



Product Service

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

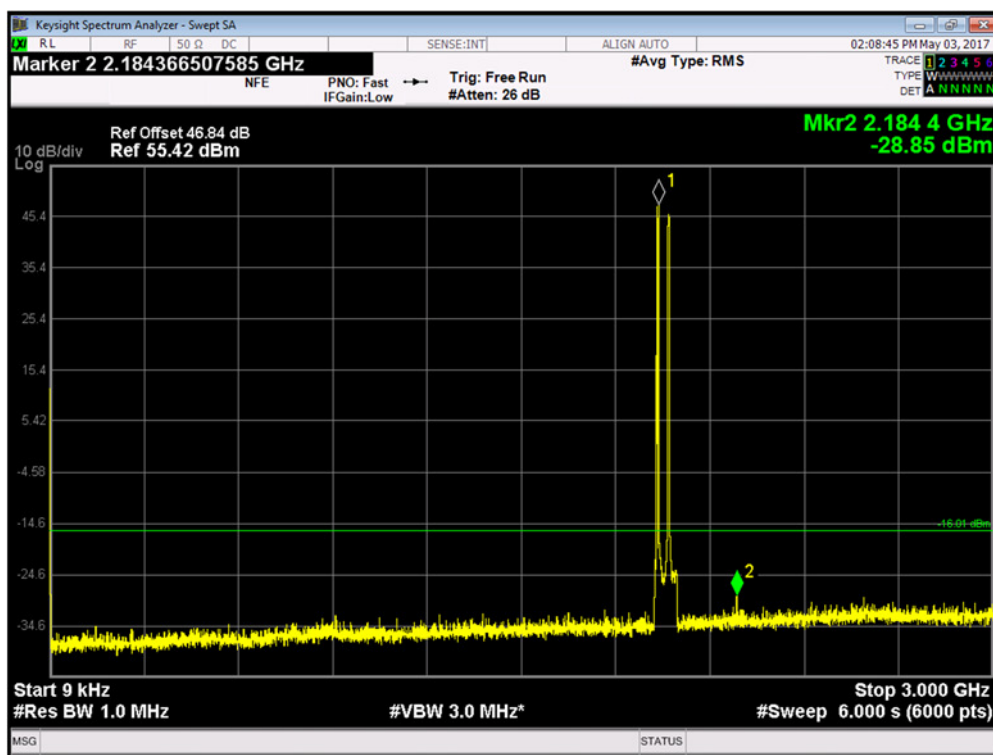
Maximum Output Power 49.0dBm per port

Channel Position	Bandwidth	Channel Frequency
Channel Position B_{RFBW}	G: 250 kHz W: 5.0 MHz	(G) 1930.4MHz + (G) 1935.8MHz + (W) 1967.6MHz
Channel Position M_{RFBW}	G: 250 kHz W: 5.0 MHz	(G) 1940.2MHz + (G) 1945.8MHz + (W) 1977.6MHz
Channel Position T_{RFBW}	G: 250 kHz W: 5.0 MHz	(G) 1950.2MHz + (G) 1955.8MHz + (W) 1987.6MHz

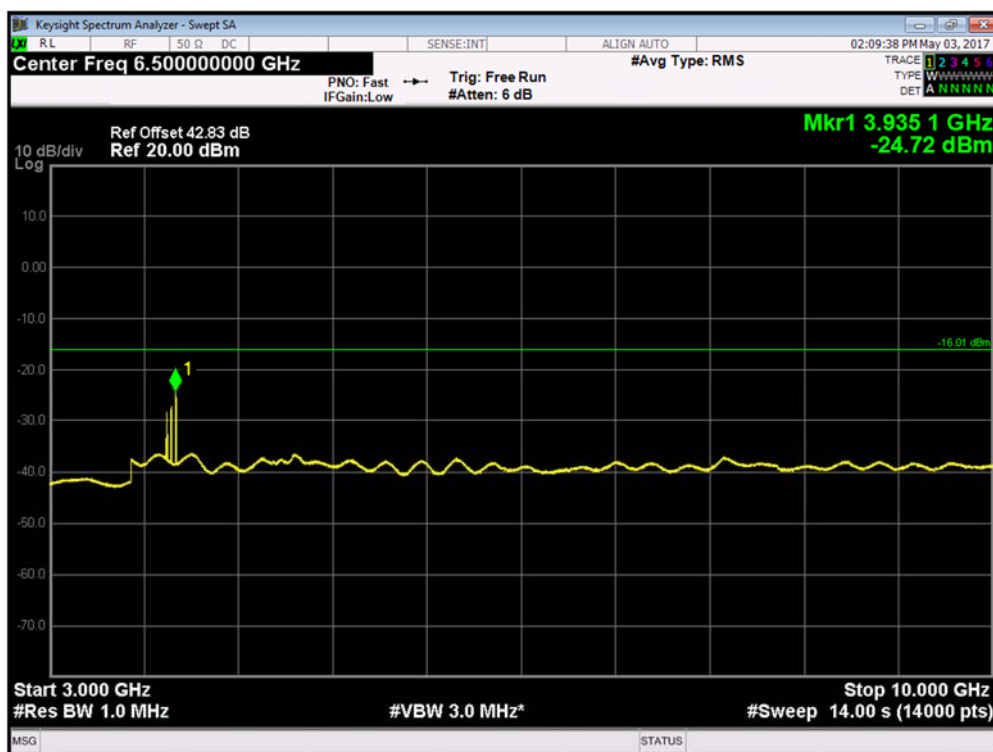


Product Service

Channel Position B_{RFBW} - GSM GMSK / WCDMA 16QAM: Bandwidth 5.0 MHz - 9kHz - 3GHz



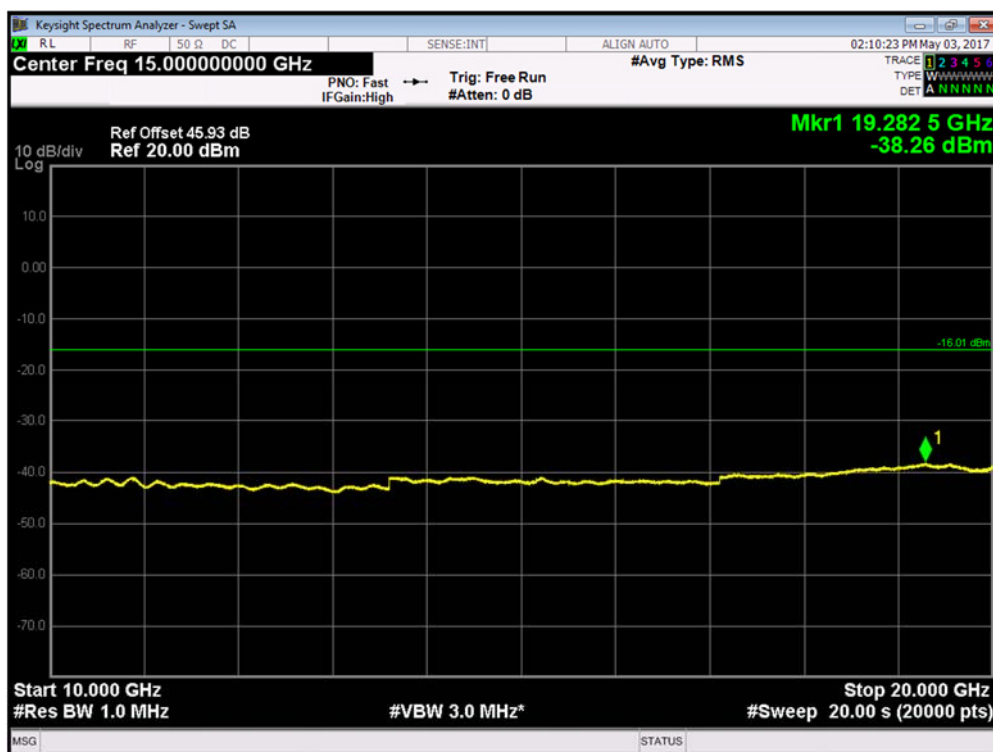
Channel Position B_{RFBW} - GSM GMSK / WCDMA 16QAM: Bandwidth 5.0 MHz - 3GHz - 10GHz



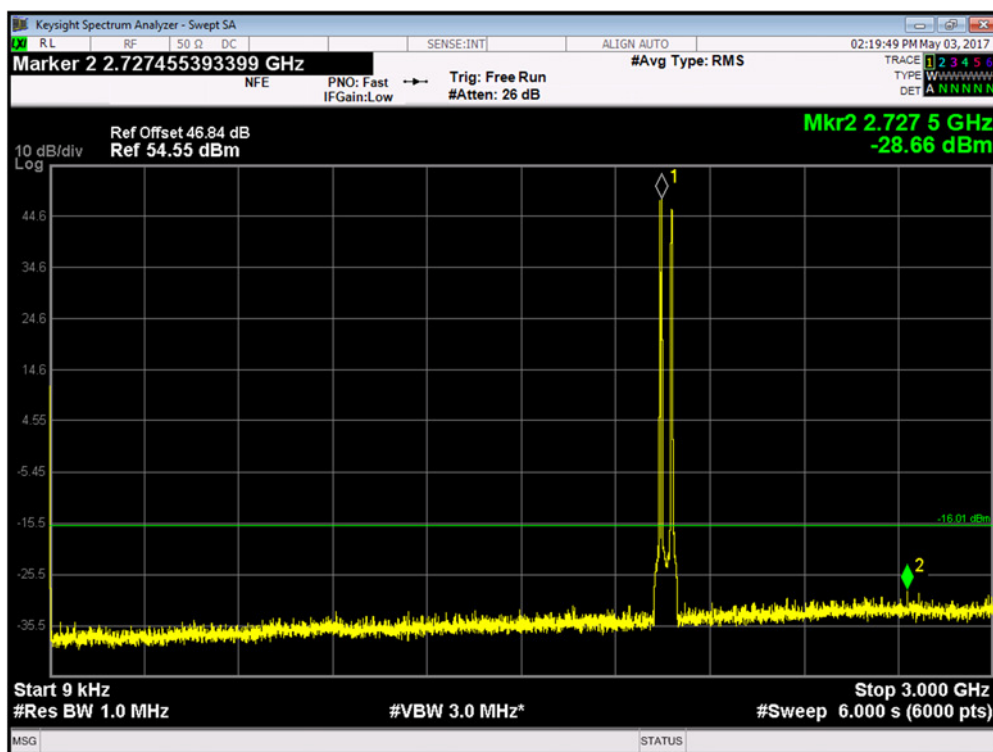


Product Service

Channel Position B_{RFBW} - GSM GMSK / WCDMA 16QAM: Bandwidth 5.0 MHz - 10GHz - 20GHz



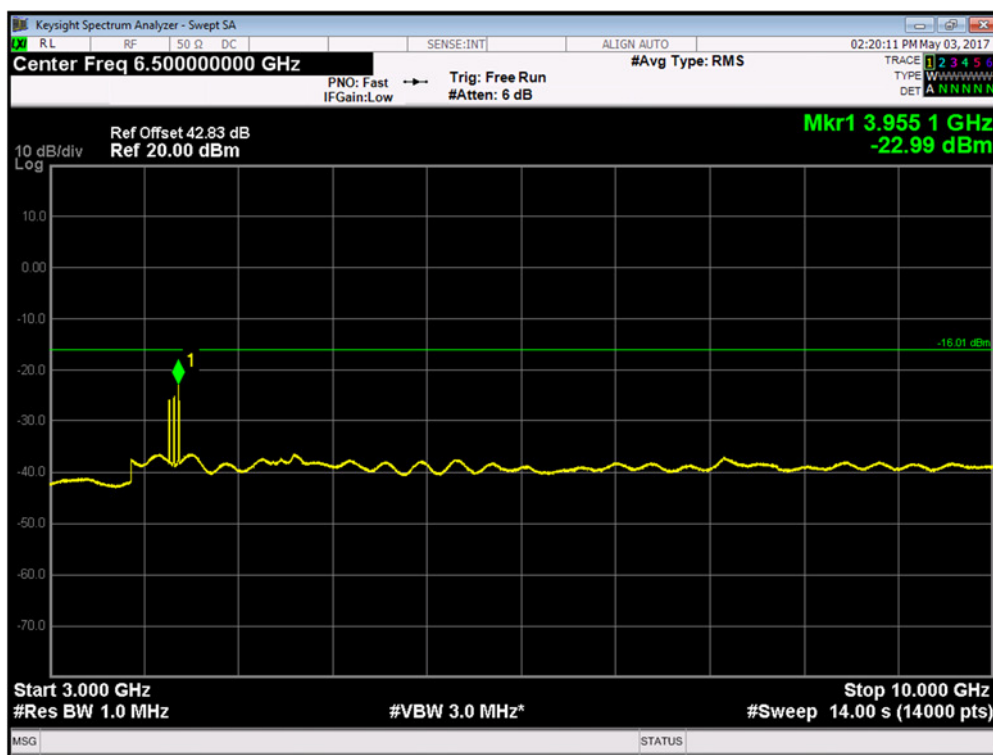
Channel Position M_{RFBW} - GSM GMSK / WCDMA 16QAM: Bandwidth 5.0 MHz - 9kHz - 3GHz



