

# FCC LTE REPORT

## Certification

**Applicant Name:**  
Franklin Technology Inc.**Date of Issue:**  
February 01, 2019**Address:**  
906 JEI Platz, 186, Gasan digital 1-ro,  
Geumcheon-gu, Seoul, Korea, (08502)**Location:**  
HCT CO., LTD.,  
74, Seoicheon-ro 578beon-gil, Majang-myeon,  
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA  
**Report No.:** HCT-RF-1902-FC006**FCC ID:** XHG-T720**APPLICANT:** Franklin Technology Inc.

**Model(s):** T720  
**EUT Type:** Home Phone Connect  
**FCC Classification:** PCS Licensed Transmitter (PCB)  
**FCC Rule Part(s):** §27, §2

| Mode<br>(MHz)      | Tx Frequency<br>(MHz) | Emission<br>Designator | Modulation | EIRP              |                     |
|--------------------|-----------------------|------------------------|------------|-------------------|---------------------|
|                    |                       |                        |            | Max. Power<br>(W) | Max. Power<br>(dBm) |
| LTE – Band 41 (5)  | 2498.5 – 2687.5       | 4M51G7D                | QPSK       | 0.610             | 27.85               |
|                    |                       | 4M51W7D                | 16QAM      | 0.449             | 26.52               |
| LTE – Band 41 (10) | 2501.0 – 2685.0       | 8M97G7D                | QPSK       | 0.648             | 28.11               |
|                    |                       | 8M96W7D                | 16QAM      | 0.480             | 26.81               |
| LTE – Band 41 (15) | 2503.5 – 2682.5       | 13M4G7D                | QPSK       | 0.609             | 27.84               |
|                    |                       | 13M4W7D                | 16QAM      | 0.452             | 26.55               |
| LTE – Band 41 (20) | 2506.0 – 2680.0       | 17M9G7D                | QPSK       | 0.639             | 28.05               |
|                    |                       | 17M9W7D                | 16QAM      | 0.462             | 26.64               |

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

**Report prepared by : Jae Ryang Do**  
**Engineer of Telecommunication Testing Center**

**Report approved by : Jong Seok Lee**  
**Manager of Telecommunication Testing Center**

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## Version

| TEST REPORT NO.   | DATE              | DESCRIPTION             |
|-------------------|-------------------|-------------------------|
| HCT-RF-1902-FC006 | February 01, 2019 | - First Approval Report |
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|                   |                   |                         |
|                   |                   |                         |

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# MEASUREMENT REPORT

## 1. GENERAL INFORMATION

|                            |   |
|----------------------------|---|
| <b>Applicant Name:</b>     | Franklin Technology Inc.  |
| <b>Address:</b>            | 906 JEI Platz, 186, Gasan digital 1-ro, Geumcheon-gu, Seoul, Korea, (08502)                                 |
| <b>FCC ID:</b>             | XHG-T720  |
| <b>Application Type:</b>   | Certification   |
| <b>FCC Classification:</b> | PCS Licensed Transmitter (PCB)  |
| <b>FCC Rule Part(s):</b>   | §27, §2   |
| <b>EUT Type:</b>           | Home Phone Connect  |
| <b>Model(s):</b>           | T720  |
| <b>Tx Frequency:</b>       | 2498.5 – 2687.5 : 5 MHz<br>2501.0 – 2685.0 : 10 MHz<br>2503.5 – 2682.5 : 15 MHz<br>2506.0 – 2680.0 : 20 MHz |
| <b>Date(s) of Tests:</b>   | December 26, 2018 ~ January 28, 2019  |
| <b>Peak. Ant gain:</b>     | 5.194 dBi   |

## **2. INTRODUCTION**

### **2.1. Description of EUT**

The EUT was a VoLTE Home Phone Connect with CDMA/EVDO Rev0/A and LTE.

### **2.2. MEASURING INSTRUMENT CALIBRATION**

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### **2.3. TEST FACILITY**

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

### **3. DESCRIPTION OF TESTS**

#### **3.1 TEST PROCEDURE**

| <b>Test Description</b>   | <b>Test Procedure Used</b>   |
|---|--|
| Occupied Bandwidth  | - KDB 971168 D01 v03 – Section 4.2<br>- ANSI C63.26-2015 – Section 5.4.4   |
| Band Edge   | - KDB 971168 D01 v03 – Section 6.0<br>- ANSI C63.26-2015 – Section 5.7   |
| Spurious and Harmonic Emissions at Antenna Terminal             | - KDB 971168 D01 v03 – Section 6.0<br>- ANSI C63.26-2015 – Section 5.7   |
| Peak- to- Average Ratio   | - KDB 971168 D01 v03 – Section 5.7<br>- ANSI C63.26-2015 – Section 5.2.3.4<br>- ANSI C63.26-2015 – Section 5.2.6(only GSM) |
| Frequency stability   | - ANSI C63.26-2015 – Section 5.6   |
| Effective Radiated Power/<br>Effective Isotropic Radiated Power | - KDB 971168 D01 v03 – Section 5.2<br>- ANSI C63.26-2015 – Section 5.2<br>- ANSI/TIA-603-E-2016 – Section 2.2.17           |
| Radiated Spurious and Harmonic Emissions                        | - KDB 971168 D01 v03 – Section 5.8<br>- ANSI/TIA-603-E-2016 – Section 2.2.12   |

### 3.2 RADIATED POWER

#### Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17.

#### Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW  $\geq$  3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

#### Test Note

1. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission.
2. 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 and the previously recorded signal was duplicated.

The power is calculated by the following formula;

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{cable loss } (\text{dB}) + \text{antenna gain } (\text{dB})$$

Where:  $P_d$  is the dipole equivalent power and  $P_g$  is the generator output power into the substitution antenna.

3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value.

These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

4. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
5. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### 3.3 RADIATED SPURIOUS EMISSIONS

#### Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA-603-E-2016.

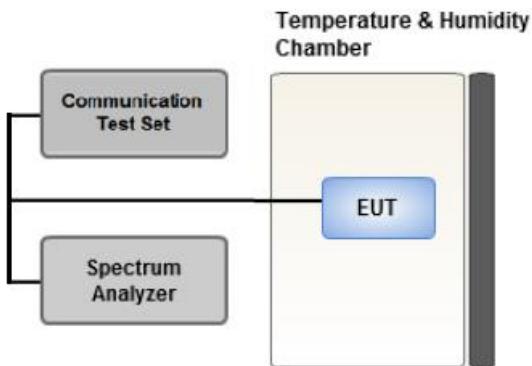
#### Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq$  3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points > 2 x span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High
9. Frequency range : We are performed all frequency to 10<sup>th</sup> harmonics from 9 kHz.

#### Test Note

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.  
The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data

### 3.4 OCCUPIED BANDWIDTH.



#### Test setup

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

The EUT makes a call to the communication simulator.

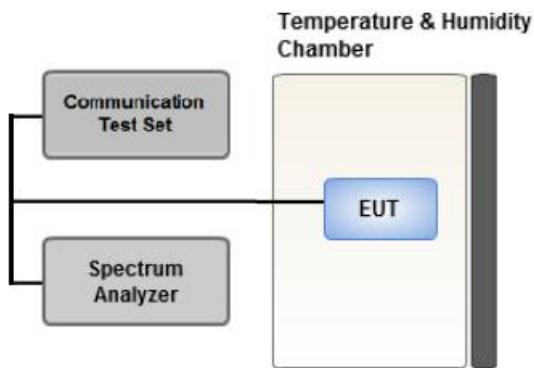
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

#### 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 x 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

### 3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



#### Test setup

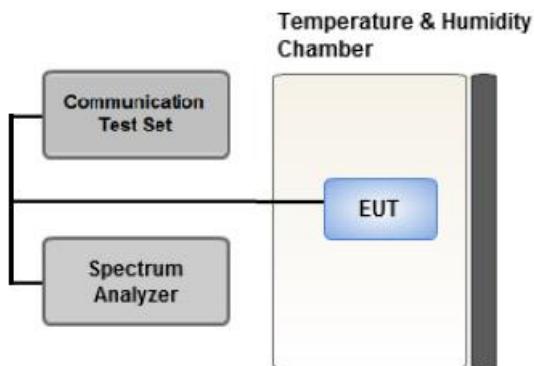
#### Test Overview

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.

#### Test Settings

1. RBW = 1 MHz
2. VBW  $\geq$  3 MHz
3. Detector = Peak
4. Trace Mode = max hold
5. Sweep time = auto
6. Number of points in sweep  $\geq$  2 \* Span / RBW

### 3.6 BAND EDGE



#### Test setup

#### Test Overview

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.

#### Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq 2 \times \text{Span}/\text{RBW}$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

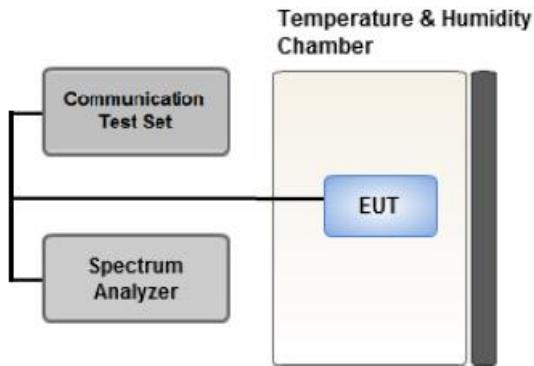
#### Test Notes

According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of The authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB. 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.

All measurements were done at 2 channels (low and high operational frequency range.)

The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

### 3.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



#### Test setup

#### Test Overview

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015.

The frequency stability of the transmitter is measured by:

1. Temperature:

The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

2. Primary Supply Voltage:

- Unless otherwise specified, vary primary supply voltage from 85% to 115% of the nominal value for other than hand carried battery equipment.
- For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

#### Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

**3.8 WORST CASE(RADIATED TEST)**

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
- The worst case is reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data.
- Please refer to the table below.

[ Worst case ]

| Test Description                         | Modulation | RB size | RB offset | Axis |
|--|------------|---------|-----------|------|
| Radiated Spurious and Harmonic Emissions | QPSK       | 1       | 0         | X    |

**3.9 WORST CASE(CONDUCTED TEST)**

[ Worst case ]

| Test Description                                    | Modulation      | Bandwidth (MHz)  | Frequency            | RB size | RB offset |
|---|-----------------|------------------|----------------------|---------|-----------|
| Occupied Bandwidth                                  | QPSK,<br>16QAM, | 5, 10, 15,<br>20 | Mid                  | Full RB | 0         |
| Band Edge   | * QPSK          | 5                | Low                  | 1       | 0         |
|   |                 |                  | High                 | 1       | 24        |
|   |                 | 10               | Low                  | 1       | 0         |
|   |                 |                  | High                 | 1       | 49        |
|   |                 | 15               | Low                  | 1       | 0         |
|   |                 |                  | High                 | 1       | 74        |
|   |                 | 20               | Low                  | 1       | 0         |
|   |                 |                  | High                 | 1       | 99        |
|   |                 | 5, 10, 15,<br>20 | Low,<br>High         | Full RB | 0         |
|   |                 |                  |                      |         |           |
| Spurious and Harmonic Emissions at Antenna Terminal | * QPSK          | 5, 10, 15,<br>20 | Low,<br>Mid,<br>High | 1       | 0         |

\* Worst case : Of all modulation, We have tested modulation of the high Conducted Output Power.

## 4. LIST OF TEST EQUIPMENT

| Manufacture      | Model/ Equipment                                     | Serial Number | Calibration Date | Calibration Interval | Calibration Due |
|------------------|--|---------------|------------------|----------------------|-----------------|
| REOHDE & SCHWARZ | SCU 18 / AMPLIFIER                                   | 10094         | 04/17/2018       | Annual               | 04/17/2019      |
| Wainwright       | WHK1.2/15G-10EF/H.P.F                                | 4             | 04/04/2018       | Annual               | 04/04/2019      |
| Wainwright       | WHK3.3/18G-10EF/H.P.F                                | 2             | 04/04/2018       | Annual               | 04/04/2019      |
| Hewlett Packard  | 11667B / Power Splitter(DC~26.5 GHz)                 | 5001          | 06/07/2018       | Annual               | 06/07/2019      |
| Agilent          | E3632A/DC Power Supply                               | KR75303243    | 05/09/2018       | Annual               | 05/09/2019      |
| Schwarzbeck      | UHAP/ Dipole Antenna                                 | 557           | 03/31/2017       | Biennial             | 03/31/2019      |
| Schwarzbeck      | UHAP/ Dipole Antenna                                 | 558           | 03/31/2017       | Biennial             | 03/31/2019      |
| ESPEC            | SU-642 / Chamber                                     | 93000718      | 08/07/2018       | Annual               | 08/07/2019      |
| Schwarzbeck      | BBHA 9120D/ Horn Antenna(1~18GHz)                    | 147           | 09/14/2018       | Annual               | 09/14/2019      |
| Schwarzbeck      | BBHA 9120D/ Horn Antenna(1~18GHz)                    | 9120D-1298    | 10/04/2018       | Annual               | 10/04/2019      |
| Schwarzbeck      | BBHA 9170/ Horn Antenna(15~40GHz)                    | BBHA9170342   | 04/25/2017       | Biennial             | 04/25/2019      |
| Schwarzbeck      | BBHA 9170/ Horn Antenna(15~40GHz)                    | BBHA9170124   | 04/25/2017       | Biennial             | 04/25/2019      |
| Agilent          | N9020A/Signal Analyzer(10Hz~26.5GHz)                 | MY52090906    | 06/08/2018       | Annual               | 06/08/2019      |
| Hewlett Packard  | 8493C/ATTENUATOR(20dB)                               | 17280         | 06/21/2018       | Annual               | 06/21/2019      |
| REOHDE & SCHWARZ | FSV40/Spectrum Analyzer(10Hz~40GHz)                  | 100931        | 10/22/2018       | Annual               | 10/22/2019      |
| Agilent          | 8960 (E5515C)/ Base Station                          | MY48360800    | 09/27/2018       | Annual               | 09/27/2019      |
| Anritsu Corp.    | MT8820C/Wideband Radio Communication Tester          | 6201026545    | 02/08/2018       | Annual               | 02/08/2019      |
| Schwarzbeck      | FMZB1513/ Loop Antenna(9kHz~30MHz)                   | 1513-175      | 08/23/2018       | Biennial             | 08/23/2020      |
| Schwarzbeck      | VULB9160/ Biog Antenna                               | 9160-3368     | 08/09/2018       | Biennial             | 08/09/2020      |
| Schwarzbeck      | VULB9160/ Hybrid Antenna                             | 760           | 04/06/2017       | Biennial             | 04/06/2019      |
| REOHDE & SCHWARZ | SMB100A/ SIGNAL GENERATOR (100kHz~40GHz)             | 177633        | 07/19/2018       | Annual               | 07/19/2019      |
| REOHDE & SCHWARZ | ESU40 / EMI TEST RECEIVER                            | 100524        | 07/27/2018       | Annual               | 07/27/2019      |
| HCT CO., LTD.,   | FCC LTE Mobile Conducted RF Automation Test Software | -             | -                | -                    | -               |

**Note:**

- Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

## **5. 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 data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Parameter                                | Expanded Uncertainty ( $\pm \text{dB}$ ) |
|--|--|
| Conducted Disturbance (150 kHz ~ 30 MHz) | 1.82                                     |
| Radiated Disturbance (9 kHz ~ 30 MHz)    | 3.40                                     |
| Radiated Disturbance (30 MHz ~ 1 GHz)    | 4.80                                     |
| Radiated Disturbance (1 GHz ~ 18 GHz)    | 5.70                                     |
| Radiated Disturbance (18 GHz ~ 40 GHz)   | 5.71                                     |

## 6. SUMMARY OF TEST RESULTS

### 6.1 Test Condition : Conducted Test

| Test Description   | FCC Part Section(s)      | Test Limit  | Test Result |
|--|--------------------------|---|-------------|
| Occupied Bandwidth   | §2.1049                  | N/A   | PASS        |
| Band Edge / Spurious and Harmonic Emissions at Antenna Terminal. | §2.1051,<br>§27.53(m)(4) | < 40 + 10log10 (P[Watts])<br>at Channel edges<br>< 43 + 10log10 (P[Watts])<br>between 5 and X MHz<br>from Channel edges<br>< 55 + 10log10 (P[Watts])<br>beyond X MHz beyond<br>from Channel edges | PASS        |
| Equivalent Isotropic Radiated Power                              | §27.50(h)(2)             | < 2 Watts max. EIRP   | PASS        |
| Frequency stability / variation of ambient temperature           | §2.1055,<br>§27.54       | Emission must remain in band  | PASS        |

### 6.2 Test Condition : Radiated Test

| Test Description                         | FCC Part Section(s)      | Test Limit  | Test Result |
|--|--------------------------|---|-------------|
| Radiated Spurious and Harmonic Emissions | §2.1053,<br>§27.53(m)(4) | < 40 + 10log10 (P[Watts])<br>at Channel edges<br>< 43 + 10log10 (P[Watts])<br>between 5 and X MHz<br>from Channel edges<br>< 55 + 10log10 (P[Watts])<br>beyond X MHz beyond<br>from Channel edges | PASS        |

## 7. SAMPLE CALCULATION

### Emission Designator

#### GSM Emission Designator

**Emission Designator = 249KGXW**

GSM BW = 249 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

#### EDGE Emission Designator

**Emission Designator = 249KG7W**

GSM BW = 249 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

#### WCDMA Emission Designator

**Emission Designator = 4M17F9W**

WCDMA BW = 4.17 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

#### QPSK Modulation

**Emission Designator = 4M48G7D**

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

#### 16QAM Modulation

**Emission Designator = 4M48W7D**

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

## 8. TEST DATA

### 8.1 EQUIVALENT ISOTROPIC RADIATED POWER

| Frequency<br>(MHz) | Channel | Resource<br>Block Size | Resource<br>Block<br>Offset | Conducted Power<br>[dBm] |       | E.I.R.P<br>[dBm] |       |
|--------------------|---------|------------------------|-----------------------------|--------------------------|-------|------------------|-------|
|                    |         |                        |                             | QPSK                     | 16QAM | QPSK             | 16QAM |
| 2498.5             | 39675   | 1                      | 0                           | 22.36                    | 20.86 | 27.55            | 26.05 |
|                    |         | 1                      | 12                          | 22.57                    | 21.02 | 27.76            | 26.21 |
|                    |         | 1                      | 24                          | 22.36                    | 20.85 | 27.55            | 26.04 |
|                    |         | 12                     | 0                           | 21.32                    | 20.12 | 26.51            | 25.31 |
|                    |         | 12                     | 6                           | 21.25                    | 20.12 | 26.44            | 25.31 |
|                    |         | 12                     | 11                          | 21.34                    | 20.14 | 26.53            | 25.33 |
|                    |         | 25                     | 0                           | 21.31                    | 20.53 | 26.50            | 25.72 |
| 2593.0             | 40620   | 1                      | 0                           | 22.55                    | 21.09 | 27.74            | 26.28 |
|                    |         | 1                      | 12                          | 22.50                    | 21.07 | 27.69            | 26.26 |
|                    |         | 1                      | 24                          | 22.29                    | 20.95 | 27.48            | 26.14 |
|                    |         | 12                     | 0                           | 21.49                    | 20.38 | 26.68            | 25.57 |
|                    |         | 12                     | 6                           | 21.41                    | 20.39 | 26.60            | 25.58 |
|                    |         | 12                     | 11                          | 21.30                    | 20.26 | 26.49            | 25.45 |
|                    |         | 25                     | 0                           | 21.41                    | 20.31 | 26.60            | 25.50 |
| 2687.5             | 41565   | 1                      | 0                           | 22.66                    | 21.30 | 27.85            | 26.49 |
|                    |         | 1                      | 12                          | 22.63                    | 21.33 | 27.82            | 26.52 |
|                    |         | 1                      | 24                          | 22.51                    | 21.08 | 27.70            | 26.27 |
|                    |         | 12                     | 0                           | 21.62                    | 20.64 | 26.81            | 25.83 |
|                    |         | 12                     | 6                           | 21.58                    | 20.67 | 26.77            | 25.86 |
|                    |         | 12                     | 11                          | 21.57                    | 20.66 | 26.76            | 25.85 |
|                    |         | 25                     | 0                           | 21.57                    | 20.52 | 26.76            | 25.71 |

LTE Conducted Average Output Powers (5 MHz Band 41 LTE)

**Note:**

1. E.I.R.P = Conducted Power + Peak. Ant Gain(dBi)
2. Peak. Ant Gain = 5.194 dBi
3. Limit = 2 Watts(=33.01dBm)

| Frequency<br>(MHz) | Channel | Resource<br>Block Size | Resource<br>Block<br>Offset | Conducted Power<br>[dBm] |       | E.I.R.P<br>[dBm] |       |
|--------------------|---------|------------------------|-----------------------------|--------------------------|-------|------------------|-------|
|                    |         |                        |                             | QPSK                     | 16QAM | QPSK             | 16QAM |
| 2501.0             | 39700   | 1                      | 0                           | 22.27                    | 21.13 | 27.46            | 26.32 |
|                    |         | 1                      | 24                          | 22.74                    | 21.27 | 27.93            | 26.46 |
|                    |         | 1                      | 49                          | 22.47                    | 21.01 | 27.66            | 26.20 |
|                    |         | 25                     | 0                           | 21.42                    | 20.64 | 26.61            | 25.83 |
|                    |         | 25                     | 12                          | 21.49                    | 20.62 | 26.68            | 25.81 |
|                    |         | 25                     | 24                          | 21.44                    | 20.67 | 26.63            | 25.86 |
|                    |         | 50                     | 0                           | 21.39                    | 20.34 | 26.58            | 25.53 |
| 2593.0             | 40620   | 1                      | 0                           | 22.39                    | 21.05 | 27.58            | 26.24 |
|                    |         | 1                      | 24                          | 22.91                    | 21.37 | 28.10            | 26.56 |
|                    |         | 1                      | 49                          | 22.42                    | 21.05 | 27.61            | 26.24 |
|                    |         | 25                     | 0                           | 21.50                    | 20.74 | 26.69            | 25.93 |
|                    |         | 25                     | 12                          | 21.38                    | 20.63 | 26.57            | 25.82 |
|                    |         | 25                     | 24                          | 21.42                    | 20.57 | 26.61            | 25.76 |
|                    |         | 50                     | 0                           | 21.37                    | 20.52 | 26.56            | 25.71 |
| 2685.0             | 41540   | 1                      | 0                           | 22.80                    | 21.41 | 27.99            | 26.60 |
|                    |         | 1                      | 24                          | 22.92                    | 21.62 | 28.11            | 26.81 |
|                    |         | 1                      | 49                          | 22.41                    | 21.19 | 27.60            | 26.38 |
|                    |         | 25                     | 0                           | 21.61                    | 20.61 | 26.80            | 25.80 |
|                    |         | 25                     | 12                          | 21.74                    | 20.76 | 26.93            | 25.95 |
|                    |         | 25                     | 24                          | 21.49                    | 20.57 | 26.68            | 25.76 |
|                    |         | 50                     | 0                           | 21.54                    | 20.62 | 26.73            | 25.81 |

LTE Conducted Average Output Powers (10 MHz Band 41 LTE)

**Note:**

1. E.I.R.P = Conducted Power + Peak. Ant Gain(dBi)
2. Peak. Ant Gain = 5.194 dBi
3. Limit = 2 Watts(=33.01dBm)

| Frequency<br>(MHz) | Channel | Resource<br>Block Size | Resource<br>Block<br>Offset | Conducted Power<br>[dBm] |       | E.I.R.P<br>[dBm] |       |
|--------------------|---------|------------------------|-----------------------------|--------------------------|-------|------------------|-------|
|                    |         |                        |                             | QPSK                     | 16QAM | QPSK             | 16QAM |
| 2503.5             | 39725   | 1                      | 0                           | 22.35                    | 21.05 | 27.54            | 26.24 |
|                    |         | 1                      | 36                          | 22.57                    | 21.12 | 27.76            | 26.31 |
|                    |         | 1                      | 74                          | 22.47                    | 20.94 | 27.66            | 26.13 |
|                    |         | 36                     | 0                           | 21.29                    | 20.36 | 26.48            | 25.55 |
|                    |         | 36                     | 18                          | 21.32                    | 20.39 | 26.51            | 25.58 |
|                    |         | 36                     | 39                          | 21.16                    | 20.19 | 26.35            | 25.38 |
|                    |         | 75                     | 0                           | 21.22                    | 20.33 | 26.41            | 25.52 |
| 2593.0             | 40620   | 1                      | 0                           | 22.41                    | 21.08 | 27.60            | 26.27 |
|                    |         | 1                      | 36                          | 22.60                    | 20.99 | 27.79            | 26.18 |
|                    |         | 1                      | 74                          | 22.36                    | 20.98 | 27.55            | 26.17 |
|                    |         | 36                     | 0                           | 21.42                    | 20.40 | 26.61            | 25.59 |
|                    |         | 36                     | 18                          | 21.34                    | 20.35 | 26.53            | 25.54 |
|                    |         | 36                     | 39                          | 21.26                    | 20.36 | 26.45            | 25.55 |
|                    |         | 75                     | 0                           | 21.32                    | 20.36 | 26.51            | 25.55 |
| 2682.5             | 41515   | 1                      | 0                           | 22.65                    | 21.36 | 27.84            | 26.55 |
|                    |         | 1                      | 36                          | 22.61                    | 21.21 | 27.80            | 26.40 |
|                    |         | 1                      | 74                          | 22.30                    | 21.07 | 27.49            | 26.26 |
|                    |         | 36                     | 0                           | 21.60                    | 20.58 | 26.79            | 25.77 |
|                    |         | 36                     | 18                          | 21.64                    | 20.70 | 26.83            | 25.89 |
|                    |         | 36                     | 39                          | 21.43                    | 20.56 | 26.62            | 25.75 |
|                    |         | 75                     | 0                           | 21.44                    | 20.61 | 26.63            | 25.80 |

LTE Conducted Average Output Powers (15 MHz Band 41 LTE)

