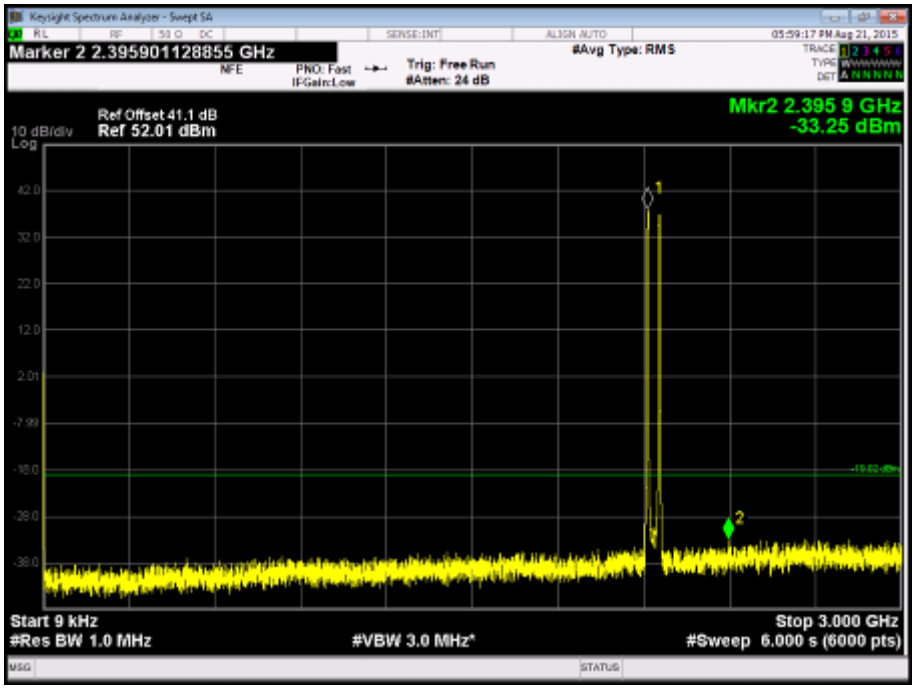
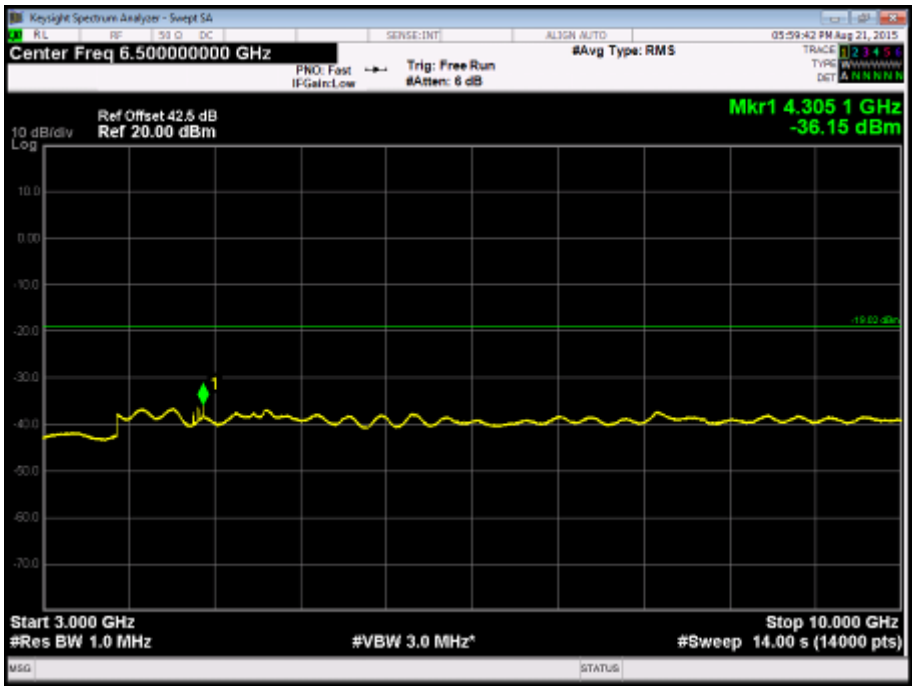
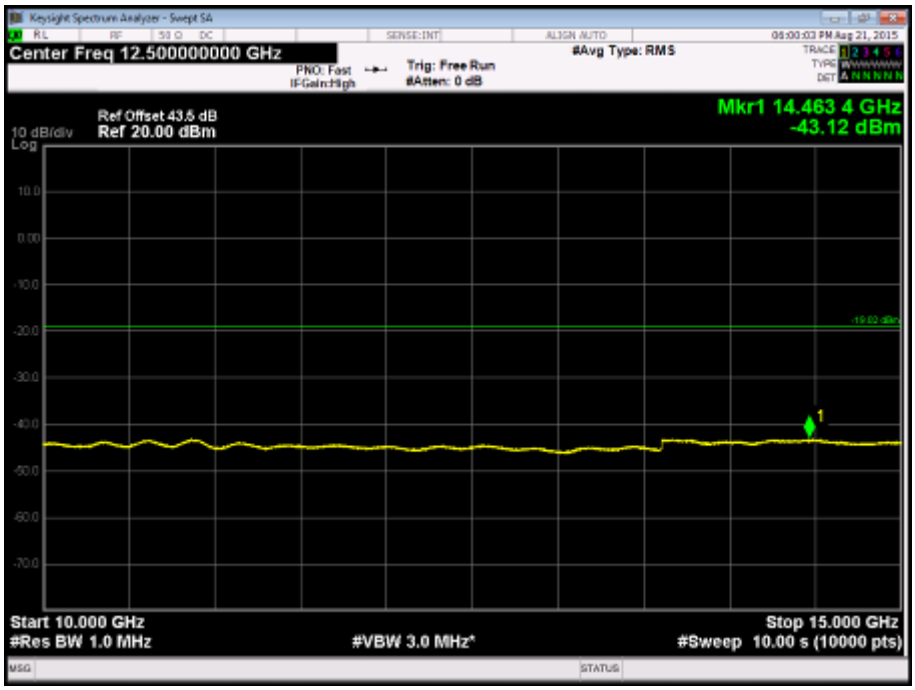
Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz - 9kHz - 3GHz