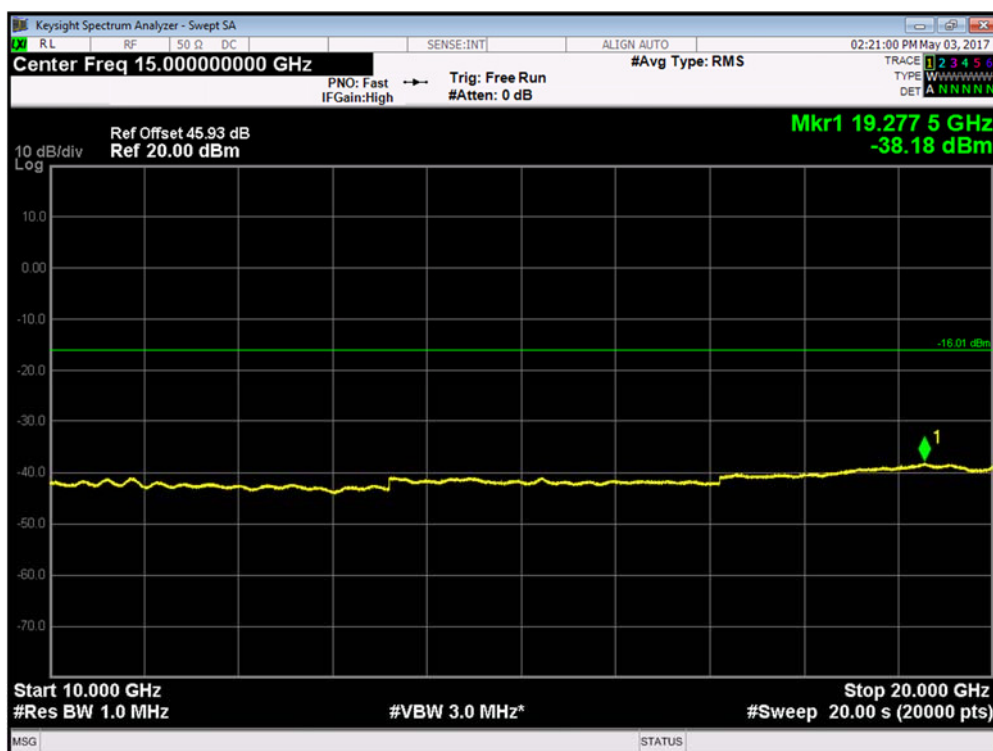


Product Service

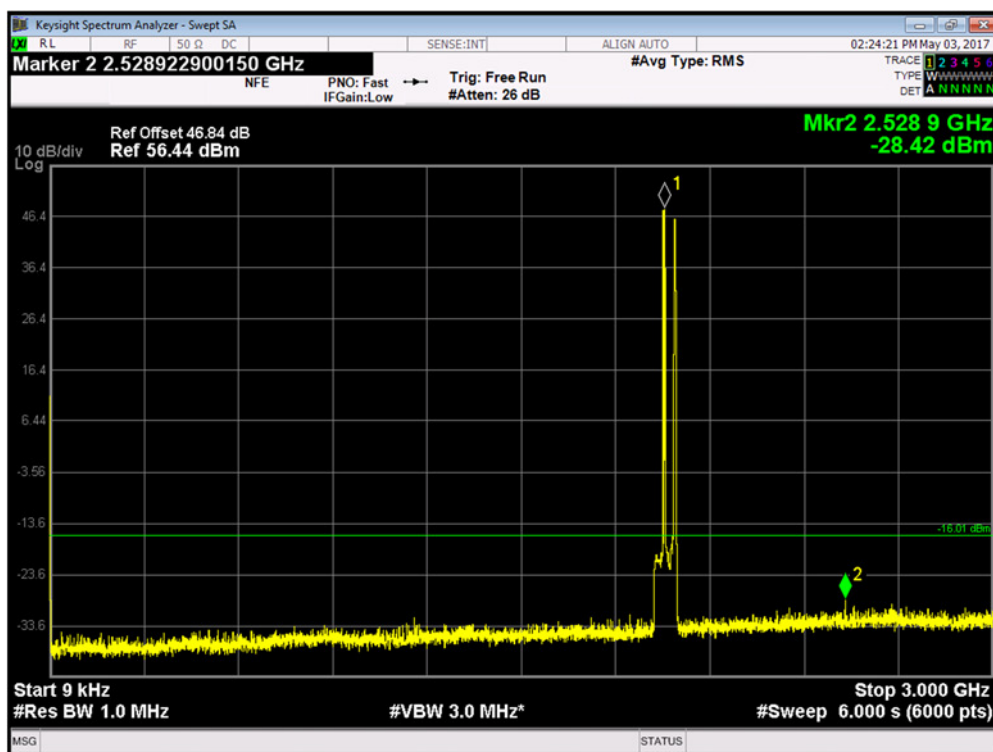
Channel Position M_{RFBW} - GSM GMSK / WCDMA 16QAM: Bandwidth 5.0 MHz - 3GHz - 10GHz



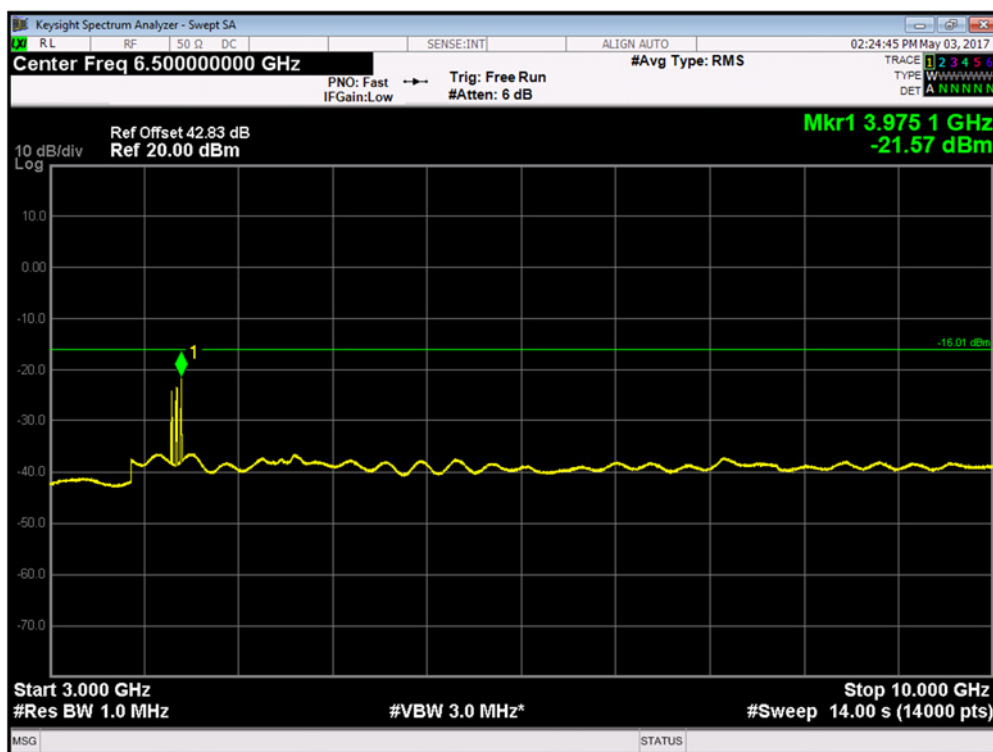
Channel Position M_{RFBW} - GSM GMSK / WCDMA 16QAM: Bandwidth 5.0 MHz - 10GHz - 20GHz



Channel Position T_{RFBW} - GSM GMSK / WCDMA 16QAM: Bandwidth 5.0 MHz - 9kHz - 3GHz



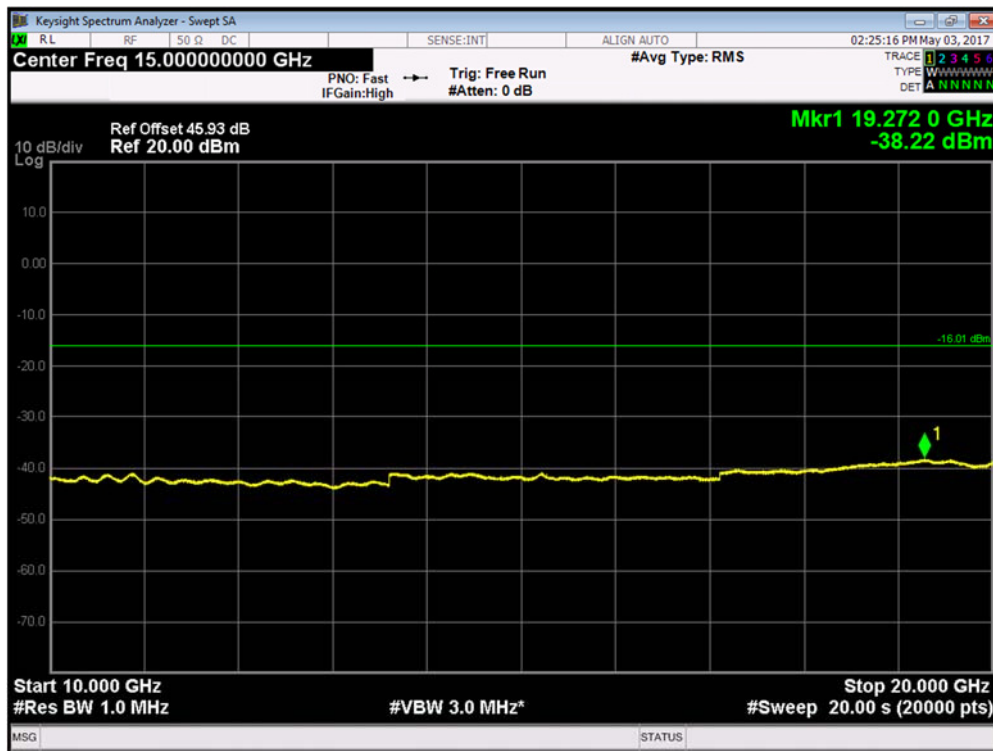
Channel Position T_{RFBW} - GSM GMSK / WCDMA 16QAM: Bandwidth 5.0 MHz - 3GHz - 10GHz





Product Service

Channel Position T_{RFBW} - GSM GMSK / WCDMA 16QAM: Bandwidth 5.0 MHz - 10GHz - 20GHz

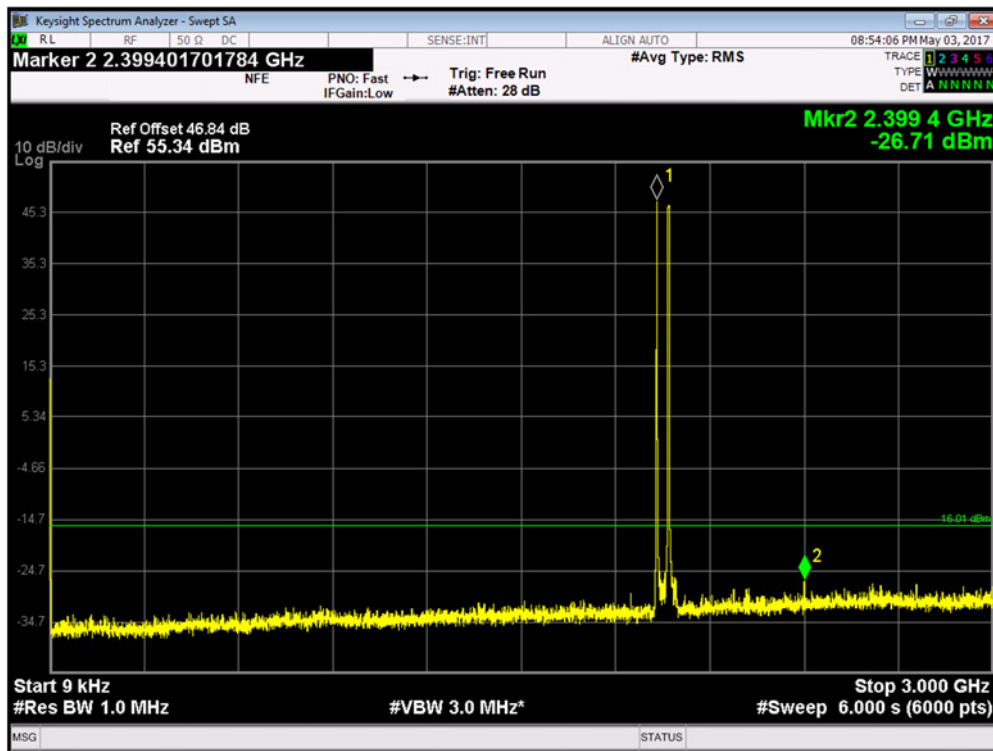


Configuration G+L-MIMO-MC 1 (1G+1L)