**Note:**

1. E.I.R.P = Conducted Power + Peak. Ant Gain(dBi)
2. Peak. Ant Gain = 5.194 dBi
3. Limit = 2 Watts(=33.01dBm)

| Frequency<br>(MHz) | Channel | Resource<br>Block Size | Resource<br>Block<br>Offset | Conducted Power<br>[dBm] |       | E.I.R.P<br>[dBm] |       |
|--------------------|---------|------------------------|-----------------------------|--------------------------|-------|------------------|-------|
|                    |         |                        |                             | QPSK                     | 16QAM | QPSK             | 16QAM |
| 2506.0             | 39750   | 1                      | 0                           | 22.22                    | 20.95 | 27.41            | 26.14 |
|                    |         | 1                      | 49                          | 22.63                    | 21.02 | 27.82            | 26.21 |
|                    |         | 1                      | 99                          | 22.24                    | 20.75 | 27.43            | 25.94 |
|                    |         | 50                     | 0                           | 21.19                    | 20.23 | 26.38            | 25.42 |
|                    |         | 50                     | 25                          | 21.15                    | 20.18 | 26.34            | 25.37 |
|                    |         | 50                     | 49                          | 21.16                    | 20.12 | 26.35            | 25.31 |
|                    |         | 100                    | 0                           | 21.24                    | 20.25 | 26.43            | 25.44 |
| 2593.0             | 40620   | 1                      | 0                           | 22.32                    | 20.95 | 27.51            | 26.14 |
|                    |         | 1                      | 49                          | 22.81                    | 21.33 | 28.00            | 26.52 |
|                    |         | 1                      | 99                          | 22.24                    | 20.81 | 27.43            | 26.00 |
|                    |         | 50                     | 0                           | 21.44                    | 20.44 | 26.63            | 25.63 |
|                    |         | 50                     | 25                          | 21.31                    | 20.45 | 26.50            | 25.64 |
|                    |         | 50                     | 49                          | 21.28                    | 20.33 | 26.47            | 25.52 |
|                    |         | 100                    | 0                           | 21.35                    | 20.39 | 26.54            | 25.58 |
| 2680.0             | 41490   | 1                      | 0                           | 22.60                    | 21.27 | 27.79            | 26.46 |
|                    |         | 1                      | 49                          | 22.86                    | 21.45 | 28.05            | 26.64 |
|                    |         | 1                      | 99                          | 22.50                    | 20.95 | 27.69            | 26.14 |
|                    |         | 50                     | 0                           | 21.58                    | 20.57 | 26.77            | 25.76 |
|                    |         | 50                     | 25                          | 21.58                    | 20.63 | 26.77            | 25.82 |
|                    |         | 50                     | 49                          | 21.49                    | 20.53 | 26.68            | 25.72 |
|                    |         | 100                    | 0                           | 21.50                    | 20.68 | 26.69            | 25.87 |

LTE Conducted Average Output Powers (20 MHz Band 41 LTE)

**Note:**

1. E.I.R.P = Conducted Power + Peak. Ant Gain(dBi)
2. Peak. Ant Gain = 5.194 dBi
3. Limit = 2 Watts(=33.01dBm)

## 8.2 RADIATED SPURIOUS EMISSIONS

- MODE: LTE B41  
 MODULATION SIGNAL: 5 MHz QPSK  
 DISTANCE: 1 meters  
 LIMIT:  $43 + 10 \log_{10}(W)$

| Ch                | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L  | Pol | EIRP (dBm) | Margin (dB) | Detector |
|-------------------|------------|----------------------|-----------------|------------------------|------|-----|------------|-------------|----------|
| 39675<br>(2498.5) | 4,997.00   | -46.18               | 12.89           | -59.87                 | 2.47 | H   | -49.45     | 24.45       | Peak     |
|                   | 7,495.50   | -34.56               | 11.51           | -41.30                 | 2.97 | H   | -32.76     | 7.76        | Peak     |
|                   | 9,994.00   | -49.80               | 11.21           | -52.25                 | 3.48 | V   | -44.52     | 19.52       | Peak     |
|                   | 12,492.50  | -48.21               | 14.20           | -52.79                 | 4.17 | V   | -42.76     | 17.76       | Peak     |
|                   | 14,991.00  | -52.23               | 13.20           | -55.07                 | 4.34 | V   | -46.21     | 21.21       | Peak     |
| 40620<br>(2593.0) | 5,186.00   | -40.84               | 13.05           | -53.44                 | 2.58 | V   | -42.97     | 17.97       | Peak     |
|                   | 7,779.00   | -29.76               | 11.98           | -37.28                 | 2.93 | V   | -28.23     | 3.23        | Peak     |
|                   | 10,372.00  | -49.80               | 10.96           | -52.79                 | 3.62 | V   | -45.45     | 20.45       | Peak     |
|                   | 12,965.00  | -50.98               | 13.61           | -53.58                 | 4.08 | V   | -44.05     | 19.05       | Peak     |
|                   | 15,558.00  | -53.21               | 16.58           | -58.02                 | 4.40 | V   | -45.84     | 20.84       | Peak     |
| 41565<br>(2687.5) | 5,375.00   | -36.80               | 13.49           | -50.08                 | 2.65 | H   | -39.24     | 14.24       | Peak     |
|                   | 8,062.50   | -32.87               | 11.46           | -37.69                 | 3.05 | H   | -29.28     | 4.28        | Average  |
|                   | 10,750.00  | -42.57               | 10.99           | -45.47                 | 3.67 | V   | -38.15     | 13.15       | Peak     |
|                   | 13,437.50  | -46.46               | 13.01           | -47.93                 | 4.09 | V   | -39.01     | 14.01       | Peak     |
|                   | 16,125.00  | -52.48               | 17.38           | -56.88                 | 4.62 | V   | -44.12     | 19.12       | Peak     |

**Note:**

1. Limit =  $55 + 10 \log_{10}(W) = -25.0$  dBm

- MODE: LTE B41
- MODULATION SIGNAL: 10 MHz QPSK
- DISTANCE: 1 meters
- LIMIT:  $43 + 10 \log_{10} (W)$

| Ch                | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L  | Pol | EIRP (dBm) | Margin (dB) | Detector |
|-------------------|------------|----------------------|-----------------|------------------------|------|-----|------------|-------------|----------|
| 39700<br>(2501.0) | 5,002.00   | -46.44               | 12.89           | -60.13                 | 2.47 | H   | -49.71     | 24.71       | Peak     |
|                   | 7,503.00   | -36.47               | 11.53           | -42.90                 | 2.92 | H   | -34.30     | 9.30        | Peak     |
|                   | 10,004.00  | -50.00               | 11.25           | -52.84                 | 3.41 | V   | -45.00     | 20.00       | Peak     |
|                   | 12,505.00  | -51.00               | 14.24           | -55.58                 | 3.99 | V   | -45.33     | 20.33       | Peak     |
| 40620<br>(2593.0) | 5,186.00   | -41.28               | 13.05           | -53.88                 | 2.58 | V   | -43.41     | 18.41       | Peak     |
|                   | 7,779.00   | -32.33               | 11.98           | -39.85                 | 2.93 | V   | -30.80     | 5.80        | Peak     |
|                   | 10,372.00  | -48.59               | 10.96           | -51.58                 | 3.62 | V   | -44.24     | 19.24       | Peak     |
|                   | 12,965.00  | -52.99               | 13.61           | -55.59                 | 4.08 | V   | -46.06     | 21.06       | Peak     |
|                   | 15,558.00  | -55.47               | 16.58           | -60.28                 | 4.40 | V   | -48.10     | 23.10       | Peak     |
| 41540<br>(2685.0) | 5,370.00   | -35.95               | 13.50           | -49.53                 | 2.65 | V   | -38.68     | 13.68       | Peak     |
|                   | 8,055.00   | -33.13               | 11.46           | -38.02                 | 3.05 | H   | -29.62     | 4.62        | Average  |
|                   | 10,740.00  | -45.60               | 10.98           | -48.41                 | 3.62 | V   | -41.05     | 16.05       | Peak     |
|                   | 13,425.00  | -48.59               | 13.07           | -50.18                 | 4.18 | V   | -41.29     | 16.29       | Peak     |
|                   | 16,110.00  | -53.99               | 17.39           | -58.02                 | 4.54 | V   | -45.17     | 20.17       | Peak     |

**Note:**

1. Limit =  $55 + 10 \log_{10} (W) = -25.0$  dBm

- MODE: LTE B41  
 MODULATION SIGNAL: 15 MHz QPSK  
 DISTANCE: 1 meters  
 LIMIT:  $43 + 10 \log_{10} (W)$

| Ch                | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L  | Pol | EIRP (dBm) | Margin (dB) | Detector |
|-------------------|------------|----------------------|-----------------|------------------------|------|-----|------------|-------------|----------|
| 39725<br>(2503.5) | 5,007.00   | -46.24               | 12.86           | -60.37                 | 2.49 | V   | -50.00     | 25.00       | Peak     |
|                   | 7,510.50   | -36.90               | 11.54           | -43.04                 | 2.90 | H   | -34.40     | 9.40        | Peak     |
|                   | 10,014.00  | -51.00               | 11.27           | -54.16                 | 3.40 | V   | -46.30     | 21.30       | Peak     |
|                   | 12,517.50  | -50.68               | 14.23           | -54.99                 | 4.05 | V   | -44.81     | 19.81       | Peak     |
|                   | 15,021.00  | -53.45               | 13.31           | -56.09                 | 4.34 | V   | -47.12     | 22.12       | Peak     |
| 40620<br>(2593.0) | 5,186.00   | -40.13               | 13.05           | -52.73                 | 2.58 | H   | -42.26     | 17.26       | Peak     |
|                   | 7,779.00   | -32.58               | 11.98           | -40.10                 | 2.93 | H   | -31.05     | 6.05        | Peak     |
|                   | 10,372.00  | -49.59               | 10.96           | -52.58                 | 3.62 | V   | -45.24     | 20.24       | Peak     |
|                   | 12,965.00  | -52.36               | 13.61           | -54.96                 | 4.08 | V   | -45.43     | 20.43       | Peak     |
|                   | 15,558.00  | -55.19               | 16.58           | -60.00                 | 4.40 | V   | -47.82     | 22.82       | Peak     |
| 41515<br>(2682.5) | 5,365.00   | -35.48               | 13.51           | -49.13                 | 2.64 | V   | -38.26     | 13.26       | Peak     |
|                   | 8,047.50   | -33.90               | 11.45           | -38.87                 | 3.05 | H   | -30.47     | 5.47        | Average  |
|                   | 10,730.00  | -47.01               | 10.98           | -49.82                 | 3.60 | V   | -42.44     | 17.44       | Peak     |
|                   | 13,412.50  | -49.49               | 13.09           | -51.48                 | 4.17 | V   | -42.56     | 17.56       | Peak     |
|                   | 16,095.00  | -54.23               | 17.41           | -58.03                 | 4.55 | V   | -45.17     | 20.17       | Peak     |

**Note:**

1. Limit =  $55 + 10 \log_{10} (W) = -25.0$  dBm

- MODE: LTE B41
- MODULATION SIGNAL: 20 MHz QPSK
- DISTANCE: 1 meters
- LIMIT:  $43 + 10 \log_{10} (W)$

| Ch                | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L  | Pol | EIRP (dBm) | Margin (dB) | Detector |
|-------------------|------------|----------------------|-----------------|------------------------|------|-----|------------|-------------|----------|
| 39750<br>(2506.0) | 5,012.00   | -44.90               | 12.86           | -59.03                 | 2.49 | H   | -48.66     | 23.66       | Peak     |
|                   | 7,518.00   | -36.31               | 11.57           | -41.62                 | 2.93 | H   | -32.98     | 7.98        | Peak     |
|                   | 10,024.00  | -51.60               | 11.29           | -54.43                 | 3.48 | V   | -46.61     | 21.61       | Peak     |
|                   | 12,530.00  | -49.44               | 14.22           | -54.09                 | 4.17 | V   | -44.04     | 19.04       | Peak     |
| 40620<br>(2593.0) | 5,186.00   | -40.75               | 13.05           | -53.35                 | 2.58 | V   | -42.88     | 17.88       | Peak     |
|                   | 7,779.00   | -33.25               | 11.98           | -40.77                 | 2.93 | V   | -31.72     | 6.72        | Peak     |
|                   | 10,372.00  | -49.60               | 10.96           | -52.59                 | 3.62 | V   | -45.25     | 20.25       | Peak     |
|                   | 12,965.00  | -54.92               | 13.61           | -57.52                 | 4.08 | V   | -47.99     | 22.99       | Peak     |
| 41490<br>(2680.0) | 5,360.00   | -36.32               | 13.51           | -50.04                 | 2.63 | V   | -39.16     | 14.16       | Peak     |
|                   | 8,040.00   | -35.85               | 11.46           | -40.75                 | 3.06 | H   | -32.35     | 7.35        | Average  |
|                   | 10,720.00  | -46.20               | 10.97           | -48.83                 | 3.66 | V   | -41.52     | 16.52       | Peak     |
|                   | 13,400.00  | -49.24               | 13.11           | -50.76                 | 4.16 | V   | -41.81     | 16.81       | Peak     |

**Note:**

1. Limit =  $55 + 10 \log_{10} (W) = -25.0$  dBm

### 8.3 OCCUPIED BANDWIDTH

| Band | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data ( MHz ) |  |
|------|------------|-----------------|------------|---------------------|-----------------------|--------------|--|
| 41   | 5 MHz      | 2593.0          | QPSK       | 25                  | 0                     | 4.5088       |  |
|      |            |                 | 16-QAM     | 25                  |                       | 4.5050       |  |
|      | 10 MHz     |                 | QPSK       | 50                  |                       | 8.9732       |  |
|      |            |                 | 16-QAM     | 50                  |                       | 8.9644       |  |
|      | 15 MHz     |                 | QPSK       | 75                  |                       | 13.438       |  |
|      |            |                 | 16-QAM     | 75                  |                       | 13.419       |  |
|      | 20 MHz     |                 | QPSK       | 100                 |                       | 17.928       |  |
|      |            |                 | 16-QAM     | 100                 |                       | 17.860       |  |

**Note:**

- Plots of the EUT's Occupied Bandwidth are shown Page 35 ~ 42.

#### 8.4 CONDUCTED SPURIOUS EMISSIONS

| Band | Band Width (MHz) | Frequency (MHz) | Frequency of Maximum Harmonic (GHz) | Factor (dB) | Measurement Maximum Data (dBm) | Result (dBm) | Limit (dBm) |
|------|------------------|-----------------|-------------------------------------|-------------|--------------------------------|--------------|-------------|
| 41   | 5                | 2498.5          | 7.4901                              | 28.591      | -66.503                        | -37.912      | -25.00      |
|      |                  | 2593.0          | 25.7831                             | 30.131      | -67.135                        | -37.004      |             |
|      |                  | 2687.5          | 25.7946                             | 30.131      | -67.248                        | -37.117      |             |
|      | 10               | 2501.0          | 26.1320                             | 30.131      | -67.143                        | -37.012      |             |
|      |                  | 2593.0          | 26.3078                             | 30.131      | -66.754                        | -36.623      |             |
|      |                  | 2685.0          | 25.9027                             | 30.131      | -66.920                        | -36.789      |             |
|      | 15               | 2503.5          | 7.4257                              | 28.591      | -67.672                        | -39.081      |             |
|      |                  | 2593.0          | 7.7597                              | 28.591      | -65.990                        | -37.399      |             |
|      |                  | 2682.5          | 2.5404                              | 27.976      | -60.185                        | -32.209      |             |
|      | 20               | 2506.0          | 7.4920                              | 28.591      | -66.874                        | -38.283      |             |
|      |                  | 2593.0          | 26.2211                             | 30.131      | -66.785                        | -36.654      |             |
|      |                  | 2680.0          | 26.1914                             | 30.131      | -66.985                        | -36.854      |             |

**Note:**

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 71 ~ 98.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

| Frequency Range (GHz) | Factor [dB] |
|-----------------------|-------------|
| 0.03 – 1              | 25.270      |
| 1 – 5                 | 27.976      |
| 5 – 10                | 28.591      |
| 10 – 15               | 29.116      |
| 15 – 20               | 29.489      |
| Above 20              | 30.131      |

**8.5 CHANNEL EDGE**

| Band Width | Frequency (MHz) | Modulation | RB (Size/Offset) | 2 495 MHz<br>~ 2 496 MHz | C.E<br>~ (C.E +1MHz) | 2 490.5 MHz<br>~ 2 495 MHz | (C.E + 1 MHz)<br>~ (C.E + 5 MHz) | Below 2 490.5 MHz | (C.E + 5 MHz)<br>~ (C.E + X MHz) | Above (C.E + X MHz) |
|------------|-----------------|------------|------------------|--------------------------|----------------------|----------------------------|----------------------------------|-------------------|----------------------------------|---------------------|
|            |                 |            |                  | Lower                    | Upper                | Lower                      | Upper                            | Lower             | Upper                            | Upper               |
| 5 MHz      | 2498.5          | QPSK       | 25/0             | -23.21                   | -23.49               | -16.57                     | -16.77                           | -35.79            | -37.50                           | -37.48              |
| 10 MHz     | 2501.0          | QPSK       | 50/0             | -24.42                   | -23.39               | -20.24                     | -20.42                           | -25.80            | -25.91                           | -41.02              |
| 15 MHz     | 2503.5          | QPSK       | 75/0             | -25.89                   | -29.22               | -23.08                     | -23.59                           | -27.02            | -26.70                           | -42.48              |
| 20 MHz     | 2506.0          | QPSK       | 100/0            | -26.67                   | -27.04               | -24.39                     | -25.10                           | -27.96            | -28.14                           | -42.40              |
| Limit      |                 |            |                  | -13.0                    | -10.0                | -13.0                      | -10.0                            | -25.0             | -13.0                            | -25.0               |

| Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | (C.E ~ (C.E ± 1MHz)) |        | (C.E ± 1 MHz)<br>~ (C.E ± 5 MHz) |        |
|------------|-----------------|------------|---------------------|-----------------------|----------------------|--------|----------------------------------|--------|
|            |                 |            |                     |                       | Lower                | Upper  | Lower                            | Upper  |
| 5 MHz      | 2593.0          | QPSK       | 25                  | 0                     | -24.32               | -25.05 | -18.68                           | -19.40 |
|            | 2687.5          | QPSK       | 25                  | 0                     | -23.88               | -24.78 | -17.21                           | -18.29 |
| 10 MHz     | 2593.0          | QPSK       | 50                  | 0                     | -25.26               | -25.57 | -20.10                           | -20.65 |
|            | 2685.0          | QPSK       | 50                  | 0                     | -21.56               | -22.34 | -17.99                           | -19.23 |
| 15 MHz     | 2593.0          | QPSK       | 75                  | 0                     | -24.83               | -26.17 | -22.40                           | -23.82 |
|            | 2682.5          | QPSK       | 75                  | 0                     | -20.95               | -22.17 | -17.89                           | -19.46 |
| 20 MHz     | 2593.0          | QPSK       | 100                 | 0                     | -25.76               | -27.06 | -23.50                           | -24.79 |
|            | 2680.0          | QPSK       | 100                 | 0                     | -20.03               | -21.08 | -16.76                           | -18.74 |
| Limit      |                 |            |                     |                       | -10.0                |        | -10.0                            |        |

| Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | (C.E ± 5 MHz)<br>~ (C.E ± X MHz) |        | Above (C.E ± X MHz) |        |
|------------|-----------------|------------|---------------------|-----------------------|----------------------------------|--------|---------------------|--------|
|            |                 |            |                     |                       | Lower                            | Upper  | Lower               | Upper  |
| 5 MHz      | 2593.0          | QPSK       | 25                  | 0                     | -38.71                           | -45.03 | -41.39              | -44.85 |
|            | 2687.5          | QPSK       | 25                  | 0                     | -36.01                           | -36.68 | -37.59              | -38.10 |
| 10 MHz     | 2593.0          | QPSK       | 50                  | 0                     | -25.68                           | -27.82 | -40.01              | -45.14 |
|            | 2685.0          | QPSK       | 50                  | 0                     | -20.72                           | -23.50 | -37.58              | -40.05 |
| 15 MHz     | 2593.0          | QPSK       | 75                  | 0                     | -25.43                           | -27.33 | -40.35              | -43.57 |
|            | 2682.5          | QPSK       | 75                  | 0                     | -20.25                           | -23.01 | -37.79              | -42.16 |
| 20 MHz     | 2593.0          | QPSK       | 100                 | 0                     | -27.07                           | -28.69 | -41.82              | -43.12 |
|            | 2680.0          | QPSK       | 100                 | 0                     | -18.51                           | -21.70 | -36.91              | -42.39 |
| Limit      |                 |            |                     |                       | -13.0                            |        | -10.0               |        |

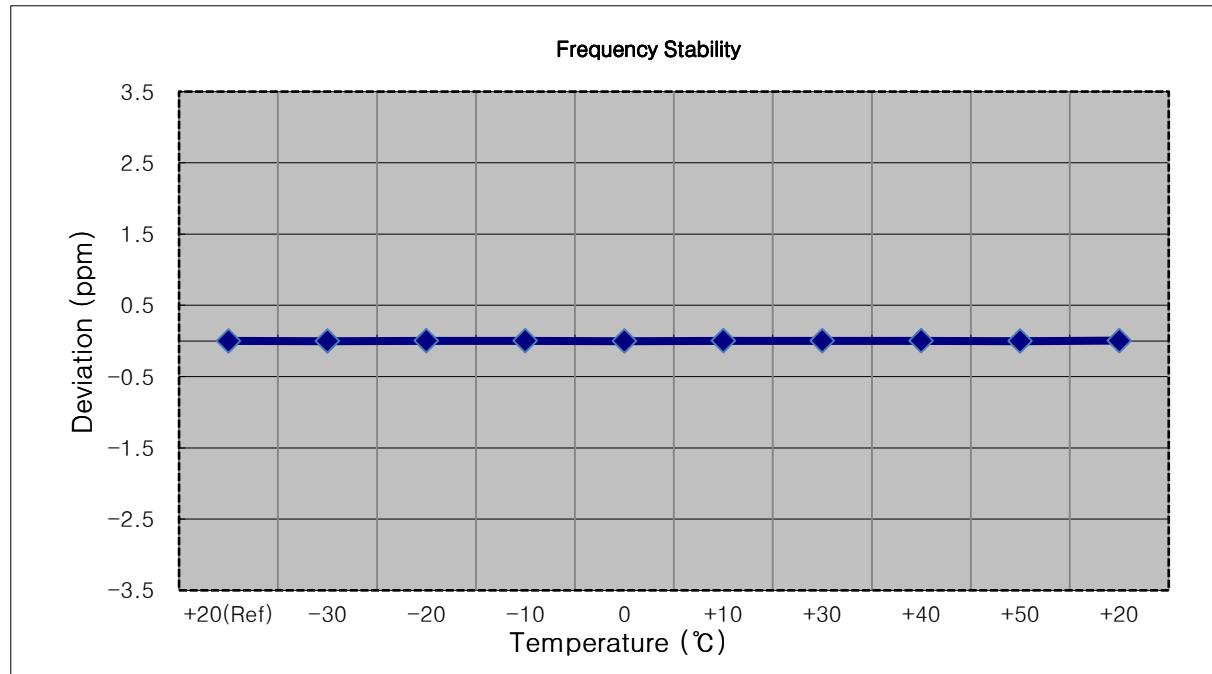
**Note:**

1. C.E = Channel Edge
2. X = X is the greater of 6MHz or the actual emission bandwidth.
3. X = 6MHz(5MHz Bandwidth), 10MHz(10MHz Bandwidth), 15MHz(15MHz Bandwidth), 20MHz(20MHz Bandwidth)
4. Plots of the EUT's Channel Edge are shown Page 43 ~ 70.

