

MEASUREMENT REPORT

LTE

Applicant Name:

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

Date of Testing:

06/12/2020-08/20/2020

Test Site/Location:

PCTEST Lab. Morgan Hill, CA, USA

Test Report Serial No.:

1C2004270023-03.BCG

FCC ID:

BCG-A2353

APPLICANT:

Apple Inc.

Application Type:

Certification

Model:

A2353

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, 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.

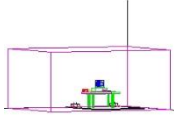

Randy Ortanez
President

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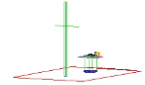
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FCC Part 22, 24, & 27



LTE	FCC Rule Part	Tx Frequency (MHz)	ERP		EIRP		Emission Designator	Modulation
			Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)		
Band 12	27	699.7 - 715.3	0.151	-8.21	0.248	-6.06	1M11G7W	QPSK
Band 12	27	699.7 - 715.3	0.138	-8.61	0.226	-6.46	1M11D7W	16QAM
Band 12	27	700.5 - 714.5	0.148	-8.30	0.243	-6.15	2M73G7W	QPSK
Band 12	27	700.5 - 714.5	0.132	-8.81	0.216	-6.66	2M72D7W	16QAM
Band 12	27	701.5 - 713.5	0.153	-8.15	0.251	-6.00	4M57G7W	QPSK
Band 12	27	701.5 - 713.5	0.129	-8.91	0.211	-6.76	4M56D7W	16QAM
Band 12	27	704 - 711	0.151	-8.22	0.247	-6.07	9M14G7W	QPSK
Band 12	27	704 - 711	0.130	-8.87	0.213	-6.72	5M45D7W	16QAM
Band 17	27	706.5 - 713.5	0.153	-8.15	0.251	-6.00	4M57G7W	QPSK
Band 17	27	706.5 - 713.5	0.133	-8.77	0.218	-6.62	4M56D7W	16QAM
Band 17	27	709 - 711	0.153	-8.15	0.251	-6.00	9M14G7W	QPSK
Band 17	27	709 - 711	0.135	-8.70	0.221	-6.55	5M45D7W	16QAM
Band 13	27	779.5 - 784.5	0.221	-6.55	0.363	-4.40	4M59G7W	QPSK
Band 13	27	779.5 - 784.5	0.190	-7.21	0.312	-5.06	4M56D7W	16QAM
Band 13	27	782	0.216	-6.66	0.354	-4.51	9M12G7W	QPSK
Band 13	27	782	0.194	-7.13	0.318	-4.98	5M76D7W	16QAM
Band 5	22H	824.7 - 848.3	0.219	-6.59	0.360	-4.44	1M11G7W	QPSK
Band 5	22H	824.7 - 848.3	0.192	-7.17	0.315	-5.02	1M11D7W	16QAM
Band 5	22H	825.5 - 847.5	0.216	-6.66	0.354	-4.51	2M73G7W	QPSK
Band 5	22H	825.5 - 847.5	0.195	-7.10	0.320	-4.95	2M72D7W	16QAM
Band 5	22H	826.5 - 846.5	0.225	-6.48	0.369	-4.33	4M58G7W	QPSK
Band 5	22H	826.5 - 846.5	0.196	-7.07	0.322	-4.92	4M56D7W	16QAM
Band 5	22H	829 - 844	0.219	-6.59	0.360	-4.44	9M11G7W	QPSK
Band 5	22H	829 - 844	0.200	-6.99	0.328	-4.84	5M37D7W	16QAM
Band 26	22H	824.7 - 848.3	0.226	-6.45	0.372	-4.30	1M11G7W	QPSK
Band 26	22H	824.7 - 848.3	0.197	-7.06	0.323	-4.91	1M11D7W	16QAM
Band 26	22H	825.5 - 847.5	0.226	-6.45	0.372	-4.30	2M73G7W	QPSK
Band 26	22H	825.5 - 847.5	0.200	-6.99	0.328	-4.84	2M72D7W	16QAM
Band 26	22H	826.5 - 846.5	0.226	-6.45	0.372	-4.30	4M58G7W	QPSK
Band 26	22H	826.5 - 846.5	0.196	-7.08	0.321	-4.93	4M56D7W	16QAM
Band 26	22H	829 - 844	0.226	-6.45	0.372	-4.30	9M11G7W	QPSK
Band 26	22H	829 - 844	0.205	-6.89	0.336	-4.74	5M37D7W	16QAM

EUT Overview (Low Bands)

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LTE	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (mW)	Max. Power (dBm)		
Band 4	27	1710.7 - 1754.3	21.135	13.25	1M11G7W	QPSK
Band 4	27	1710.7 - 1754.3	19.275	12.85	1M11D7W	16QAM
Band 4	27	1711.5 - 1753.5	21.135	13.25	2M73G7W	QPSK
Band 4	27	1711.5 - 1753.5	19.861	12.98	2M74D7W	16QAM
Band 4	27	1712.5 - 1752.5	21.380	13.30	4M58G7W	QPSK
Band 4	27	1712.5 - 1752.5	19.588	12.92	4M56D7W	16QAM
Band 4	27	1715 - 1750	20.893	13.20	9M13G7W	QPSK
Band 4	27	1715 - 1750	19.454	12.89	5M50D7W	16QAM
Band 4	27	1717.5 - 1747.5	21.380	13.30	13M7G7W	QPSK
Band 4	27	1717.5 - 1747.5	19.498	12.90	6M26D7W	16QAM
Band 4	27	1720 - 1745	21.281	13.28	18M3G7W	QPSK
Band 4	27	1720 - 1745	19.364	12.87	8M01D7W	16QAM
Band 66	27	1710.7 - 1779.3	21.330	13.29	1M11G7W	QPSK
Band 66	27	1710.7 - 1779.3	18.880	12.76	1M11D7W	16QAM
Band 66	27	1711.5 - 1778.5	21.038	13.23	2M73G7W	QPSK
Band 66	27	1711.5 - 1778.5	18.750	12.73	2M74D7W	16QAM
Band 66	27	1712.5 - 1777.5	21.380	13.30	4M58G7W	QPSK
Band 66	27	1712.5 - 1777.5	19.588	12.92	4M56D7W	16QAM
Band 66	27	1715 - 1775	20.941	13.21	9M13G7W	QPSK
Band 66	27	1715 - 1775	19.011	12.79	5M50D7W	16QAM
Band 66	27	1717.5 - 1772.5	21.380	13.30	13M7G7W	QPSK
Band 66	27	1717.5 - 1772.5	18.323	12.63	6M26D7W	16QAM
Band 66	27	1720 - 1770	21.380	13.30	18M3G7W	QPSK
Band 66	27	1720 - 1770	18.793	12.74	8M01D7W	16QAM
Band 2	24E	1850.7 - 1909.3	25.704	14.10	1M11G7W	QPSK
Band 2	24E	1850.7 - 1909.3	23.014	13.62	1M11D7W	16QAM
Band 2	24E	1851.5 - 1908.5	25.704	14.10	2M73G7W	QPSK
Band 2	24E	1851.5 - 1908.5	22.909	13.60	2M74D7W	16QAM
Band 2	24E	1852.5 - 1907.5	25.704	14.10	4M59G7W	QPSK
Band 2	24E	1852.5 - 1907.5	21.979	13.42	4M56D7W	16QAM
Band 2	24E	1855 - 1905	25.704	14.10	9M16G7W	QPSK
Band 2	24E	1855 - 1905	23.281	13.67	5M48D7W	16QAM
Band 2	24E	1857.5 - 1902.5	25.704	14.10	13M7G7W	QPSK
Band 2	24E	1857.5 - 1902.5	23.442	13.70	6M20D7W	16QAM
Band 2	24E	1860 - 1900	25.704	14.10	18M4G7W	QPSK
Band 2	24E	1860 - 1900	22.594	13.54	7M52D7W	16QAM
Band 25	24E	1850.7 - 1914.3	25.704	14.10	1M11G7W	QPSK
Band 25	24E	1850.7 - 1914.3	22.646	13.55	1M11D7W	16QAM
Band 25	24E	1851.5 - 1913.5	25.704	14.10	2M73G7W	QPSK
Band 25	24E	1851.5 - 1913.5	22.856	13.59	2M74D7W	16QAM
Band 25	24E	1852.5 - 1912.5	25.704	14.10	4M59G7W	QPSK
Band 25	24E	1852.5 - 1912.5	22.233	13.47	4M56D7W	16QAM
Band 25	24E	1855 - 1910	25.704	14.10	9M16G7W	QPSK
Band 25	24E	1855 - 1910	23.014	13.62	5M48D7W	16QAM
Band 25	24E	1857.5 - 1907.5	25.704	14.10	13M7G7W	QPSK
Band 25	24E	1857.5 - 1907.5	22.029	13.43	6M20D7W	16QAM
Band 25	24E	1860 - 1905	25.704	14.10	18M4G7W	QPSK
Band 25	24E	1860 - 1905	22.336	13.49	7M52D7W	16QAM

EUT Overview (Mid Bands)

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LTE	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (mW)	Max. Power (dBm)		
Band 7	27	2502.5 - 2567.5	45.709	16.60	4M59G7W	QPSK
Band 7	27	2502.5 - 2567.5	40.738	16.10	4M57D7W	16QAM
Band 7	27	2505 - 2565	44.668	16.50	9M16G7W	QPSK
Band 7	27	2505 - 2565	38.905	15.90	5M46D7W	16QAM
Band 7	27	2507.5 - 2562.5	45.709	16.60	13M7G7W	QPSK
Band 7	27	2507.5 - 2562.5	38.637	15.87	6M12D7W	16QAM
Band 7	27	2510 - 2560	45.709	16.60	18M3G7W	QPSK
Band 7	27	2510 - 2560	38.994	15.91	7M08D7W	16QAM
Band 41	27	2498.5 - 2687.5	45.709	16.60	4M53G7W	QPSK
Band 41	27	2498.5 - 2687.5	36.224	15.59	4M56D7W	16QAM
Band 41	27	2501 - 2685	45.709	16.60	9M13G7W	QPSK
Band 41	27	2501 - 2685	37.757	15.77	5M47D7W	16QAM
Band 41	27	2503.5 - 2682.5	45.709	16.60	13M7G7W	QPSK
Band 41	27	2503.5 - 2682.5	36.058	15.57	6M16D7W	16QAM
Band 41	27	2506 - 2680	44.566	16.49	18M2G7W	QPSK
Band 41	27	2506 - 2680	37.068	15.69	7M47D7W	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 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 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-A2353**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

Test Device Serial No.: DVPCR023Q7TM, DVPCR00VQ7TM

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 and the portion of Band 26 subject to Part 22.

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 operations, which allows for multiple transmitters to transmit simultaneously on the same antenna. The table below shows all configurations possible.

Simultaneous Tx Config	Antenna FCM		
	WLAN	Bluetooth	LTE/WCDMA
	802.11 b/g/n	BDR, EDR, HDR4/8, LE	Mid band/ High band
Config 1	✗	✓	✓
Config 2	✓	✗	✓

Table 2-1. Simultaneous Transmission Configuration

✓ = Support ; ✗ = NOT Support

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2.3 Antenna Description

Following antennas were used for the testing.

Frequency [MHz]	Antenna Gain (dBi)	
	BCM	FCM
698-716	-31.0	N/A
777-787	-29.4	N/A
814-849	-29.3	N/A
1710-1785	N/A	-10.7
1850-1915	N/A	-9.9
2496-2690	N/A	-6.9

Table 2-2. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple MacBook	Model:	A1398	S/N:	C2QKP008F6F3
	w/AC/DC Adapter	Model:	A1435	S/N:	N/A
2	Apple USB Cable	Model:	Kanzi	S/N:	32530F
	w/ Charging Dock	Model:	FAPS73	S/N:	17481001320
	w/ Dock	Model:	X241	S/N:	CVY751400J
3	USB Lightning Cable	Model:	N/A	S/N:	N/A
	w/ AC Adapter	Model:	A1385	S/N:	N/A
4	Wireless Charging Pad (WCP)	Model:	EVT	S/N:	DLC9223004YLNWL43
	Wireless Charging Pad (WCP)	Model:	EVT	S/N:	DLC92230061LNWK4V
5	X1456 Test Pathfinder Sinsa Board	Model:	920-06235-01	S/N:	N/A
	SiP Cradle	Model:	P1 X1819S	S/N:	N/A
6	DC Power Supply	Model:	KPS3010D	S/N:	N/A

Table 2-3. Test Support Equipment List

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2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015, 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 various types of wristbands, metal and non-metal wristbands. 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 and the worst case channel.

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.

All possible simultaneous transmission configurations have been investigated and the worst case config has been reported.

Description	Bluetooth	LTE (Band 41)
Antenna	FCM	FCM
Channel	39	39750
Operating Frequency (MHz)	2441	2506
Mode/Modulation	GFSK ePA	QPSK/1RB/20MHz

Table 2-4. Worst Case Simultaneous Transmission Configuration

2.6 Software and Firmware

The test was conducted with firmware version wOS 7.0 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 C63.26-2015/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 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 C63.26-2015/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 $55 + 10\log_{10}(\text{Power [Watts]})$.

Per KDB 414788 D01 v01r01, radiated emission test sites other than open-field test sites (e.g., shielded anechoic chambers), may be employed for emission measurements below 30MHz if characterized so that the measurements correspond to those obtained at an open-field test site. To determine test site equivalency, a reference sample transmitting at 149kHz was measured on an open field test site (asphalt with no ground plane) and then measured in the 3m semi-anechoic chamber. A calibrated 60cm loop antenna was used while the reference device was rotated through the X, Y and Z axis in order to capture the worst case level. A maximum deviation of 2.77dB at 149kHz was measured when comparing the 3 meter semi-anechoic chamber to the open field site.

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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	1.30
Radiated Disturbance (<1GHz)	4.15
Radiated Disturbance (>1GHz)	4.59
Radiated Disturbance (>18GHz)	4.96

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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	3/4/2020	Annual	3/4/2021	MY49430244
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	10/29/2019	Annual	10/29/2020	T058701-02
ESPEC	SU-241	Tabletop Temperature Chamber	9/3/2019	Annual	9/3/2020	92009574
ETS-Lindgren	3142E-PA	Pre-Amplifier (30MHz - 6GHz)	9/19/2019	Annual	9/19/2020	213236
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	1/6/2020	Annual	1/6/2021	224569
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	4/21/2020	Annual	4/21/2021	205956
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/2/2020	Annual	3/2/2021	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	6/1/2020	Annual	6/1/2021	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	9/13/2019	Annual	9/13/2020	101570
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/16/2019	Annual	11/16/2020	164715
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	4/16/2020	Annual	4/16/2021	166869
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	9/19/2019	Annual	9/19/2020	100051
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	11/14/2019	Annual	11/14/2020	101057
Rohde & Schwarz	HFH2-Z2	Loop Antenna	3/12/2020	Annual	3/12/2021	100546

Table 5-1. Test Equipment List

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-A2353
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
27.53(a)	Out of Band Emissions	Undesirable emissions must meet the limits detailed in 27.53(a)			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			Refer to RF Exposure Report
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

FCC ID: BCG-A2353	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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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	CONDUCTED	PASS	Section 7.6
27.50(b)(10) 27.50(c)(10)	Effective Radiated Power / Equivalent Isotropic Radiated Power (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	RADIATED		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 5.3.

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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.

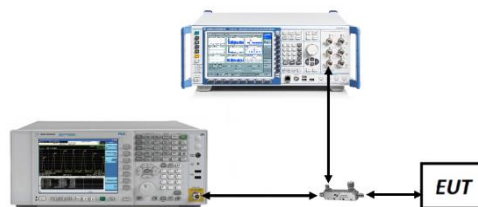


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. This device only supports 27RBs or less for 16-QAM uplink.
2. All RB sizes have been investigated and Full RB configuration was found and reported as worst case.

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LTE	BW (MHz)	Modulation	Occupied BW [kHz]
Band 12	1.4	QPSK	1106.7
Band 12	1.4	16QAM	1110.9
Band 12	3	QPSK	2726.5
Band 12	3	16QAM	2724.0
Band 12	5	QPSK	4574.9
Band 12	5	16QAM	4562.2
Band 12	10	QPSK	9135.9
Band 12	10	16QAM	5454.4
Band 17	5	QPSK	4574.9
Band 17	5	16QAM	4562.2
Band 17	10	QPSK	9135.9
Band 17	10	16QAM	5454.4
Band 13	5	QPSK	4585.6
Band 13	5	16QAM	4556.8
Band 13	10	QPSK	9118.5
Band 13	10	16QAM	5760.7
Band 5	1.4	QPSK	1105.0
Band 5	1.4	16QAM	1108.5
Band 5	3	QPSK	2733.6
Band 5	3	16QAM	2721.1
Band 5	5	QPSK	4578.3
Band 5	5	16QAM	4555.3
Band 5	10	QPSK	9114.3
Band 5	10	16QAM	5372.7
Band 26	1.4	QPSK	1105.0
Band 26	1.4	16QAM	1108.5
Band 26	3	QPSK	2733.6
Band 26	3	16QAM	2721.1
Band 26	5	QPSK	4578.3
Band 26	5	16QAM	4555.3
Band 26	10	QPSK	9114.3
Band 26	10	16QAM	5372.7

Table 7-3. Occupied Bandwidth Results (Low Bands)

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LTE	BW (MHz)	Modulation	Occupied BW [kHz]
Band 4	1.4	QPSK	1108.0
Band 4	1.4	16QAM	1108.8
Band 4	3	QPSK	2732.9
Band 4	3	16QAM	2736.6
Band 4	5	QPSK	4582.0
Band 4	5	16QAM	4564.8
Band 4	10	QPSK	9127.8
Band 4	10	16QAM	5495.8
Band 4	15	QPSK	13734.5
Band 4	15	16QAM	6258.9
Band 4	20	QPSK	18337.1
Band 4	20	16QAM	8005.9
Band 66	1.4	QPSK	1108.0
Band 66	1.4	16QAM	1108.8
Band 66	3	QPSK	2732.9
Band 66	3	16QAM	2736.6
Band 66	5	QPSK	4582.0
Band 66	5	16QAM	4564.8
Band 66	10	QPSK	9127.8
Band 66	10	16QAM	5495.8
Band 66	15	QPSK	13734.5
Band 66	15	16QAM	6258.9
Band 66	20	QPSK	18337.1
Band 66	20	16QAM	8005.9
Band 2	1.4	QPSK	1105.2
Band 2	1.4	16QAM	1107.4
Band 2	3	QPSK	2726.5
Band 2	3	16QAM	2736.6
Band 2	5	QPSK	4589.0
Band 2	5	16QAM	4556.7
Band 2	10	QPSK	9163.3
Band 2	10	16QAM	5477.5
Band 2	15	QPSK	13718.4
Band 2	15	16QAM	6199.7
Band 2	20	QPSK	18372.2
Band 2	20	16QAM	7517.8
Band 25	1.4	QPSK	1105.2
Band 25	1.4	16QAM	1107.4
Band 25	3	QPSK	2726.5
Band 25	3	16QAM	2736.6
Band 25	5	QPSK	4589.0
Band 25	5	16QAM	4556.7
Band 25	10	QPSK	9163.3
Band 25	10	16QAM	5477.5
Band 25	15	QPSK	13718.4
Band 25	15	16QAM	6199.7
Band 25	20	QPSK	18372.2
Band 25	20	16QAM	7517.8

Table 7-4. Occupied Bandwidth Results (Mid Bands)

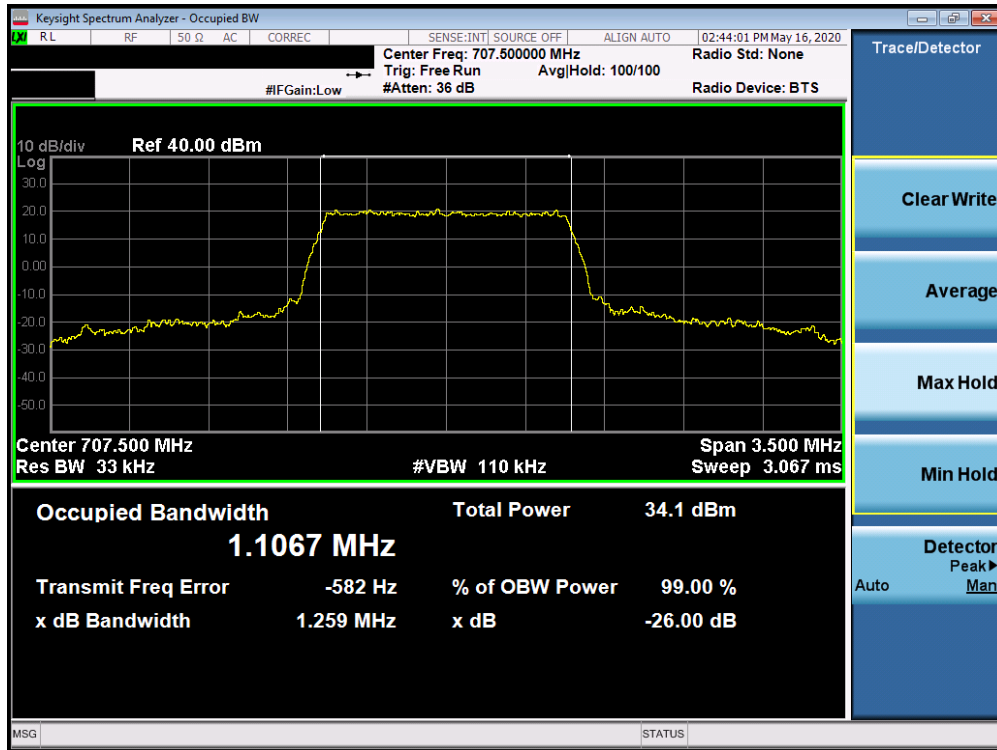
FCC ID: BCG-A2353	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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LTE	BW (MHz)	Modulation	Occupied BW [kHz]
Band 7	5	QPSK	4587.8
Band 7	5	16QAM	4570.1
Band 7	10	QPSK	9159.1
Band 7	10	16QAM	5461.0
Band 7	15	QPSK	13714.4
Band 7	15	16QAM	6120.2
Band 7	20	QPSK	18263.2
Band 7	20	16QAM	7084.4
Band 41	5	QPSK	4533.8
Band 41	5	16QAM	4564.9
Band 41	10	QPSK	9133.0
Band 41	10	16QAM	5473.9
Band 41	15	QPSK	13652.8
Band 41	15	16QAM	6160.2
Band 41	20	QPSK	18238.0
Band 41	20	16QAM	7469.4

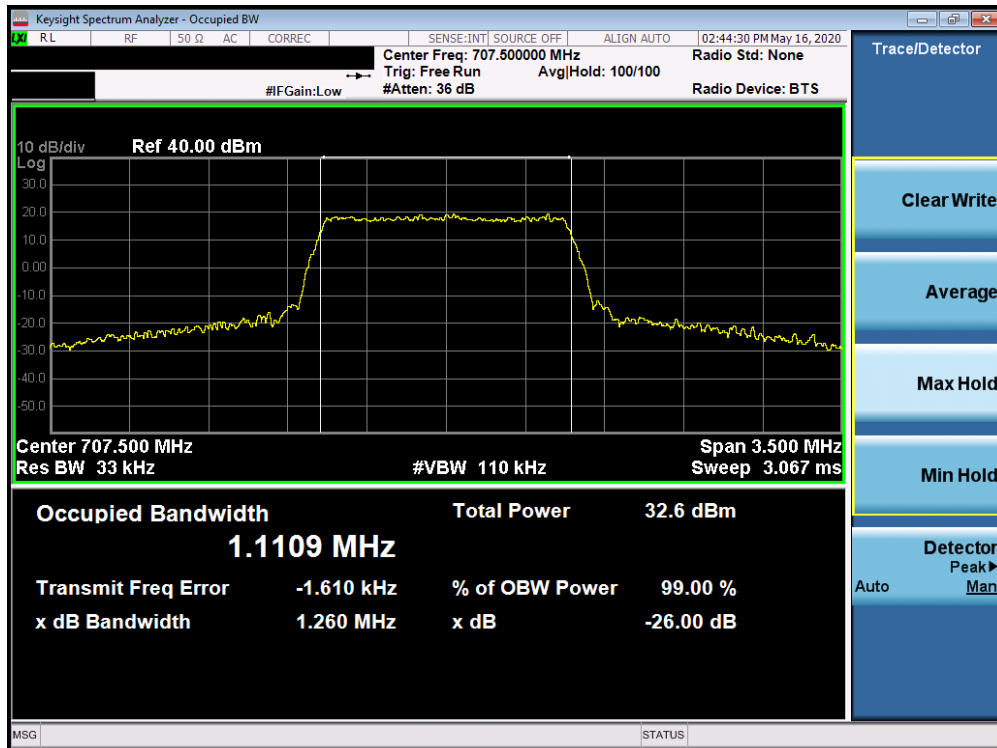
Table 7-5. Occupied Bandwidth Results (High Bands)

FCC ID: BCG-A2353	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Band 12/17

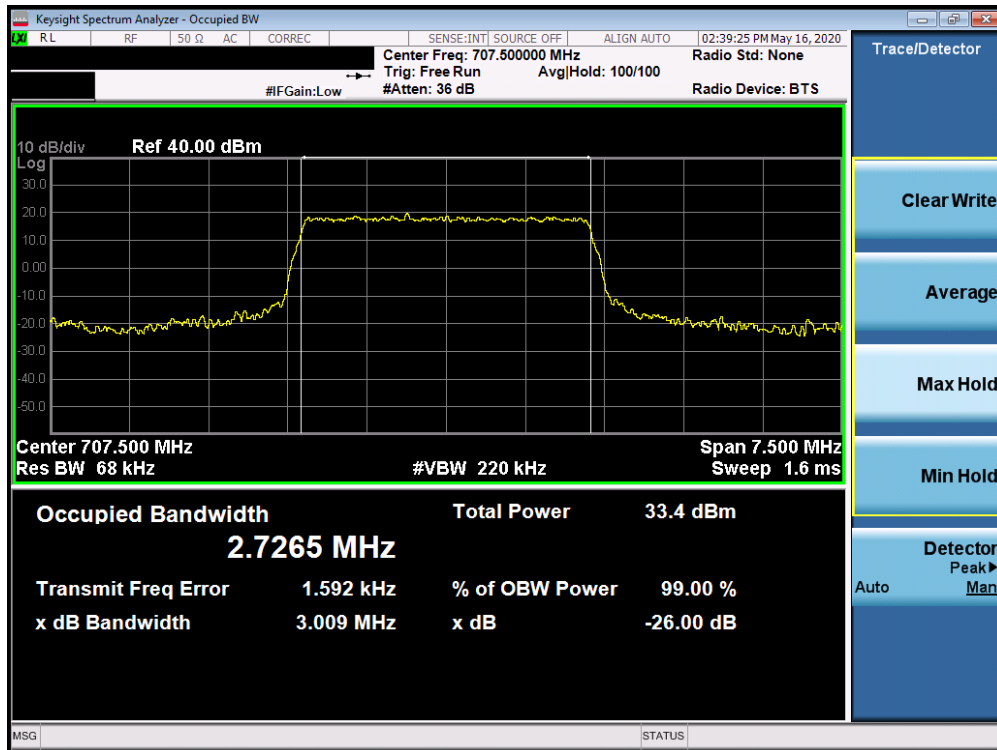


Plot 7-1. Occupied Bandwidth Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)