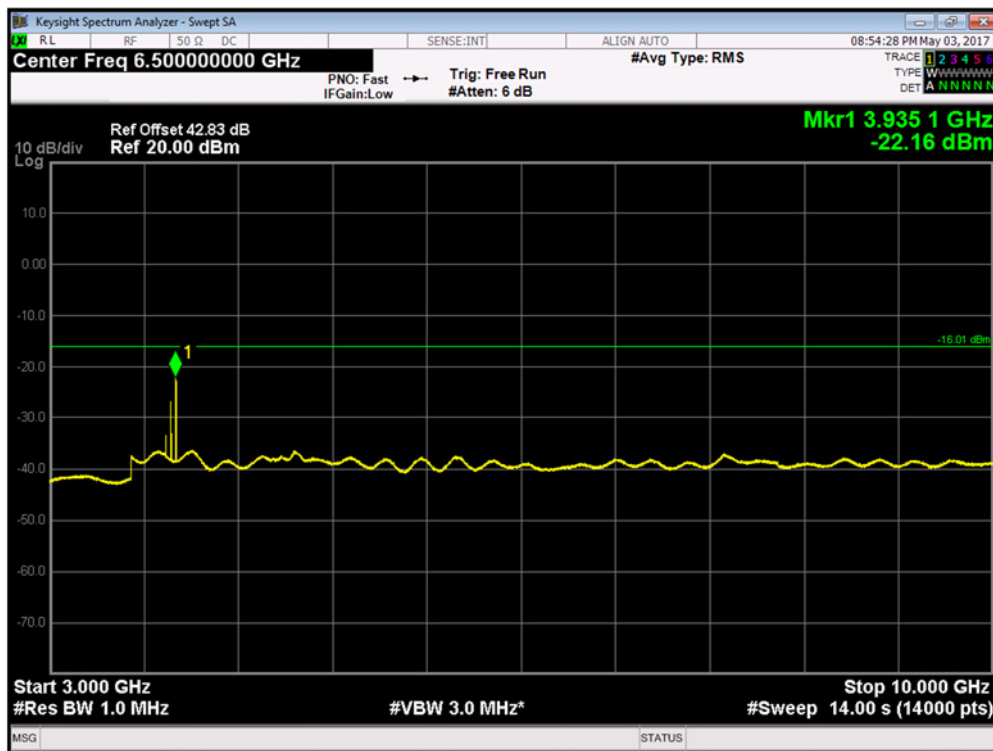
Maximum Output Power 49.0dBm per port

Channel Position	Bandwidth	Channel Frequency
Channel Position B_{RFBW}	G: 250 kHz L: 5.0 MHz	(G) 1930.4MHz + (L) 1967.5MHz
Channel Position M_{RFBW}	G: 250 kHz L: 5.0 MHz	(G) 1940.2MHz + (L) 1977.5MHz
Channel Position T_{RFBW}	G: 250 kHz L: 5.0 MHz	(G) 1950.2MHz + (L) 1987.5MHz

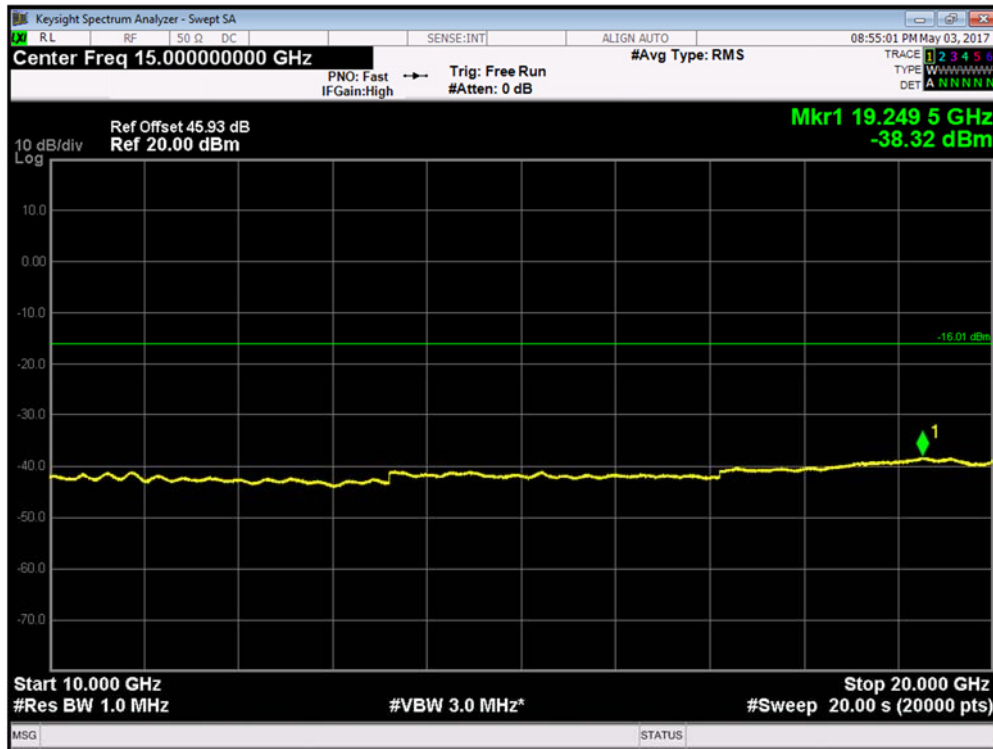
Channel Position B_{RFBW} - GSM GMSK / LTE QPSK: Bandwidth 5.0 MHz - 9kHz - 3GHz



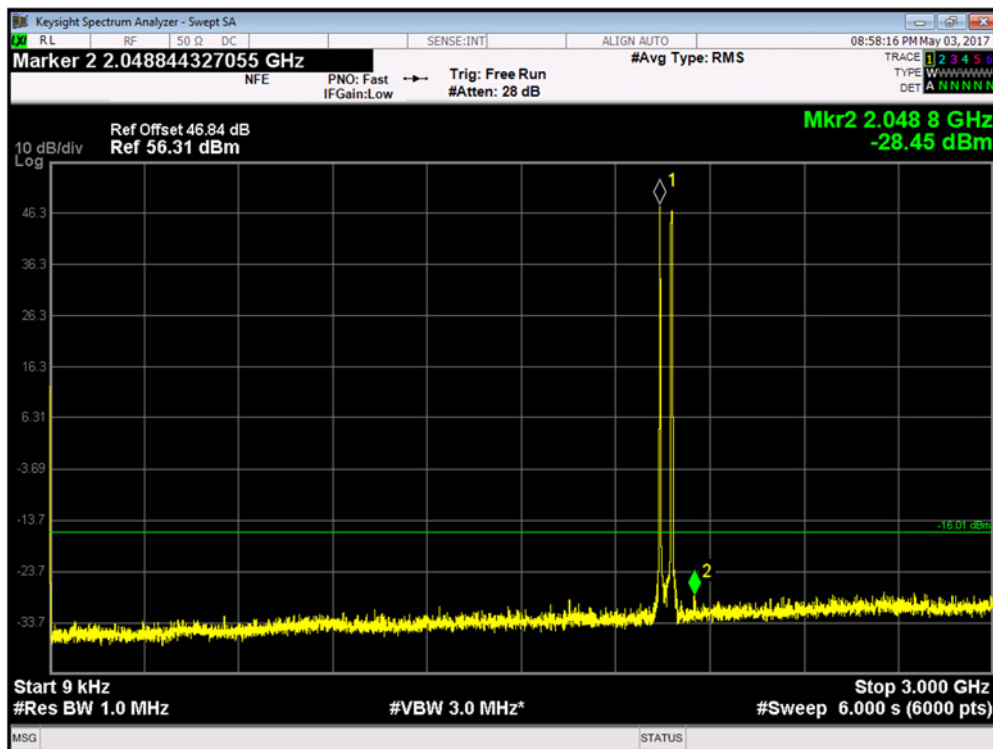
Channel Position B_{RFBW} - GSM GMSK / LTE QPSK: Bandwidth 5.0 MHz - 3GHz - 10GHz



Channel Position B_{RFBW} - GSM GMSK / LTE QPSK: Bandwidth 5.0 MHz - 10GHz - 20GHz



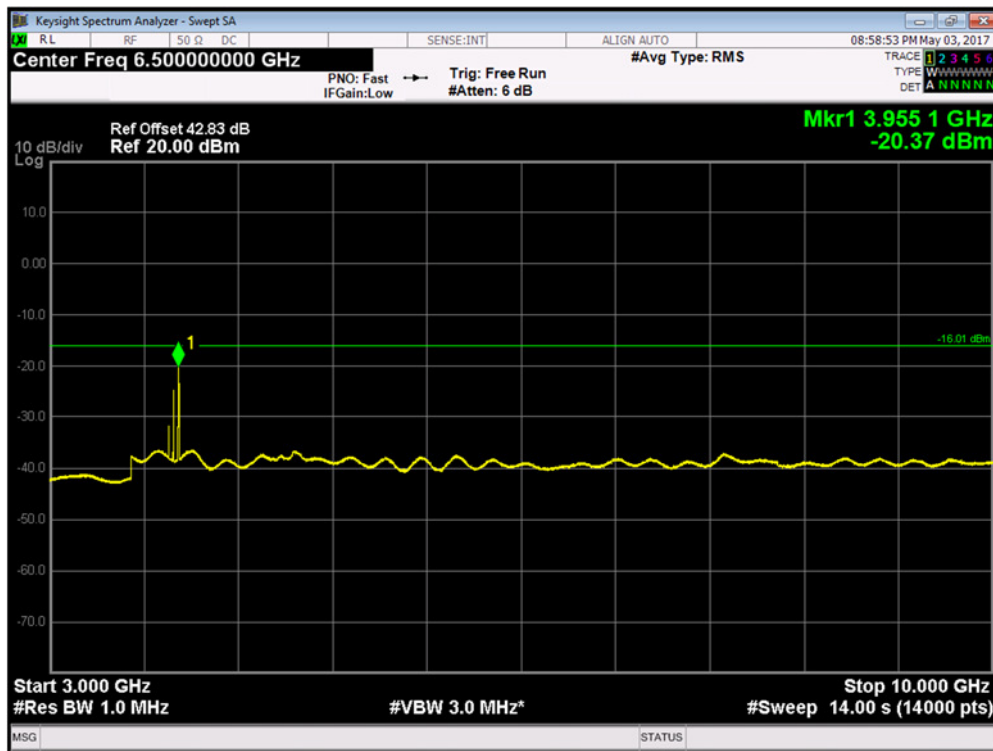
Channel Position M_{RFBW} - GSM GMSK / LTE QPSK: Bandwidth 5.0 MHz - 9kHz - 3GHz



