

MEASUREMENT REPORT

LTE

Applicant Name:

Apple Inc.
One Apple Park Way
Cupertino, CA 95014
United States

Date of Testing:

05/01/2019 - 08/01/2019

Test Site/Location:

PCTEST Lab. Morgan Hill, CA, USA

Test Report Serial No.:

1C1905130008-03.BCG

FCC ID:

BCG-A2094

APPLICANT:

Apple Inc.

Application Type:

Certification

Model:

A2094

EUT Type:

Watch

FCC Classification:

PCS Licensed Transmitter Worn on Body (PCT)

FCC Rule Part(s):

22, 24, & 27

Test Procedure(s):

ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



Randy Ortanez
President

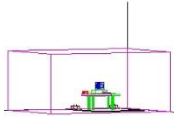


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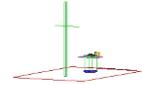
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FCC Part 22, 24, & 27



Mode	FCC Rule Part	Tx Frequency (MHz)	ERP		EIRP		Emission Designator	Modulation
			Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)		
LTE Band 12	27	699.7 - 715.3	0.305	-5.15	0.501	-3.00	1M11G7W	QPSK
LTE Band 12	27	699.7 - 715.3	0.269	-5.70	0.442	-3.55	1M11D7W	16QAM
LTE Band 12	27	700.5 - 714.5	0.305	-5.16	0.500	-3.01	2M73G7W	QPSK
LTE Band 12	27	700.5 - 714.5	0.274	-5.63	0.449	-3.48	2M73D7W	16QAM
LTE Band 12	27	701.5 - 713.5	0.305	-5.16	0.500	-3.01	4M58G7W	QPSK
LTE Band 12	27	701.5 - 713.5	0.266	-5.75	0.437	-3.60	4M57D7W	16QAM
LTE Band 12	27	704 - 711	0.299	-5.24	0.491	-3.09	9M11G7W	QPSK
LTE Band 12	27	704 - 711	0.269	-5.70	0.442	-3.55	5M43D7W	16QAM
LTE Band 17	27	706.5 - 713.5	0.305	-5.15	0.501	-3.00	4M58G7W	QPSK
LTE Band 17	27	706.5 - 713.5	0.271	-5.67	0.445	-3.52	4M57D7W	16QAM
LTE Band 17	27	709 - 711	0.304	-5.17	0.499	-3.02	9M11G7W	QPSK
LTE Band 17	27	709 - 711	0.269	-5.71	0.441	-3.56	5M43D7W	16QAM
LTE Band 13	27	779.5 - 784.5	0.442	-3.55	0.724	-1.40	4M57G7W	QPSK
LTE Band 13	27	779.5 - 784.5	0.422	-3.75	0.692	-1.60	4M56D7W	16QAM
LTE Band 13	27	782	0.442	-3.55	0.724	-1.40	9M09G7W	QPSK
LTE Band 13	27	782	0.396	-4.02	0.650	-1.87	5M53D7W	16QAM
LTE Band 5	22H	824.7 - 848.3	0.451	-3.46	0.740	-1.31	1M11G7W	QPSK
LTE Band 5	22H	824.7 - 848.3	0.403	-3.95	0.661	-1.80	1M11D7W	16QAM
LTE Band 5	22H	825.5 - 847.5	0.444	-3.53	0.728	-1.38	2M72G7W	QPSK
LTE Band 5	22H	825.5 - 847.5	0.397	-4.01	0.652	-1.86	2M73D7W	16QAM
LTE Band 5	22H	826.5 - 846.5	0.452	-3.45	0.741	-1.30	4M57G7W	QPSK
LTE Band 5	22H	826.5 - 846.5	0.406	-3.92	0.665	-1.77	4M56D7W	16QAM
LTE Band 5	22H	829 - 844	0.444	-3.53	0.728	-1.38	9M14G7W	QPSK
LTE Band 5	22H	829 - 844	0.405	-3.93	0.664	-1.78	5M41D7W	16QAM
LTE Band 26	22H	824.7 - 848.3	0.449	-3.48	0.736	-1.33	1M11G7W	QPSK
LTE Band 26	22H	824.7 - 848.3	0.401	-3.97	0.658	-1.82	1M11D7W	16QAM
LTE Band 26	22H	825.5 - 847.5	0.434	-3.63	0.711	-1.48	2M72G7W	QPSK
LTE Band 26	22H	825.5 - 847.5	0.397	-4.01	0.652	-1.86	2M73D7W	16QAM
LTE Band 26	22H	826.5 - 846.5	0.452	-3.45	0.741	-1.30	4M57G7W	QPSK
LTE Band 26	22H	826.5 - 846.5	0.403	-3.95	0.661	-1.80	4M56D7W	16QAM
LTE Band 26	22H	829 - 844	0.442	-3.55	0.724	-1.40	9M14G7W	QPSK
LTE Band 26	22H	829 - 844	0.404	-3.94	0.662	-1.79	5M41D7W	16QAM

EUT Overview (Low Bands)

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Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (mW)	Max. Power (dBm)		
LTE Band 4	27	1710.7 - 1754.3	10.000	10.00	1M10G7W	QPSK
LTE Band 4	27	1710.7 - 1754.3	8.933	9.51	1M11D7W	16QAM
LTE Band 4	27	1711.5 - 1753.5	10.000	10.00	2M72G7W	QPSK
LTE Band 4	27	1711.5 - 1753.5	8.913	9.50	2M73D7W	16QAM
LTE Band 4	27	1712.5 - 1752.5	10.000	10.00	4M56G7W	QPSK
LTE Band 4	27	1712.5 - 1752.5	8.770	9.43	4M56D7W	16QAM
LTE Band 4	27	1715 - 1750	10.000	10.00	9M15G7W	QPSK
LTE Band 4	27	1715 - 1750	8.750	9.42	5M51D7W	16QAM
LTE Band 4	27	1717.5 - 1747.5	10.000	10.00	13M7G7W	QPSK
LTE Band 4	27	1717.5 - 1747.5	8.810	9.45	6M25D7W	16QAM
LTE Band 4	27	1720 - 1745	10.000	10.00	18M3G7W	QPSK
LTE Band 4	27	1720 - 1745	8.770	9.43	7M58D7W	16QAM
LTE Band 66	27	1710.7 - 1779.3	9.908	9.96	1M10G7W	QPSK
LTE Band 66	27	1710.7 - 1779.3	8.610	9.35	1M11D7W	16QAM
LTE Band 66	27	1711.5 - 1778.5	9.572	9.81	2M72G7W	QPSK
LTE Band 66	27	1711.5 - 1778.5	8.710	9.40	2M73D7W	16QAM
LTE Band 66	27	1712.5 - 1777.5	9.683	9.86	4M56G7W	QPSK
LTE Band 66	27	1712.5 - 1777.5	8.954	9.52	4M56D7W	16QAM
LTE Band 66	27	1715 - 1775	9.550	9.80	9M15G7W	QPSK
LTE Band 66	27	1715 - 1775	9.016	9.55	5M51D7W	16QAM
LTE Band 66	27	1717.5 - 1772.5	10.000	10.00	13M7G7W	QPSK
LTE Band 66	27	1717.5 - 1772.5	8.913	9.50	6M25D7W	16QAM
LTE Band 66	27	1720 - 1770	9.977	9.99	18M3G7W	QPSK
LTE Band 66	27	1720 - 1770	8.710	9.40	7M58D7W	16QAM
LTE Band 2	24E	1850.7 - 1909.3	14.093	11.49	1M11G7W	QPSK
LTE Band 2	24E	1850.7 - 1909.3	12.503	10.97	1M11D7W	16QAM
LTE Band 2	24E	1851.5 - 1908.5	13.583	11.33	2M73G7W	QPSK
LTE Band 2	24E	1851.5 - 1908.5	12.331	10.91	2M73D7W	16QAM
LTE Band 2	24E	1852.5 - 1907.5	13.740	11.38	4M57G7W	QPSK
LTE Band 2	24E	1852.5 - 1907.5	12.388	10.93	4M55D7W	16QAM
LTE Band 2	24E	1855 - 1905	13.804	11.40	9M09G7W	QPSK
LTE Band 2	24E	1855 - 1905	12.503	10.97	5M46D7W	16QAM
LTE Band 2	24E	1857.5 - 1902.5	13.868	11.42	13M6G7W	QPSK
LTE Band 2	24E	1857.5 - 1902.5	12.677	11.03	6M07D7W	16QAM
LTE Band 2	24E	1860 - 1900	14.388	11.58	18M2G7W	QPSK
LTE Band 2	24E	1860 - 1900	12.706	11.04	7M77D7W	16QAM
LTE Band 25	24E	1850.7 - 1914.3	14.028	11.47	1M11G7W	QPSK
LTE Band 25	24E	1850.7 - 1914.3	12.246	10.88	1M11D7W	16QAM
LTE Band 25	24E	1851.5 - 1913.5	14.028	11.47	2M73G7W	QPSK
LTE Band 25	24E	1851.5 - 1913.5	12.503	10.97	2M73D7W	16QAM
LTE Band 25	24E	1852.5 - 1912.5	13.964	11.45	4M57G7W	QPSK
LTE Band 25	24E	1852.5 - 1912.5	12.503	10.97	4M55D7W	16QAM
LTE Band 25	24E	1855 - 1910	13.646	11.35	9M09G7W	QPSK
LTE Band 25	24E	1855 - 1910	12.503	10.97	5M46D7W	16QAM
LTE Band 25	24E	1857.5 - 1907.5	14.093	11.49	13M6G7W	QPSK
LTE Band 25	24E	1857.5 - 1907.5	12.589	11.00	6M07D7W	16QAM
LTE Band 25	24E	1860 - 1905	13.964	11.45	18M2G7W	QPSK
LTE Band 25	24E	1860 - 1905	12.417	10.94	7M77D7W	16QAM

EUT Overview (Mid Bands)

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Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (mW)	Max. Power (dBm)		
LTE Band 7	27	2502.5 - 2567.5	10.914	10.38	4M56G7W	QPSK
LTE Band 7	27	2502.5 - 2567.5	9.727	9.88	4M56D7W	16QAM
LTE Band 7	27	2505 - 2565	10.471	10.20	9M12G7W	QPSK
LTE Band 7	27	2505 - 2565	9.954	9.98	5M51D7W	16QAM
LTE Band 7	27	2507.5 - 2562.5	10.257	10.11	13M7G7W	QPSK
LTE Band 7	27	2507.5 - 2562.5	9.727	9.88	6M07D7W	16QAM
LTE Band 7	27	2510 - 2560	10.233	10.10	18M3G7W	QPSK
LTE Band 7	27	2510 - 2560	9.772	9.90	7M71D7W	16QAM
LTE Band 41	27	2498.5 - 2687.5	11.220	10.50	4M59G7W	QPSK
LTE Band 41	27	2498.5 - 2687.5	9.290	9.68	4M57D7W	16QAM
LTE Band 41	27	2501 - 2685	11.220	10.50	9M11G7W	QPSK
LTE Band 41	27	2501 - 2685	9.183	9.63	5M48D7W	16QAM
LTE Band 41	27	2503.5 - 2682.5	11.169	10.48	13M6G7W	QPSK
LTE Band 41	27	2503.5 - 2682.5	9.183	9.63	6M36D7W	16QAM
LTE Band 41	27	2506 - 2680	11.220	10.50	18M2G7W	QPSK
LTE Band 41	27	2506 - 2680	9.183	9.63	7M94D7W	16QAM

EUT Overview (High Bands)

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 18855 Adams Court, Morgan Hill, CA 95037. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Morgan Hill, CA 95037, U.S.A.

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISSED Standards (RSS).
- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISSED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Watch FCC ID: BCG-A2094**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

Test Device Serial No.: D92F00DM950, D92YD04FM94X, D92YD032M8CF, D92YD001M94V, FN6911200JFK6RL5C

2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, Bluetooth (1x, EDR, HDR4, HDR8, LE), NFC

LTE Band 12 (698 - 716 MHz) overlaps the entire frequency range of LTE Band 17 (704 - 716 MHz). Therefore, test data provided in this report covers Band 17 as well as Band 12.

LTE Band 26 (814.7 – 849 MHz) overlaps the entire frequency range of LTE Band 5 (824 – 849 MHz). Therefore, test data provided in this report covers Band 5 as well as Band 26.

LTE Band 66 (1710 - 1780 MHz) overlaps the entire frequency range of LTE Band 4 (1710 - 1755 MHz). Therefore, test data provided in this report covers Band 4 as well as Band 66.

LTE Band 25 (1850 - 1915 MHz) overlaps the entire frequency range of LTE Band 2 (1850 - 1910 MHz). Therefore, test data provided in this report covers Band 2 as well as Band 25.

This device supports simultaneous transmission operation, which allows for two transmitters to transmit simultaneously on the same antenna. The table below shows all configurations possible.

Simultaneous Tx Configurations	Antenna			
	FCM			
	Configuration 1	Configuration 2	Configuration 3	Configuration 4
WIFI 2.4GHz	✓	✓	✗	✗
Bluetooth	✗	✗	✓	✓
LTE Mid Bands	✓	✗	✓	✗
LTE High Bands	✗	✓	✗	✓

Table 2-1. Simultaneous Tx Configurations

✓ = Support ; ✗ = NOT Support

Worst Case Configuration

Description	WIFI 2.4GHz	LTE
Antenna	FCM	FCM
Channel	6	41490
Operating Frequency (MHz)	2437	2680
Mode/Modulation	802.11b	QPSK/1RB/20MHz

Table 2-2. Worst Case Configuration

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2.3 Antenna Description

Following antenna was used for the testing.

Frequency [MHz]	Antenna Gain (dBi)	
	BCM	FCM
698-716	-28.0	N/A
777-787	-26.4	N/A
814-849	-26.3	N/A
1710-1785	N/A	-14.0
1850-1915	N/A	-12.4
2496-2690	N/A	-13.0
2500-2570	N/A	-13.1

Table 2-3. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple MacBook w/AC/DC Adapter	Model: A1398 Model: A1435	S/N: C2QKP008F6F3 S/N: N/A
2	Apple USB Cable w/ Charging Dock w/ Dock	Model: Kanzi Model: FAPS73 Model: X241	S/N: 311C81 S/N: 17481001022 S/N: GW17F01ST22
3	USB Lightning Cable w/ AC Adapter	Model: N/A Model: A1385	S/N: N/A S/N: N/A
4	Wireless Charging Pad (WCP) Wireless Charging Pad (WCP)	Model: EVT Model: EVT	S/N: DLC915600ECLNWL3K S/N: DLC9156006TLNWK3V
5	Test Pathfinder Sinsa Board w/ SiP Cradle	Model: X1456 Model: P1 X1454S	S/N: 920-062535-01 S/N: 920-06373-02
6	DC Power Supply	Model: KPS3010D	S/N: N/A
7	Mobile Comm DC Source	Model: 66321D	S/N: MY52000555

Table 2-4. Test Support Equipment Used

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2.5 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

The worst case configuration was investigated for all combinations of the four materials, aluminum, stainless steel, ceramic, and aluminum/ceramic mix, and various types of wristbands, metal and non-metal wristbands. The store display sample was investigated and determined as not the worst case. The EUT was also investigated with and without wireless charger. The worst case configuration found was used for all testing.

For emissions from 1GHz – 18GHz, low, mid, and high channels were tested with highest power and worst case configuration. The emissions below 1GHz and above 18GHz were tested with the highest transmitting power channel and the worst case configuration.

The EUT was manipulated through three orthogonal planes of X-orientation (flatbed), Y-orientation (landscape), and Z-orientation (portrait) during the testing. Only the worst case emissions were reported in this test report.

This device only supports 27RBs or less for 16-QAM uplink.

2.6 Software and Firmware

The test was conducted with firmware version wOS 6.0 installed on the EUT.

2.7 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Measurement Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

3.2 Block C Frequency Range

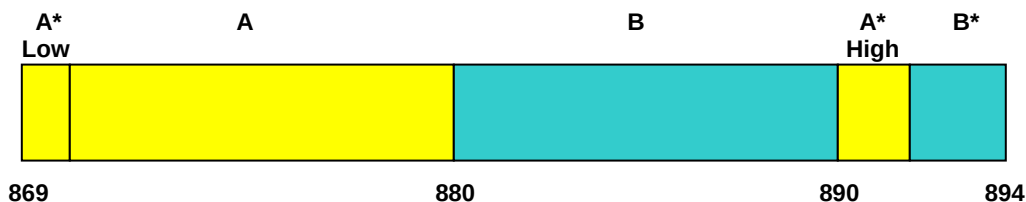
Two paired channels of 11 megahertz each are available for assignment in Block C in the 746-757 MHz and 776-787 MHz bands. In the event that no licenses for two channels in this Block C are assigned based on the results of the first auction in which such licenses were offered because the auction results do not satisfy the applicable reserve price, the spectrum in the 746-757 MHz and 776-787 MHz bands will instead be made available for assignment at a subsequent auction as follows: (i) Two paired channels of 6 megahertz each available for assignment in Block C1 in the 746-752 MHz and 776-782 MHz bands. (ii) Two paired channels of 5 megahertz each available for assignment in Block C2 in the 752-757 MHz and 782-787 MHz bands.

3.3 Block A Frequency Range

698-746 MHz band. The following frequencies are available for licensing pursuant to this part in the 698-746 MHz band: (1) Three paired channel blocks of 12 megahertz each are available for assignment as follows:

Block A: 698-704 MHz and 728-734 MHz;
Block B: 704-710 MHz and 734-740 MHz; and
Block C: 710-716 MHz and 740-746 MHz.

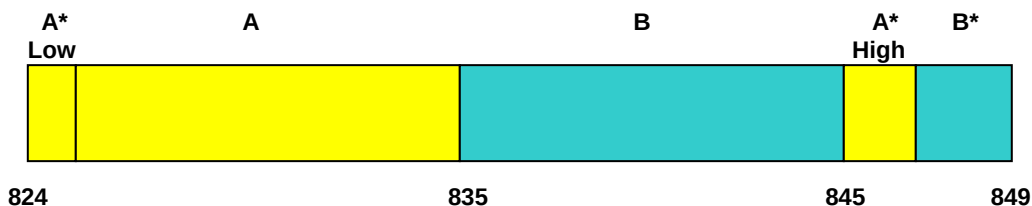
3.4 Cellular - Base Frequency Blocks



BLOCK 1: 869 – 880 MHz (A* Low + A)
BLOCK 2: 880 – 890 MHz (B)

BLOCK 3: 890 – 891.5 MHz (A* High)
BLOCK 4: 891.5 – 894 MHz (B*)

3.5 Cellular - Mobile Frequency Blocks

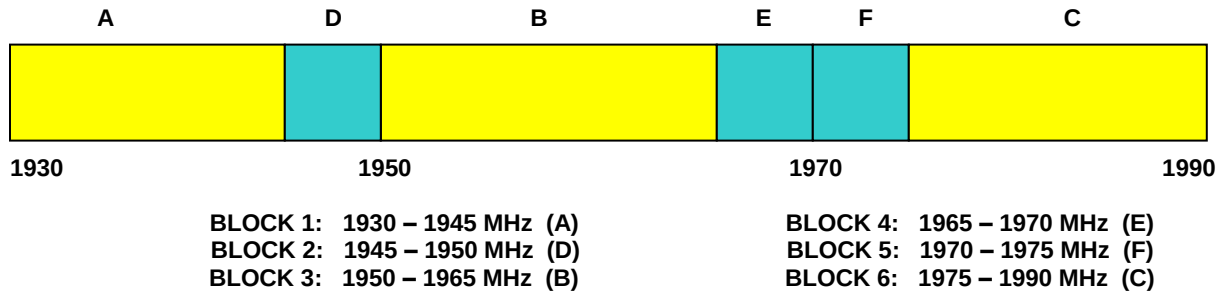


BLOCK 1: 824 – 835 MHz (A* Low + A)
BLOCK 2: 835 – 845 MHz (B)

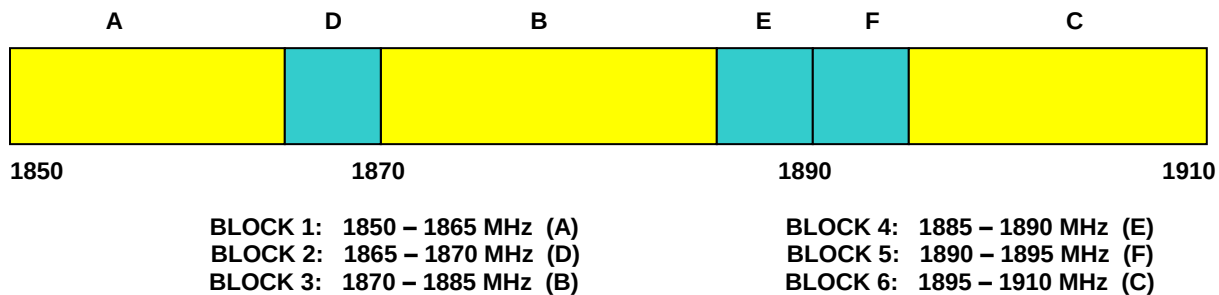
BLOCK 3: 845 – 846.5 MHz (A* High)
BLOCK 4: 846.5 – 849 MHz (B*)

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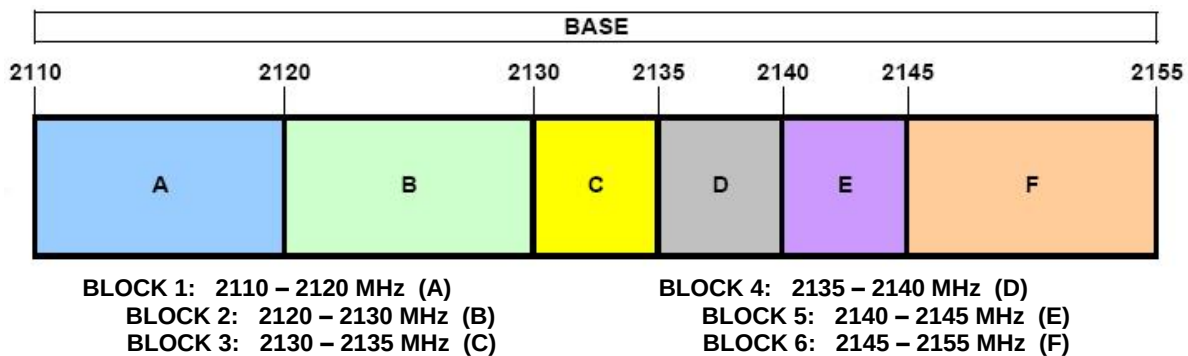
3.6 PCS - Base Frequency Blocks



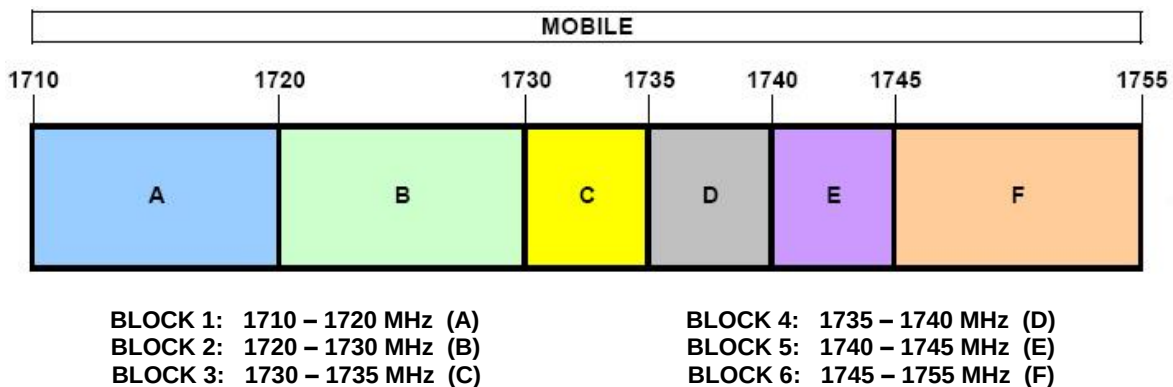
3.7 PCS - Mobile Frequency Blocks



3.8 AWS - Base Frequency Blocks

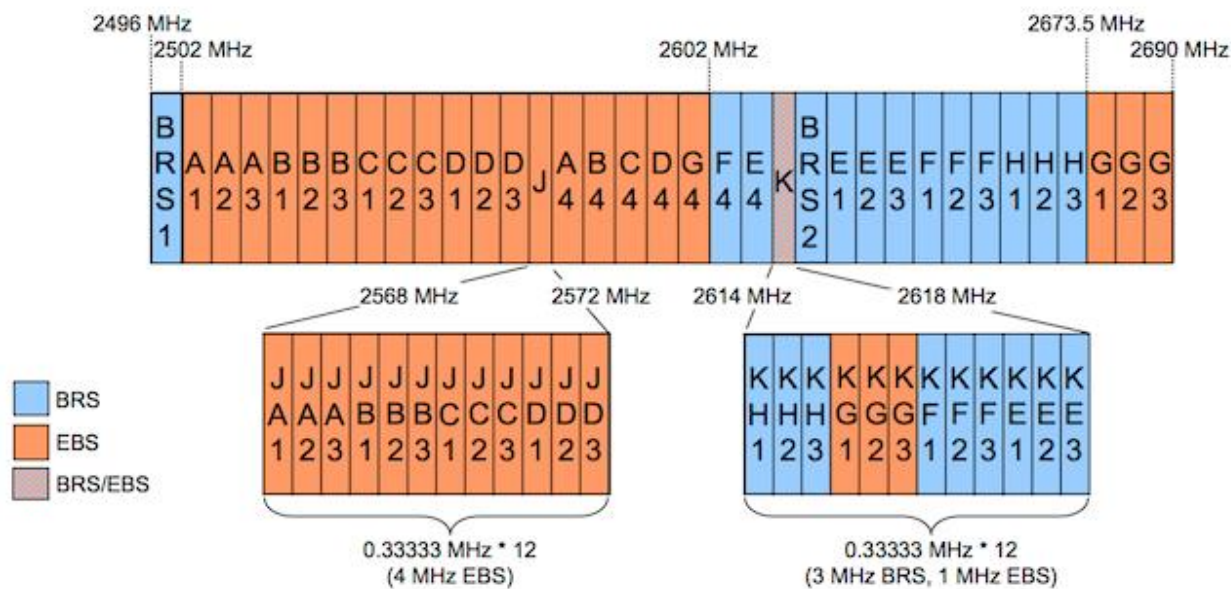


3.9 AWS - Mobile Frequency Blocks



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3.10 BRS/EBS Frequency Block



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3.11 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Per the guidelines of KDB 412172 D01 v01r01, radiated power levels are measured using the following formula:

$$ERP \text{ or } EIRP = P_T + G_T - L_C$$

Where P_T is the transmitter output power, expressed in dBm, G_T is the gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP), and L_C signal attenuation in the connecting cable between the transmitter and antenna in dB.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]}$$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of $43 + 10 \log_{10}(\text{Power [Watts]})$. For Band 7 and 41, the calculated P_d levels are compared to the absolute spurious emission limit of -25dBm which is equivalent to the required minimum attenuation of $55 + 10 \log_{10}(\text{Power [Watts]})$.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ($\pm$ dB)
Conducted Bench Top Measurements	1.29
Radiated Disturbance (<1GHz)	4.15
Radiated Disturbance (>1GHz)	4.70
Radiated Disturbance (>18GHz)	5.01
Temperature	0.01

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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/13/2019	Annual	3/13/2020	MY49430244
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	9/10/2018	Annual	9/10/2019	T058701-03
ESPEC	SU-241	Tabletop Temperature Chamber	8/10/2018	Annual	8/10/2019	92009574
ETS-Lindgren	118490	Pre-Amplifier (30MHz - 6GHz)	8/31/2018	Annual	8/31/2019	213236
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	12/11/2018	Annual	12/11/2019	224569
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	2/27/2019	Annual	2/27/2020	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	5/21/2019	Annual	5/21/2020	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	11/20/2018	Annual	11/20/2019	101570
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	8/10/2018	Annual	8/10/2019	161616
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/16/2018	Annual	11/16/2019	164715
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	1/8/2019	Annual	1/8/2020	166869
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	9/5/2018	Annual	9/5/2019	100050
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	11/21/2018	Annual	11/21/2019	101057
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	12/7/2018	Annual	12/7/2019	101063
Rohde & Schwarz	HFH2-Z2	Loop Antenna	3/21/2019	Annual	3/21/2020	100519

Table 5-1. Test Equipment

Notes:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7W

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination of Any

QAM Modulation

Emission Designator = 8M45D7W

LTE BW = 8.45 MHz

D = Amplitude/Angle Modulated

7 = Quantized/Digital Info

W = Combination of Any

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (1564 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

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7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
 FCC ID: BCG-A2094
 FCC Classification: PCS Licensed Transmitter Worn on Body (PCT)
 Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 22.917(a) 24.238(a) 27.53(c) 27.53(g) 27.53(h)	Out of Band Emissions	$> 43 + 10 \log_{10}(P[\text{Watts}])$ at Band Edge and for all out-of-band emissions			Section 7.3, 7.4
27.53(m)	Out of Band Emissions	Undesirable emissions must meet the limits detailed in 27.53(m)			Section 7.3, 7.4
24.232(d) 27.50(d)(5)	Peak-Average Ratio	$< 13 \text{ dB}$			Section 7.5
2.1046	Transmitter Conducted Output Power	N/A			Section 7.6
2.1055 22.355 24.235 27.54	Frequency Stability	$< 2.5 \text{ ppm}$ (Part 22) and fundamental emissions stay within authorized frequency block (Part 24, 27)			Section 7.8

Table 7-1. Summary of Conducted Test Results

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FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
22.913(a)(5)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 26/5)	< 7 Watts max. ERP	RADIATED	PASS	Section 7.6
27.50(b)(10) 27.50(c)(10)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 12/17, 13)	< 3 Watts max. ERP			Section 7.6
24.232(c) 27.50(h)(2)	Equivalent Isotropic Radiated Power (Band 25/2, 7, 41)	< 2 Watts max. EIRP			Section 7.6
27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 66/4)	< 1 Watts max. EIRP			Section 7.6
2.1053 22.917(a) 24.238(a) 27.53(c) 27.53(g) 27.53(h)	Undesirable Emissions	> 43 + 10 log ₁₀ (P[Watts]) for all out-of-band emissions			Section 7.7
27.53(f)	Undesirable Emissions (Band 13)	< -70 dBW/MHz (for wideband signals) < -80 dBW (for discrete emissions less than 700Hz BW) For all emissions in the band 1559 – 1610 MHz			Section 7.7
27.53(m)	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 27.53(m)			Section 7.7

Table 7-2. Summary of Radiated Test Results

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots (Sections 7.2, 7.3, 7.4, 7.5) were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "LTE Automation," Version 4.8.

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7.2 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 4.2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

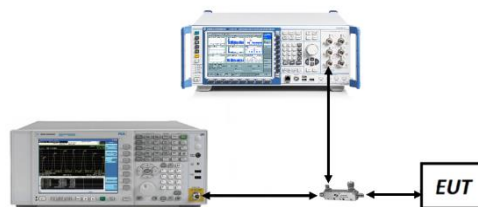


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

This device only supports 27RBs or less for 16-QAM uplink.