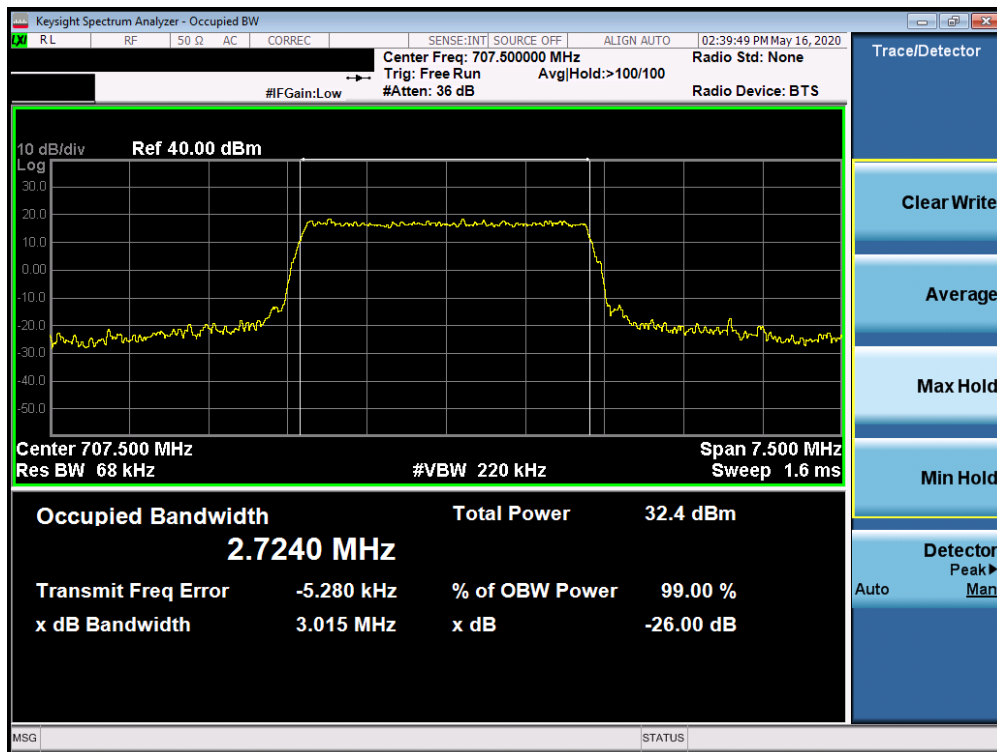


Plot 7-2. Occupied Bandwidth Plot (Band 12 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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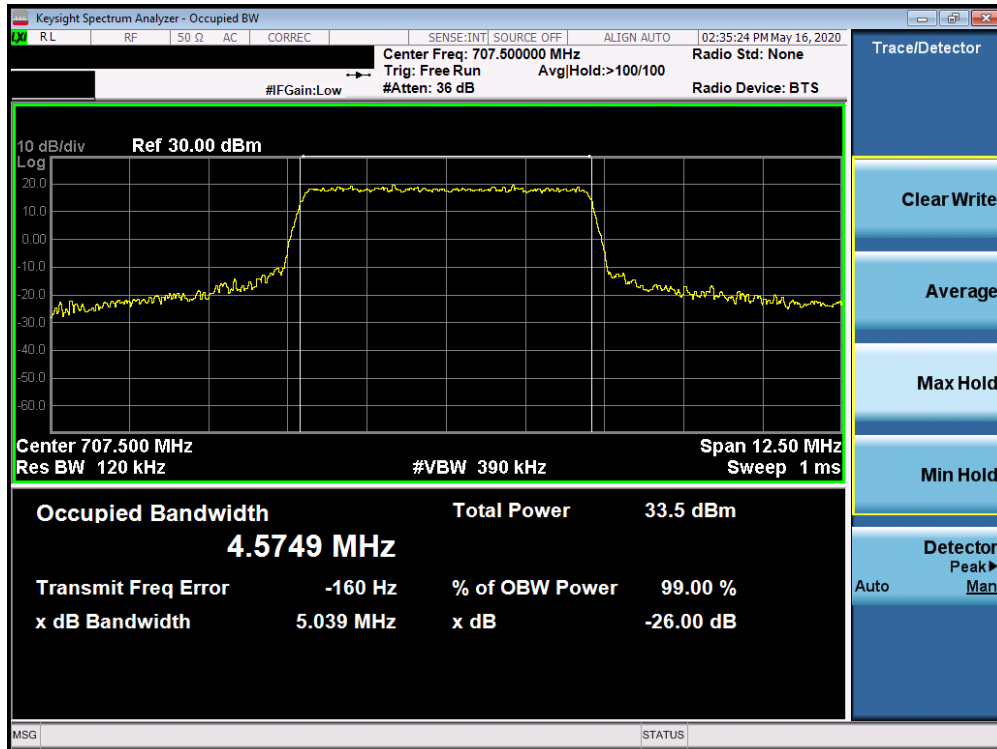


Plot 7-3. Occupied Bandwidth Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)

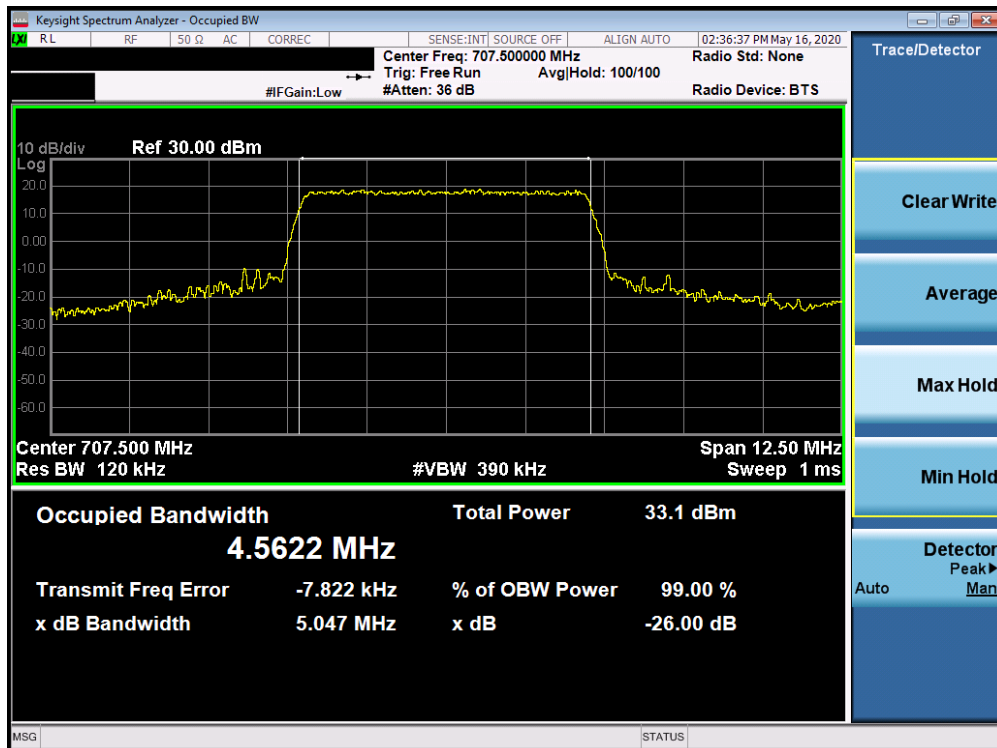


Plot 7-4. Occupied Bandwidth Plot (Band 12 - 3.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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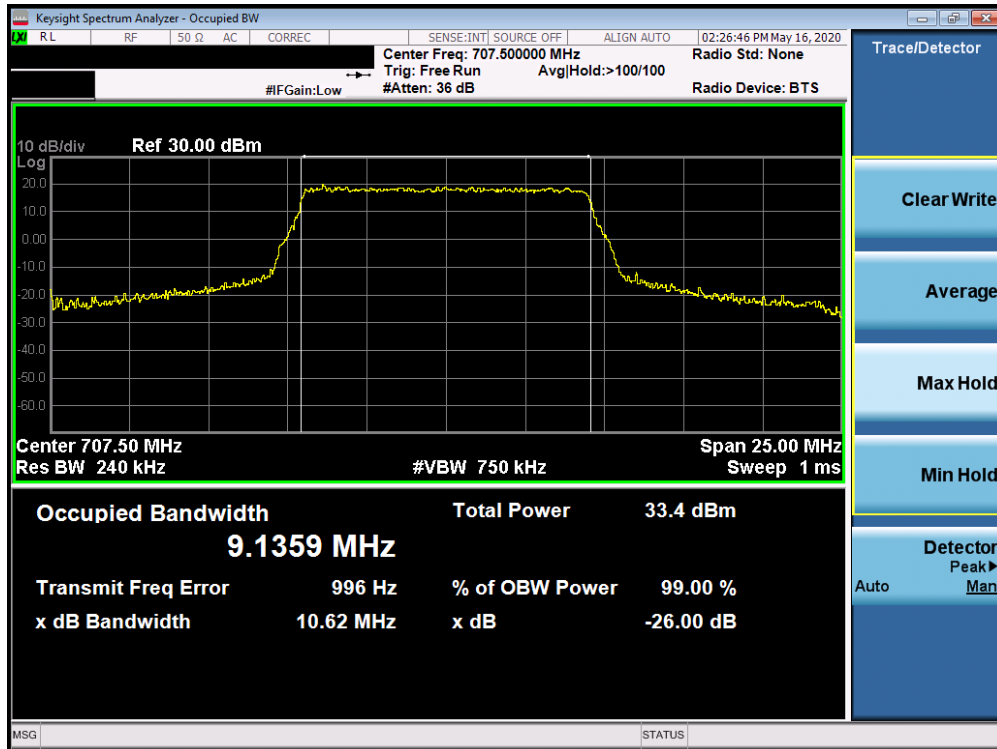


Plot 7-5. Occupied Bandwidth Plot (Band 12/17 - 5.0MHz QPSK - Full RB Configuration)

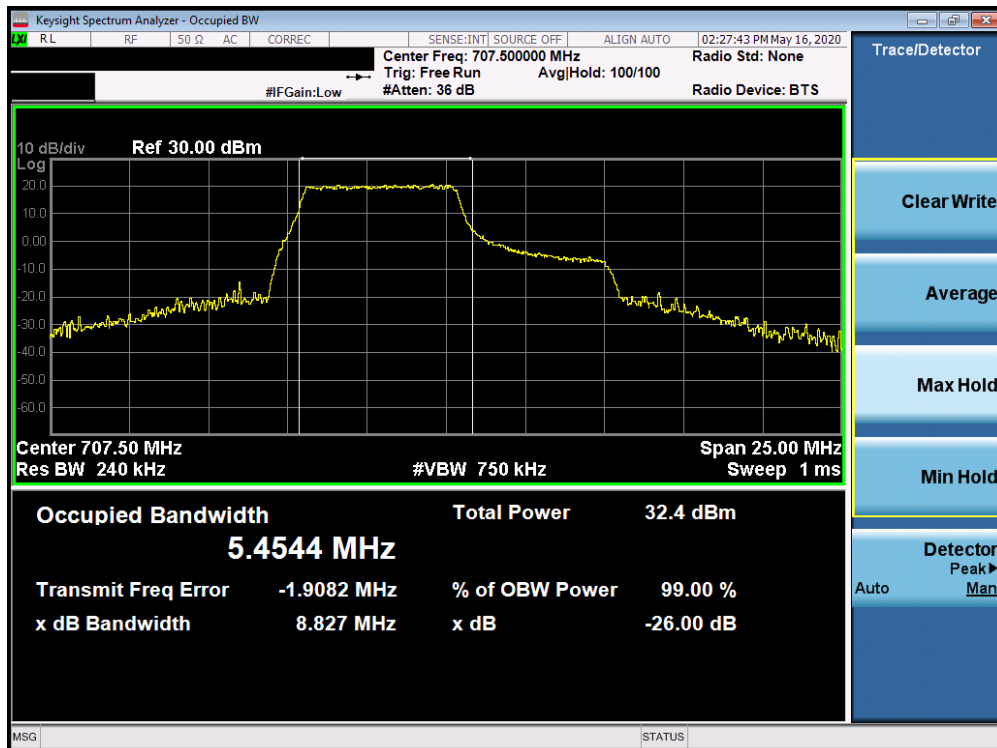


Plot 7-6. Occupied Bandwidth Plot (Band 12/17 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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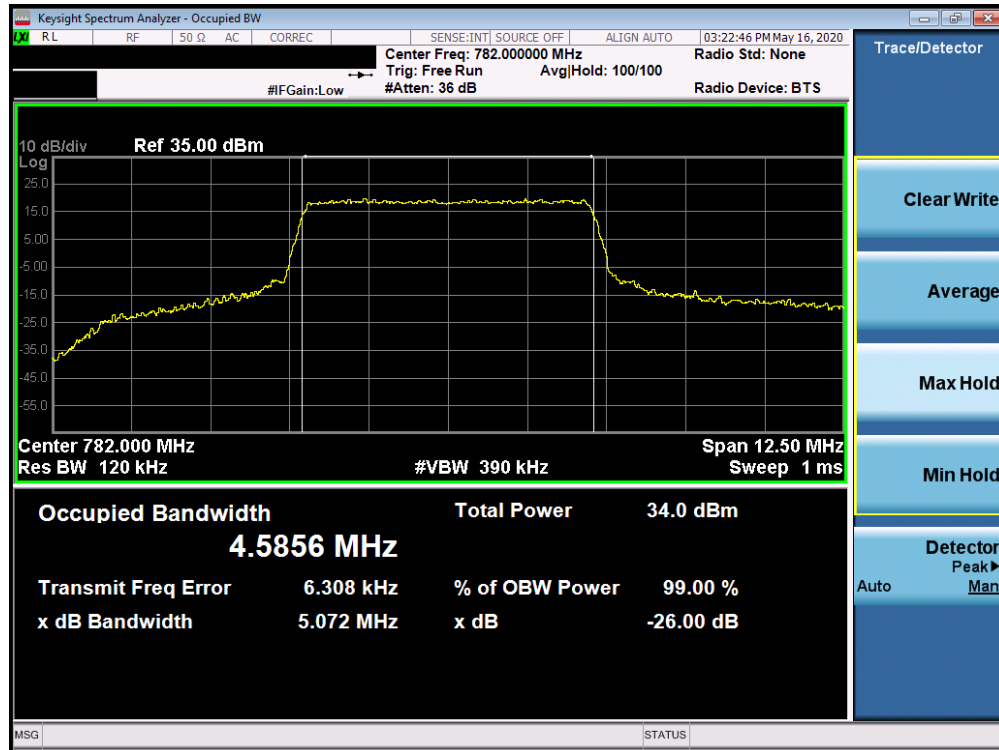
Plot 7-7. Occupied Bandwidth Plot (Band 12/17 - 10.0MHz QPSK - Full RB Configuration)



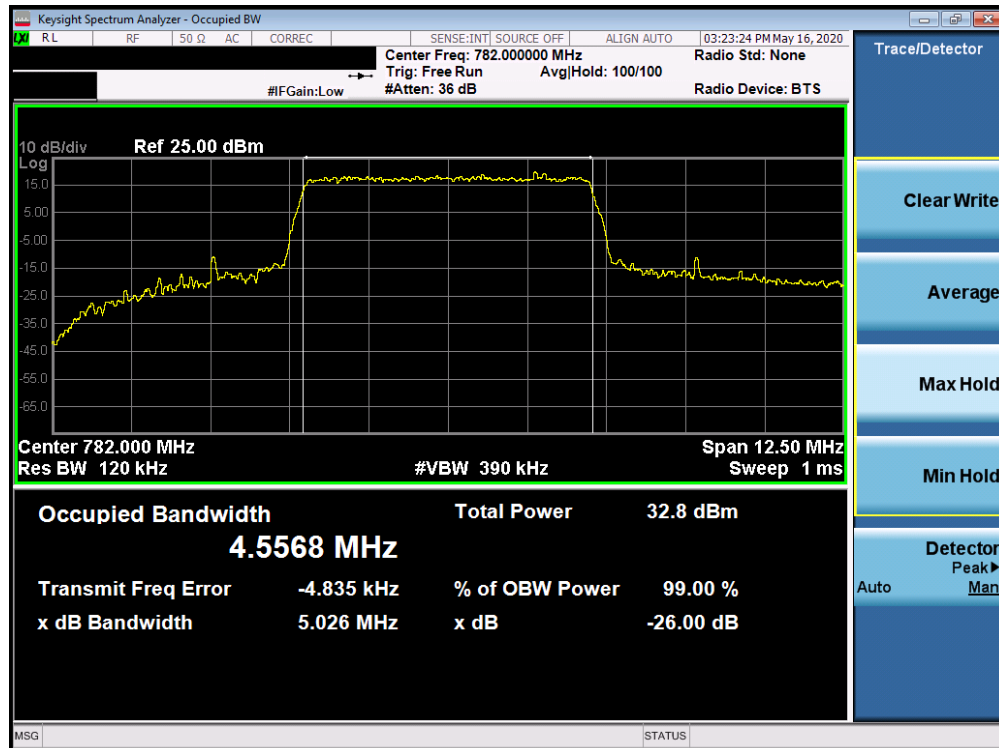
Plot 7-8. Occupied Bandwidth Plot (Band 12/17 - 10.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Band 13

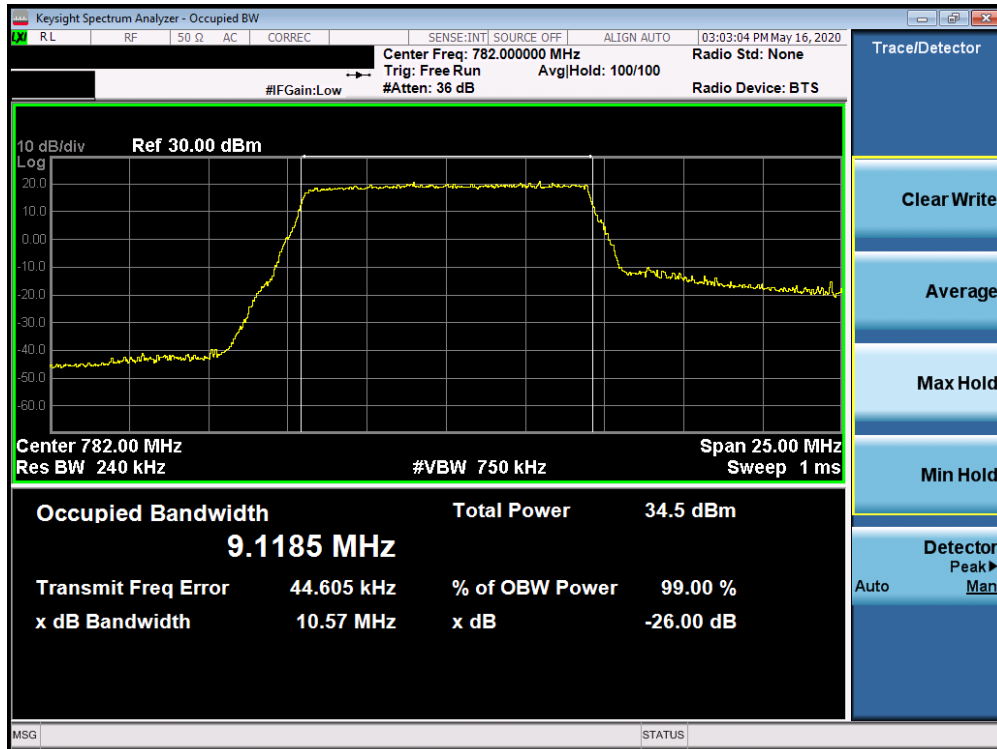


Plot 7-9. Occupied Bandwidth Plot (Band 13 - 5.0MHz QPSK - Full RB Configuration)

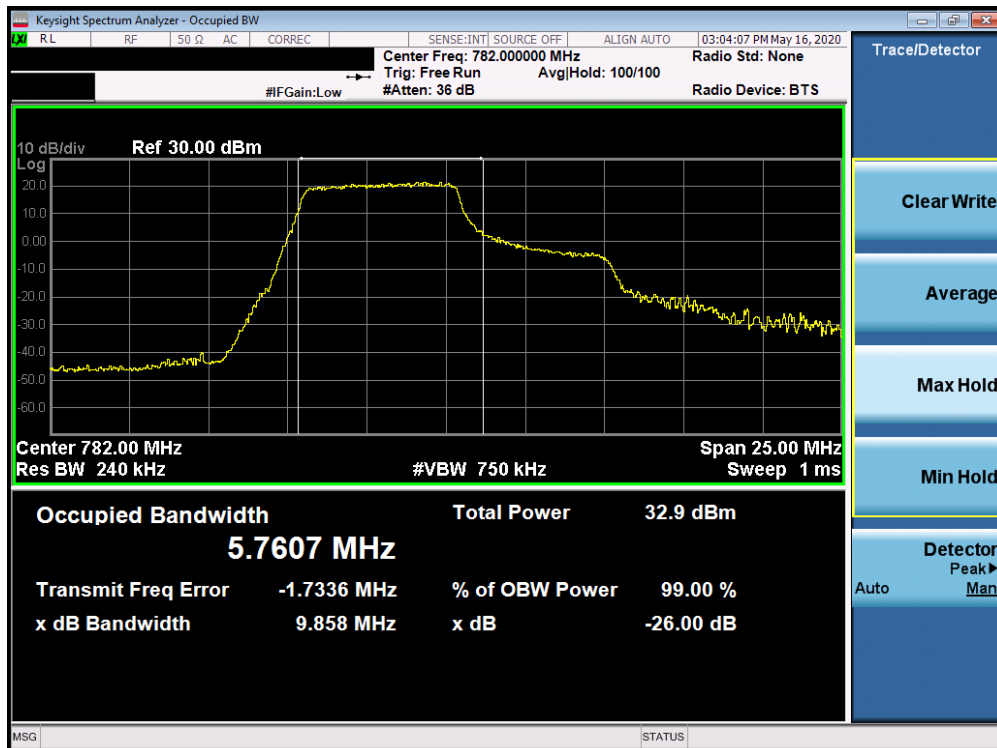


Plot 7-10. Occupied Bandwidth Plot (Band 13 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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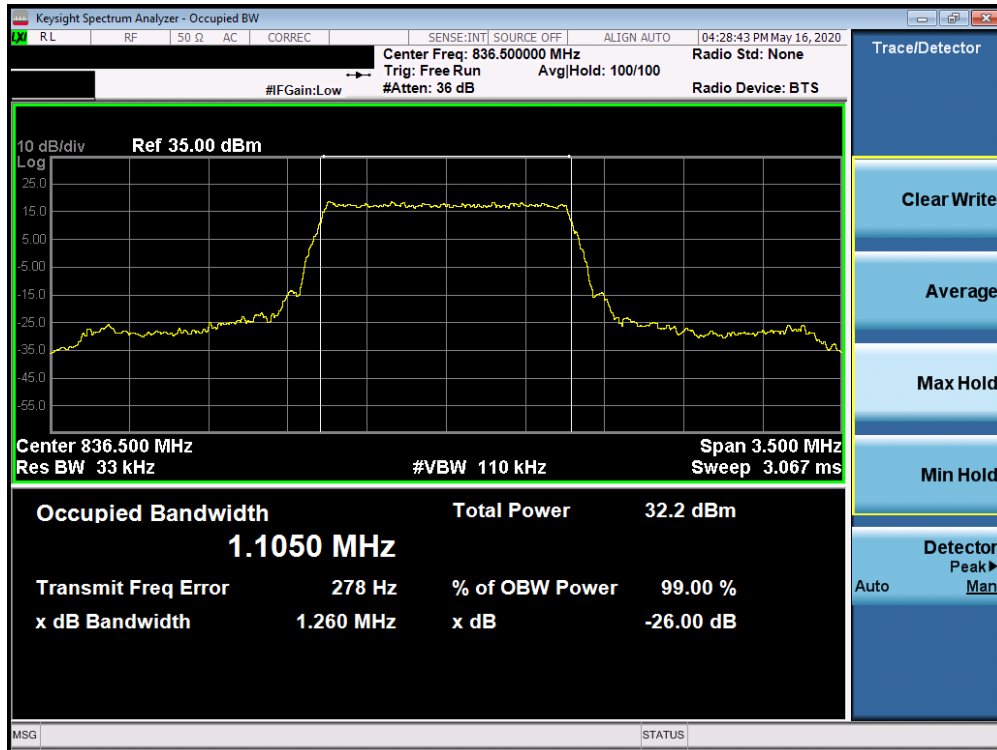
Plot 7-11. Occupied Bandwidth Plot (Band 13 - 10.0MHz QPSK - Full RB Configuration)



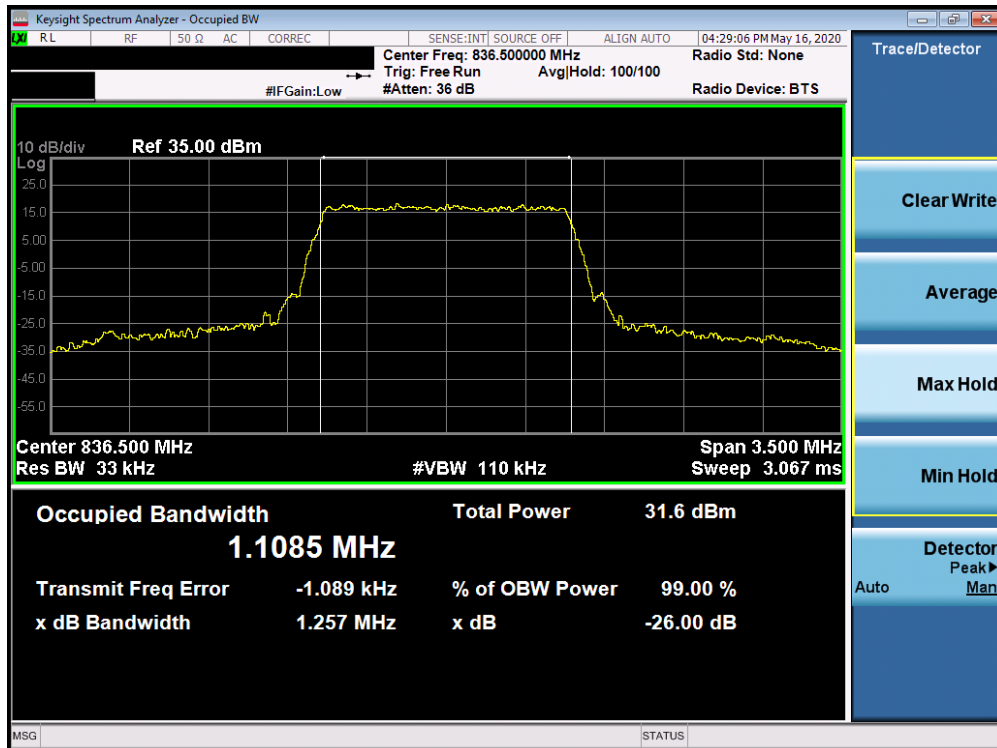
Plot 7-12. Occupied Bandwidth Plot (Band 13 - 10.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Band 26/5

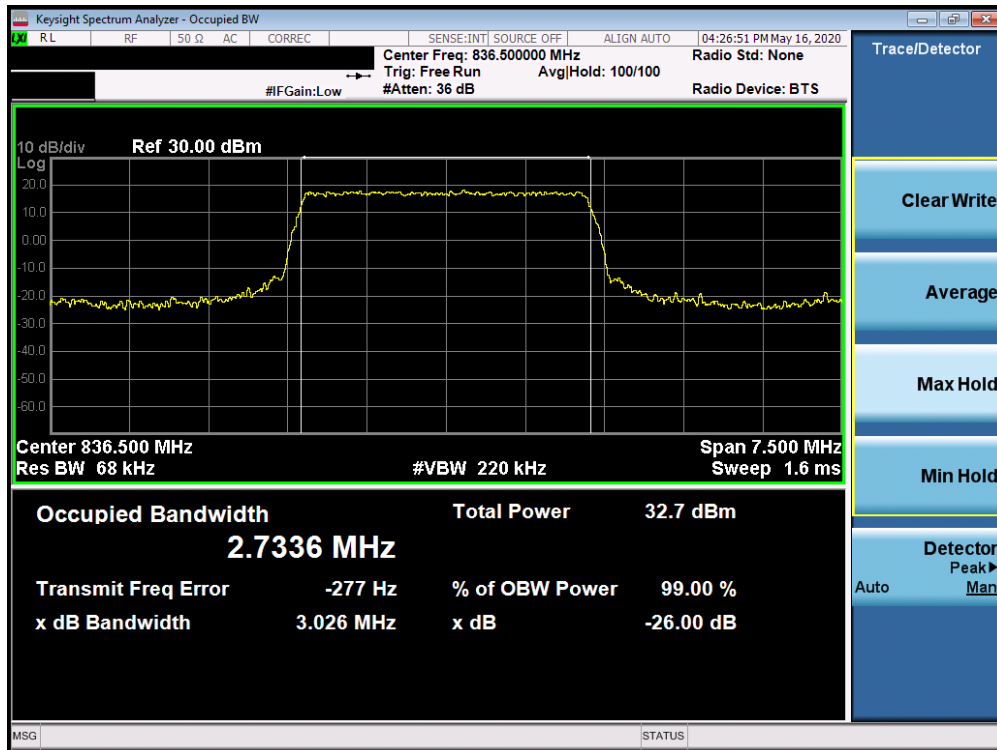


Plot 7-13. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz QPSK - Full RB Configuration)