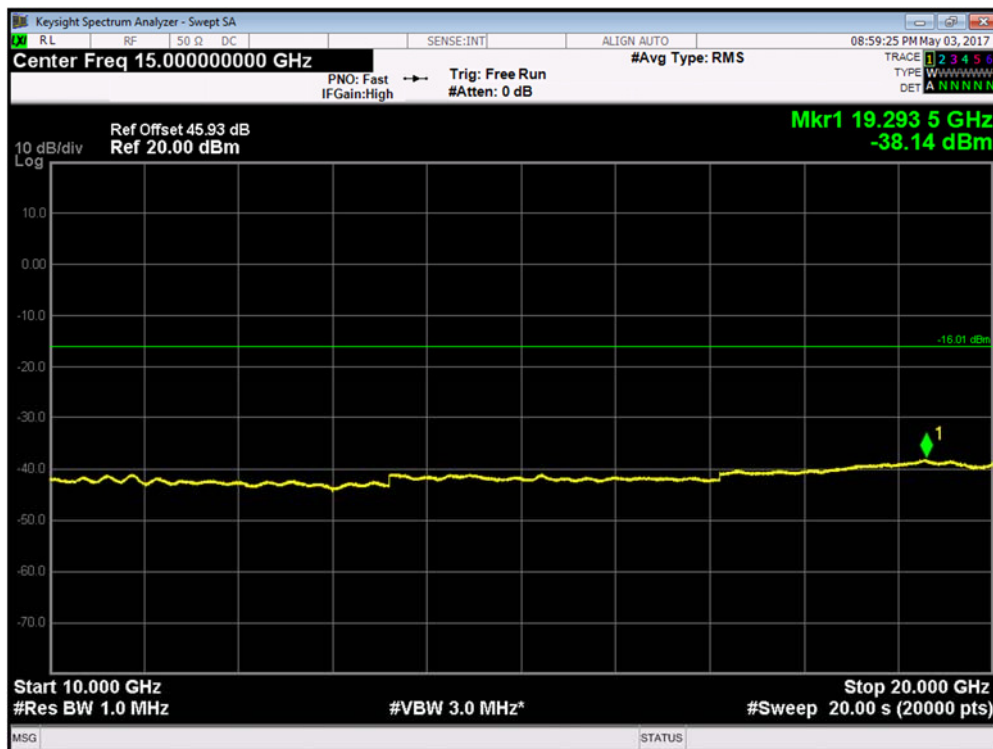


Product Service

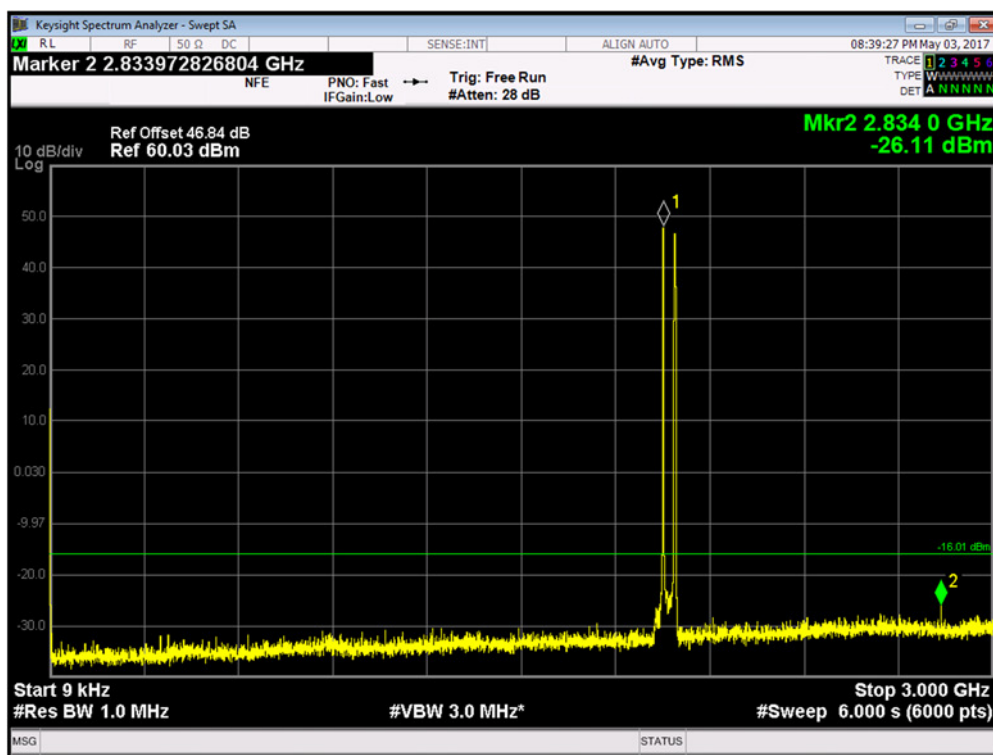
Channel Position M_{RFBW} - GSM GMSK / LTE QPSK: Bandwidth 5.0 MHz - 3GHz - 10GHz



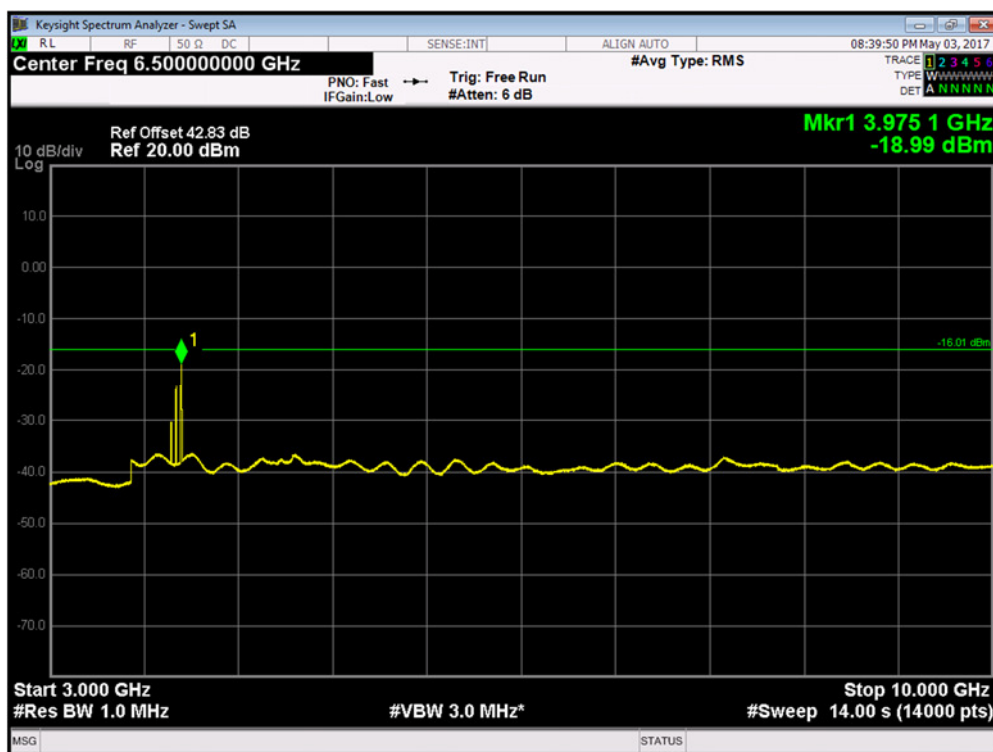
Channel Position M_{RFBW} - GSM GMSK / LTE QPSK: Bandwidth 5.0 MHz - 10GHz - 20GHz



Channel Position T_{RFBW} - GSM GMSK / LTE QPSK: Bandwidth 5.0 MHz - 9kHz - 3GHz



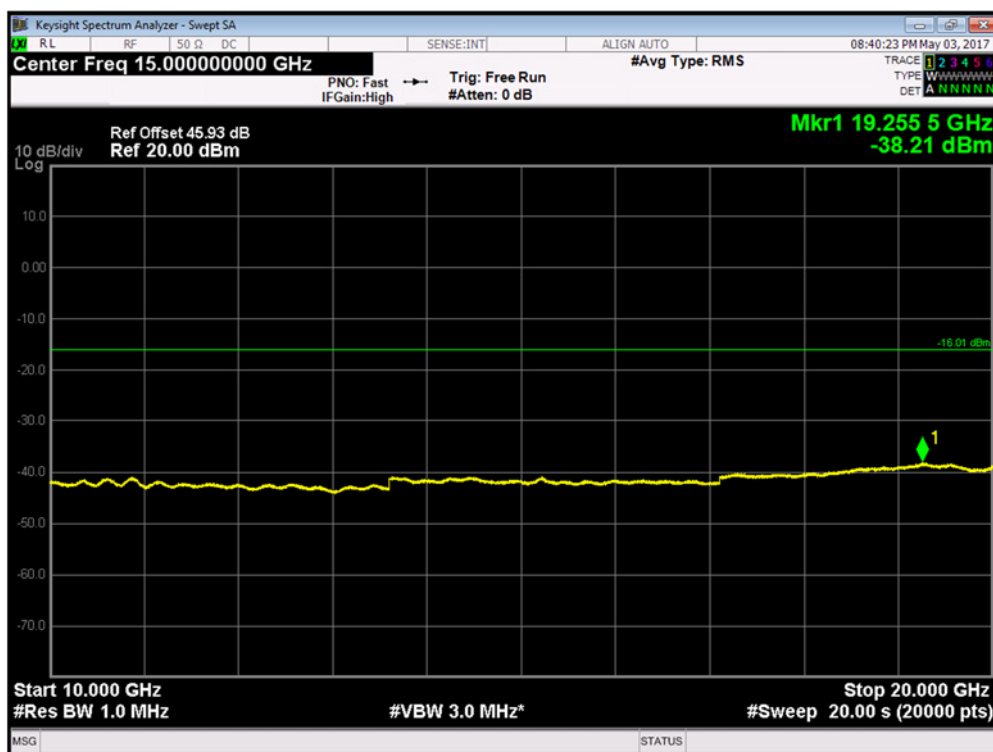
Channel Position T_{RFBW} - GSM GMSK / LTE QPSK: Bandwidth 5.0 MHz - 3GHz - 10GHz





Product Service

Channel Position T_{RFBW} - GSM GMSK / LTE QPSK: Bandwidth 5.0 MHz - 10GHz - 20GHz





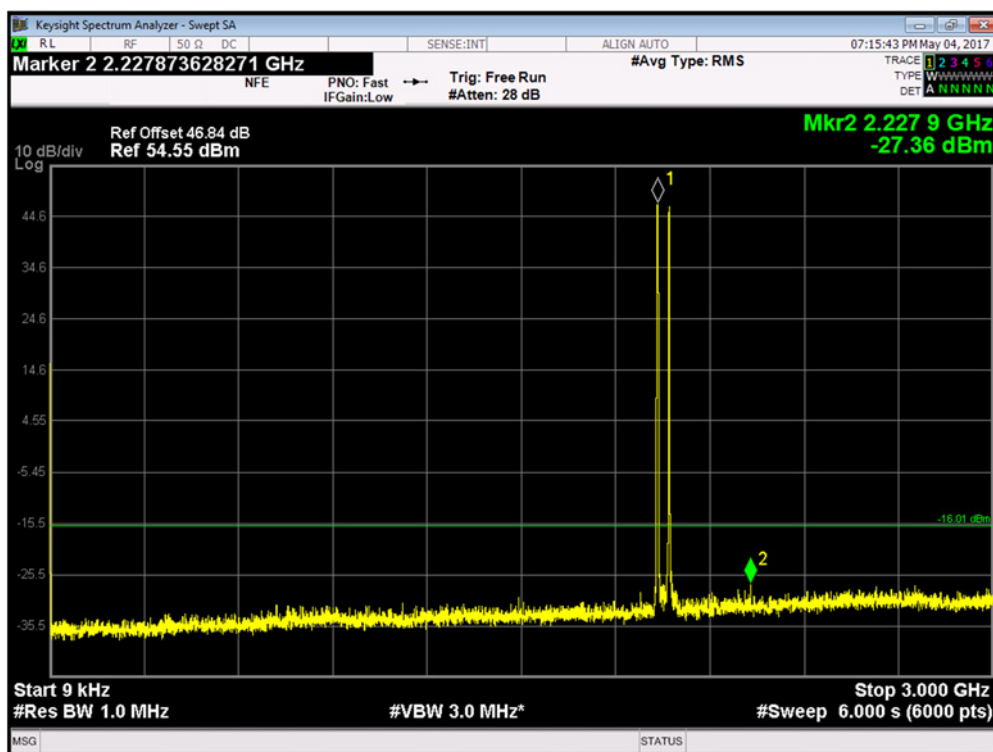
Product Service

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

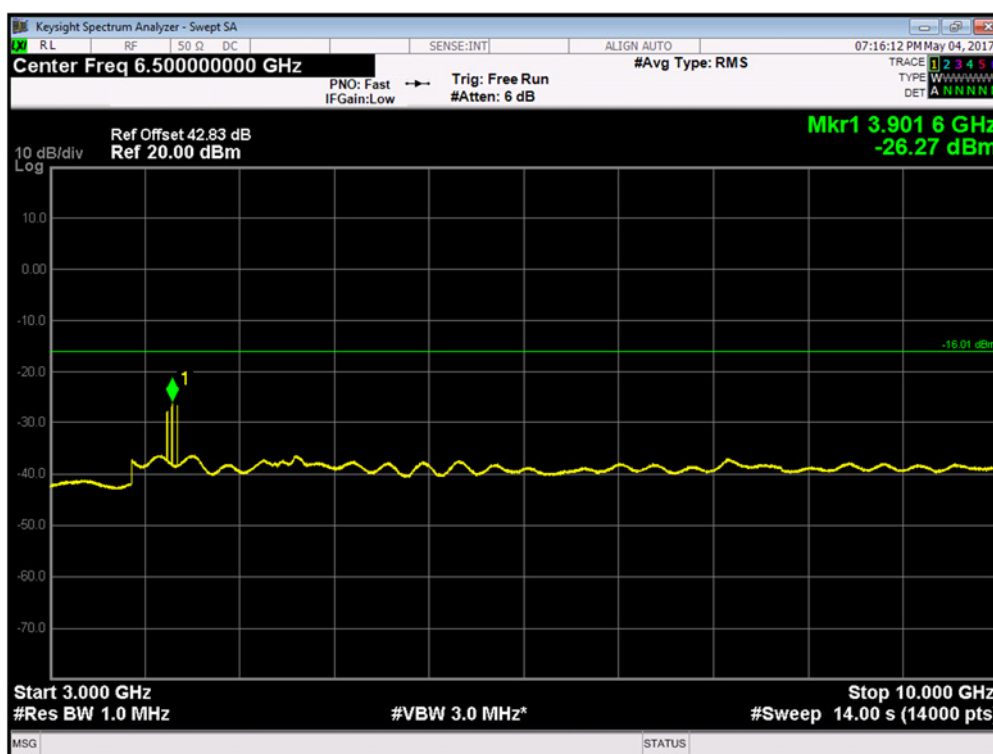
Maximum Output Power 48.5dBm per port

Channel Position	Bandwidth	Channel Frequency
Channel Position B _{RFBW}	W: 5.0 MHz L: 1.4 MHz	(W) 1932.4MHz + (L) 1969.3MHz
Channel Position M _{RFBW}	W: 5.0 MHz L: 1.4 MHz	(W) 1942.4MHz + (L) 1979.3MHz
Channel Position T _{RFBW}	W: 5.0 MHz L: 1.4 MHz	(W) 1952.4MHz + (L) 1989.3MHz