## 8.6 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

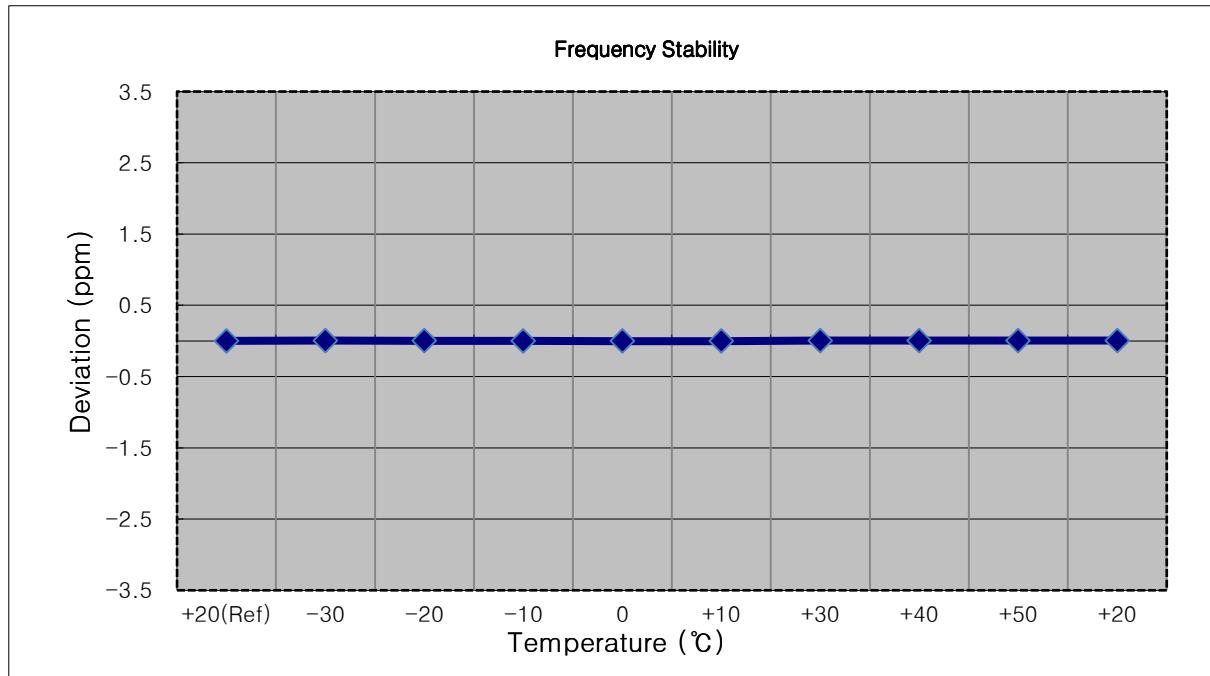
- MODE: LTE 41
- OPERATING FREQUENCY: 2,498,500,000 Hz
- CHANNEL: 39675 (5 MHz)
- REFERENCE VOLTAGE: 3.80 VDC
- DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100%           | 3.80        | +20(Ref)   | 2498 500 012   | 0.0                  | 0.000 000     | 0.000  |
| 100%           |             | -30        | 2498 500 005   | -7.0                 | 0.000 000     | -0.003 |
| 100%           |             | -20        | 2498 500 018   | 5.9                  | 0.000 000     | 0.002  |
| 100%           |             | -10        | 2498 500 017   | 5.3                  | 0.000 000     | 0.002  |
| 100%           |             | 0          | 2498 500 008   | -4.3                 | 0.000 000     | -0.002 |
| 100%           |             | +10        | 2498 500 018   | 6.2                  | 0.000 000     | 0.002  |
| 100%           |             | +30        | 2498 500 019   | 7.1                  | 0.000 000     | 0.003  |
| 100%           |             | +40        | 2498 500 019   | 6.6                  | 0.000 000     | 0.003  |
| 100%           |             | +50        | 2498 500 007   | -4.8                 | 0.000 000     | -0.002 |
| Batt. Endpoint | 3.40        | +20        | 2498 500 021   | 8.8                  | 0.000 000     | 0.004  |



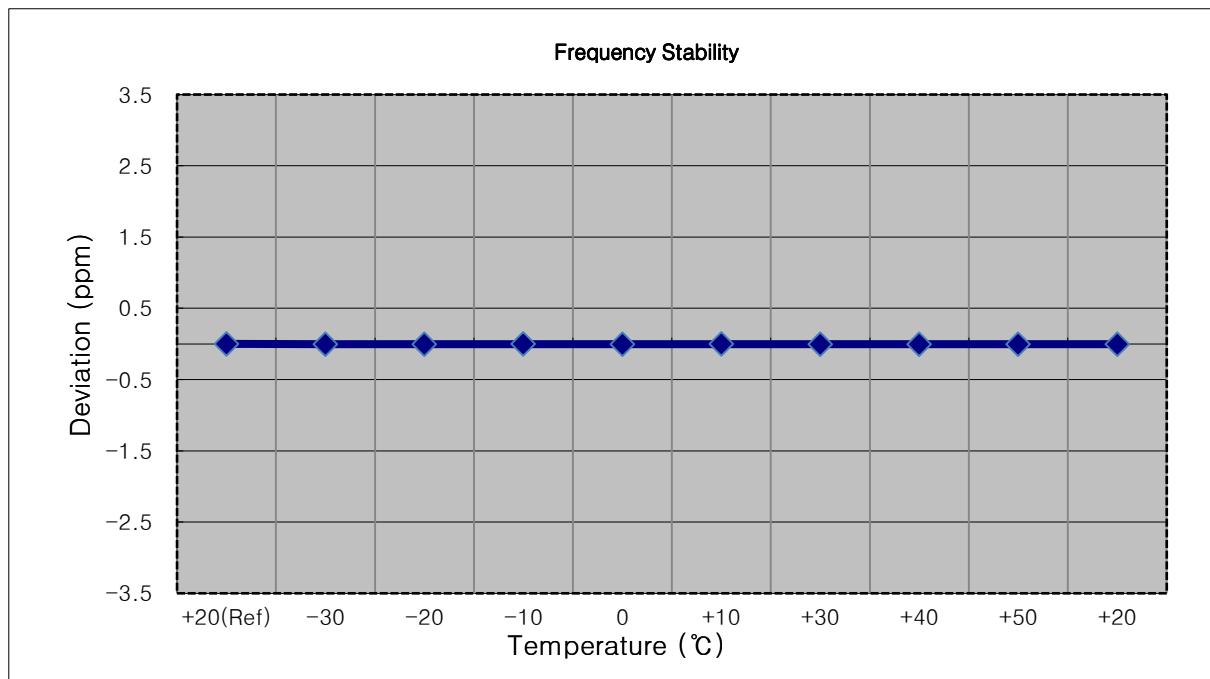
- MODE: LTE 41
- OPERATING FREQUENCY: 2501.000,000 Hz
- CHANNEL: 39700 (10 MHz)
- REFERENCE VOLTAGE: 3.80 VDC
- DEVIATION LIMIT: Emission must remain in band

| Voltage<br>(%) | Power<br>(VDC) | Temp.<br>(°C) | Frequency<br>(Hz) | Frequency<br>Error (Hz) | Deviation<br>(%) | ppm    |
|----------------|----------------|---------------|-------------------|-------------------------|------------------|--------|
| 100%           | 3.80           | +20(Ref)      | 2501 000 009      | 0.0                     | 0.000 000        | 0.000  |
| 100%           |                | -30           | 2501 000 019      | 9.7                     | 0.000 000        | 0.004  |
| 100%           |                | -20           | 2501 000 014      | 4.9                     | 0.000 000        | 0.002  |
| 100%           |                | -10           | 2501 000 006      | -3.7                    | 0.000 000        | -0.001 |
| 100%           |                | 0             | 2501 000 004      | -5.6                    | 0.000 000        | -0.002 |
| 100%           |                | +10           | 2501 000 004      | -5.1                    | 0.000 000        | -0.002 |
| 100%           |                | +30           | 2501 000 018      | 8.4                     | 0.000 000        | 0.003  |
| 100%           |                | +40           | 2501 000 020      | 10.4                    | 0.000 000        | 0.004  |
| 100%           |                | +50           | 2501 000 017      | 7.5                     | 0.000 000        | 0.003  |
| Batt. Endpoint |                | +20           | 2501 000 019      | 9.4                     | 0.000 000        | 0.004  |



- MODE: LTE 41
- OPERATING FREQUENCY: 2503.500,000 Hz
- CHANNEL: 39725 (15 MHz)
- REFERENCE VOLTAGE: 3.80 VDC
- DEVIATION LIMIT: Emission must remain in band

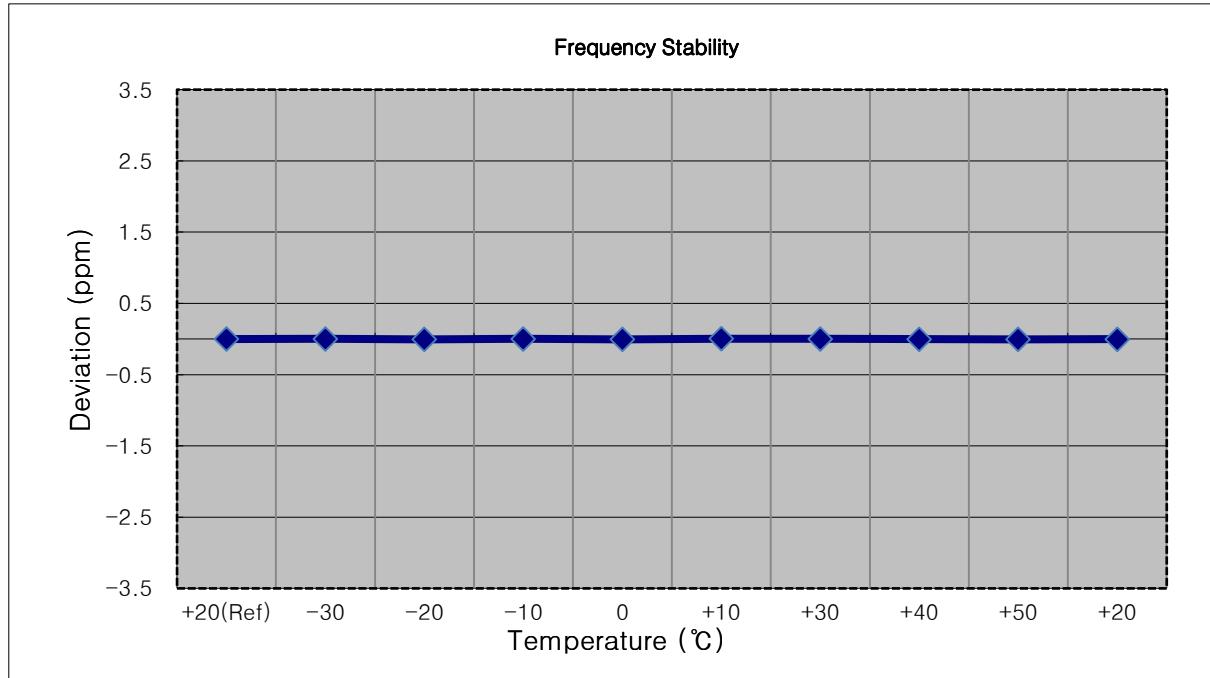
| Voltage<br>(%) | Power<br>(VDC) | Temp.<br>(°C) | Frequency<br>(Hz) | Frequency<br>Error (Hz) | Deviation<br>(%) | ppm    |
|----------------|----------------|---------------|-------------------|-------------------------|------------------|--------|
| 100%           | 3.80           | +20(Ref)      | 2503 499 990      | 0.0                     | 0.000 000        | 0.000  |
| 100%           |                | -30           | 2503 499 980      | -10.4                   | 0.000 000        | -0.004 |
| 100%           |                | -20           | 2503 499 979      | -11.7                   | 0.000 000        | -0.005 |
| 100%           |                | -10           | 2503 499 982      | -8.2                    | 0.000 000        | -0.003 |
| 100%           |                | 0             | 2503 499 978      | -12.1                   | 0.000 000        | -0.005 |
| 100%           |                | +10           | 2503 499 984      | -6.5                    | 0.000 000        | -0.003 |
| 100%           |                | +30           | 2503 499 977      | -12.9                   | -0.000 001       | -0.005 |
| 100%           |                | +40           | 2503 499 978      | -12.7                   | -0.000 001       | -0.005 |
| 100%           |                | +50           | 2503 499 979      | -11.7                   | 0.000 000        | -0.005 |
| Batt. Endpoint |                | 3.40          | 2503 499 976      | -14.1                   | -0.000 001       | -0.006 |



- MODE: LTE 41

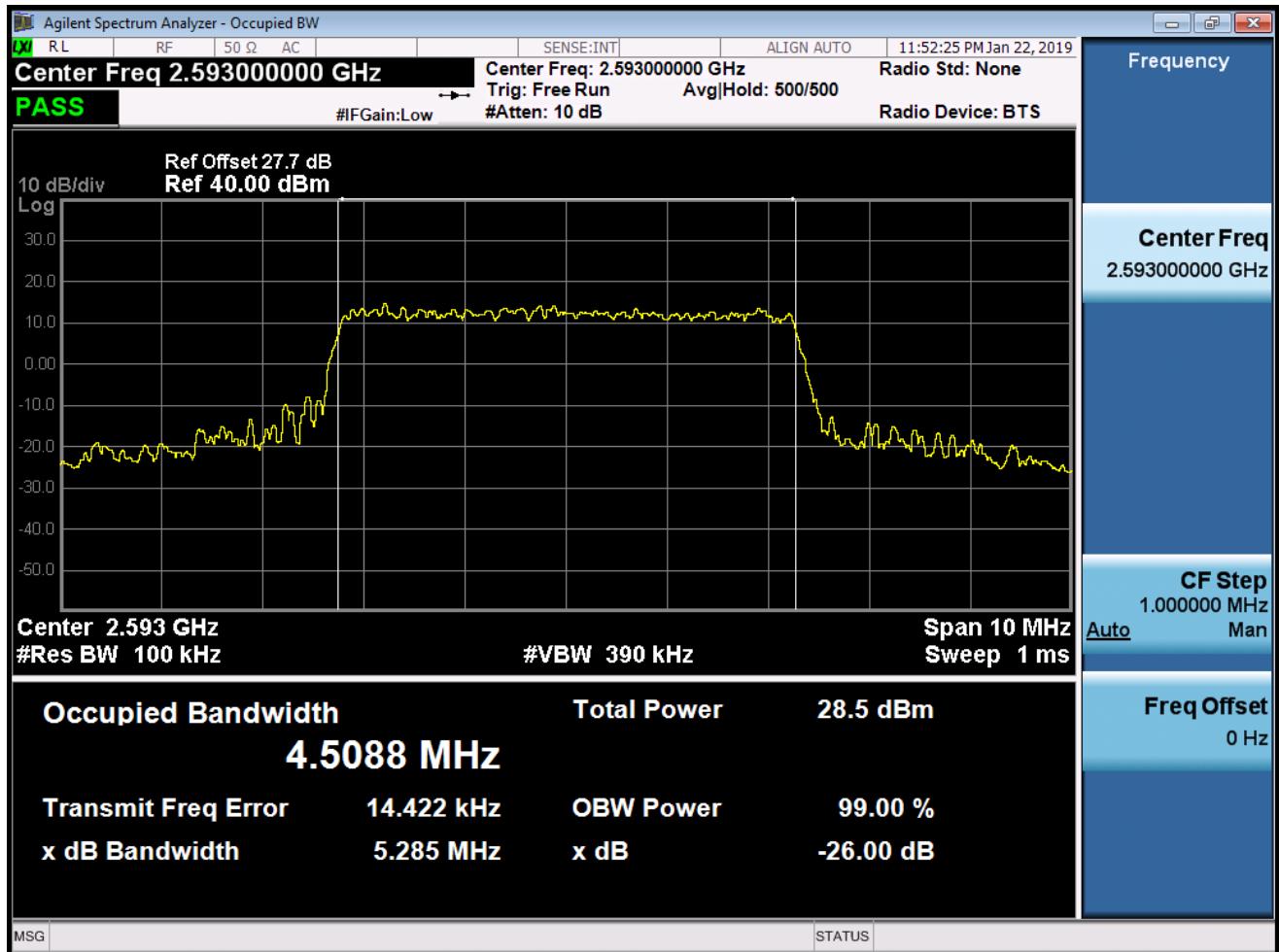
- OPERATING FREQUENCY: 2506.000,000 Hz
- CHANNEL: 39750 (20 MHz)
- REFERENCE VOLTAGE: 3.80 VDC
- DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100%           | 3.80        | +20(Ref)   | 2505 999 993   | 0.0                  | 0.000 000     | 0.000  |
| 100%           |             | -30        | 2506 000 001   | 8.3                  | 0.000 000     | 0.003  |
| 100%           |             | -20        | 2505 999 984   | -8.8                 | 0.000 000     | -0.004 |
| 100%           |             | -10        | 2505 999 999   | 6.3                  | 0.000 000     | 0.003  |
| 100%           |             | 0          | 2505 999 985   | -7.6                 | 0.000 000     | -0.003 |
| 100%           |             | +10        | 2506 000 002   | 9.7                  | 0.000 000     | 0.004  |
| 100%           |             | +30        | 2505 999 997   | 4.7                  | 0.000 000     | 0.002  |
| 100%           |             | +40        | 2505 999 985   | -7.3                 | 0.000 000     | -0.003 |
| 100%           |             | +50        | 2505 999 985   | -8.0                 | 0.000 000     | -0.003 |
| Batt. Endpoint |             | +20        | 2505 999 987   | -5.7                 | 0.000 000     | -0.002 |

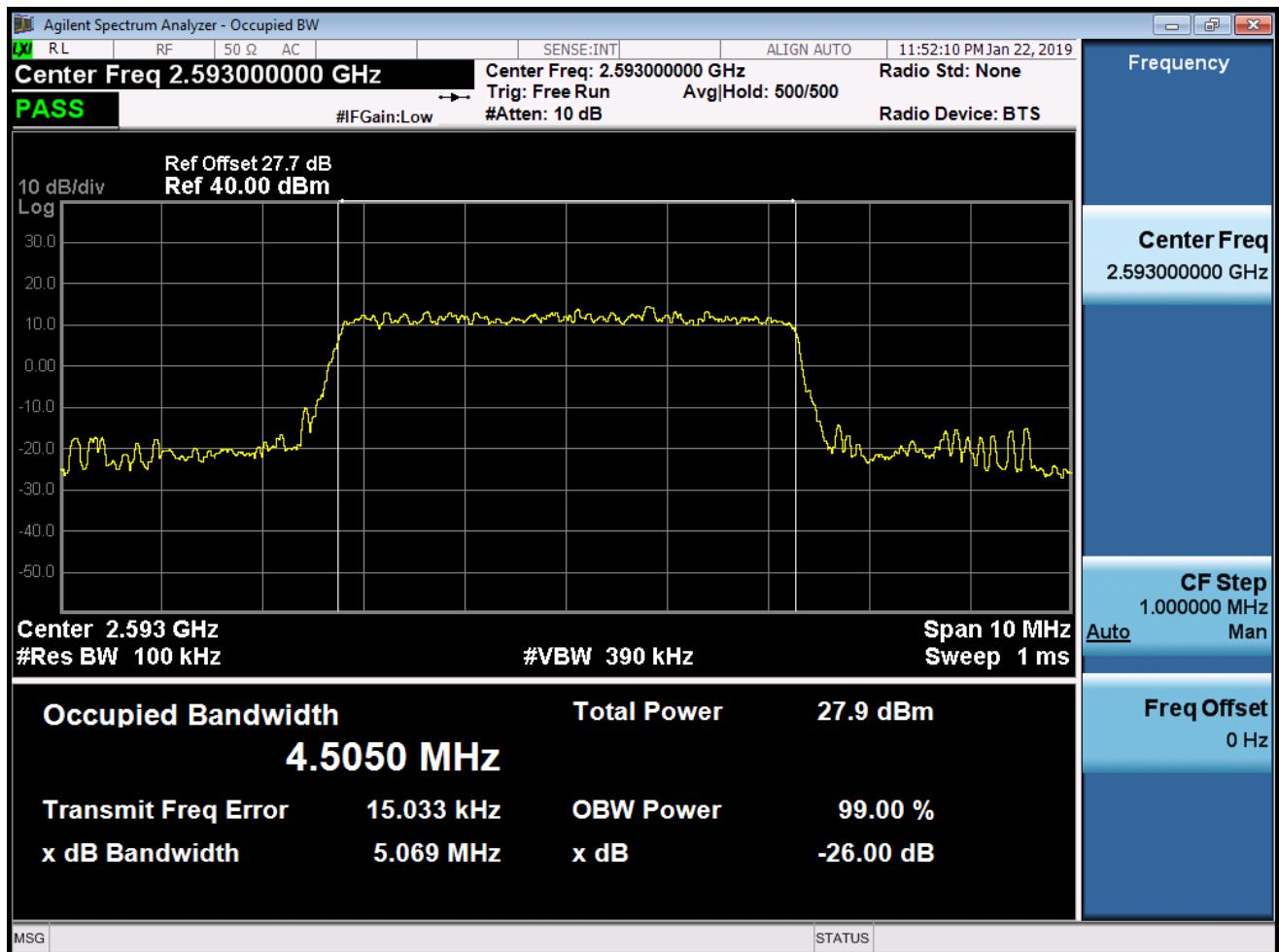


## **9. TEST PLOTS**

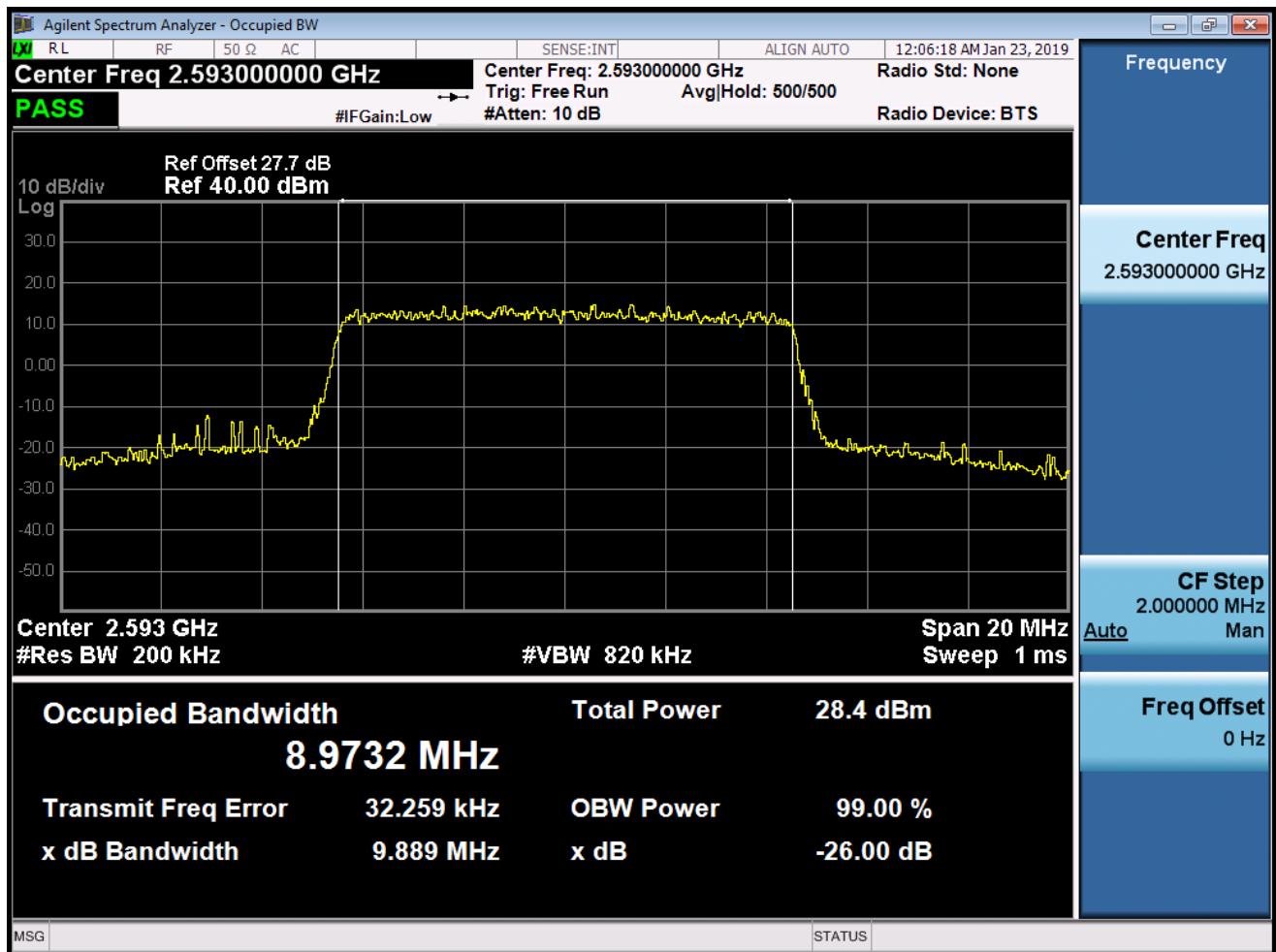
BAND 41. Occupied Bandwidth Plot (5 MHz Ch.40620 QPSK RB 25)



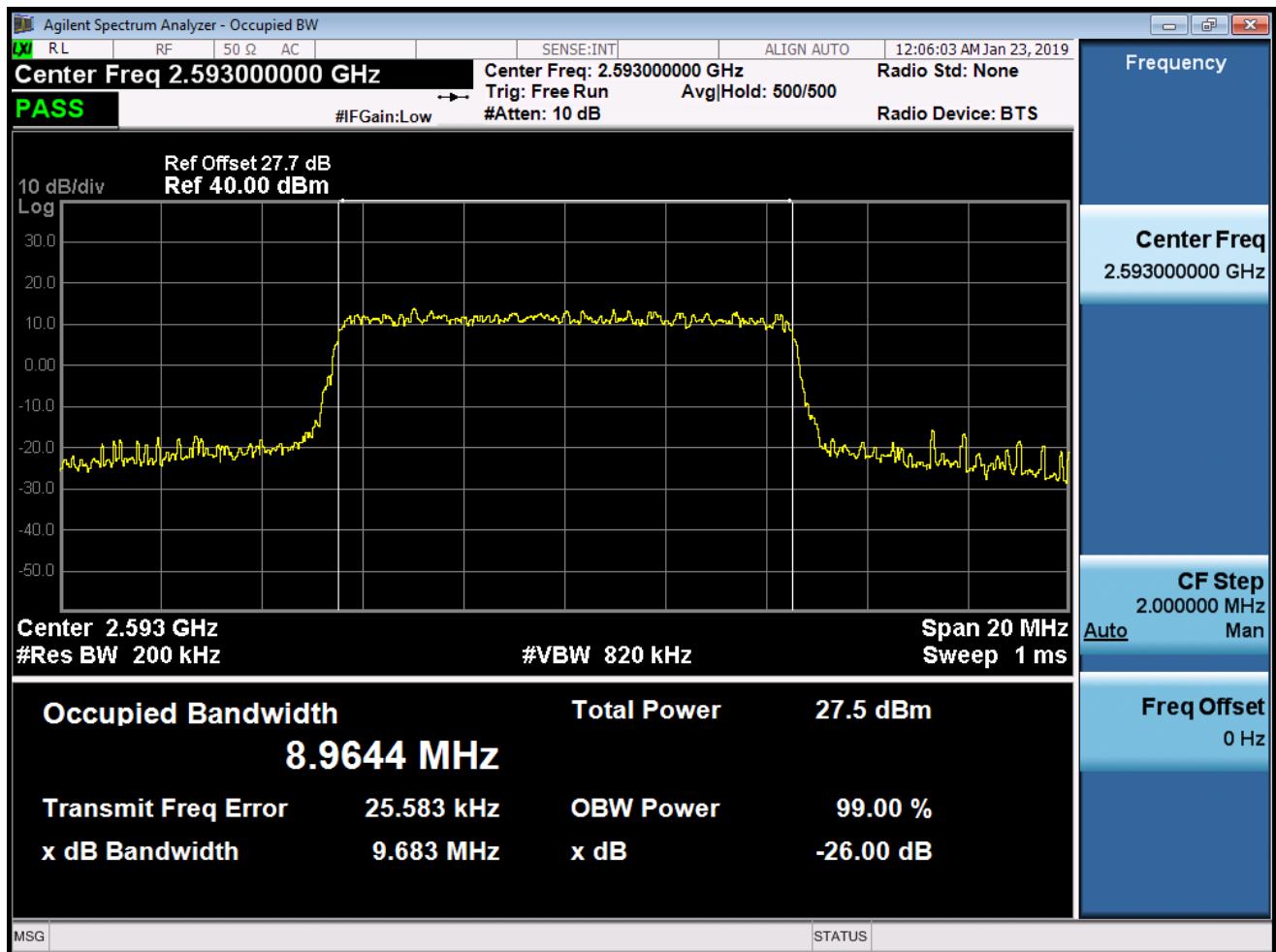
BAND 41. Occupied Bandwidth Plot (5 MHz Ch.40620 16-QAM RB 25)