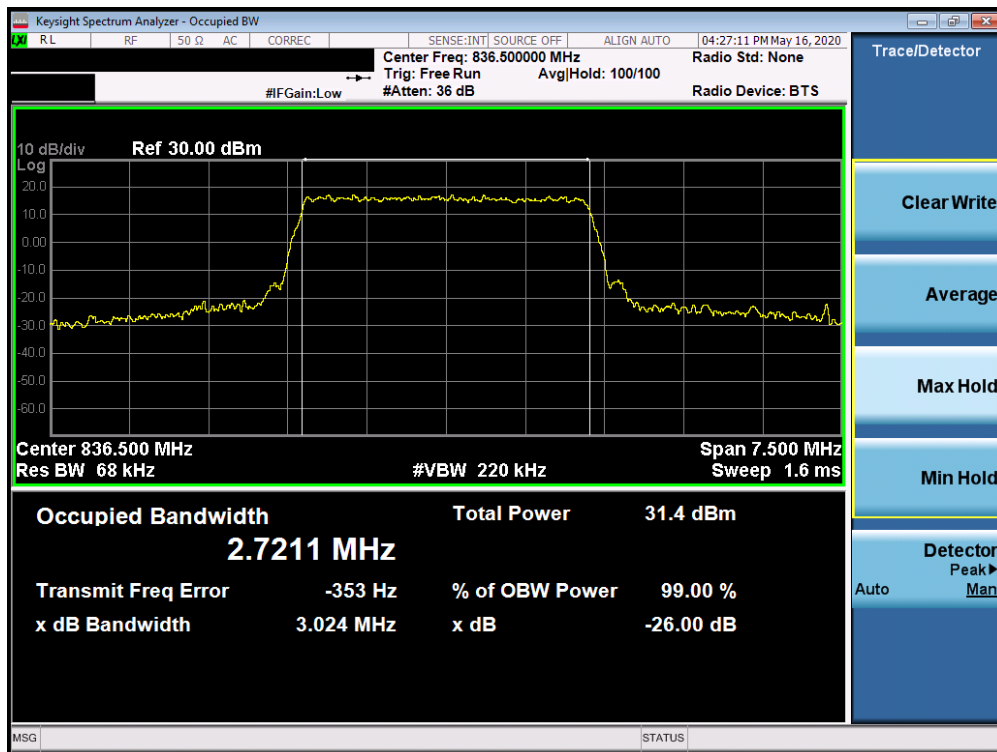


Plot 7-14. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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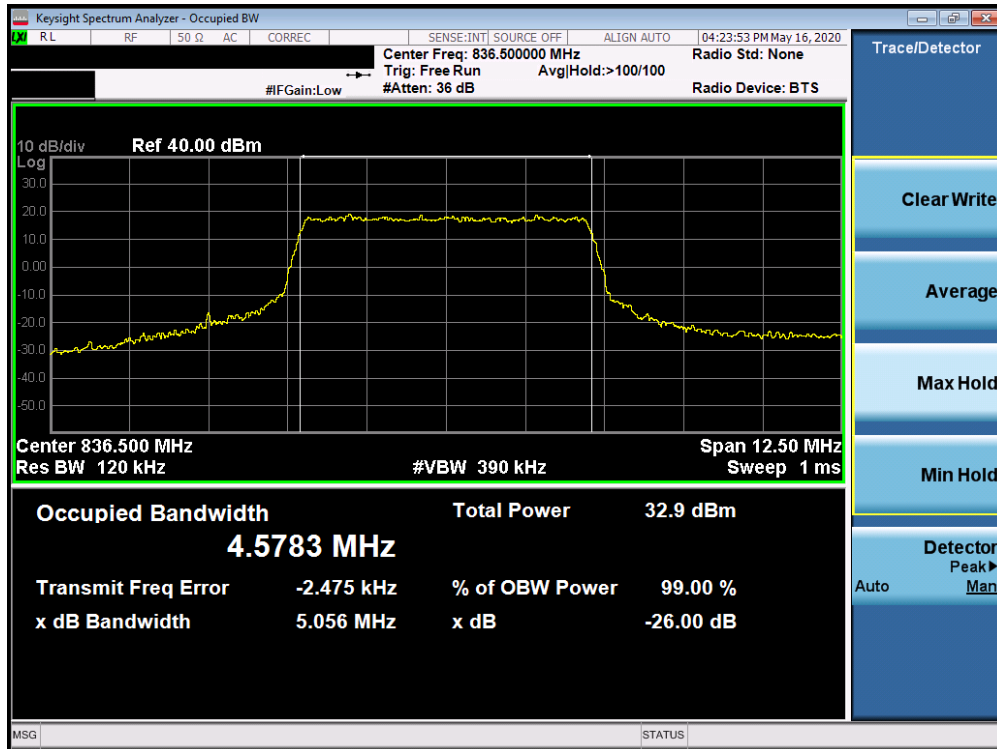


Plot 7-15. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz QPSK - Full RB Configuration)

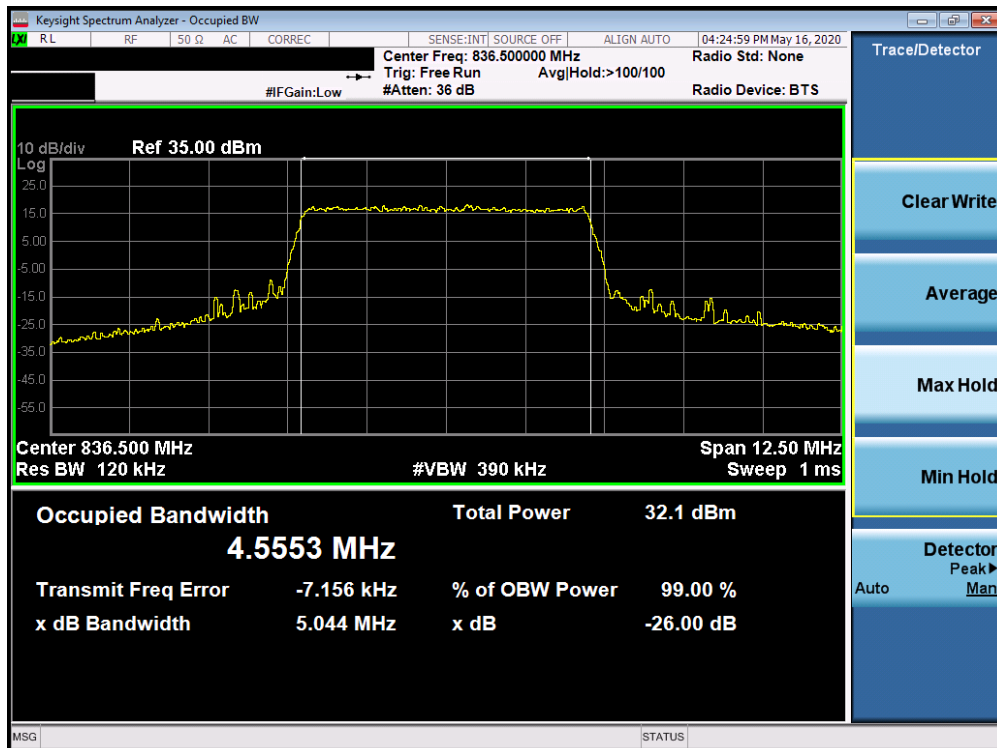


Plot 7-16. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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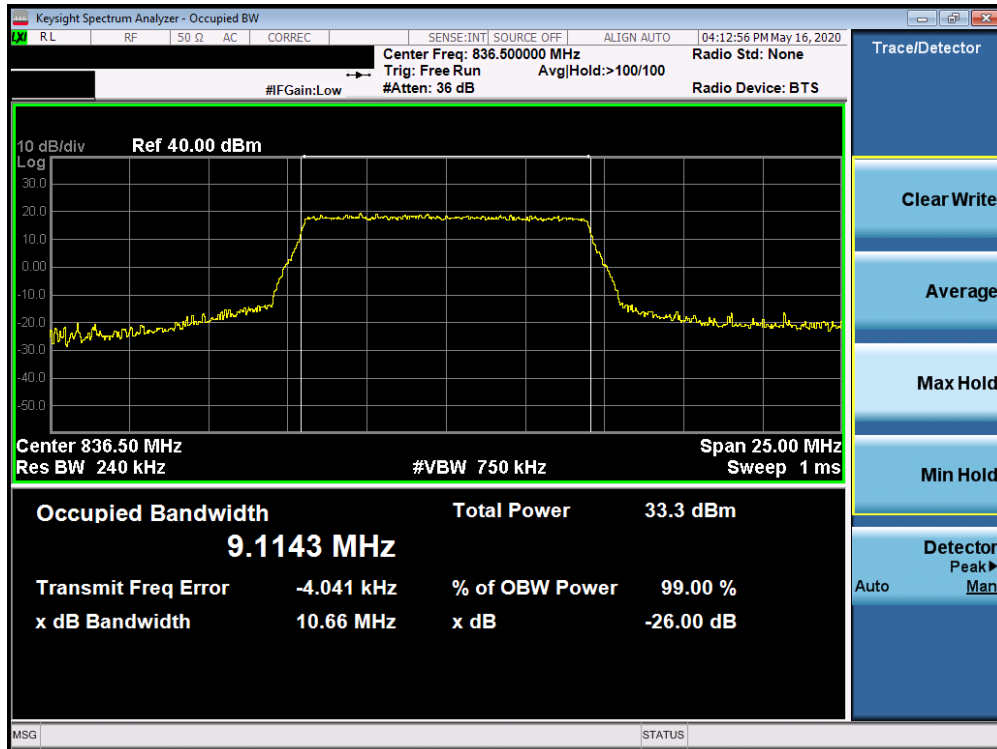


Plot 7-17. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz QPSK - Full RB Configuration)

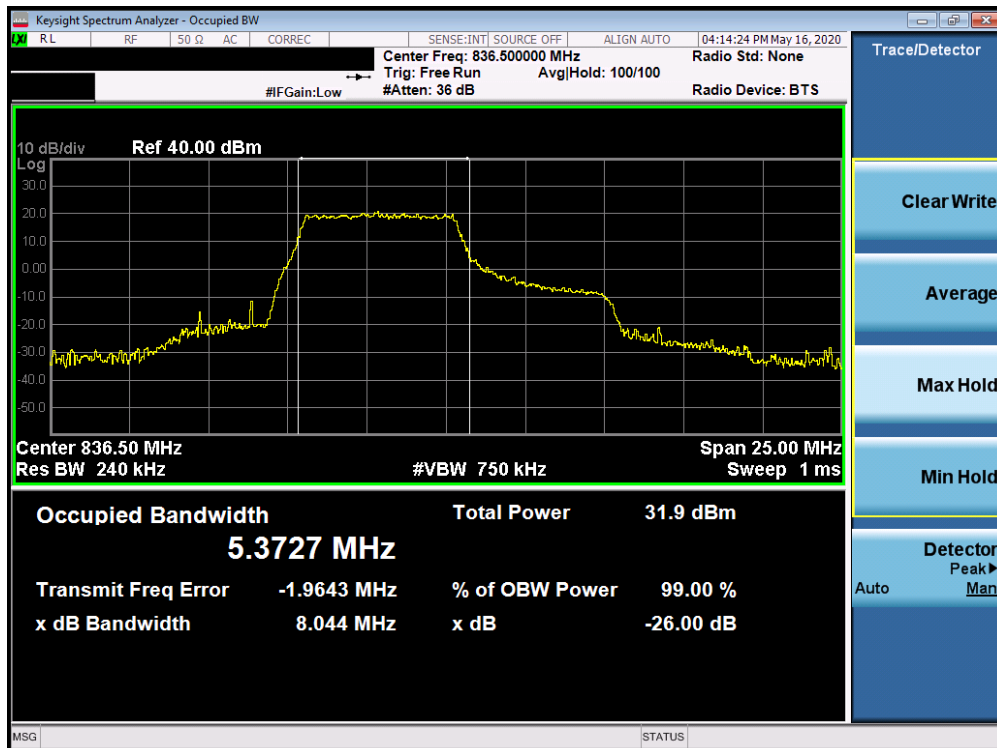


Plot 7-18. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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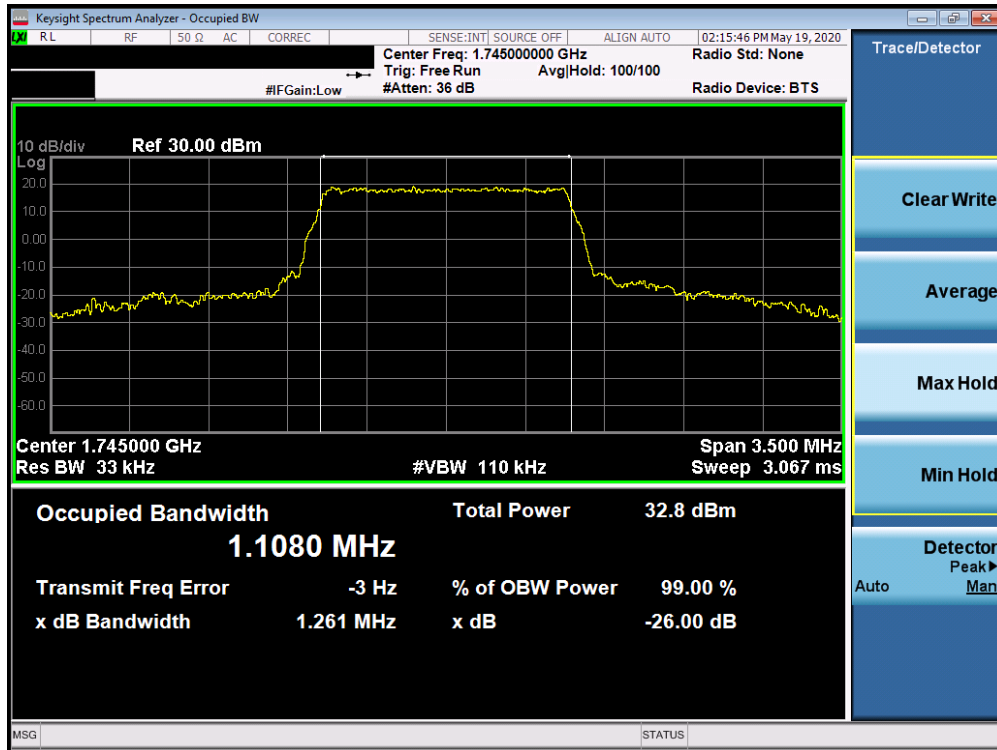
Plot 7-19. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz QPSK - Full RB Configuration)



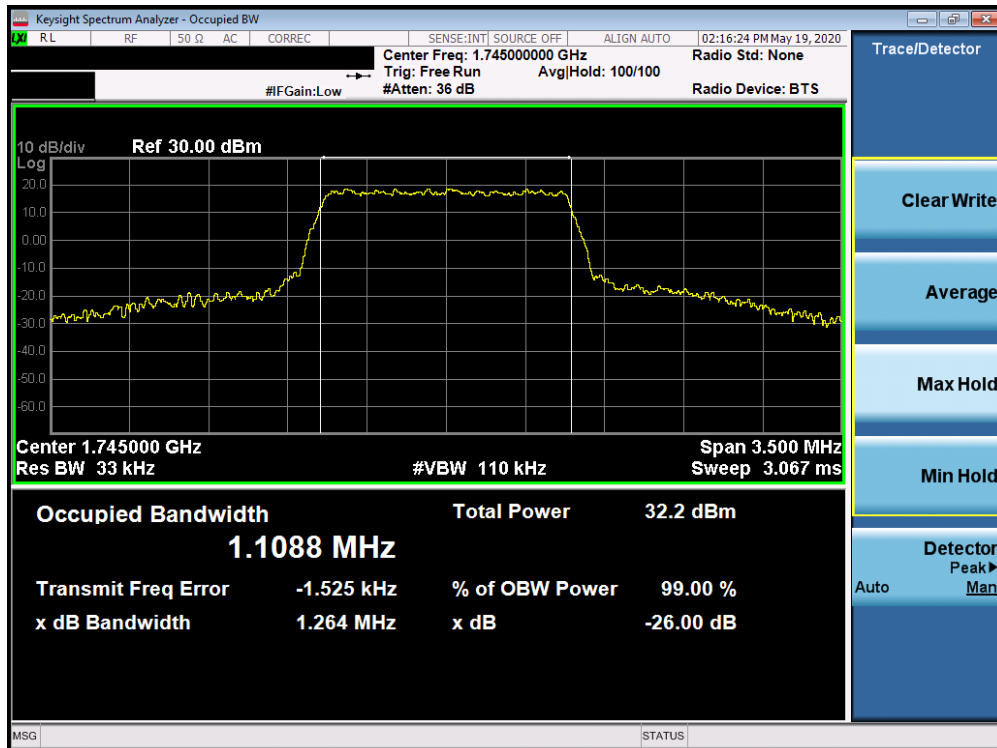
Plot 7-20. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 29 of 238

Band 66/4

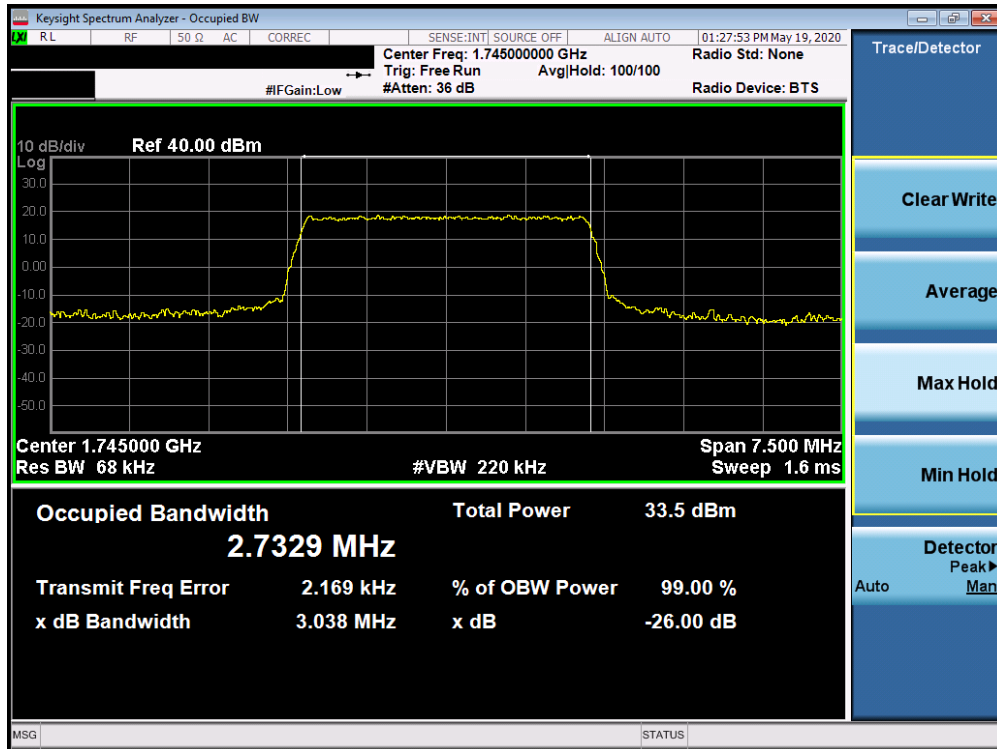


Plot 7-21. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)

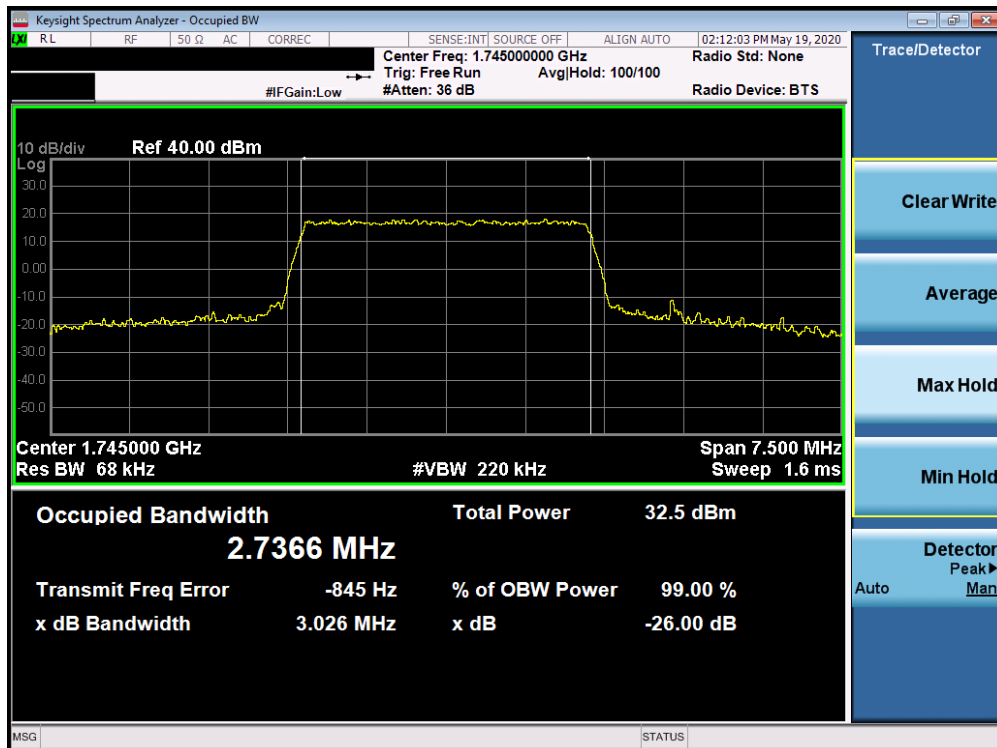


Plot 7-22. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 30 of 238

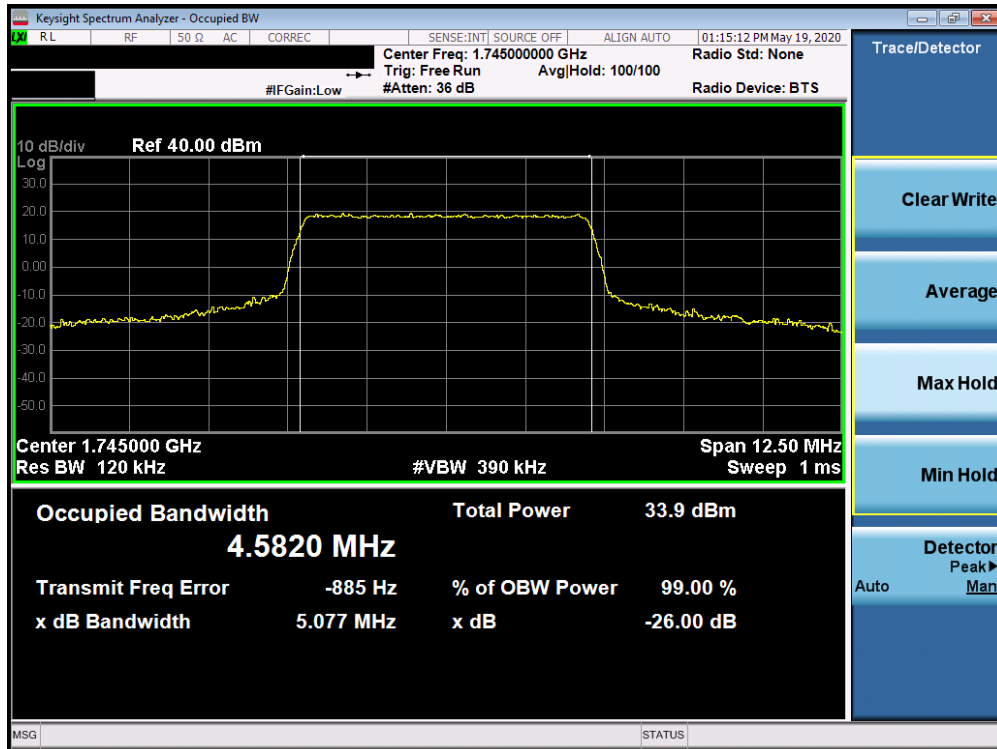


Plot 7-23. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)

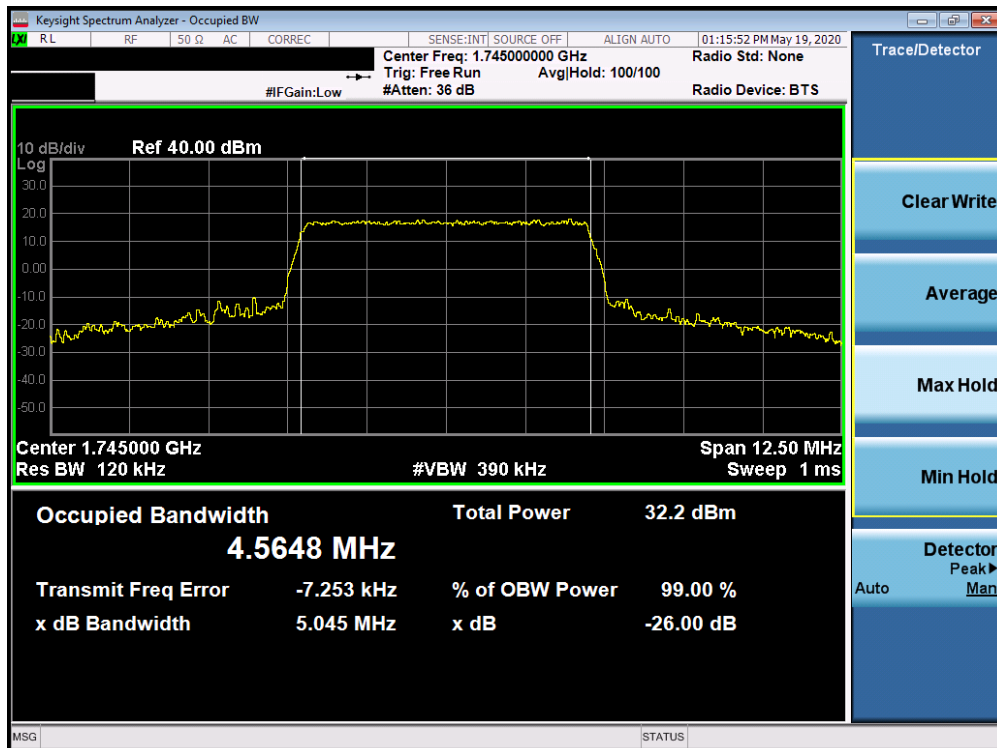


Plot 7-24. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 31 of 238

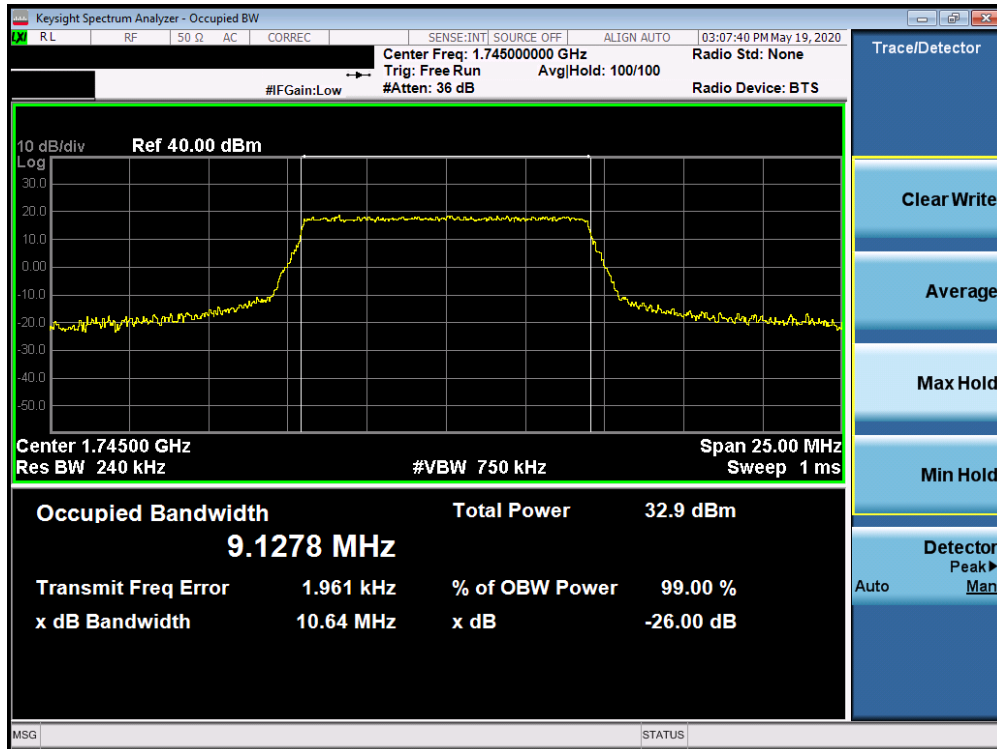


Plot 7-25. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)