Channel Position B_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 9kHz - 3GHz



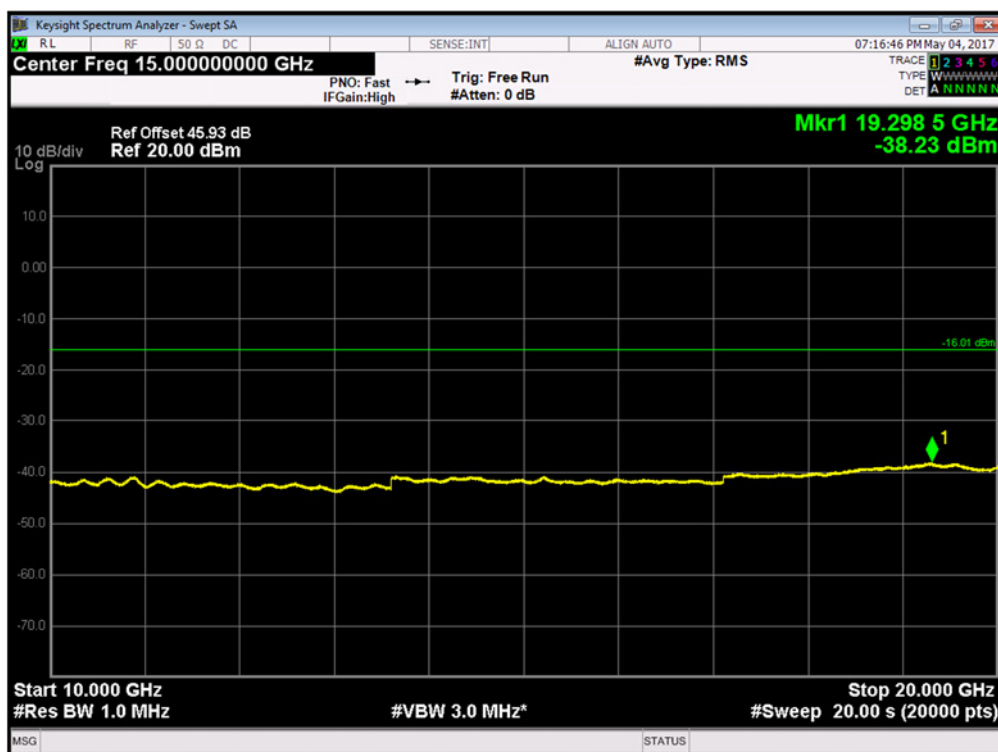
Channel Position B_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 3GHz - 10GHz



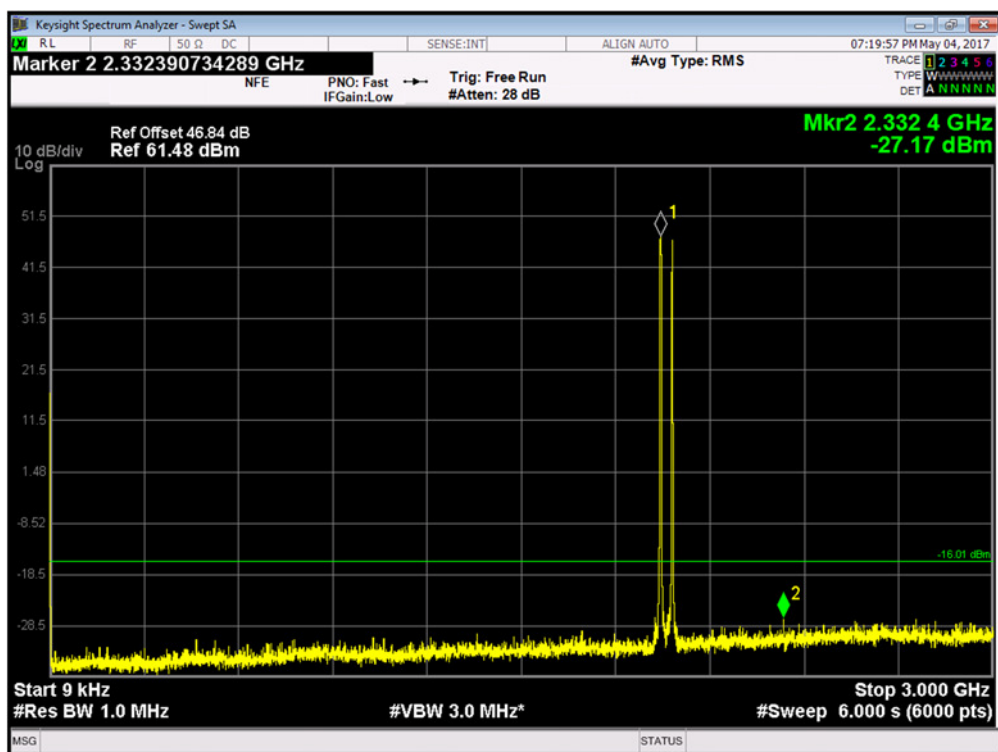


Product Service

Channel Position B_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 10GHz - 20GHz



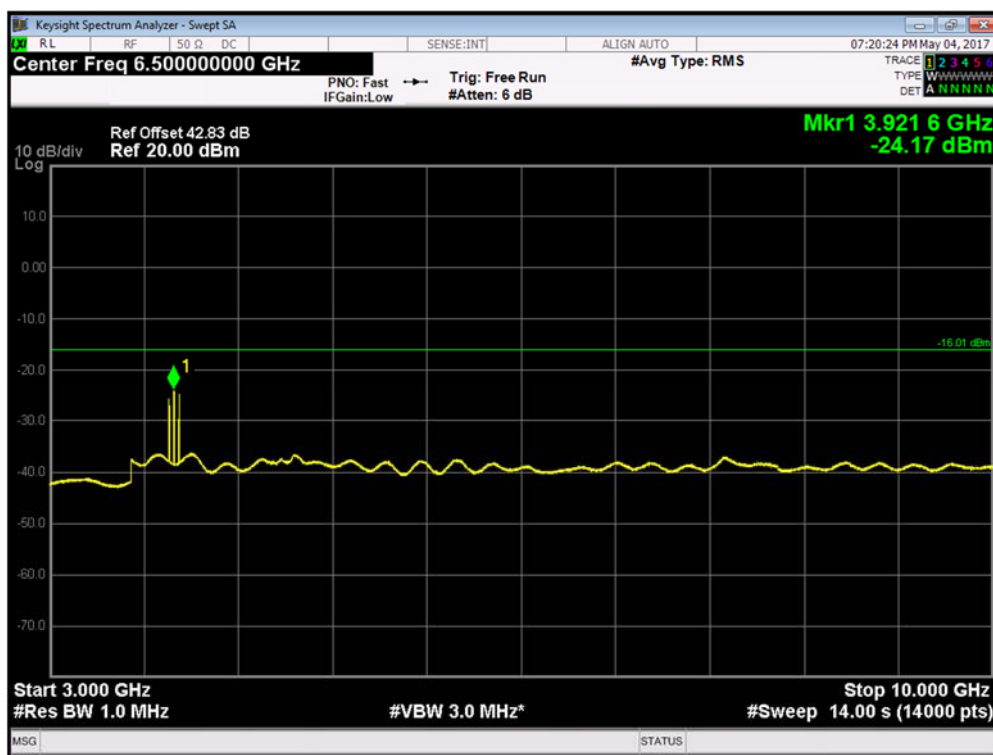
Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 9kHz - 3GHz



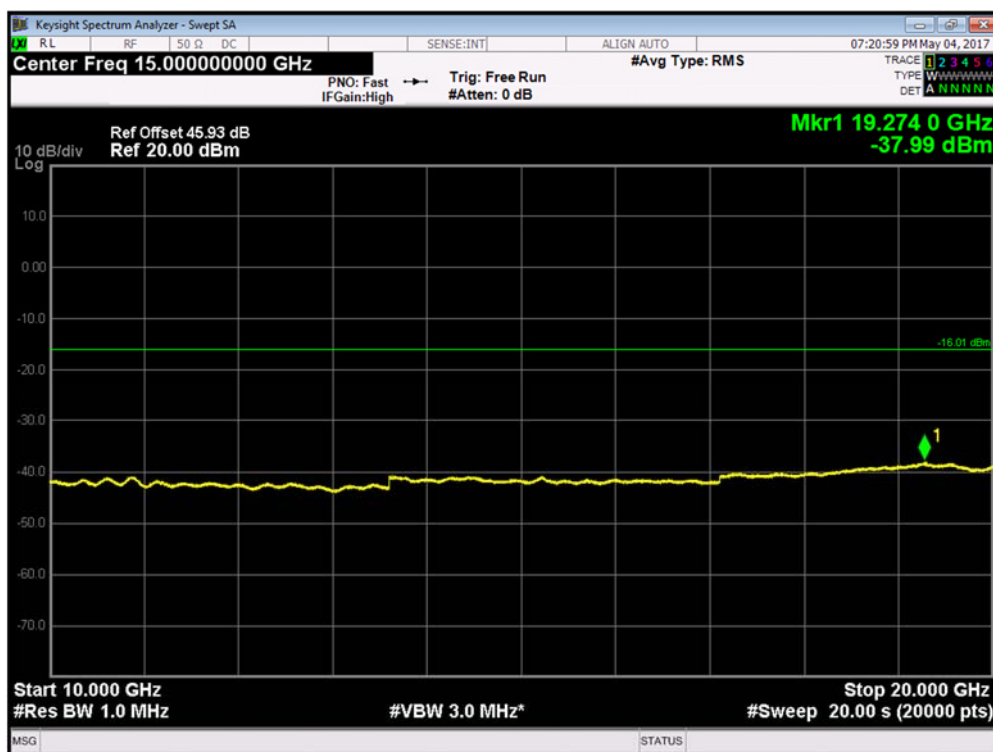


Product Service

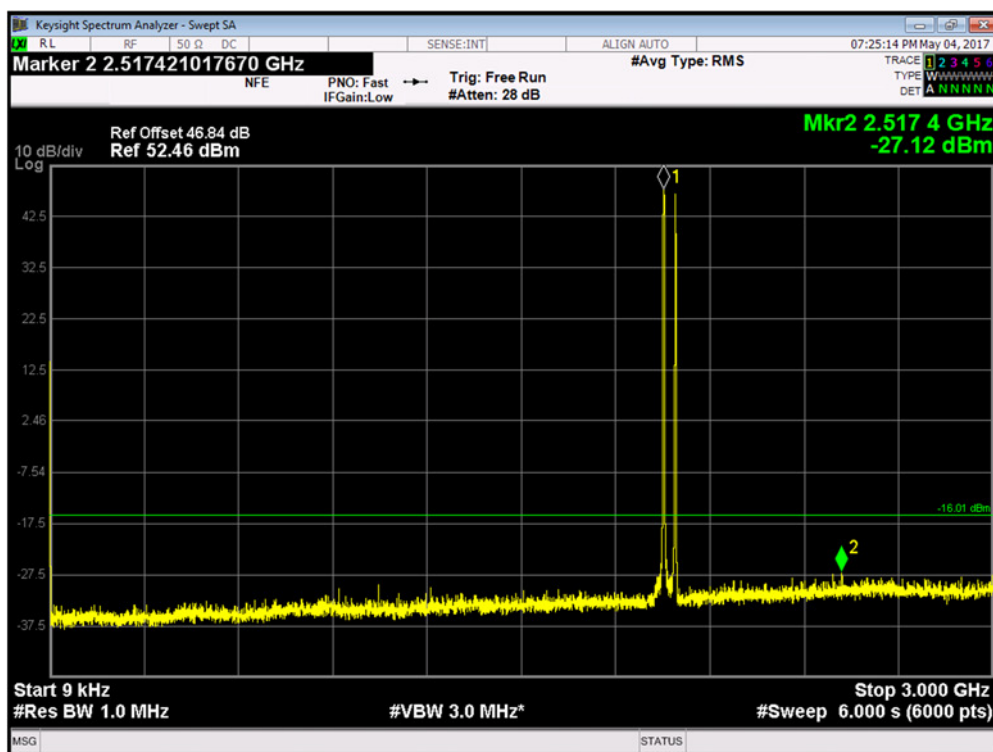
Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 3GHz - 10GHz