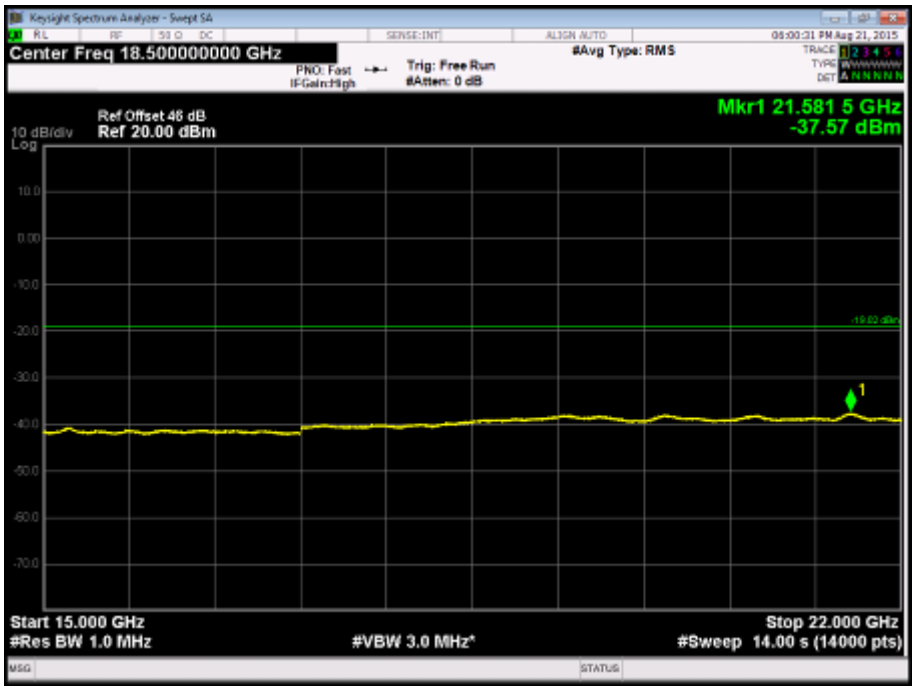
Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz - 3GHz - 10GHz



Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz - 10GHz - 15GHz



Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz - 15GHz - 22GHz

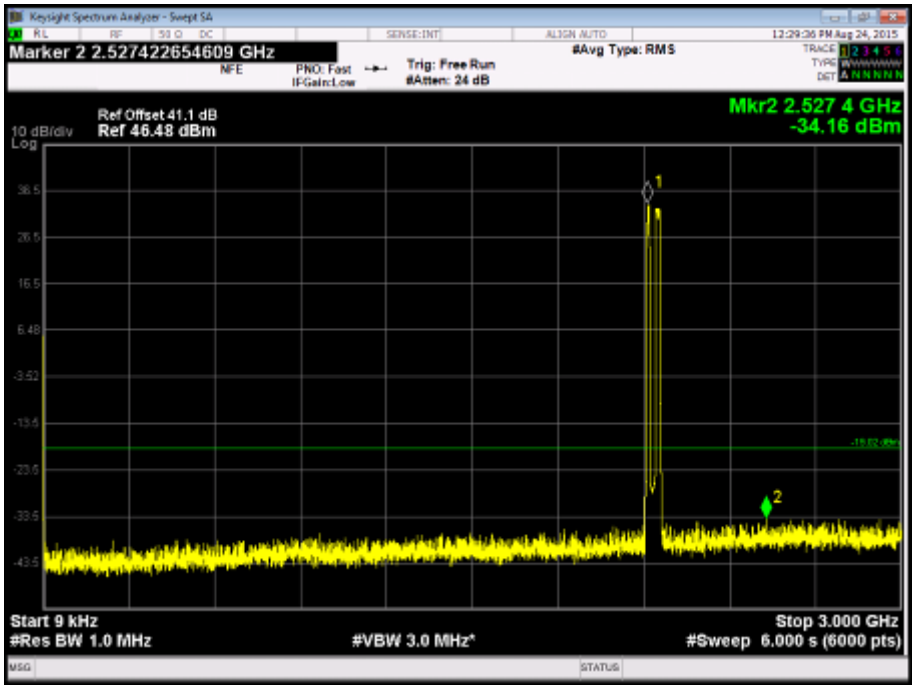


Configuration W+L-MIMO-MC 3 (2W+1L)

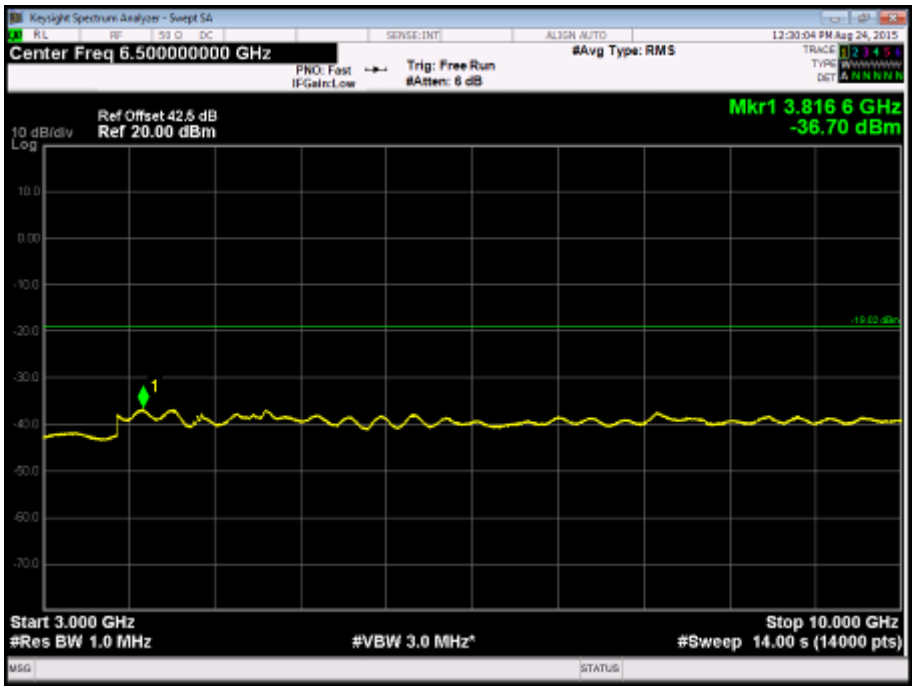
Maximum Output Power 41.2dBm per carrier

Channel Position	Bandwidth	Channel Frequency
Channel Position M_{RFBW}	5.0MHz	(W) 2112.4MHz + (W) 2117.4MHz + (L) 2152.5MHz