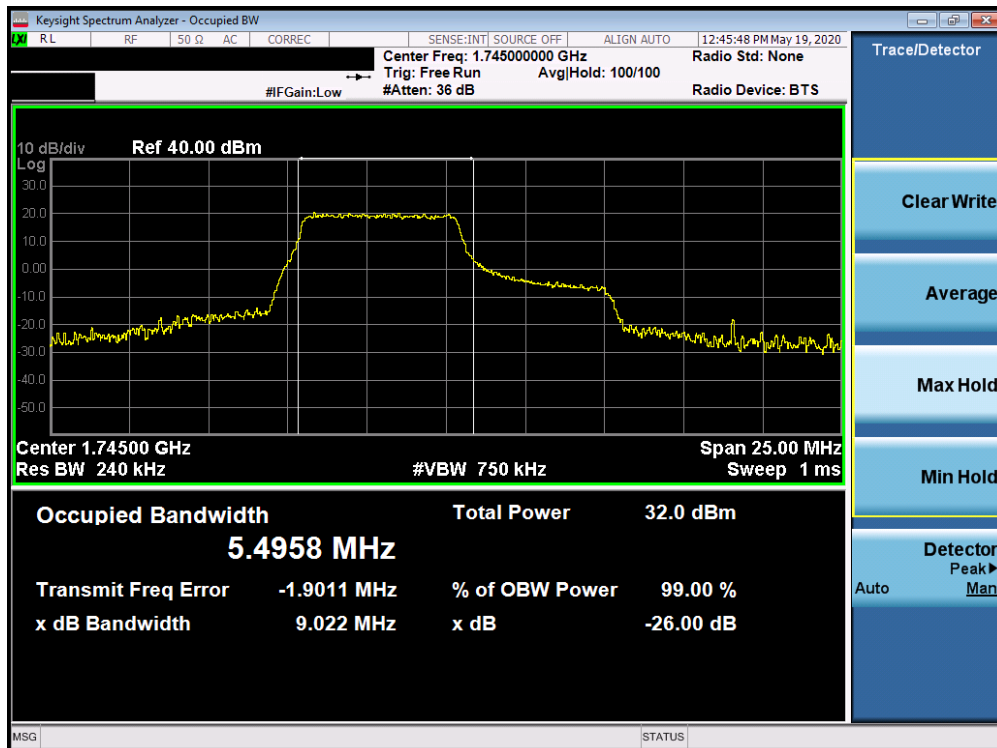


Plot 7-26. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 32 of 238

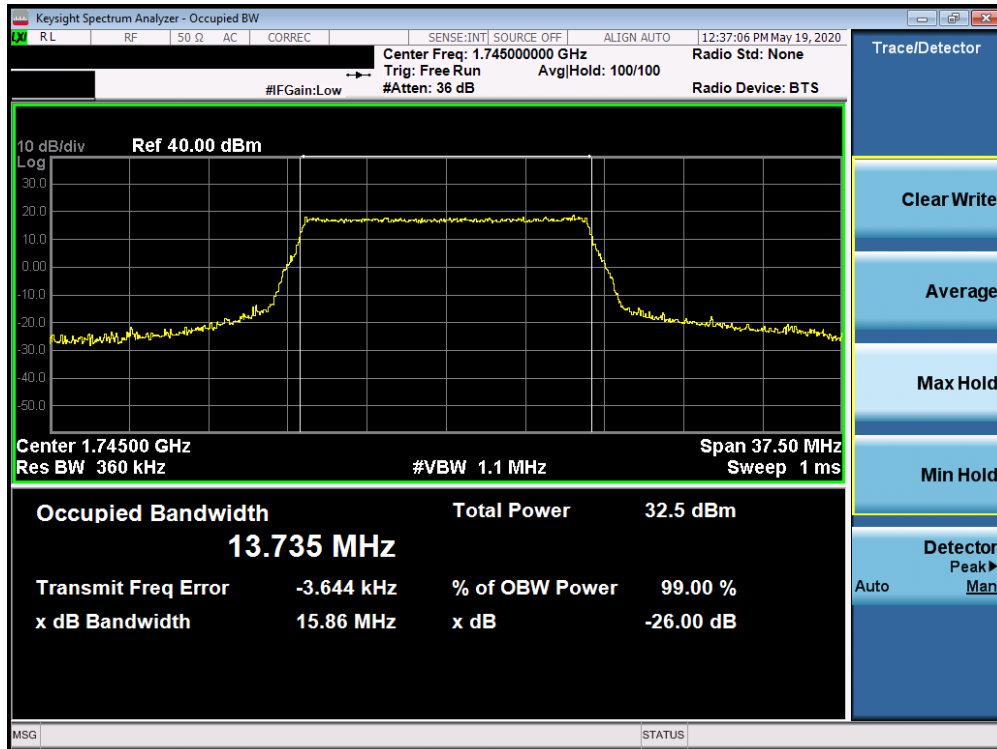


Plot 7-27. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)



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

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 33 of 238

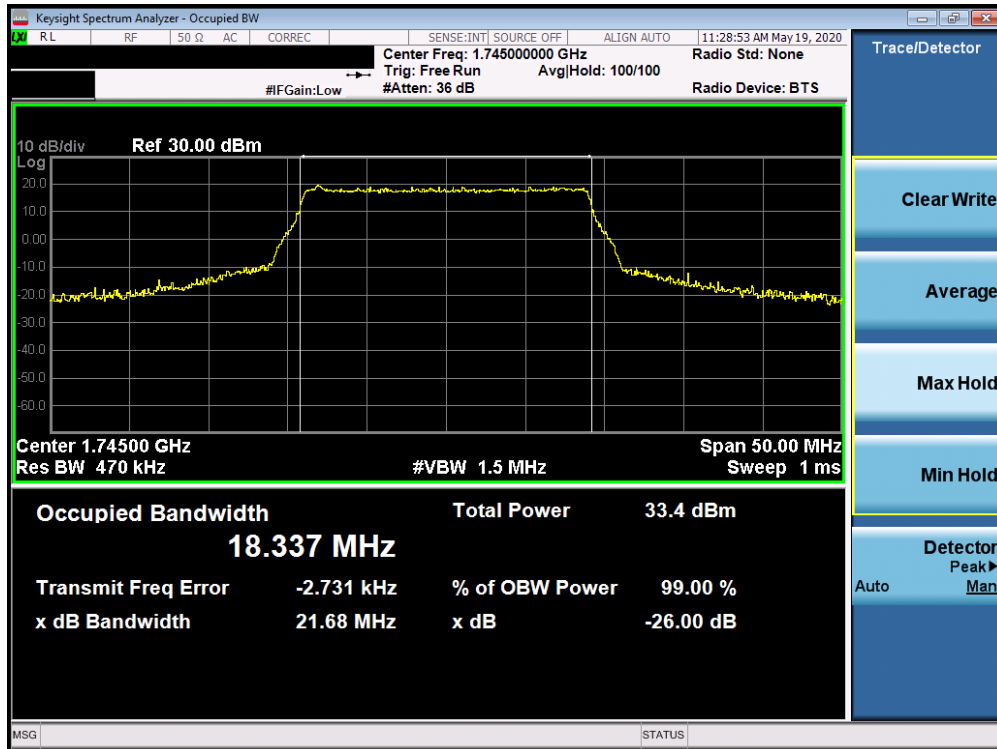


Plot 7-29. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



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

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 34 of 238



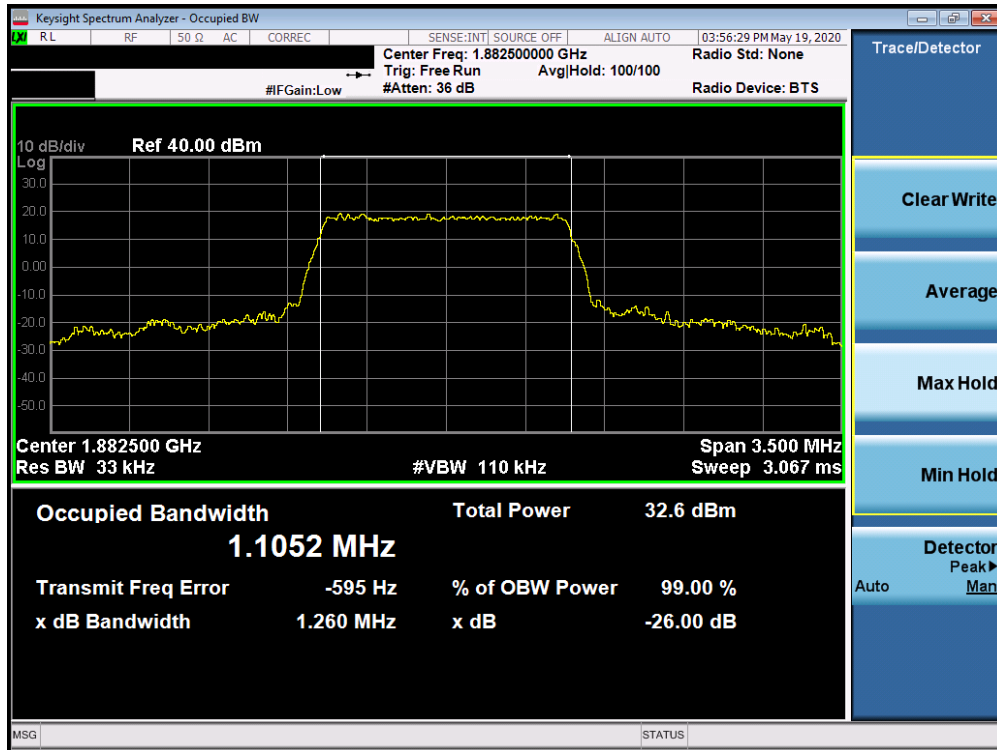
Plot 7-31. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)



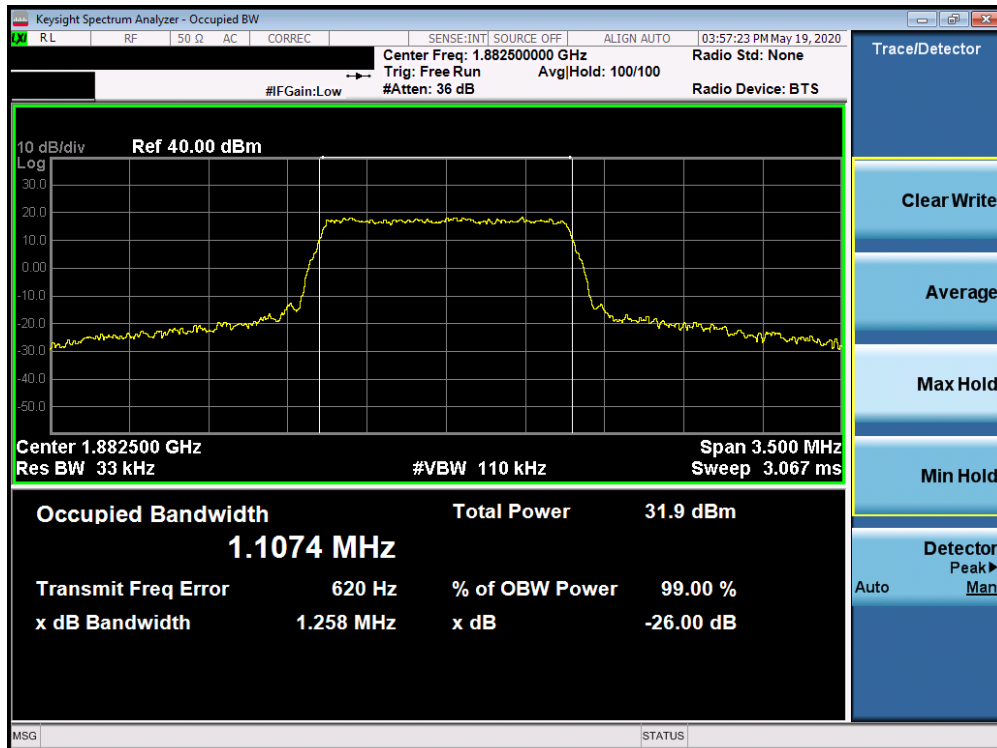
Plot 7-32. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 35 of 238

Band 25/2

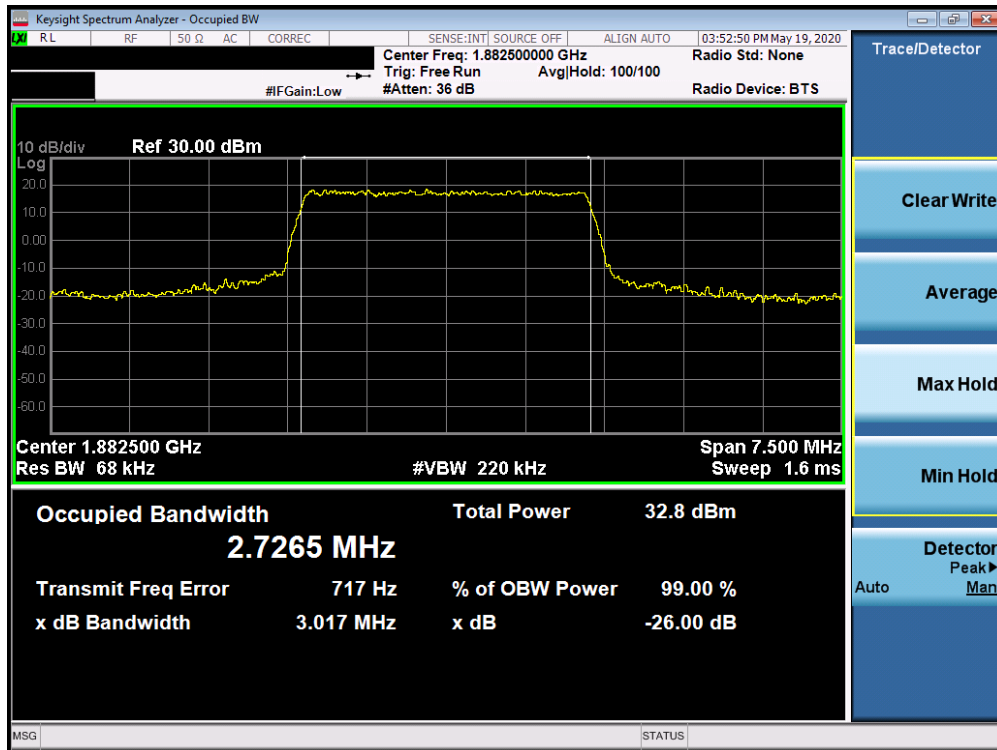


Plot 7-33. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz QPSK - Full RB Configuration)

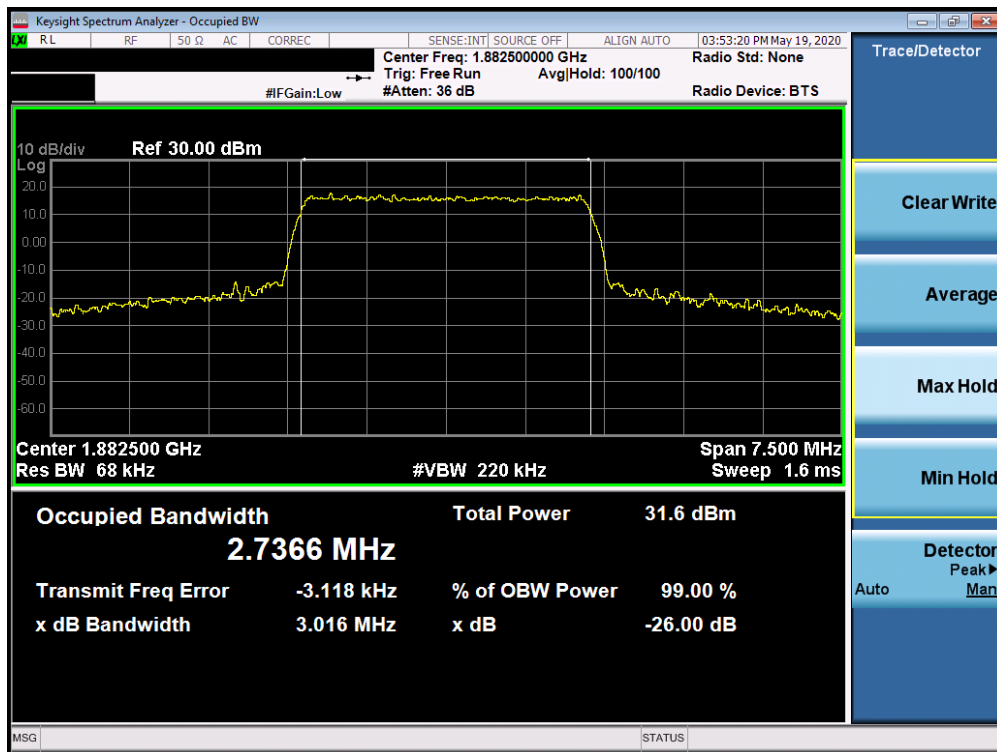


Plot 7-34. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 36 of 238

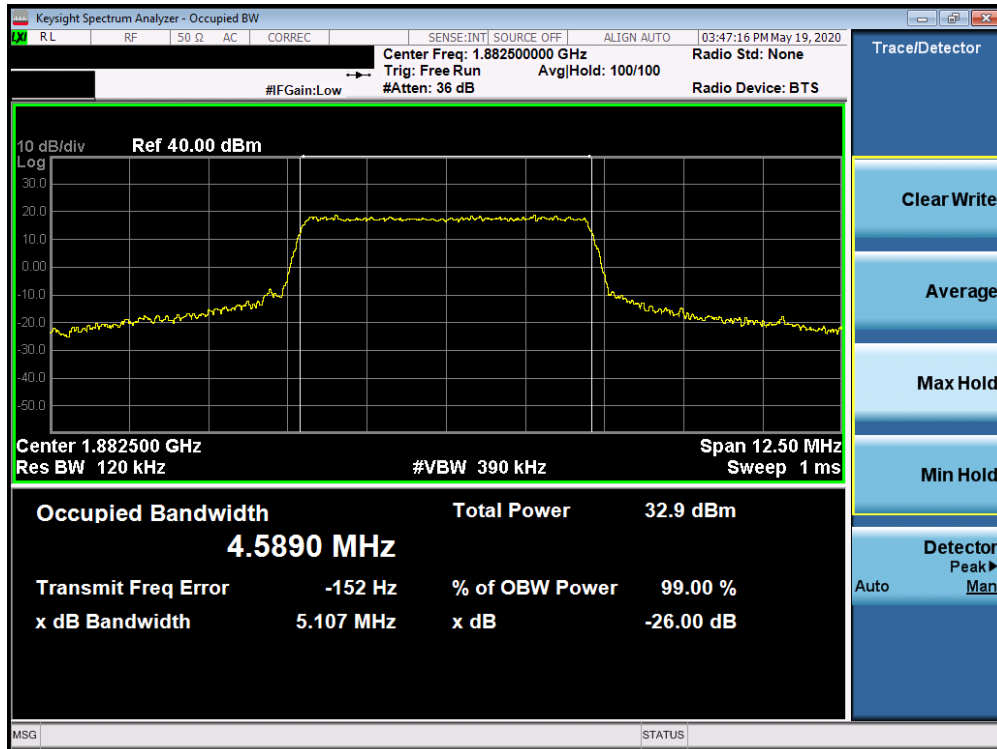


Plot 7-35. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz QPSK - Full RB Configuration)

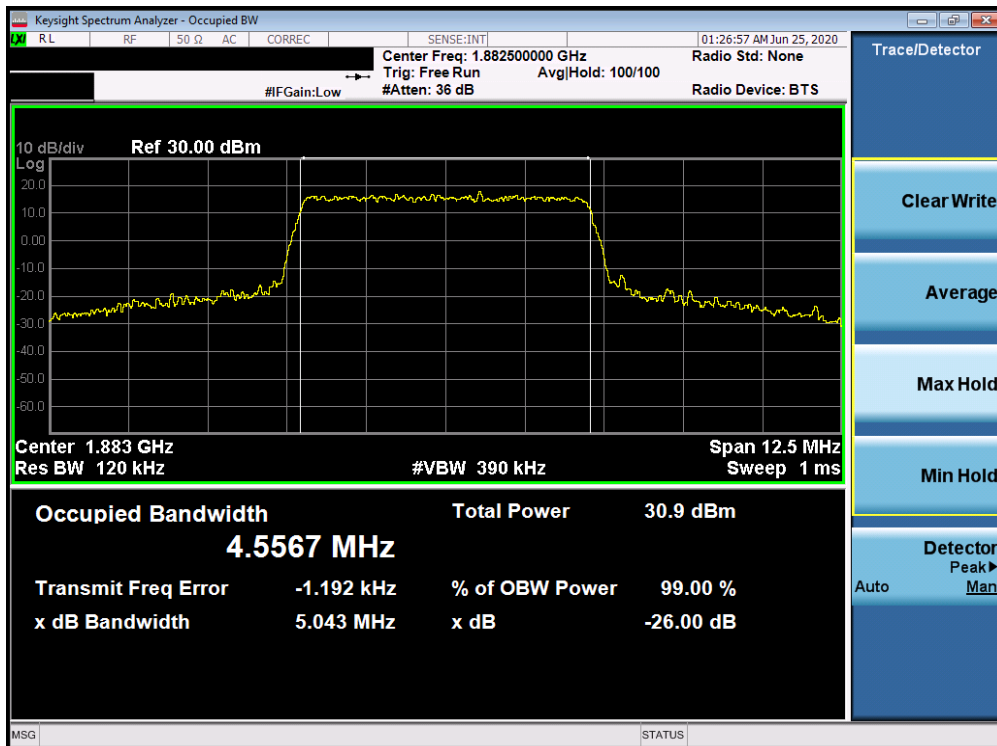


Plot 7-36. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 37 of 238

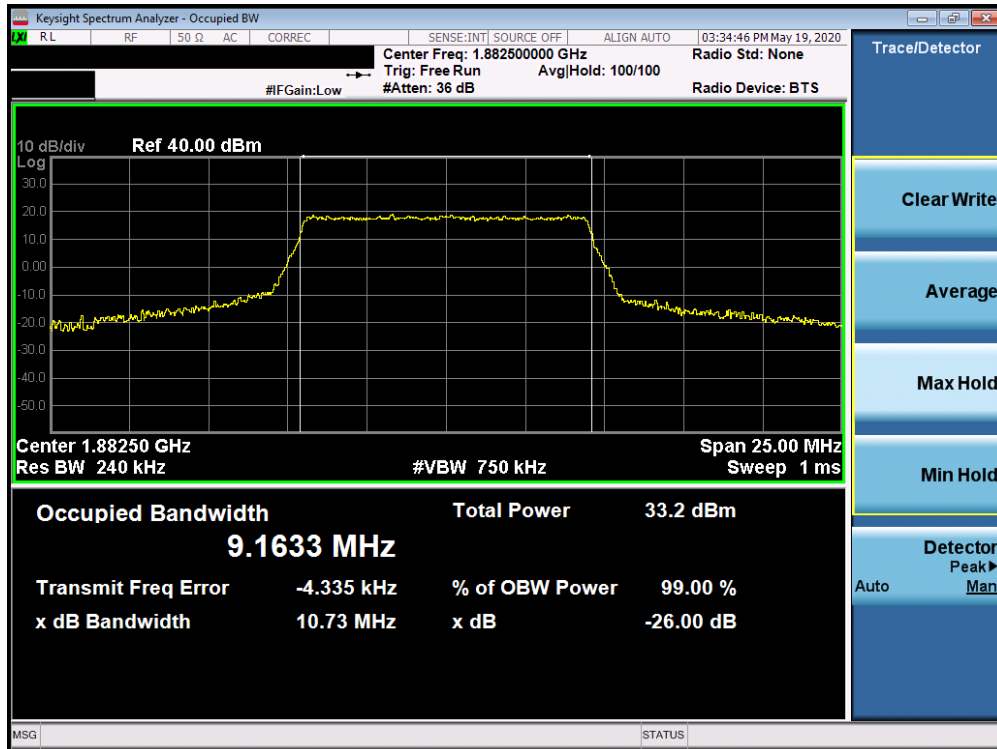


Plot 7-37. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz QPSK - Full RB Configuration)

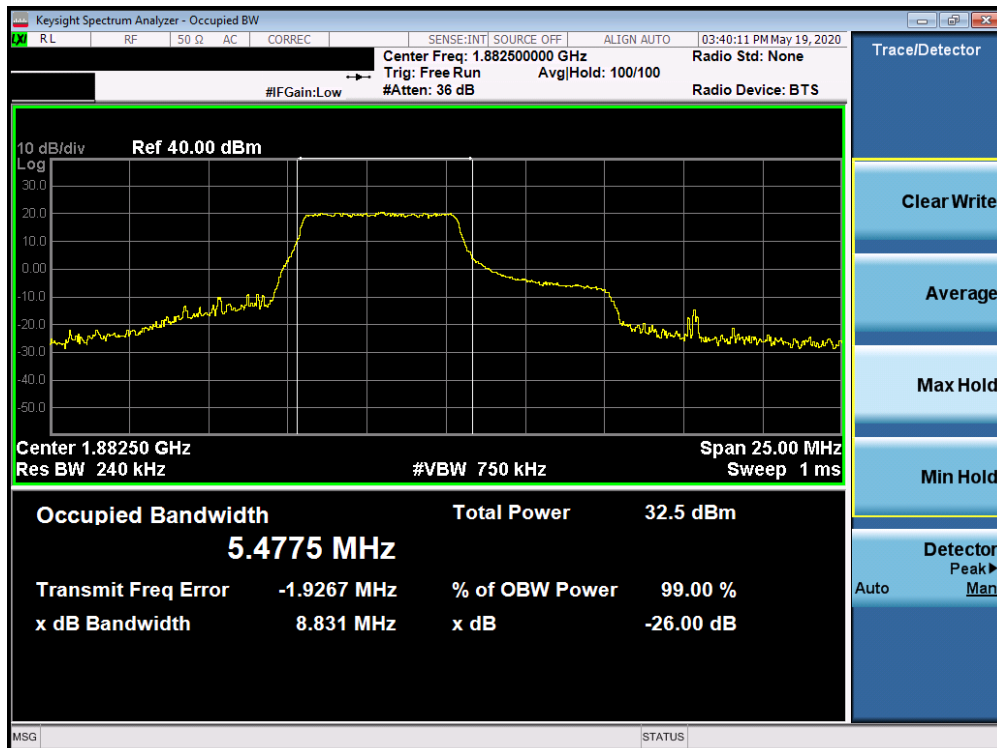


Plot 7-38. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 38 of 238

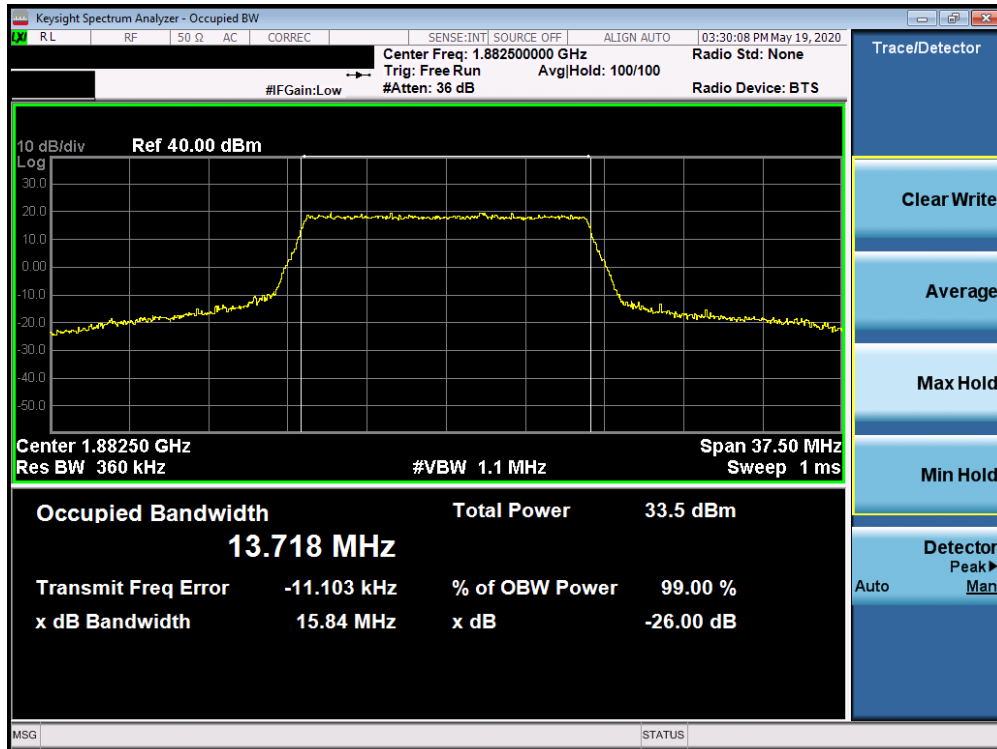


Plot 7-39. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz QPSK - Full RB Configuration)