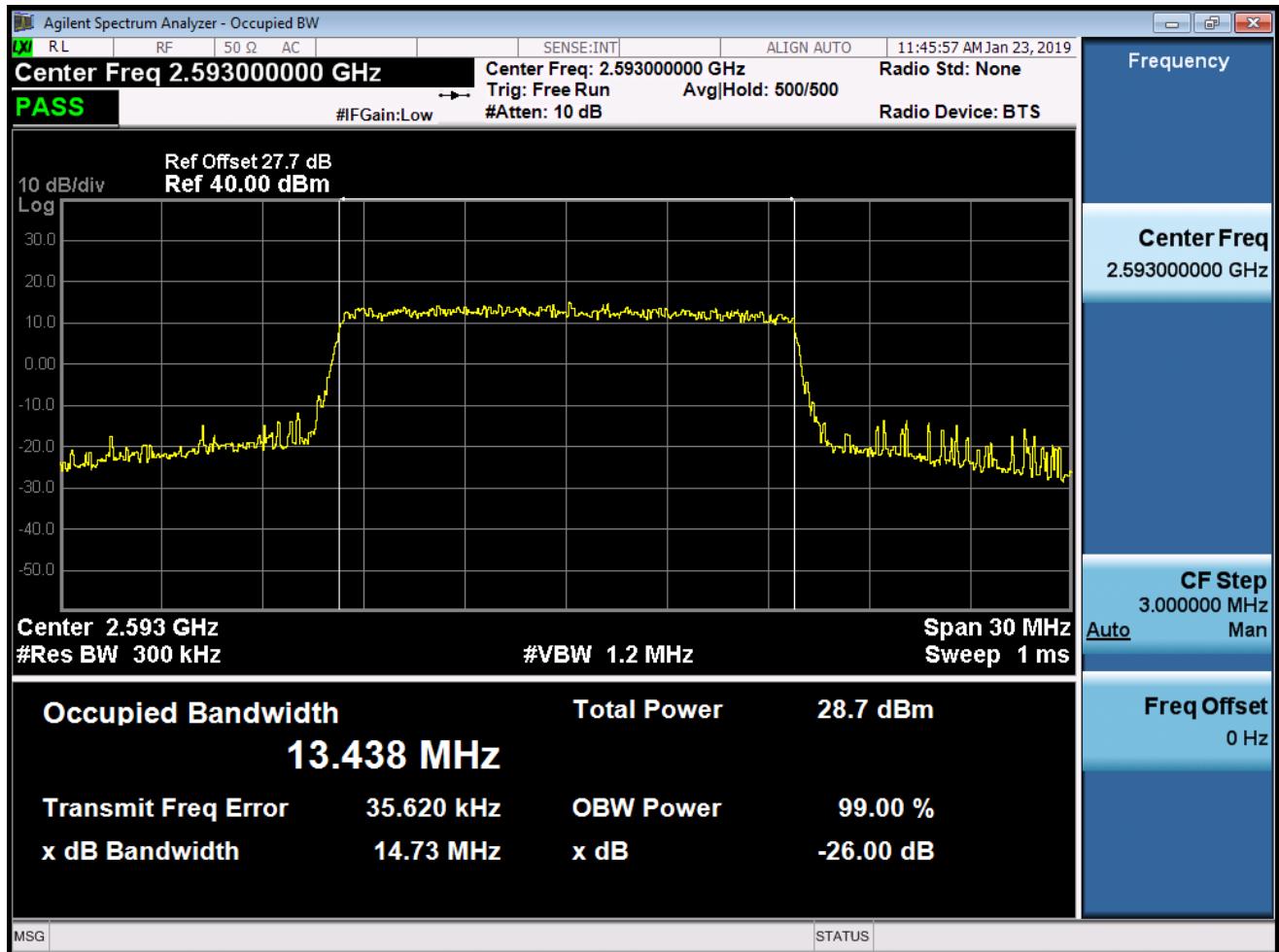
BAND 41. Occupied Bandwidth Plot (10 MHz Ch.40620 QPSK RB 50)



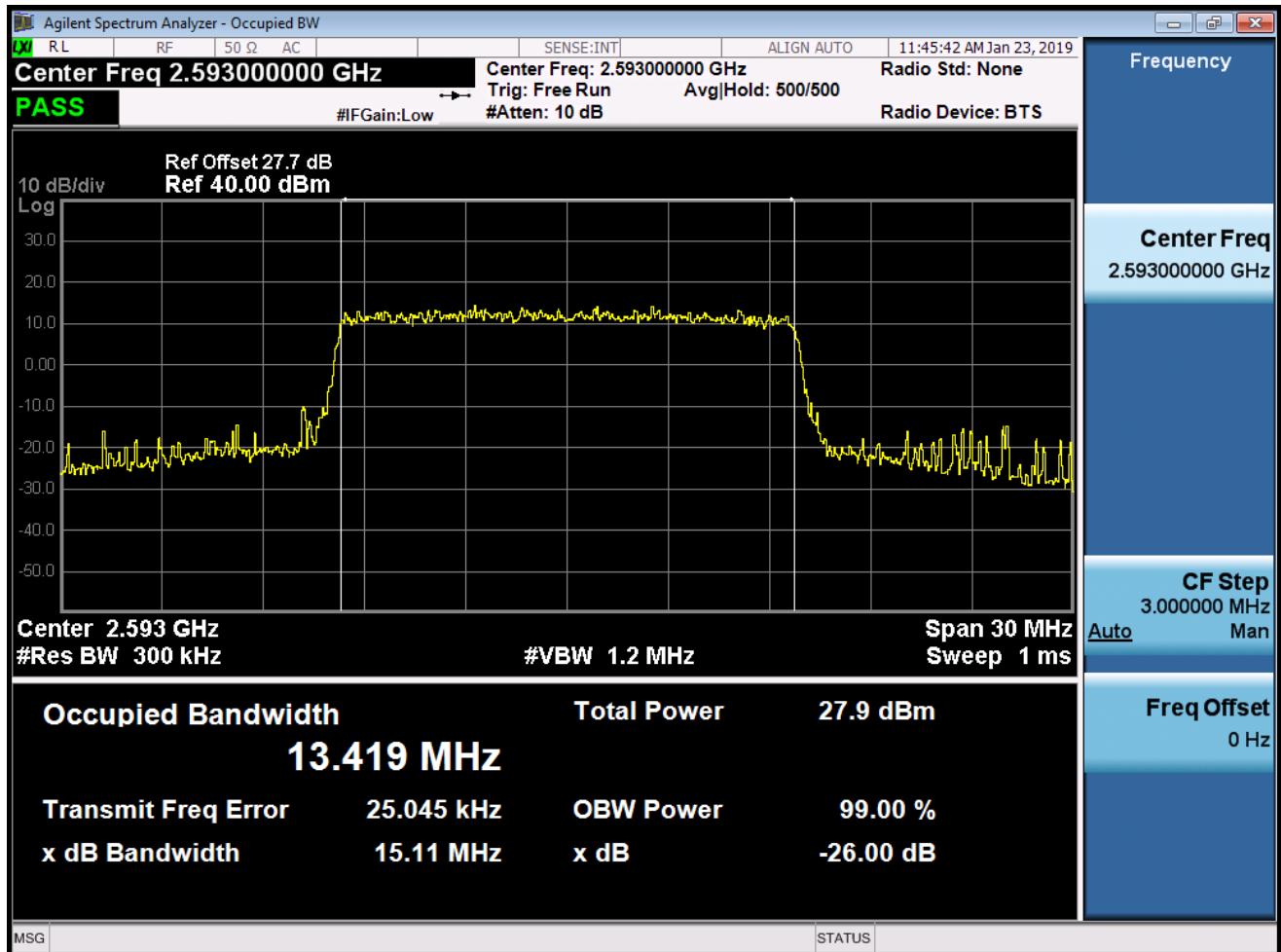
BAND 41. Occupied Bandwidth Plot (10 MHz Ch.40620 16-QAM RB 50)



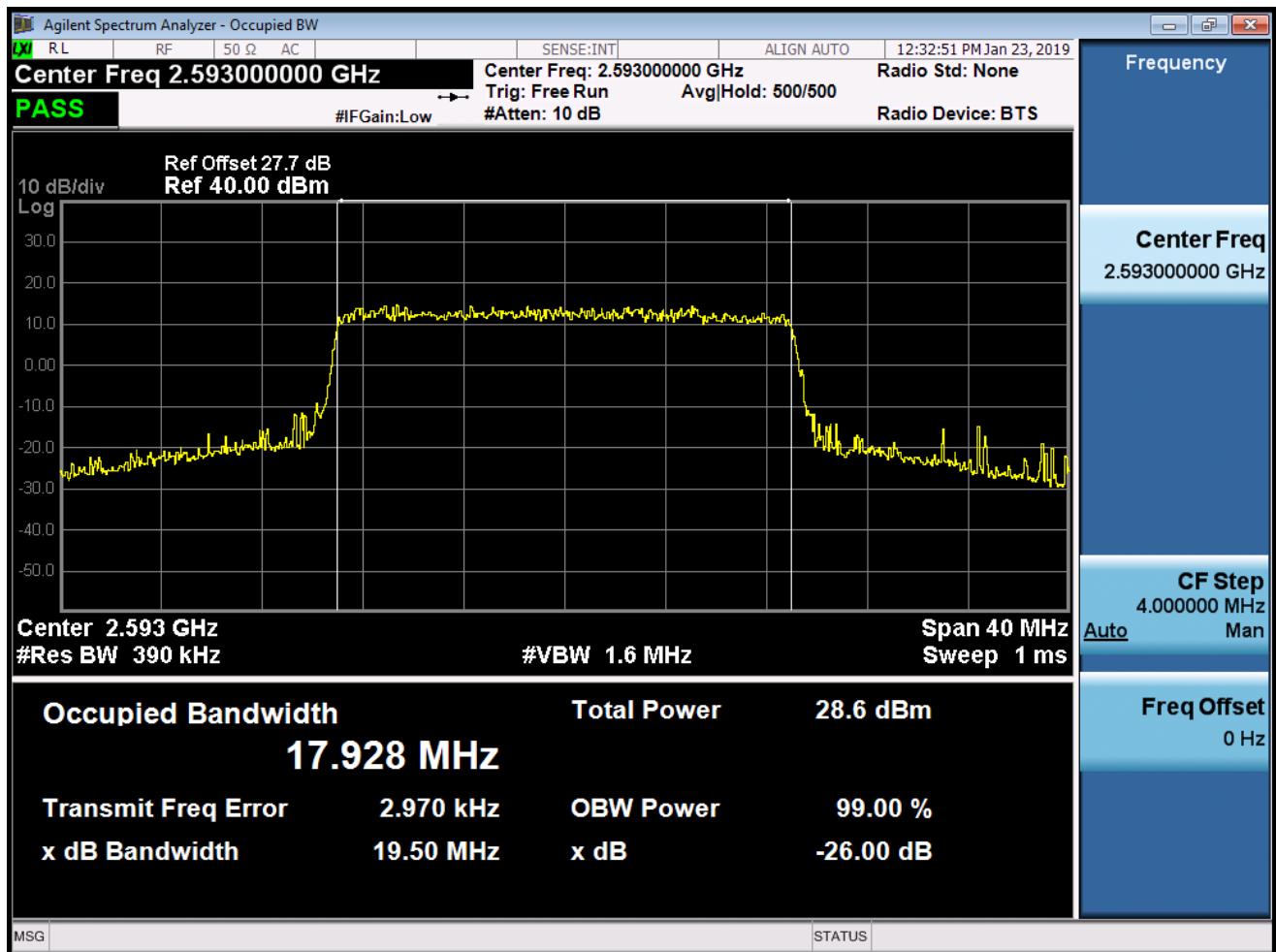
BAND 41. Occupied Bandwidth Plot (15 MHz Ch.40620 QPSK RB 75)



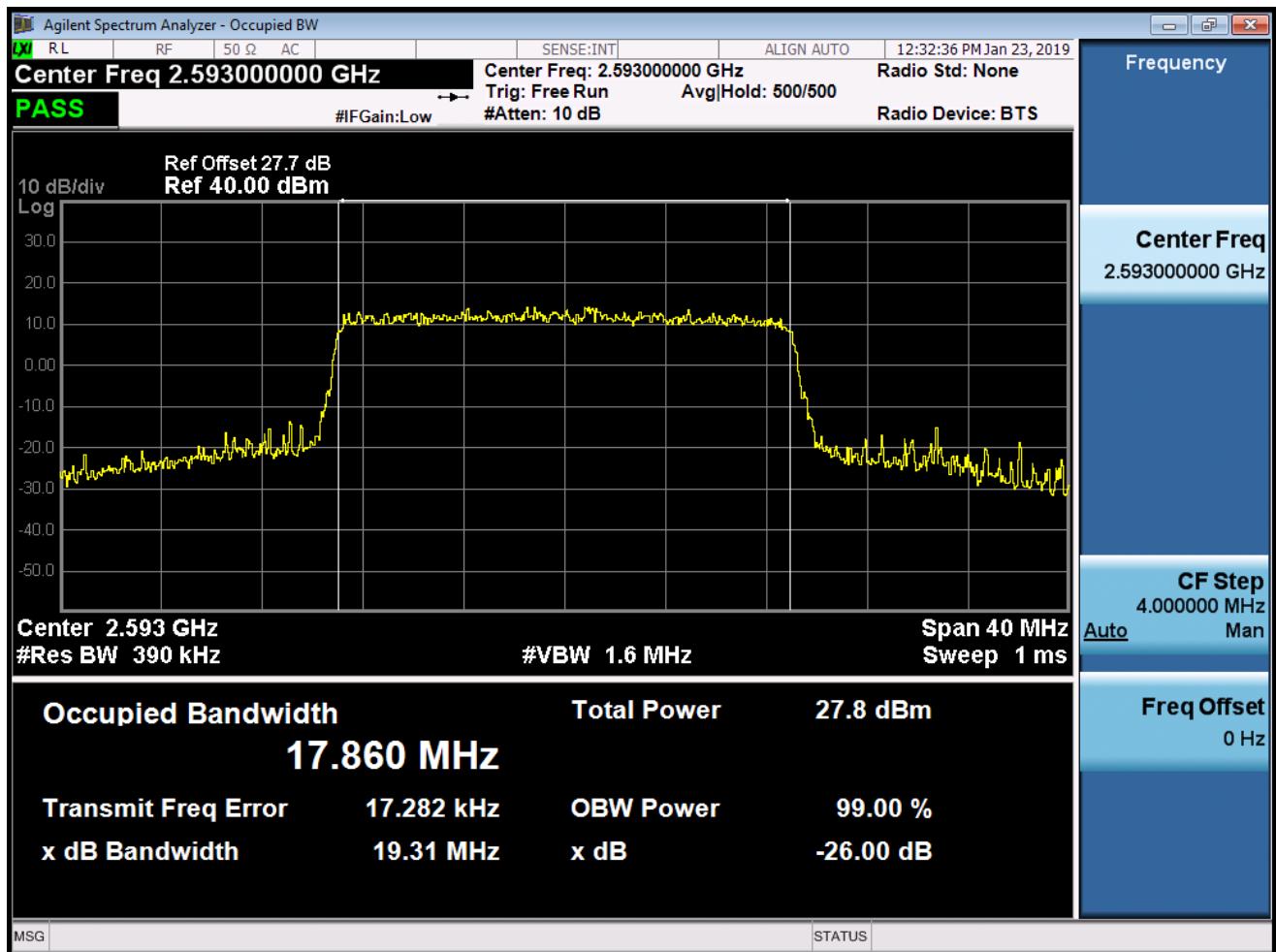
BAND 41. Occupied Bandwidth Plot (15 MHz Ch.40620 16-QAM RB 75)



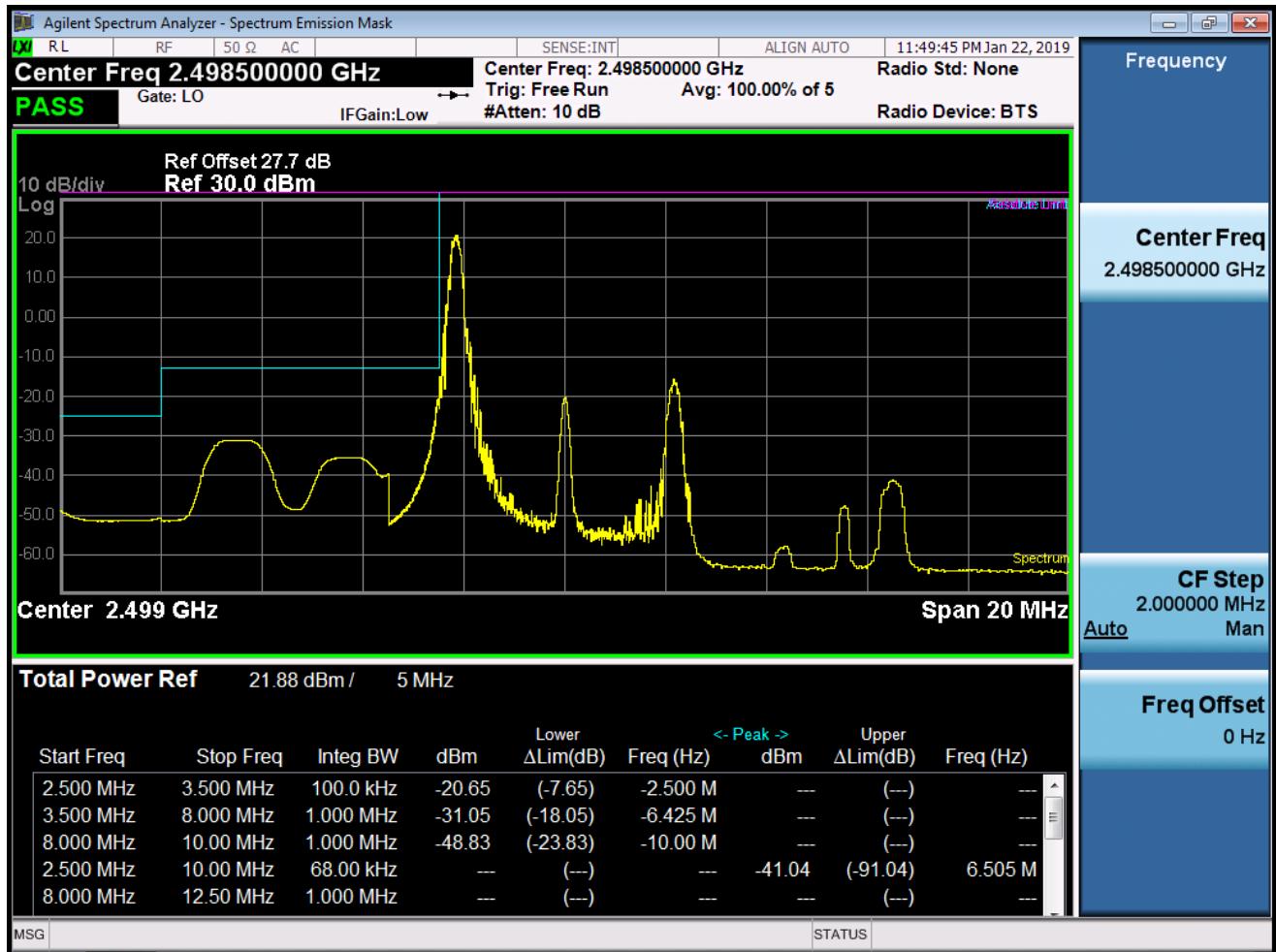
BAND 41. Occupied Bandwidth Plot (20 MHz Ch.40620 QPSK RB 100)



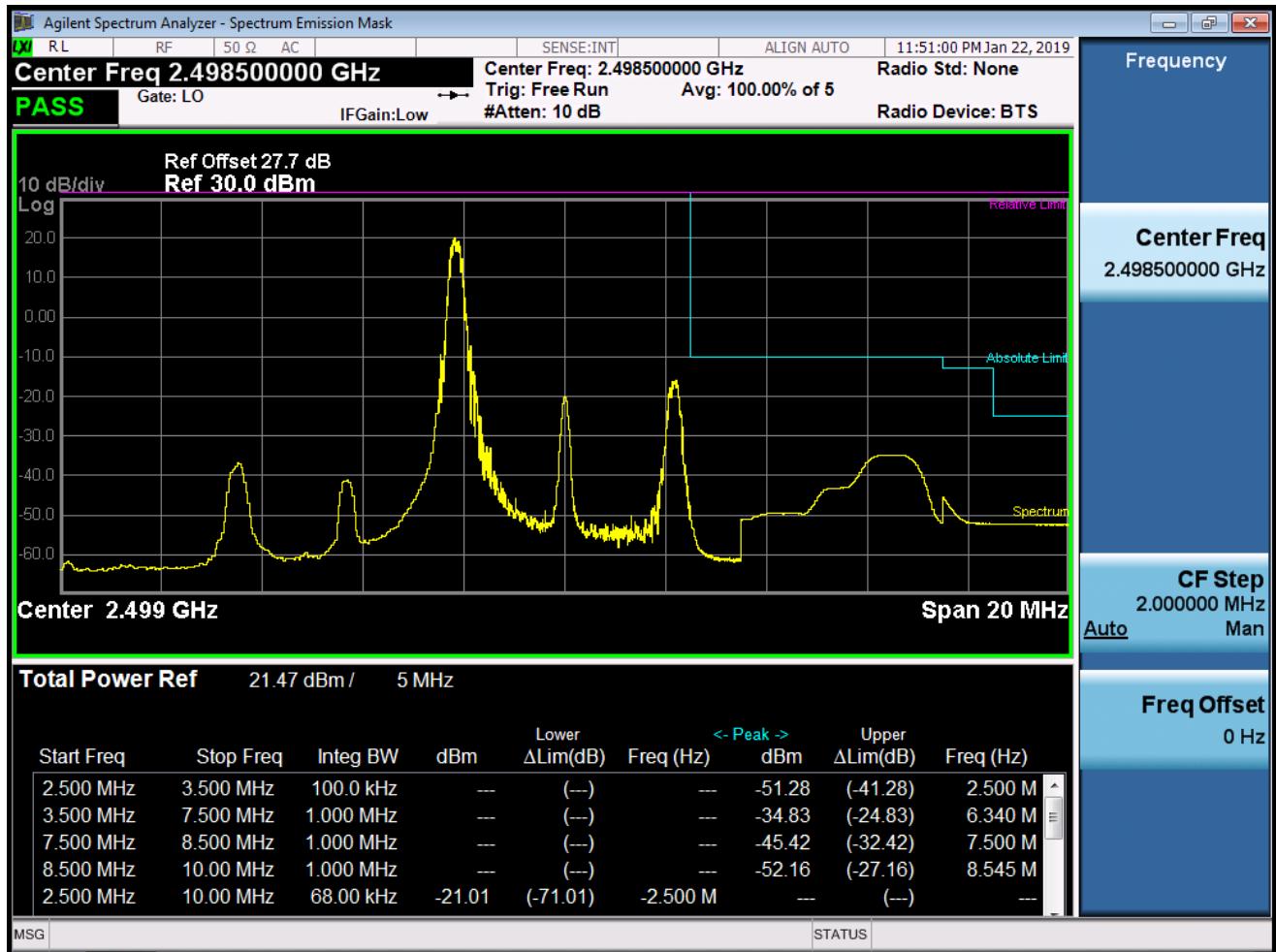
BAND 41. Occupied Bandwidth Plot (20 MHz Ch.40620 16-QAM RB 100)



BAND 41. Low Channel Edge Plot (5 MHz Ch.39675 QPSK RB 1, Offset 0)-1



BAND 41. Low Channel Edge Plot (5 MHz Ch.39675 QPSK RB 1, Offset 0)-2



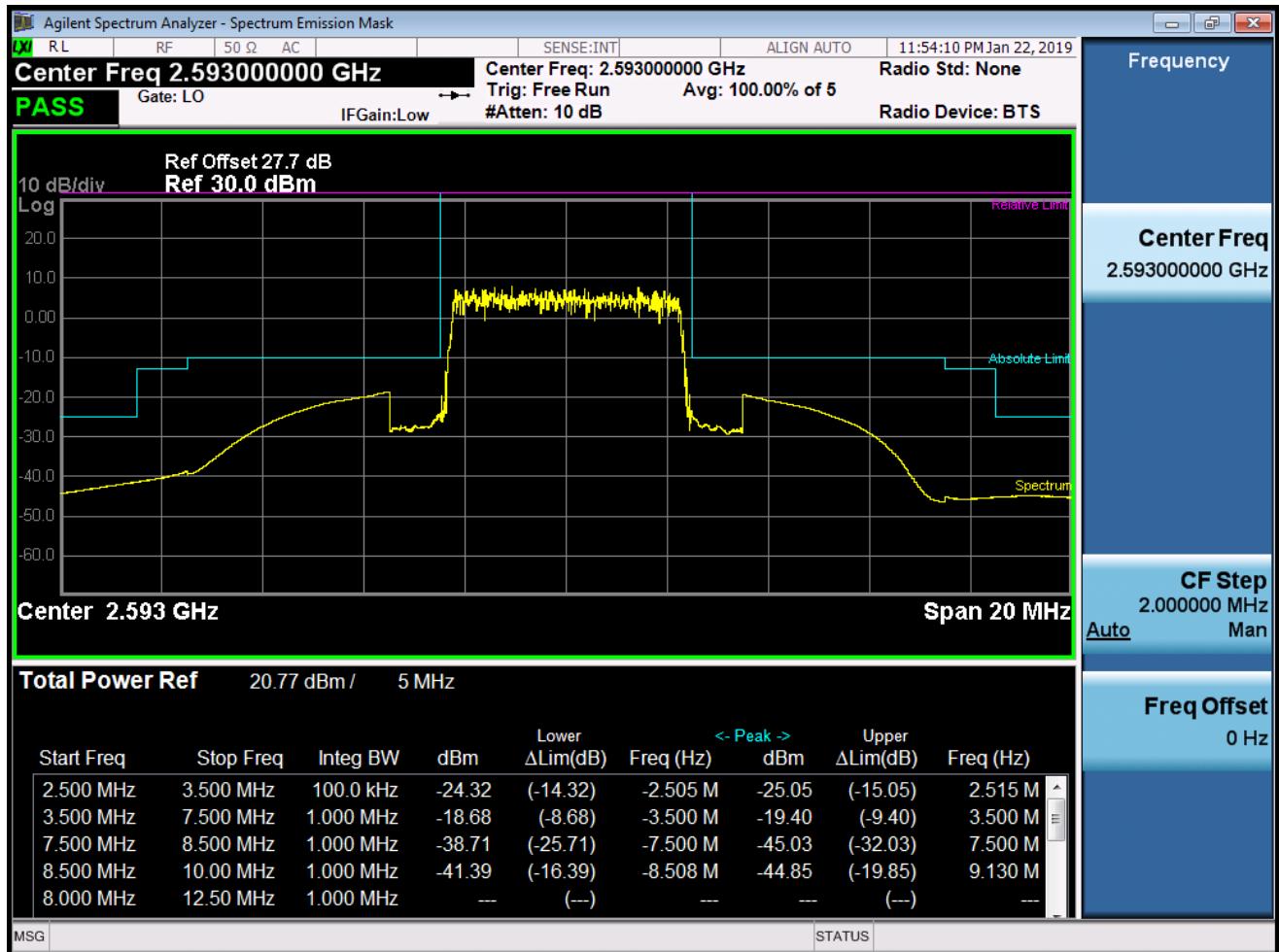
BAND 41. Low Channel Edge Plot (5 MHz Ch.39675 QPSK\_RB25\_Offset 0)-1