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Mode	BW (MHz)	Modulation	Occupied BW [kHz]
LTE Band 12	1.4	QPSK	1105.7
LTE Band 12	1.4	16QAM	1109.0
LTE Band 12	3	QPSK	2727.7
LTE Band 12	3	16QAM	2727.1
LTE Band 12	5	QPSK	4578.1
LTE Band 12	5	16QAM	4571.2
LTE Band 12	10	QPSK	9112.4
LTE Band 12	10	16QAM	5431.7
LTE Band 17	5	QPSK	4578.1
LTE Band 17	5	16QAM	4571.2
LTE Band 17	10	QPSK	9112.4
LTE Band 17	10	16QAM	5431.7
LTE Band 13	5	QPSK	4566.5
LTE Band 13	5	16QAM	4564.0
LTE Band 13	10	QPSK	9093.1
LTE Band 13	10	16QAM	5527.1
LTE Band 5	1.4	QPSK	1108.9
LTE Band 5	1.4	16QAM	1108.9
LTE Band 5	3	QPSK	2723.9
LTE Band 5	3	16QAM	2727.6
LTE Band 5	5	QPSK	4572.6
LTE Band 5	5	16QAM	4558.8
LTE Band 5	10	QPSK	9136.7
LTE Band 5	10	16QAM	5408.9
LTE Band 26	1.4	QPSK	1108.9
LTE Band 26	1.4	16QAM	1108.9
LTE Band 26	3	QPSK	2723.9
LTE Band 26	3	16QAM	2727.6
LTE Band 26	5	QPSK	4572.6
LTE Band 26	5	16QAM	4558.8
LTE Band 26	10	QPSK	9136.7
LTE Band 26	10	16QAM	5408.9

Table 7-3. Occupied Band Width Results (Low Bands)

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Mode	BW (MHz)	Modulation	Occupied BW [kHz]
LTE Band 4	1.4	QPSK	1103.1
LTE Band 4	1.4	16QAM	1106.9
LTE Band 4	3	QPSK	2724.4
LTE Band 4	3	16QAM	2728.7
LTE Band 4	5	QPSK	4559.3
LTE Band 4	5	16QAM	4560.3
LTE Band 4	10	QPSK	9154.3
LTE Band 4	10	16QAM	5508.8
LTE Band 4	15	QPSK	13676.5
LTE Band 4	15	16QAM	6249.9
LTE Band 4	20	QPSK	18313.8
LTE Band 4	20	16QAM	7582.9
LTE Band 66	1.4	QPSK	1103.1
LTE Band 66	1.4	16QAM	1106.9
LTE Band 66	3	QPSK	2724.4
LTE Band 66	3	16QAM	2728.7
LTE Band 66	5	QPSK	4559.3
LTE Band 66	5	16QAM	4560.3
LTE Band 66	10	QPSK	9154.3
LTE Band 66	10	16QAM	5508.8
LTE Band 66	15	QPSK	13676.5
LTE Band 66	15	16QAM	6249.9
LTE Band 66	20	QPSK	18313.8
LTE Band 66	20	16QAM	7582.9
LTE Band 2	1.4	QPSK	1108.0
LTE Band 2	1.4	16QAM	1105.2
LTE Band 2	3	QPSK	2726.0
LTE Band 2	3	16QAM	2729.1
LTE Band 2	5	QPSK	4574.4
LTE Band 2	5	16QAM	4553.9
LTE Band 2	10	QPSK	9092.0
LTE Band 2	10	16QAM	5457.8
LTE Band 2	15	QPSK	13640.6
LTE Band 2	15	16QAM	6067.4
LTE Band 2	20	QPSK	18228.2
LTE Band 2	20	16QAM	7774.4
LTE Band 25	1.4	QPSK	1108.0
LTE Band 25	1.4	16QAM	1105.2
LTE Band 25	3	QPSK	2726.0
LTE Band 25	3	16QAM	2729.1
LTE Band 25	5	QPSK	4574.4
LTE Band 25	5	16QAM	4553.9
LTE Band 25	10	QPSK	9092.0
LTE Band 25	10	16QAM	5457.8
LTE Band 25	15	QPSK	13640.6
LTE Band 25	15	16QAM	6067.4
LTE Band 25	20	QPSK	18228.2
LTE Band 25	20	16QAM	7774.4

Table 7-4. Occupied Band Width Results (Mid Bands)

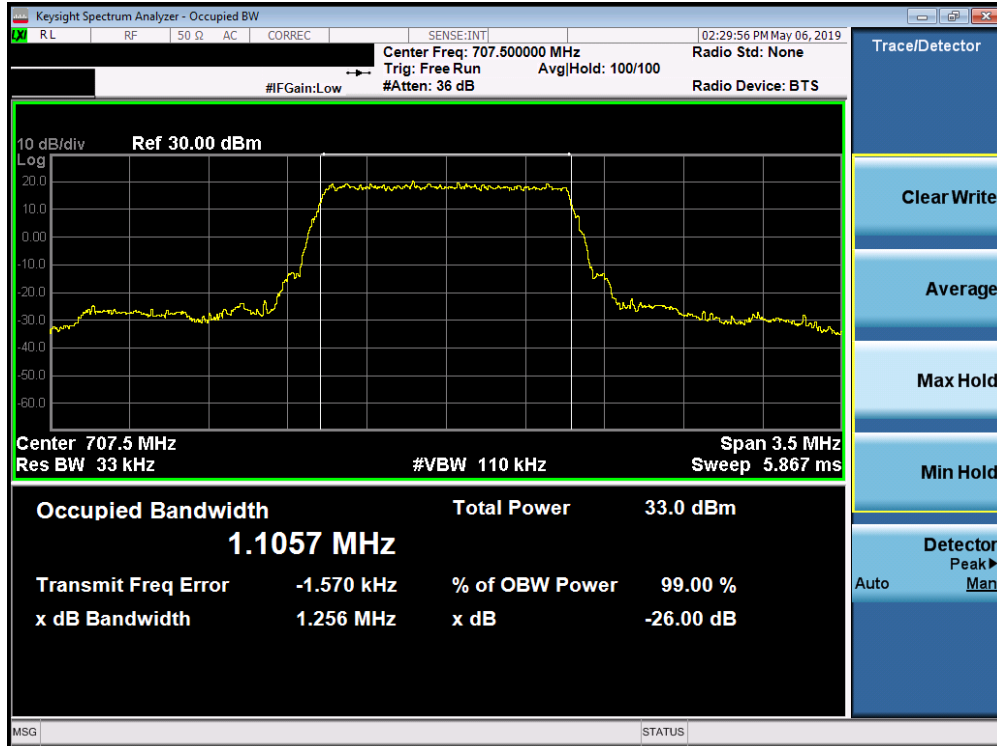
FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Mode	BW (MHz)	Modulation	Occupied BW [kHz]
LTE Band 7	5	QPSK	4563.2
LTE Band 7	5	16QAM	4562.1
LTE Band 7	10	QPSK	9120.0
LTE Band 7	10	16QAM	5511.5
LTE Band 7	15	QPSK	13670.8
LTE Band 7	15	16QAM	6070.1
LTE Band 7	20	QPSK	18287.2
LTE Band 7	20	16QAM	7707.8
LTE Band 41	5	QPSK	4587.3
LTE Band 41	5	16QAM	4573.5
LTE Band 41	10	QPSK	9107.7
LTE Band 41	10	16QAM	5477.3
LTE Band 41	15	QPSK	13637.1
LTE Band 41	15	16QAM	6355.3
LTE Band 41	20	QPSK	18181.7
LTE Band 41	20	16QAM	7939.1

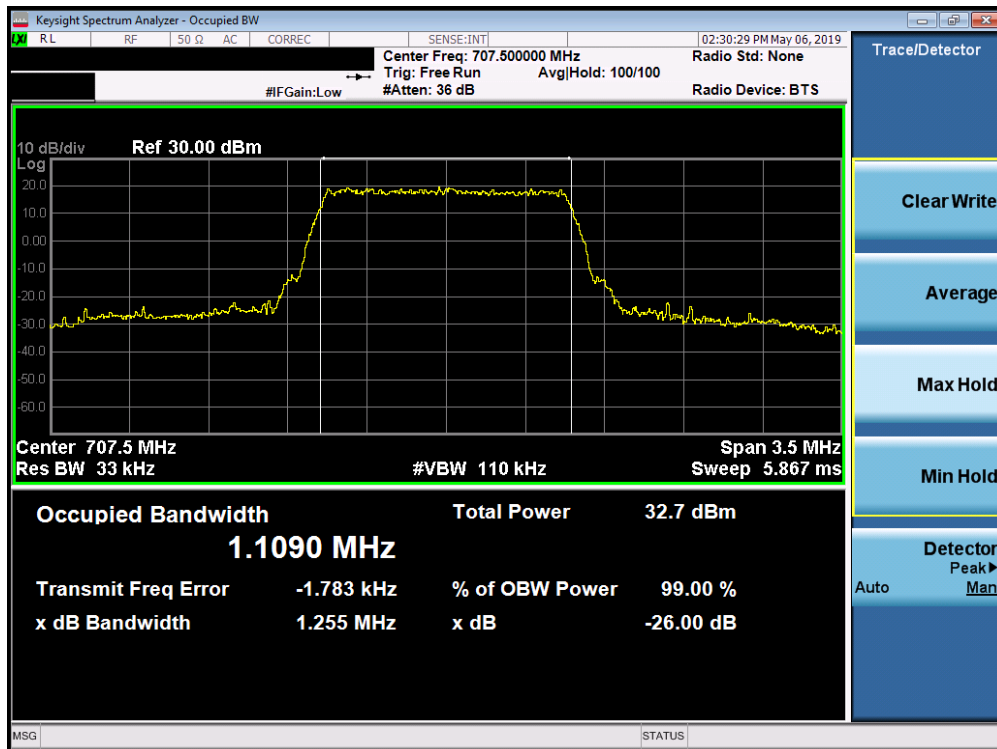
Table 7-5. Occupied Band Width Results (High Bands)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 12/17

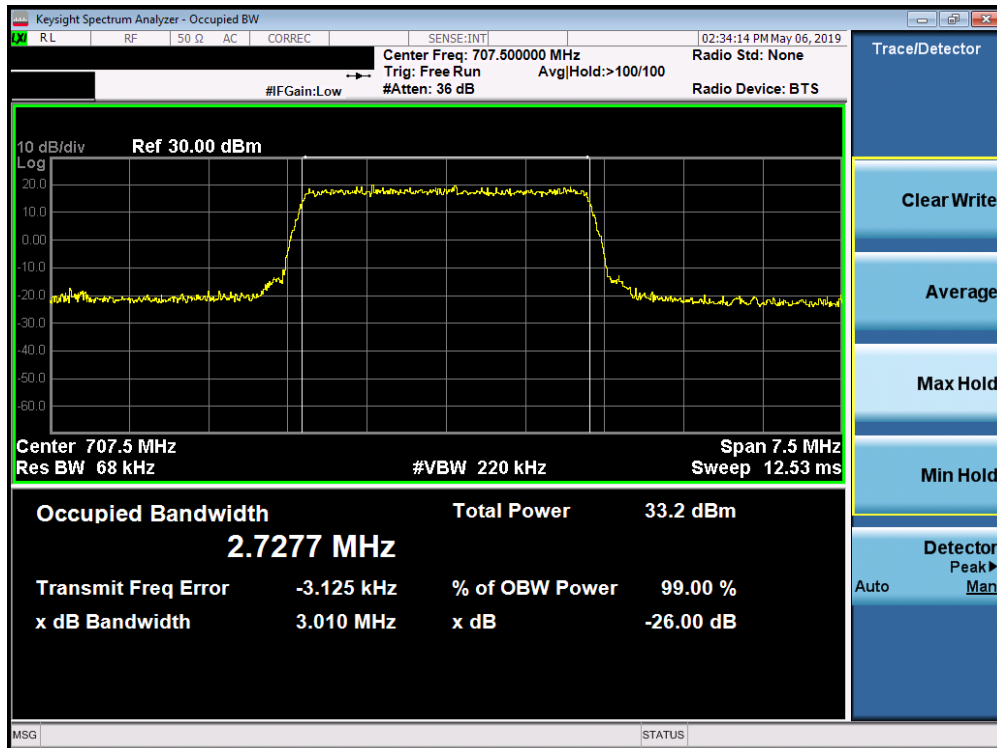


Plot 7-1. Occupied Bandwidth Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)

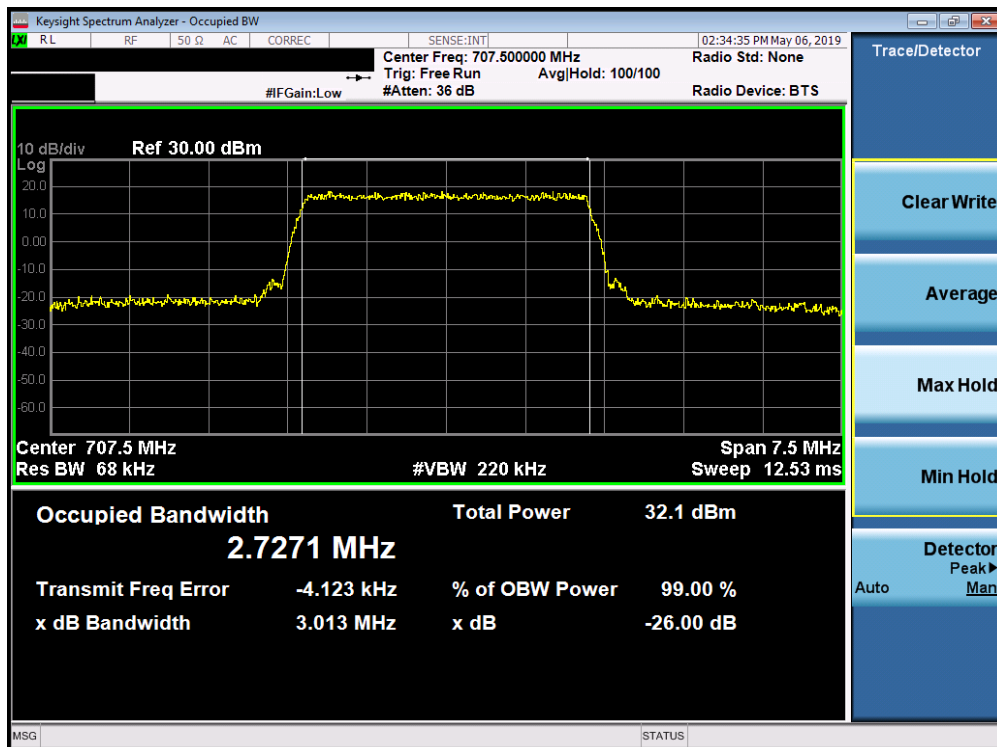


Plot 7-2. Occupied Bandwidth Plot (Band 12 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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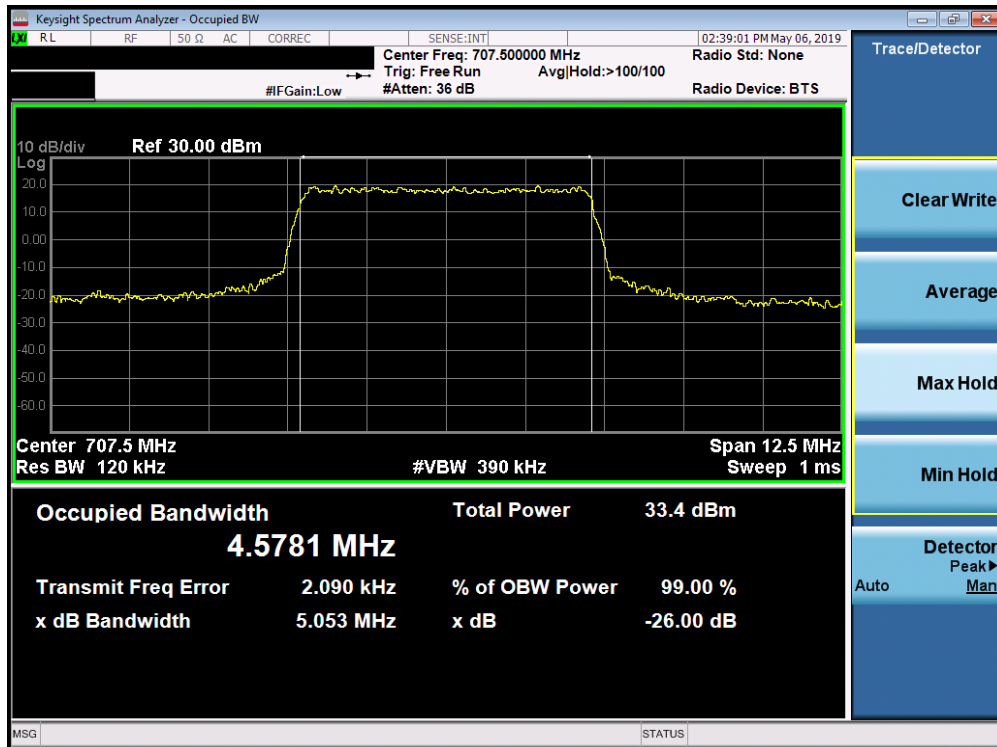


Plot 7-3. Occupied Bandwidth Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)

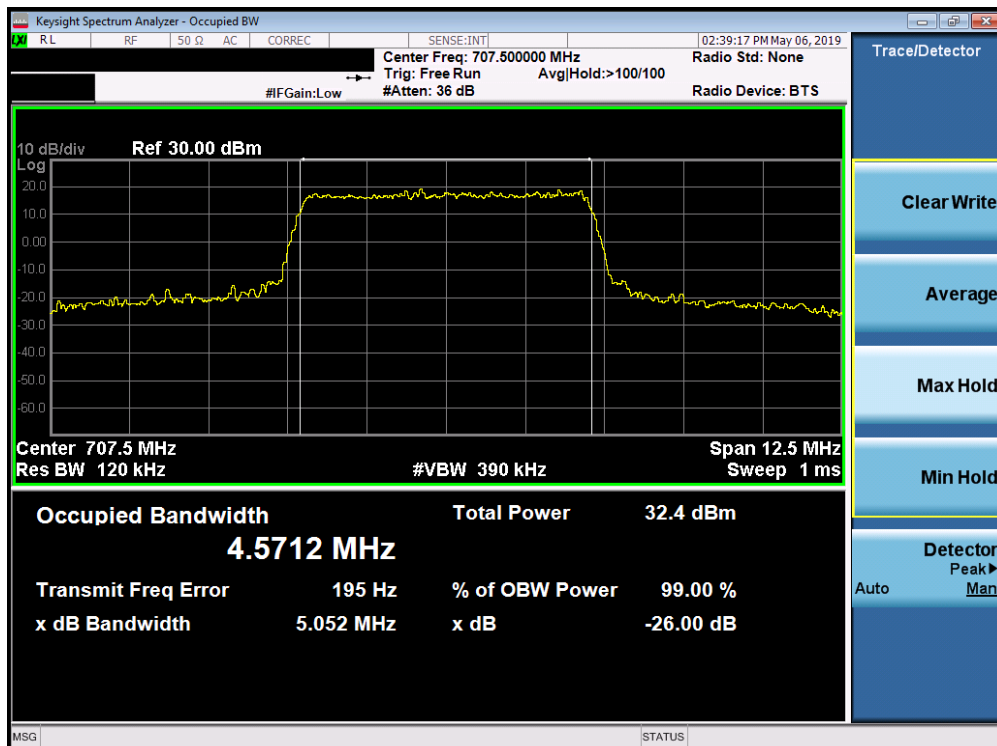


Plot 7-4. Occupied Bandwidth Plot (Band 12 - 3.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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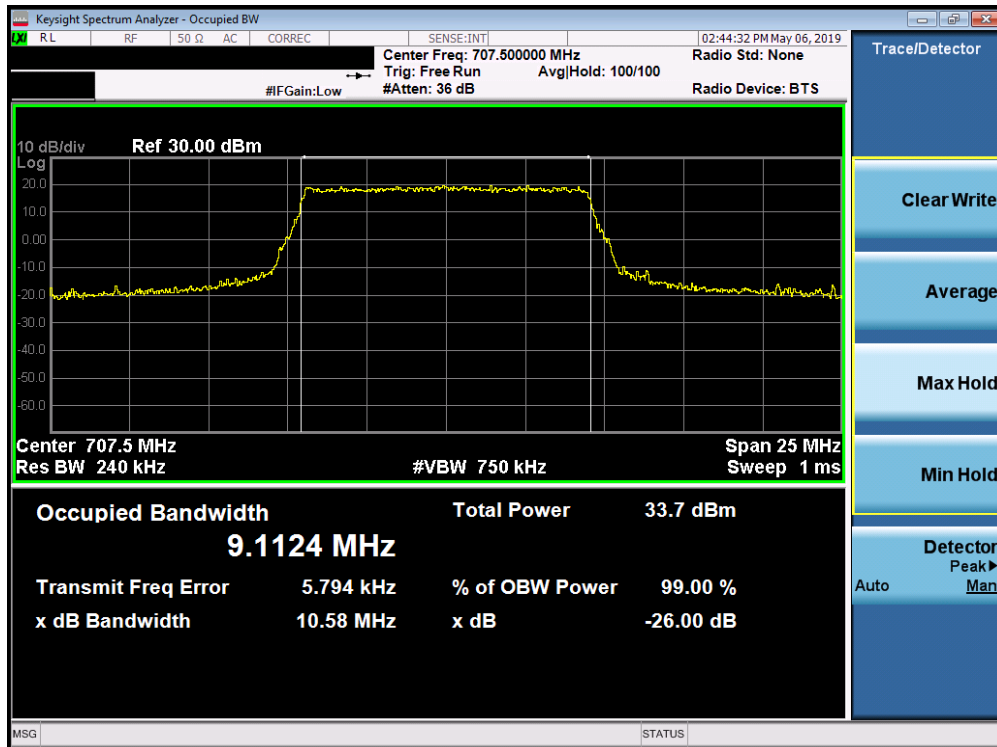


Plot 7-5. Occupied Bandwidth Plot (Band 12/17 - 5.0MHz QPSK - Full RB Configuration)

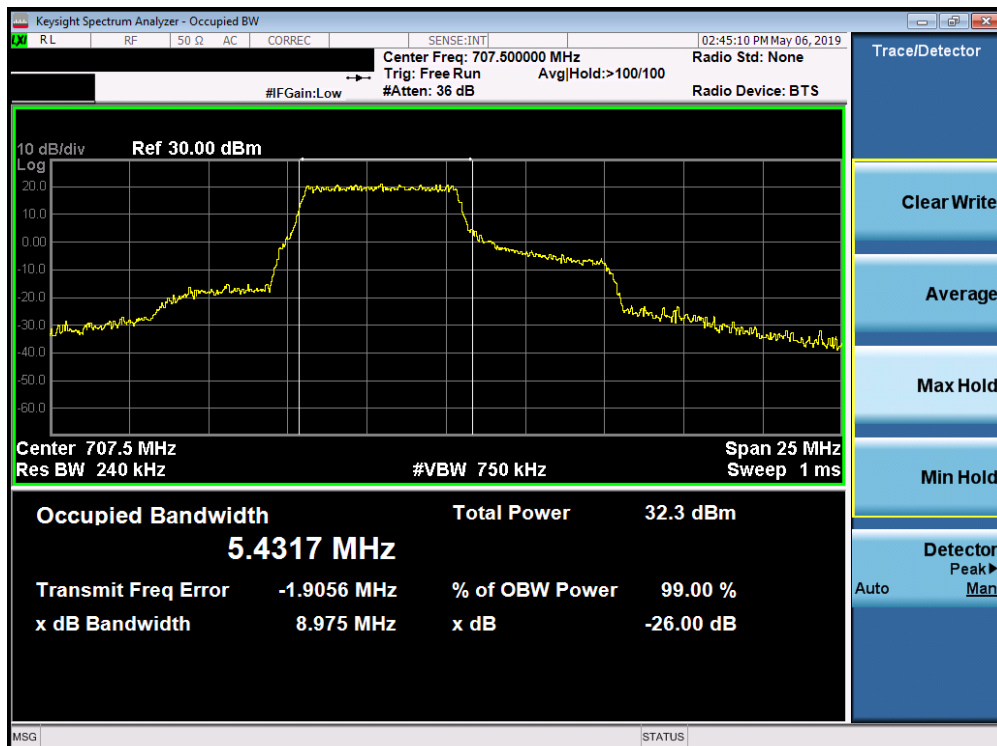


Plot 7-6. Occupied Bandwidth Plot (Band 12/17 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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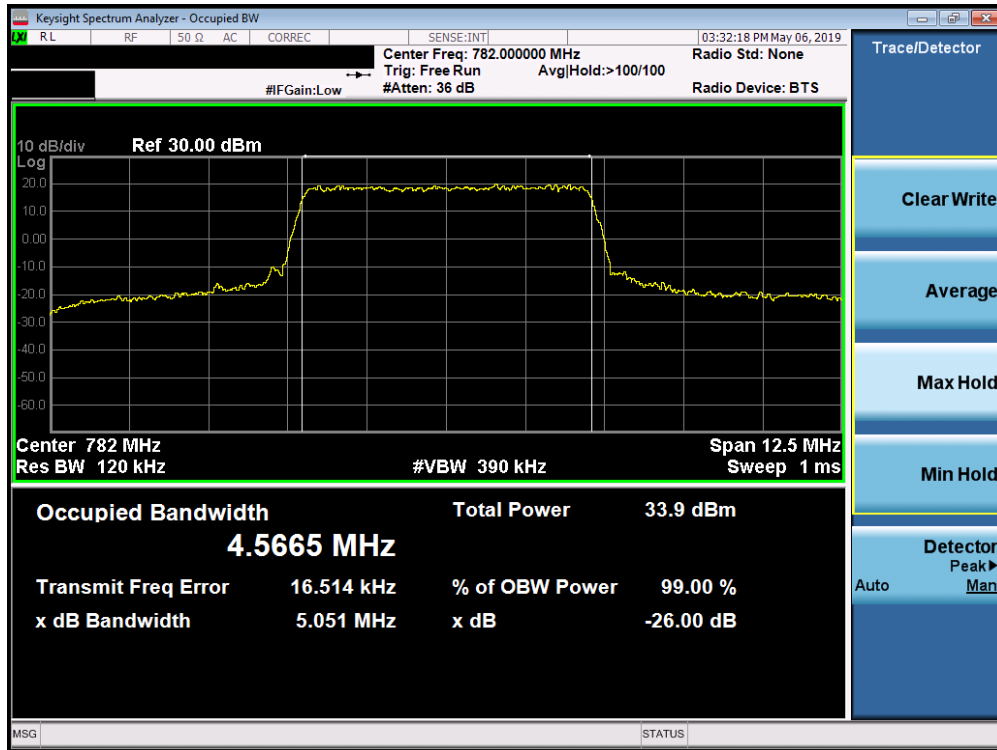
Plot 7-7. Occupied Bandwidth Plot (Band 12/17 - 10.0MHz QPSK - Full RB Configuration)



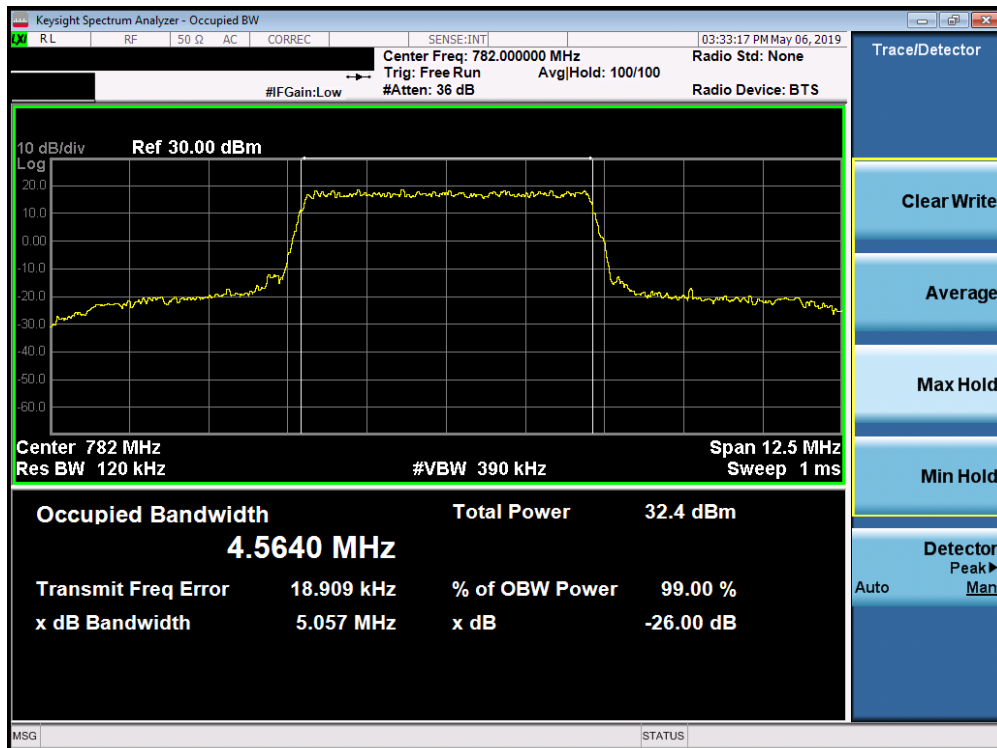
Plot 7-8. Occupied Bandwidth Plot (Band 12/17 - 10.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Band 13

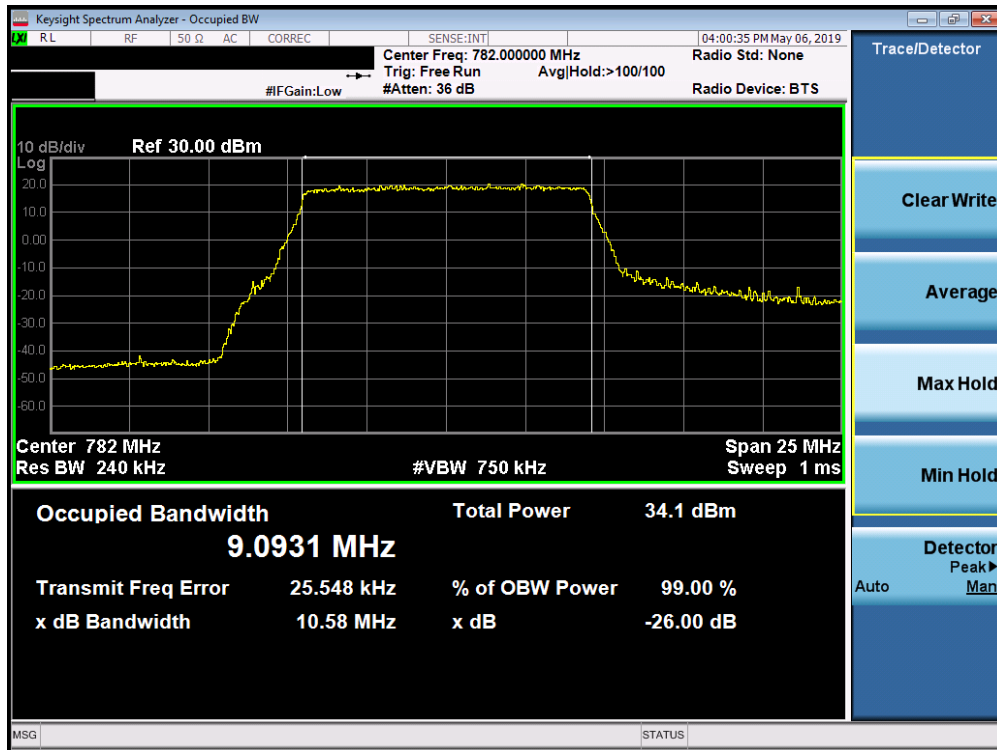


Plot 7-9. Occupied Bandwidth Plot (Band 13 - 5.0MHz QPSK - Full RB Configuration)

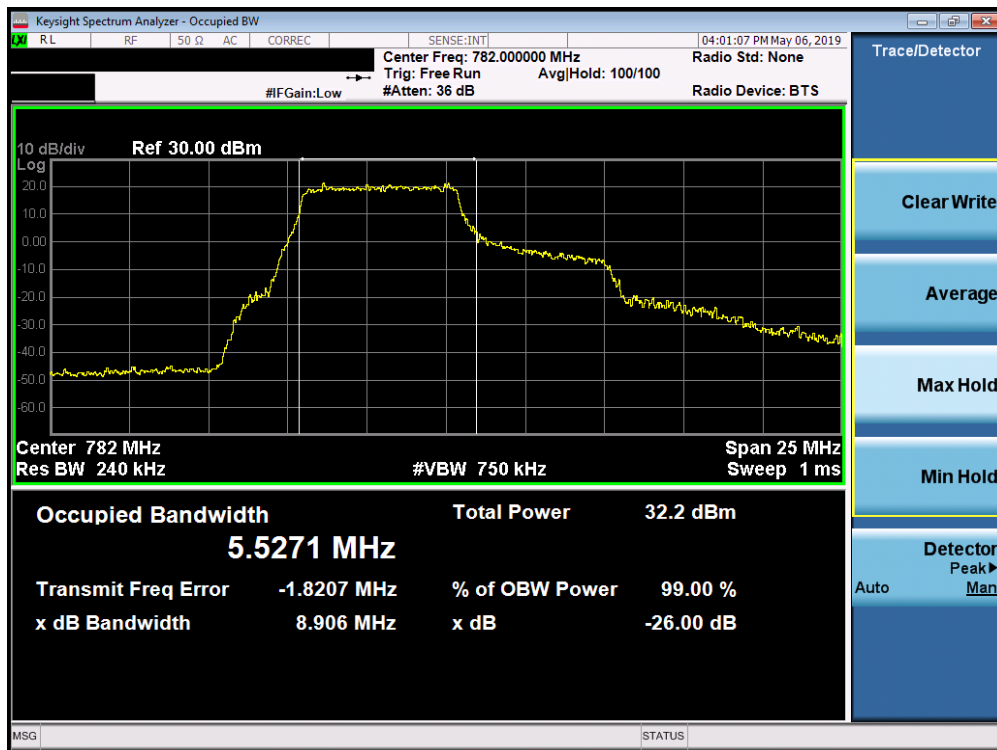


Plot 7-10. Occupied Bandwidth Plot (Band 13 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 27 of 238



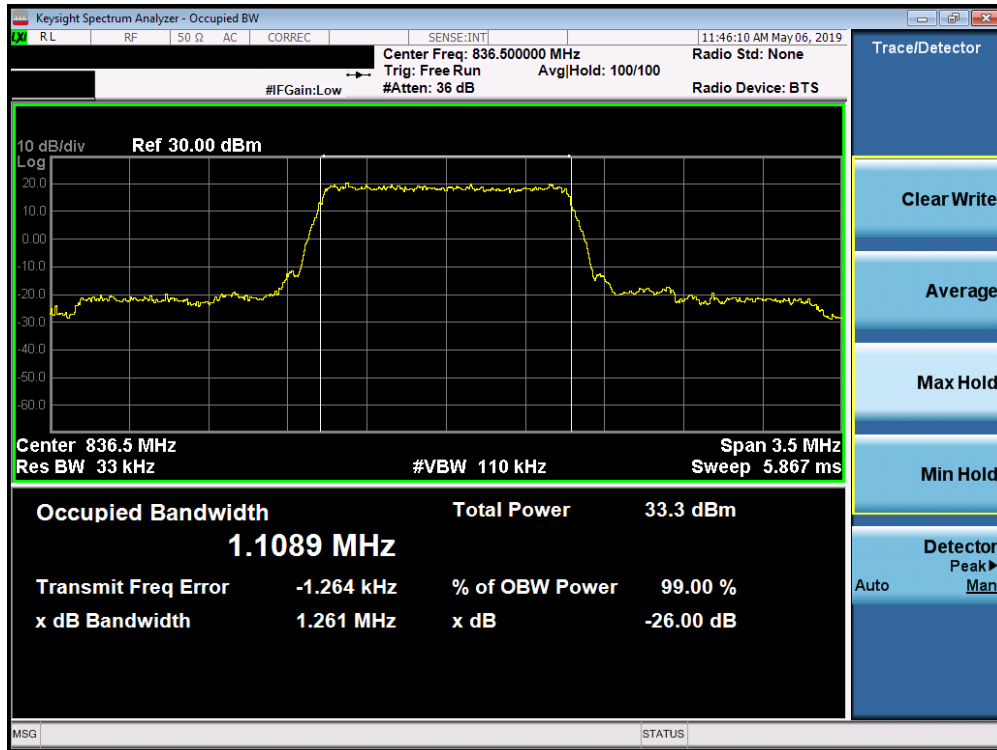
Plot 7-11. Occupied Bandwidth Plot (Band 13 - 10.0MHz QPSK - Full RB Configuration)



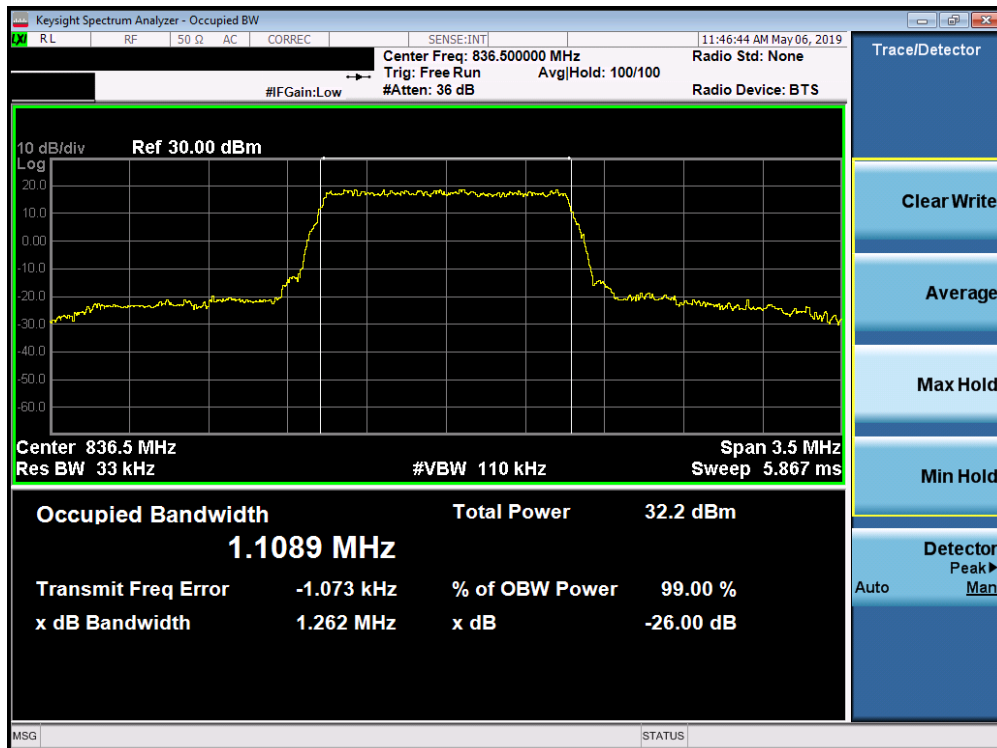
Plot 7-12. Occupied Bandwidth Plot (Band 13 - 10.0MHz 16-QAM – Full RB (27/0) Configuration)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 28 of 238

Band 26/5

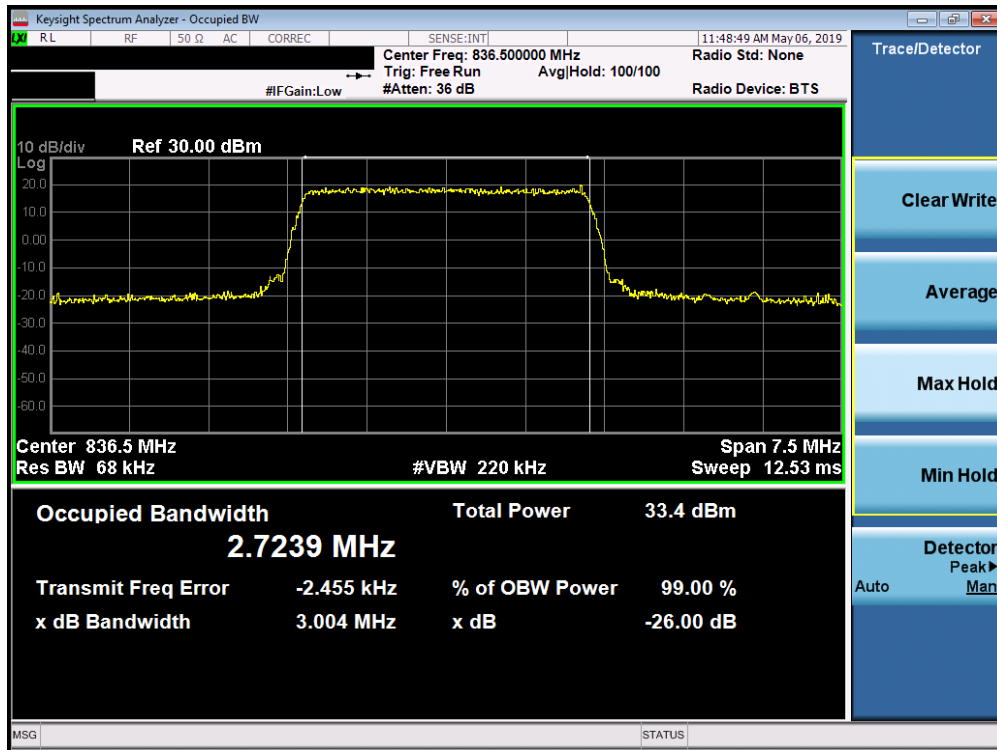


Plot 7-13. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz QPSK - Full RB Configuration)