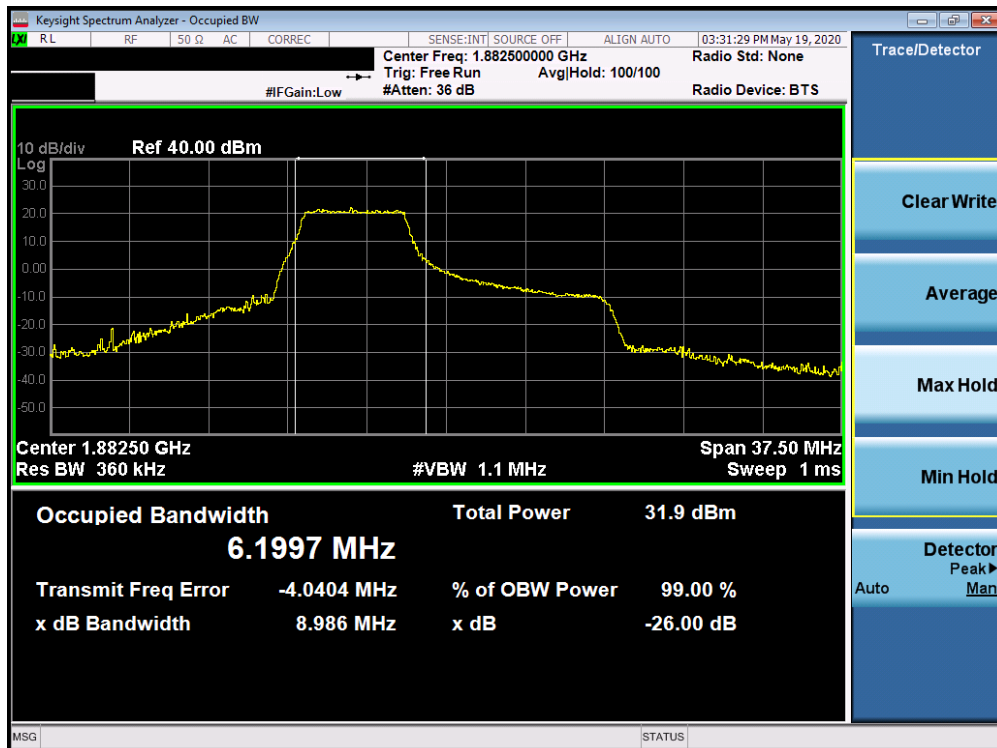


Plot 7-40. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 39 of 238

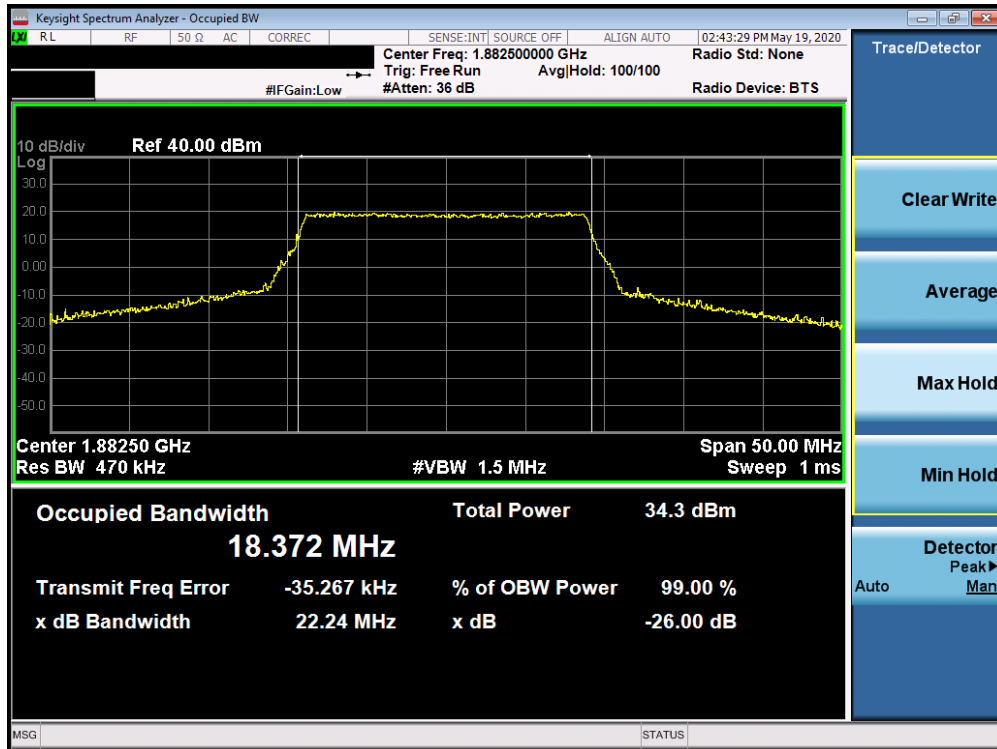


Plot 7-41. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz QPSK - Full RB Configuration)



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

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 40 of 238



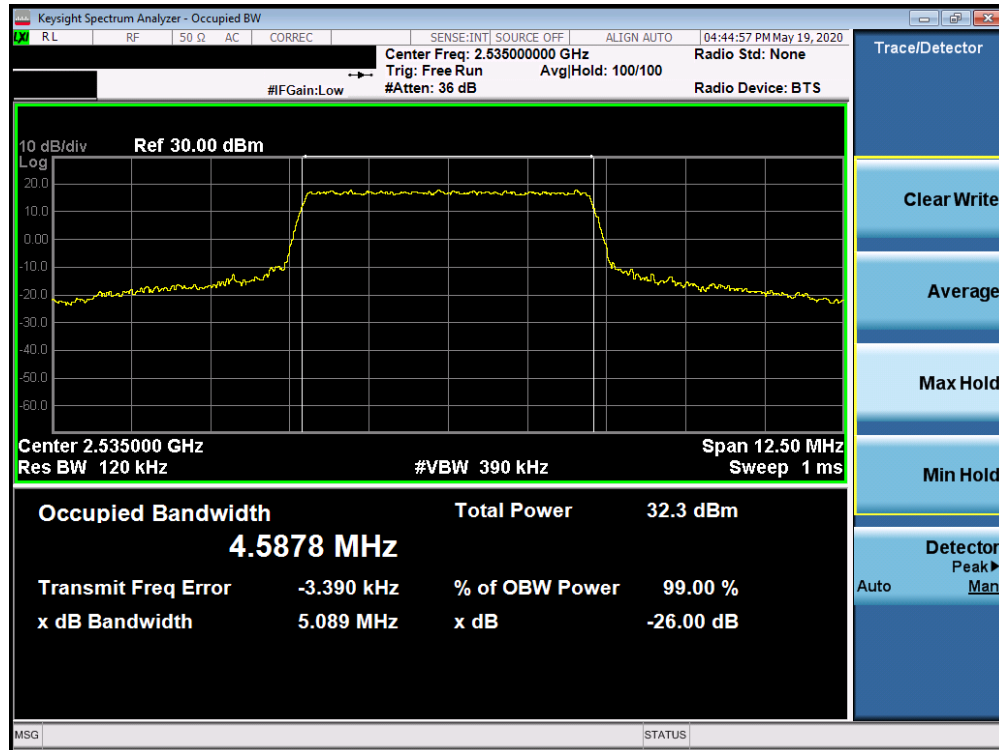
Plot 7-43. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz QPSK - Full RB Configuration)



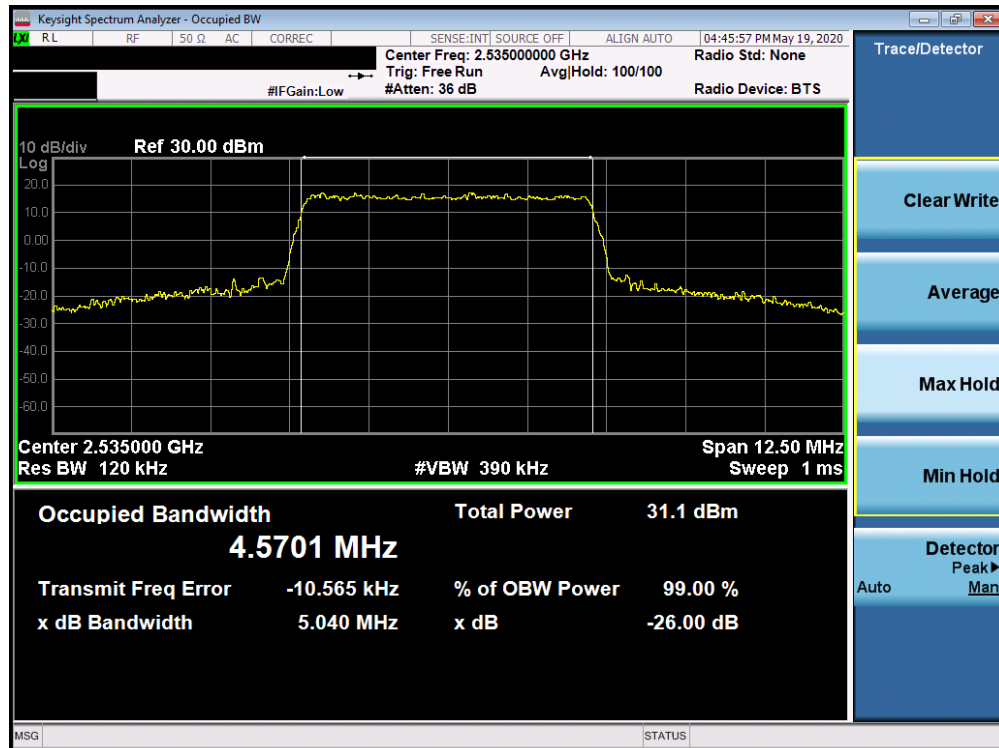
Plot 7-44. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 41 of 238

Band 7

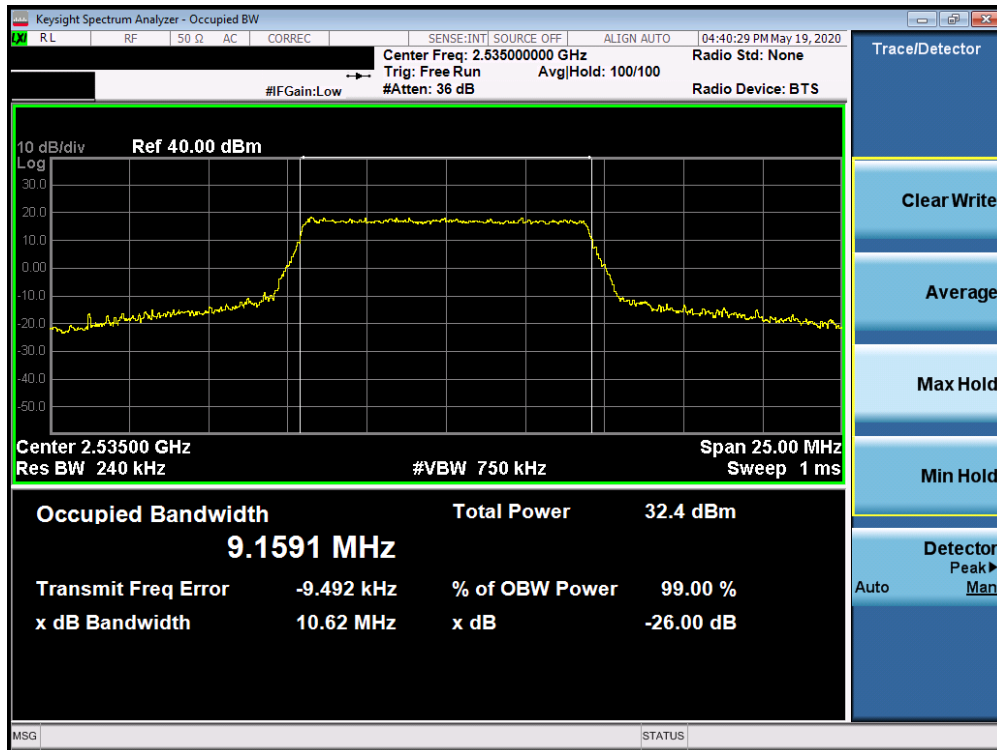


Plot 7-45. Occupied Bandwidth Plot (Band 7 - 5.0MHz QPSK - Full RB Configuration)



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

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 42 of 238

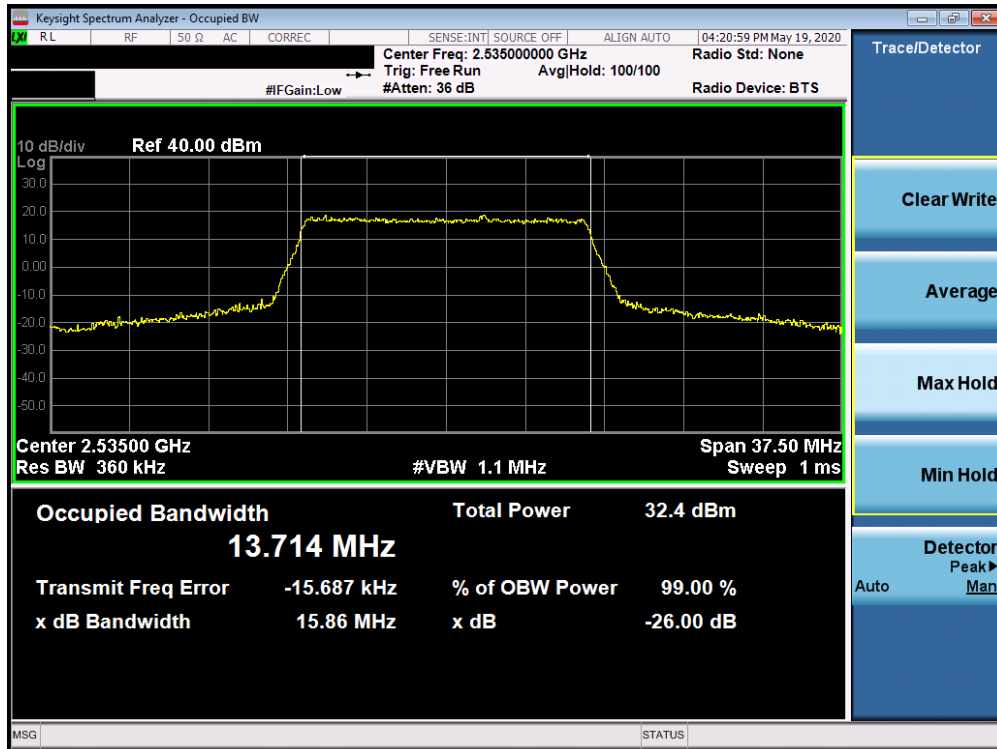


Plot 7-47. Occupied Bandwidth Plot (Band 7 - 10.0MHz QPSK - Full RB Configuration)

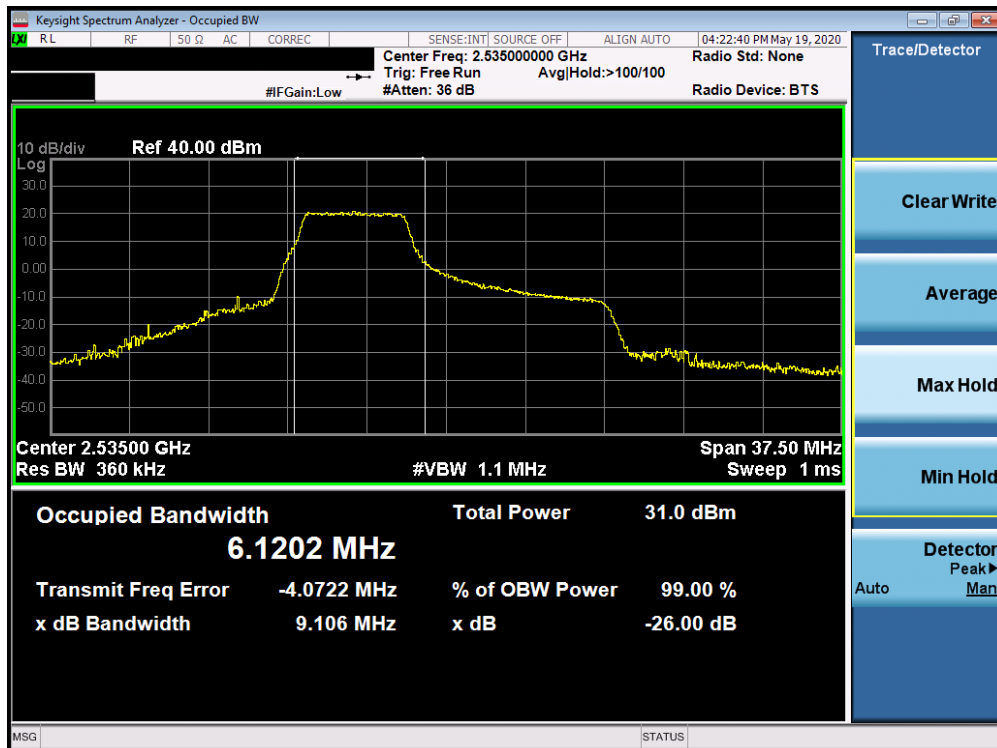


Plot 7-48. Occupied Bandwidth Plot (Band 7 - 10.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 43 of 238

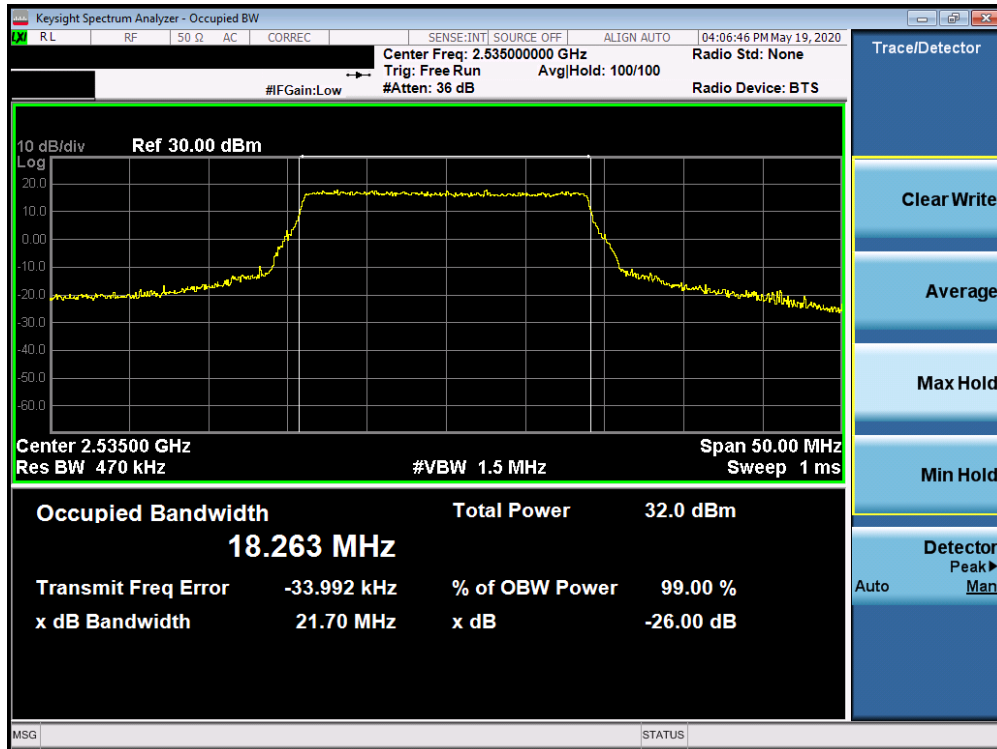


Plot 7-49. Occupied Bandwidth Plot (Band 7 - 15.0MHz QPSK - Full RB Configuration)



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

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 44 of 238



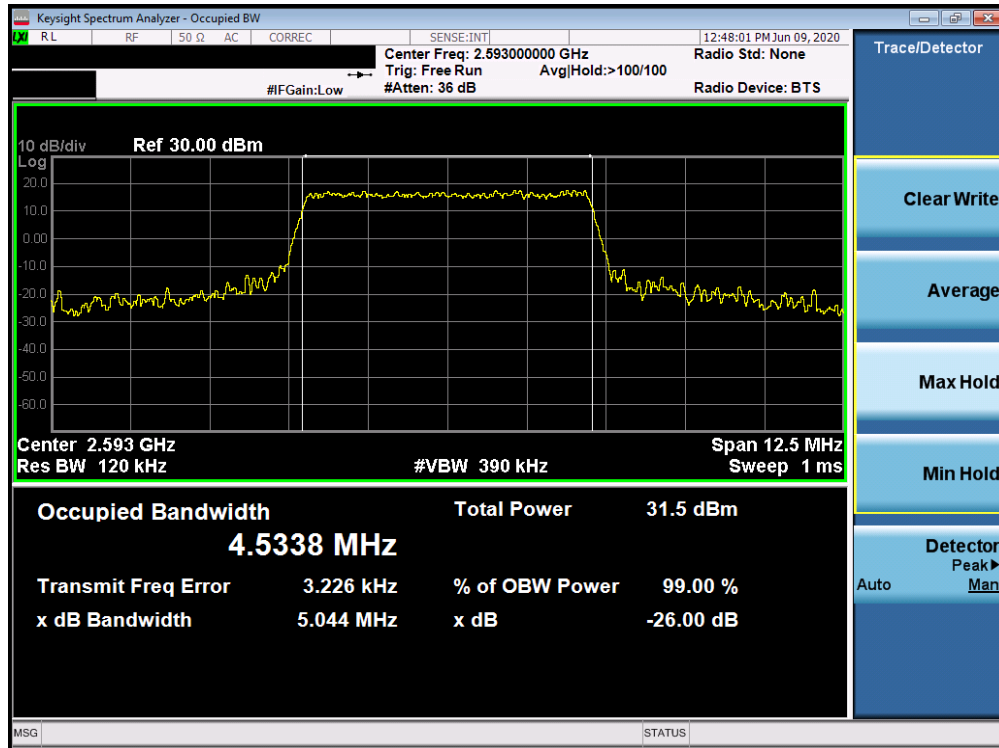
Plot 7-51. Occupied Bandwidth Plot (Band 7 - 20.0MHz QPSK - Full RB Configuration)



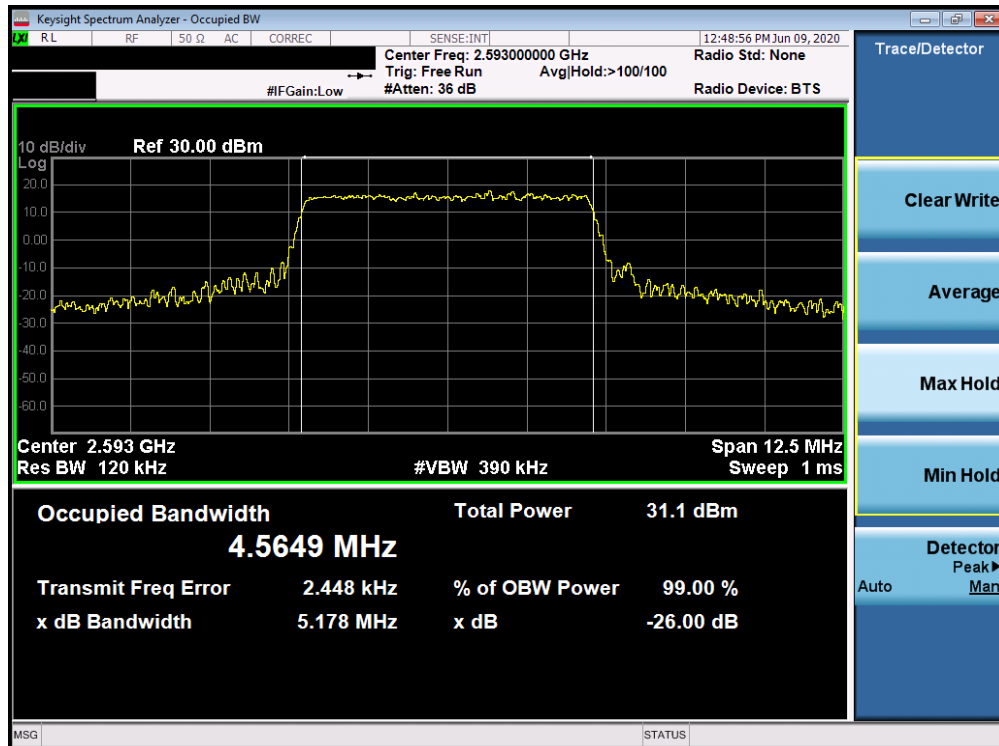
Plot 7-52. Occupied Bandwidth Plot (Band 7 - 20.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 45 of 238

Band 41

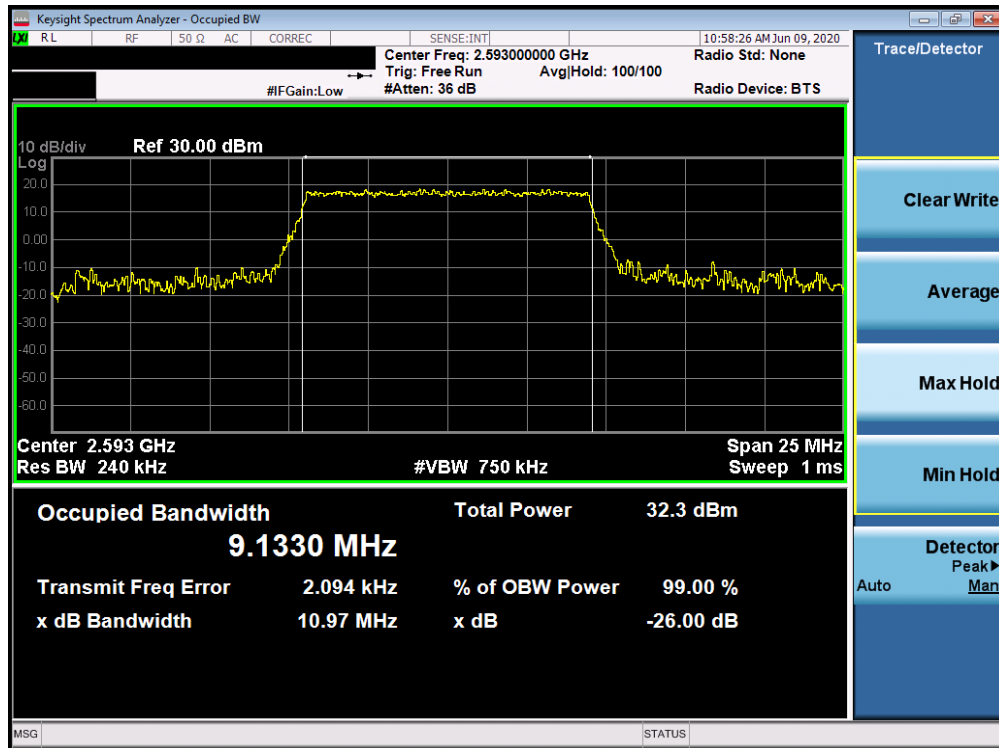


Plot 7-53. Occupied Bandwidth Plot (Band 41 - 5.0MHz QPSK - Full RB Configuration)