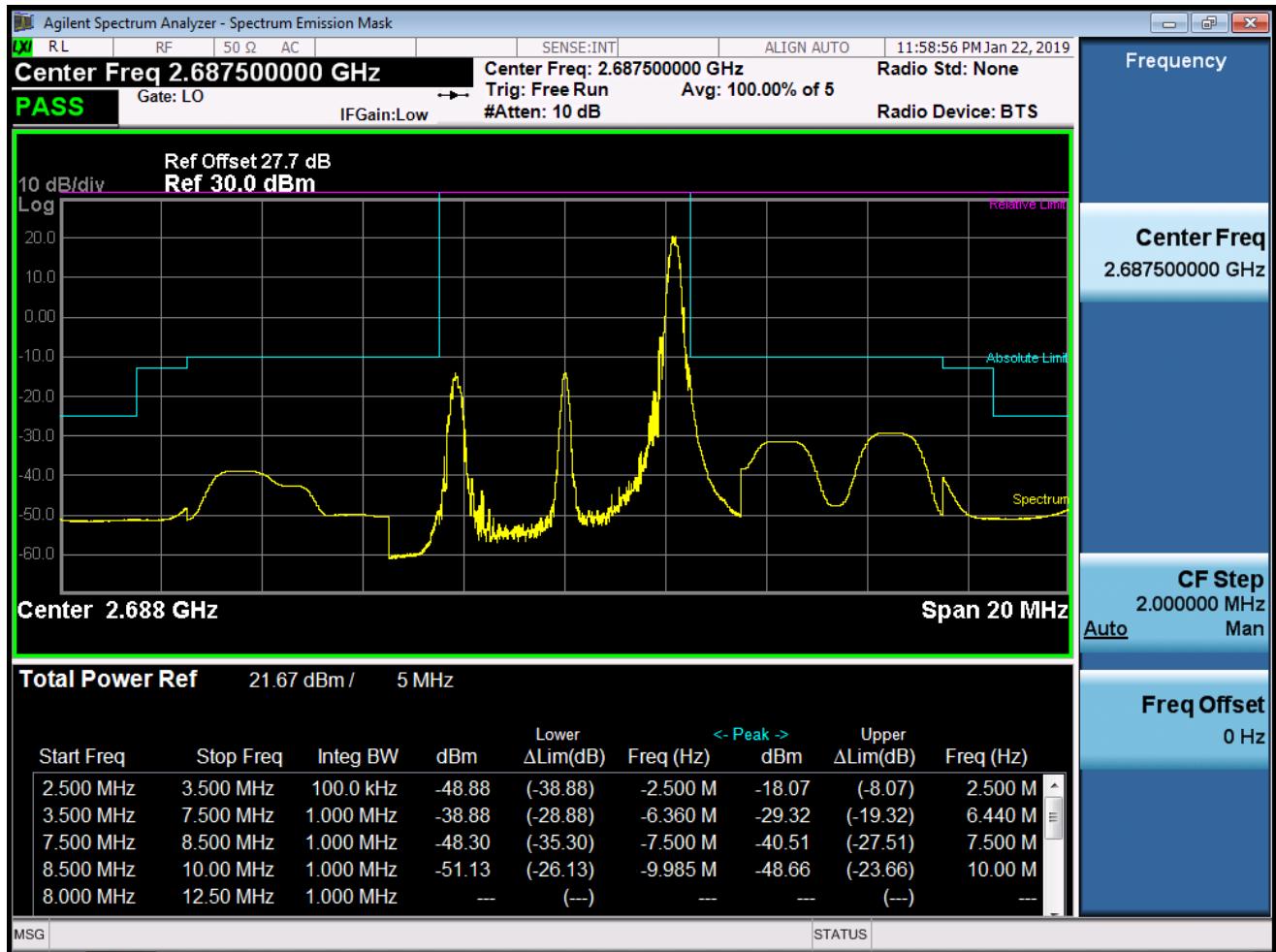
BAND 41. Low Channel Edge Plot (5 MHz Ch.39675 QPSK\_RB25\_Offset 0)-2



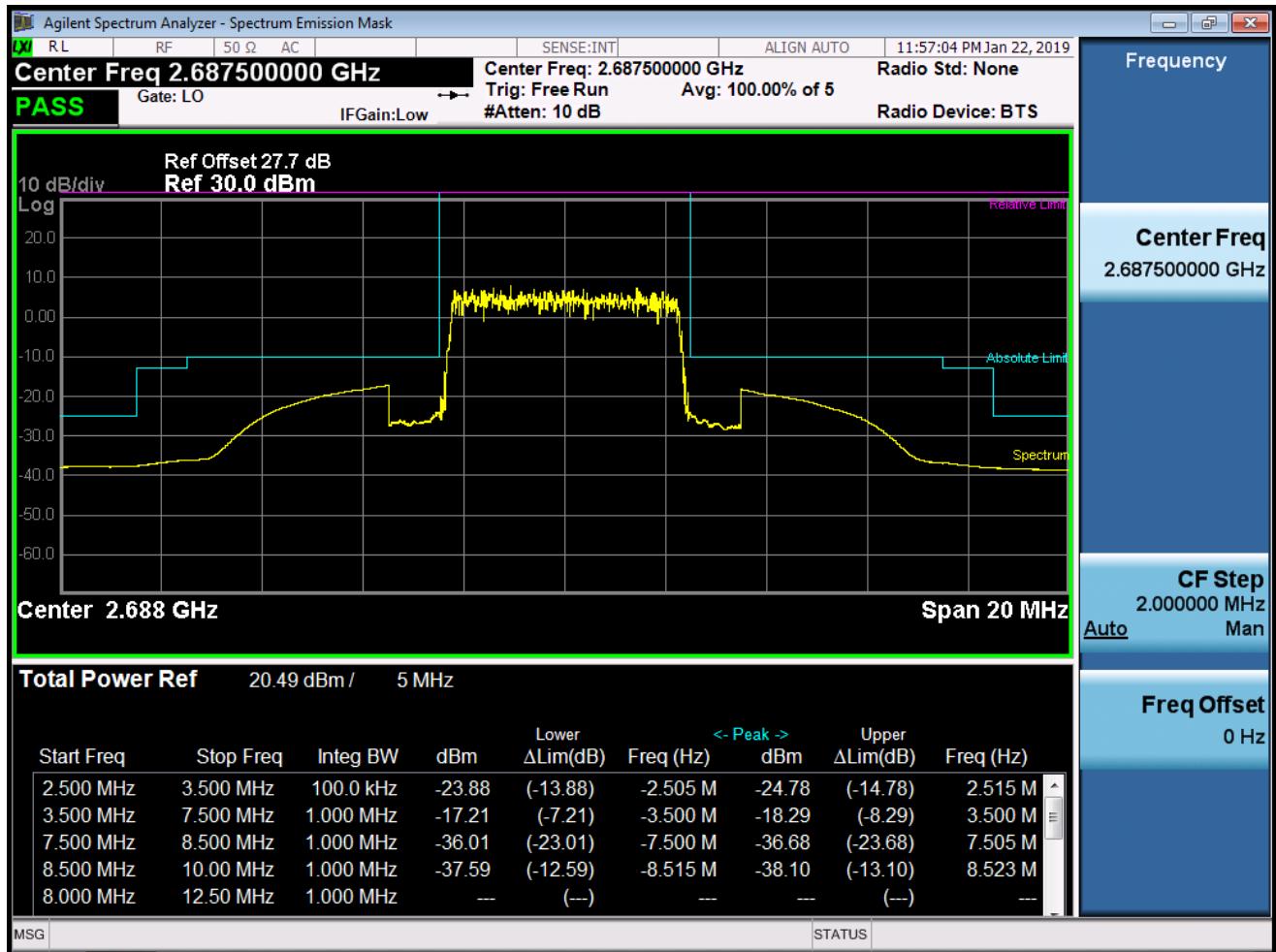
BAND 41. Mid Channel Edge Plot (5 MHz Ch.40620 QPSK RB 25)



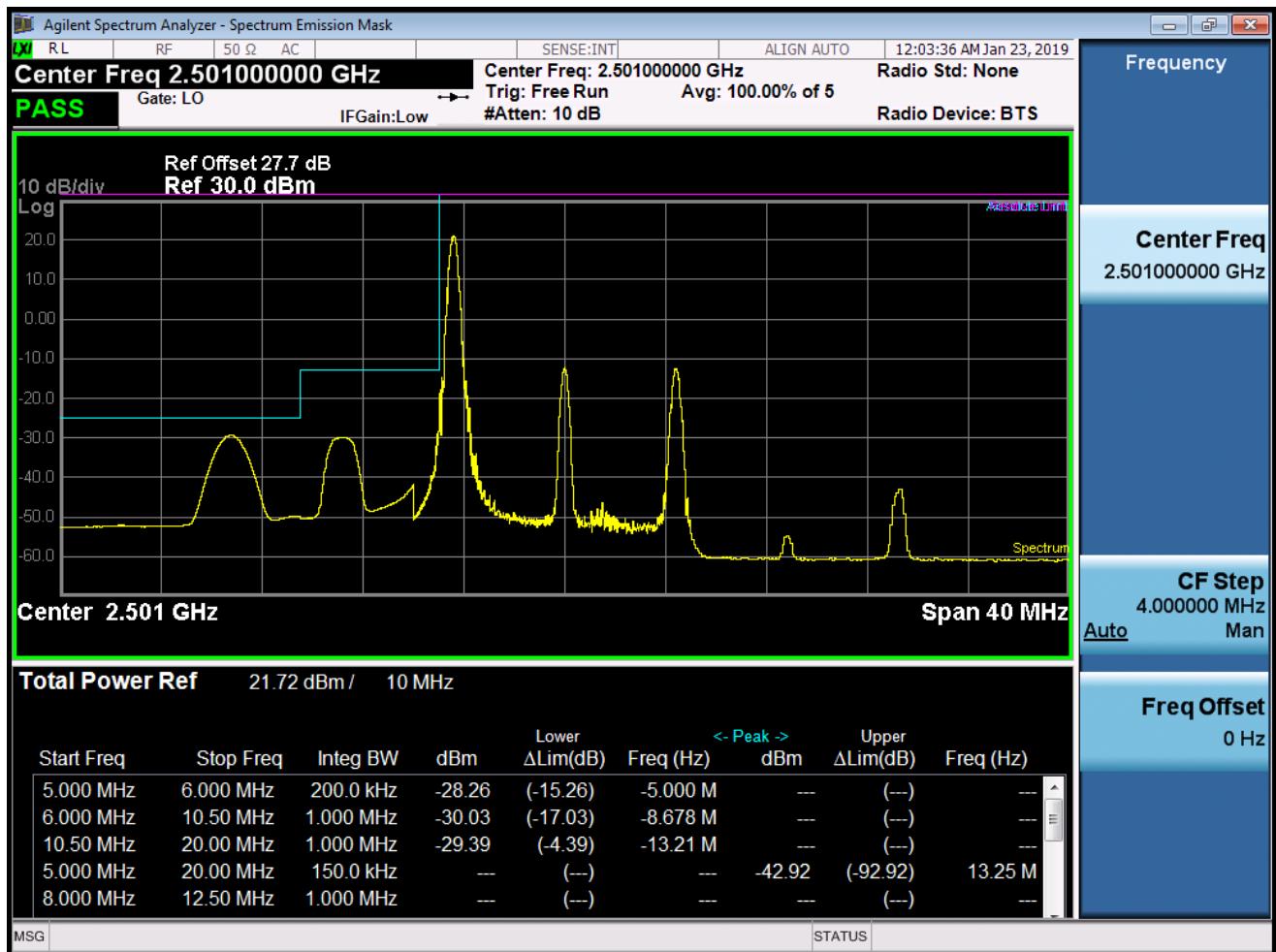
BAND 41. High Channel Edge Plot (5 MHz Ch.41565 QPSK RB 1, Offset 0)



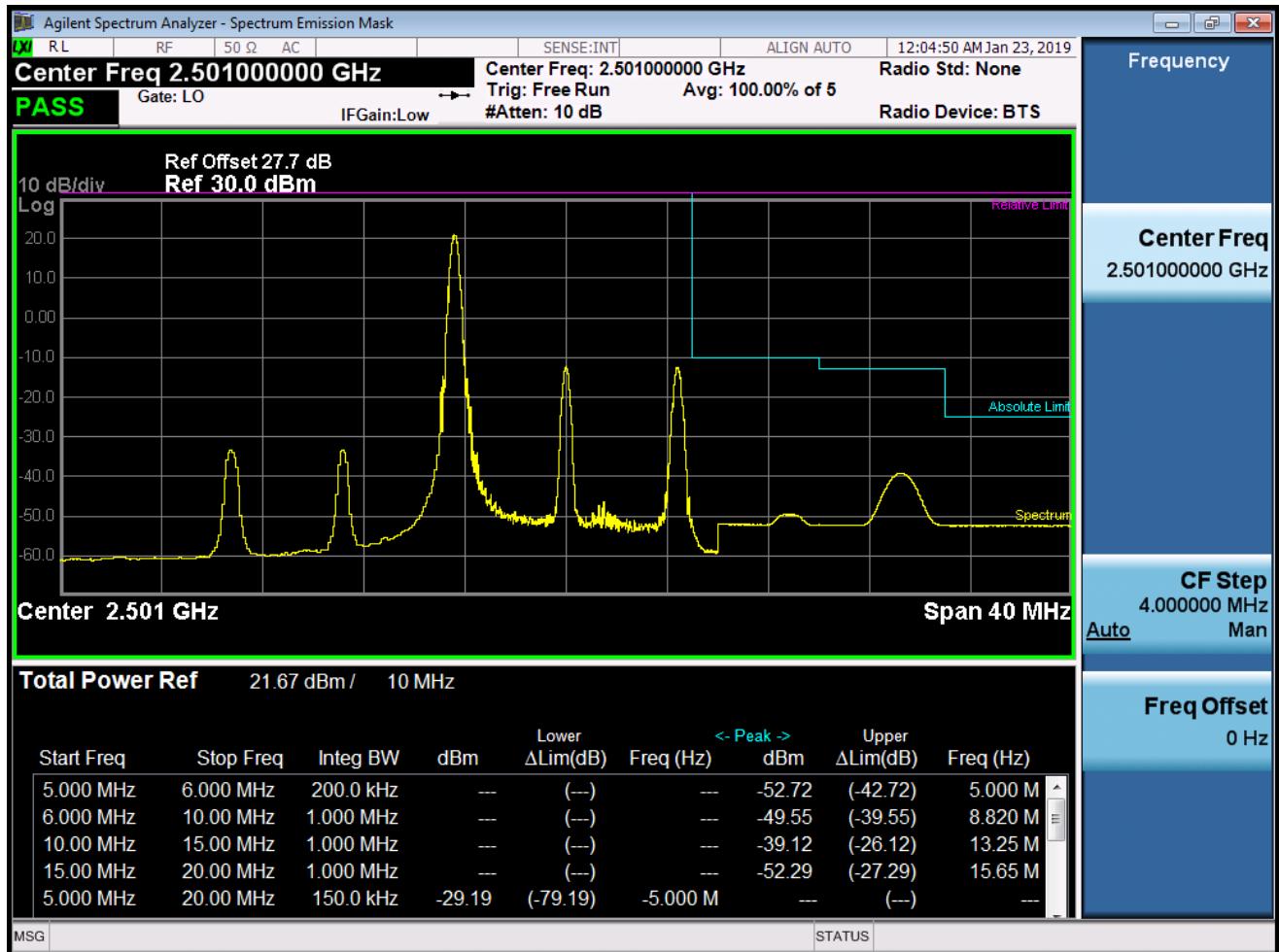
BAND 41. High Channel Edge Plot (5 MHz Ch.41565 QPSK\_RB25\_Offset 0)



BAND 41. Low Channel Edge Plot (10 MHz Ch.39700 QPSK RB 1, Offset 0)-1



BAND 41. Low Channel Edge Plot (10 MHz Ch.39700 QPSK RB 1, Offset 0)-2



BAND 41. Low Channel Edge Plot (10 MHz Ch.39700 QPSK\_RB50\_Offset 0)-1



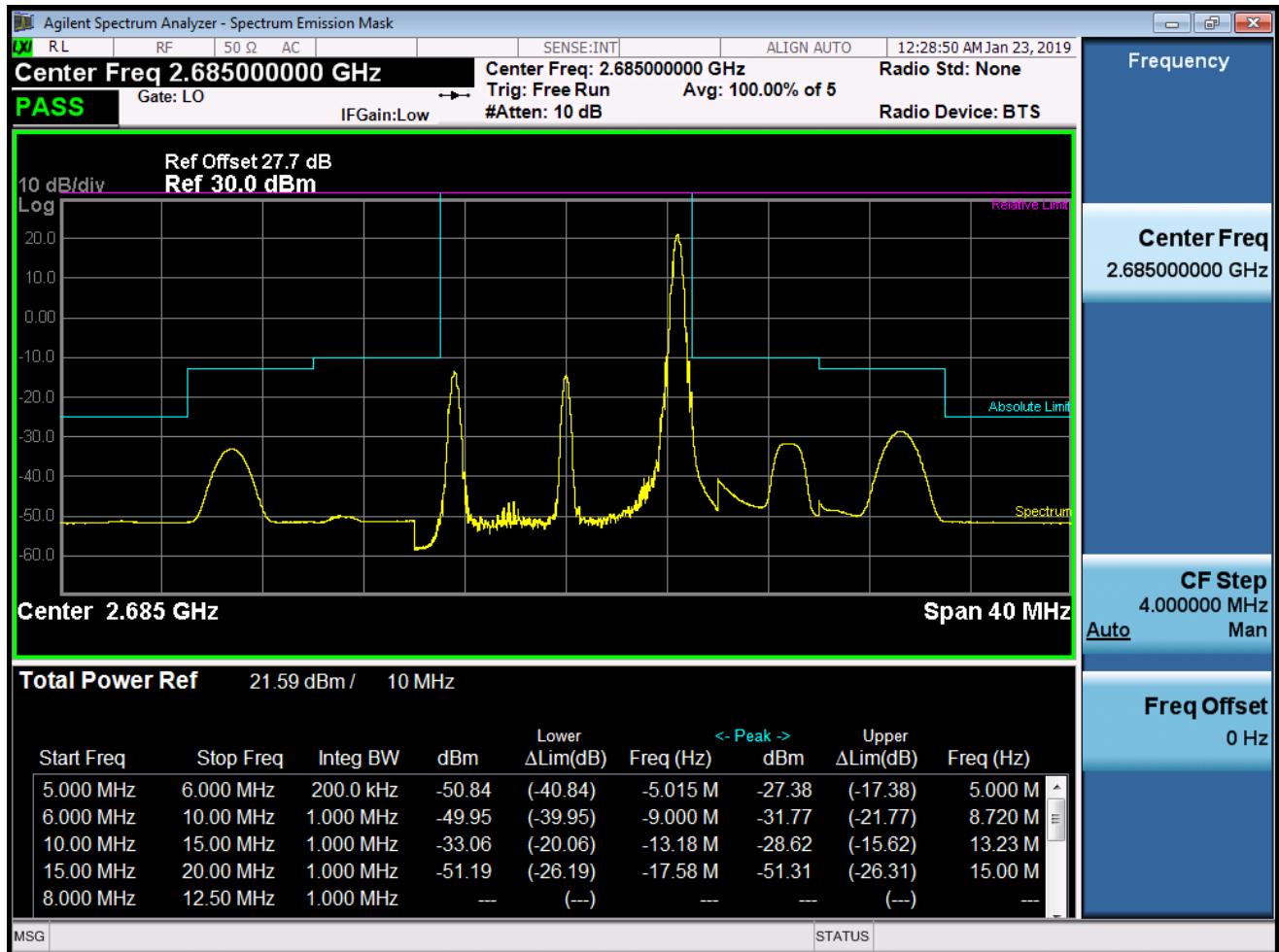
BAND 41. Low Channel Edge Plot (10 MHz Ch.39700 QPSK\_RB50\_Offset 0)-2



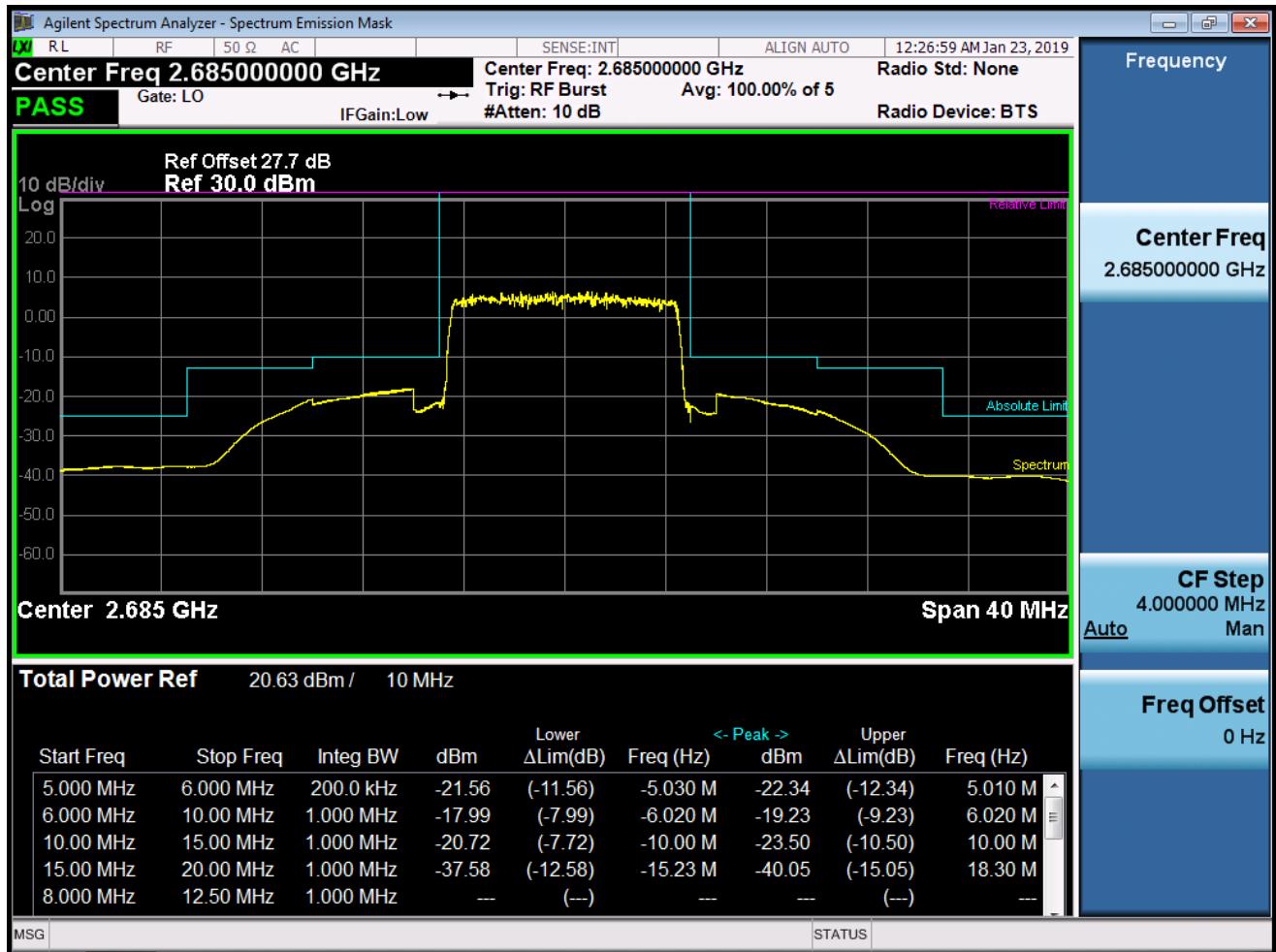
BAND 41. Mid Channel Edge Plot (10 MHz Ch.40620 QPSK RB 50)



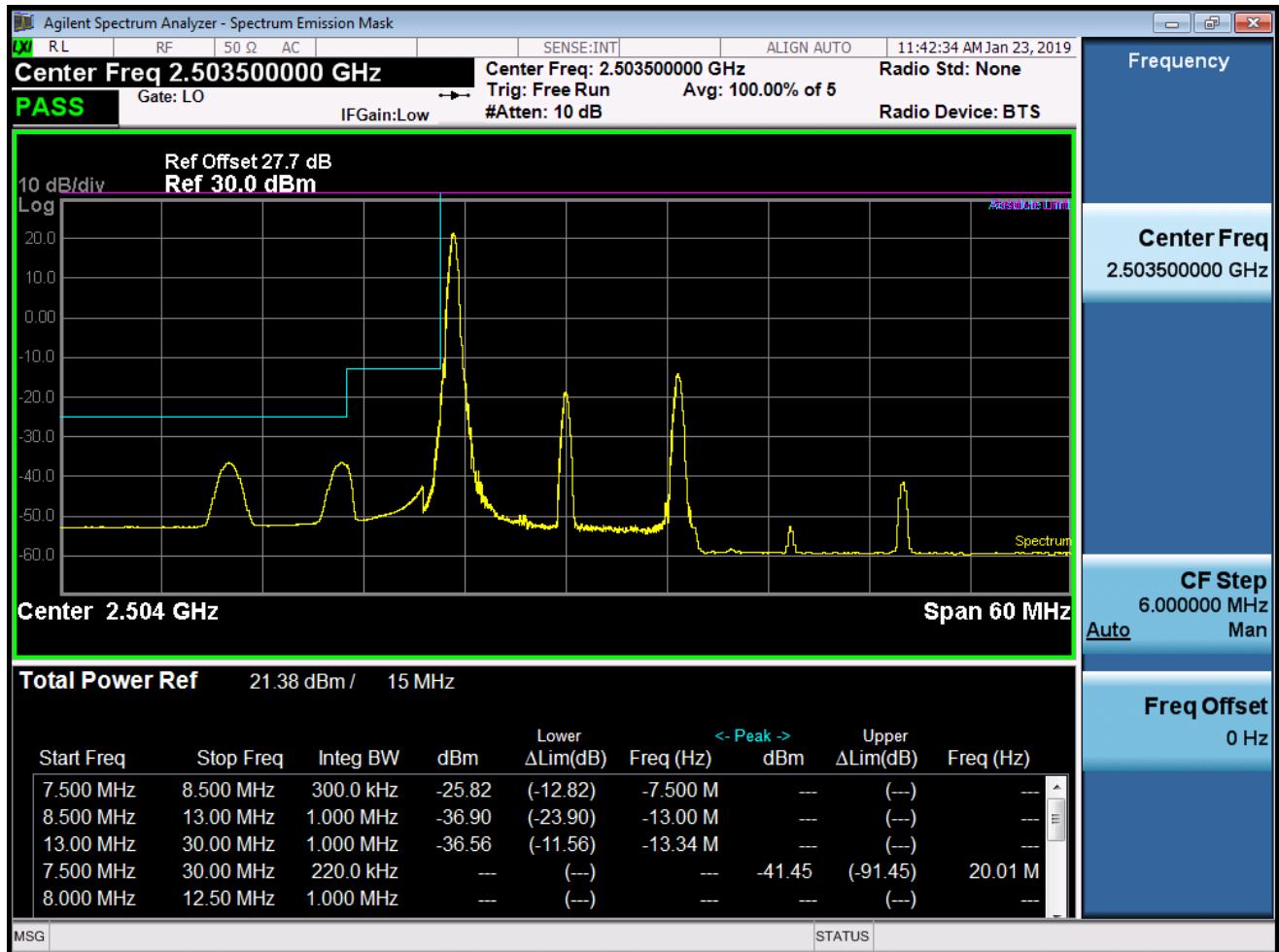
BAND 41. High Channel Edge Plot (10 MHz Ch.41540 QPSK RB 1, Offset 0)