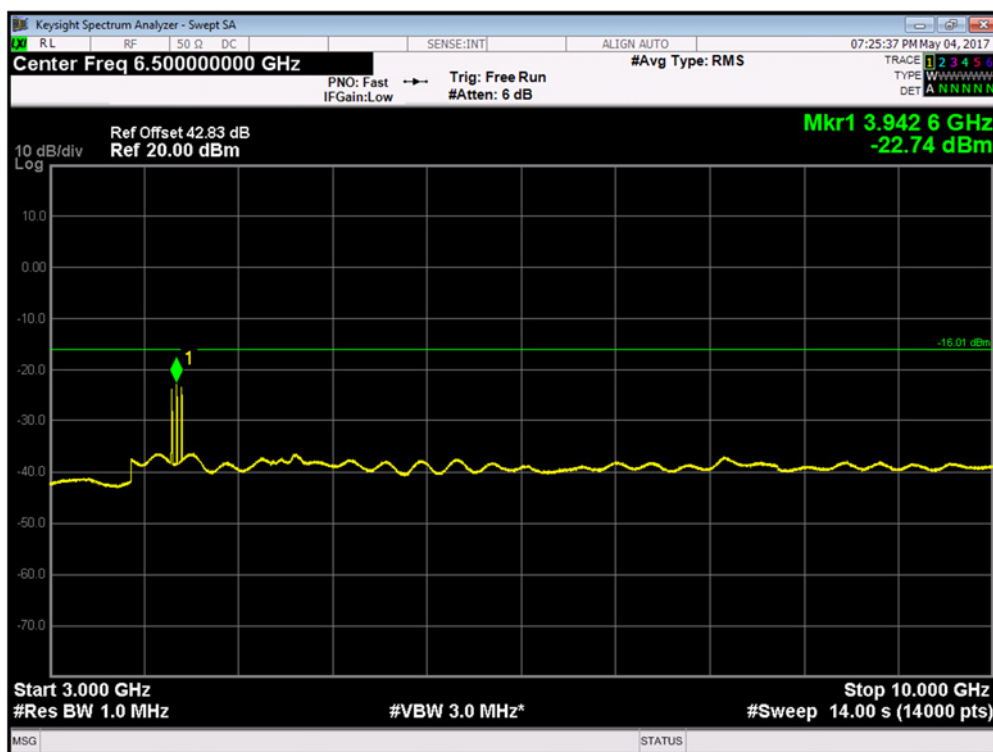
Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 10GHz - 20GHz



Channel Position T_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 9kHz - 3GHz



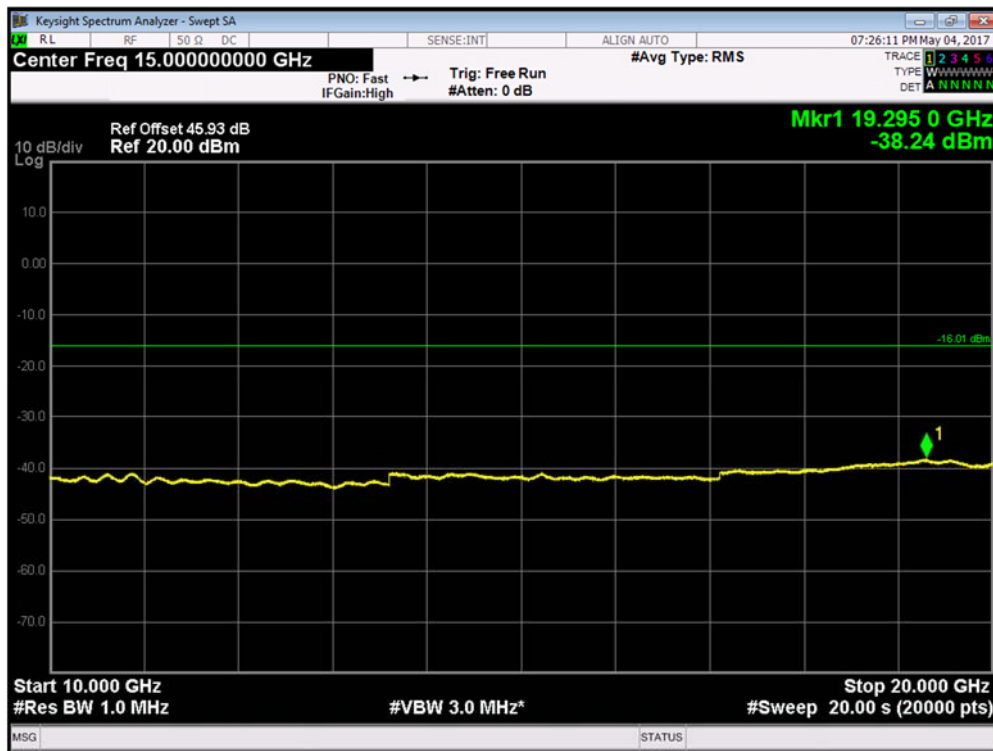
Channel Position T_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 3GHz - 10GHz





Product Service

Channel Position T_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 10GHz - 20GHz





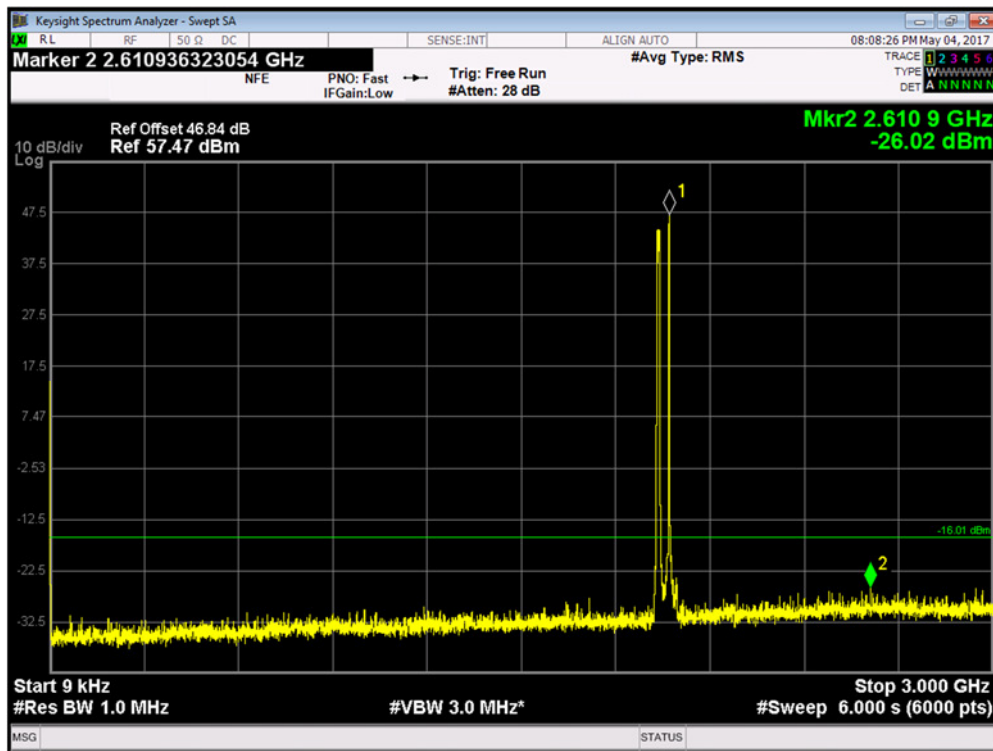
Product Service

Configuration W+L-MIMO-MC 4 (2W+1L)

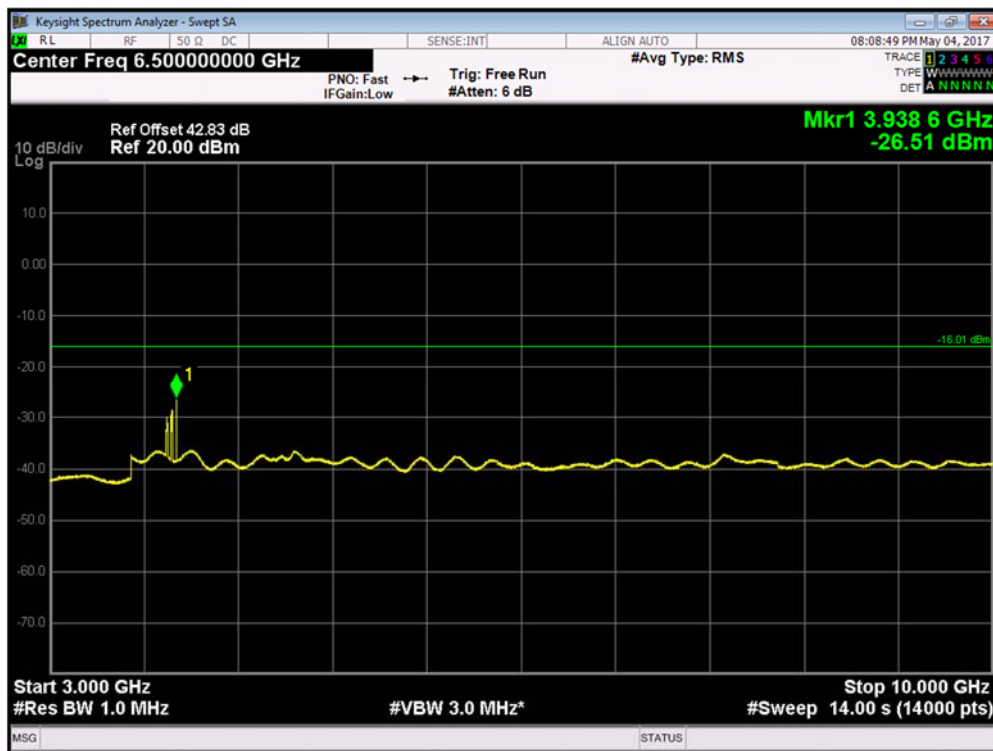
Maximum Output Power 49.0dBm per port

Channel Position	Bandwidth	Channel Frequency
Channel Position B _{RFBW}	W: 5.0 MHz L: 1.4 MHz	(W) 1932.4MHz + (W) 1937.4MHz + (L) 1969.3MHz
Channel Position M _{RFBW}	W: 5.0 MHz L: 1.4 MHz	(W) 1942.4MHz + (W) 1947.4MHz + (L) 1979.3MHz
Channel Position T _{RFBW}	W: 5.0 MHz L: 1.4 MHz	(W) 1952.4MHz + (W) 1957.4MHz + (L) 1989.3MHz

Channel Position B_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 9kHz - 3GHz