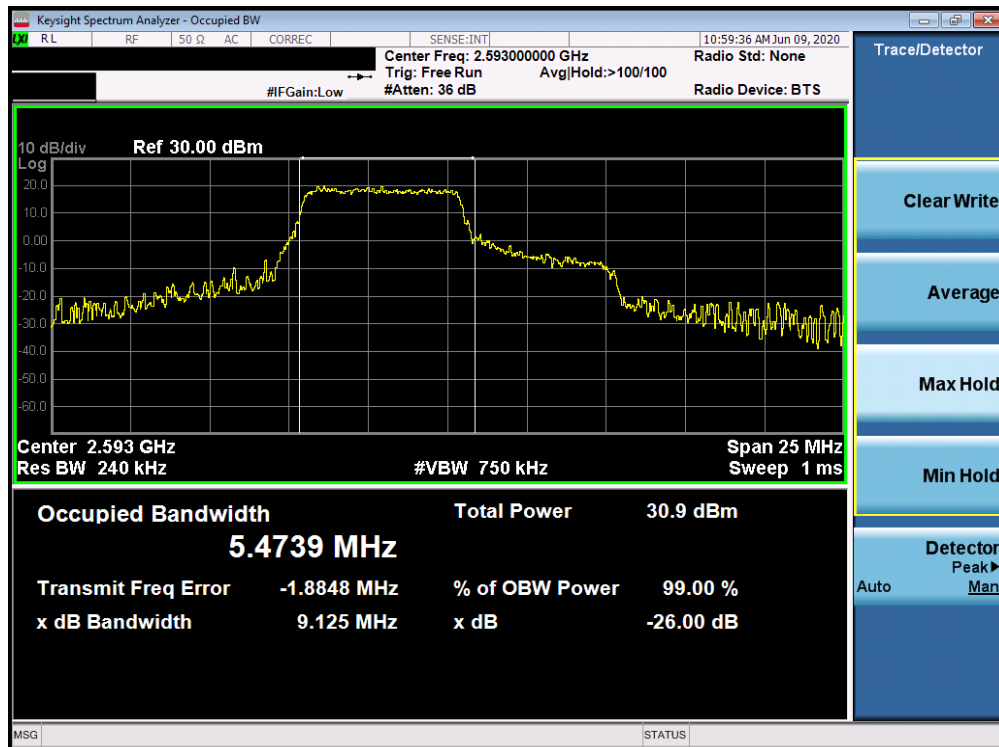


Plot 7-54. Occupied Bandwidth Plot (Band 41 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 46 of 238

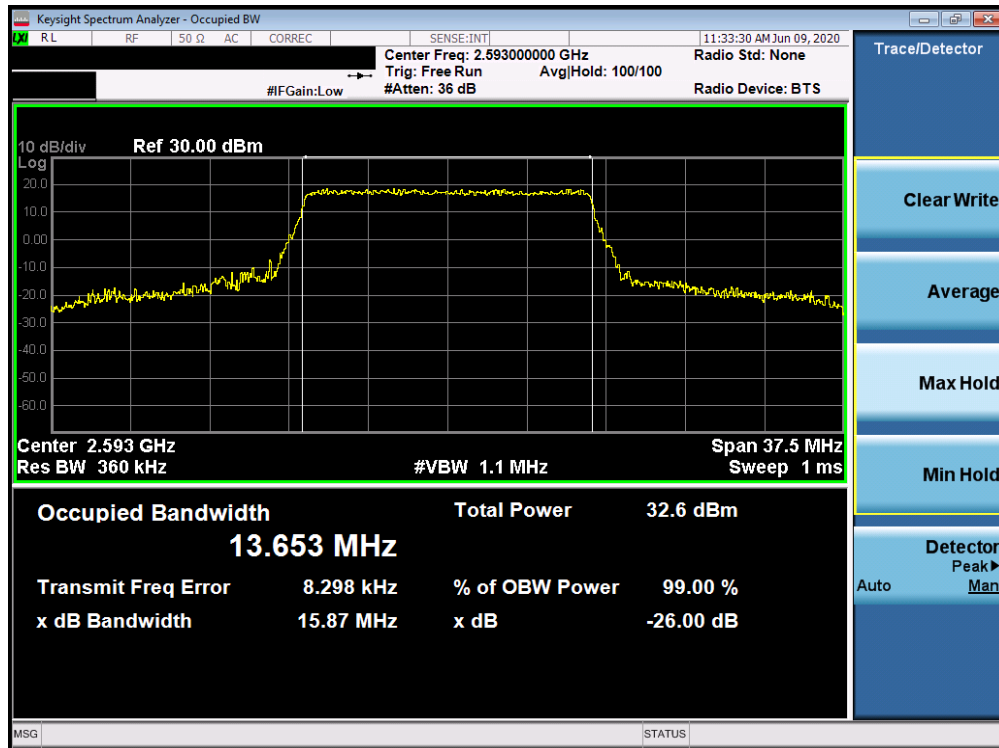


Plot 7-55. Occupied Bandwidth Plot (Band 41 - 10.0MHz QPSK - Full RB Configuration)

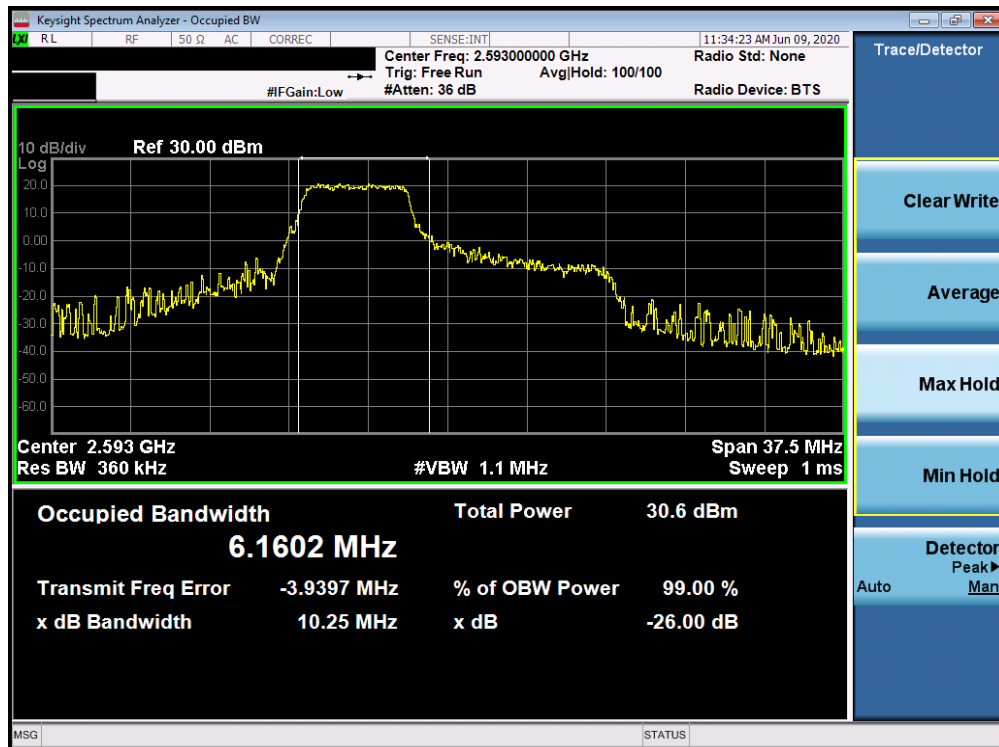


Plot 7-56. Occupied Bandwidth Plot (Band 41 - 10.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 47 of 238

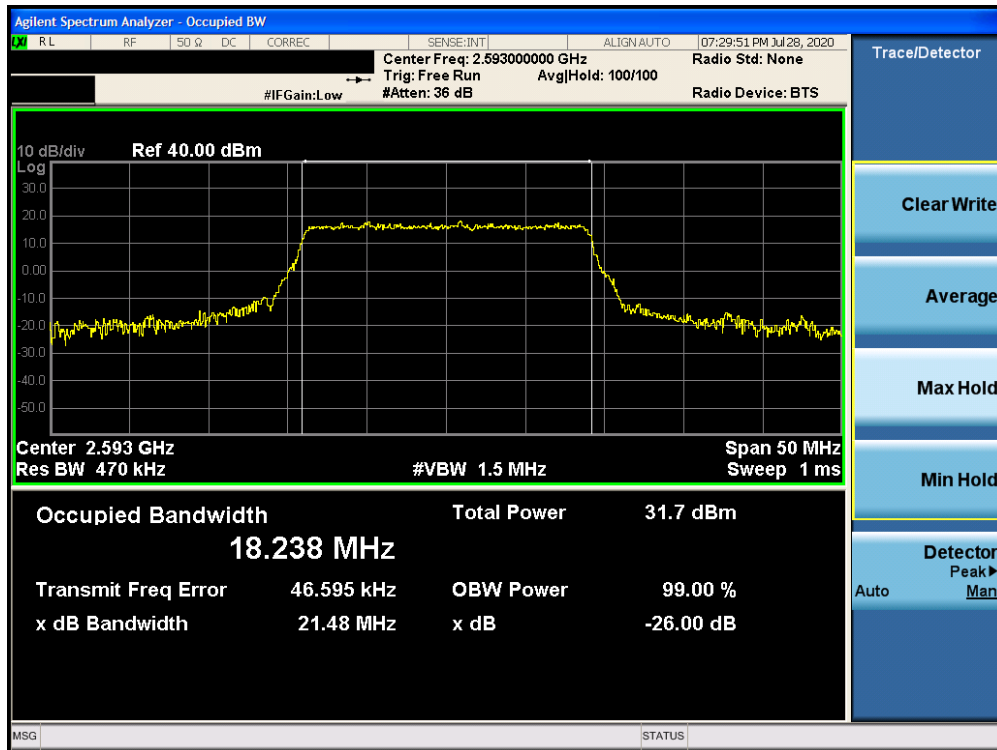


Plot 7-57. Occupied Bandwidth Plot (Band 41 - 15.0MHz QPSK - Full RB Configuration)



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

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 48 of 238



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 Configuration)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 49 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.

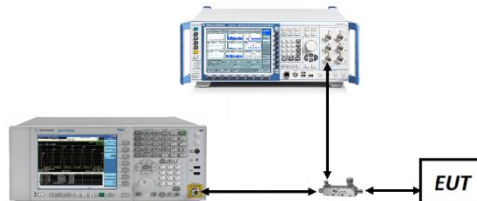


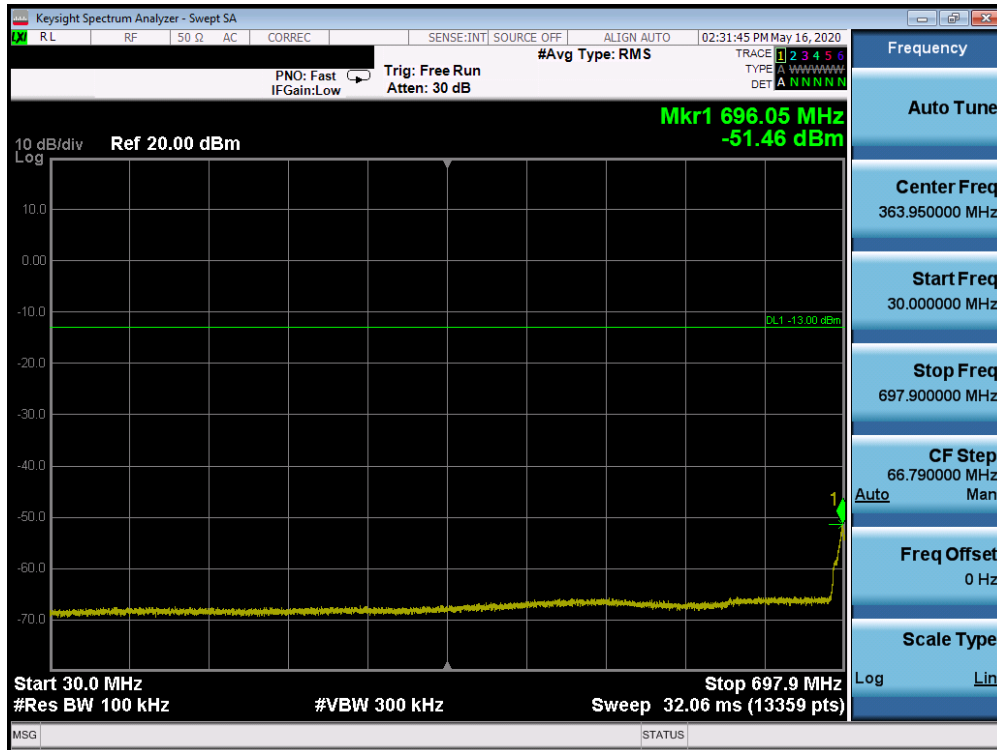
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

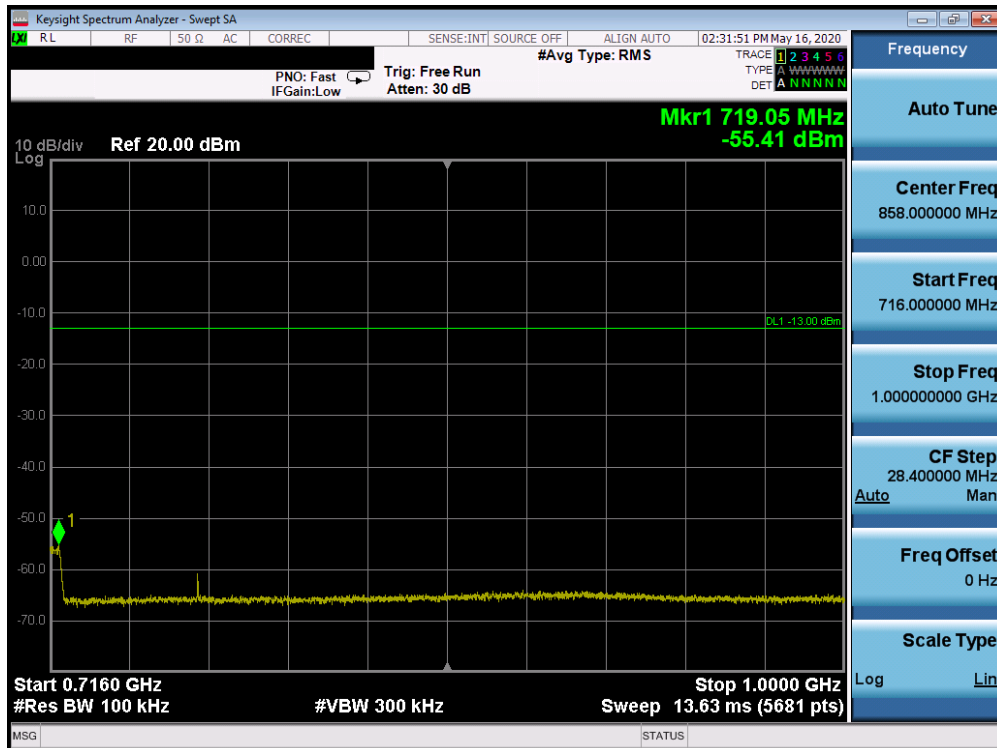
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the 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.

FCC ID: BCG-A2353	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Band 12/17

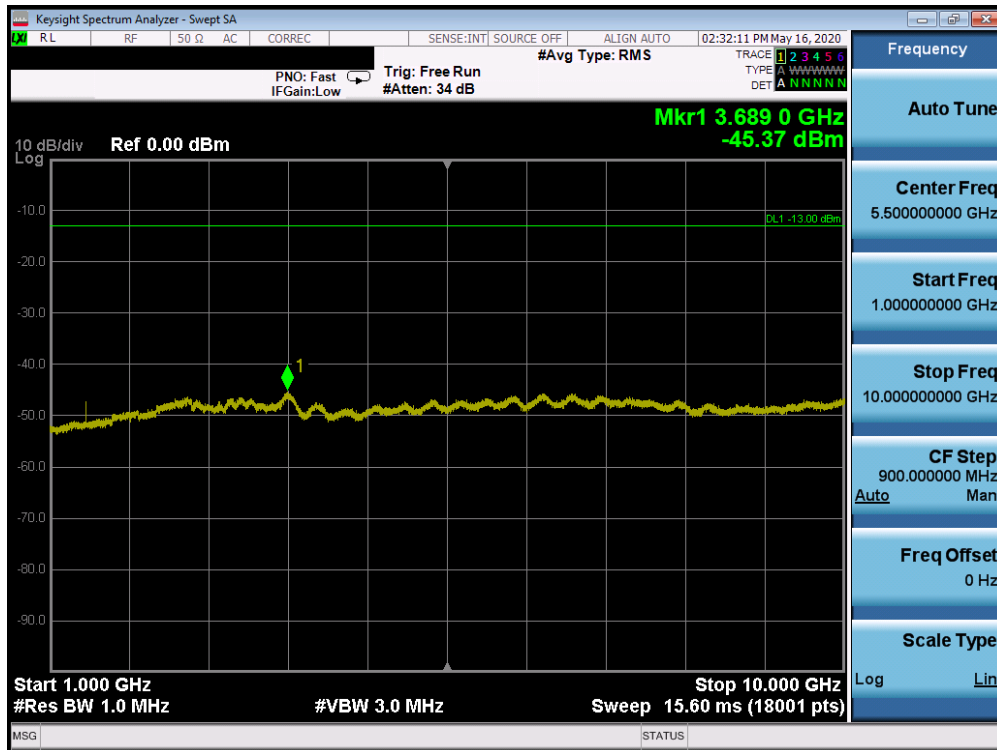


Plot 7-61. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

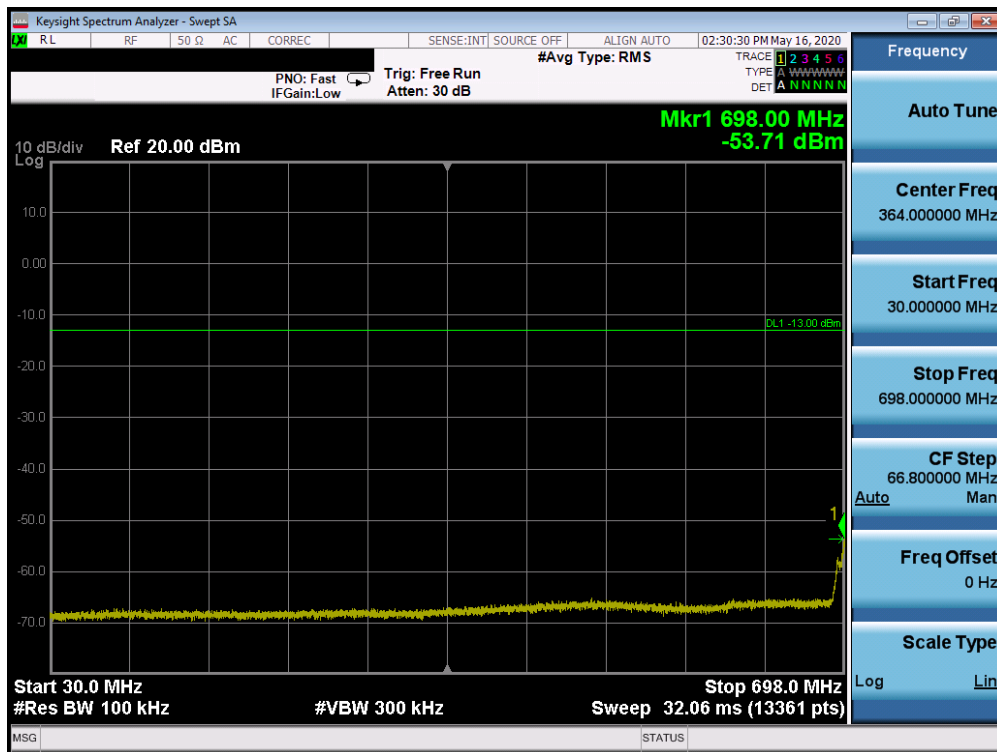


Plot 7-62. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 51 of 238

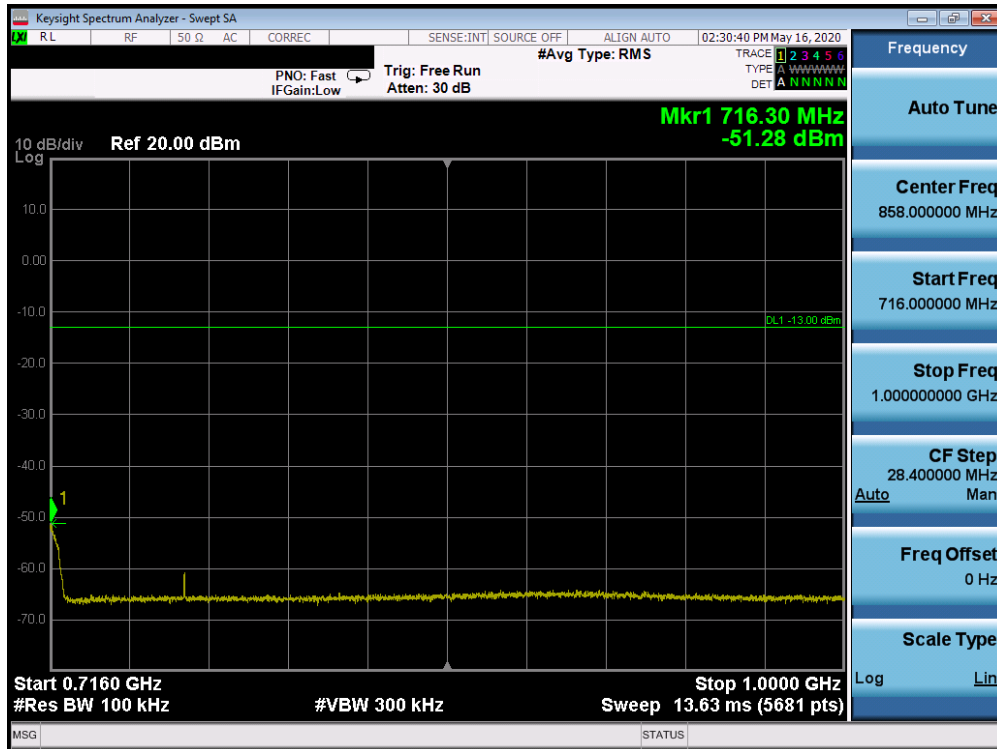


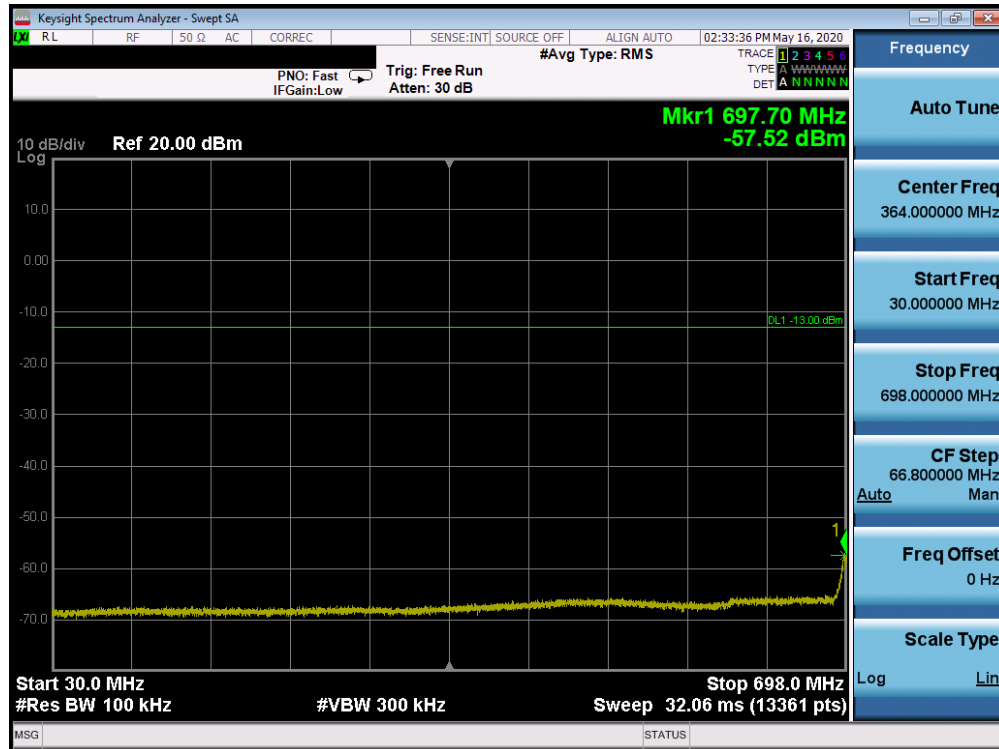
Plot 7-63. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



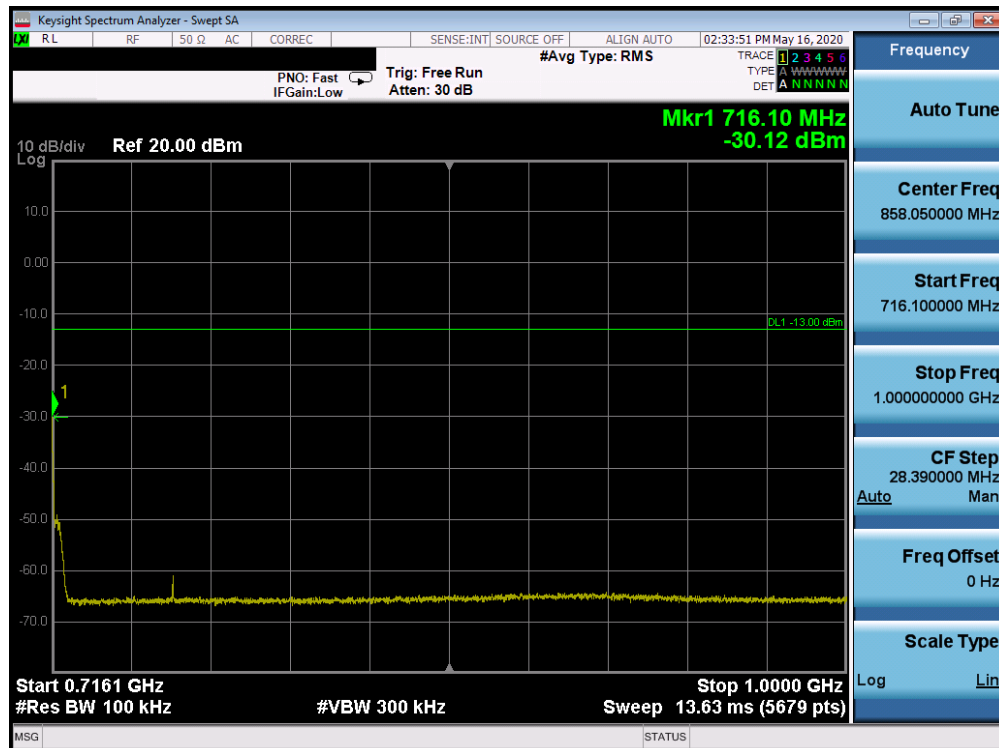
Plot 7-64. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 52 of 238