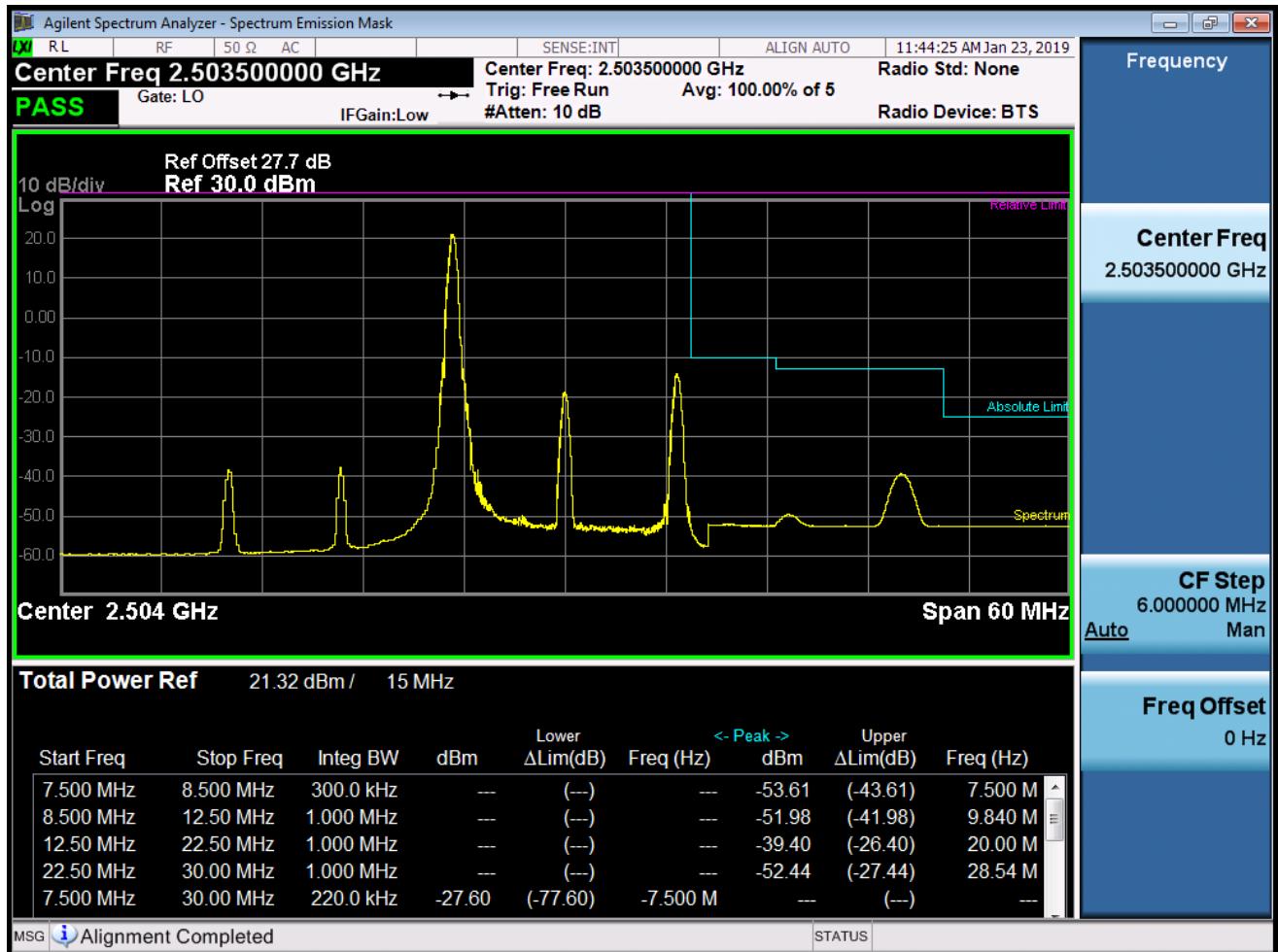
BAND 41. High Channel Edge Plot (10 MHz Ch.41540 QPSK\_RB50\_Offset 0)



BAND 41. Low Channel Edge Plot (15 MHz Ch.39725 QPSK RB 1, Offset 0)-1



BAND 41. Low Channel Edge Plot (15 MHz Ch.39725 QPSK RB 1, Offset 0)-2



BAND 41. Low Channel Edge Plot (15 MHz Ch.39725 QPSK\_RB75\_Offset 0)-1



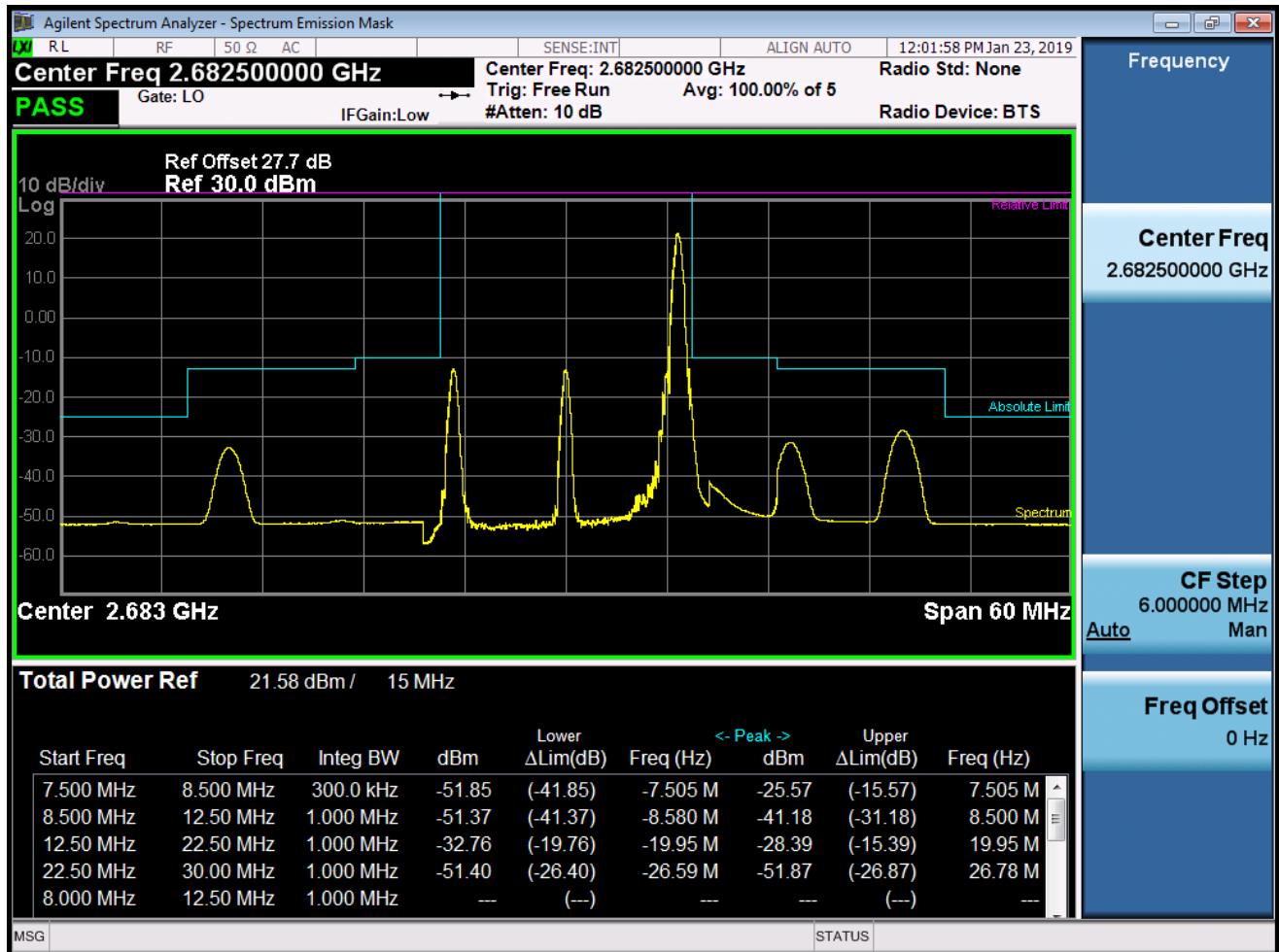
BAND 41. Low Channel Edge Plot (15 MHz Ch.39725 QPSK\_RB75\_Offset 0)-2



BAND 41. Mid Channel Edge Plot (15 MHz Ch.40620 QPSK RB 75)



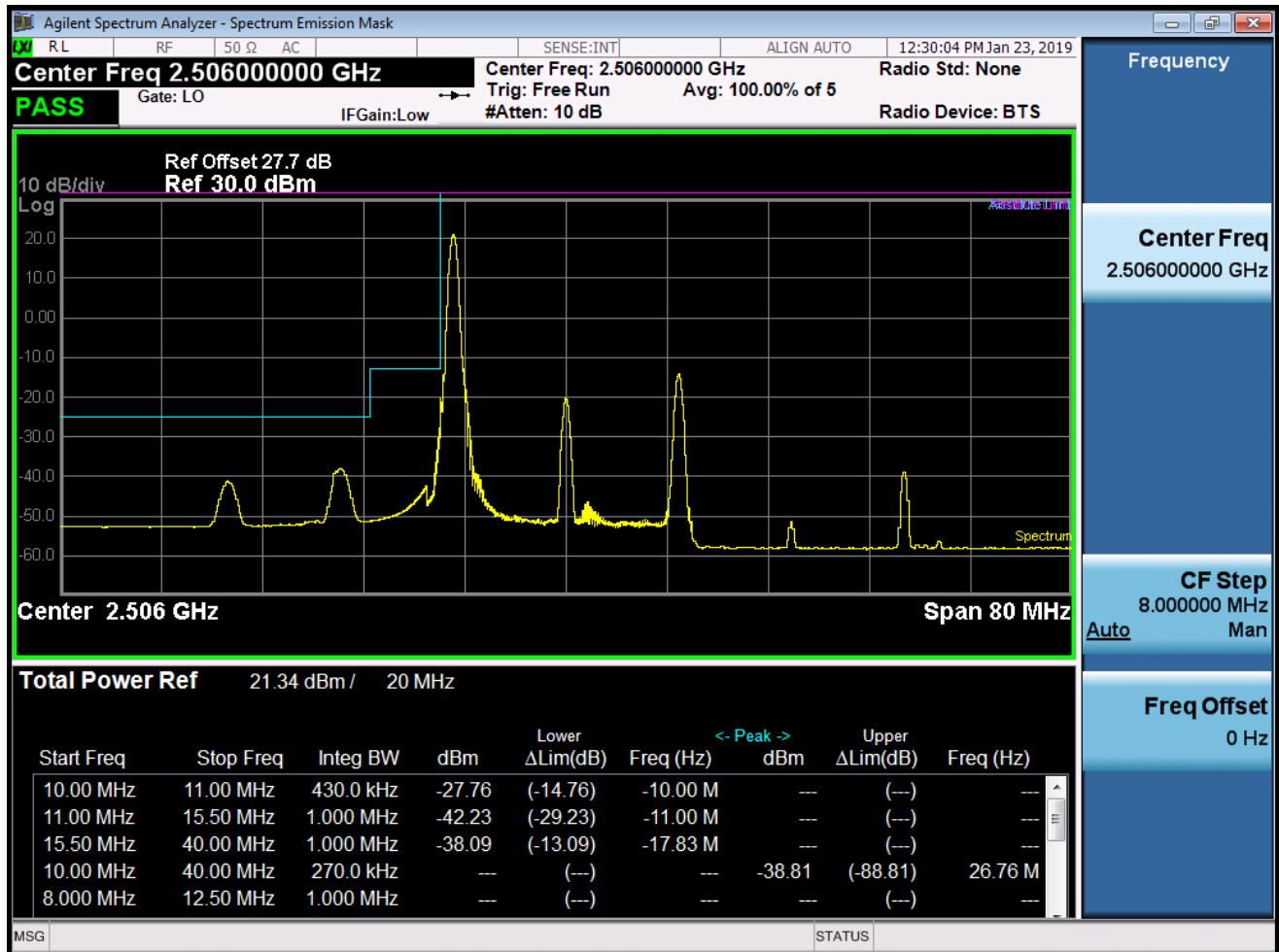
BAND 41. High Channel Edge Plot (15 MHz Ch.41515 QPSK RB 1, Offset 0)



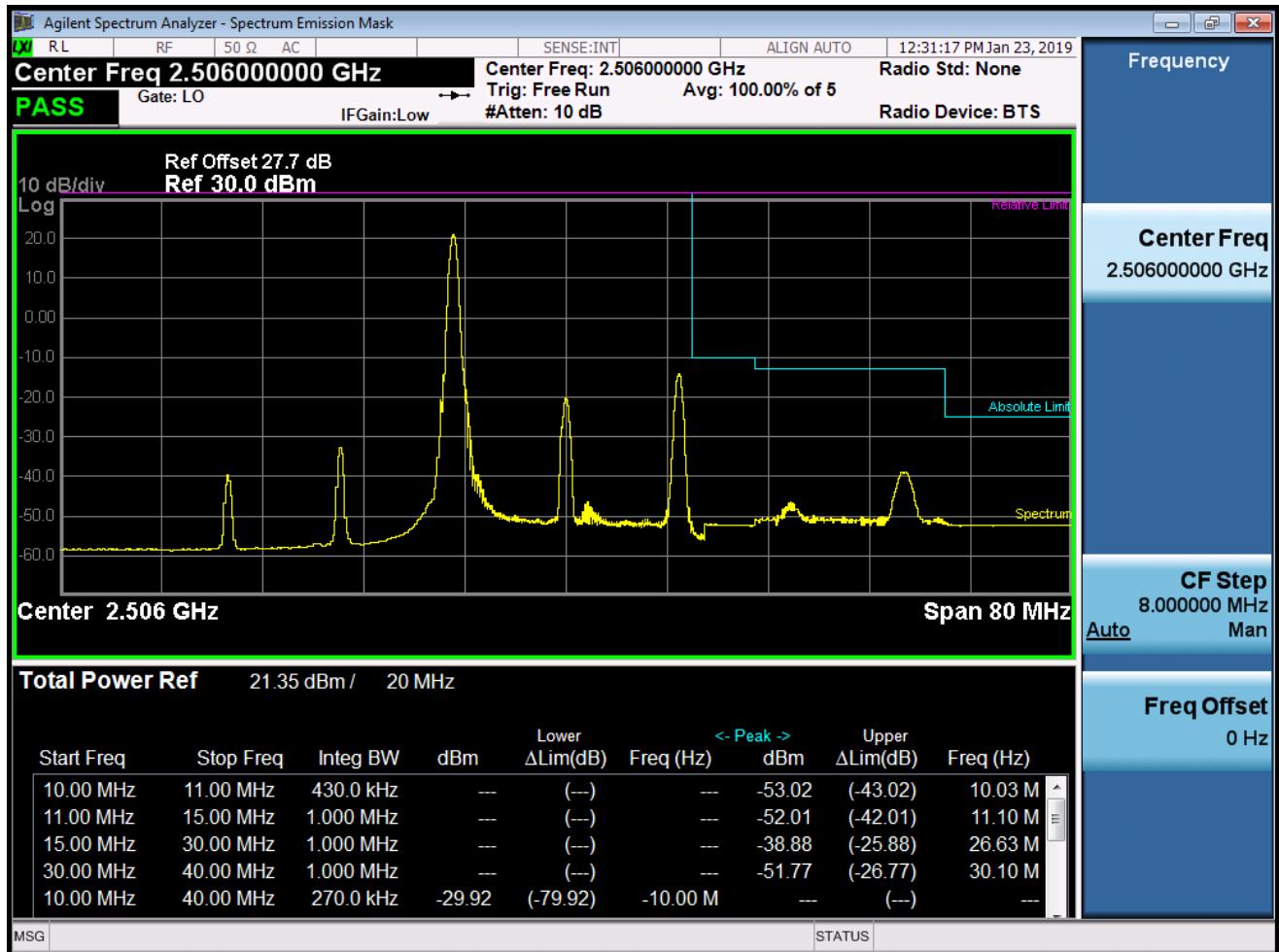
BAND 41. High Channel Edge Plot (15 MHz Ch.41515 QPSK\_RB75\_Offset 0)



BAND 41. Low Channel Edge Plot (20 MHz Ch.39750 QPSK RB 1, Offset 0)-1



BAND 41. Low Channel Edge Plot (20 MHz Ch.39750 QPSK RB 1, Offset 0)-2



BAND 41. Low Channel Edge Plot (20 MHz Ch.39750 QPSK\_RB100\_Offset 0)-1



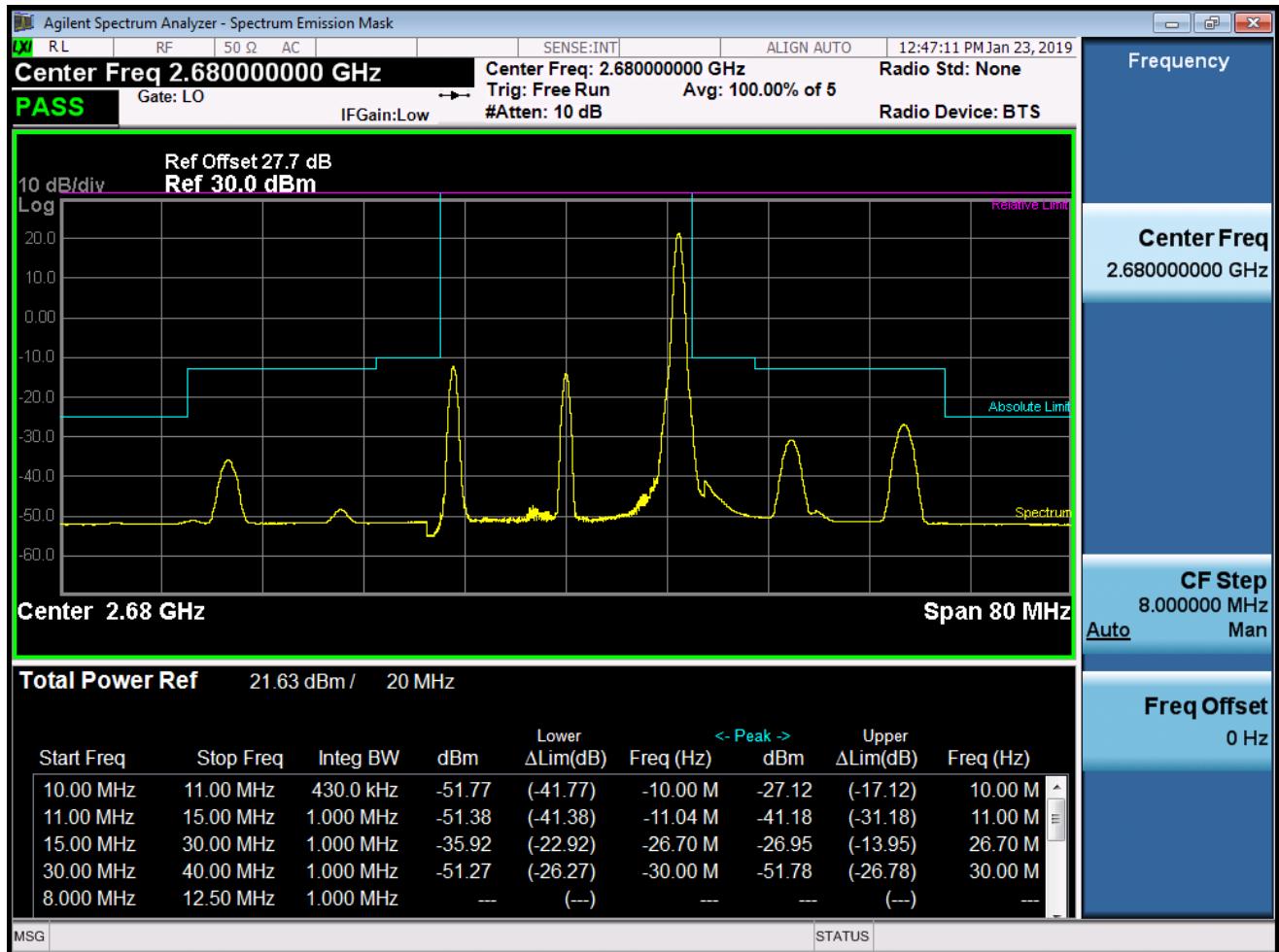
BAND 41. Low Channel Edge Plot (20 MHz Ch.39750 QPSK\_RB100\_Offset 0)-2



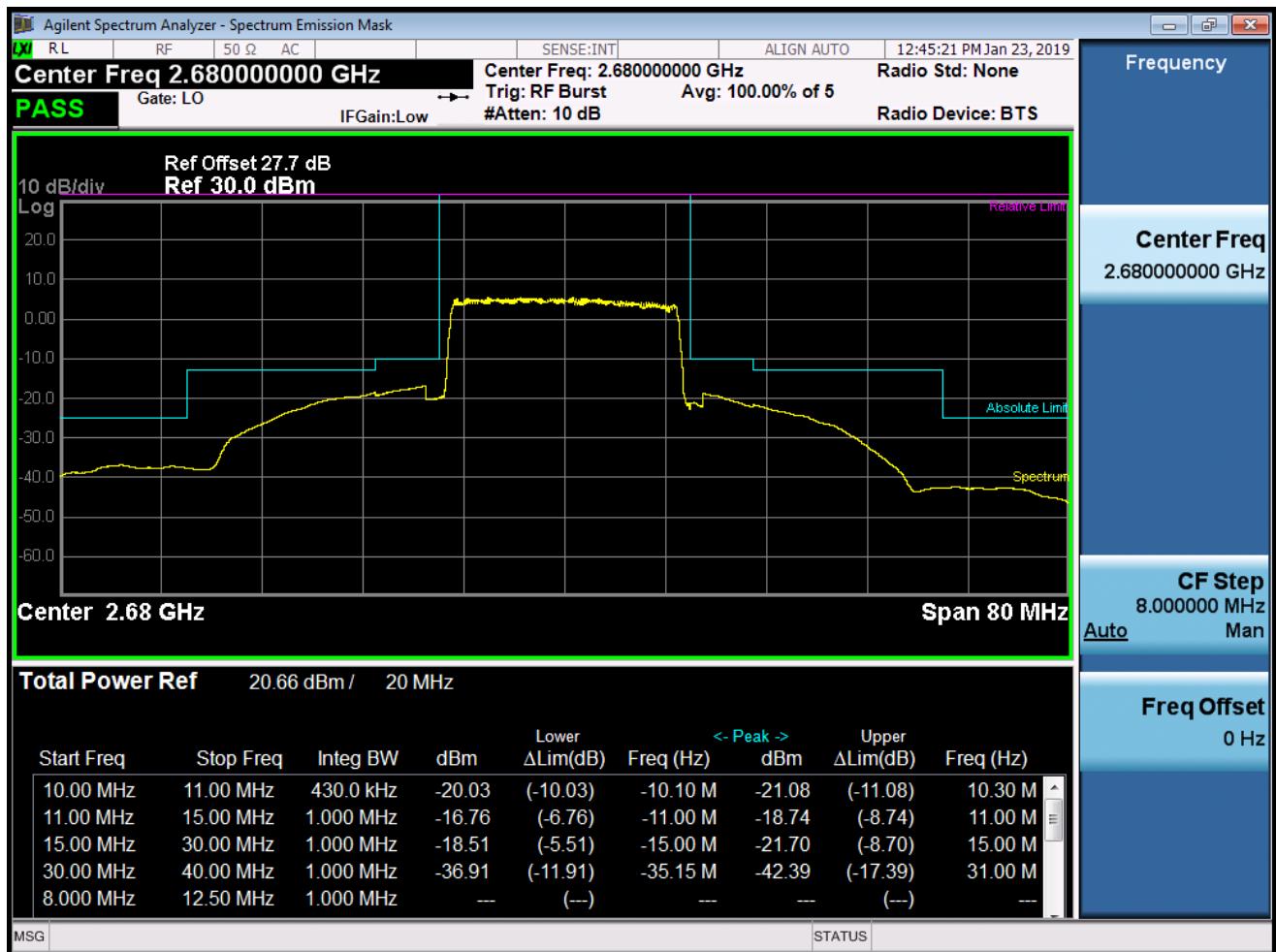
BAND 41. Mid Channel Edge Plot (20 MHz Ch.40620 QPSK RB 100)



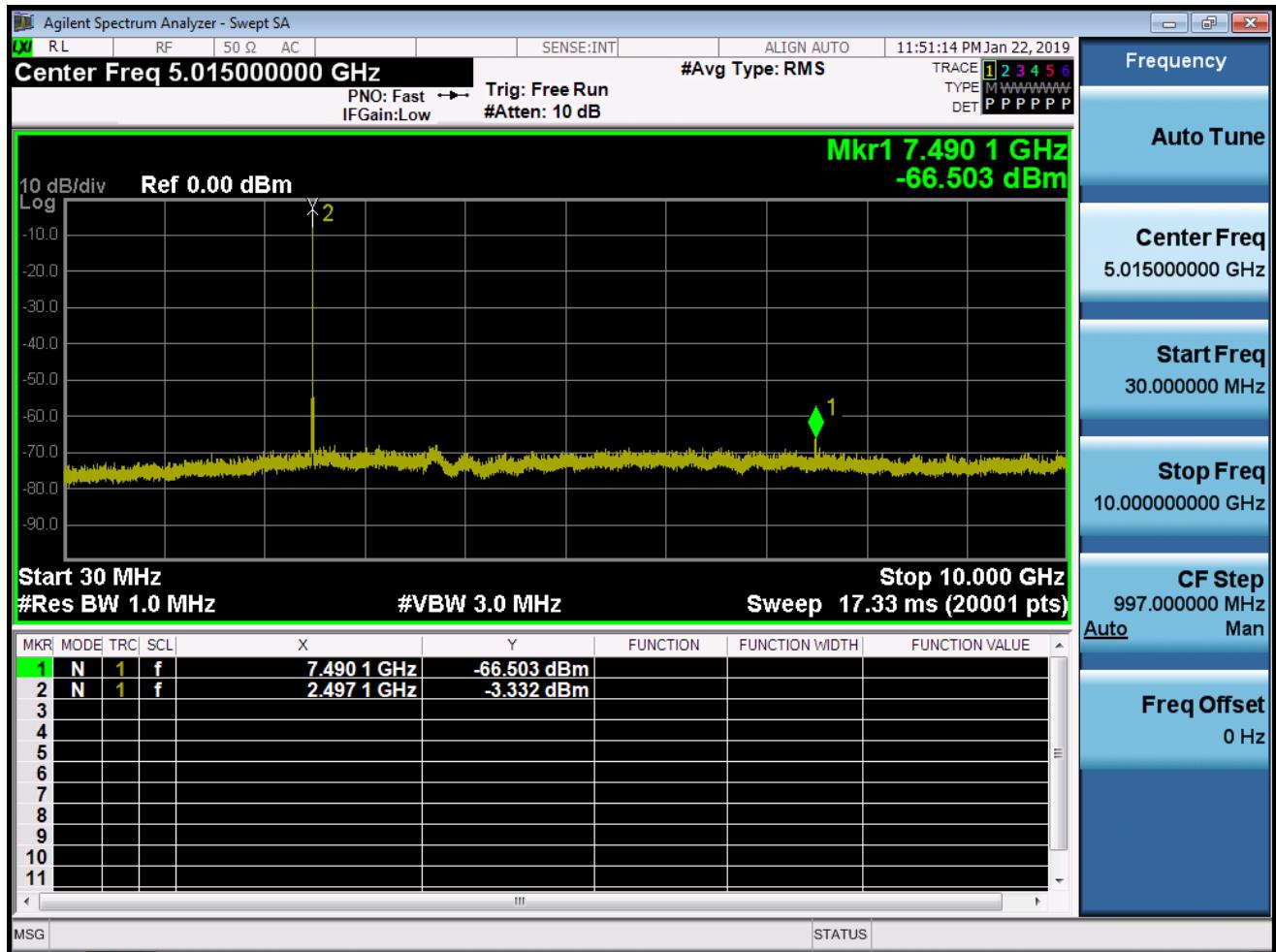
BAND 41. High Channel Edge Plot (20 MHz Ch.41490 QPSK RB 1, Offset 0)