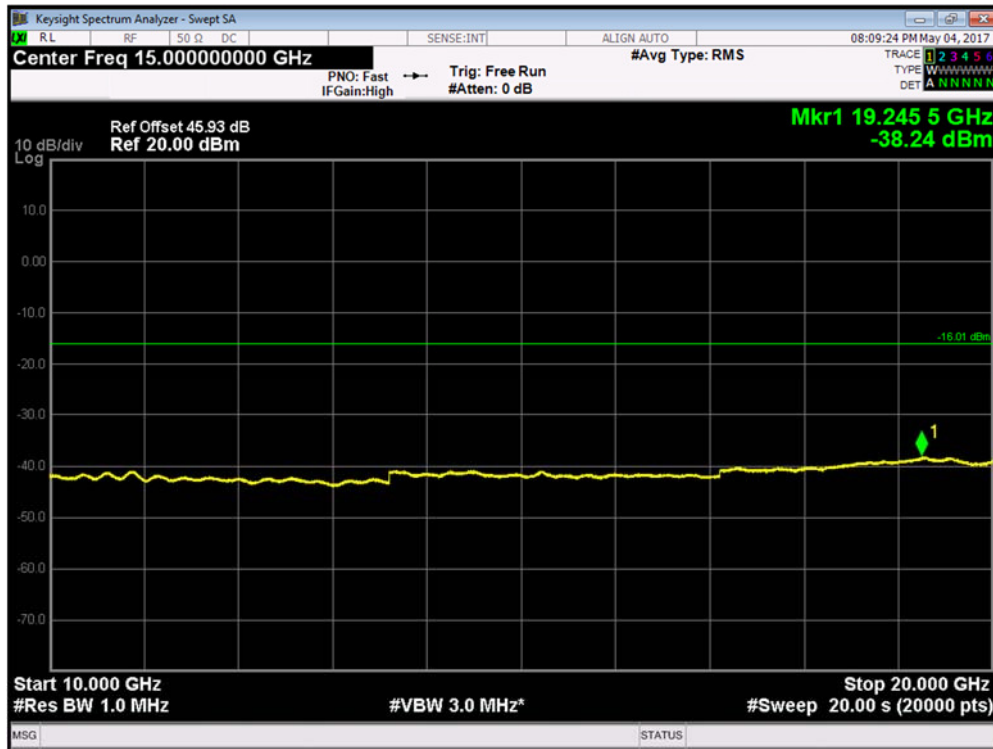
Channel Position B_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 3GHz - 10GHz



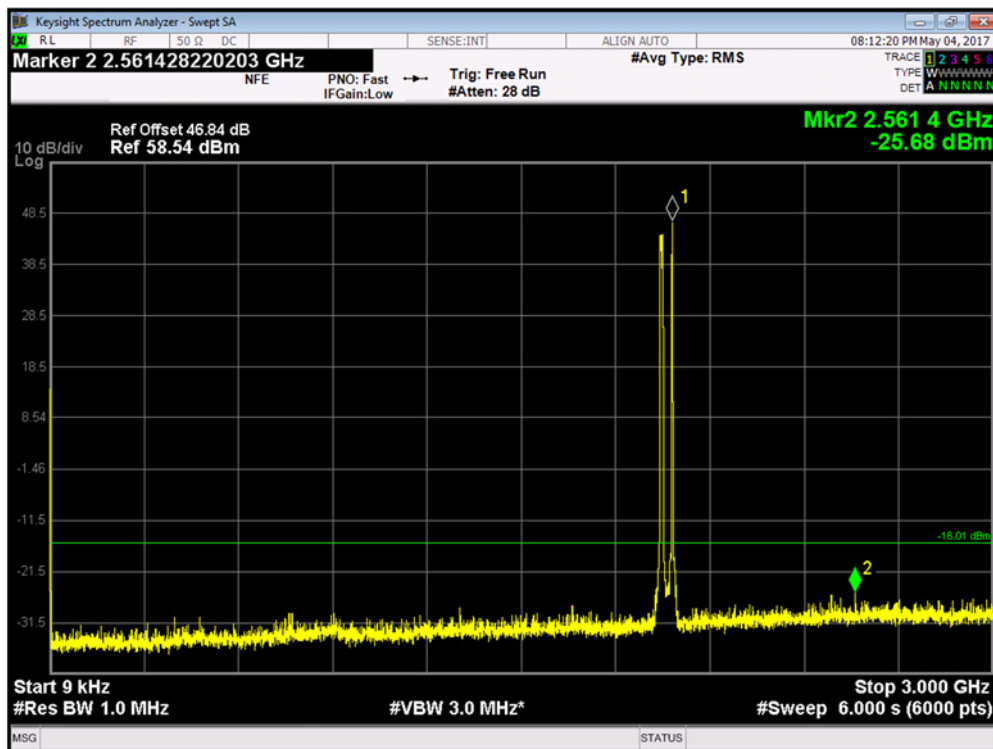


Product Service

Channel Position B_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 10GHz - 20GHz



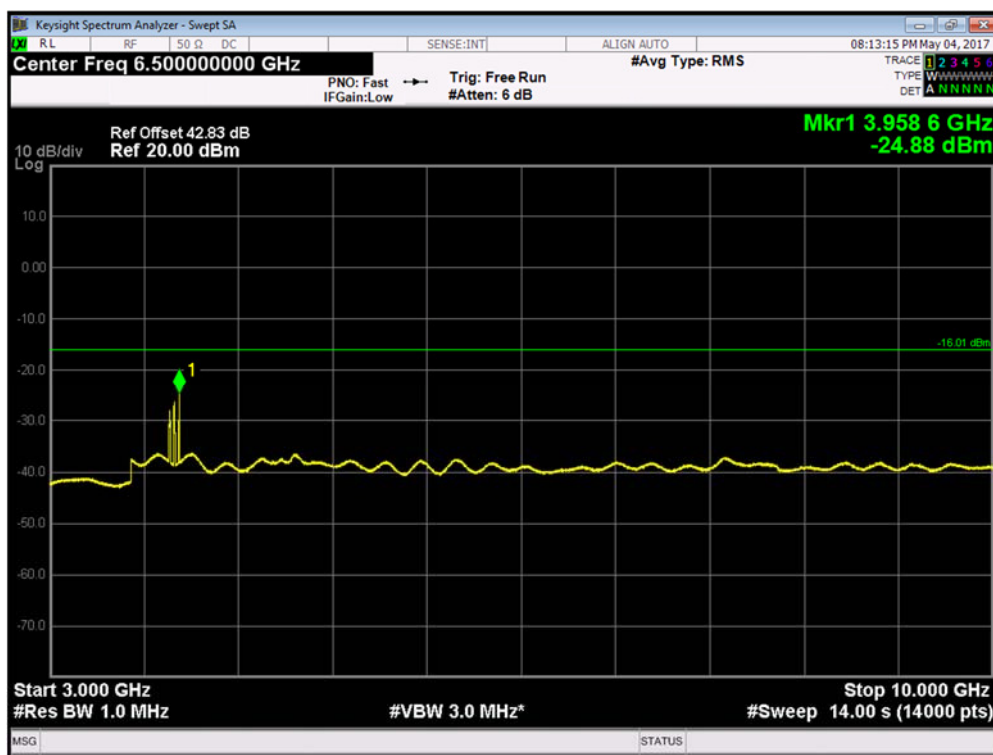
Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 9kHz - 3GHz



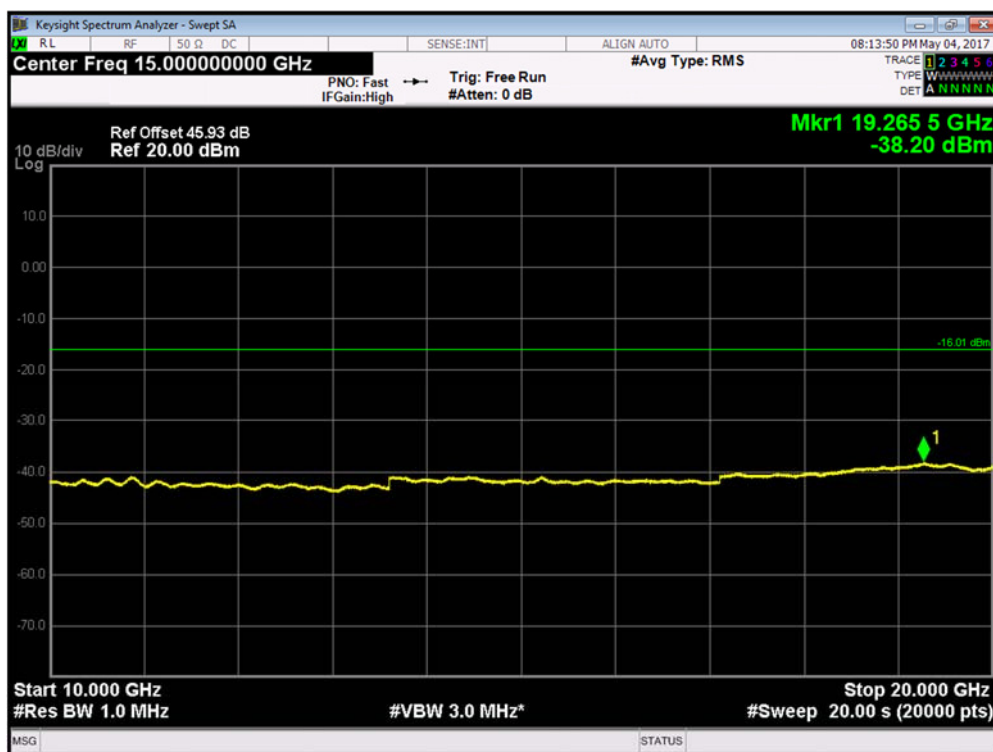


Product Service

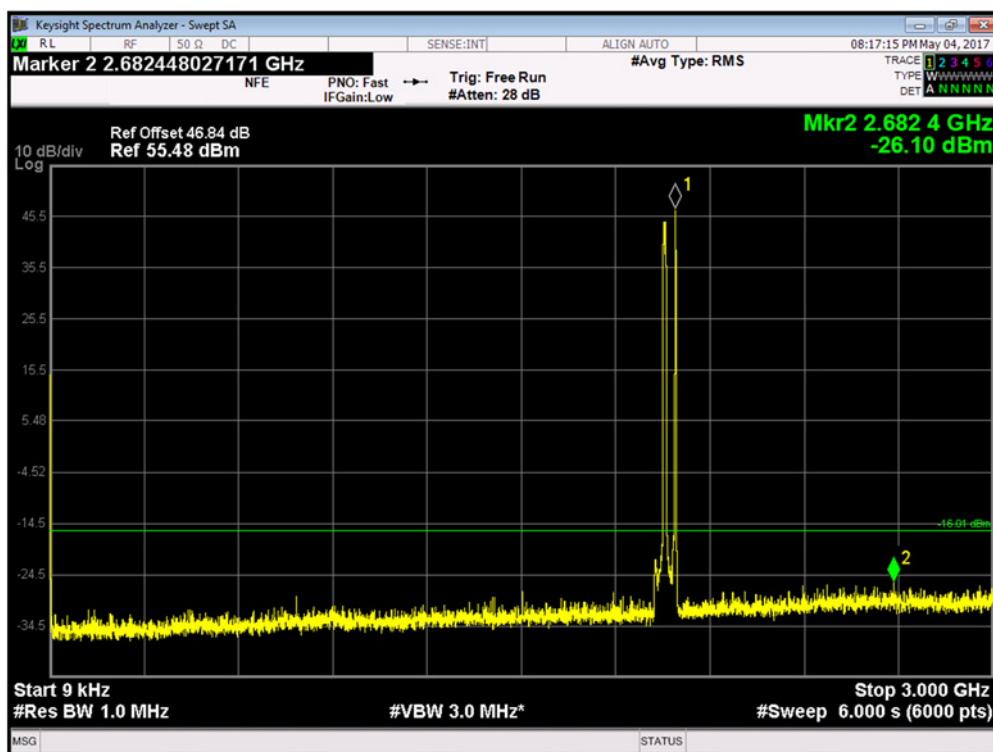
Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 3GHz - 10GHz



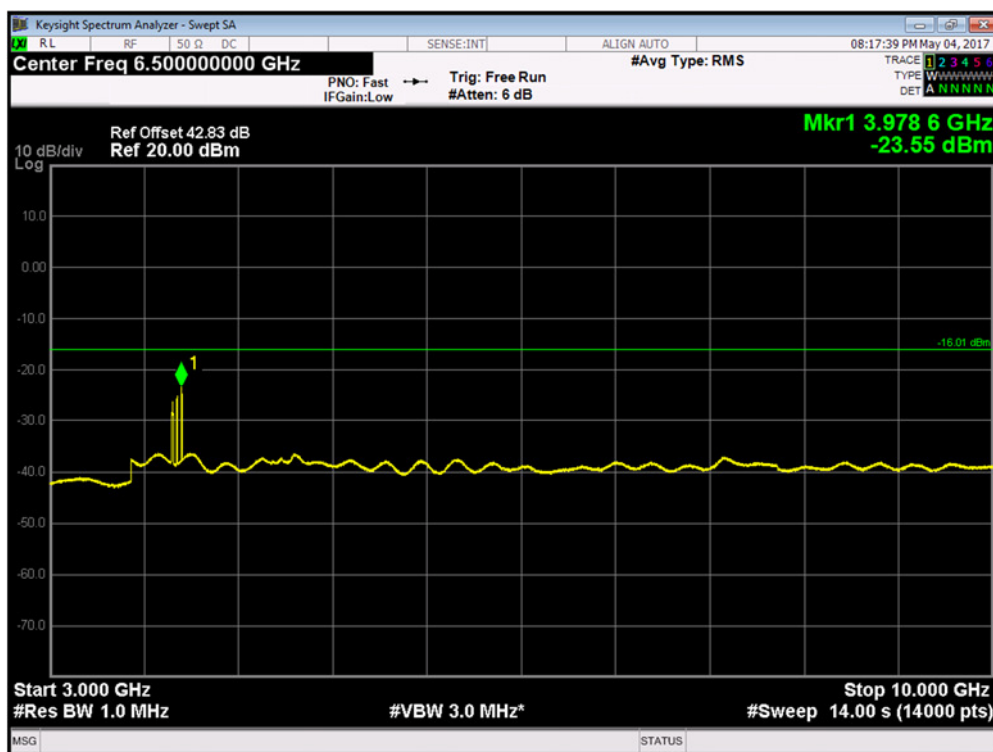
Channel Position M_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 10GHz - 20GHz