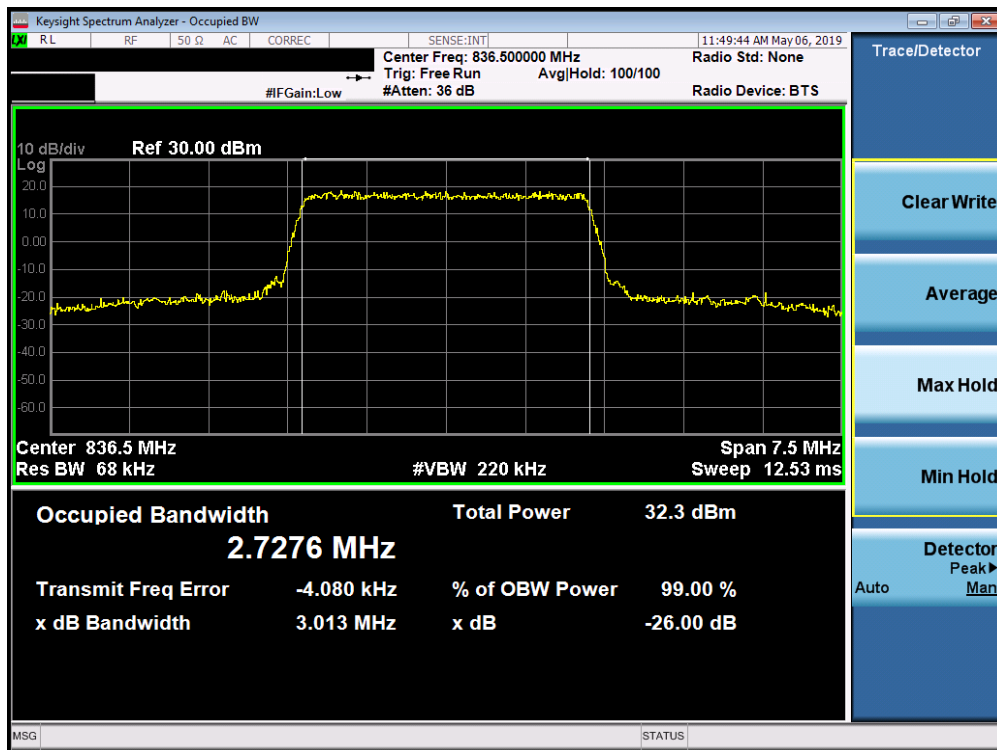


Plot 7-14. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 29 of 238

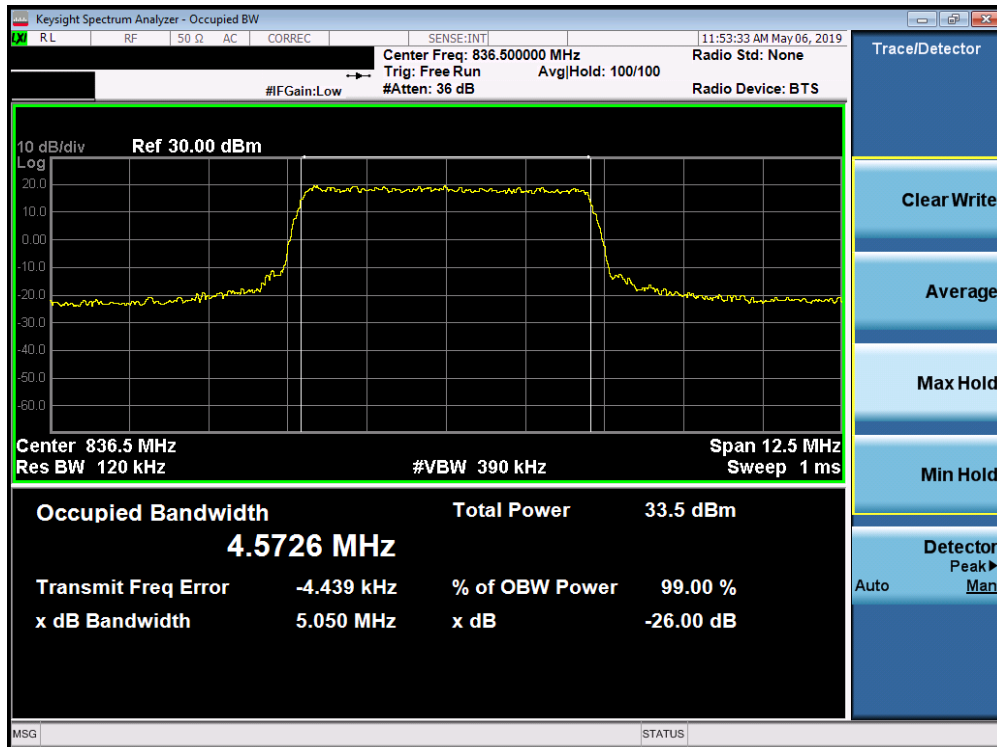


Plot 7-15. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz QPSK - Full RB Configuration)

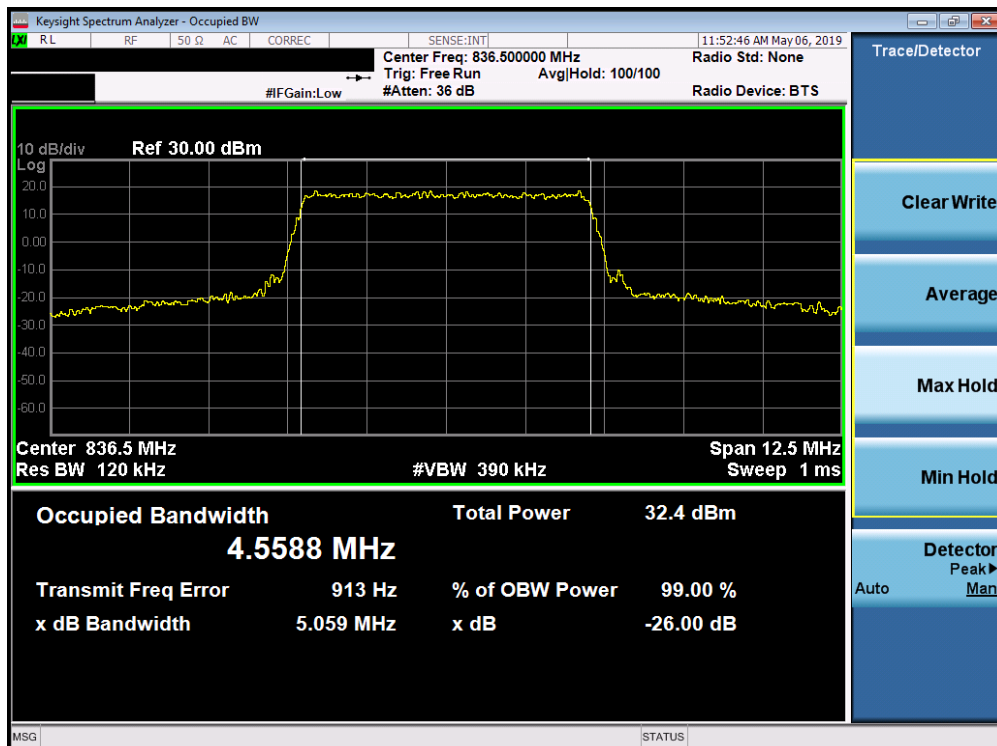


Plot 7-16. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 30 of 238

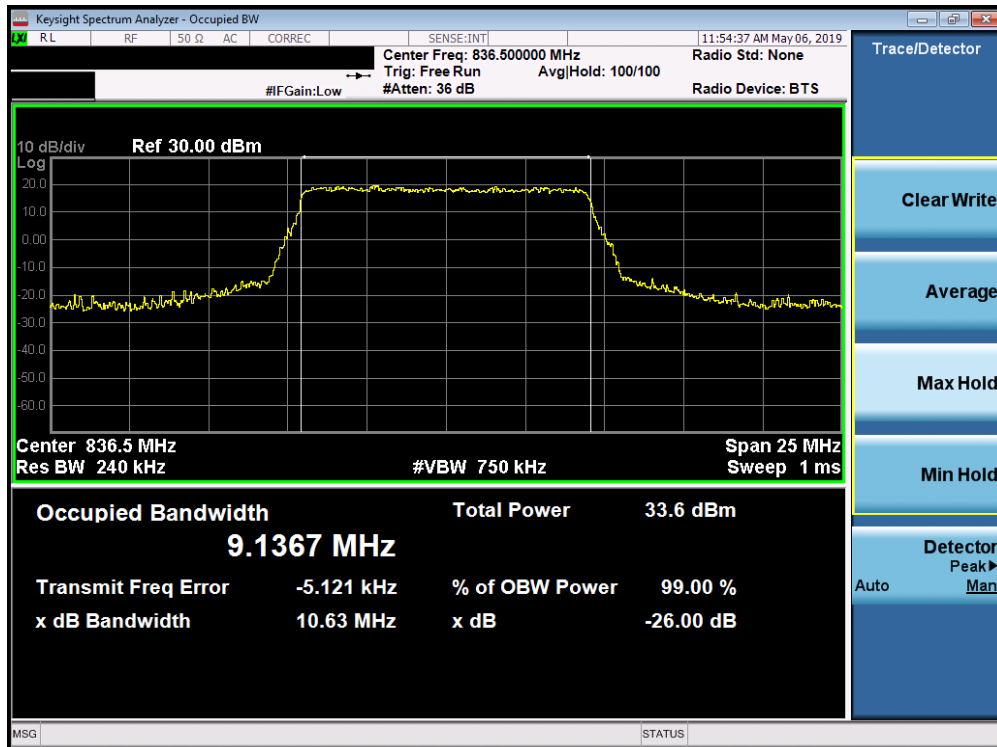


Plot 7-17. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-18. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 31 of 238



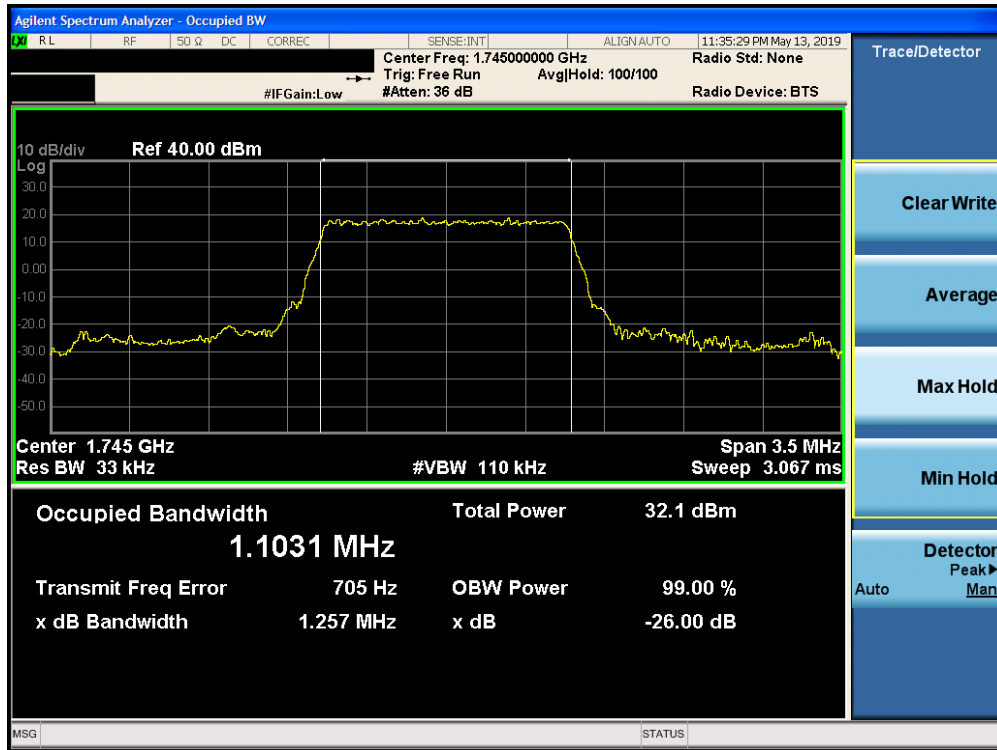
Plot 7-19. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz QPSK - Full RB Configuration)



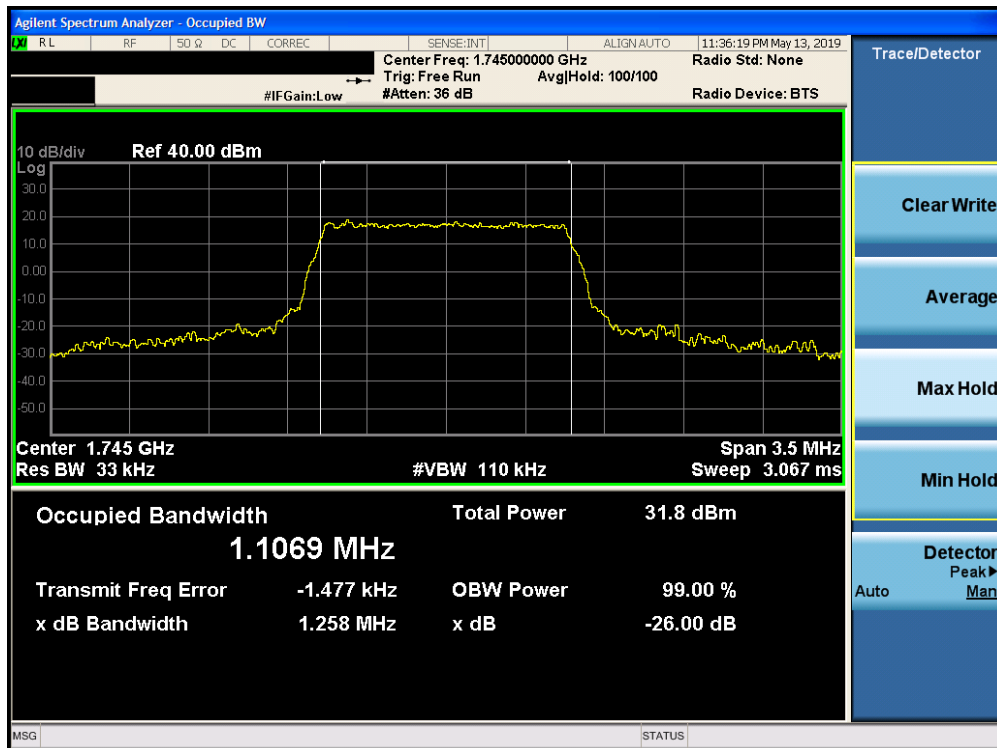
Plot 7-20. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz 16-QAM – Full RB (27/0) Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 32 of 238

Band 66/4

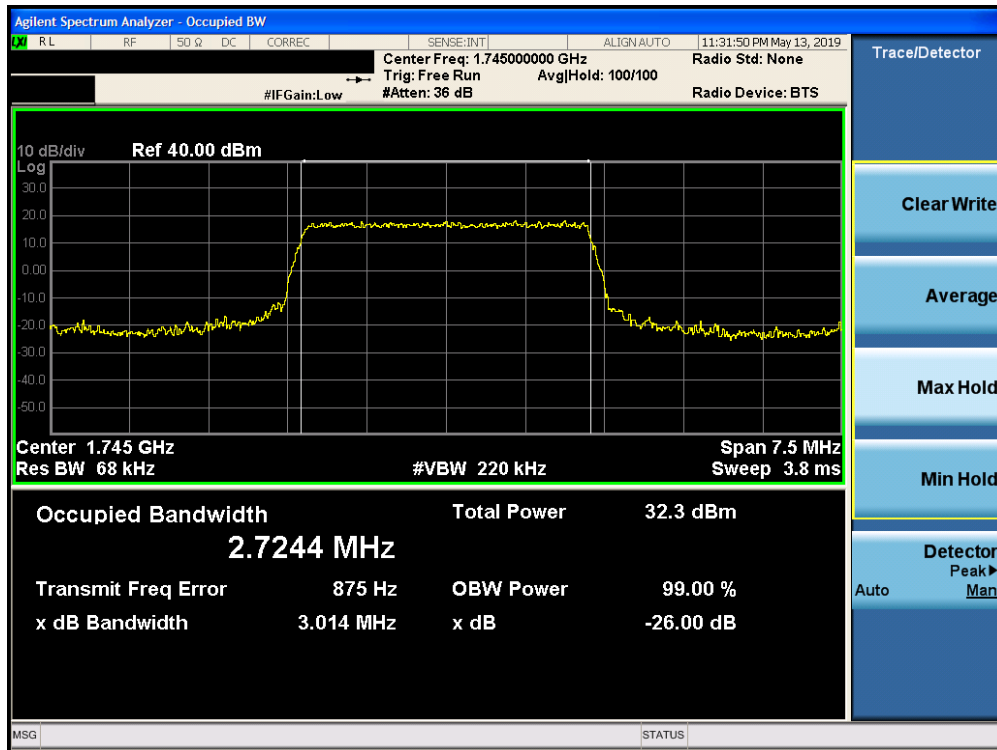


Plot 7-21. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)

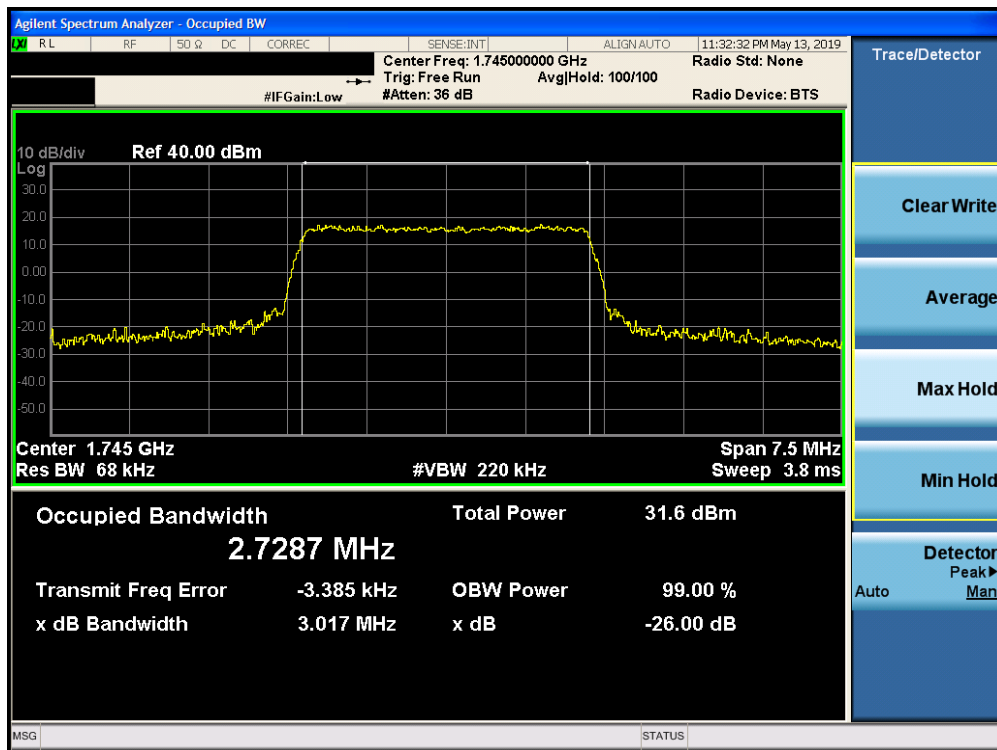


Plot 7-22. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 33 of 238

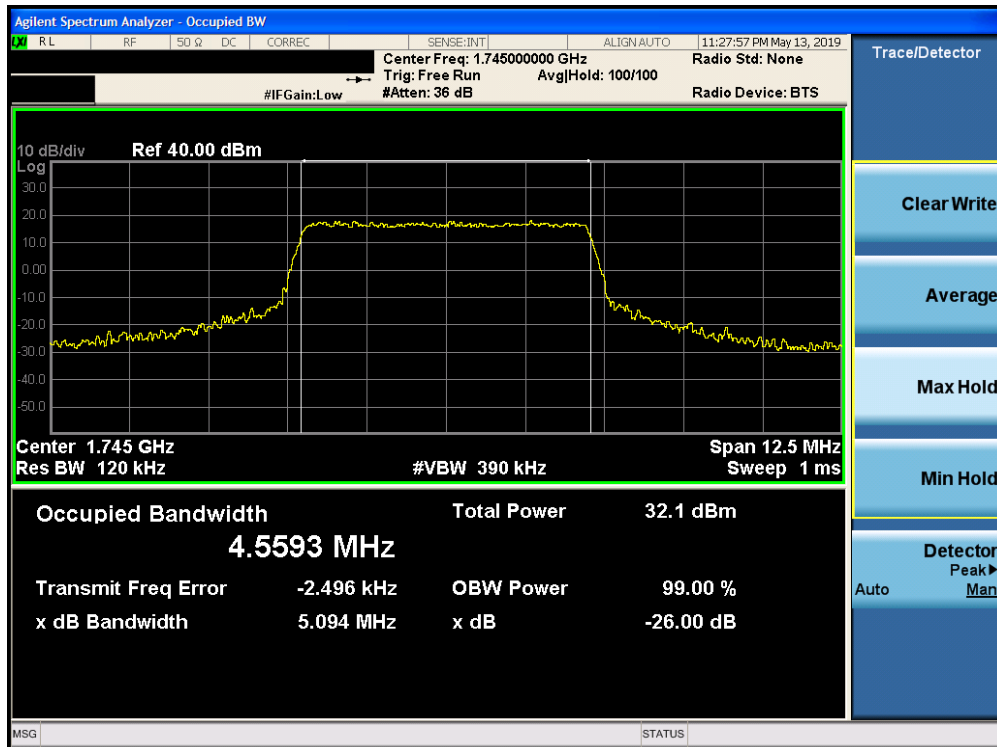


Plot 7-23. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)

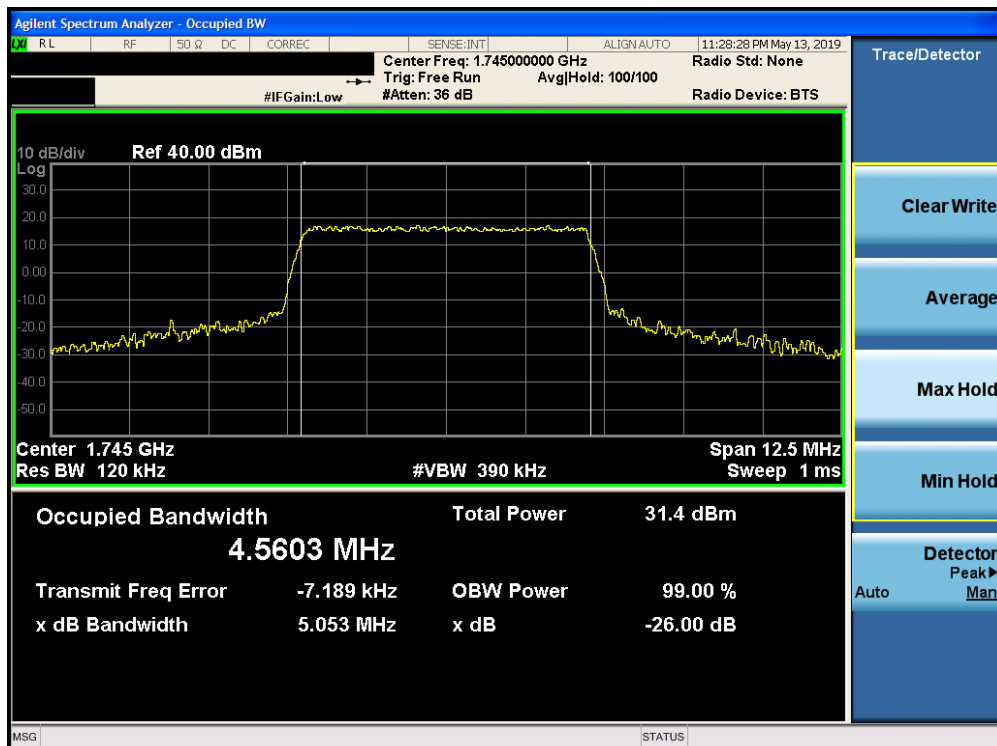


Plot 7-24. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 34 of 238

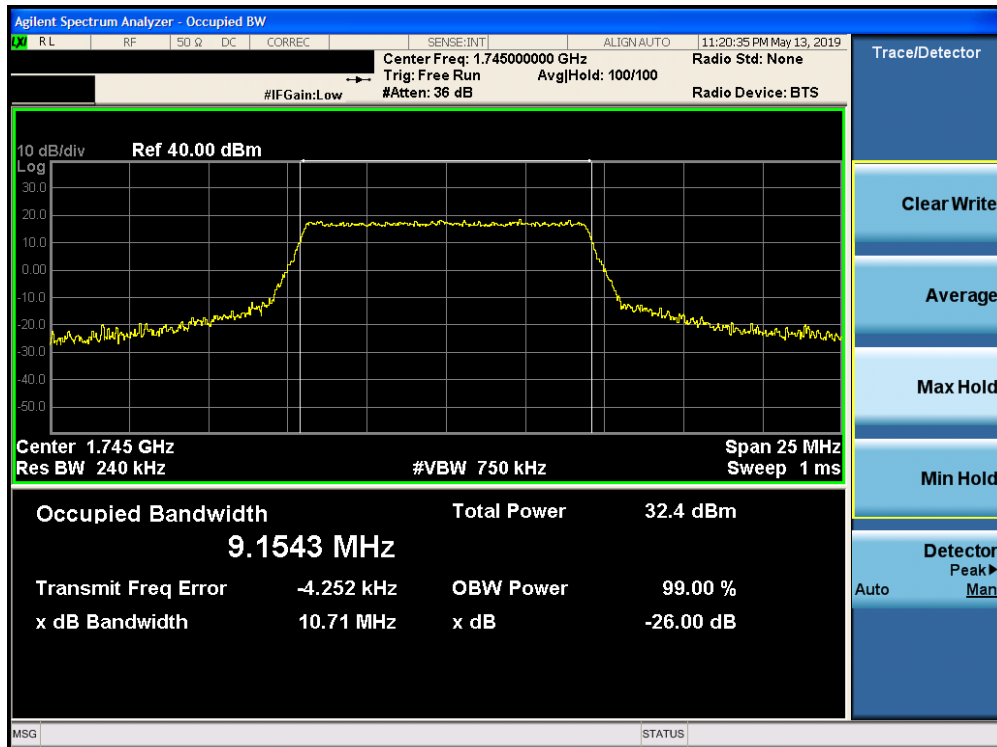


Plot 7-25. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-26. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 35 of 238

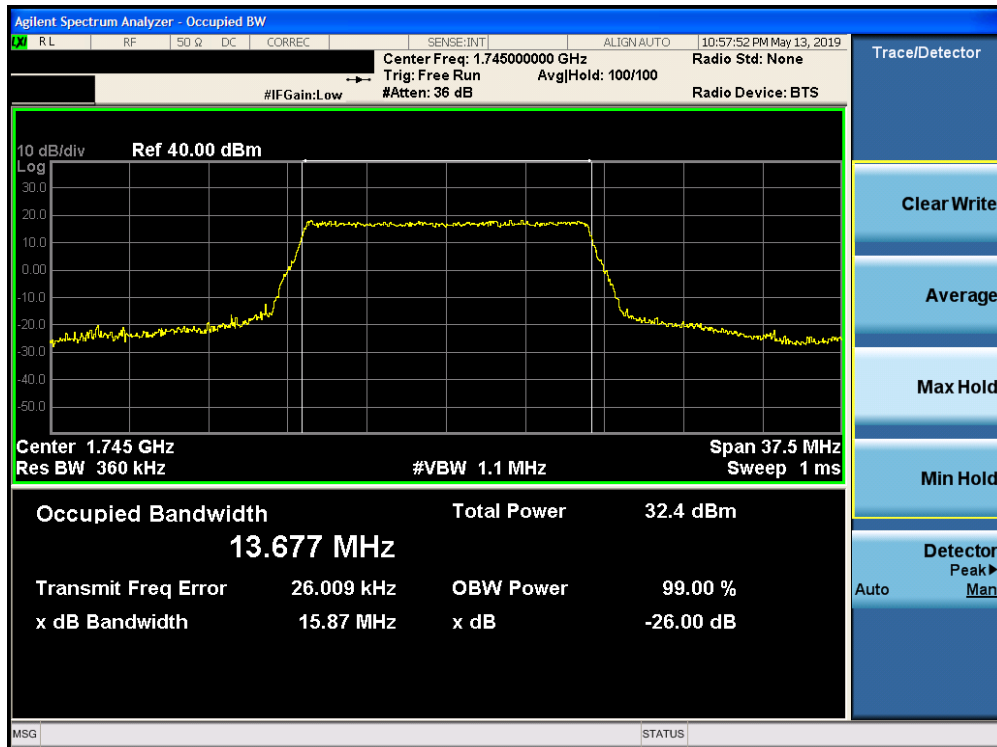


Plot 7-27. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)

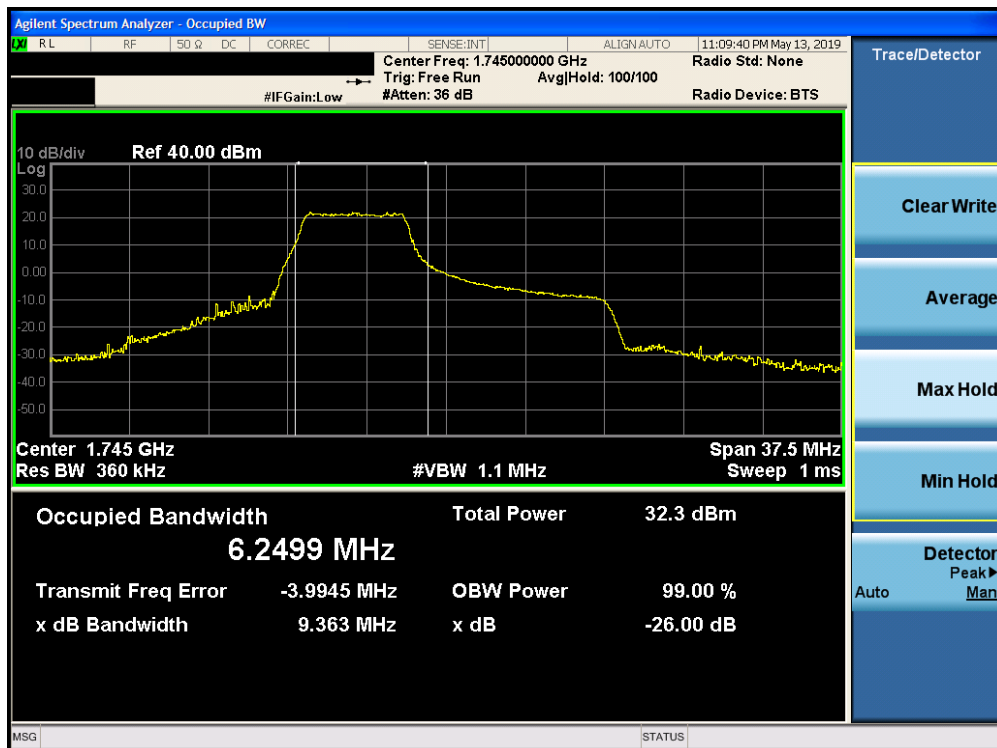


Plot 7-28. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 36 of 238

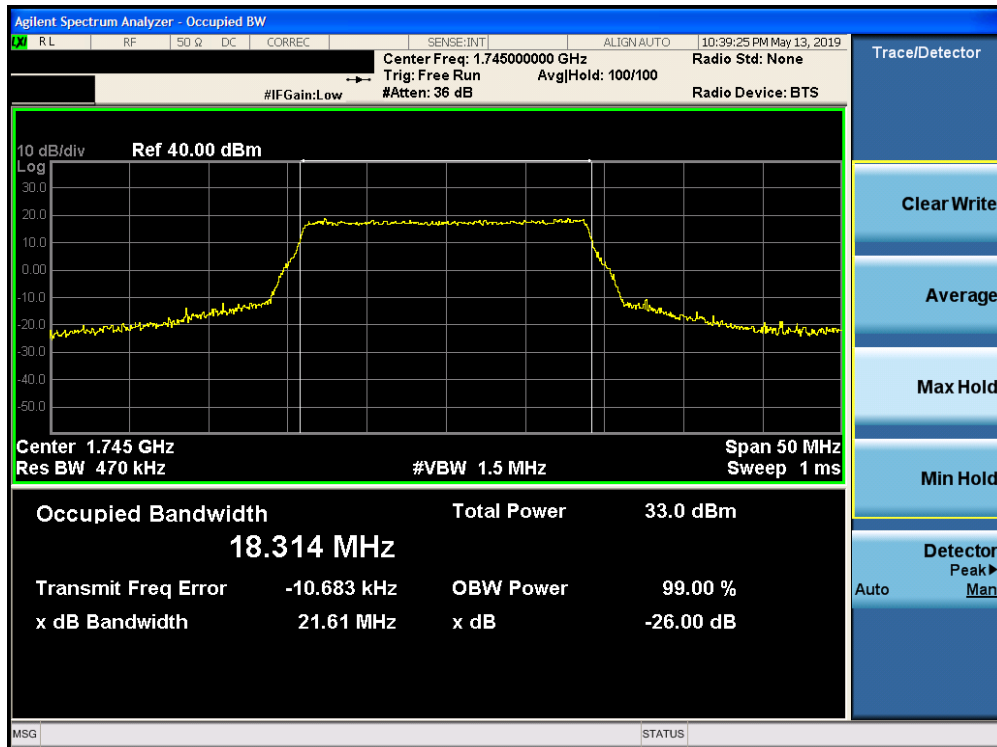


Plot 7-29. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-30. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 37 of 238



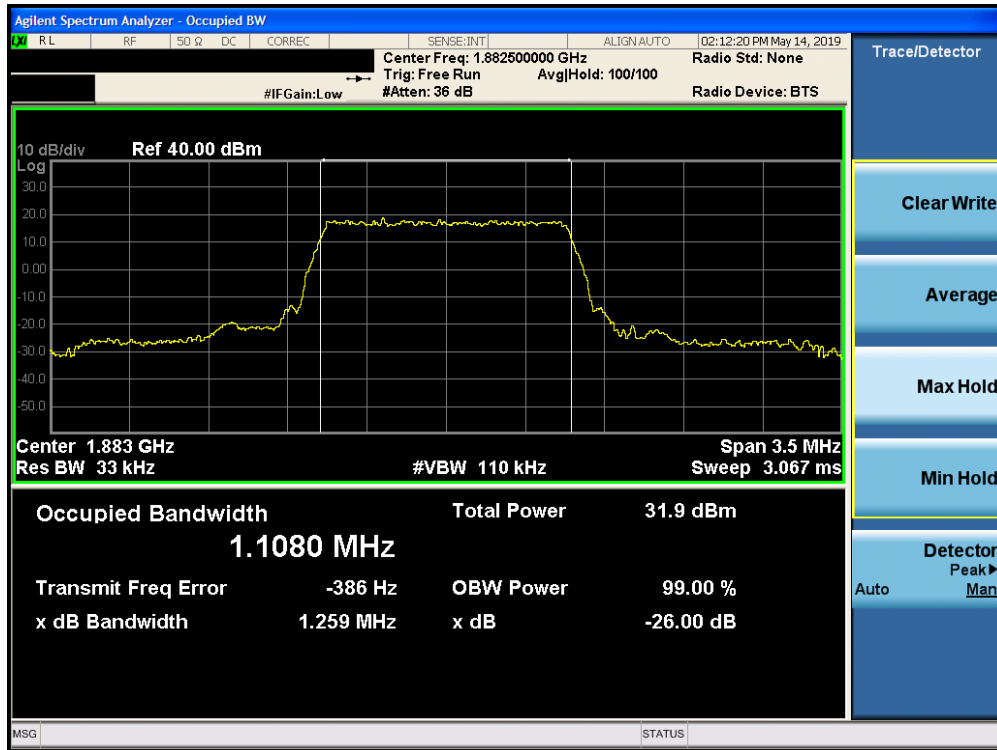
Plot 7-31. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)