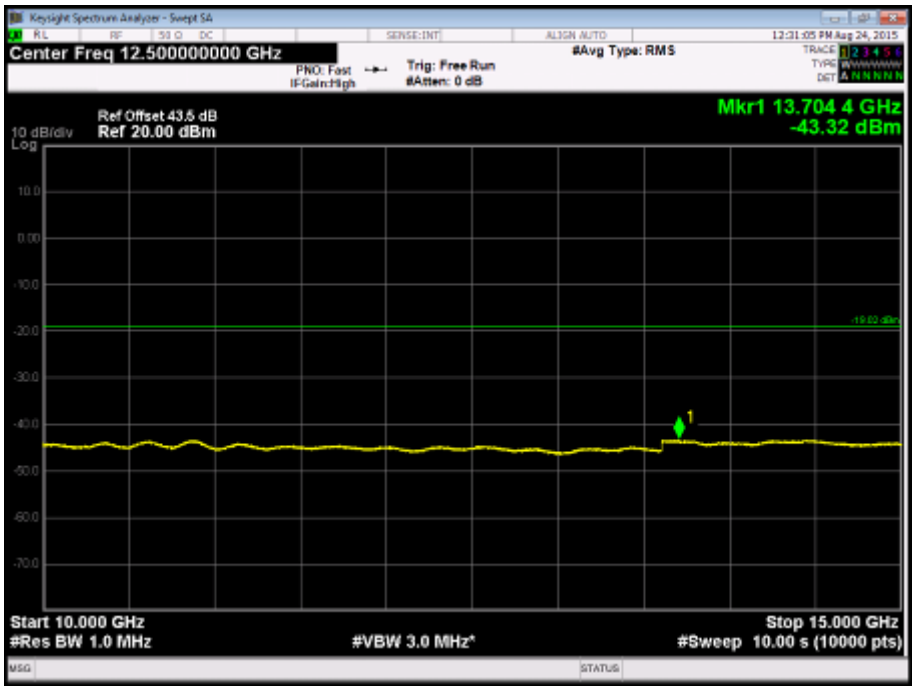
Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz - 9kHz - 3GHz



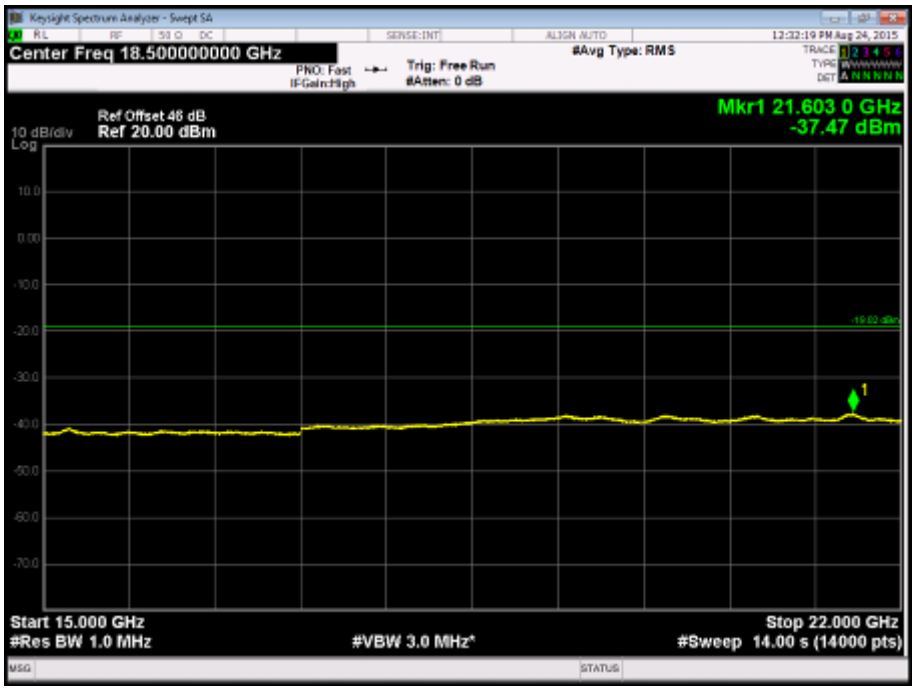
Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz - 3GHz - 10GHz



Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz - 10GHz - 15GHz



Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 5.0 MHz - 15GHz - 22GHz



Limit	-13dBm for outside a licensee's frequency band(s) of operation

Remarks

All the unwanted emissions of EUT does not exceed the limitations at the frequency range of 9kHz to 22GHz.