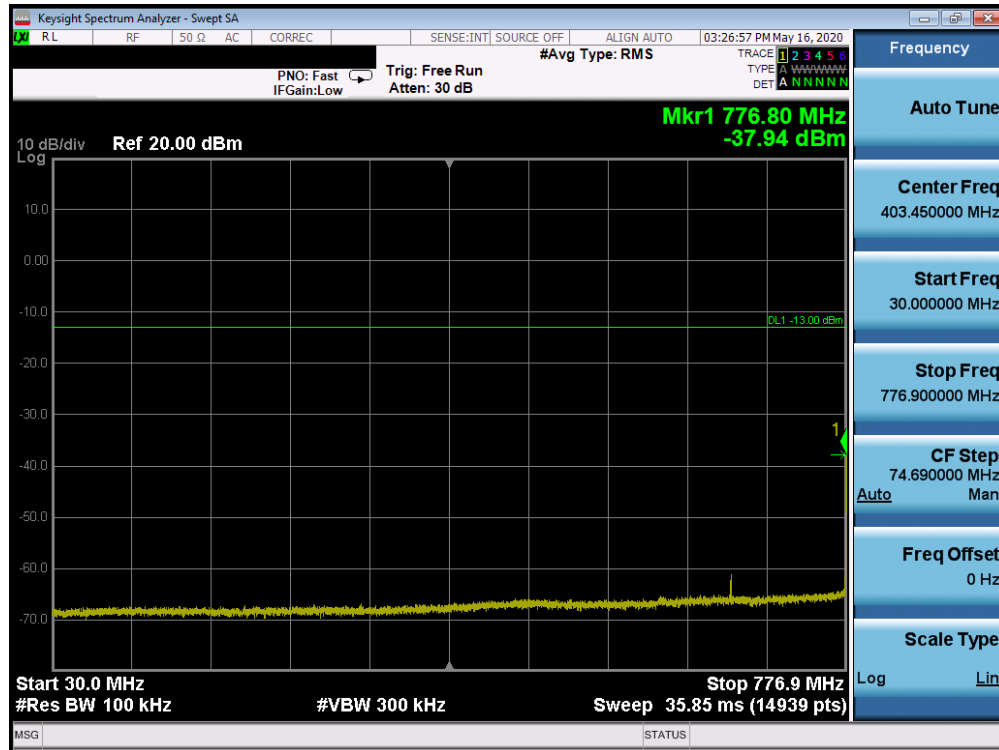
Plot 7-67. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



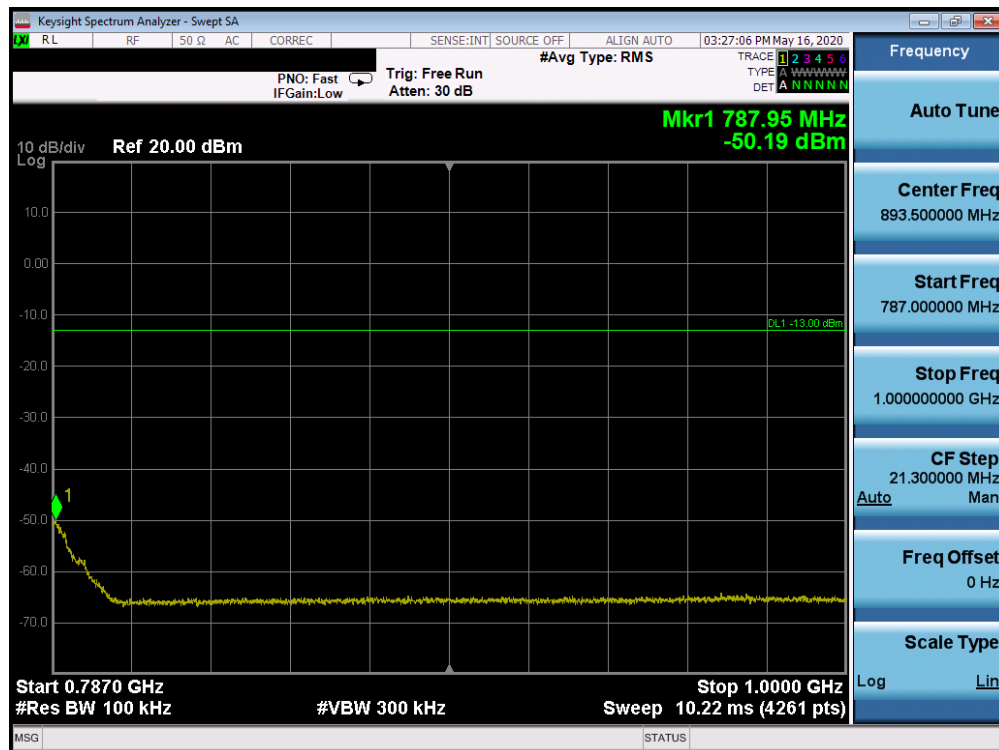
Plot 7-68. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Band 13

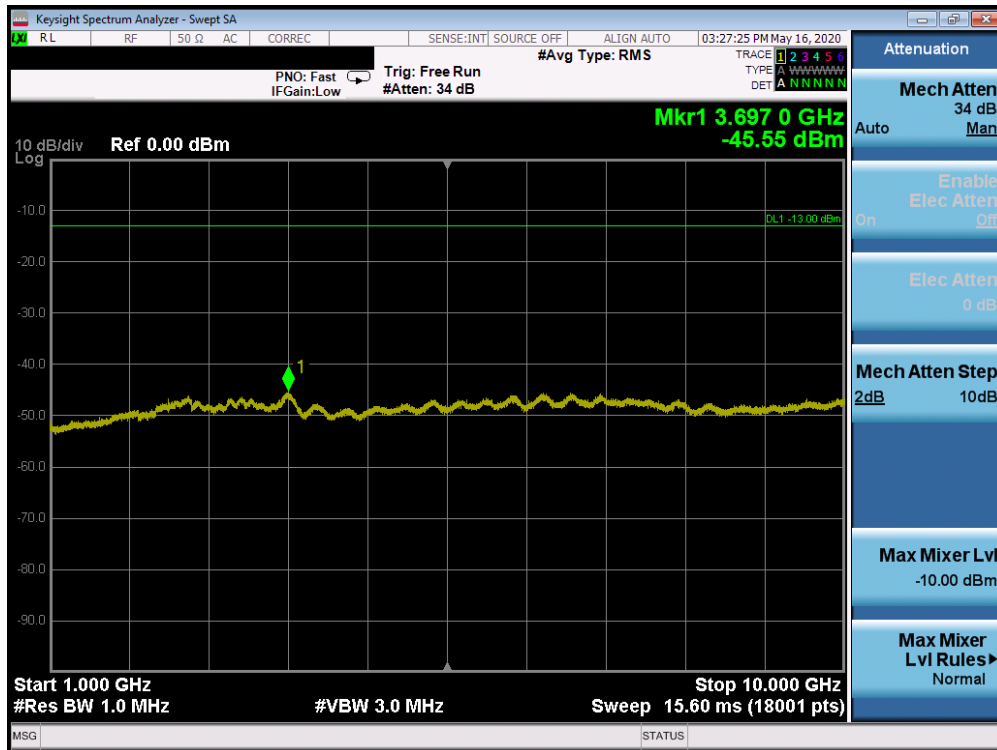


Plot 7-70. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

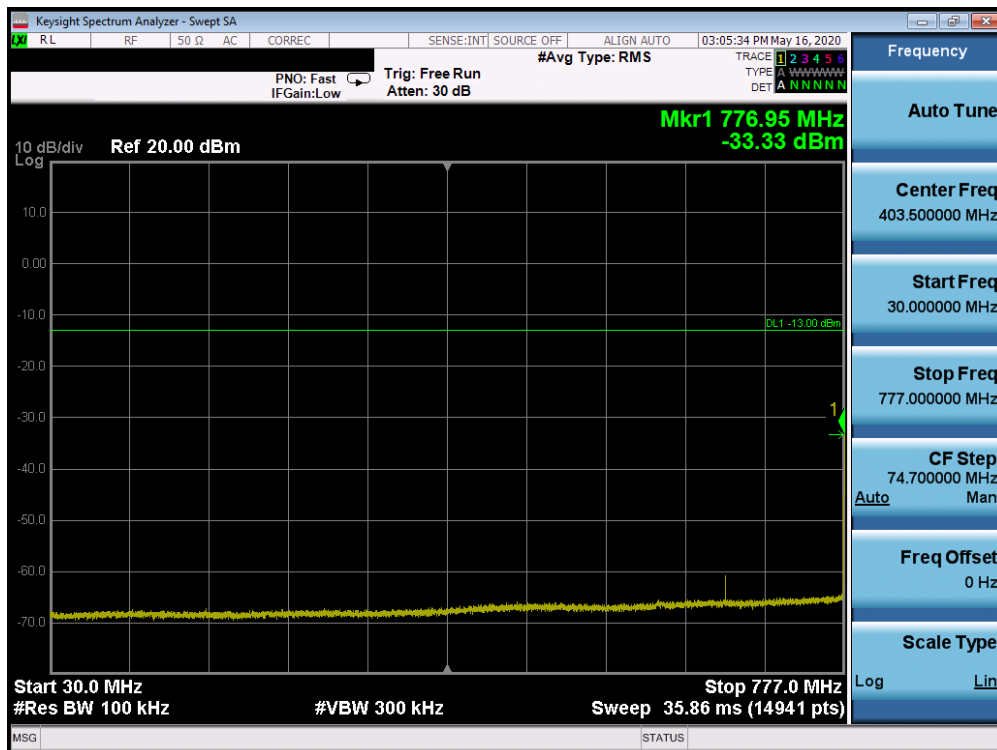


Plot 7-71. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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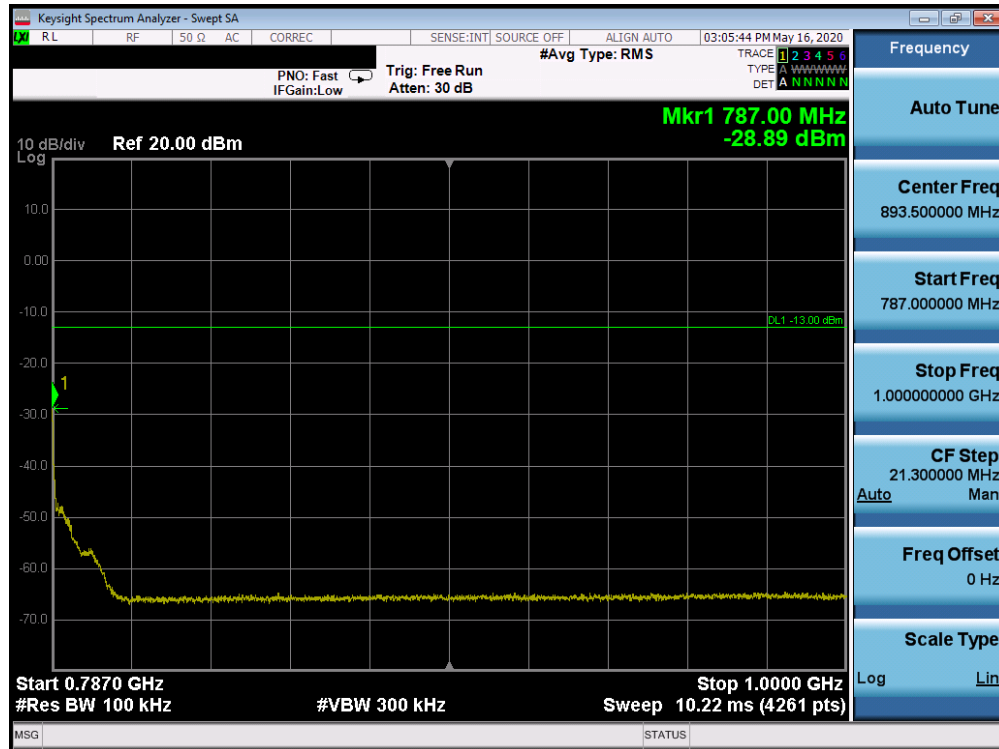


Plot 7-72. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

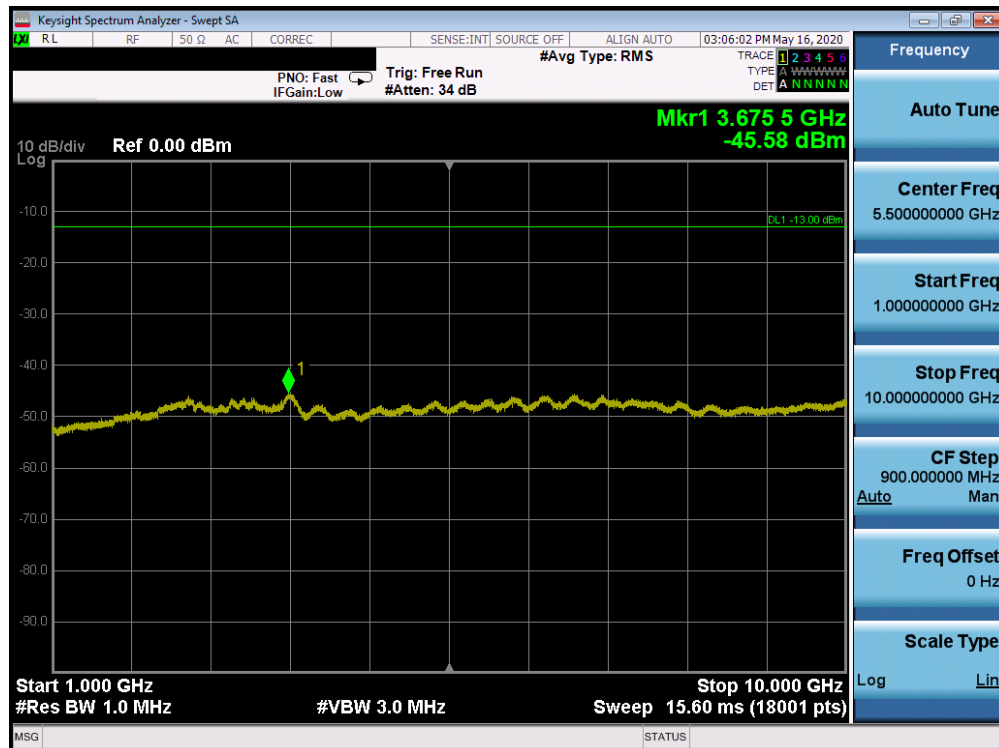


Plot 7-73. Conducted Spurious Plot (Band 13 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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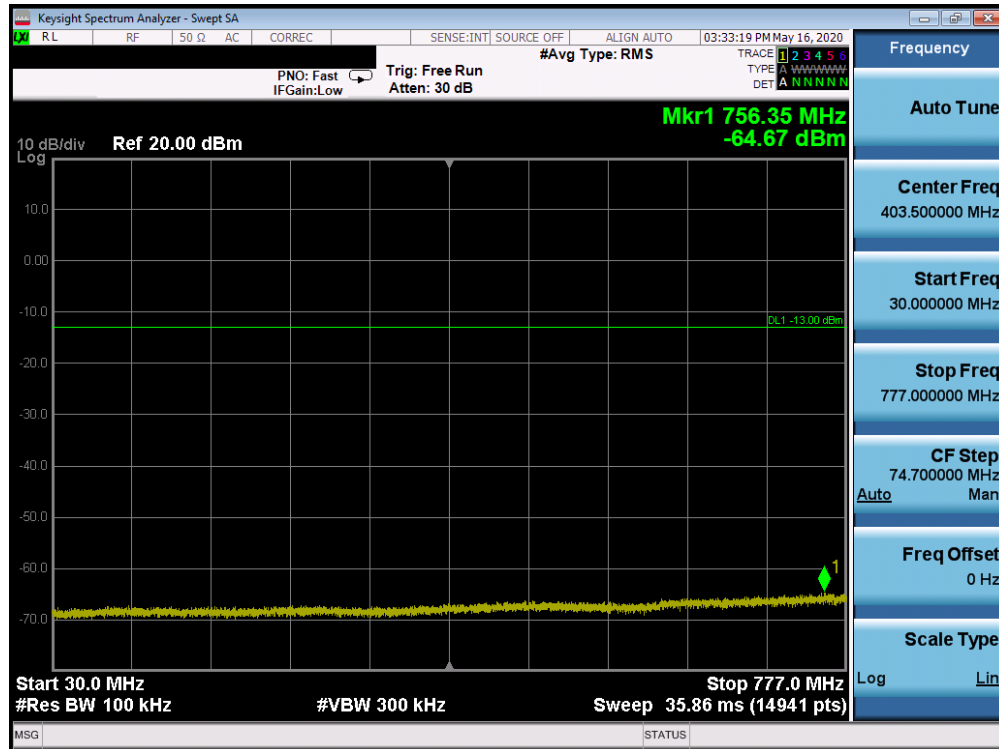


Plot 7-74. Conducted Spurious Plot (Band 13 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

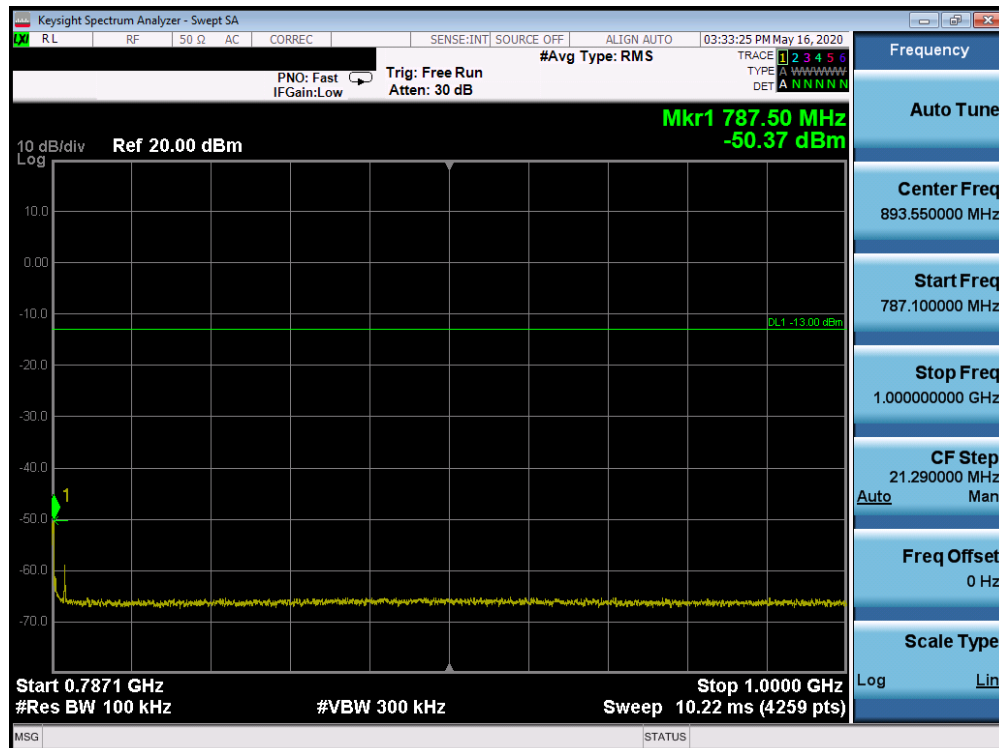


Plot 7-75. Conducted Spurious Plot (Band 13 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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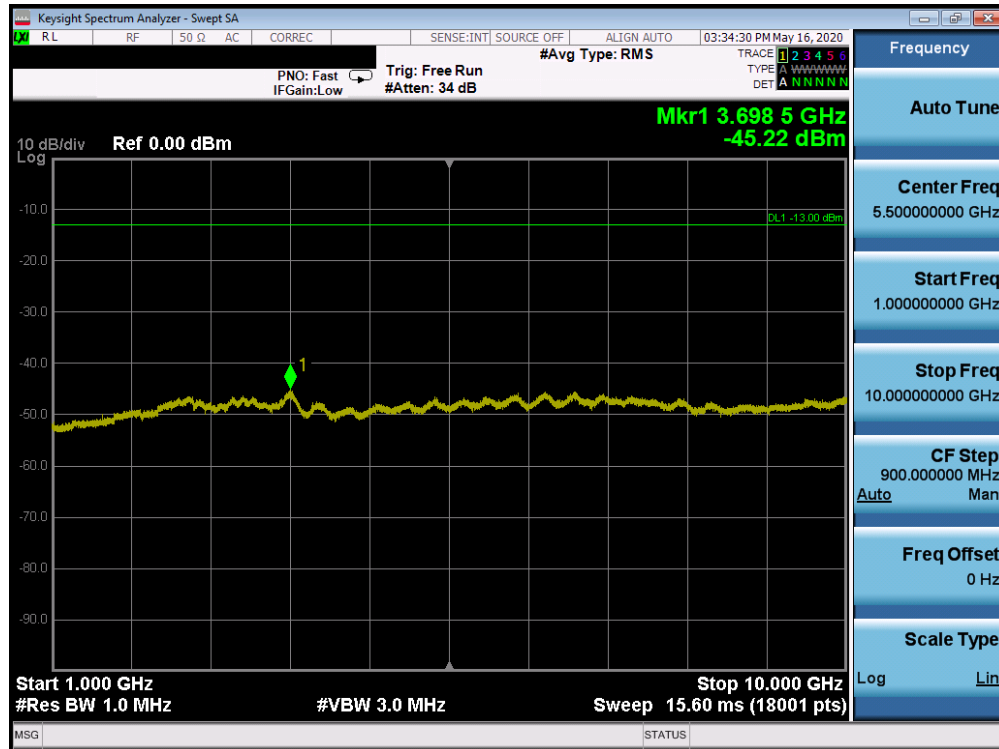


Plot 7-76. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



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

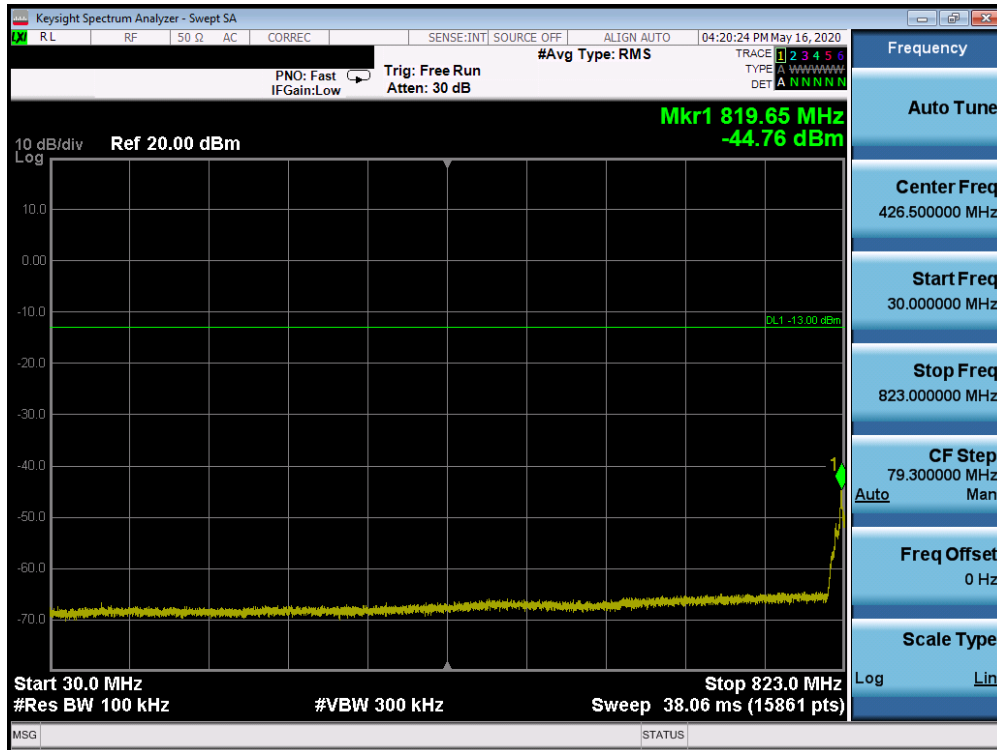
FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 59 of 238



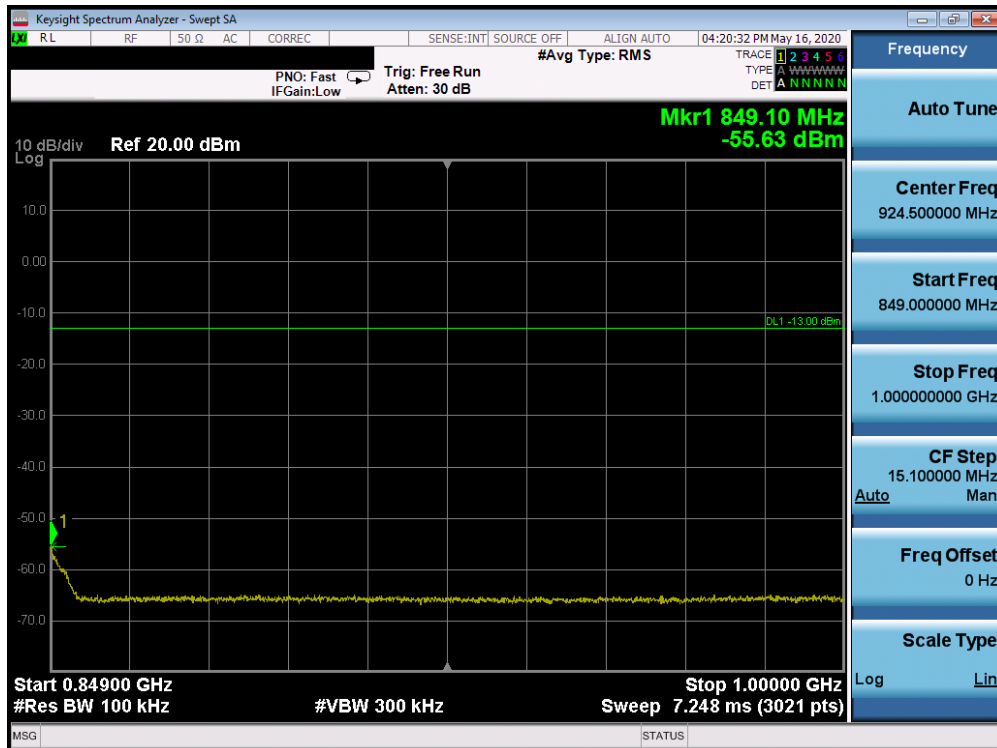
Plot 7-78. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 60 of 238