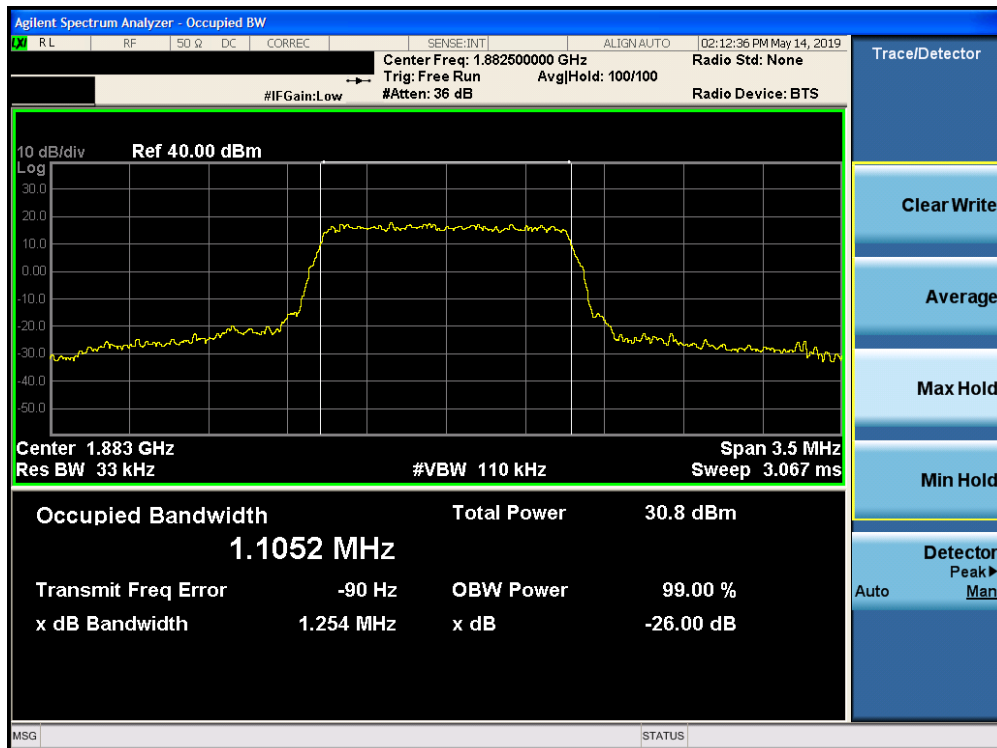
Plot 7-32. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 38 of 238

Band 25/2

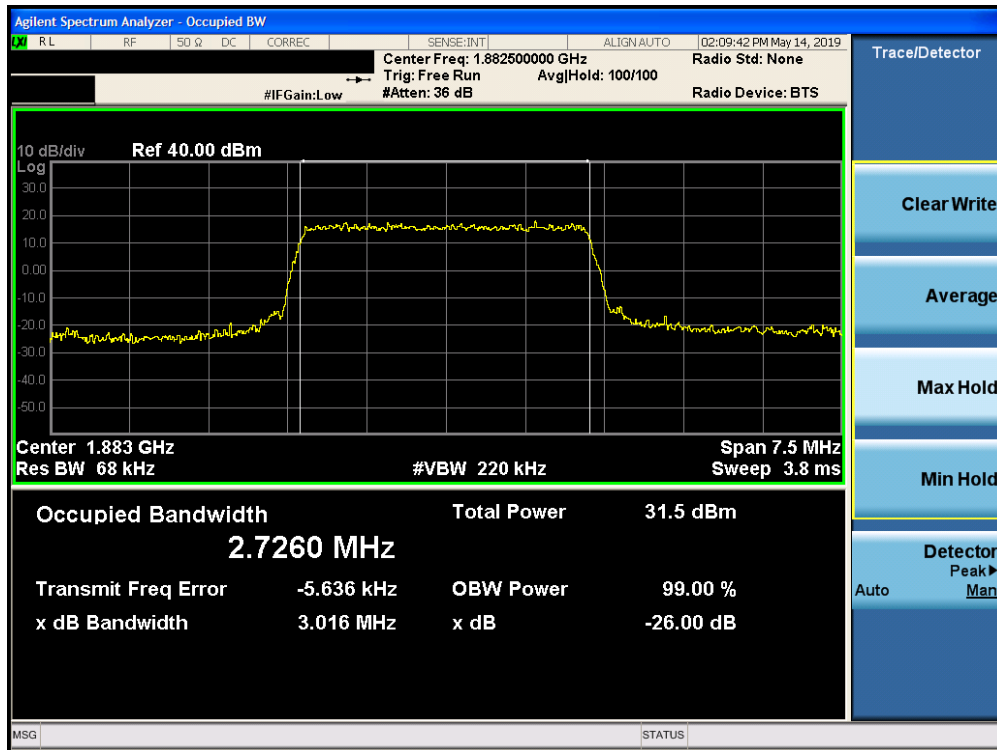


Plot 7-33. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz QPSK - Full RB Configuration)

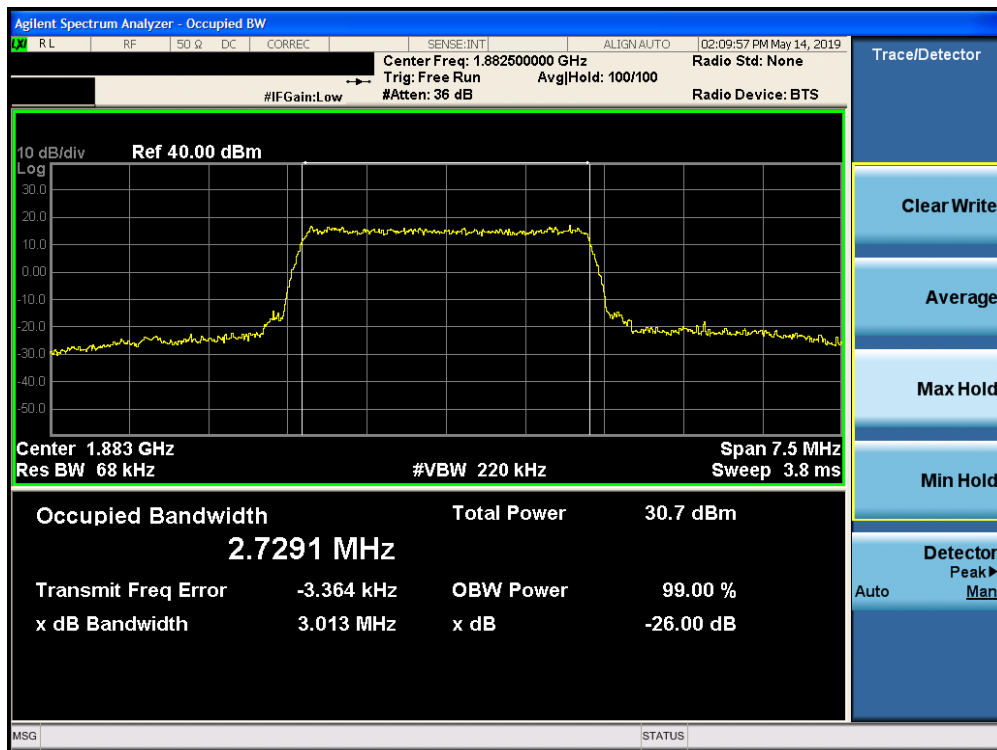


Plot 7-34. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 39 of 238

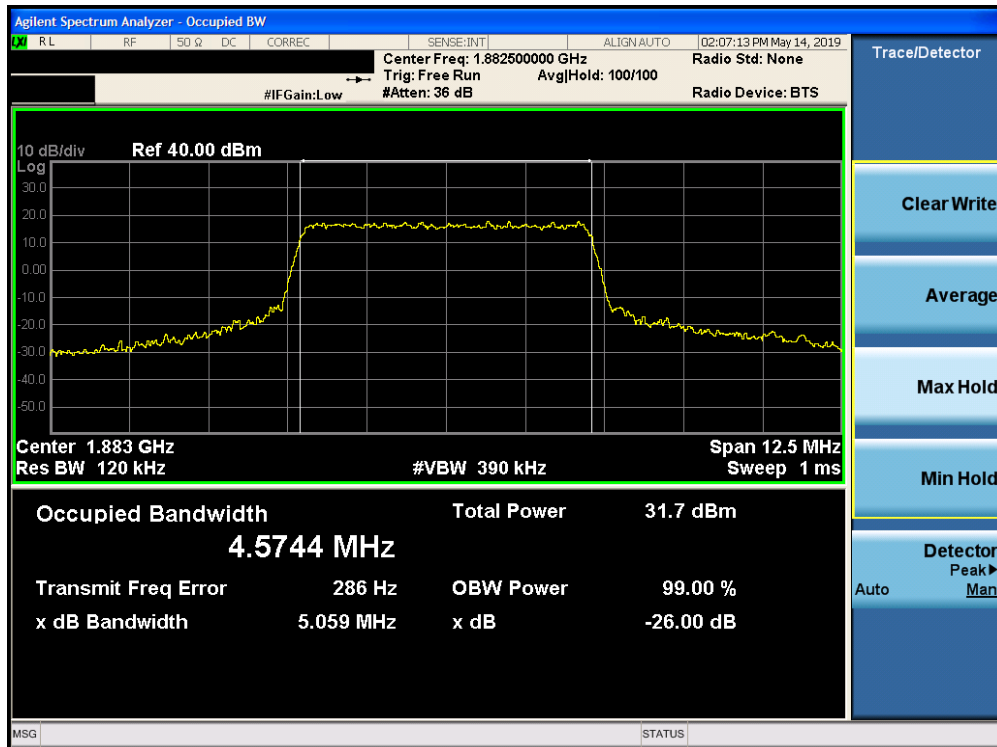


Plot 7-35. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz QPSK - Full RB Configuration)

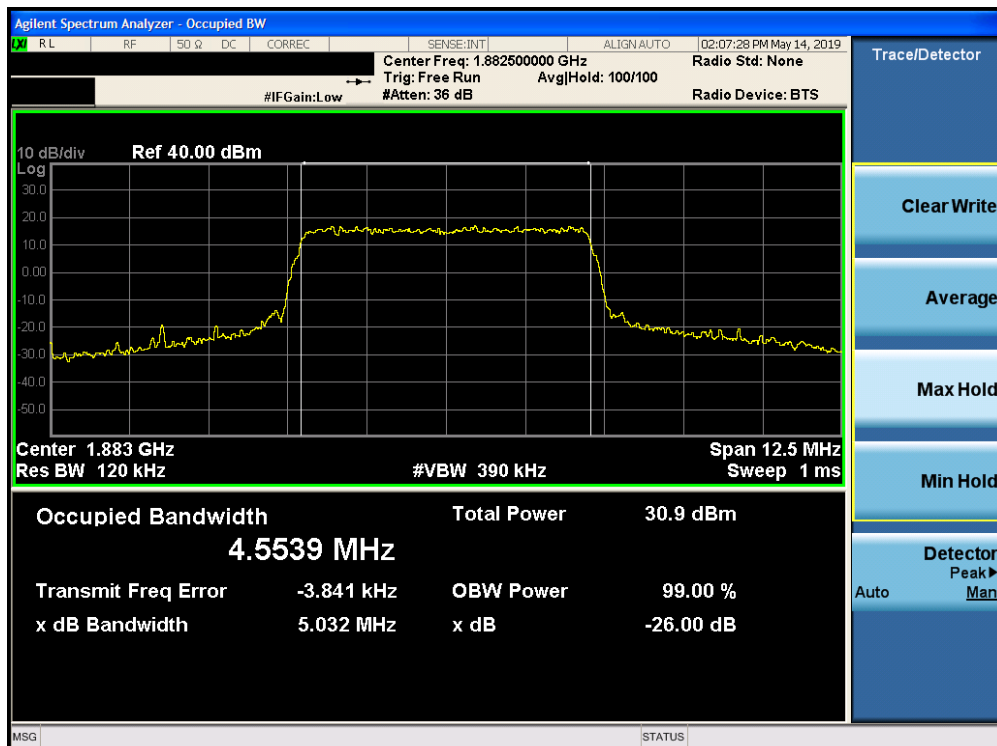


Plot 7-36. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 40 of 238

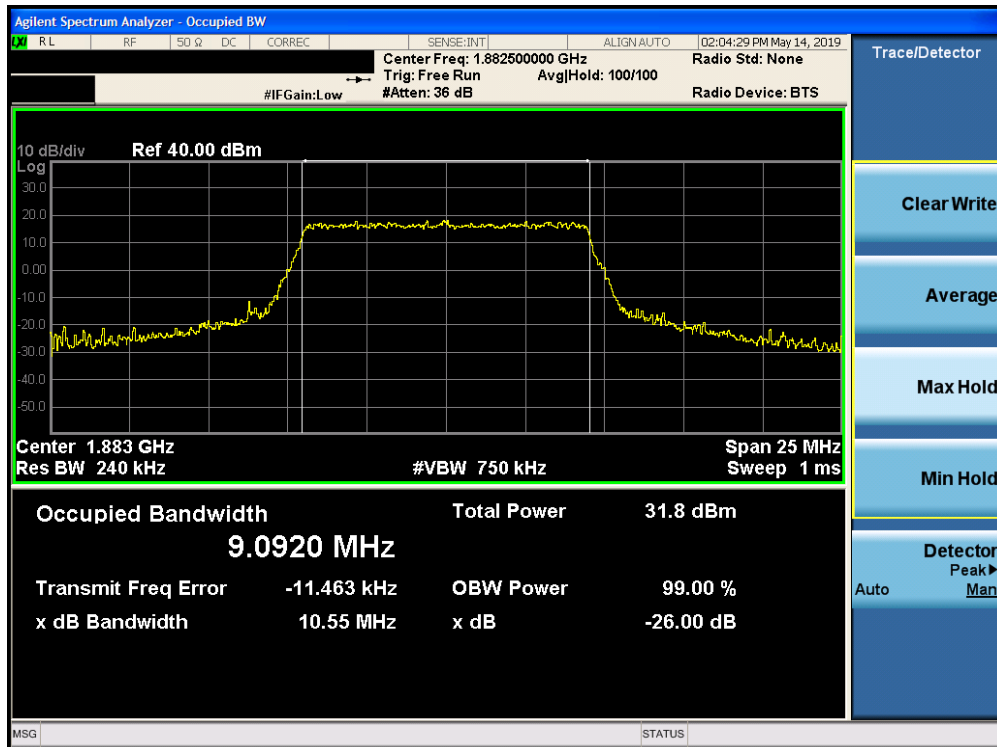


Plot 7-37. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz QPSK - Full RB Configuration)

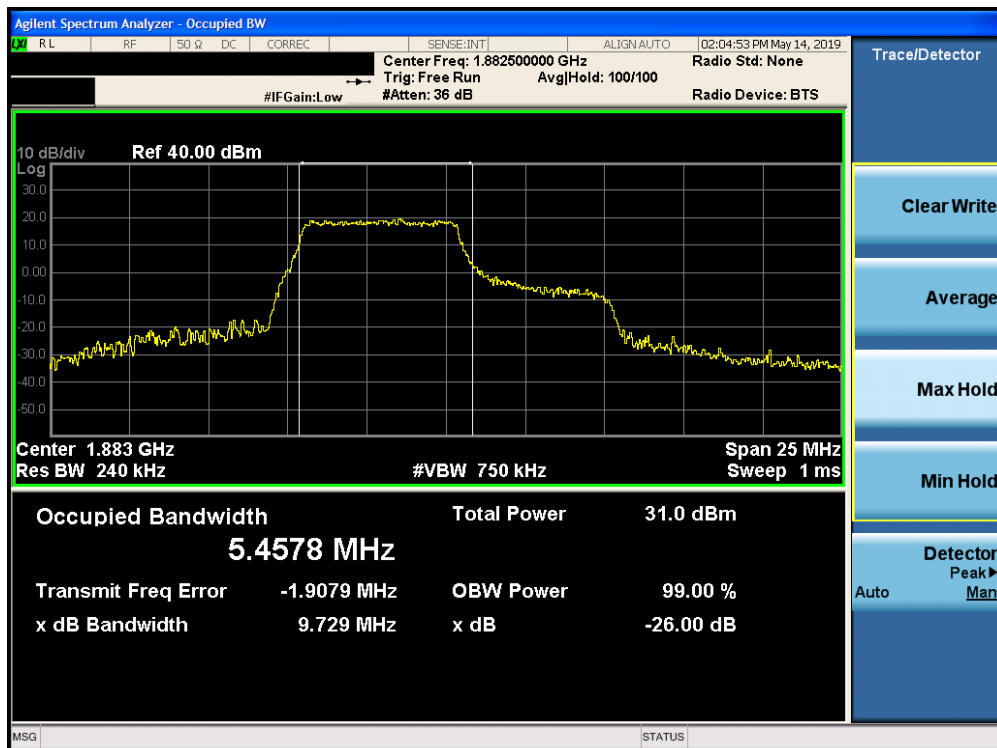


Plot 7-38. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 41 of 238

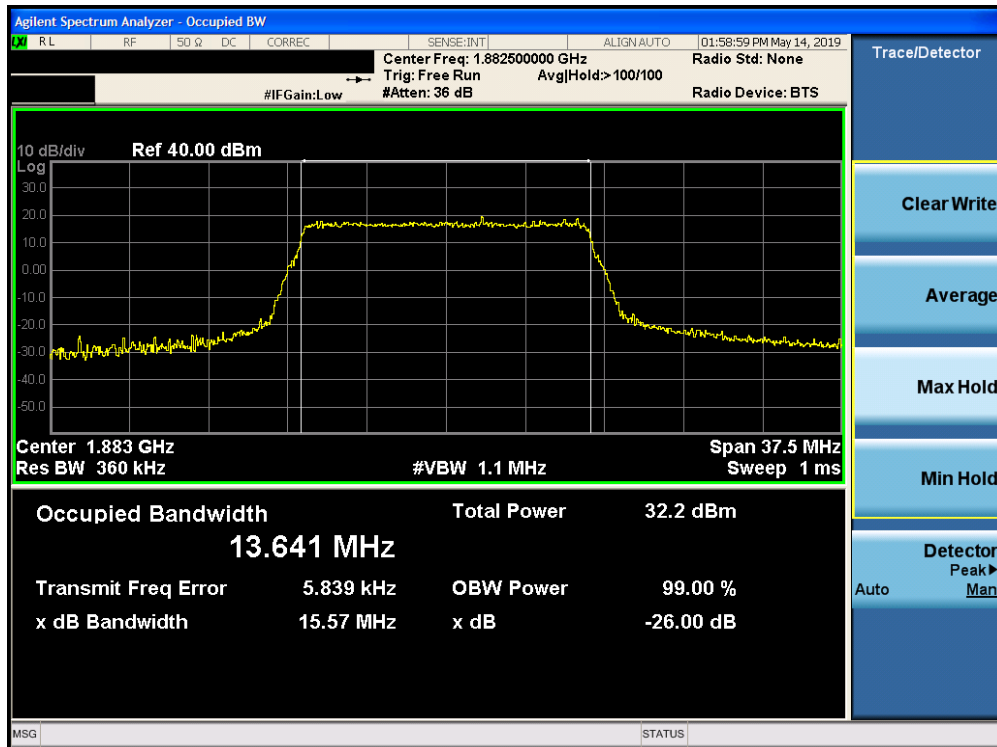


Plot 7-39. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-40. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 42 of 238

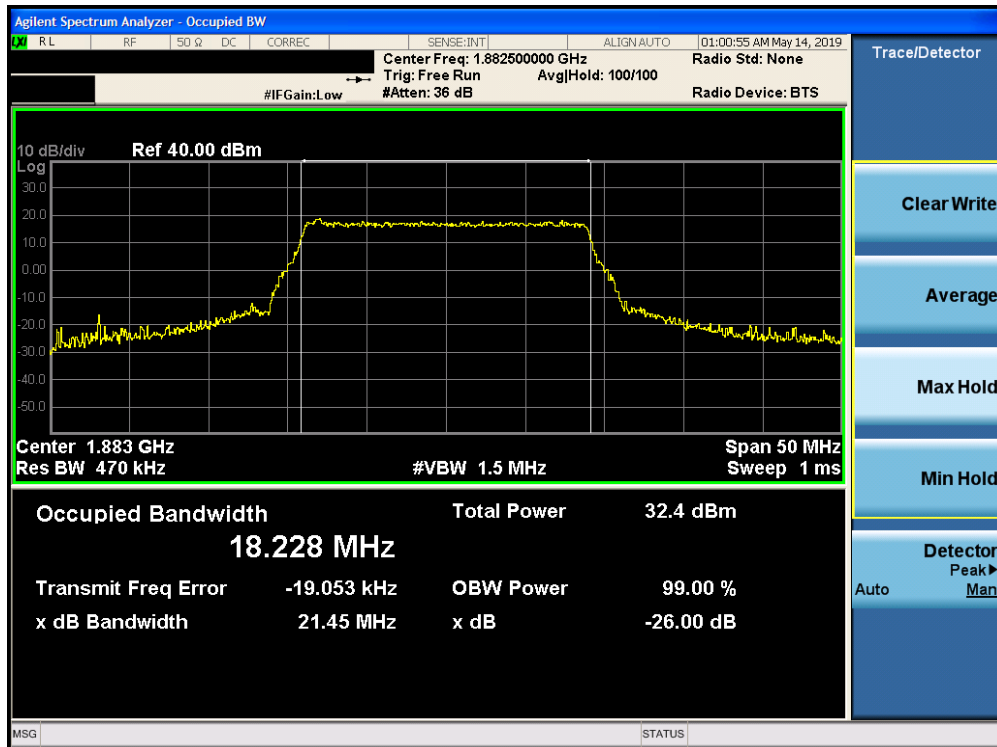


Plot 7-41. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz QPSK - Full RB Configuration)

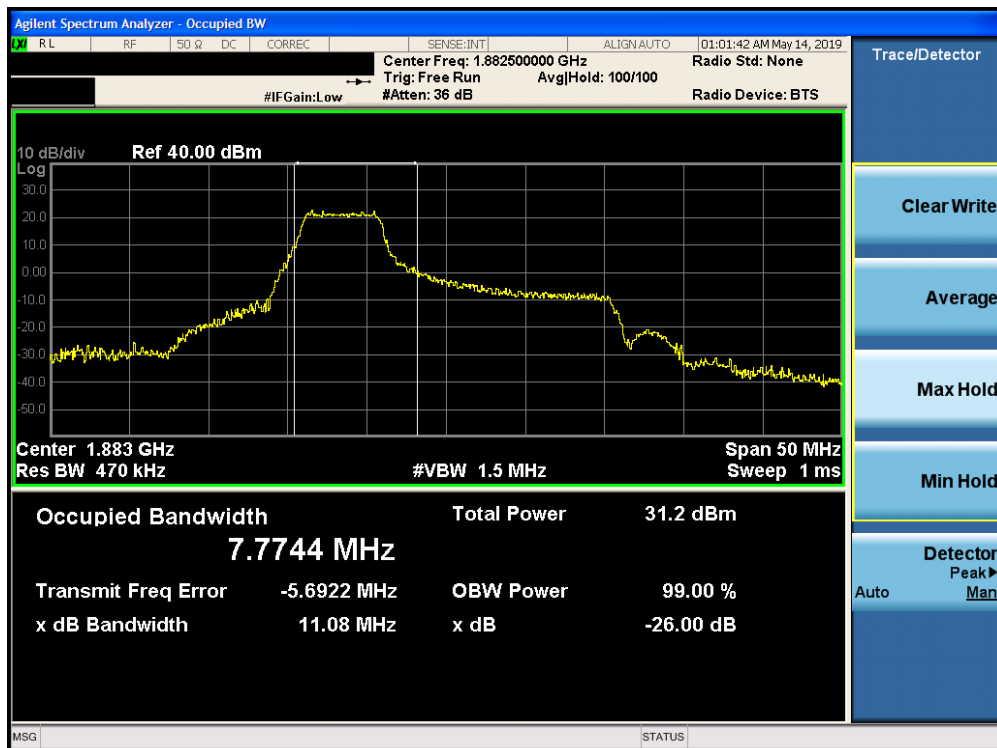


Plot 7-42. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 43 of 238



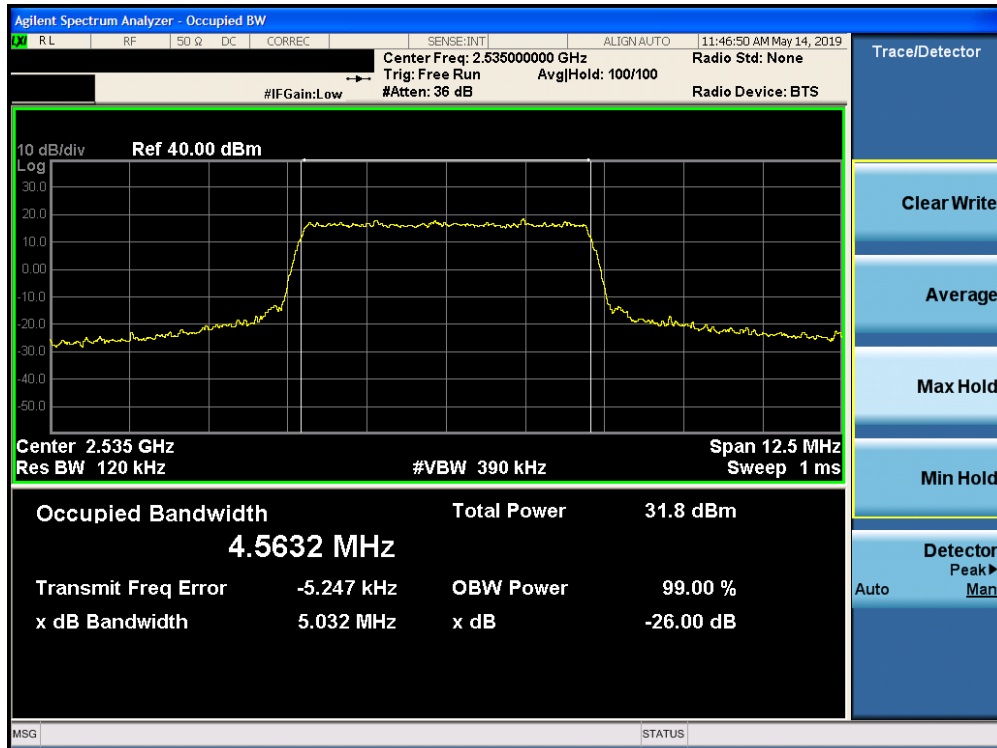
Plot 7-43. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz QPSK - Full RB Configuration)



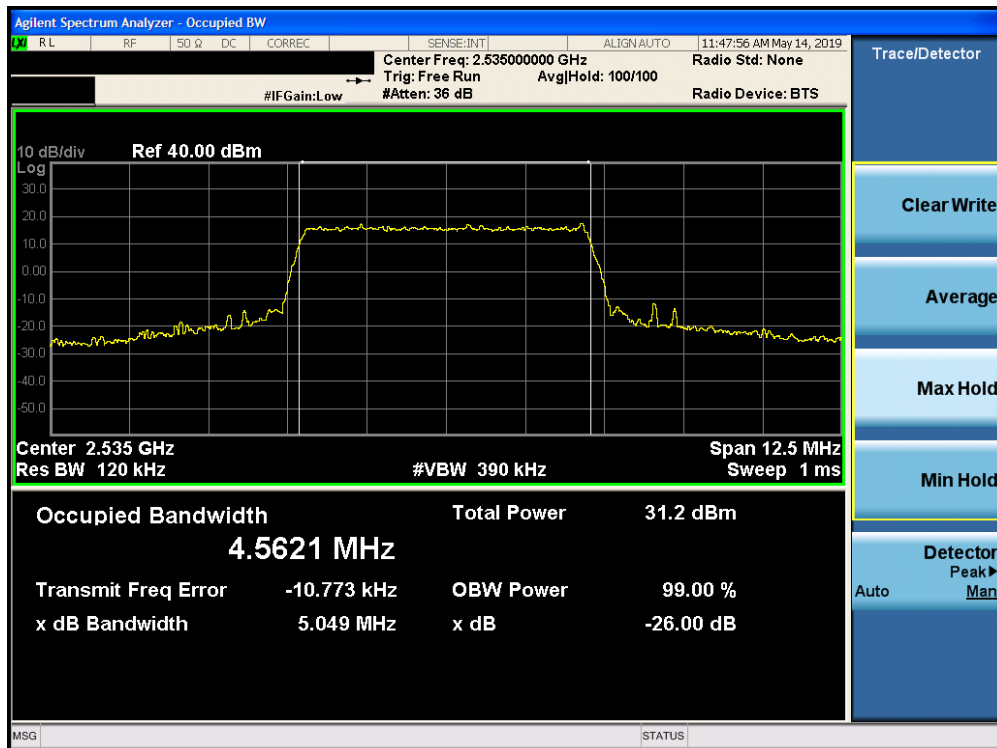
Plot 7-44. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 44 of 238

Band 7

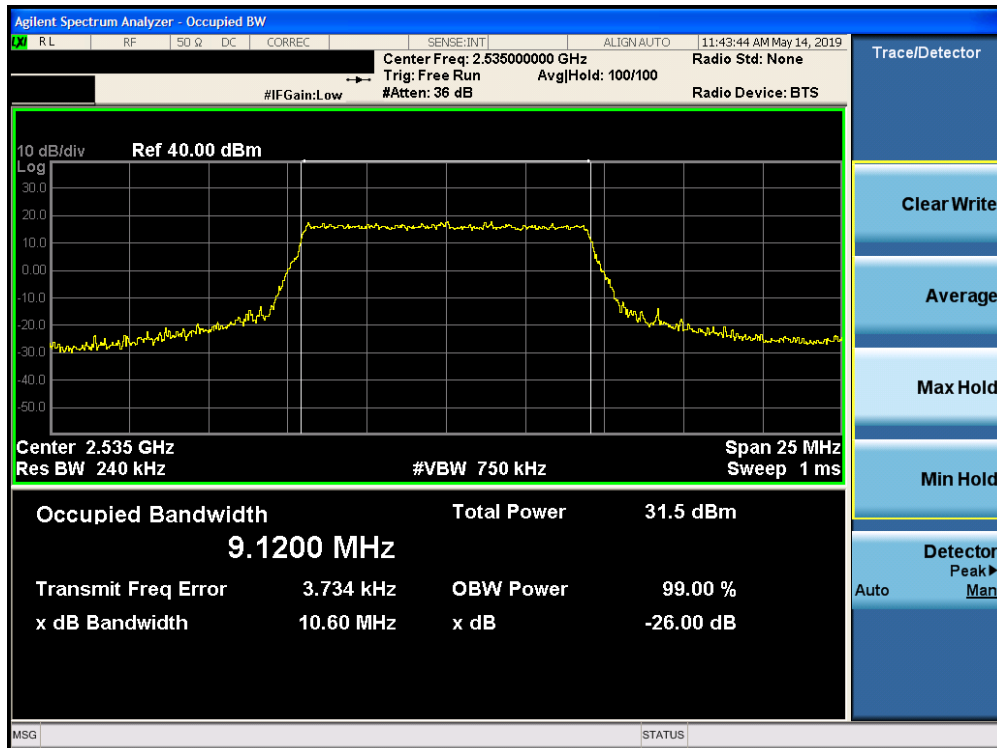


Plot 7-45. Occupied Bandwidth Plot (Band 7 - 5.0MHz QPSK - Full RB Configuration)

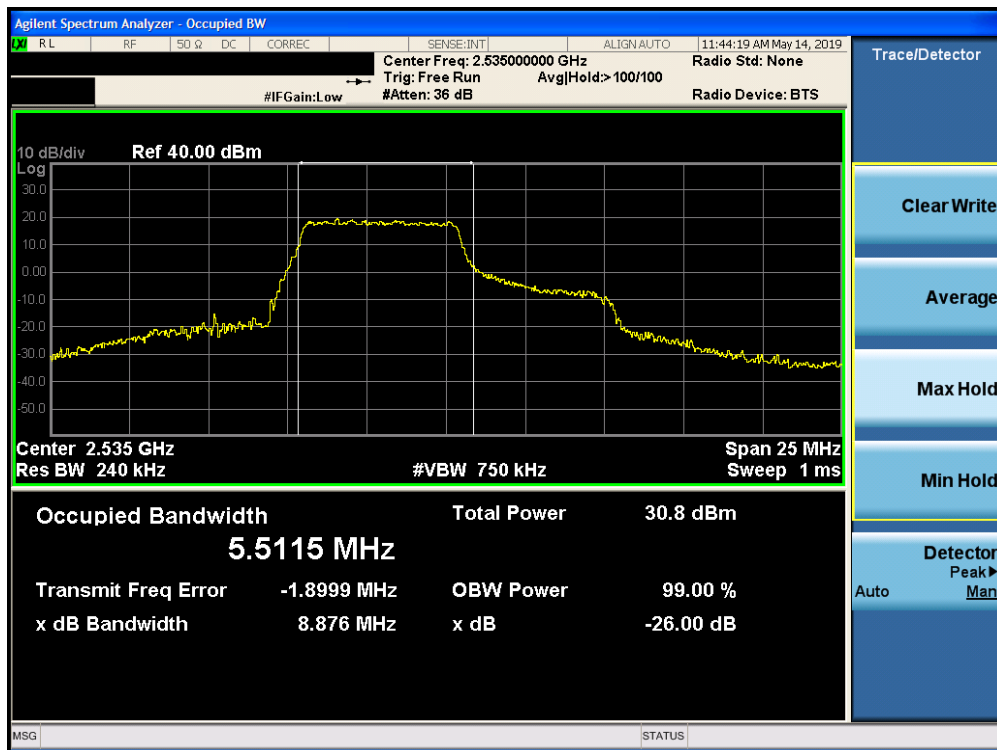


Plot 7-46. Occupied Bandwidth Plot (Band 7 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 45 of 238

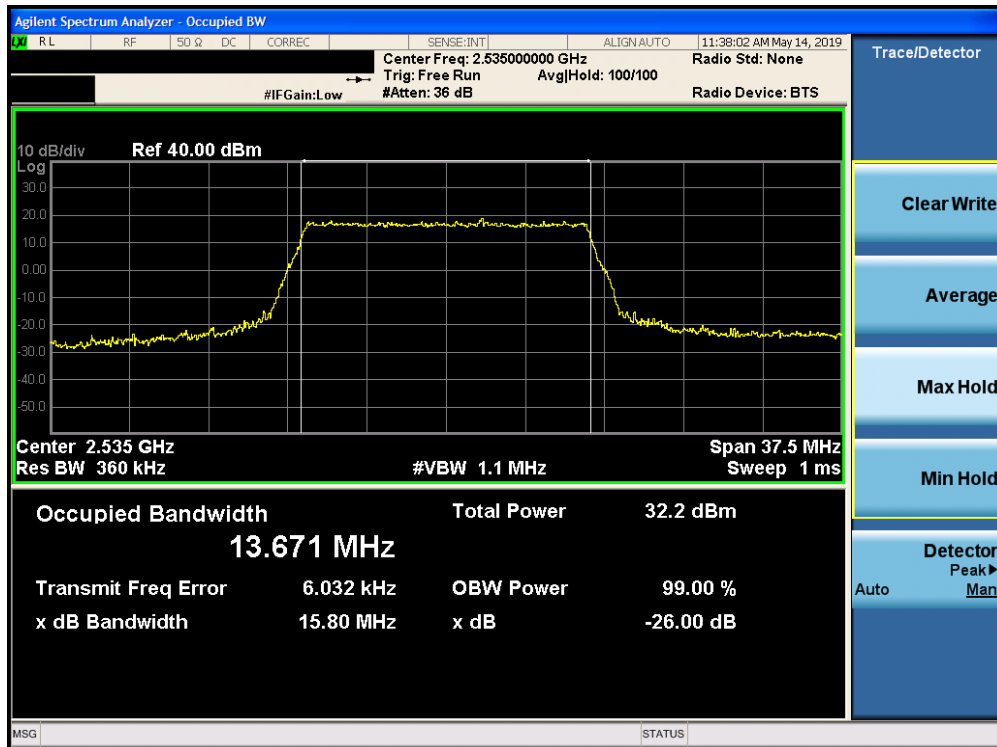


Plot 7-47. Occupied Bandwidth Plot (Band 7 - 10.0MHz QPSK - Full RB Configuration)

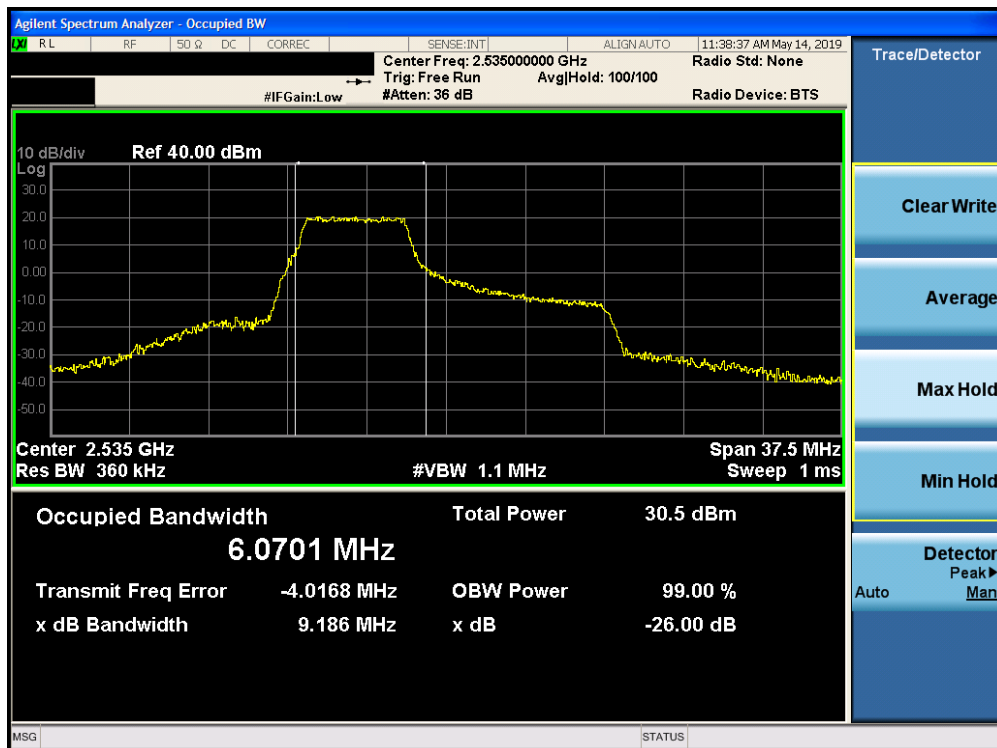


Plot 7-48. Occupied Bandwidth Plot (Band 7 - 10.0MHz 16-QAM – Full RB (27/0) Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 46 of 238