2.6 FREQUENCY STABILITY

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 27, Clause 27.54
Industry Canada RSS-139, Clause 6.3

2.6.2 Equipment Under Test

RRUS 32 B4, KRC 161 416/1, S/N: D16Q644897

2.6.3 Date of Test and Modification State

26 and 27 August 2015 - Modification State 0

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Environmental Conditions

Ambient Temperature	24.7 - 26.8°C
Relative Humidity	42.0 - 43.0%

2.6.6 Test Method

The test was applied in accordance with test method requirements of FCC Part 27 and RSS-139.

Frequency Error – Temperature Variation

The EUT was tested over the temperature range -30˚C to +50˚C in 10˚C steps with -48 VDC Power Supply. At each temperature step, the Base Station was configured to transmit an [RAT]* at maximum power on the middle channel of the operating band. After achieving thermal balance, the averages of 200 transmission bursts were measured and the result recorded.

Frequency Error – Voltage Variation

The EUT was tested at the supplied voltages varied from 85 to 115 percent of the nominal values of -48 VDC. At +20˚C, the Base Station was configured to transmit an [RAT]* at maximum power on the bottom, middle and top channel of the operating band. The average of 200 transmission bursts was measured and the result recorded.

[RAT]*: WCDMA, LTE (5.0 MHz OBW) – Single Carrier with QPSK modulation.

2.6.7 Test Results

Frequency Error – Temperature Variation

Configuration W-SC

Maximum Output Power 46.0dBm per carrier, Channel Bandwidth 5MHz

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B (2112.4MHz)	Channel Position M (2132.6MHz)	Channel Position T (2152.6MHz)
-48.0	-30°C	-3.09	-2.92	+3.86
	-20°C	+4.50	-3.32	+4.41
	-10°C	-4.35	+3.65	+5.13
	0°C	+4.97	-5.77	+4.69
	+10°C	-3.84	-4.14	+4.51
	+20°C	+3.97	+4.27	+4.88
	+30°C	+4.32	+4.78	+4.66
	+40°C	-4.60	-4.98	+5.02
	+50°C	+3.85	+3.97	-4.73

Configuration L-MIMO-SC

Maximum Output Power 46.0dBm per carrier, Channel Bandwidth 5MHz

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B (2112.5MHz)	Channel Position M (2132.5MHz)	Channel Position T (2152.5MHz)
-48.0	-30°C	+2.77	-3.00	+3.51
	-20°C	+3.36	-3.10	-2.91
	-10°C	-3.31	+3.43	-4.09
	0°C	-2.96	+3.22	-2.93
	+10°C	-3.38	+4.70	-4.58
	+20°C	-4.59	-4.95	-3.89
	+30°C	-4.05	+3.61	+4.31
	+40°C	+3.84	-3.74	+3.91
	+50°C	-3.46	-3.57	+3.50

Frequency Error – Voltage Variation

Configuration W-SC

Maximum Output Power 46.0dBm per carrier, Channel Bandwidth 5MHz

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B (2112.4MHz)	Channel Position M (2132.6MHz)	Channel Position T (2152.6MHz)
-40.8	+20°C	+4.19	-4.32	+4.43
-48.0		+3.97	+4.27	+4.88
-55.2		-5.61	-4.21	+4.02

Configuration L-MIMO-SC

Maximum Output Power 46.0dBm per carrier, Channel Bandwidth 5MHz

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B (2112.5MHz)	Channel Position M (2132.5MHz)	Channel Position T (2152.5MHz)
-40.8	+20°C	+4.03	-4.24	-4.19
-48.0		-4.59	-4.95	-3.89
-55.2		+3.70	-4.04	+4.55

Limit	FCC: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized band of operation.
	IC: The frequency stability shall be sufficient to ensure that the emission bandwidth stays within the operating frequency block

Remarks

The frequency stablity of the EUT is sufficient to keep it within the authourised frequency ranges at any temperature and voltage interval across the measured range.