BAND 41. High Channel Edge Plot (20 MHz Ch.41490 QPSK\_RB100\_Offset 0)



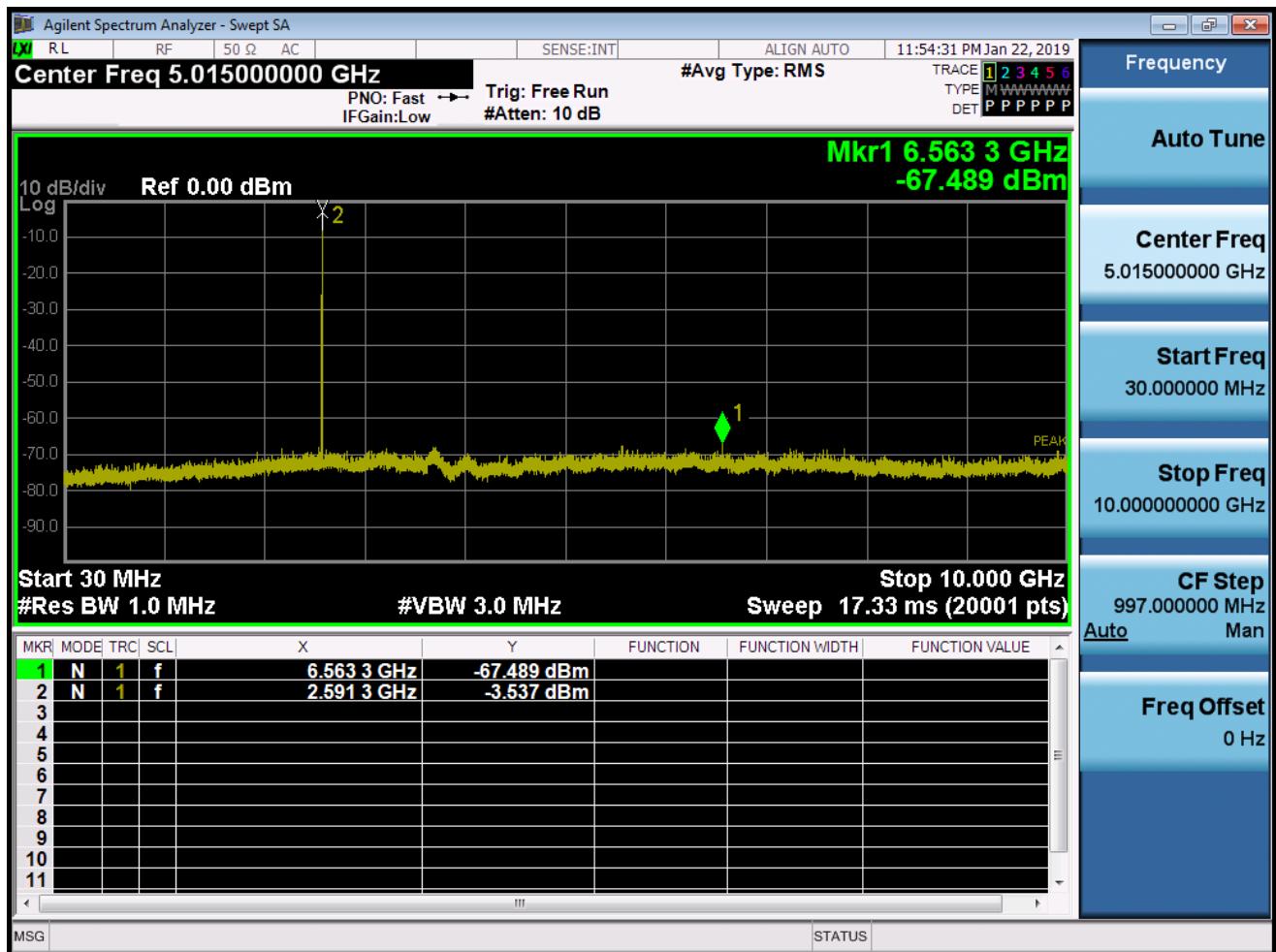
BAND 41. Conducted Spurious Plot 1 (5 MHz Ch.39675 QPSK RB 1, Offset 0)



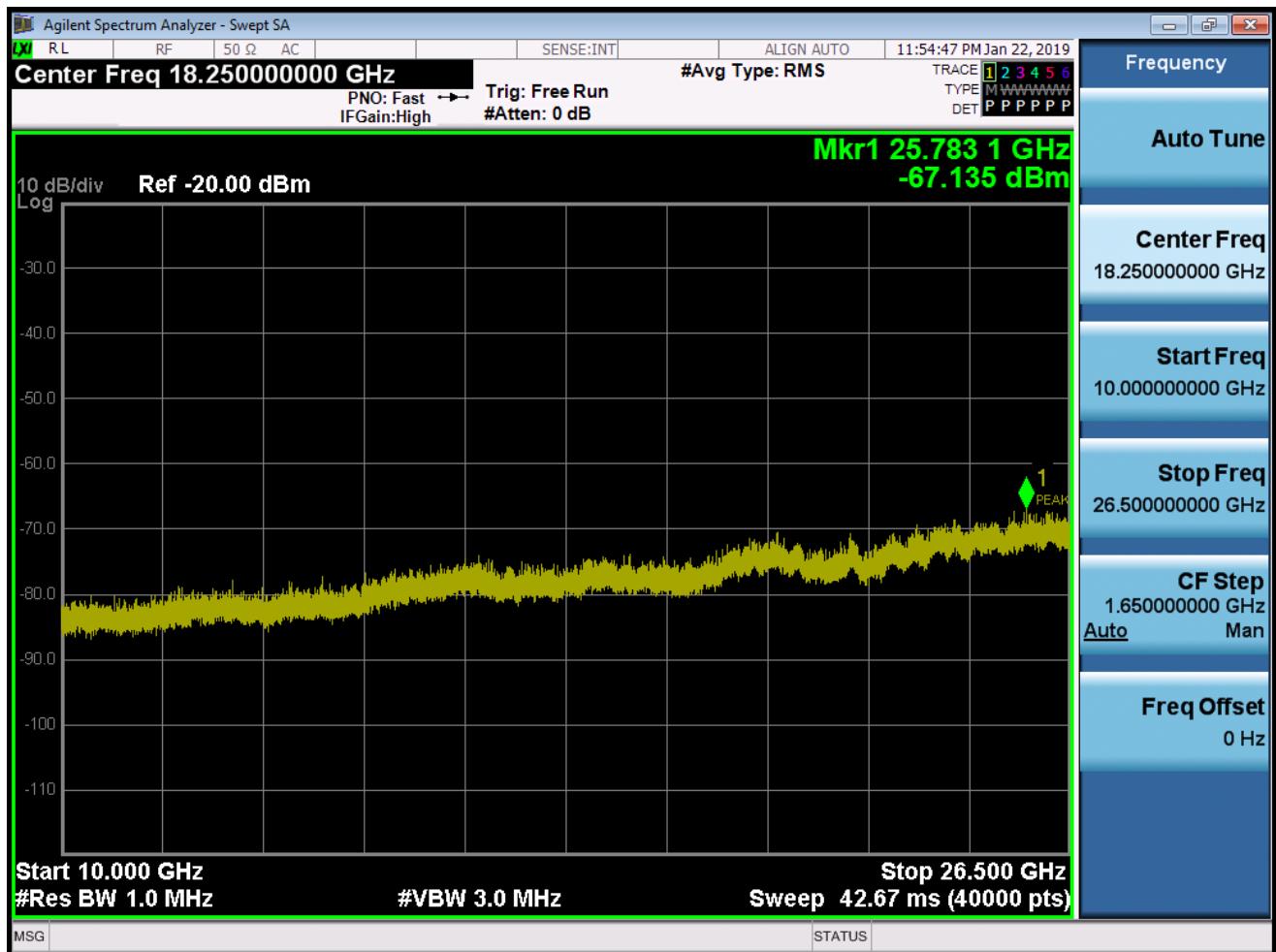
BAND 41. Conducted Spurious Plot 2 (5 MHz Ch. 39675 QPSK RB 1, Offset 0)



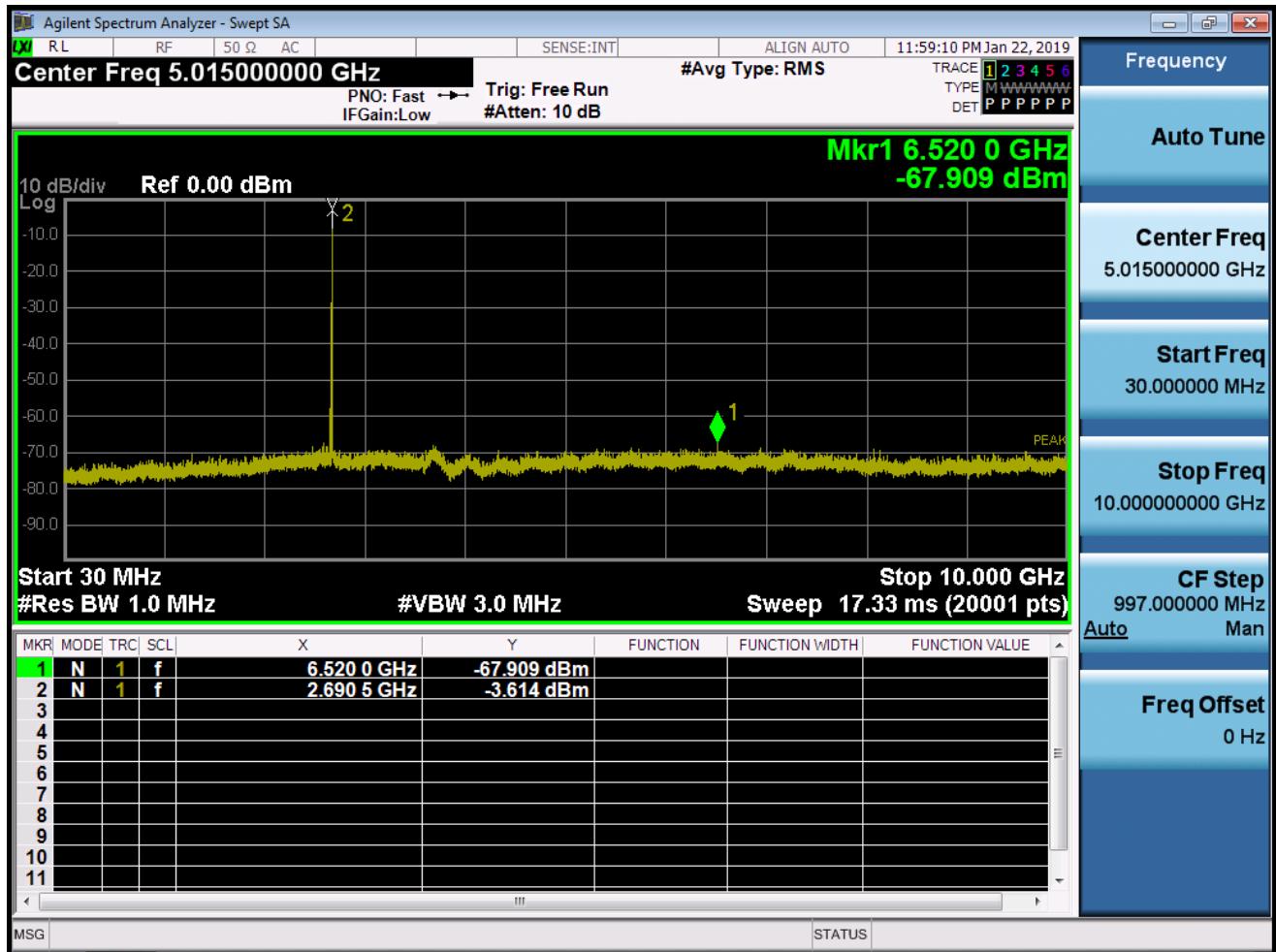
BAND 41. Conducted Spurious Plot 1 (5 MHz Ch.40620 QPSK RB 1, Offset 0)



BAND 41. Conducted Spurious Plot 2 (5 MHz Ch. 40620 QPSK RB 1, Offset 0)



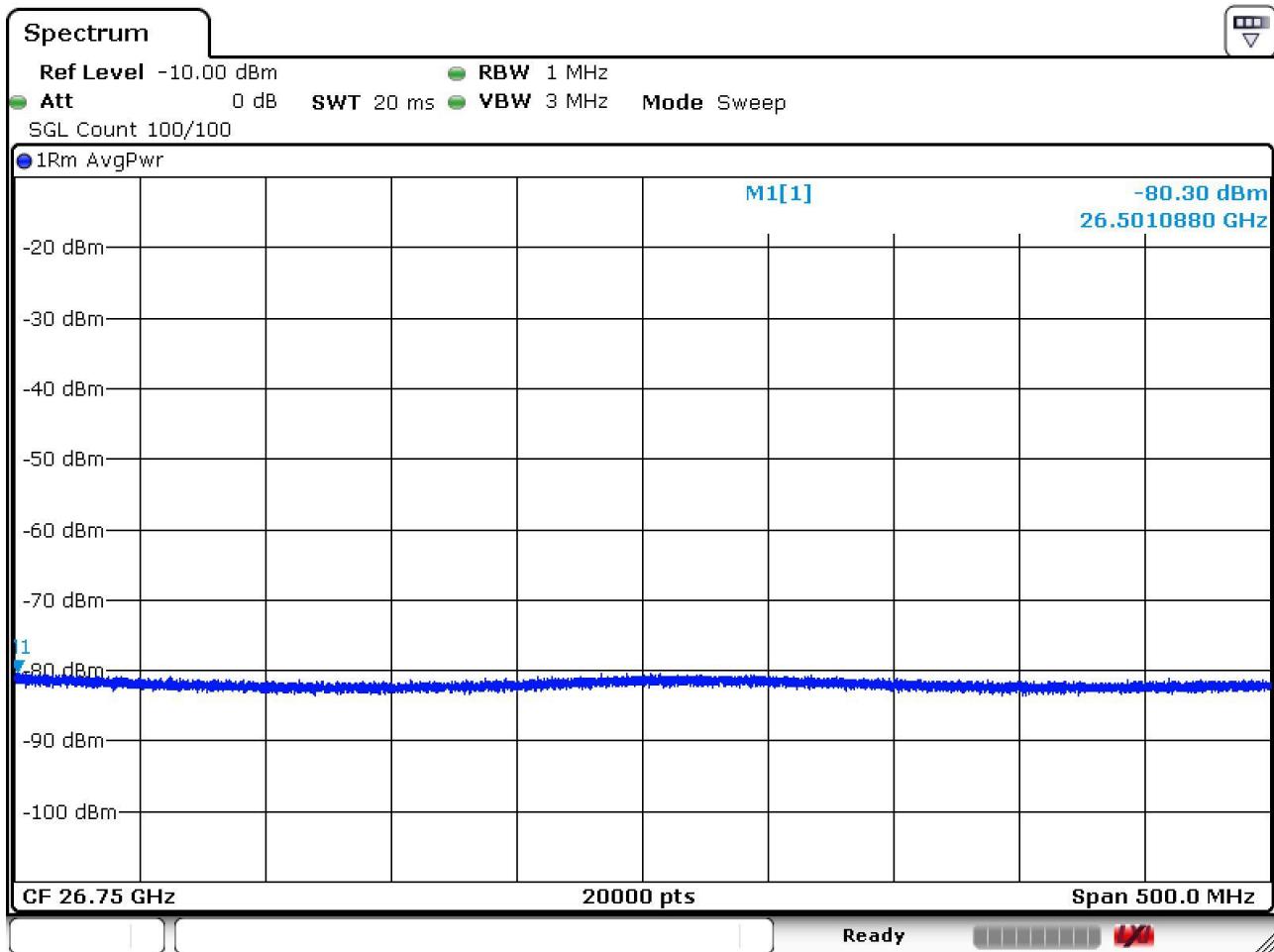
BAND 41. Conducted Spurious Plot 1 (5 MHz Ch.41565 QPSK RB 1, Offset 0)



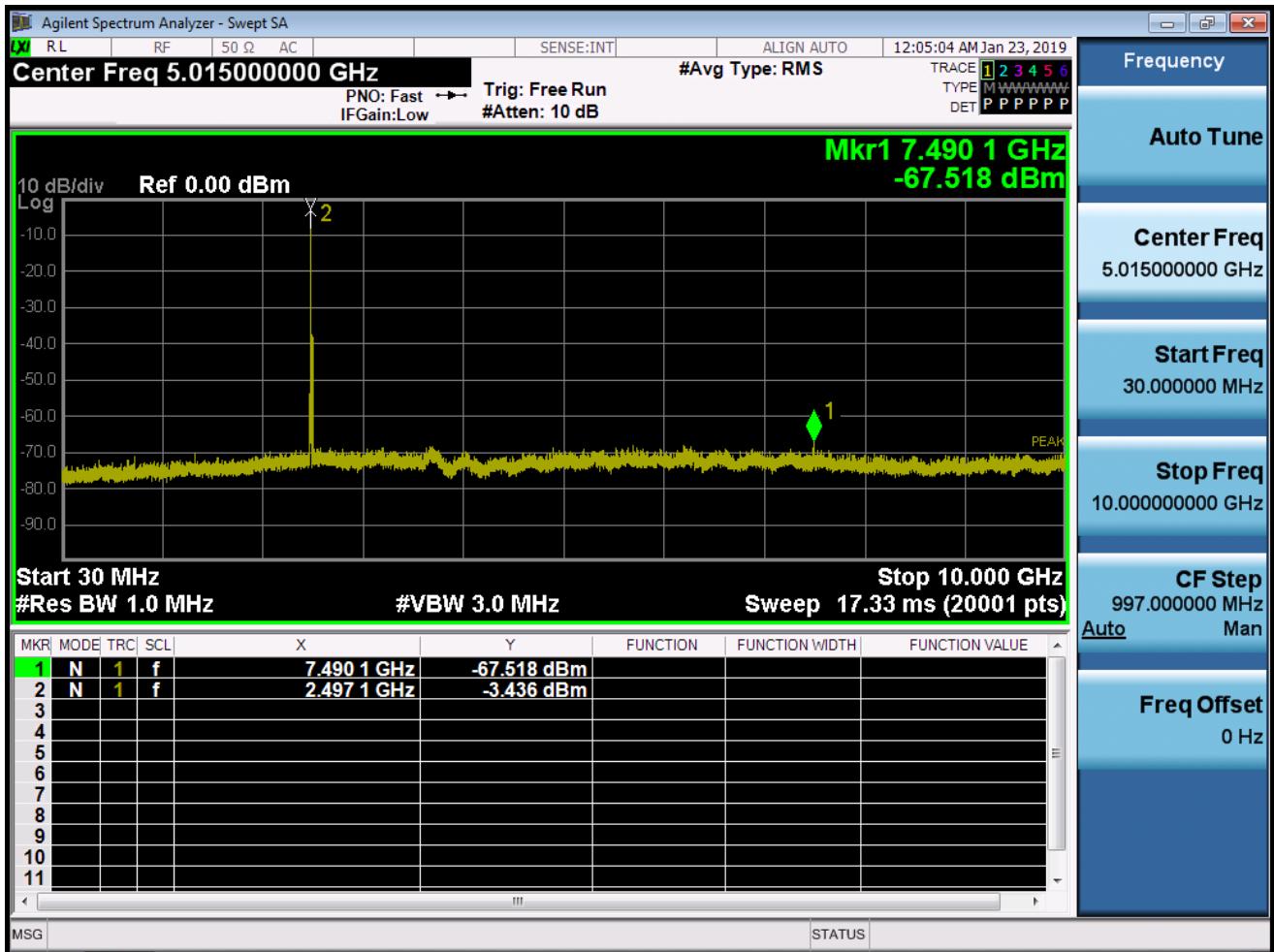
BAND 41. Conducted Spurious Plot 2 (5 MHz Ch. 41565 QPSK RB 1, Offset 0)



## BAND 41. Conducted Spurious Plot 3 (5 MHz Ch. 41565 QPSK RB 1, Offset 0)



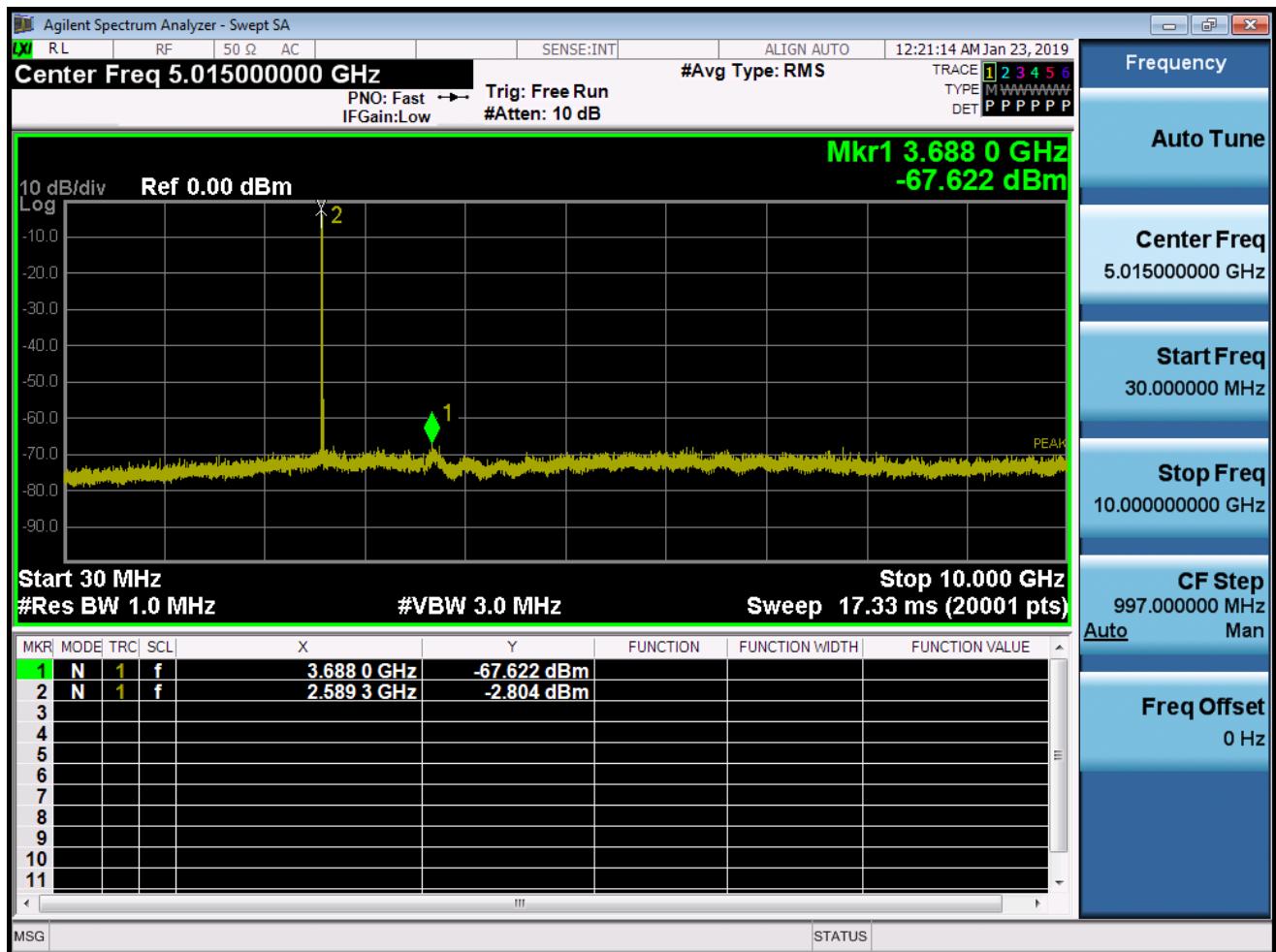
BAND 41. Conducted Spurious Plot 1 (10 MHz Ch.39700 QPSK RB 1, Offset 0)



BAND 41. Conducted Spurious Plot 2 (10 MHz Ch. 39700 QPSK RB 1, Offset 0)