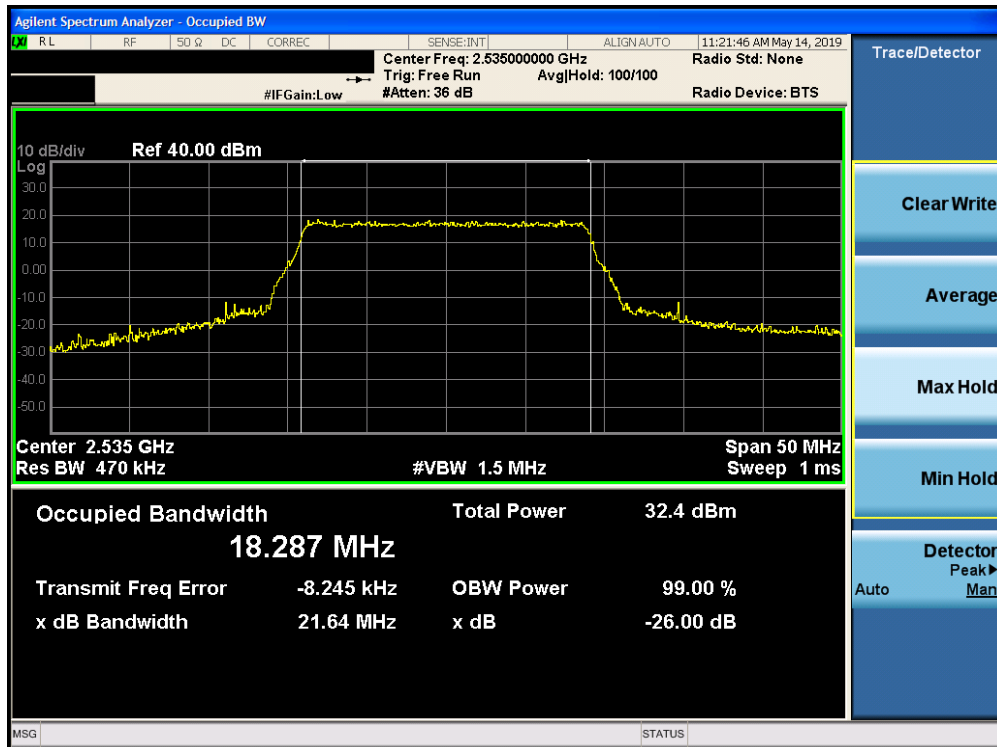


Plot 7-49. Occupied Bandwidth Plot (Band 7 - 15.0MHz QPSK - Full RB Configuration)

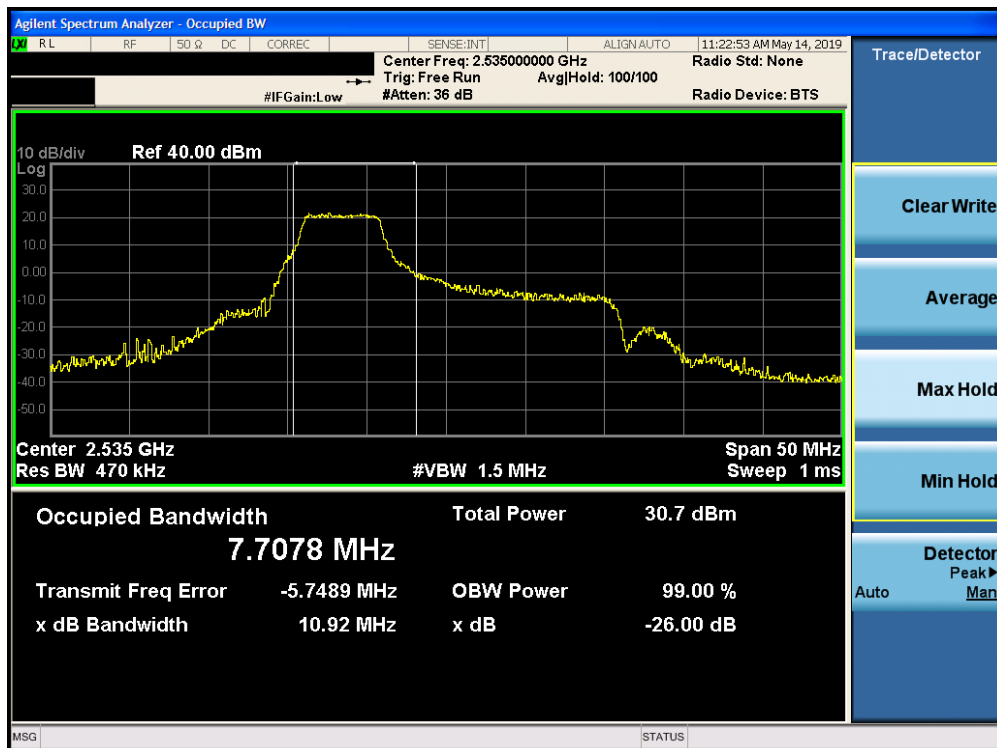


Plot 7-50. Occupied Bandwidth Plot (Band 7 - 15.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 47 of 238



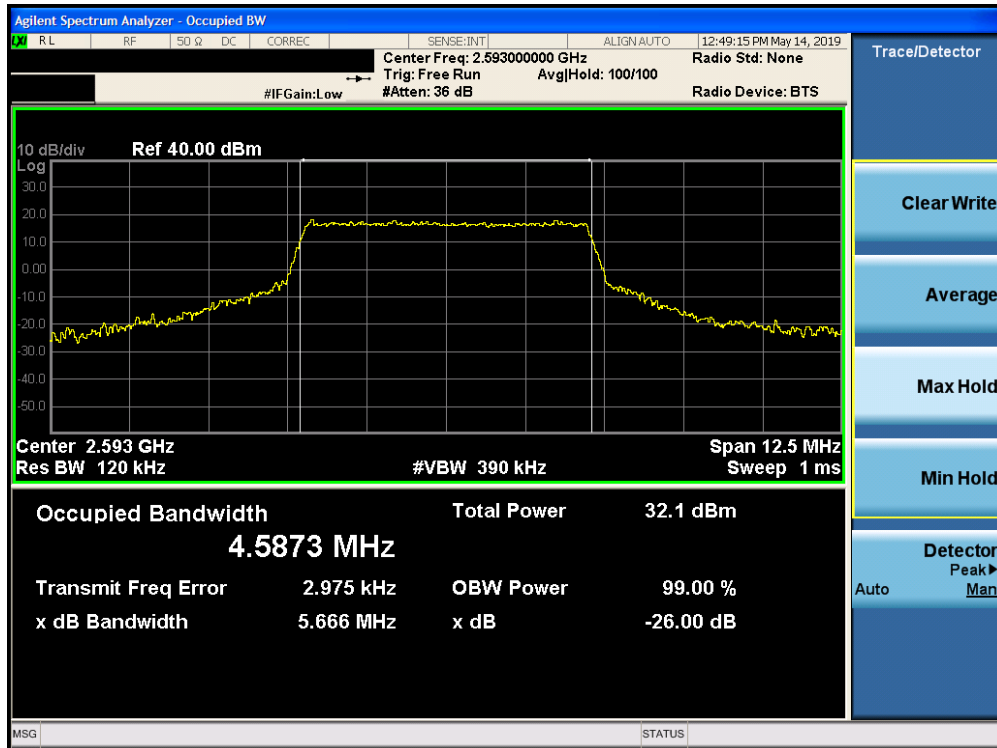
Plot 7-51. Occupied Bandwidth Plot (Band 7 - 20.0MHz QPSK - Full RB Configuration)



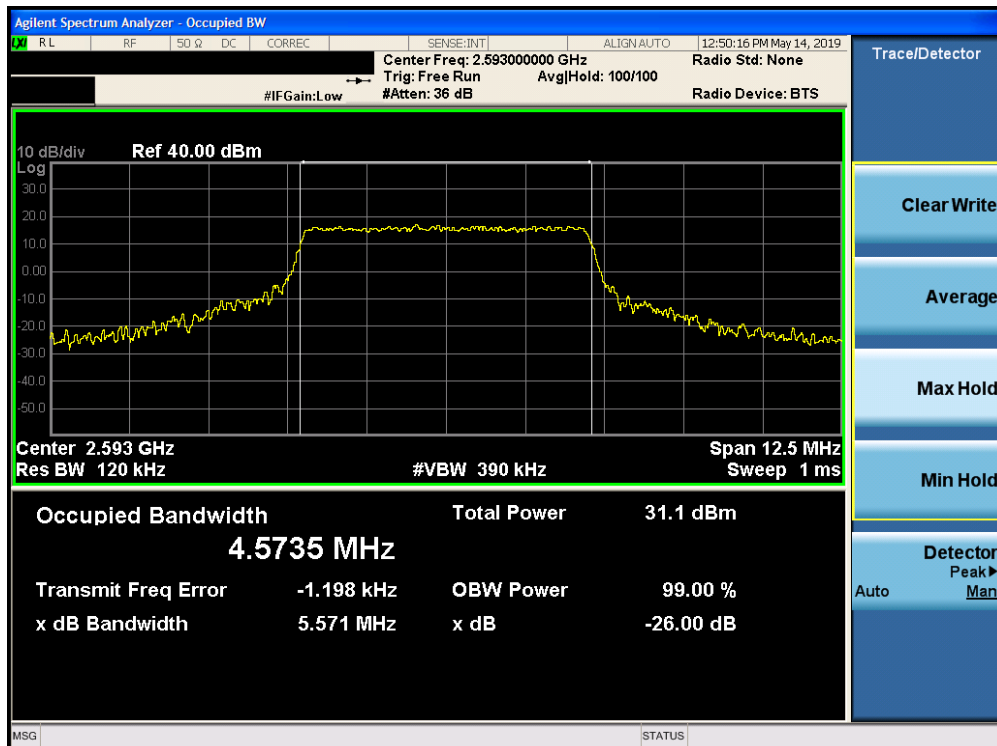
Plot 7-52. Occupied Bandwidth Plot (Band 7 - 20.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 48 of 238

Band 41

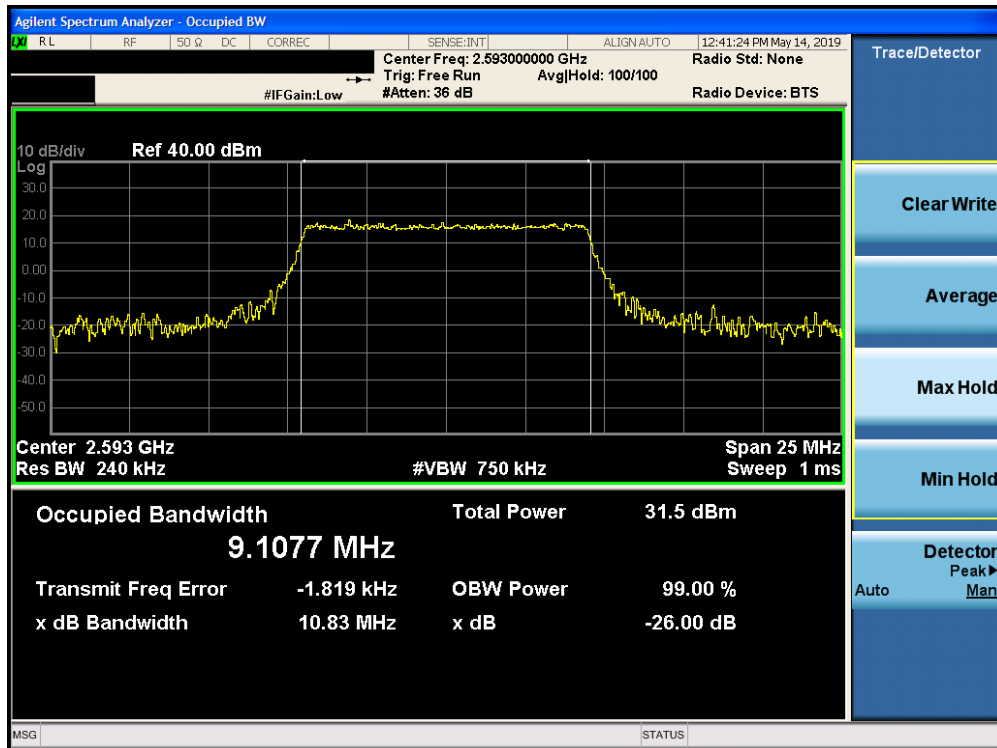


Plot 7-53. Occupied Bandwidth Plot (Band 41 - 5.0MHz QPSK - Full RB Configuration)

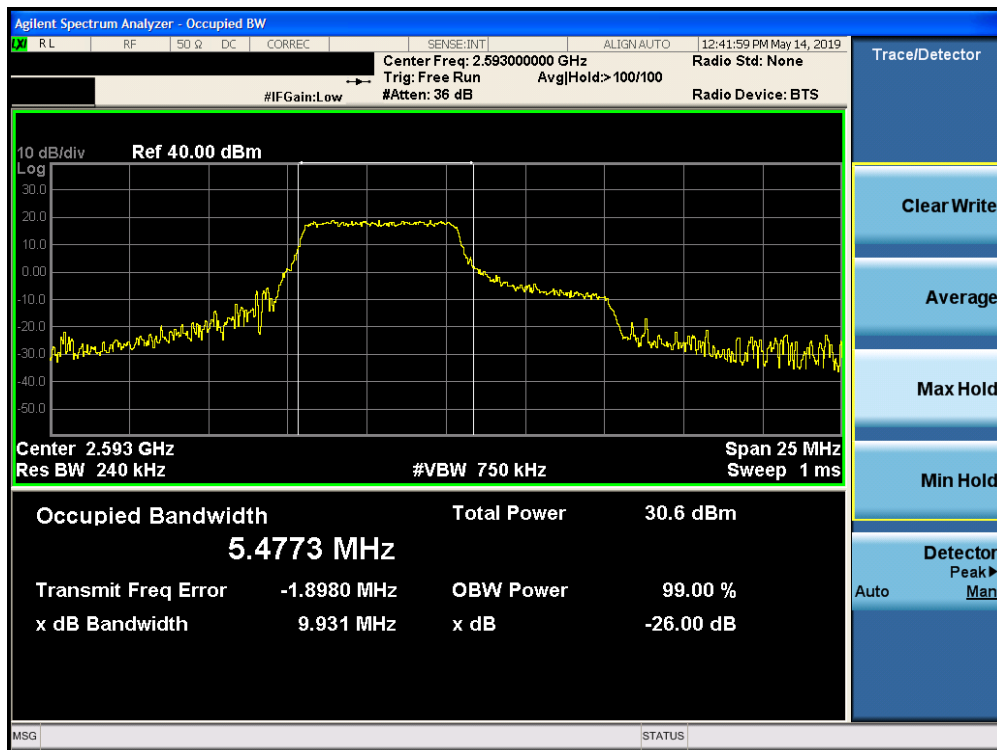


Plot 7-54. Occupied Bandwidth Plot (Band 41 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 49 of 238

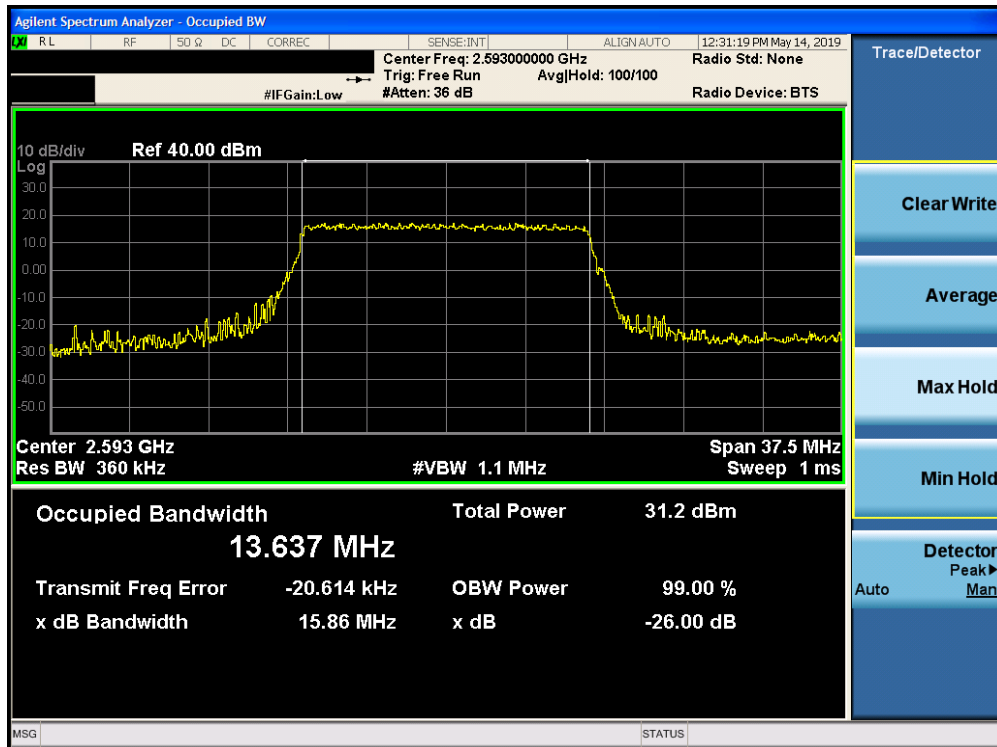


Plot 7-55. Occupied Bandwidth Plot (Band 41 - 10.0MHz QPSK - Full RB Configuration)

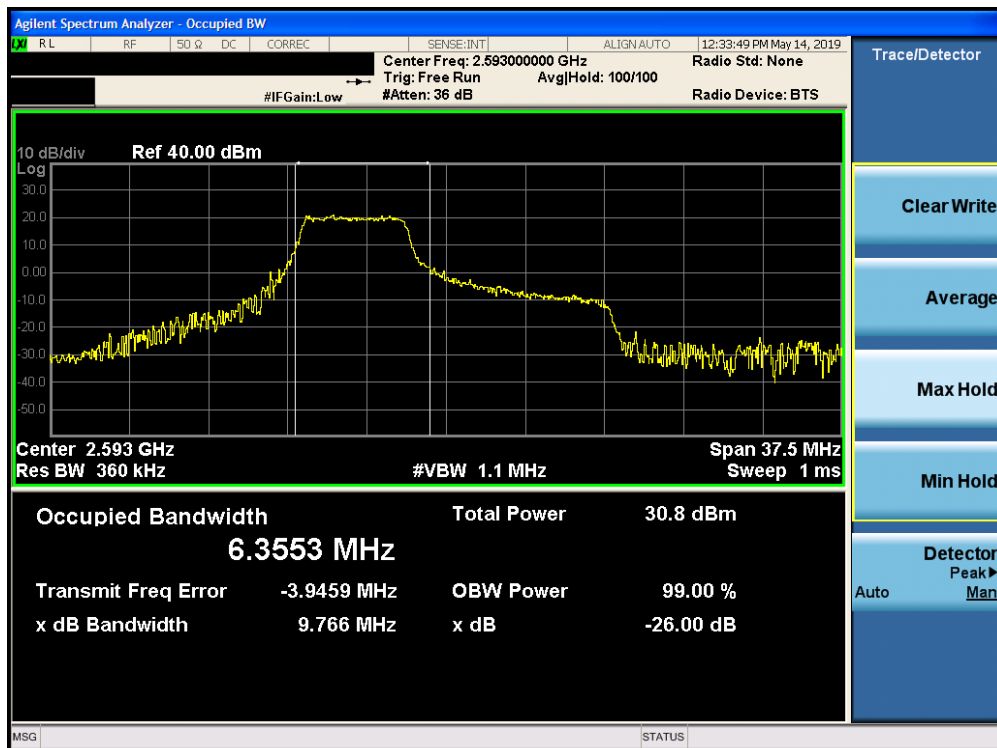


Plot 7-56. Occupied Bandwidth Plot (Band 41 - 10.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 50 of 238

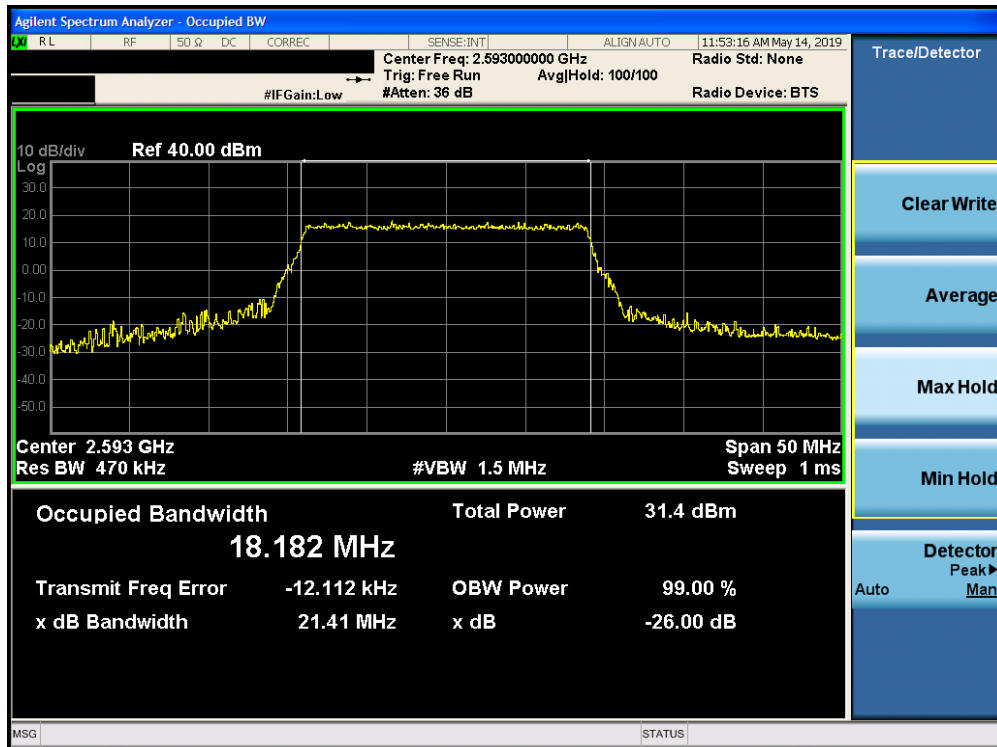


Plot 7-57. Occupied Bandwidth Plot (Band 41 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-58. Occupied Bandwidth Plot (Band 41 - 15.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Plot 7-59. Occupied Bandwidth Plot (Band 41 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-60. Occupied Bandwidth Plot (Band 41 - 20.0MHz 16-QAM - Full RB (27/0) Configuration)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 52 of 238

7.3 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is $43 + 10 \log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

For Band 7 and 41, the minimum permissible attenuation level of any spurious emission is $55 + 10 \log_{10}(P_{[Watts]})$.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

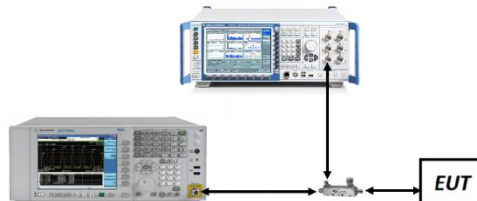


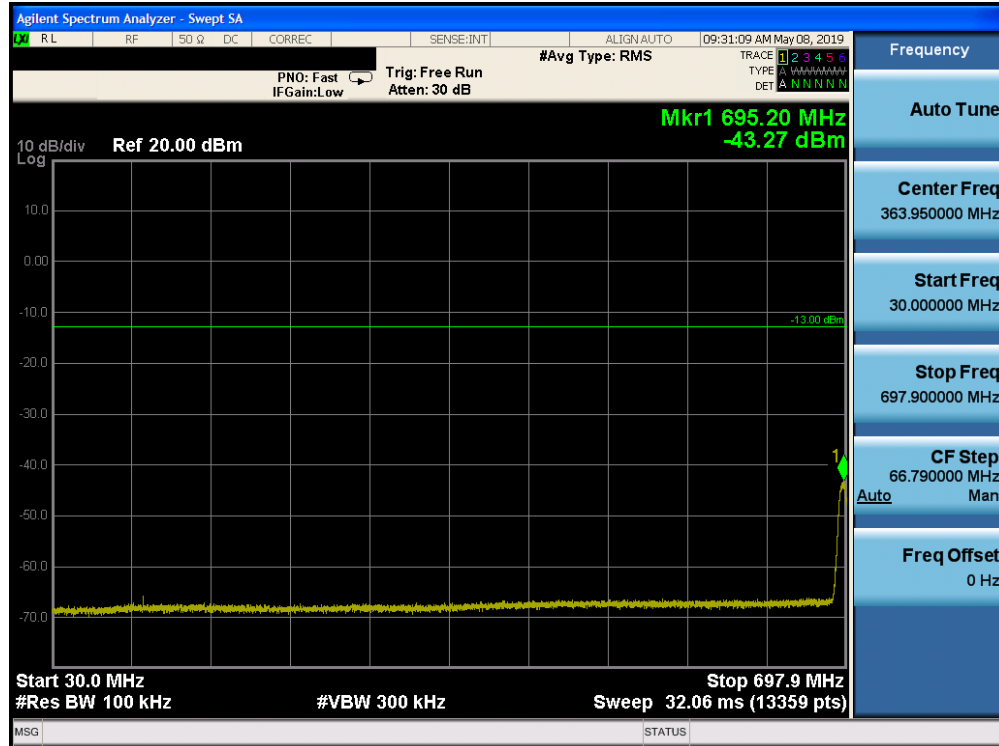
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

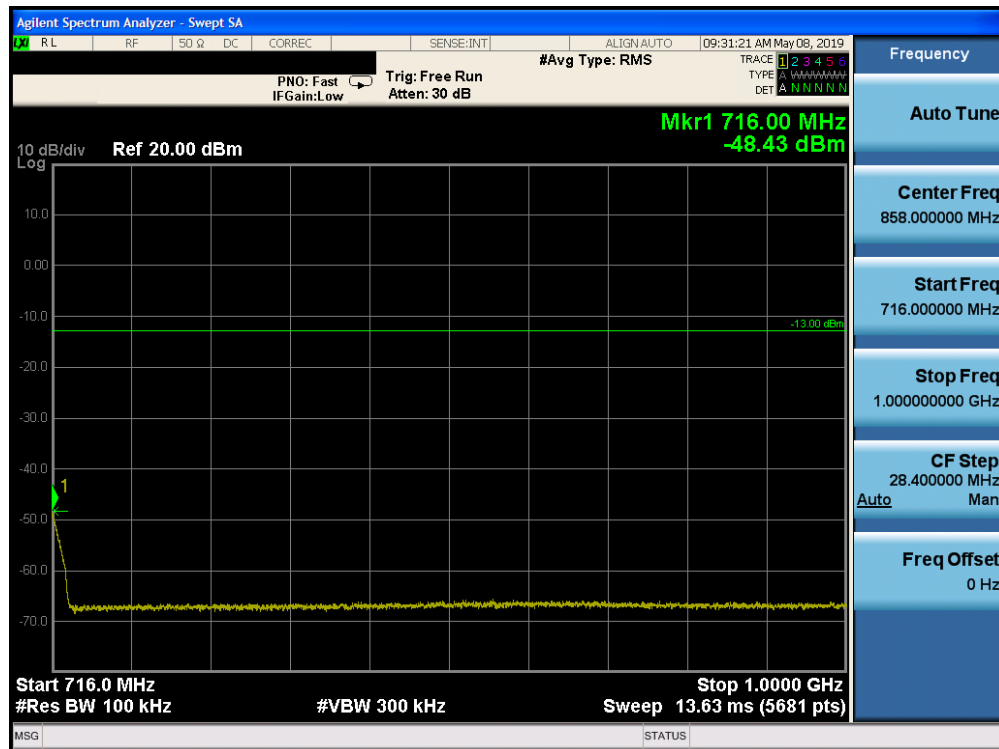
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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Band 12/17

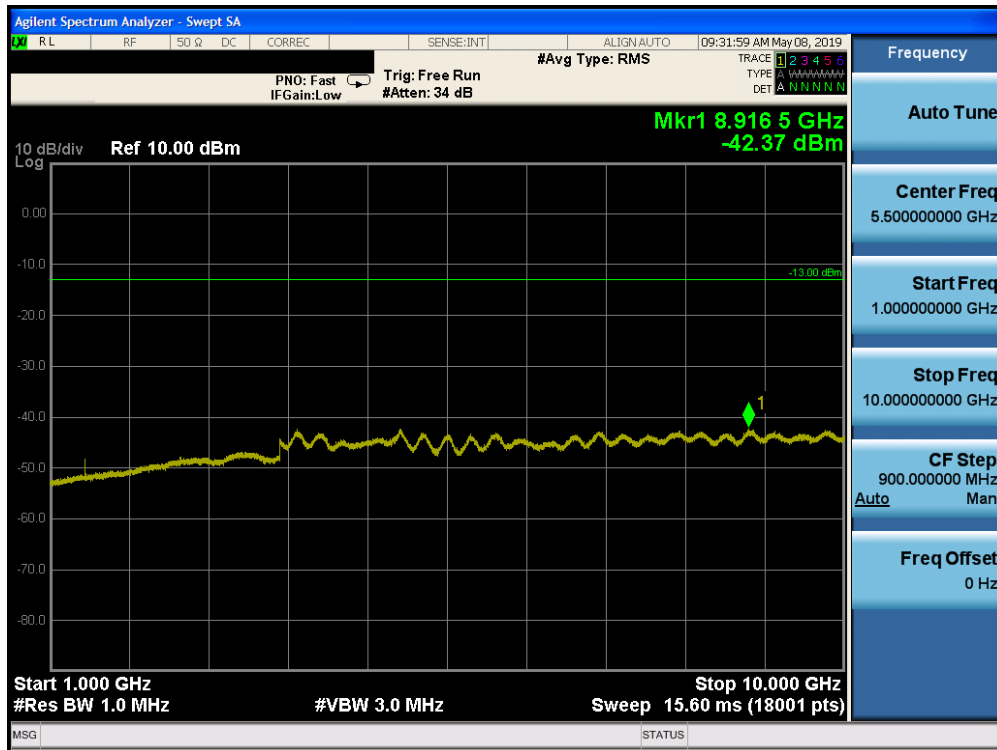


Plot 7-61. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

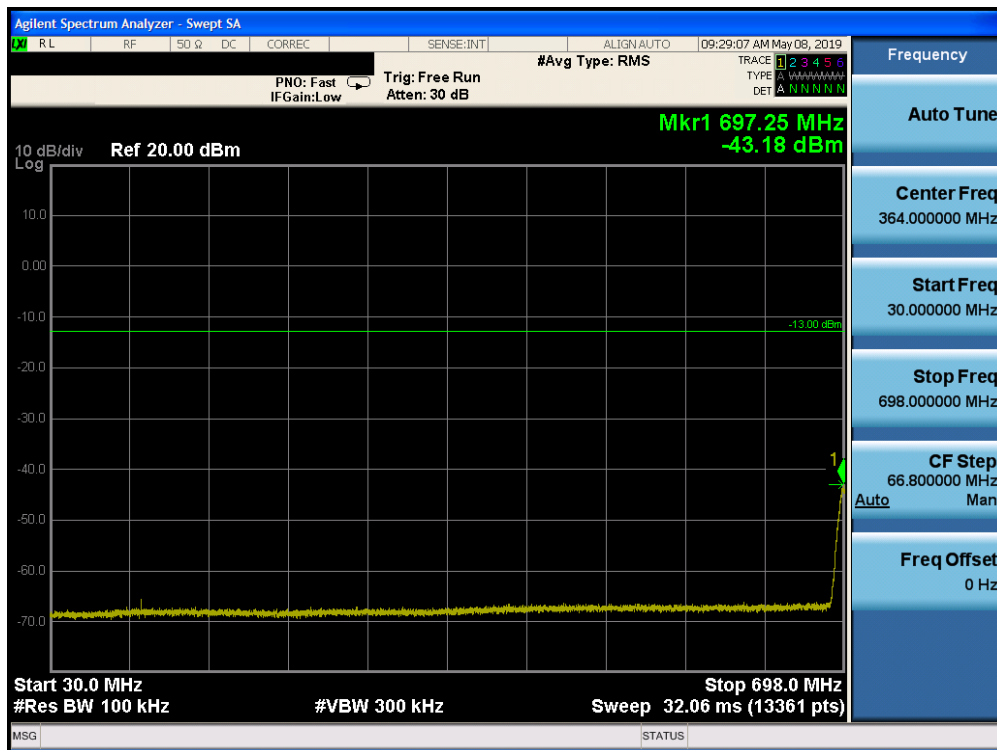


Plot 7-62. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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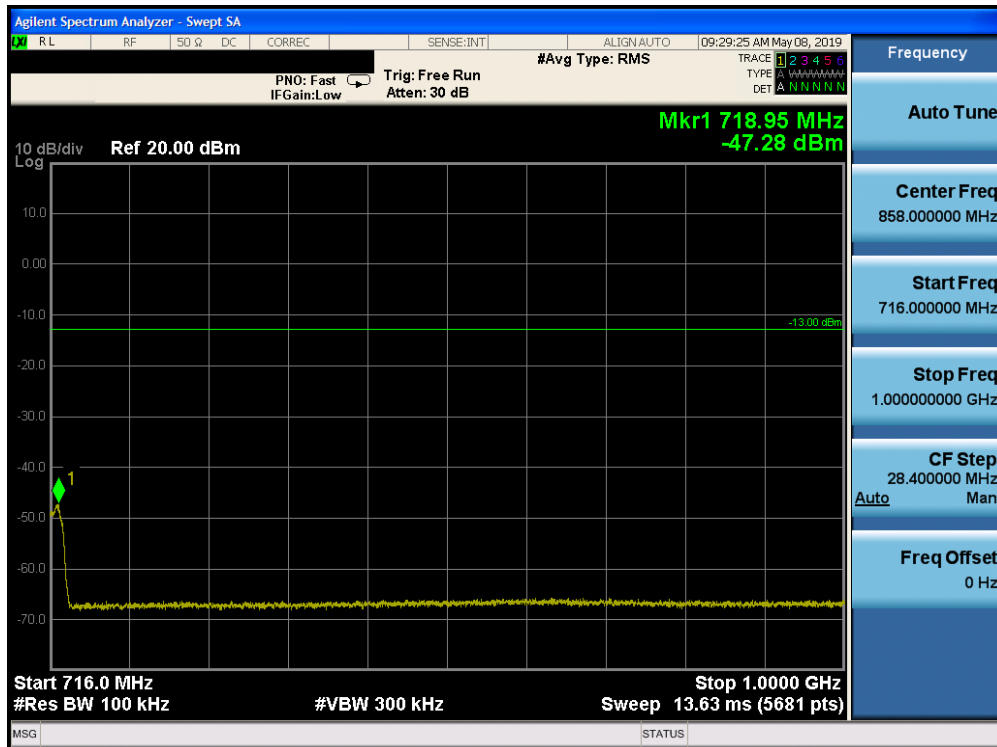