Band 26/5

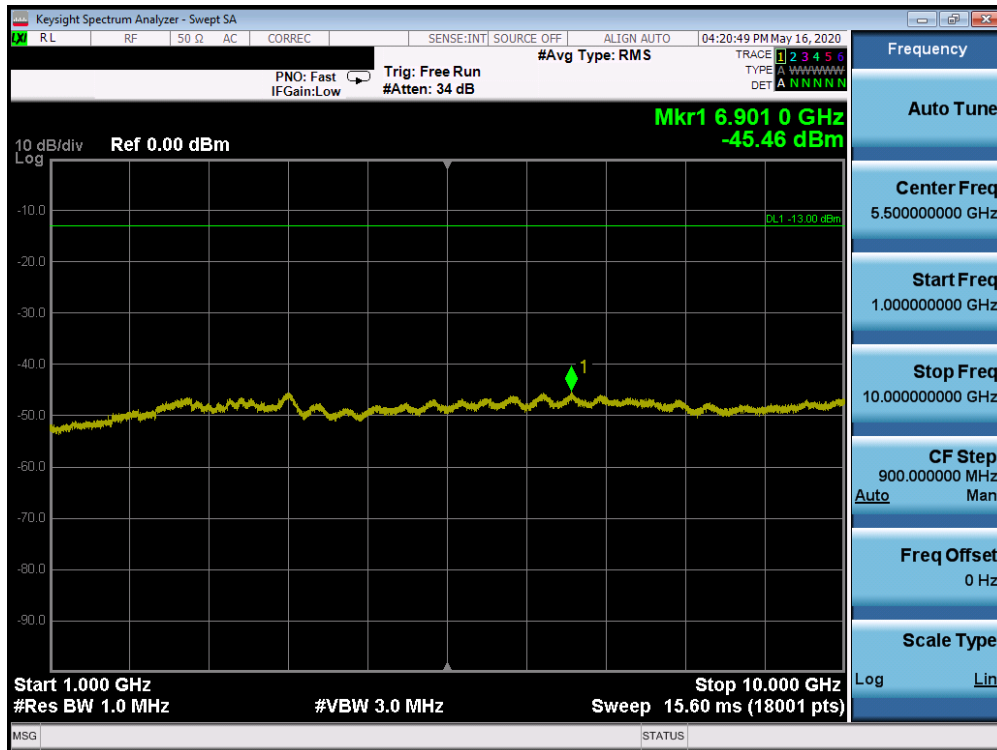


Plot 7-79. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

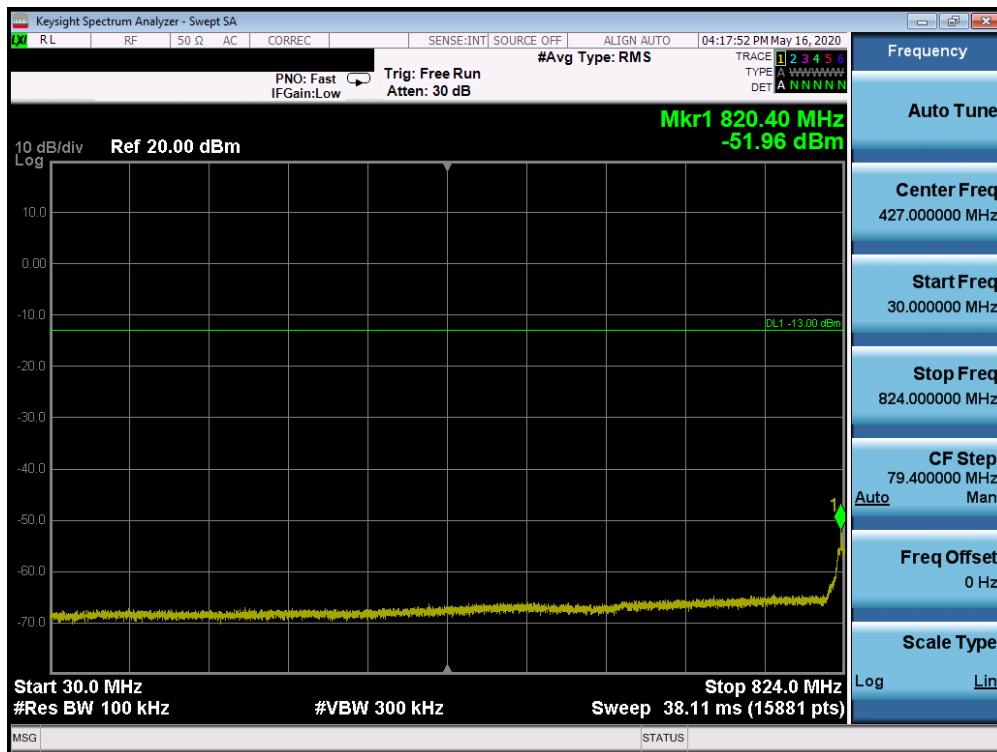


Plot 7-80. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 61 of 238

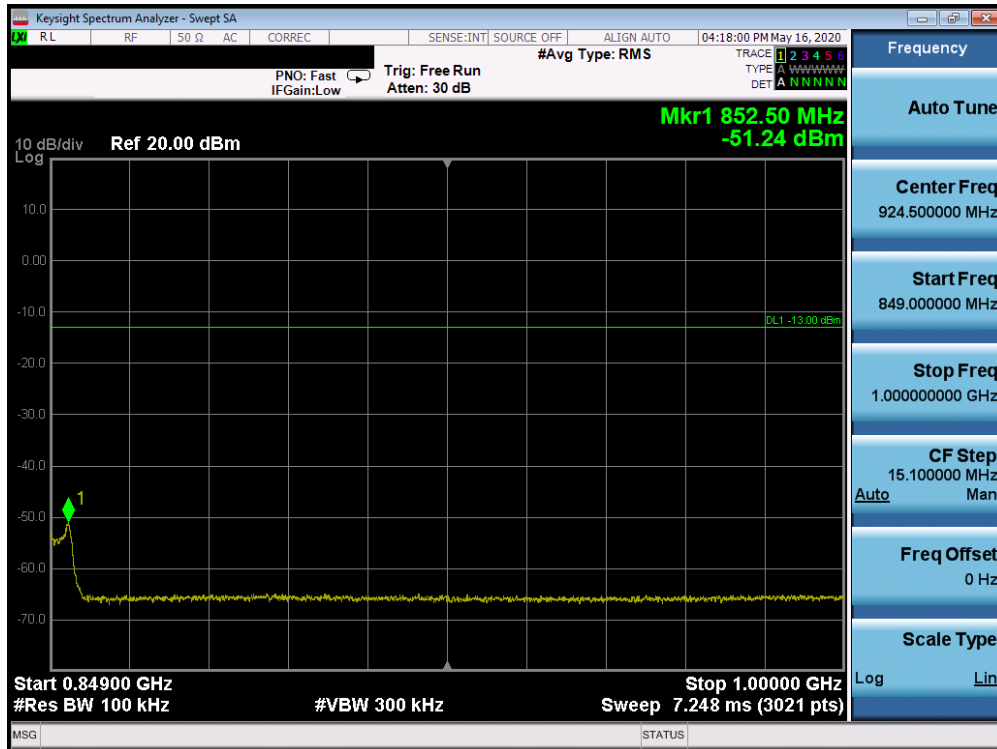


Plot 7-81. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

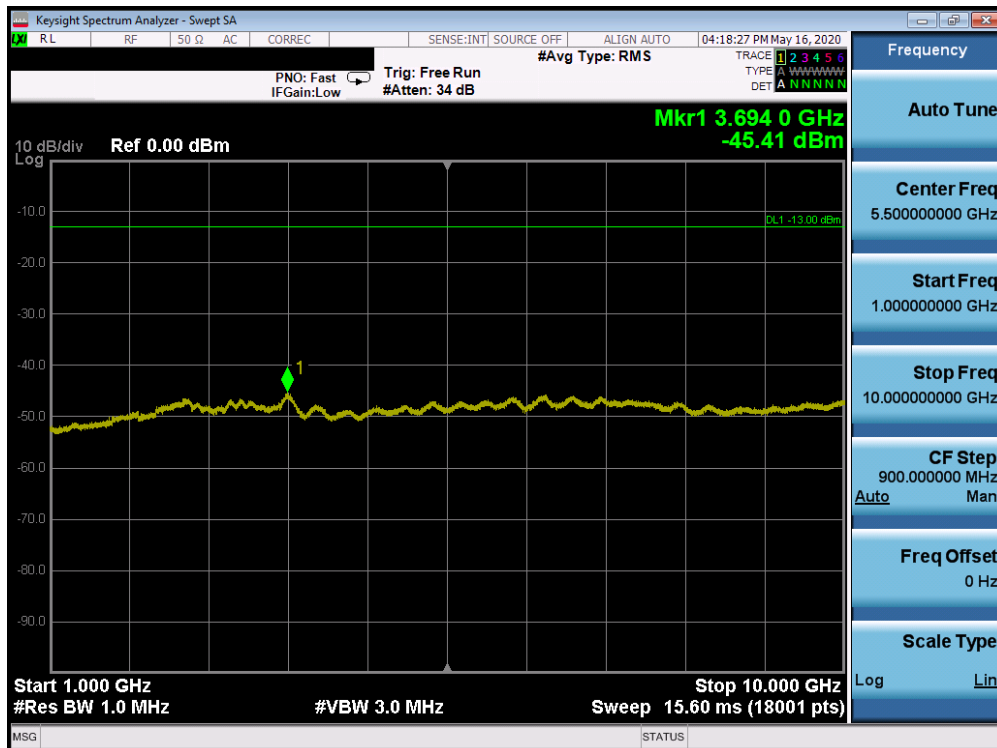


Plot 7-82. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 62 of 238

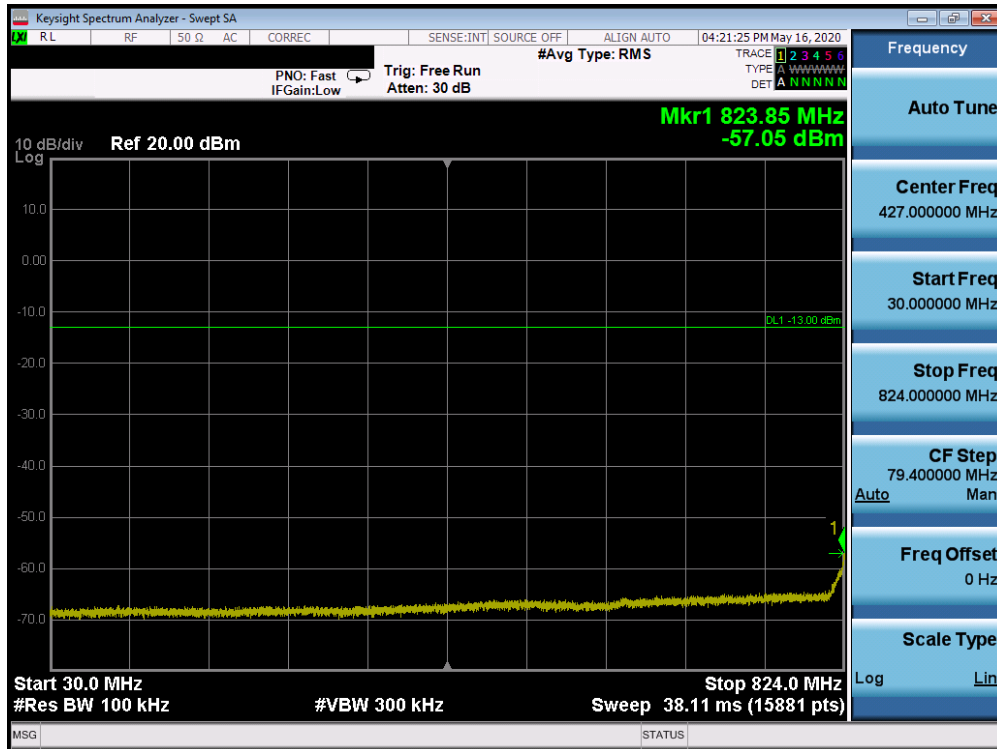


Plot 7-83. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

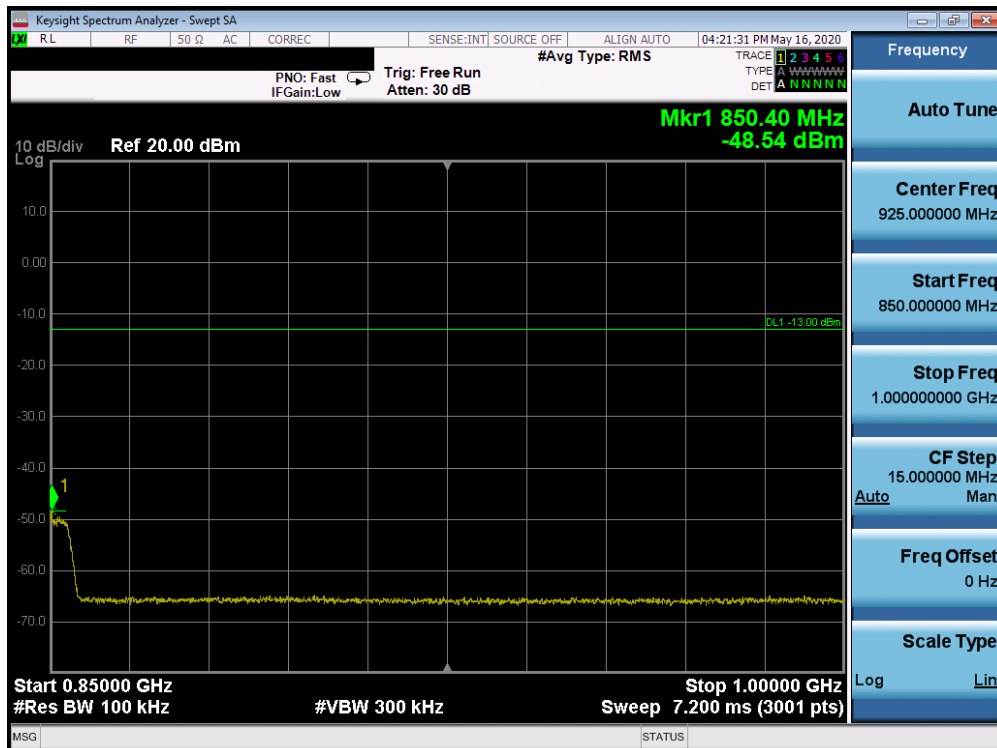


Plot 7-84. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 63 of 238

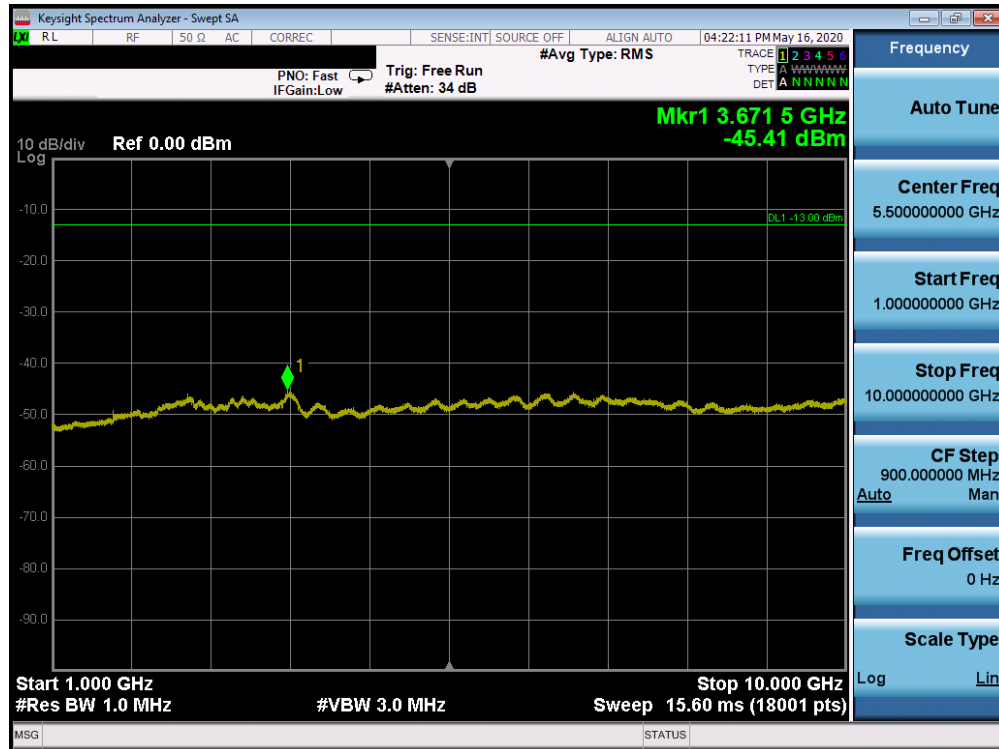


Plot 7-85. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



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

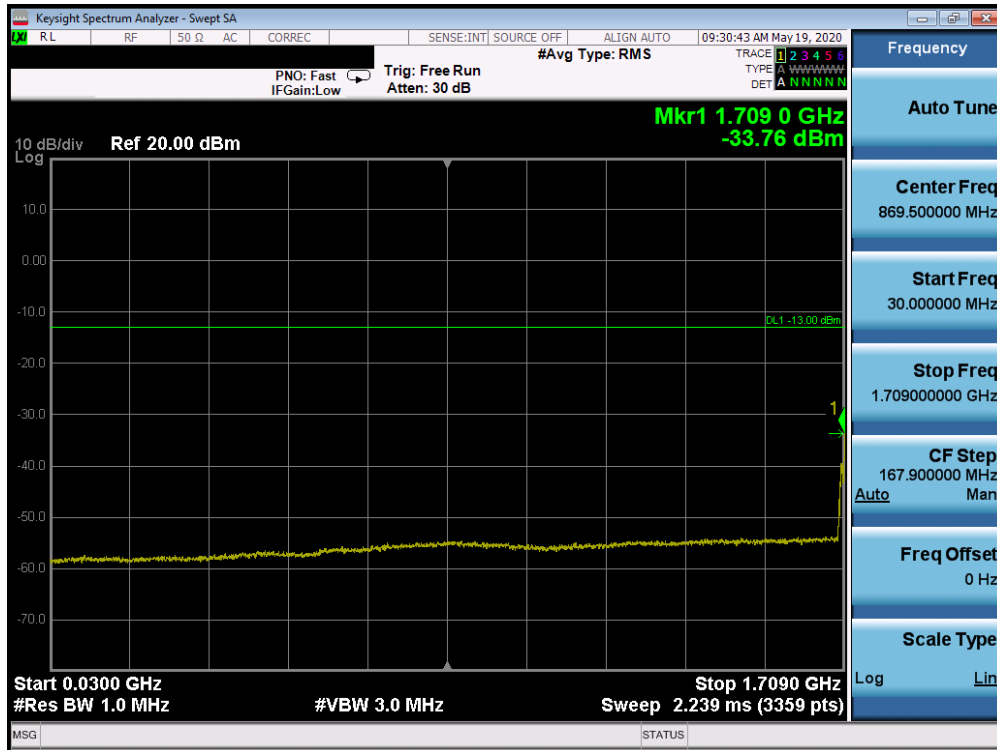
FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 64 of 238



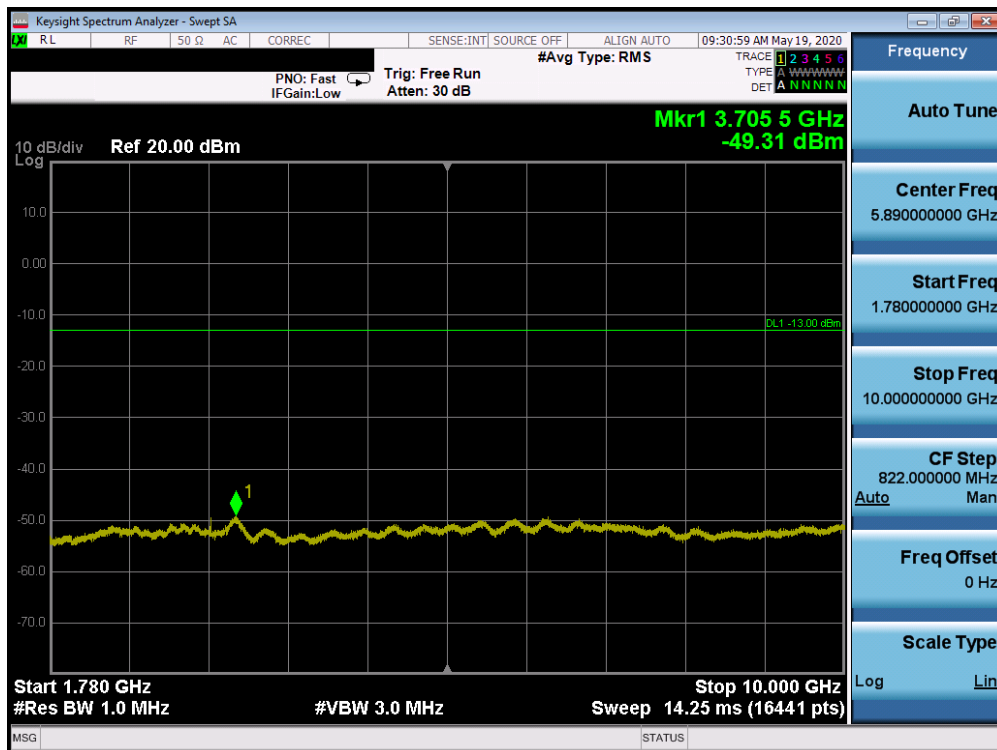
Plot 7-87. Conducted Spurious Plot (Band 26/5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 65 of 238

Band 66/4

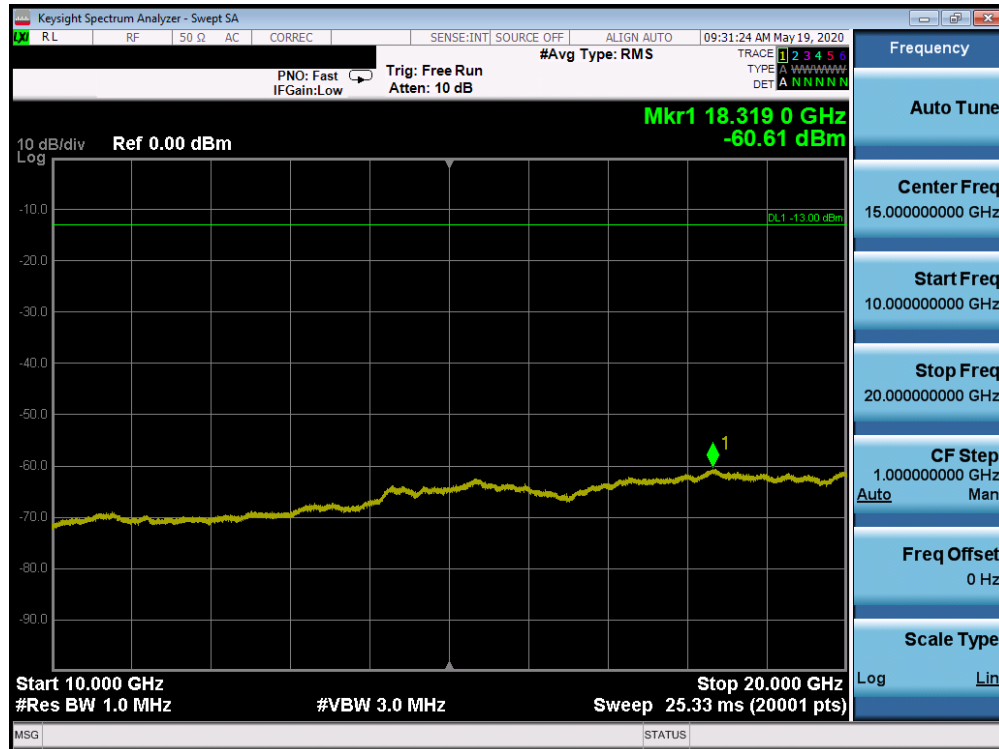


Plot 7-88. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

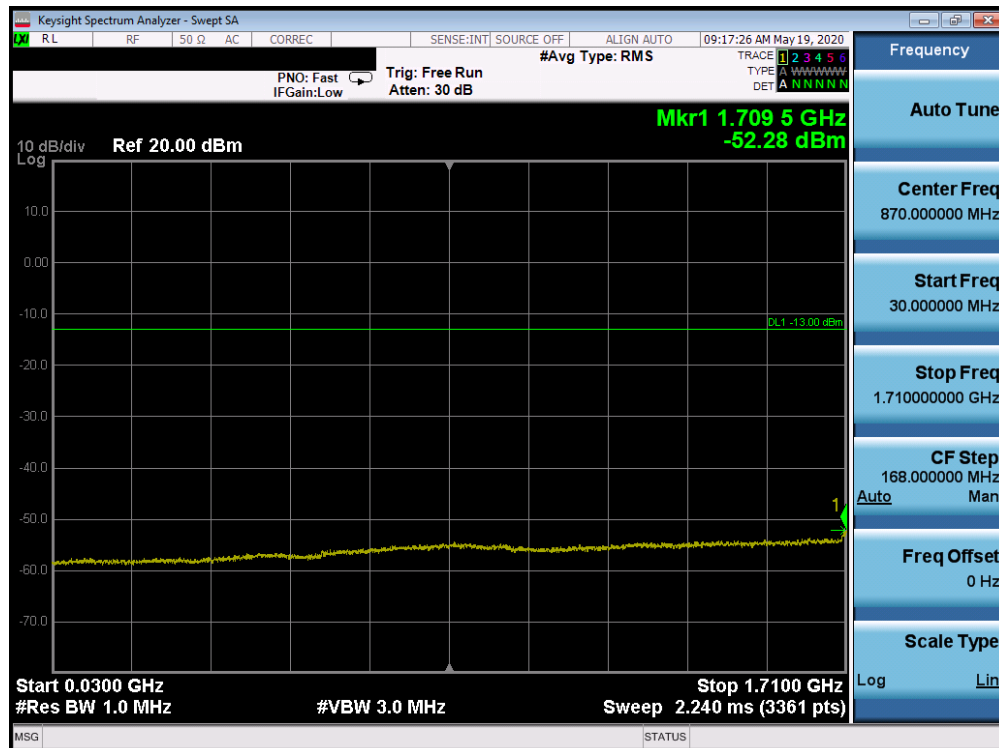


Plot 7-89. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 66 of 238

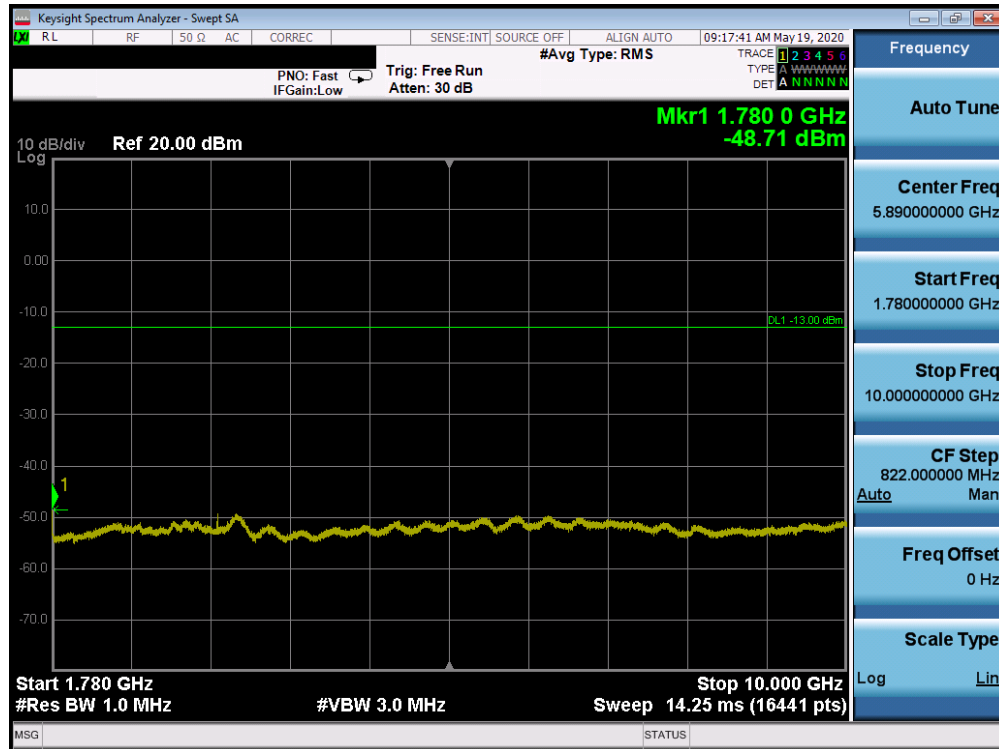


Plot 7-90. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

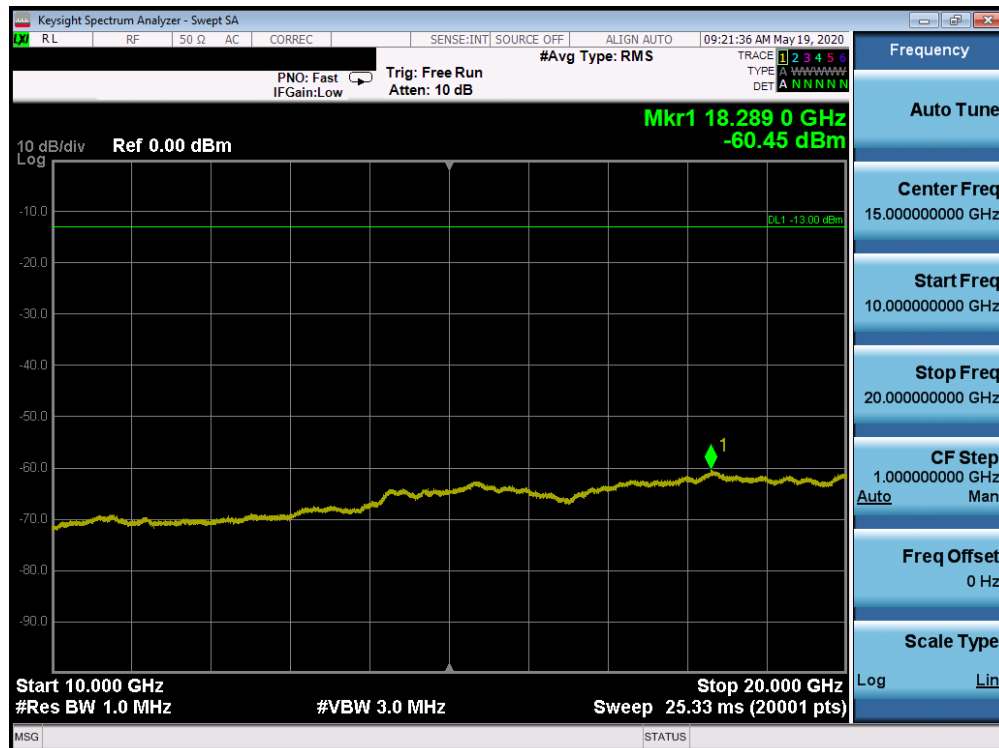


Plot 7-91. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 67 of 238



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-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270023-03.BCG	Test Dates: 06/12/2020-08/20/2020	EUT Type: Watch	Page 68 of 238