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Maximum Output Power and Peak to Average Ratio - Conducted					
Network Analyzer	Agilent	5071C	MY46105235	12	11-Aug-2016
Power Meter	Rohde & Schwarz	NRP2	104221	12	20-Mar-2016
Power Sensor	Rohde & Schwarz	NRP-Z51	121216	12	17-Mar-2016
Spectrum Analyser	KEYSIGHT	N9030A	MY54490502	12	27-Apr-2016
40dB Attenuator	Aeroflex / Weinschel	66-40-33	CD4016	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121609	-	O/P MON
Load	Shanghai Huaxiang	TF150	11081905	-	O/P MON
Load	Shanghai Huaxiang	TF150	06081413	-	O/P MON
DC Power Supply	Ericsson	PSU AC 08	BR83767592	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015
Occupied Bandwidth					
Network Analyzer	Agilent	5071C	MY46105235	12	11-Aug-2016
Spectrum Analyser	KEYSIGHT	N9030A	MY54490502	12	27-Apr-2016
40dB Attenuator	Aeroflex / Weinschel	66-40-33	CD4016	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121609	-	O/P MON
Load	Shanghai Huaxiang	TF150	11081905	-	O/P MON
Load	Shanghai Huaxiang	TF150	06081413	-	O/P MON
DC Power Supply	Ericsson	PSU AC 08	BR83767592	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015
Band Edge					
Network Analyzer	Agilent	5071C	MY46105235	12	11-Aug-2016
Spectrum Analyser	KEYSIGHT	N9030A	MY54490502	12	27-Apr-2016
40dB Attenuator	Aeroflex / Weinschel	66-40-33	CD4016	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121609	-	O/P MON
Load	Shanghai Huaxiang	TF150	11081905	-	O/P MON
Load	Shanghai Huaxiang	TF150	06081413	-	O/P MON
DC Power Supply	Ericsson	PSU AC 08	BR83767592	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015
Conducted Spurious Emission					
Network Analyzer	Agilent	5071C	MY46105235	12	11-Aug-2016
Spectrum Analyser	KEYSIGHT	N9030A	MY54490502	12	27-Apr-2016
40dB Attenuator	Aeroflex / Weinschel	66-40-33	CD4016	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121609	-	O/P MON
Load	Shanghai Huaxiang	TF150	11081905	-	O/P MON
Load	Shanghai Huaxiang	TF150	06081413	-	O/P MON
DC Power Supply	Ericsson	PSU AC 08	BR83767592	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Radiated Spurious Emissions					
Load	Shanghai Huaxiang	TF100	09121609	-	O/P MON
Load	Shanghai Huaxiang	TF150	11081905	-	O/P MON
Load	Shanghai Huaxiang	TF150	06081413	-	O/P MON
Load	Weinschel	WA1428-3	608	-	O/P MON
EMI Receiver	Rohde & Schwarz	ESI40	100015	12	20-Aug-2016
Ultra Log Test Antenna	Rohde & Schwarz	HL562	100167	12	20-Aug-2016
Double-Ridge Waveguide Horn Antenna	Rohde & Schwarz	HF 906	100030	12	20-Aug-2016
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Semi Anechoic Chamber	Frankonia	23.18m×16.88m×9.60m	-	12	20-Aug-2016
Antenna Master	Frankonia	MA 260	-	12	20-Aug-2016
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
DC Power Supply	Ericsson	PSU AC 08	BR83767592	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015
Frequency Stability					
Network Analyzer	Agilent	5071C	MY46105235	12	11-Aug-2016
Spectrum Analyser	KEYSIGHT	N9030A	MY54490502	12	27-Apr-2016
40dB Attenuator	Aeroflex / Weinschel	66-40-33	CD4016	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121609	-	O/P MON
Load	Shanghai Huaxiang	TF150	11081905	-	O/P MON
Load	Shanghai Huaxiang	TF150	06081413	-	O/P MON
Climate Chamber	Shang Hai Zengda	ZTH100U	10080003	-	O/P MON
DC Power Supply	Ericsson	PSU AC 08	BR83767592	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015

N/A – Not Applicable
OP MON – Output Monitored with Calibrated Equipment

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30MHz to 10GHz Amplitude	0.5dB*
Conducted Emissions	30MHz to 40GHz Amplitude	3.0dB*
Frequency stability	30MHz to 2GHz	$<\pm 1 \times 10^{-7}$
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Worst case error for both Time and Frequency measurement 12 parts in 10^6		

* In accordance with CISPR 16-4

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).