Plot 7-63. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

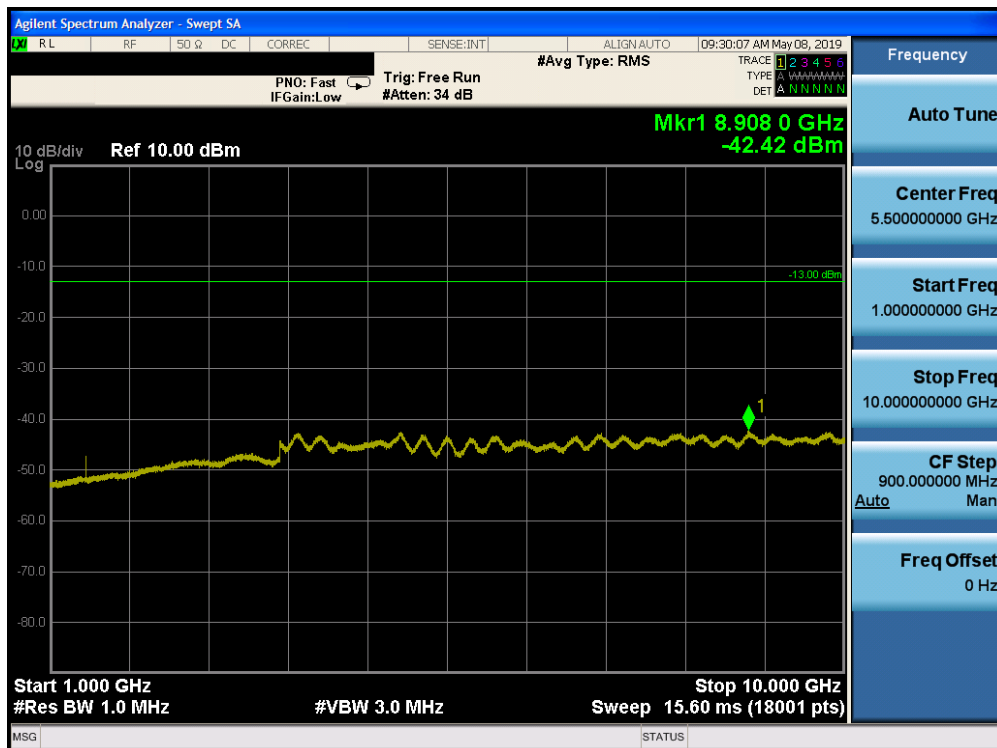


Plot 7-64. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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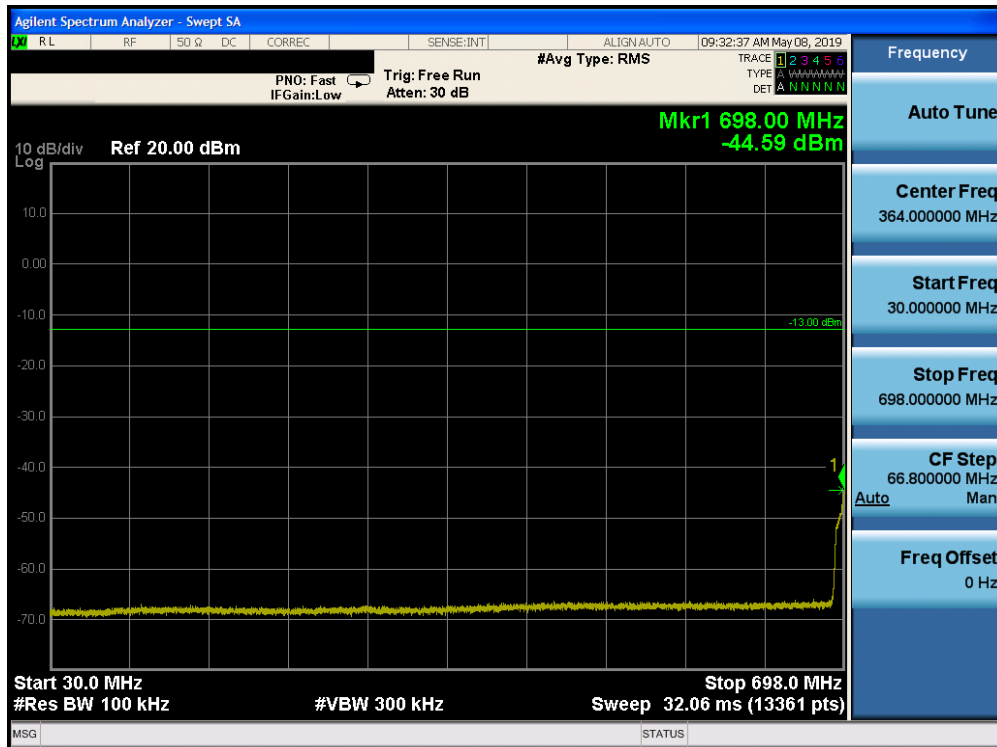


Plot 7-65. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

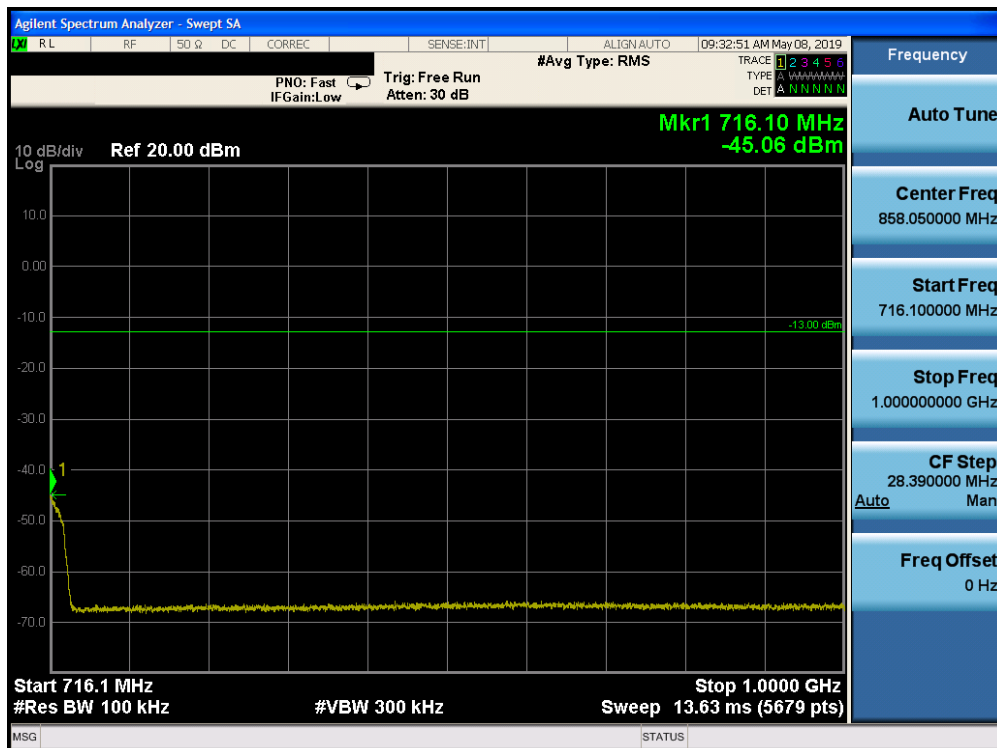


Plot 7-66. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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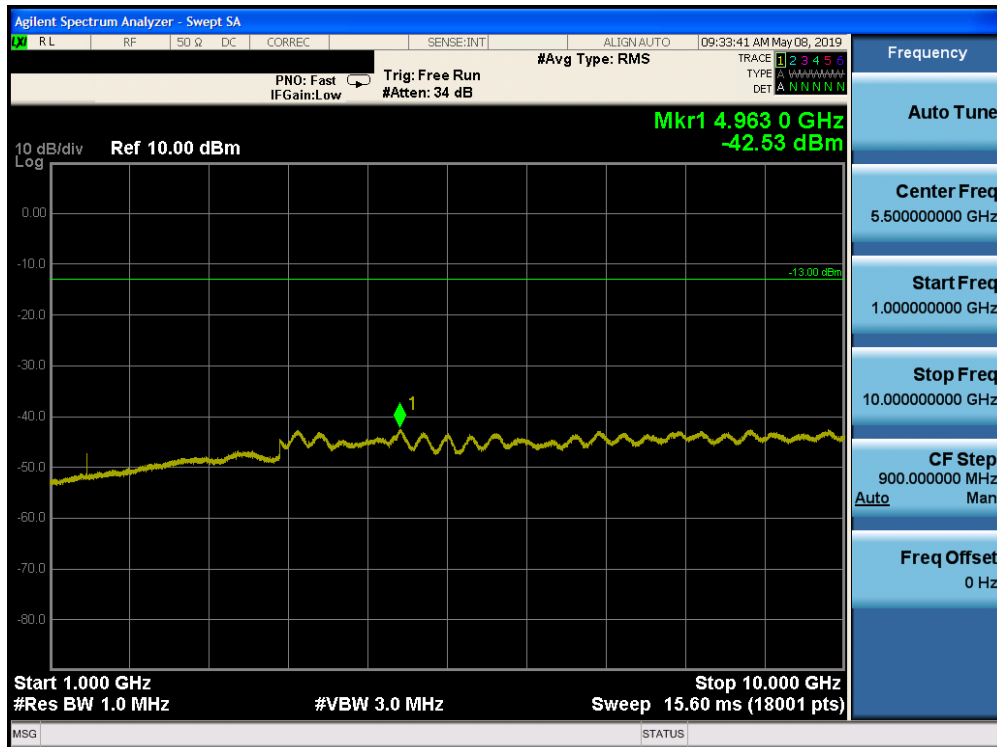


Plot 7-67. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-68. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

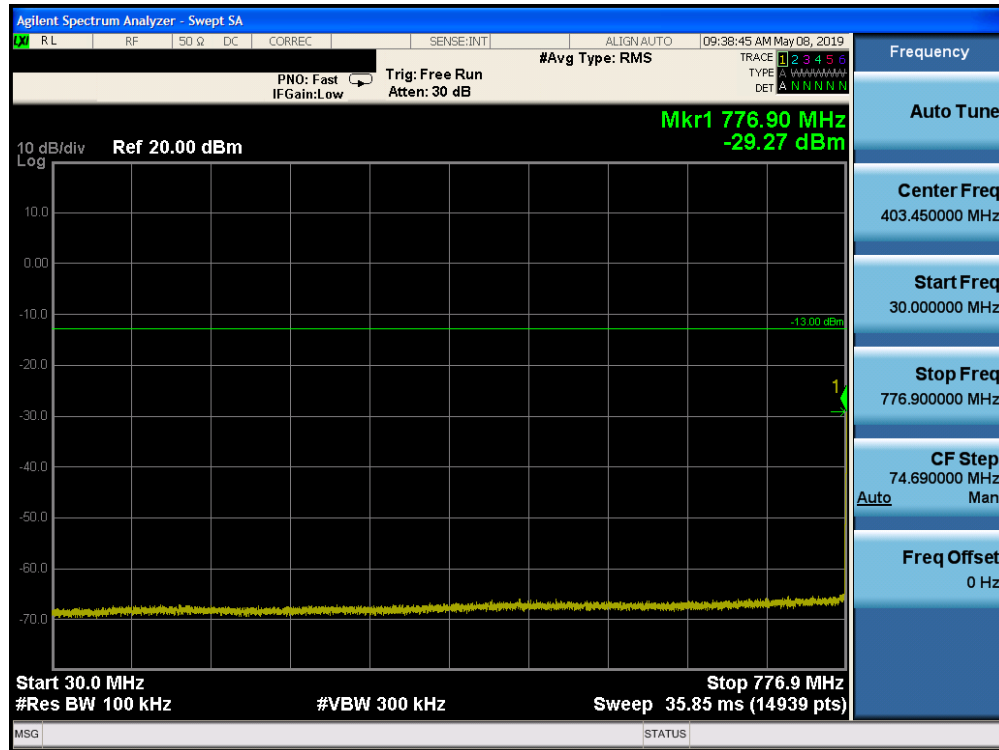
FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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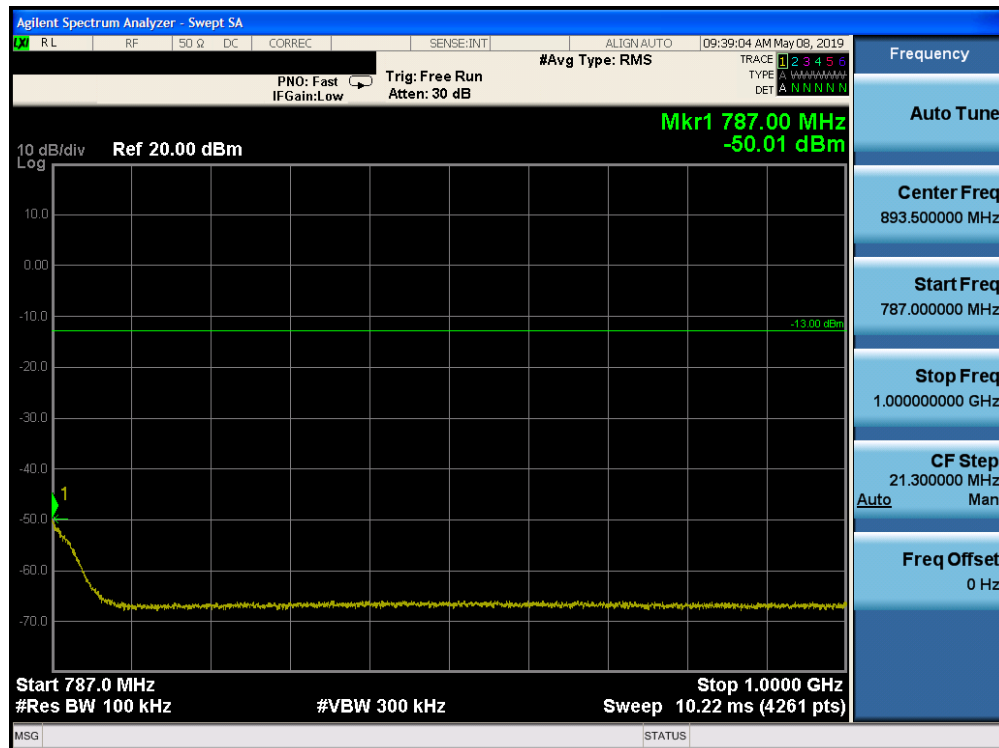
Plot 7-69. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 13

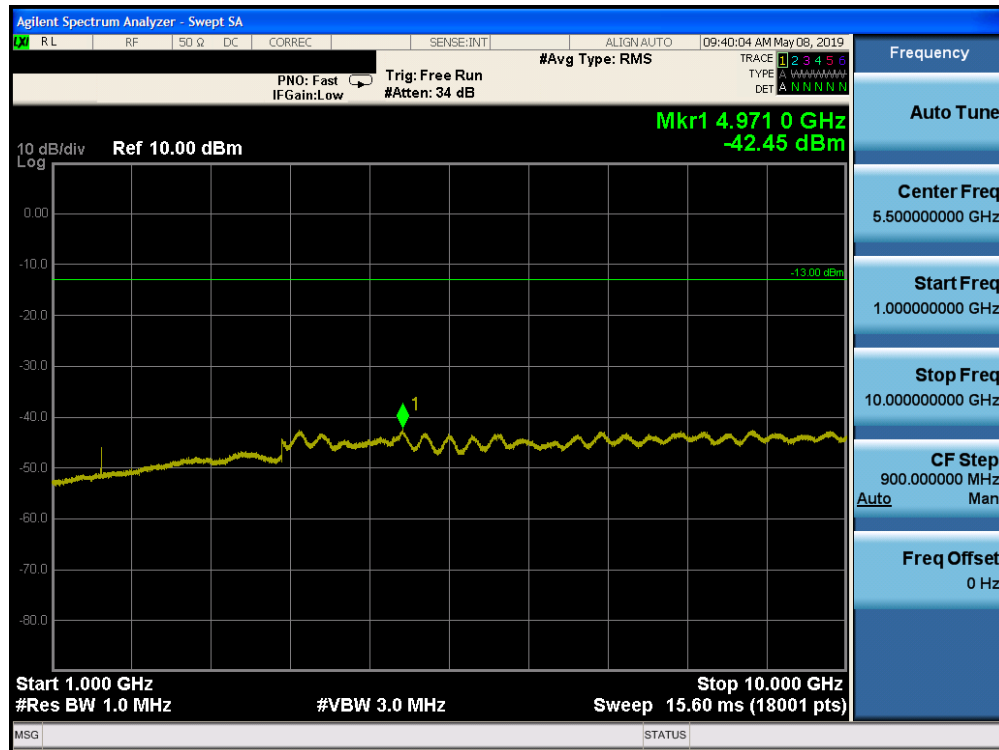


Plot 7-70. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

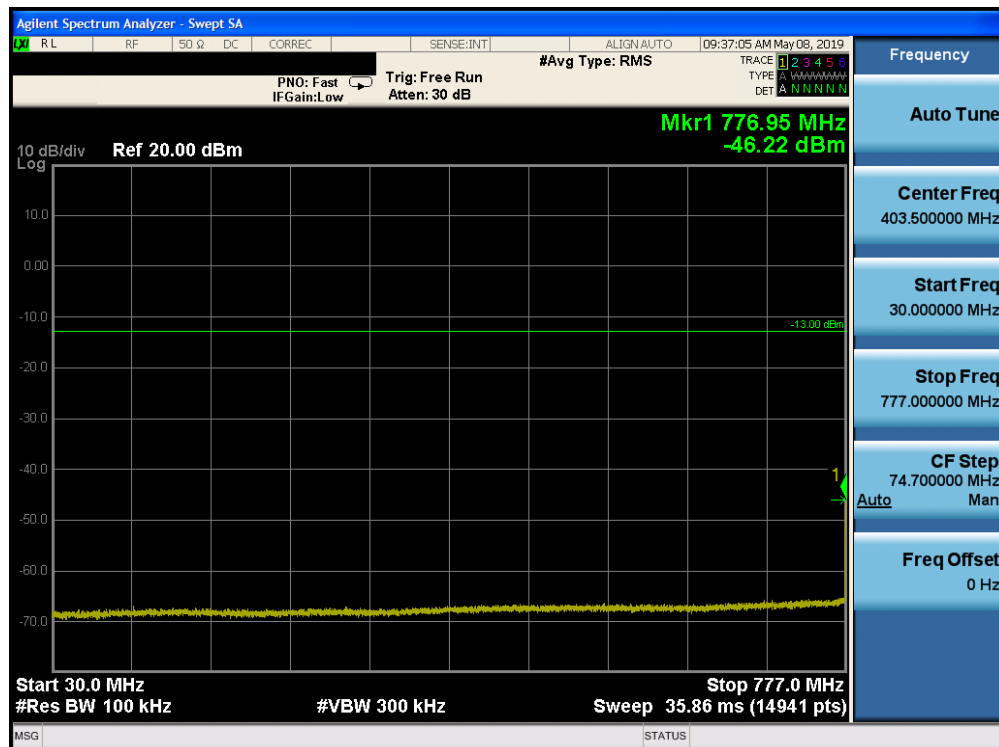


Plot 7-71. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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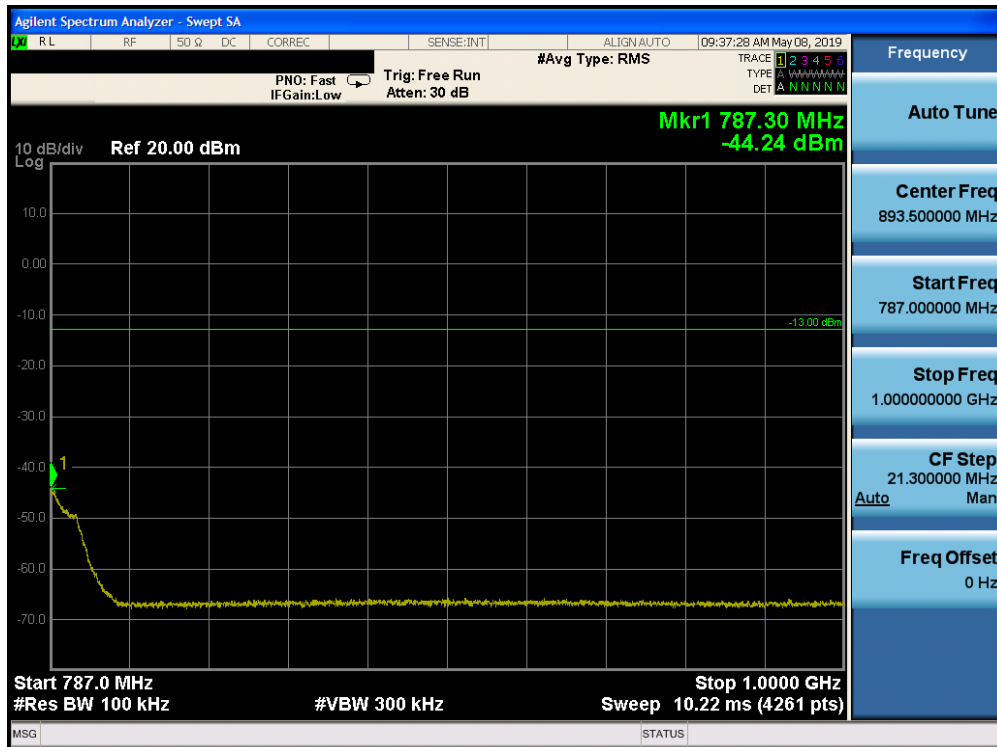


Plot 7-72. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

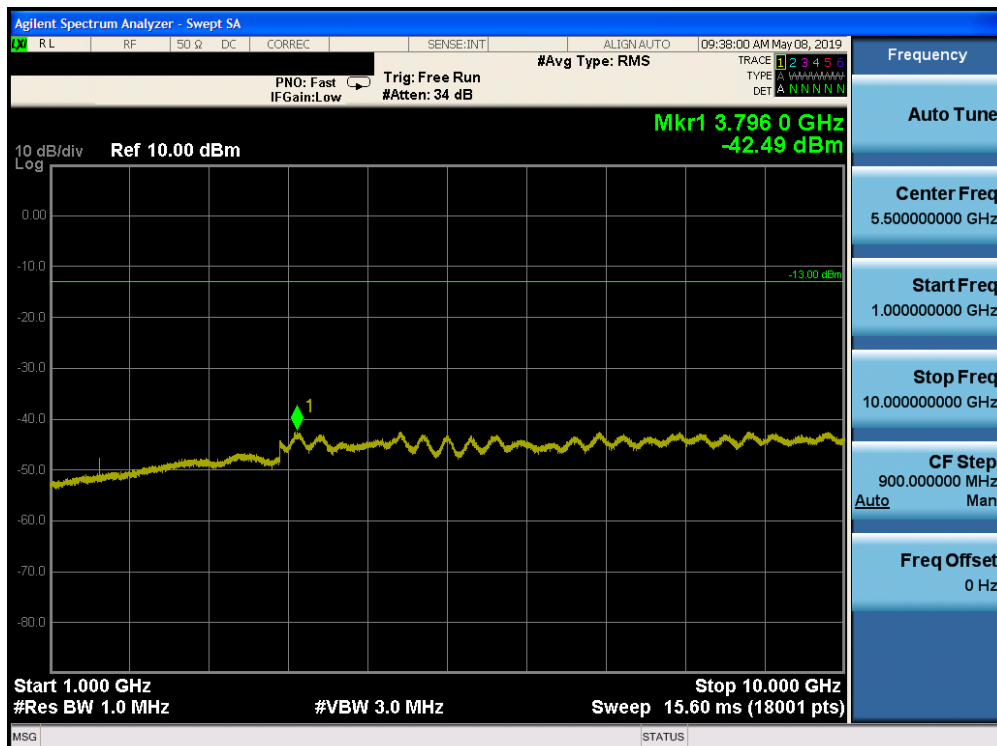


Plot 7-73. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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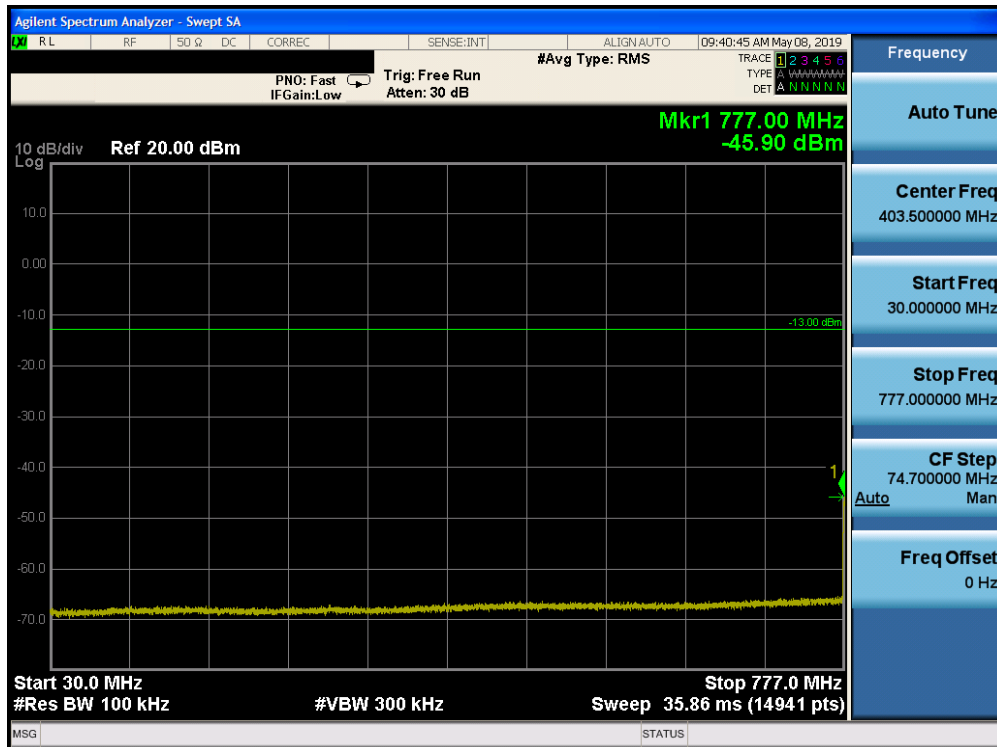


Plot 7-74. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

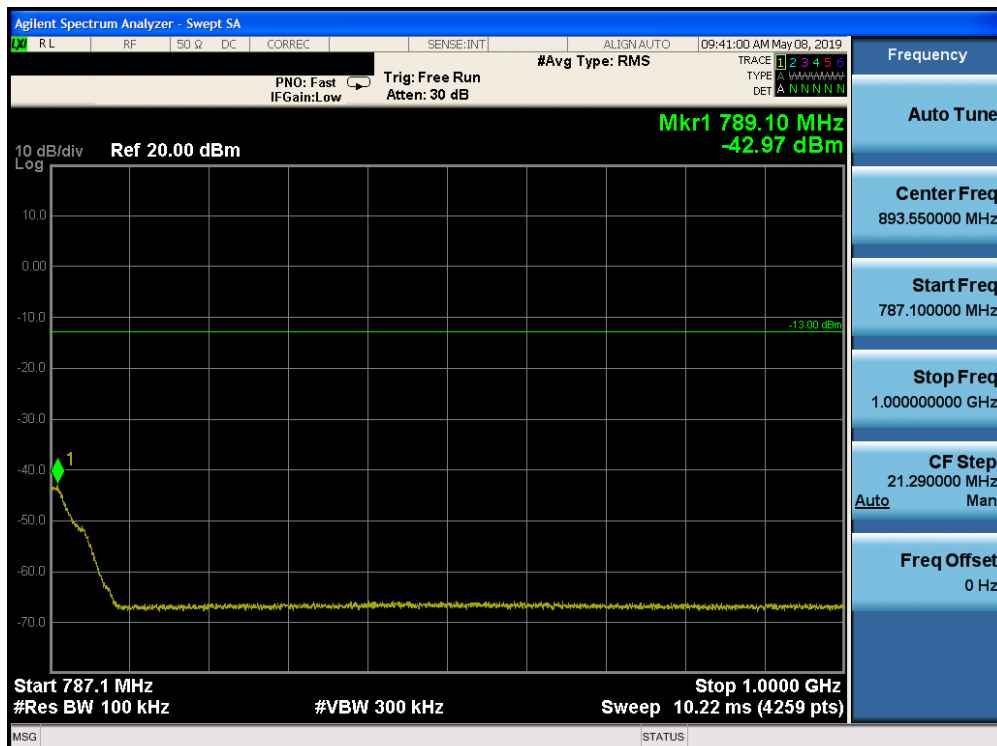


Plot 7-75. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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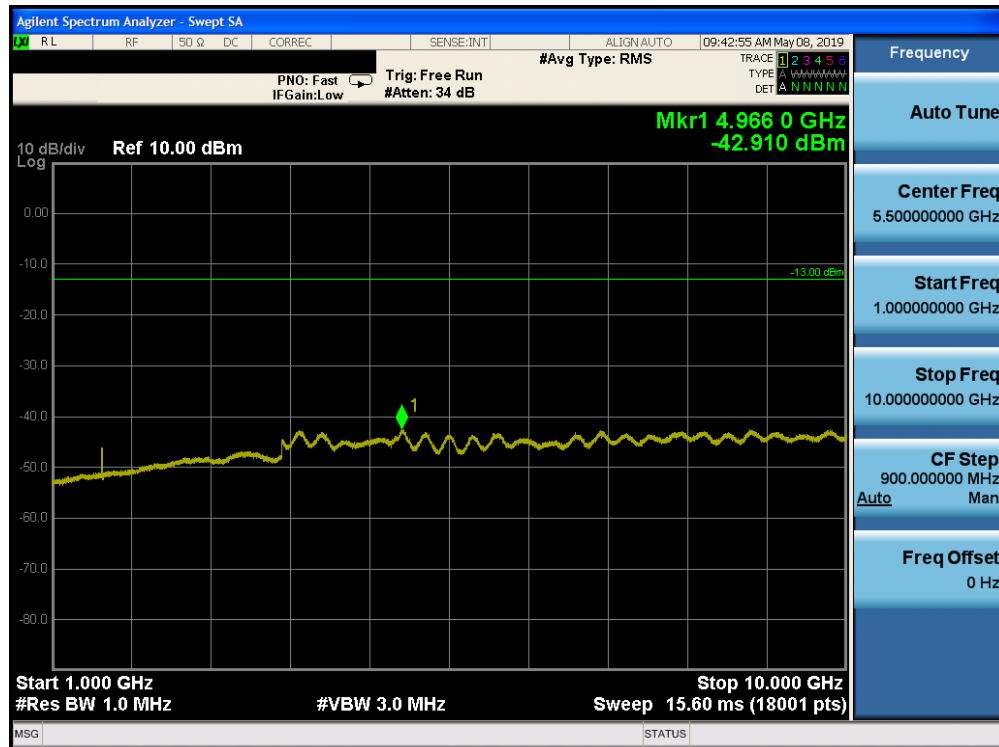


Plot 7-76. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-77. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

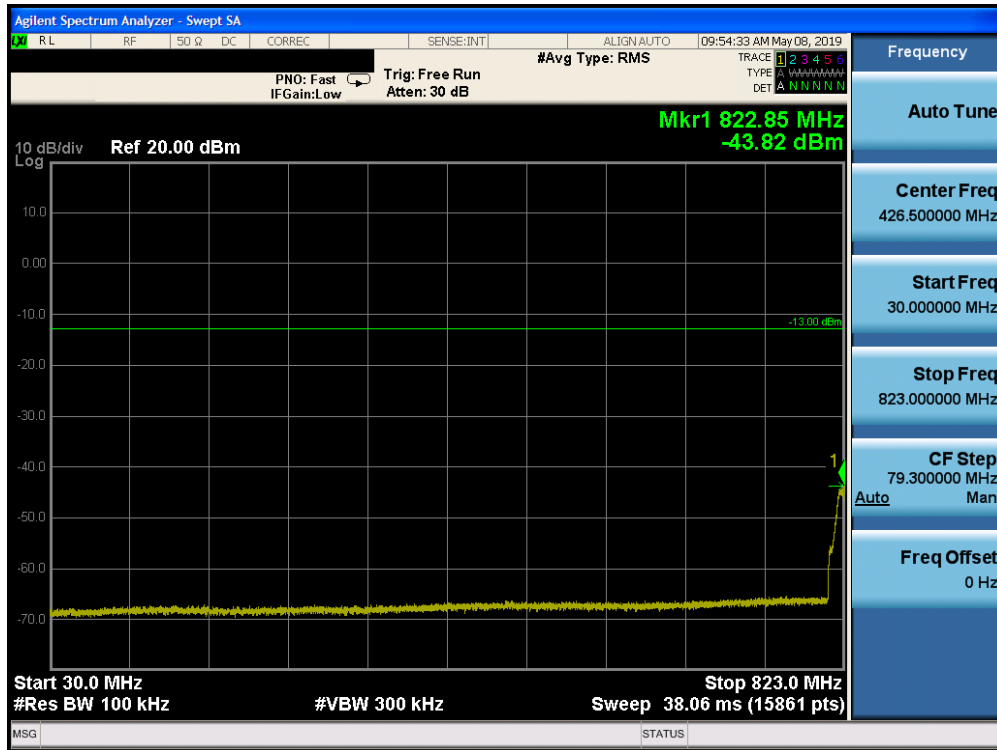
FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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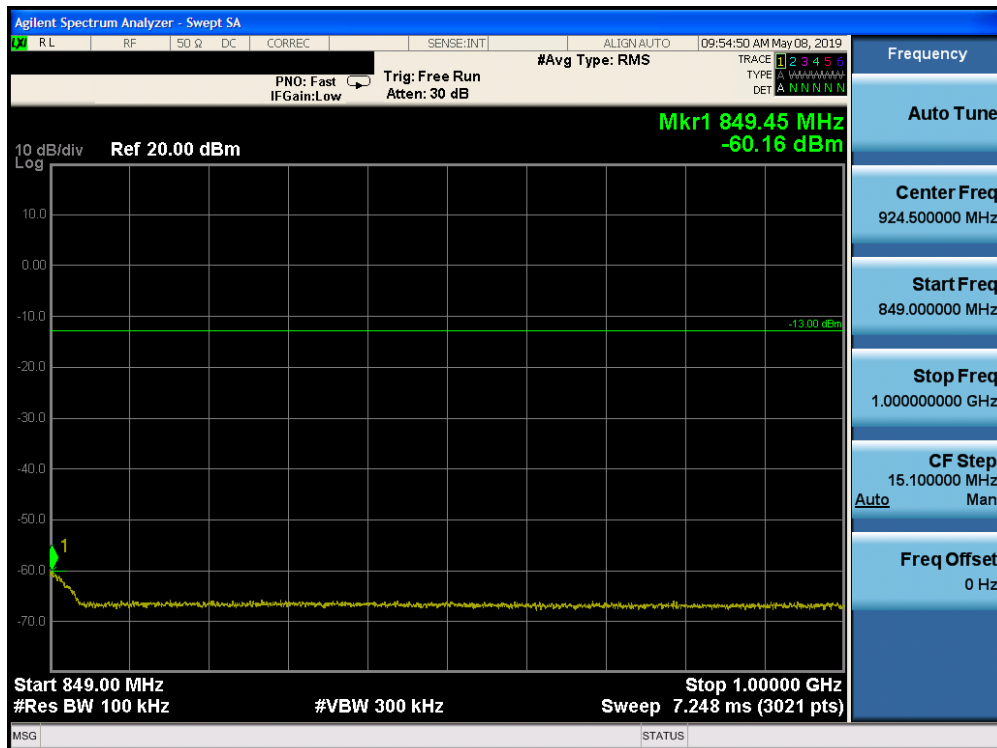
Plot 7-78. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 63 of 238