Channel Position T_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 9kHz - 3GHz



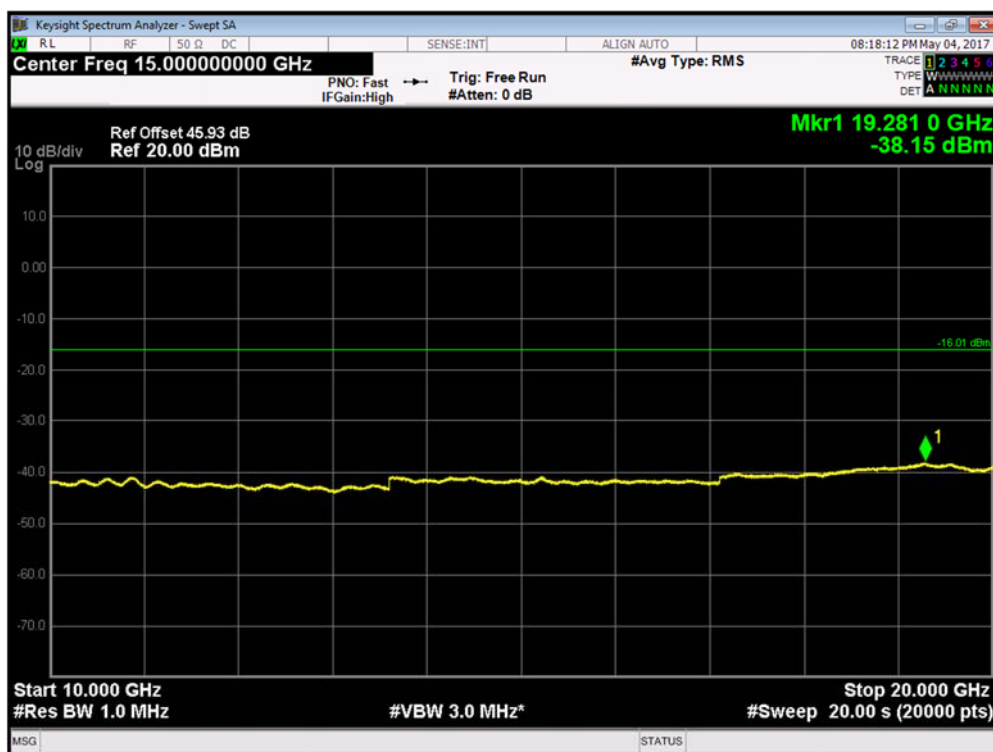
Channel Position T_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 3GHz - 10GHz





Product Service

Channel Position T_{RFBW} - WCDMA 16QAM / LTE QPSK: Bandwidth 1.4 MHz - 10GHz - 20GHz



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

All the unwanted emissions of EUT does not exceed the limitations at the frequency range of 9kHz to 20GHz.



Product Service

2.6 FREQUENCY STABILITY

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 24, Clause 24.235
Industry Canada RSS-133, Clause 6.3

2.6.2 Equipment Under Test

Radio 2219 B2, KRC 161 627/1, S/N: D825490218

2.6.3 Date of Test and Modification State

09 and 10 May 2017 - 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	22.9 - 23.0°C
Relative Humidity	43.0 - 44.0%

2.6.6 Test Method

The test was applied in accordance with test method requirements of FCC Part 24 and RSS-133.

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]*: GSM - GSM Single Carrier with all timeslots active with GMSK modulation
WCDMA - Test Model 1 Single Carrier with QPSK modulation
LTE (3.0 MHz OBW) - Test Model E-TM1.1 Single Carrier with QPSK modulation

2.6.7 Test Results

Frequency Error – Temperature Variation

Configuration G-SC

Maximum Output Power 43.0dBm per port, Channel Bandwidth 250kHz

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B (1930.4MHz)	Channel Position M (1960.0MHz)	Channel Position T (1989.6MHz)
-48.0	-30°C	6.67	5.27	6.66
	-20°C	5.15	5.55	6.60
	-10°C	5.09	5.22	5.10
	0°C	4.49	4.69	5.20
	+10°C	4.92	4.65	4.51
	+20°C	4.38	5.16	4.50
	+30°C	4.13	4.68	4.92
	+40°C	4.19	4.72	4.43
	+50°C	4.67	4.76	5.75

Configuration W-SC

Maximum Output Power 49.0dBm per port, Channel Bandwidth 5MHz

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B (1932.4MHz)	Channel Position M (1960.0MHz)	Channel Position T (1987.6MHz)
-48.0	-30°C	2.72	2.73	3.01
	-20°C	3.33	2.87	3.22
	-10°C	3.28	2.78	2.52
	0°C	2.15	2.81	2.55
	+10°C	2.13	2.27	2.19
	+20°C	2.15	2.34	2.65
	+30°C	2.36	2.32	2.31
	+40°C	1.98	1.99	2.41
	+50°C	2.82	-2.41	2.62

Configuration L-MIMO-SC

Maximum Output Power 43.0dBm per port, Channel Bandwidth 3MHz

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B (1931.5MHz)	Channel Position M (1960.0MHz)	Channel Position T (1988.5MHz)
-48.0	-30°C	-2.51	2.49	-2.07
	-20°C	-2.02	2.21	2.35
	-10°C	-1.96	1.93	-2.04
	0°C	-1.81	1.84	-2.01
	+10°C	-2.23	1.97	-2.00
	+20°C	-1.68	1.76	-1.83
	+30°C	-2.44	2.23	-1.95
	+40°C	-2.62	2.18	2.70
	+50°C	-2.54	-2.02	-2.54

Frequency Error – Voltage Variation

Configuration G-SC

Maximum Output Power 43.0dBm per port, Channel Bandwidth 250kHz

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B (1930.4MHz)	Channel Position M (1960.0MHz)	Channel Position T (1989.6MHz)
-40.8	+20°C	4.79	5.01	5.11
-48.0		4.38	5.16	4.50
-55.2		4.55	4.75	4.61

Configuration W-SC

Maximum Output Power 49.0dBm per port, Channel Bandwidth 5MHz

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B (1932.4MHz)	Channel Position M (1960.0MHz)	Channel Position T (1987.6MHz)
-40.8	+20°C	2.31	2.39	2.21
-48.0		2.15	2.34	2.65
-55.2		2.03	2.36	2.53

Configuration L-MIMO-SC

Maximum Output Power 43.0dBm per port, Channel Bandwidth 3MHz

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B (1931.5MHz)	Channel Position M (1960.0MHz)	Channel Position T (1988.5MHz)
-40.8	+20°C	2.05	1.89	2.05
-48.0		-1.68	1.76	-1.83
-55.2		2.22	2.06	1.64

Limit	FCC: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.
	IC: ± 1.0 ppm

Remarks

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



Product Service

SECTION 3

TEST EQUIPMENT USED



Product Service

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	5230C	MY49002402	12	30-Mar-2018
Power Meter	Rohde & Schwarz	NRP2	101593	12	14-Aug-2017
Power Sensor	Rohde & Schwarz	NRP-Z11	121216	12	14-Aug-2017
Power Sensor	Rohde & Schwarz	NRP-Z51	102309	12	14-Aug-2017
Spectrum Analyser	KEYSIGHT	N9030A	MY54490502	12	05-Apr-2018
40dB Attenuator	Aeroflex / Weinschel	66-40-33	CD4019	-	O/P MON
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
DC Power Supply	KEYSIGHT	N5767A	US15C4120P	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	20-Dec-2017
Thermo-hygrometer	AZ Instruments	8705	9151665	12	02-Jan-2018
Occupied Bandwidth					
Network Analyzer	Agilent	5230C	MY49002402	12	30-Mar-2018
Power Meter	Rohde & Schwarz	NRP2	101593	12	14-Aug-2017
Power Sensor	Rohde & Schwarz	NRP-Z11	121216	12	14-Aug-2017
Power Sensor	Rohde & Schwarz	NRP-Z51	102309	12	14-Aug-2017
Spectrum Analyser	KEYSIGHT	N9030A	MY54490502	12	05-Apr-2018
40dB Attenuator	Aeroflex / Weinschel	66-40-33	CD4019	-	O/P MON
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
DC Power Supply	KEYSIGHT	N5767A	US15C4120P	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	20-Dec-2017
Thermo-hygrometer	AZ Instruments	8705	9151665	12	02-Jan-2018
Spurious Emission at Band Edge					
Network Analyzer	Agilent	5230C	MY49002402	12	30-Mar-2018
Power Meter	Rohde & Schwarz	NRP2	101593	12	14-Aug-2017
Power Sensor	Rohde & Schwarz	NRP-Z11	121216	12	14-Aug-2017
Power Sensor	Rohde & Schwarz	NRP-Z51	102309	12	14-Aug-2017
Spectrum Analyser	KEYSIGHT	N9030A	MY54490502	12	05-Apr-2018
40dB Attenuator	Aeroflex / Weinschel	66-40-33	CD4019	-	O/P MON
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
DC Power Supply	KEYSIGHT	N5767A	US15C4120P	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	20-Dec-2017
Thermo-hygrometer	AZ Instruments	8705	9151665	12	02-Jan-2018
Conducted Spurious Emission					
Network Analyzer	Agilent	5230C	MY49002402	12	30-Mar-2018
Power Meter	Rohde & Schwarz	NRP2	101593	12	14-Aug-2017
Power Sensor	Rohde & Schwarz	NRP-Z11	121216	12	14-Aug-2017
Power Sensor	Rohde & Schwarz	NRP-Z51	102309	12	14-Aug-2017
Spectrum Analyser	KEYSIGHT	N9030A	MY54490502	12	05-Apr-2018
40dB Attenuator	Aeroflex / Weinschel	66-40-33	CD4019	-	O/P MON
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
DC Power Supply	KEYSIGHT	N5767A	US15C4120P	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	20-Dec-2017
Thermo-hygrometer	AZ Instruments	8705	9151665	12	02-Jan-2018



Product Service

Radiated Spurious Emissions					
EMI Receiver	Rohde & Schwarz	ES140	100015	12	20-Aug-2017
Ultra Log Test Antenna	Rohde & Schwarz	HL562	100167	12	20-Aug-2017
Double-Ridge Waveguide Horn Antenna	Rohde & Schwarz	HF 906	100030	12	20-Aug-2017
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Semi Anechoic Chamber	Frankonia	23.18m×16.88m×9.60m	-	12	20-Aug-2017
Antenna Master	Frankonia	MA 260	-	12	20-Aug-2017
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Load	Shanghai Huaxiang	TF150	090323432	-	O/P MON
Load	Shanghai Huaxiang	TF100	090323433	-	O/P MON
DC Power Supply	Ericsson	PSU AC 08	BR83767592	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	20-Dec-2017
Thermo-hygrometer	AZ Instruments	8705	9151665	12	02-Jan-2018
Frequency Stability					
Network Analyzer	Agilent	5230C	MY49002402	12	30-Mar-2018
Power Meter	Rohde & Schwarz	NRP2	101593	12	14-Aug-2017
Power Sensor	Rohde & Schwarz	NRP-Z11	121216	12	14-Aug-2017
Power Sensor	Rohde & Schwarz	NRP-Z51	102309	12	14-Aug-2017
Spectrum Analyser	KEYSIGHT	N9030A	MY54490502	12	05-Apr-2018
40dB Attenuator	Aeroflex / Weinschel	66-40-33	CD4019	-	O/P MON
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
DC Power Supply	KEYSIGHT	N5767A	US15C4120P	-	O/P MON
Climate Chamber	Votsch	C1000	ETC/098	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	20-Dec-2017
Thermo-hygrometer	AZ Instruments	8705	9151665	12	02-Jan-2018

N/A – Not Applicable

OP MON – Output Monitored with Calibrated Equipment



Product Service

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



Product Service

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).

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