Band 26/5

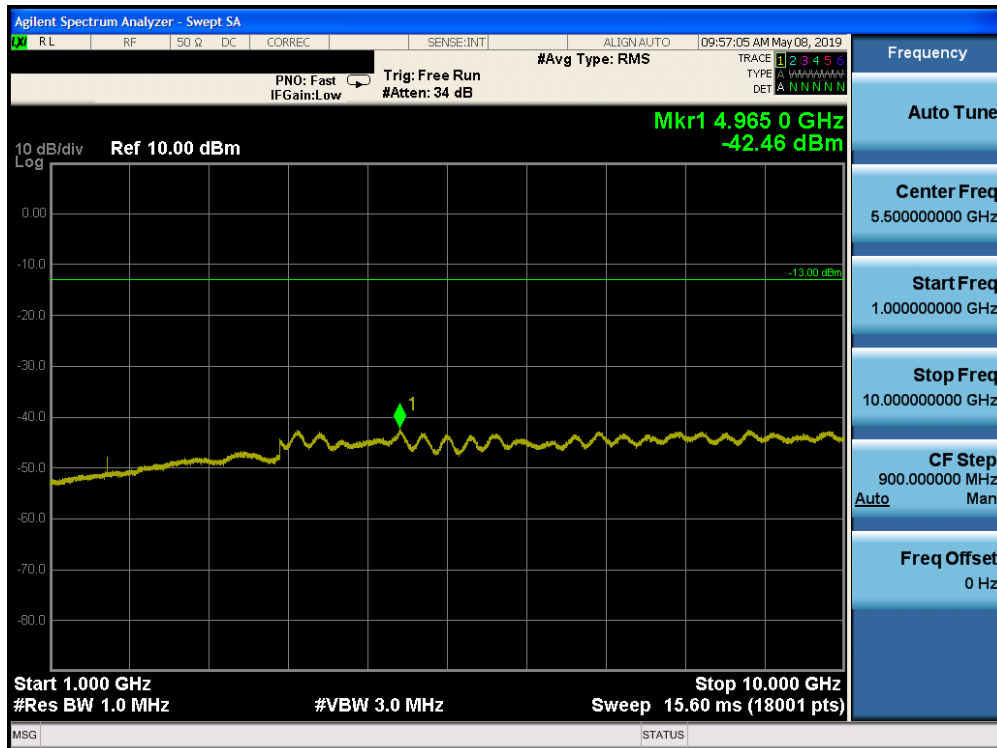


Plot 7-79. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

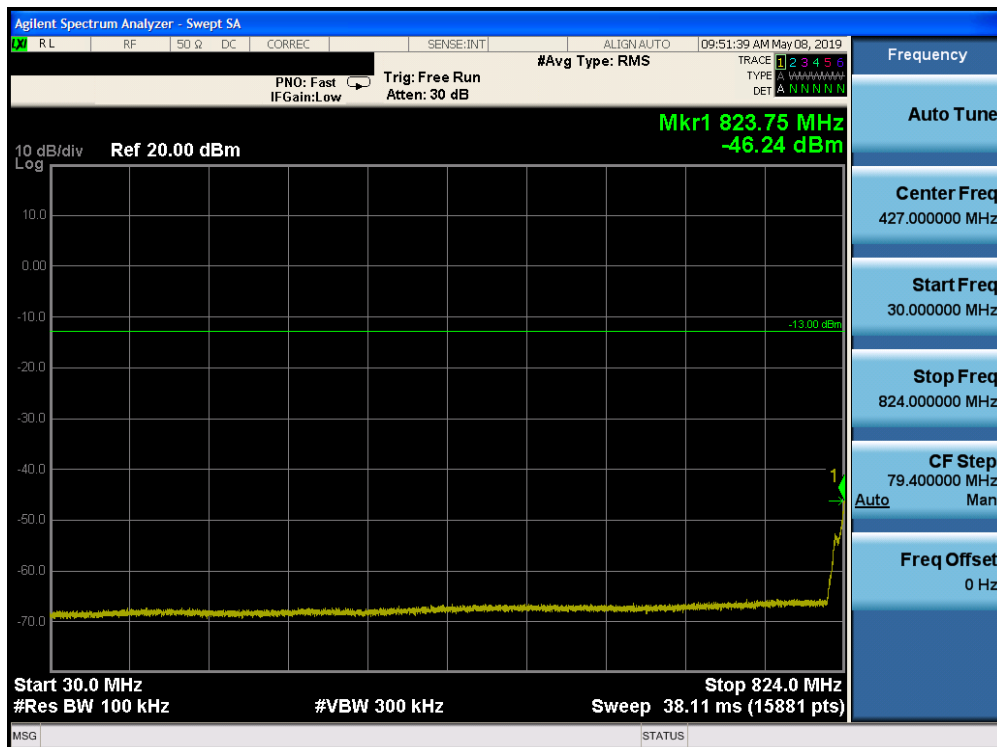


Plot 7-80. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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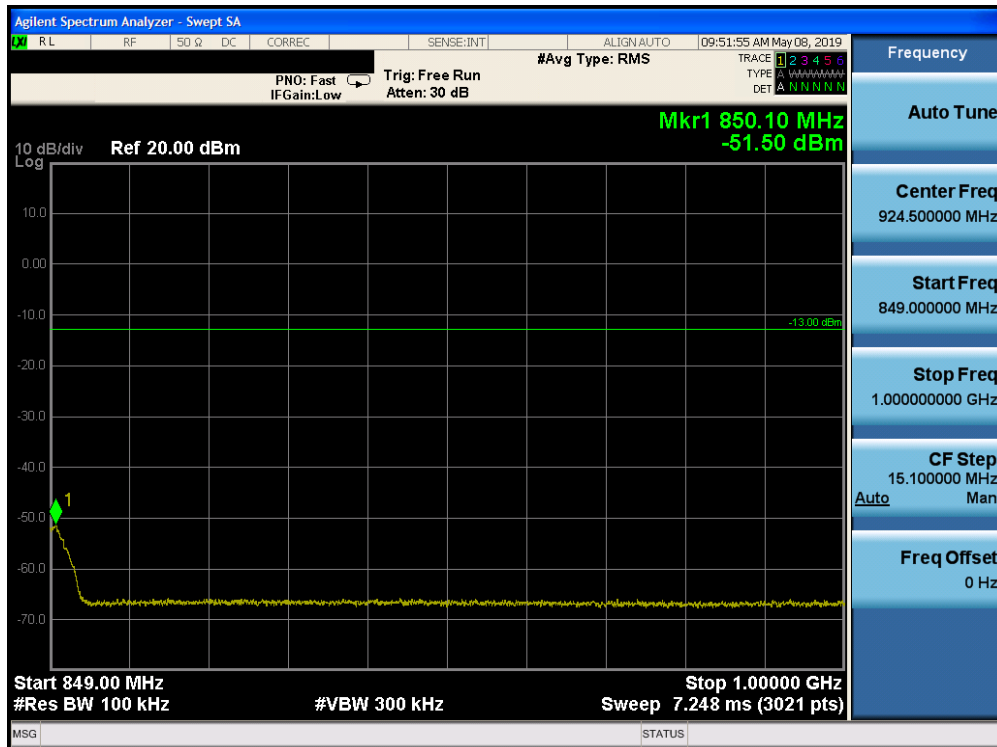


Plot 7-81. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

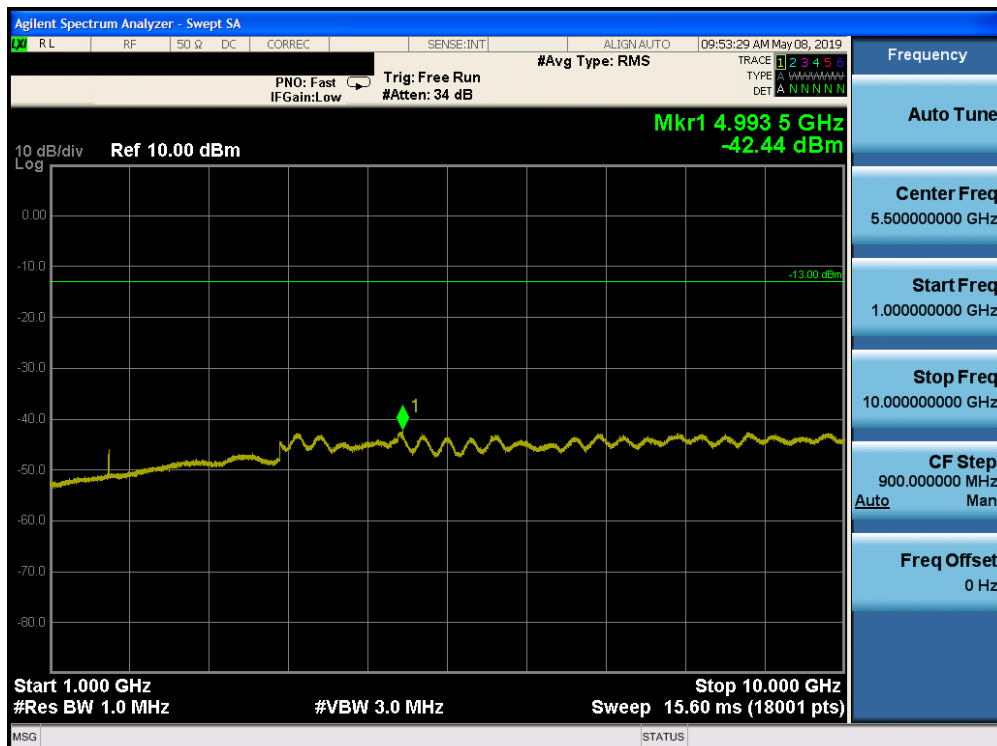


Plot 7-82. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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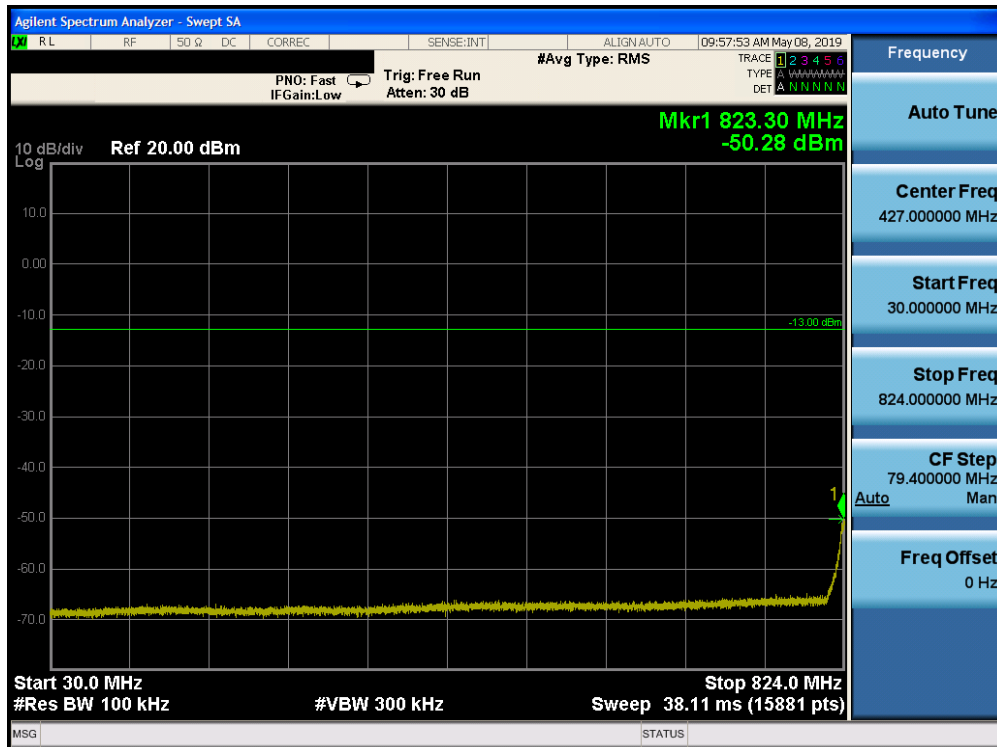


Plot 7-83. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

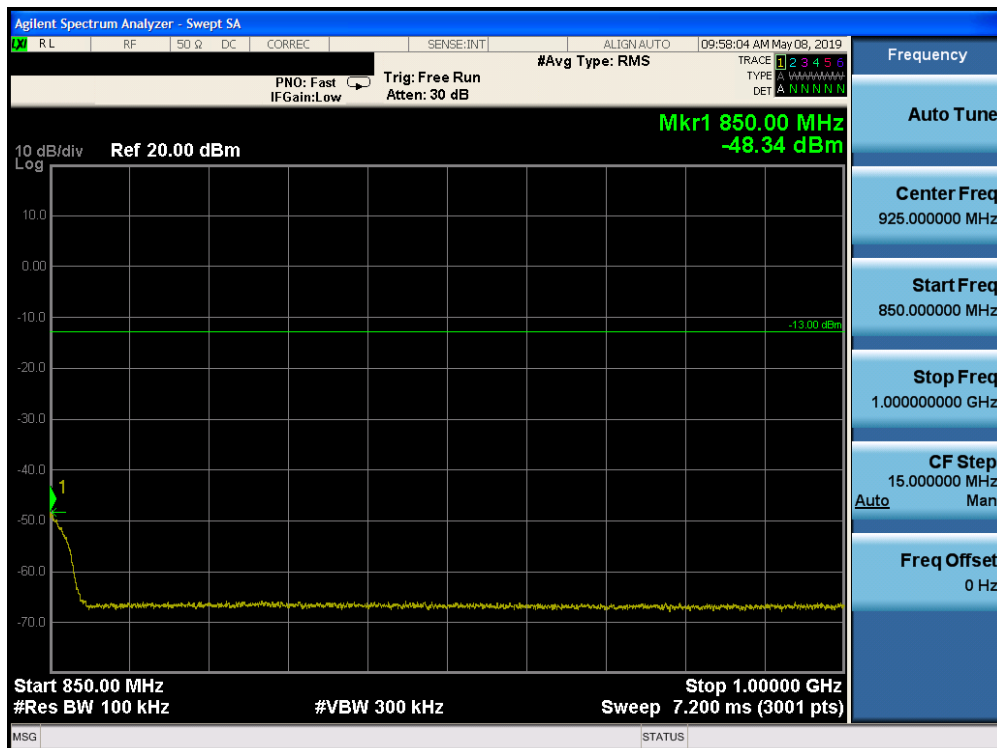


Plot 7-84. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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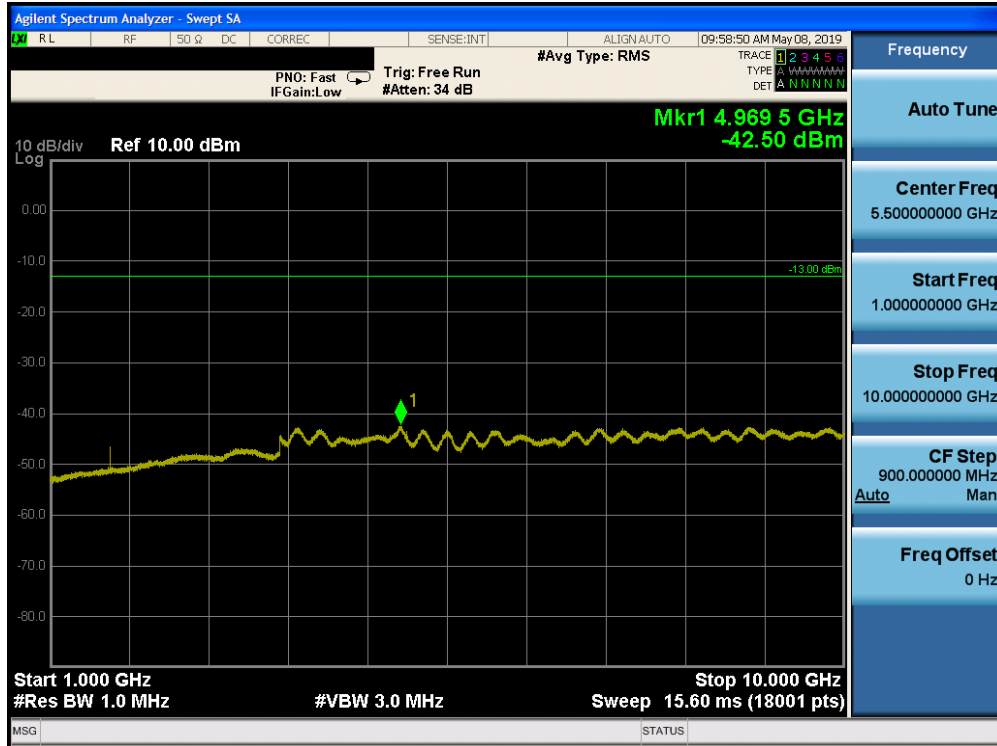


Plot 7-85. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-86. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

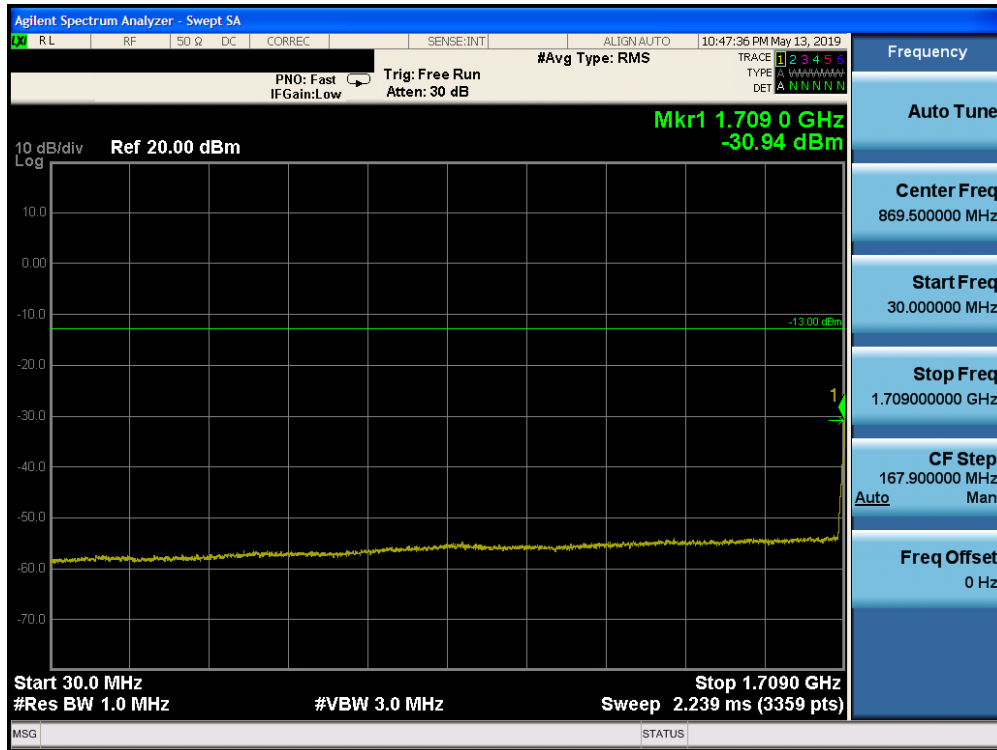
FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 67 of 238



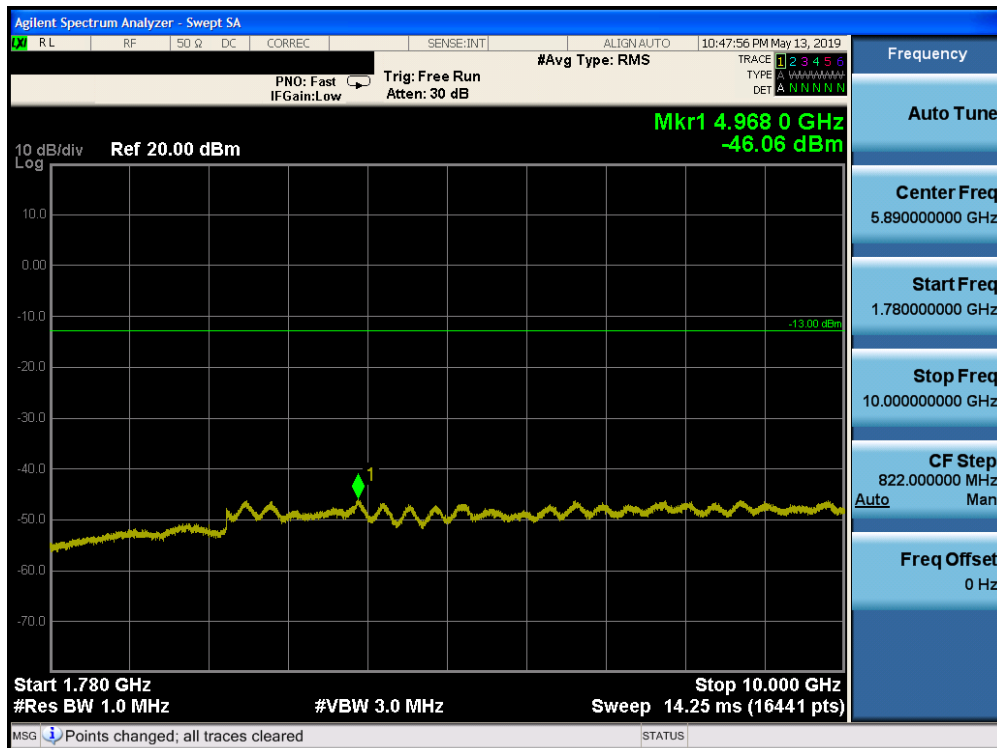
Plot 7-87. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 66/4

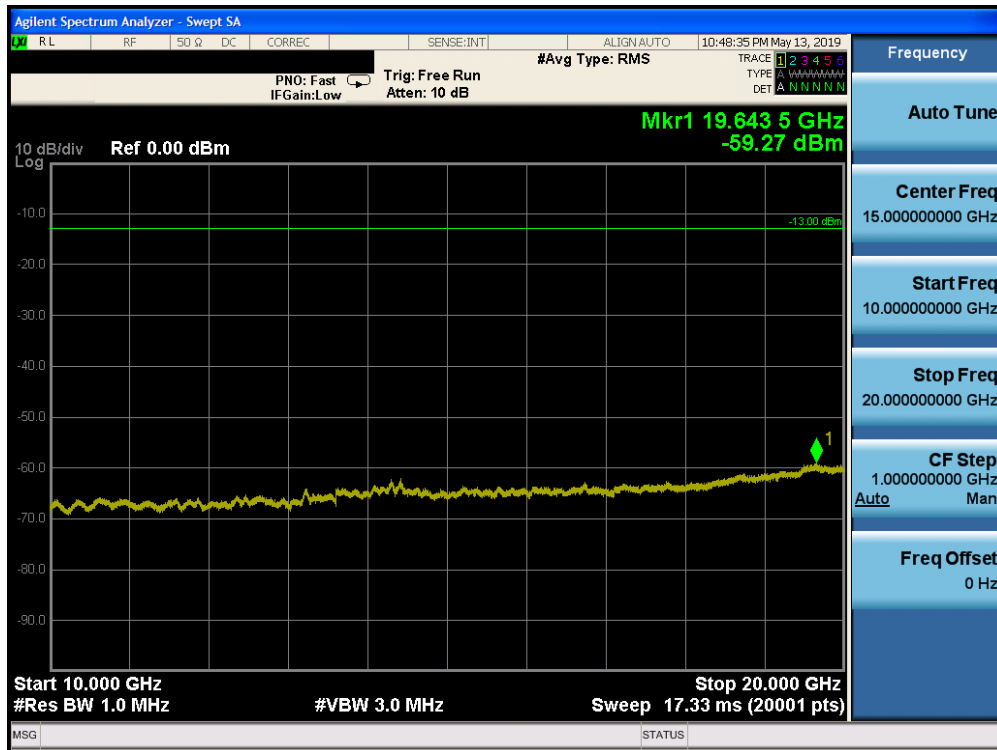


Plot 7-88. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

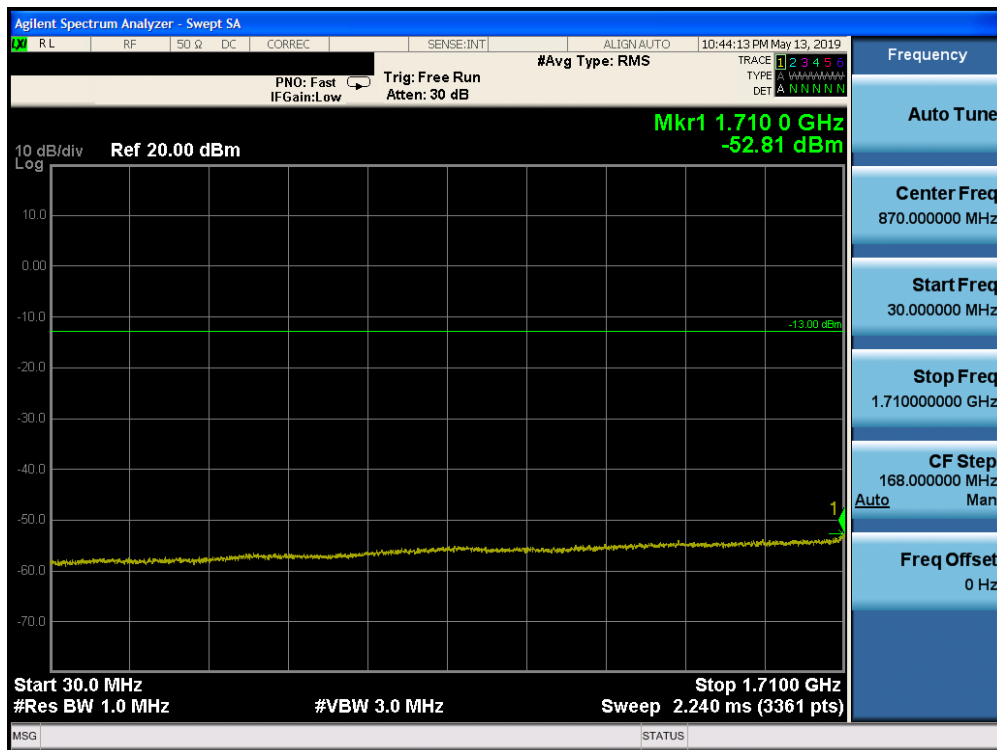


Plot 7-89. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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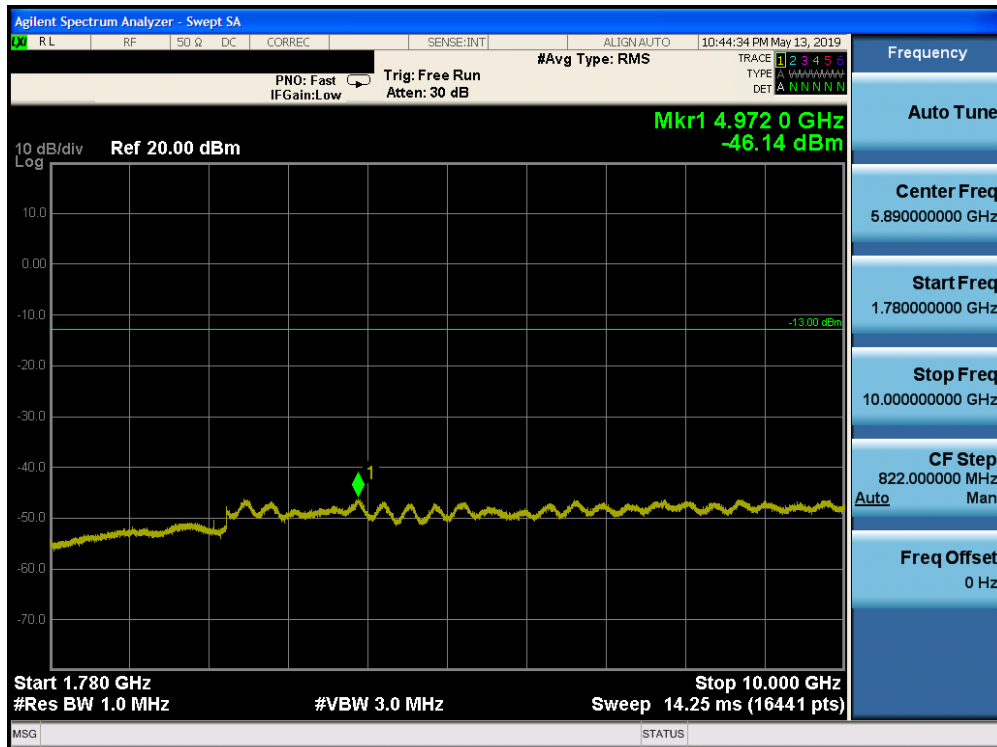


Plot 7-90. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

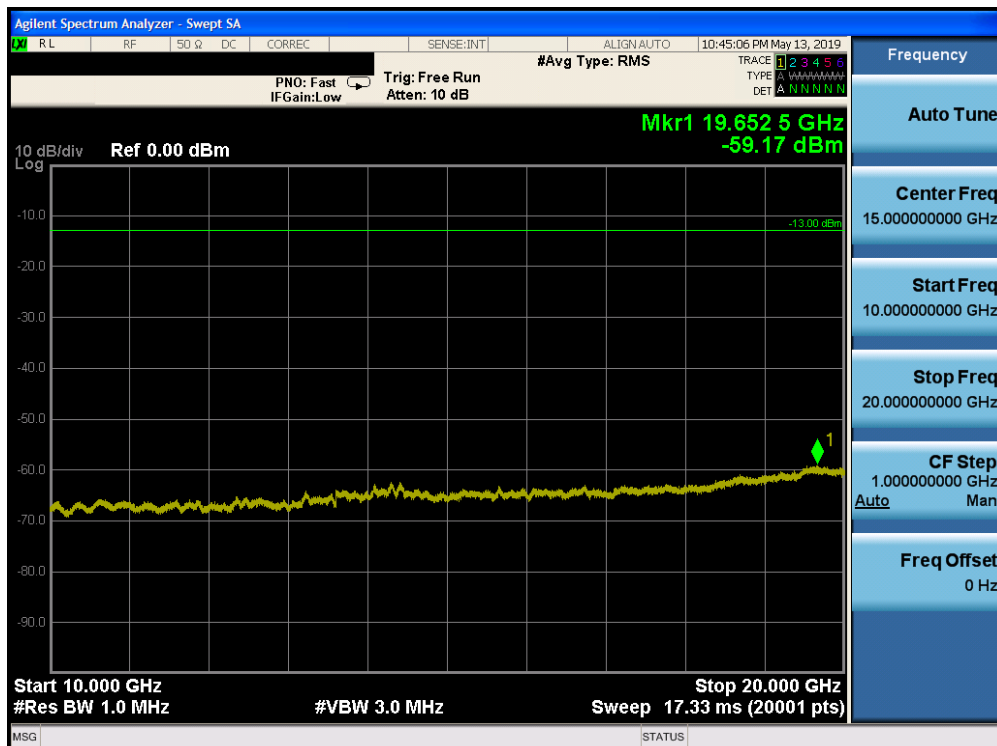


Plot 7-91. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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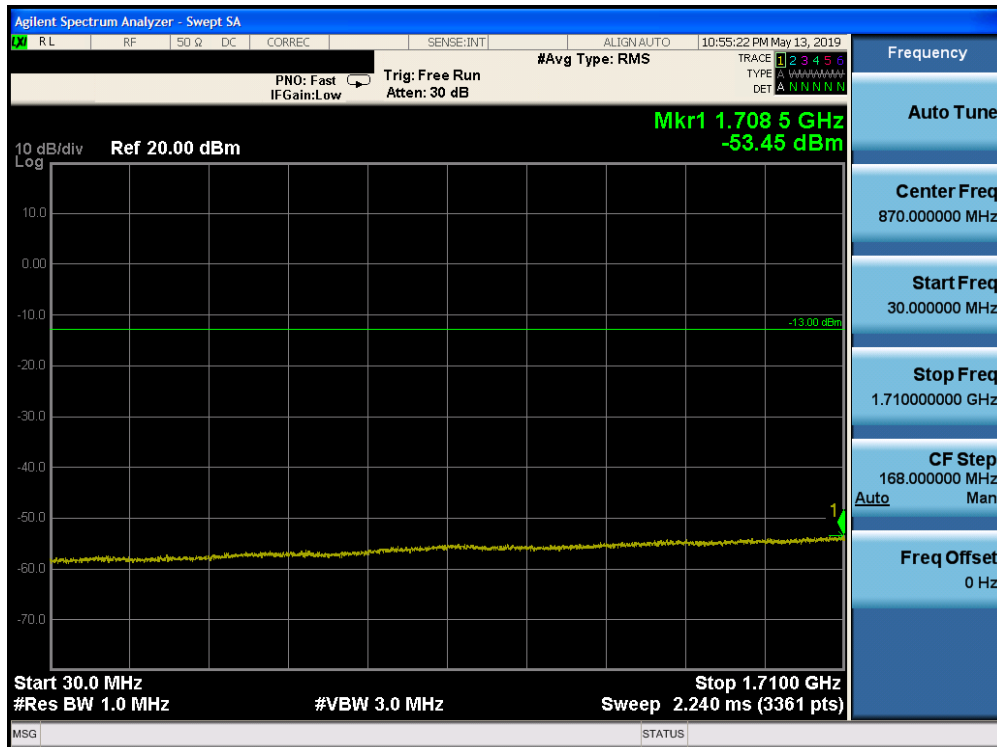


Plot 7-92. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

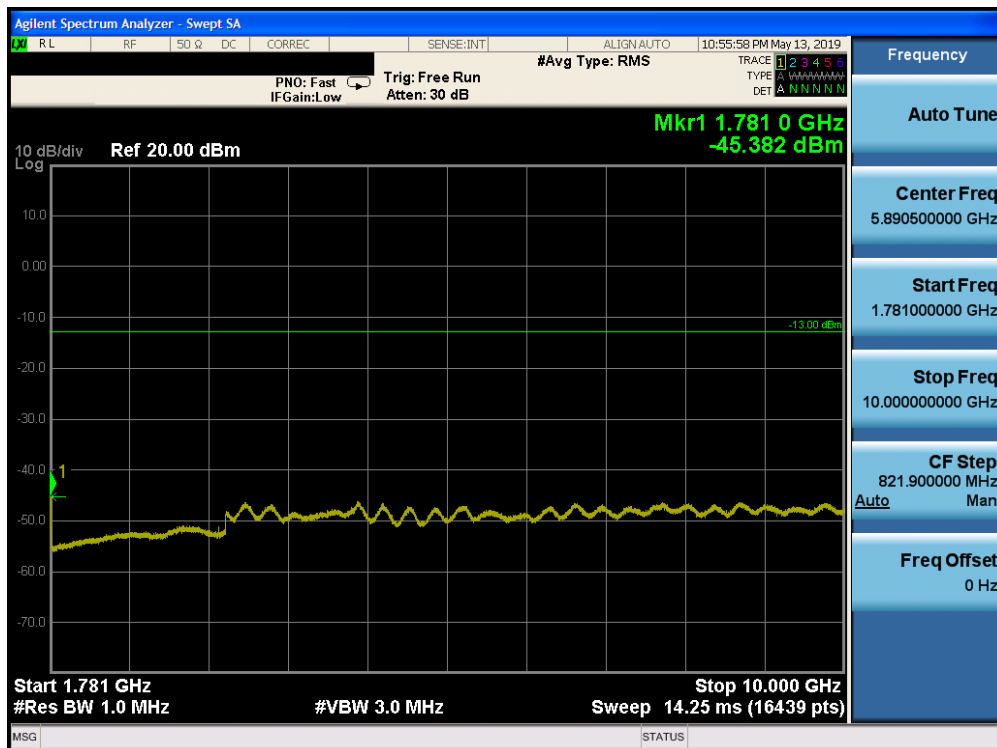


Plot 7-93. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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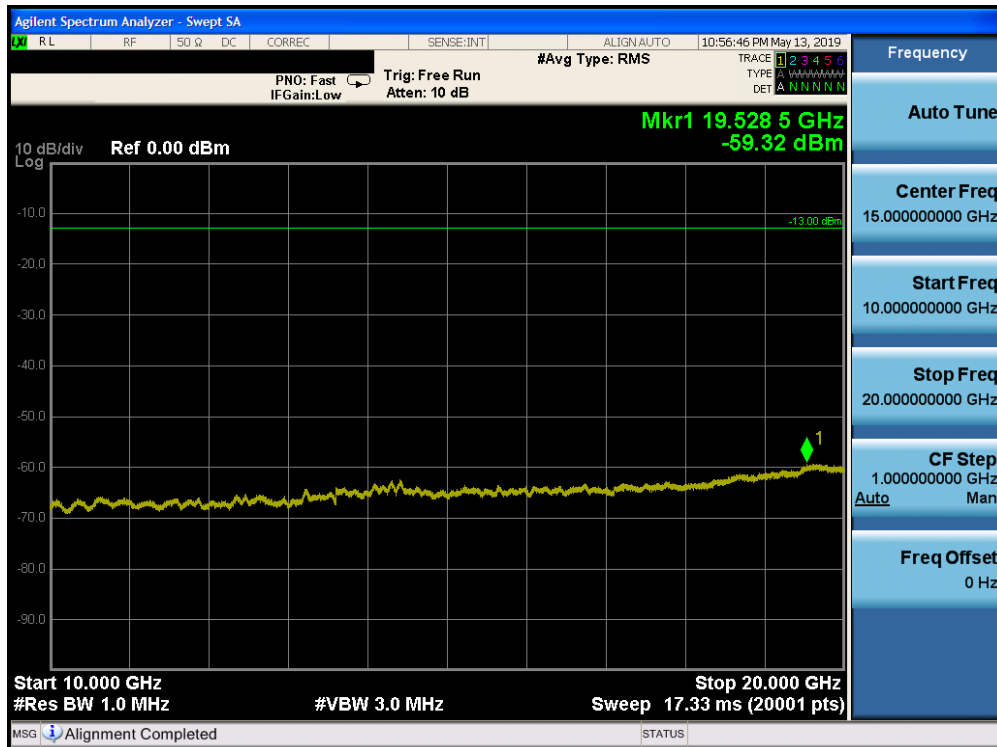


Plot 7-94. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-95. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

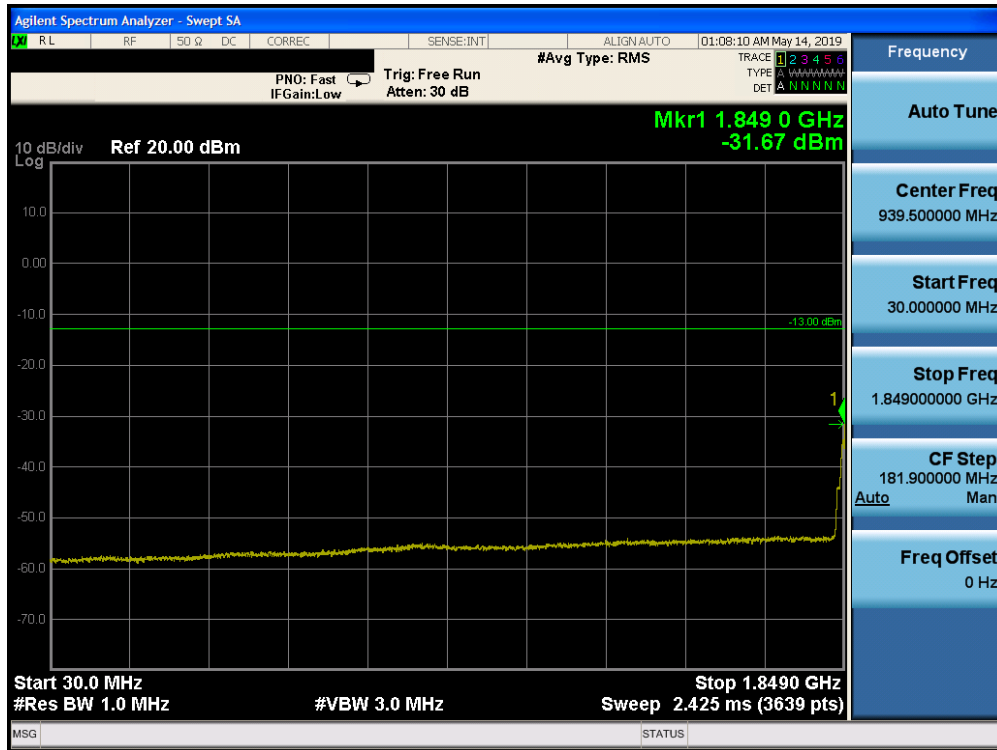
FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130008-03.BCG	Test Dates: 05/01/2019 - 08/01/2019	EUT Type: Watch	Page 72 of 238



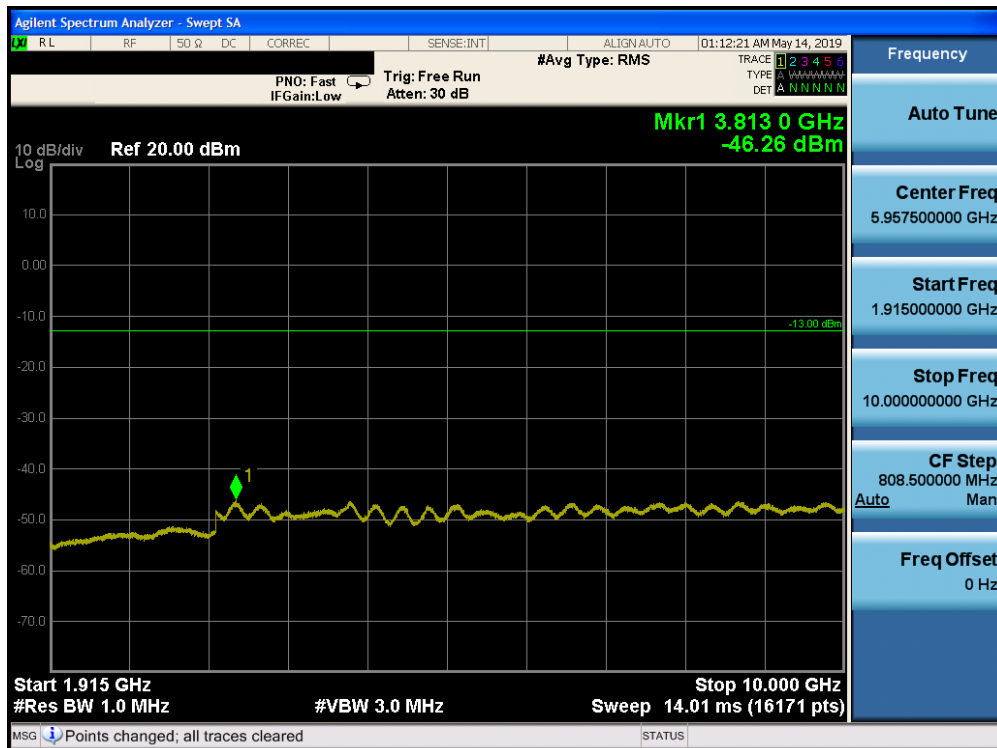
Plot 7-96. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 25/2

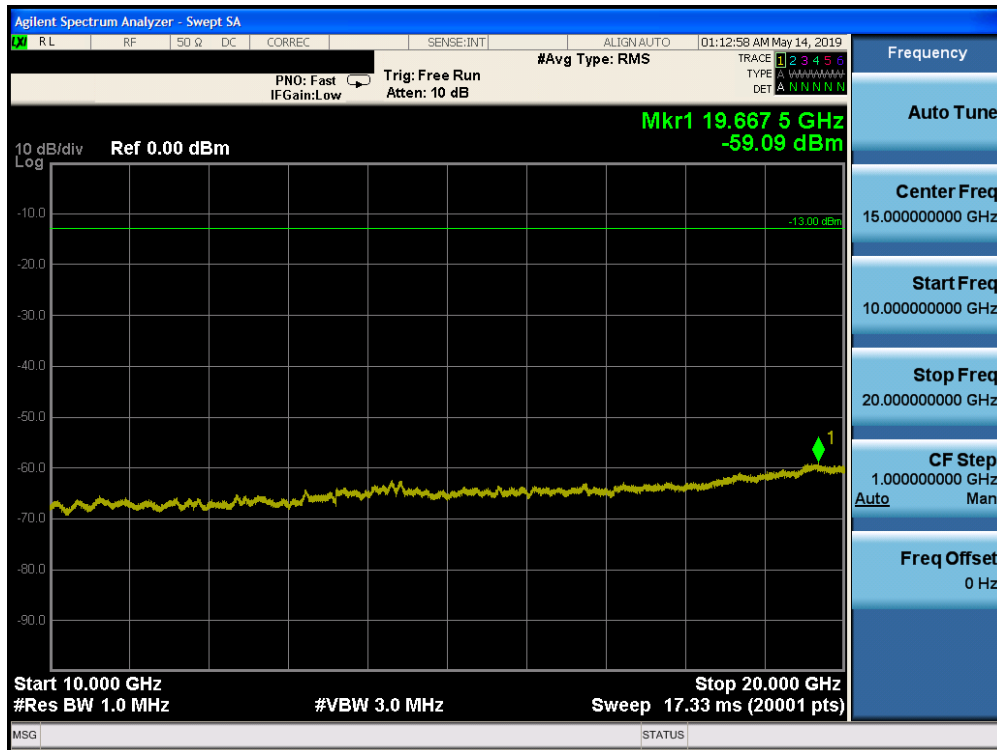


Plot 7-97. Conducted Spurious Plot (Band 25/2 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

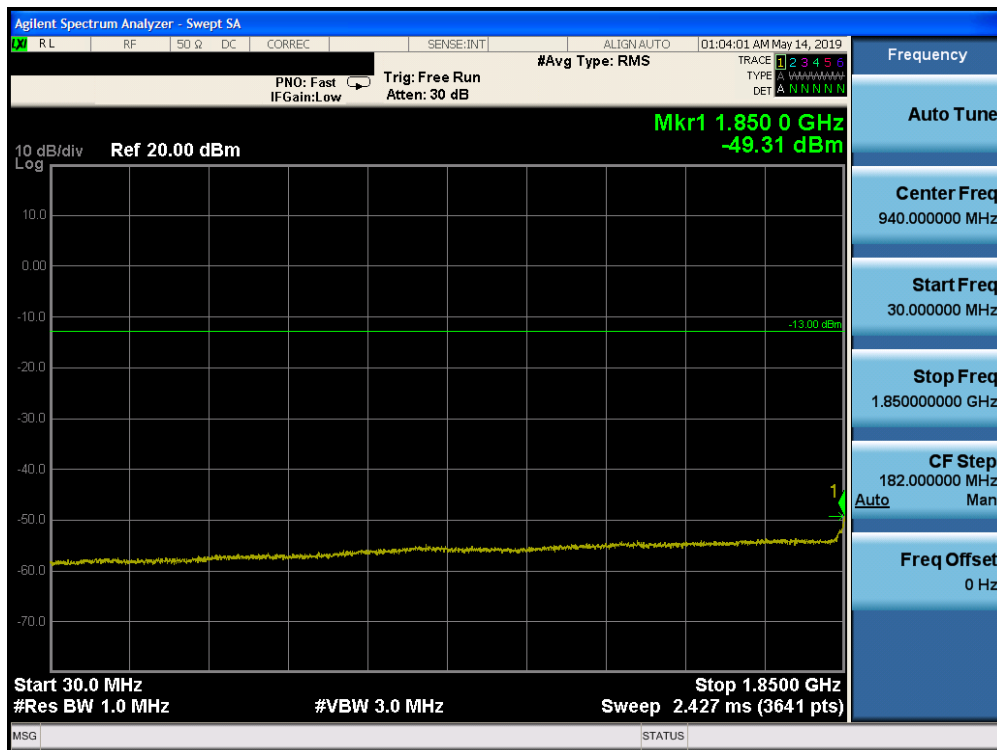


Plot 7-98. Conducted Spurious Plot (Band 25/2 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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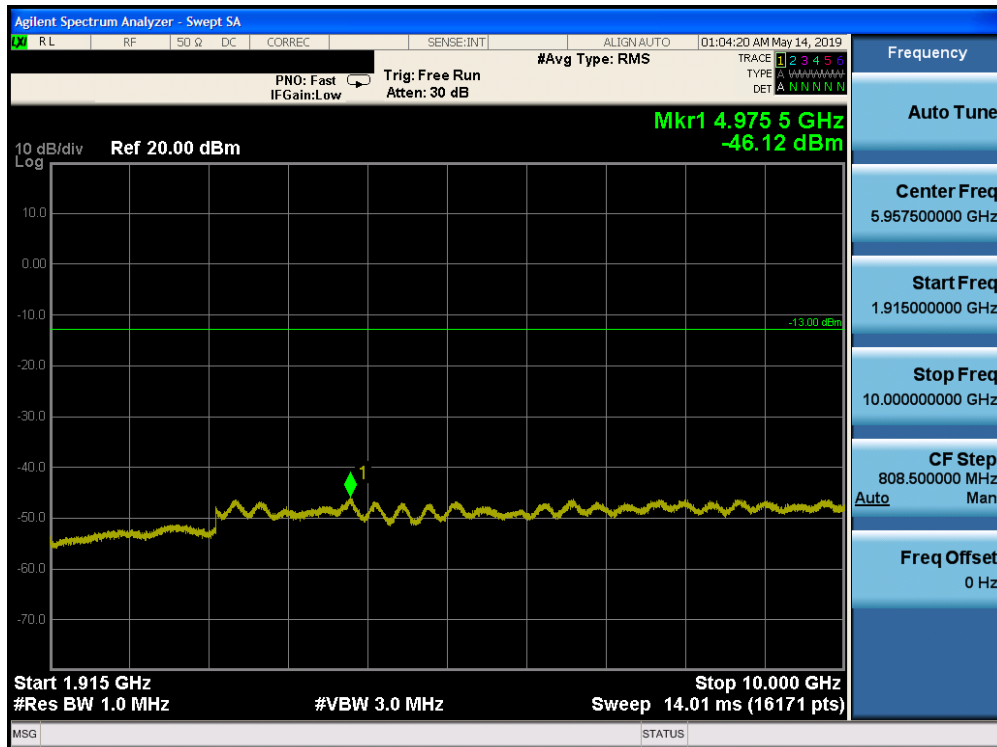


Plot 7-99. Conducted Spurious Plot (Band 25/2 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

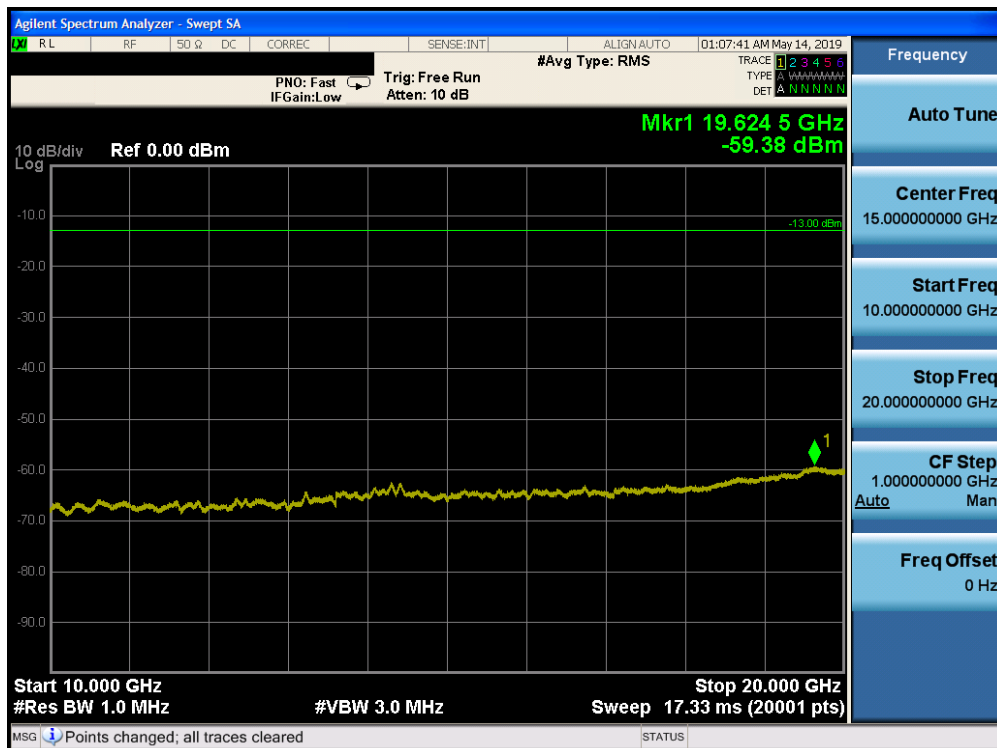


Plot 7-100. Conducted Spurious Plot (Band 25/2 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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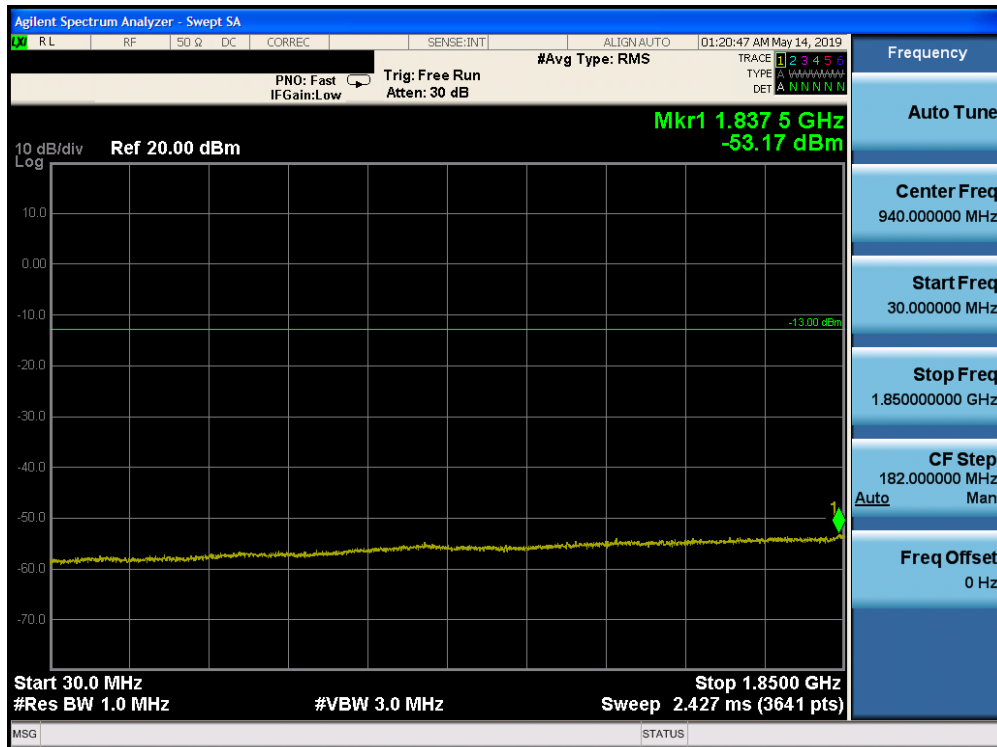


Plot 7-101. Conducted Spurious Plot (Band 25/2 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

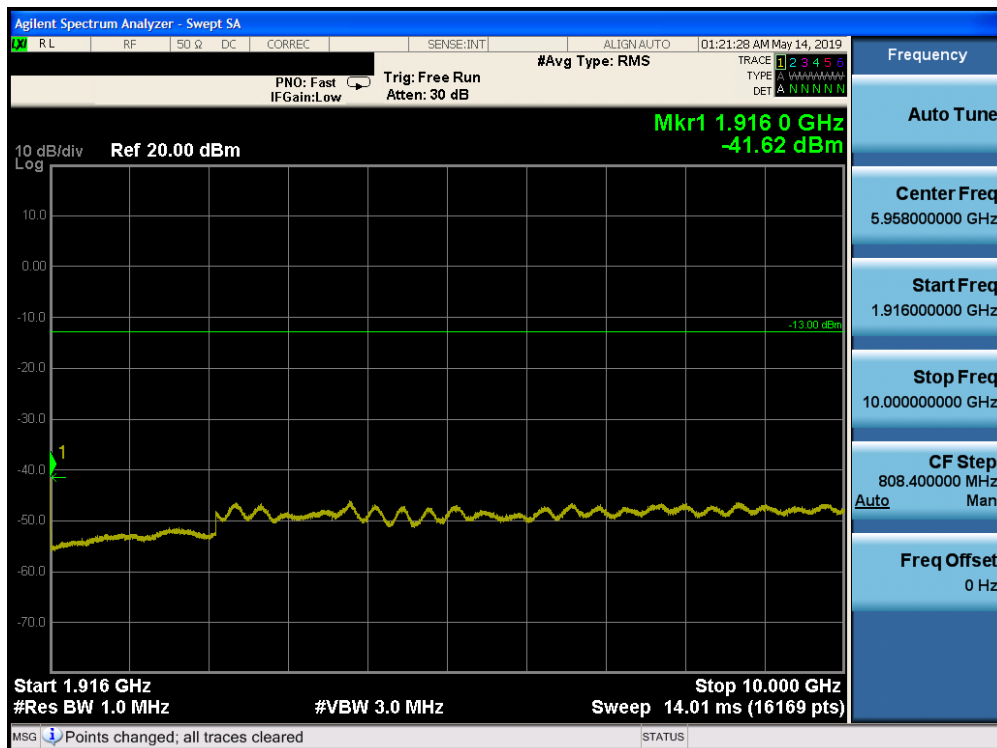


Plot 7-102. Conducted Spurious Plot (Band 25/2 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2094	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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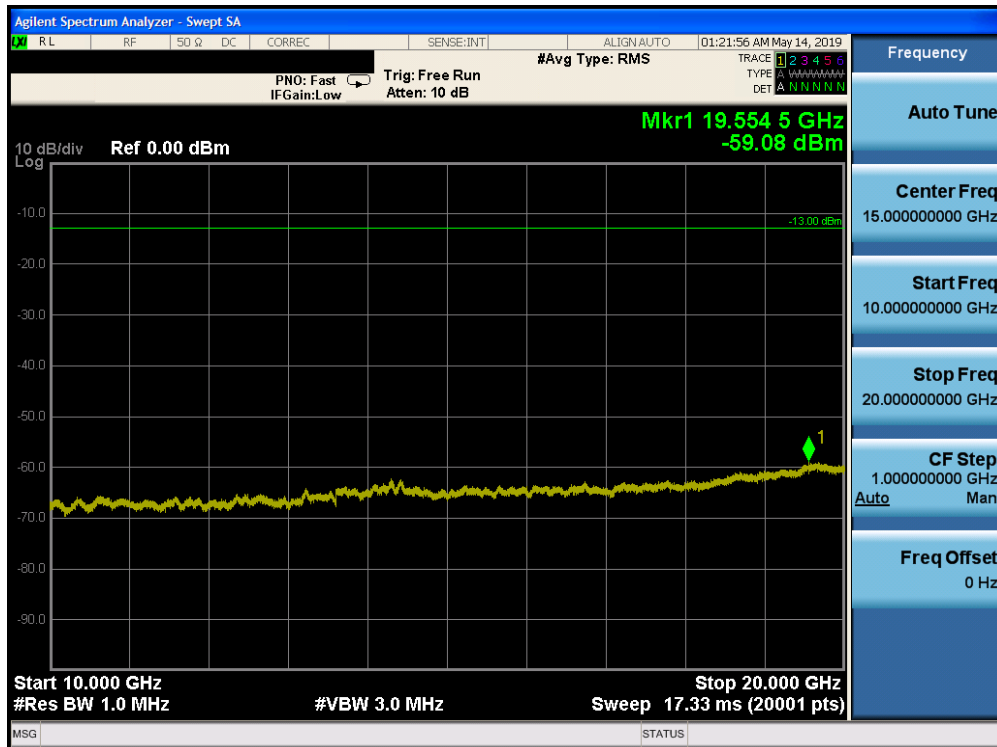


Plot 7-103. Conducted Spurious Plot (Band 25/2 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-104. Conducted Spurious Plot (Band 25/2 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

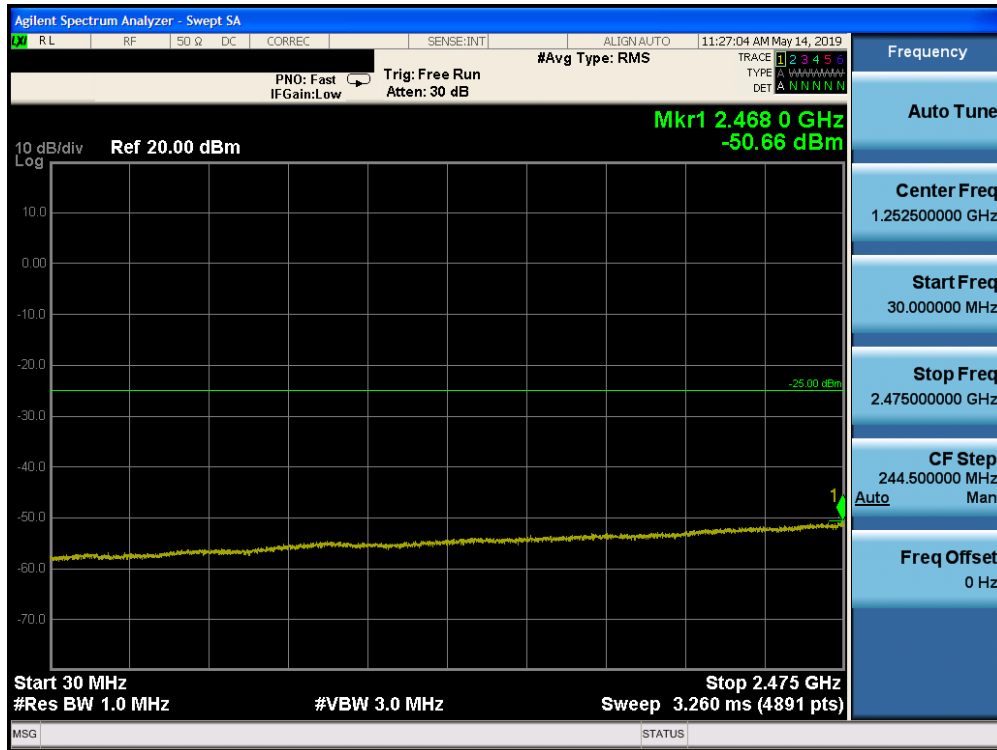
FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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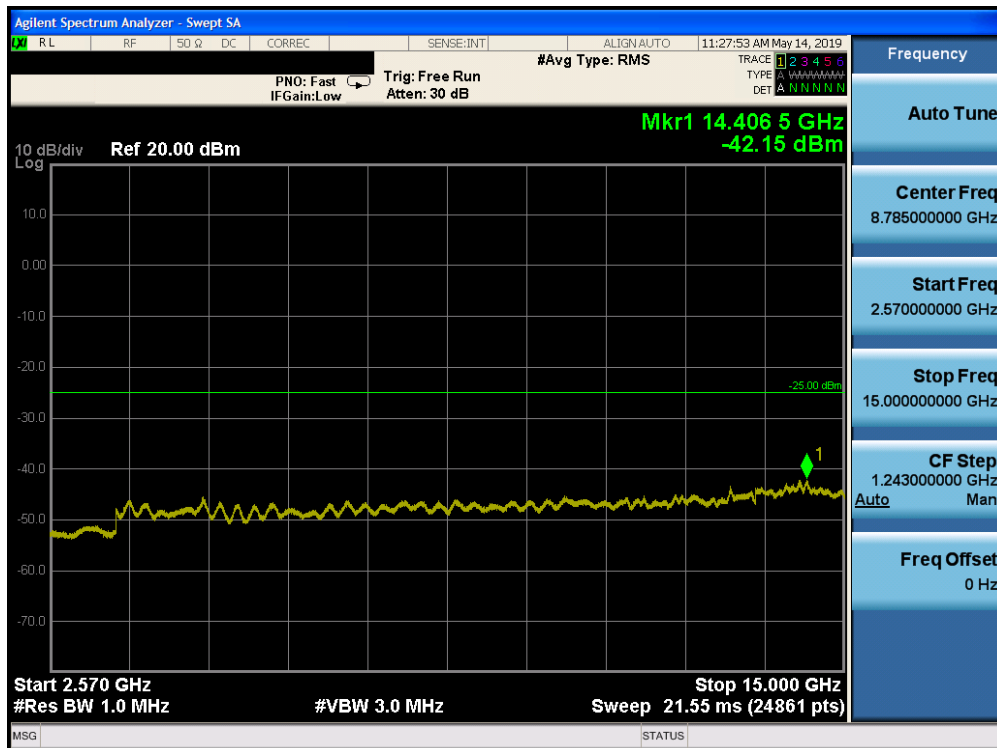
Plot 7-105. Conducted Spurious Plot (Band 25/2 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2094	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 7

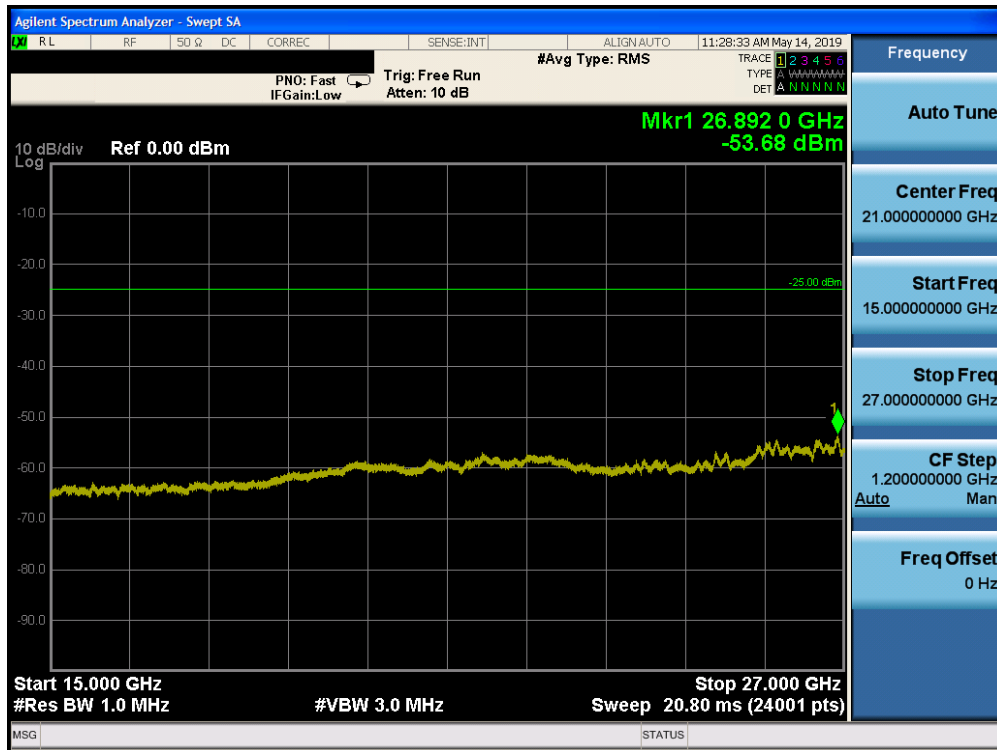


Plot 7-106. Conducted Spurious Plot (Band 7 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

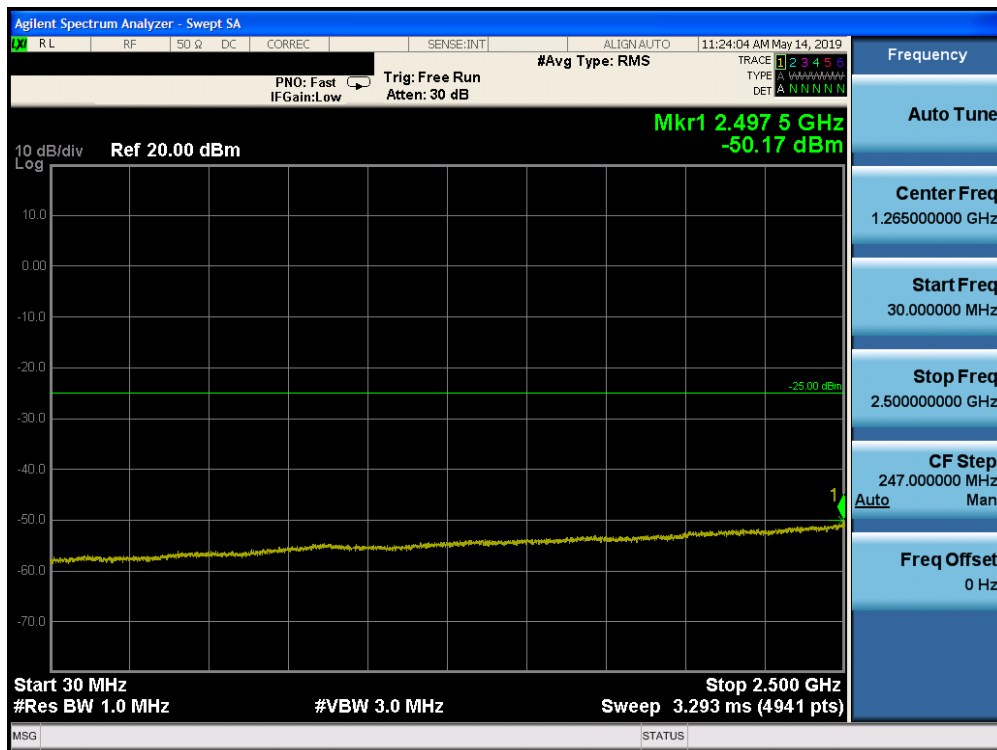


Plot 7-107. Conducted Spurious Plot (Band 7 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2094	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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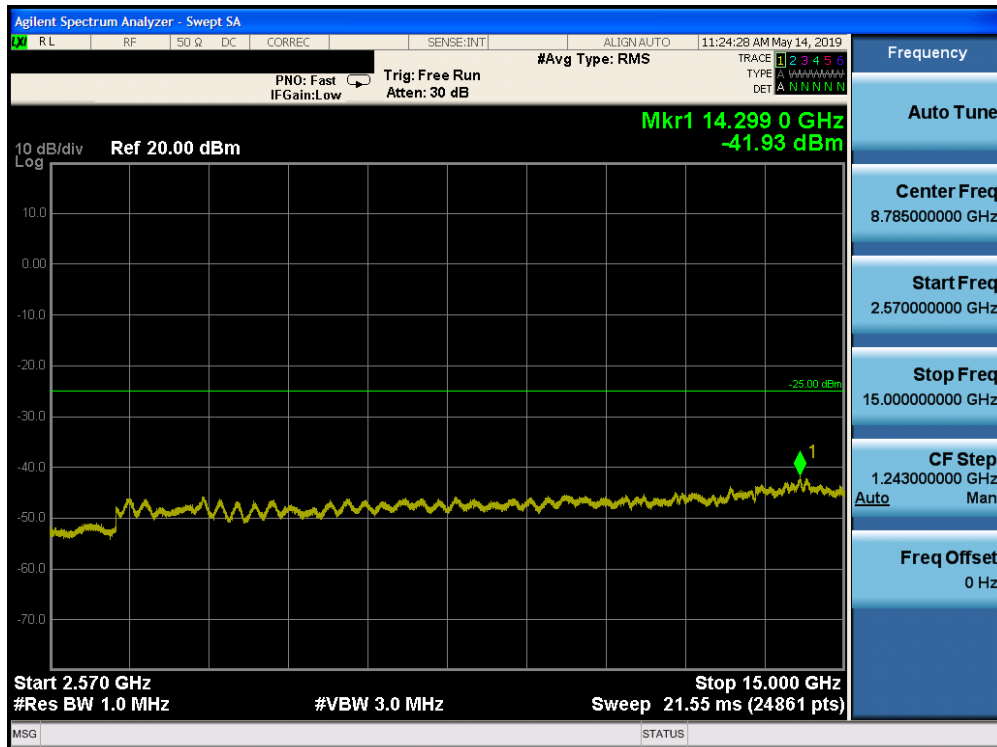


Plot 7-108. Conducted Spurious Plot (Band 7 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

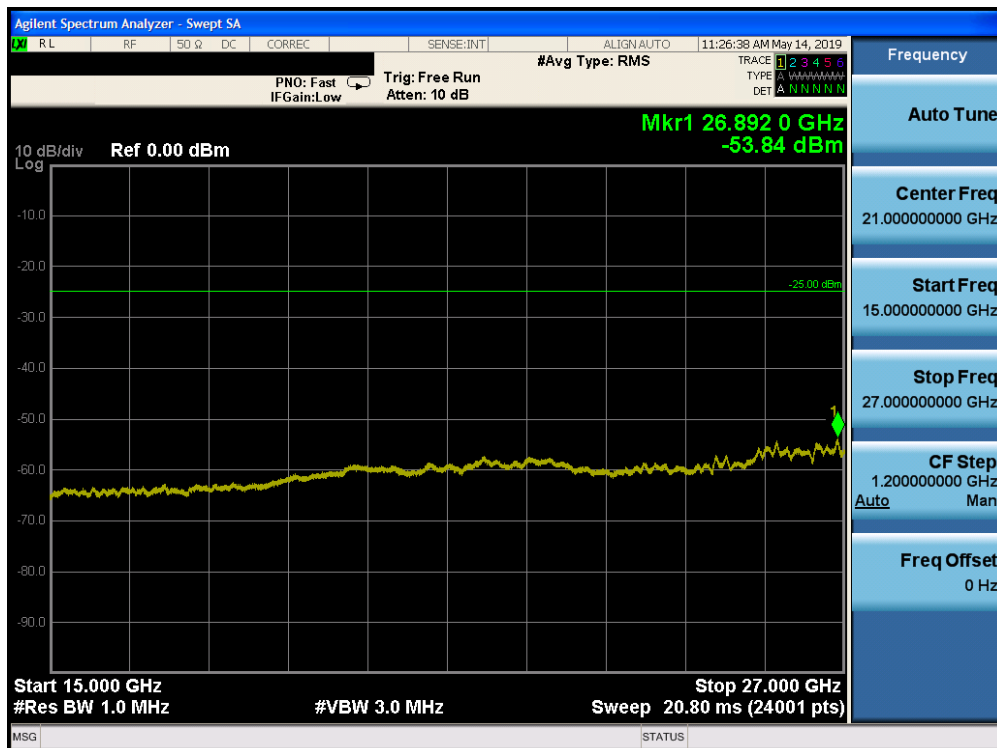


Plot 7-109. Conducted Spurious Plot (Band 7 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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Plot 7-110. Conducted Spurious Plot (Band 7 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-111. Conducted Spurious Plot (Band 7 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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