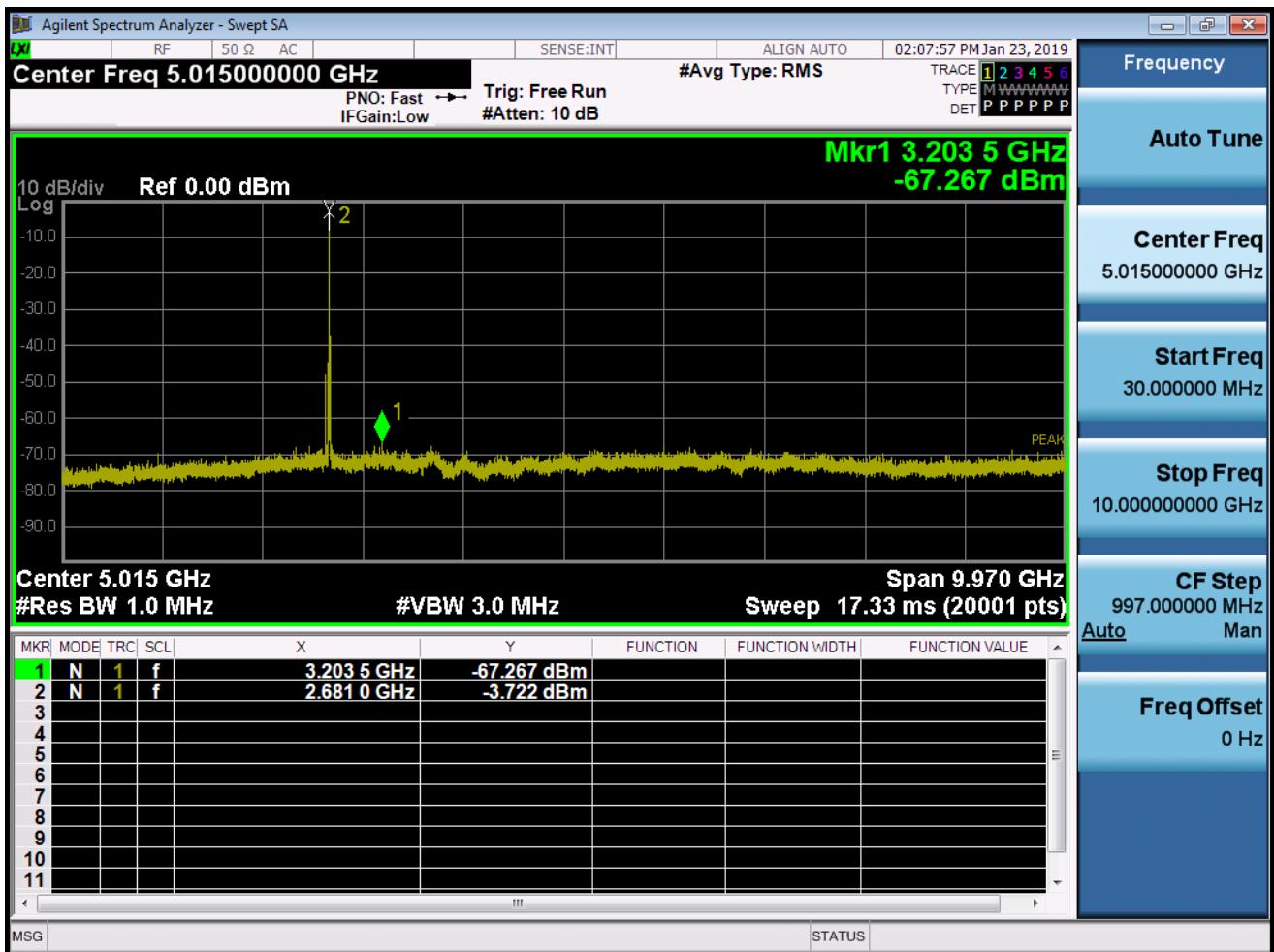
BAND 41. Conducted Spurious Plot 1 (10 MHz Ch.40620 QPSK RB 1, Offset 0)



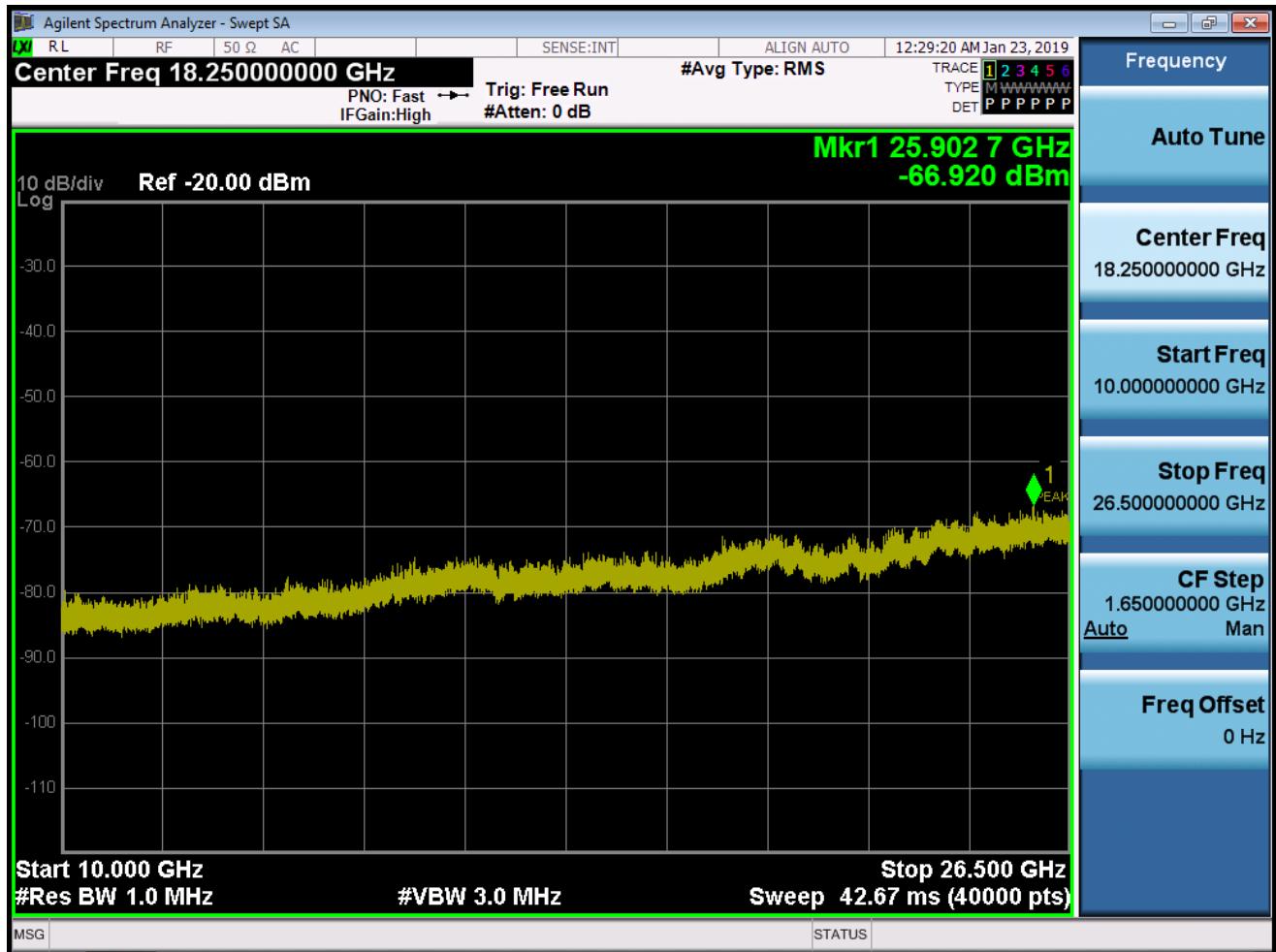
BAND 41. Conducted Spurious Plot 2 (10 MHz Ch. 40620 QPSK RB 1, Offset 0)



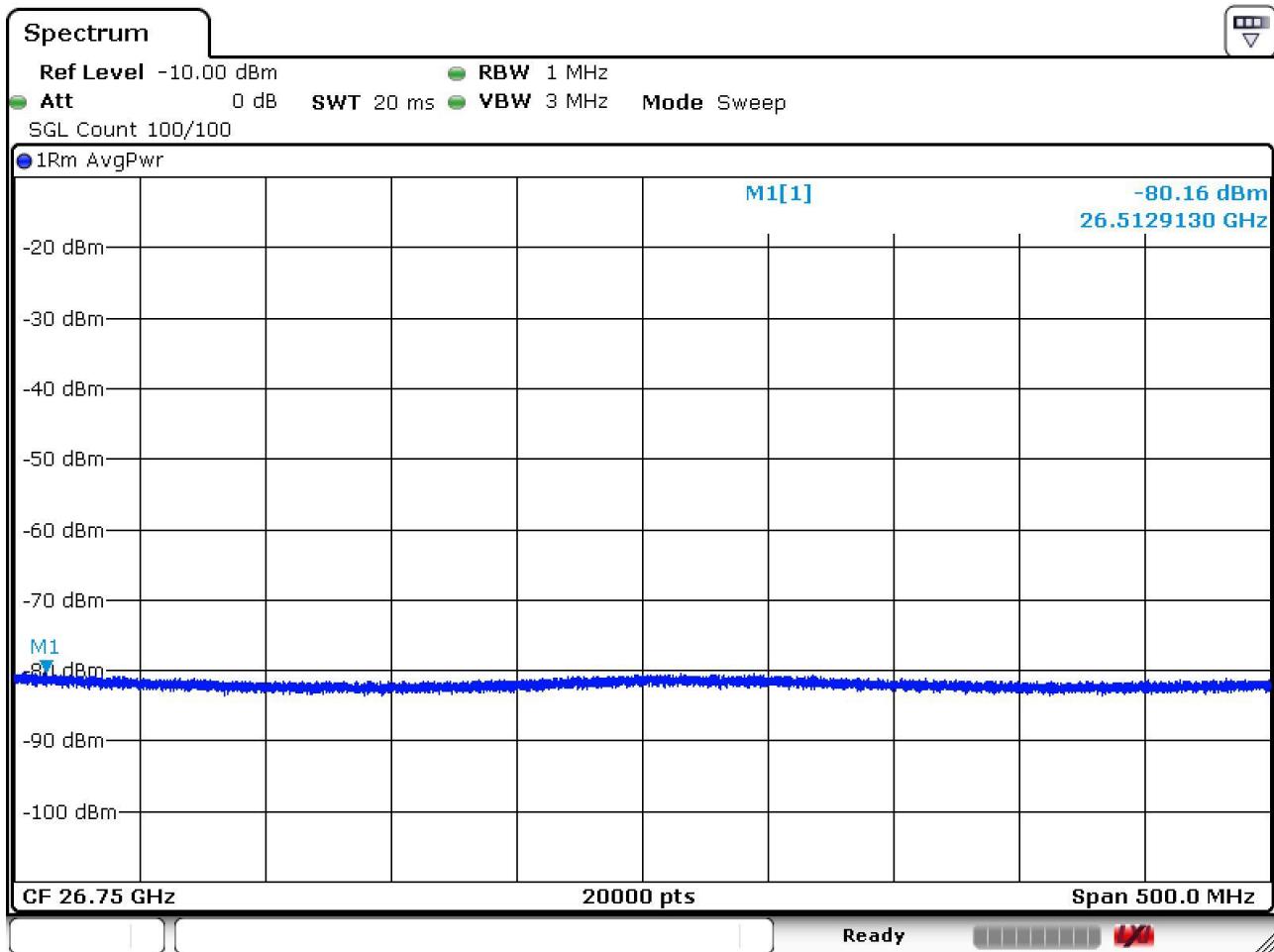
BAND 41. Conducted Spurious Plot 1 (10 MHz Ch. 41540 QPSK RB 1, Offset 0)



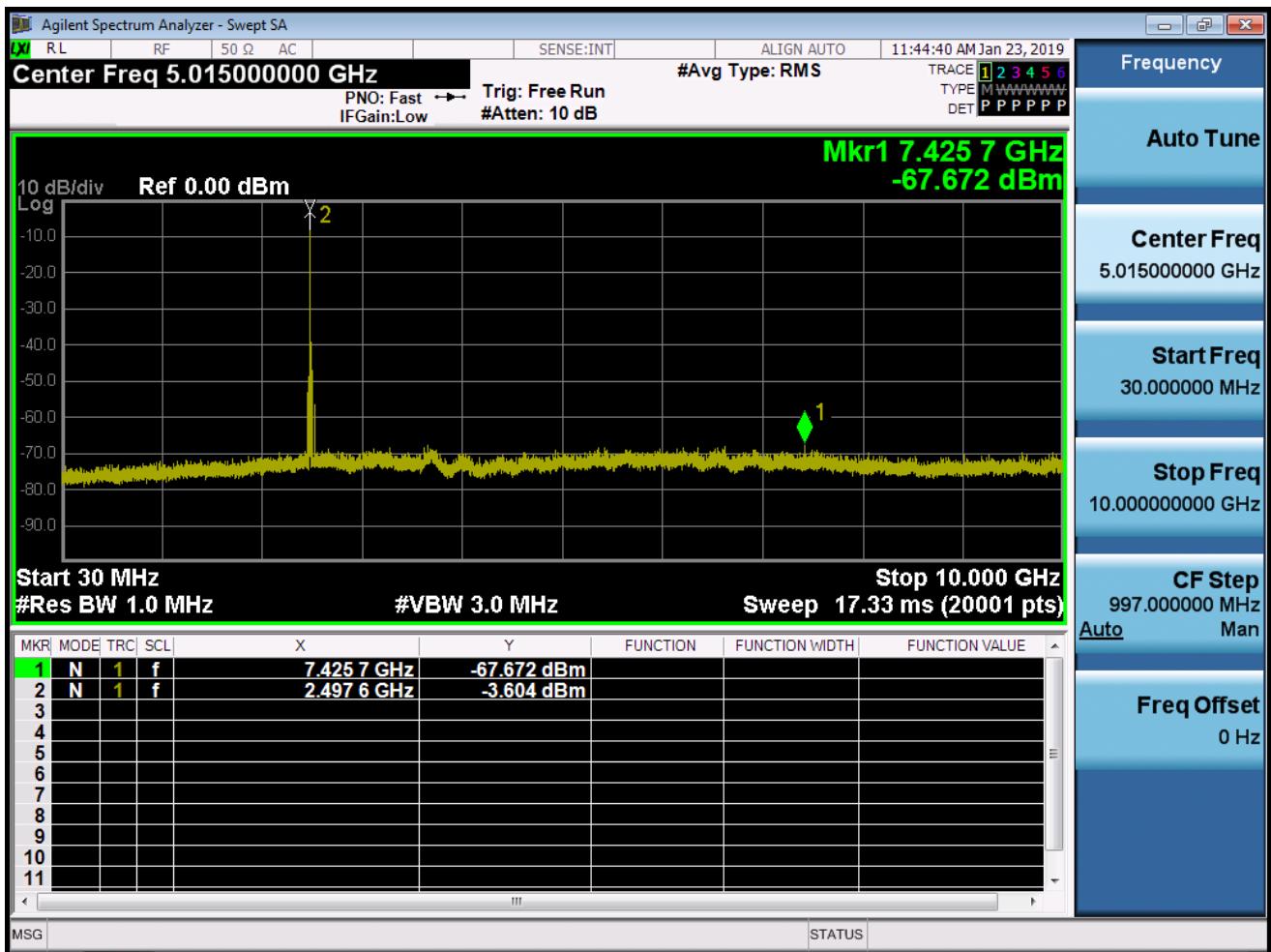
BAND 41. Conducted Spurious Plot 2 (10 MHz Ch. 41540 QPSK RB 1, Offset 0)



## BAND 41. Conducted Spurious Plot 3 (10 MHz Ch. 41540 QPSK RB 1, Offset 0)



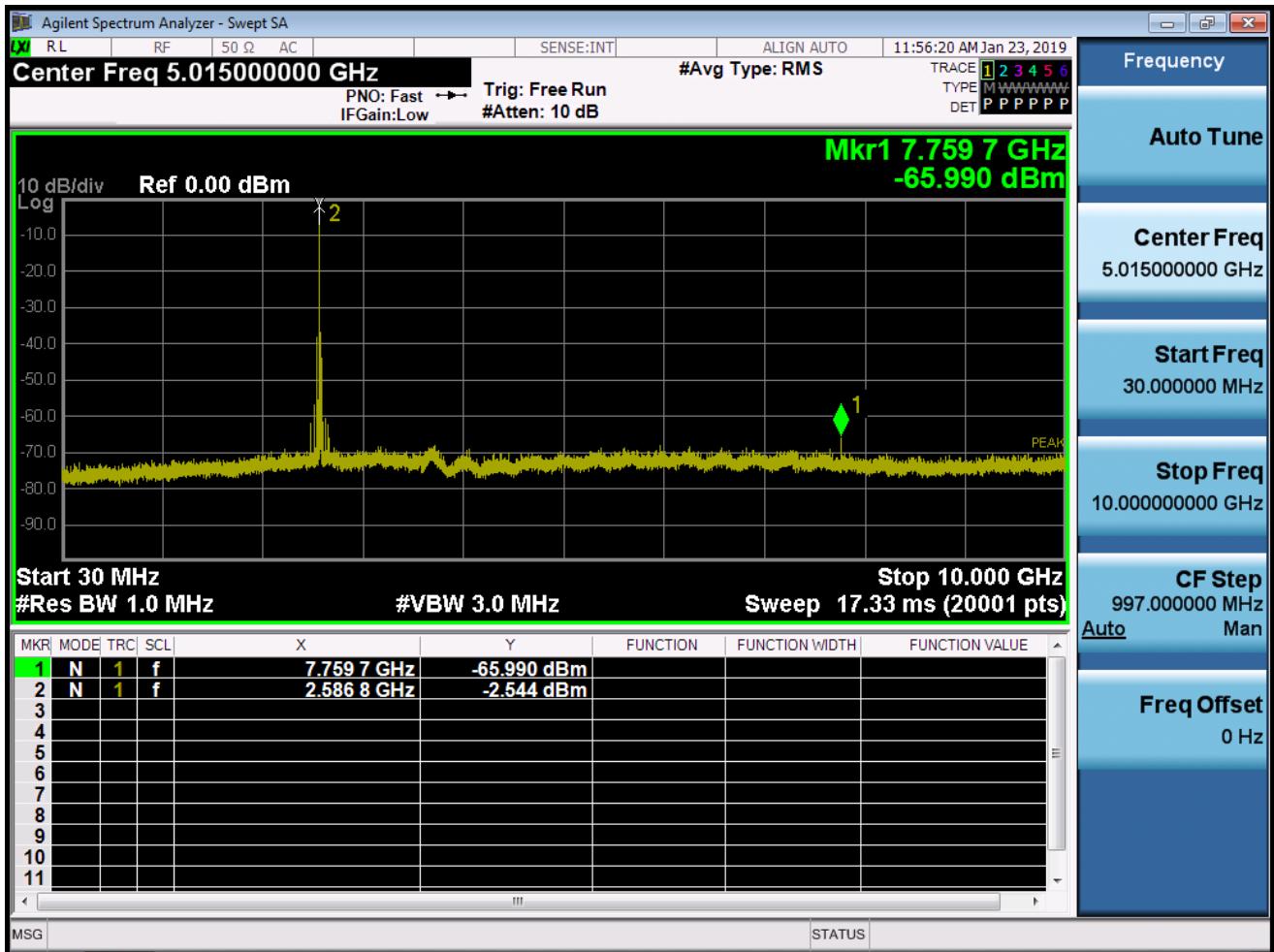
BAND 41. Conducted Spurious Plot 1 (15 MHz Ch.39725 QPSK RB 1, Offset 0)



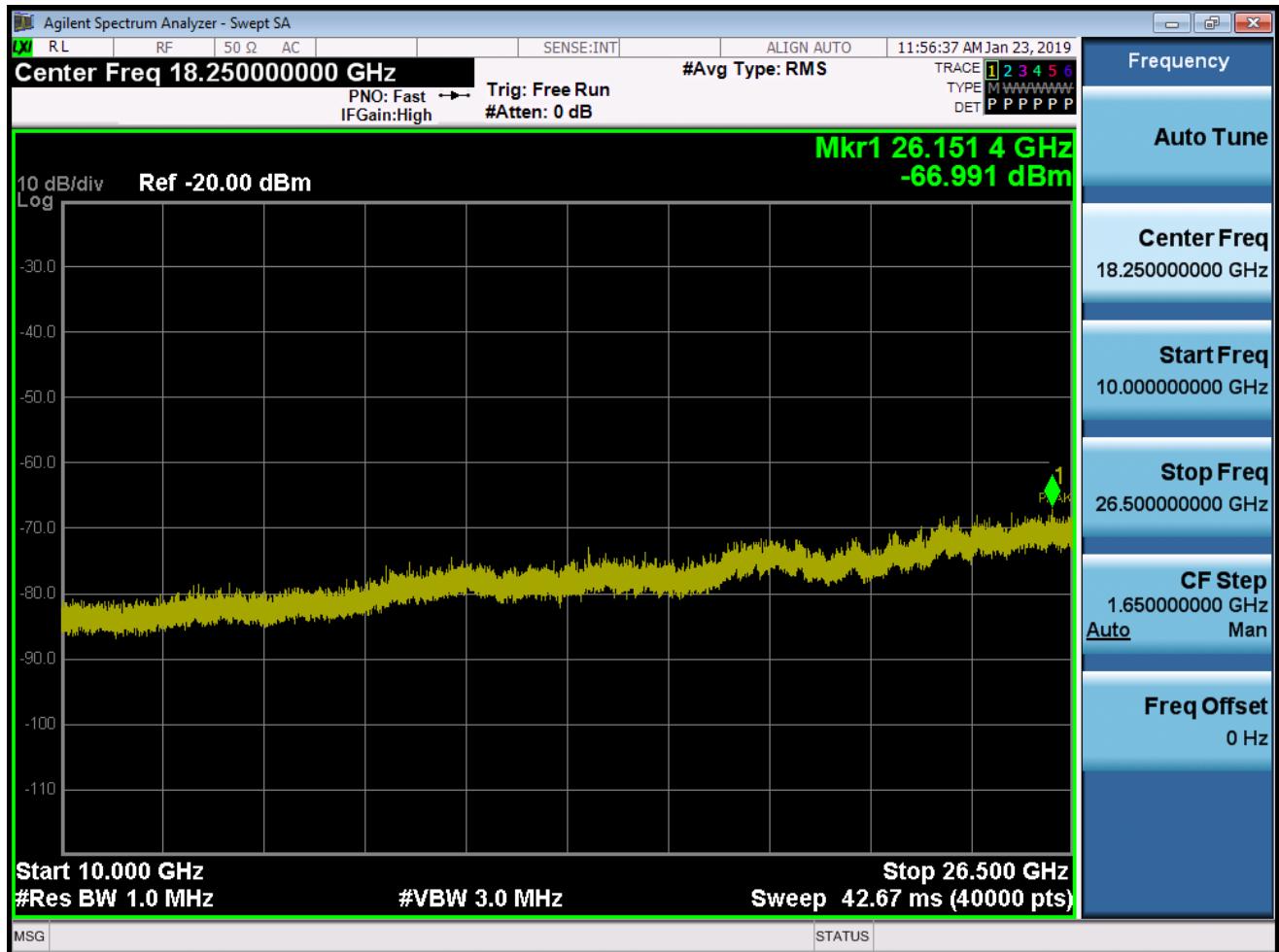
BAND 41. Conducted Spurious Plot 2 (15 MHz Ch. 39725 QPSK RB 1, Offset 0)



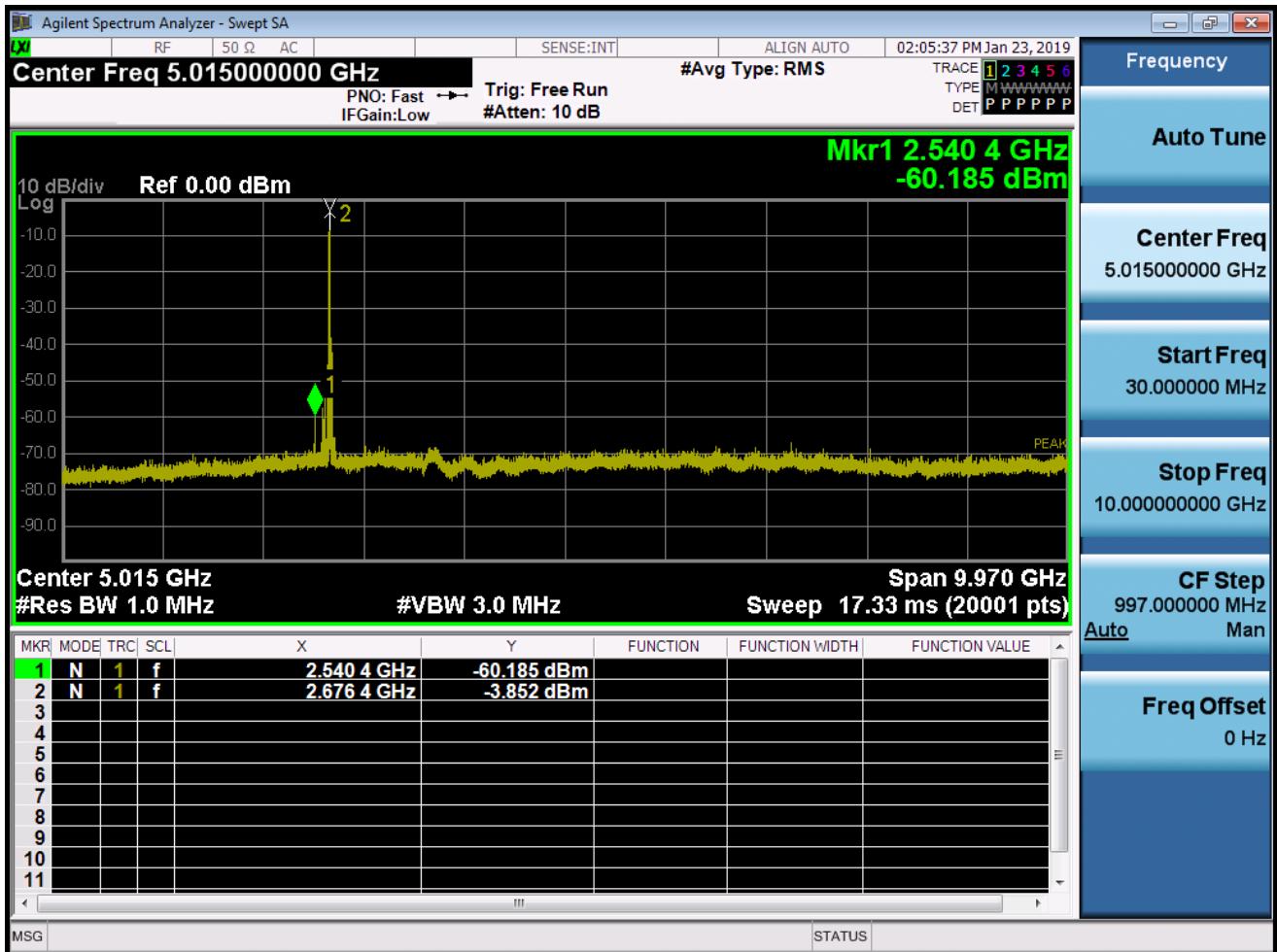
BAND 41. Conducted Spurious Plot 1 (15 MHz Ch.40620 QPSK RB 1, Offset 0)



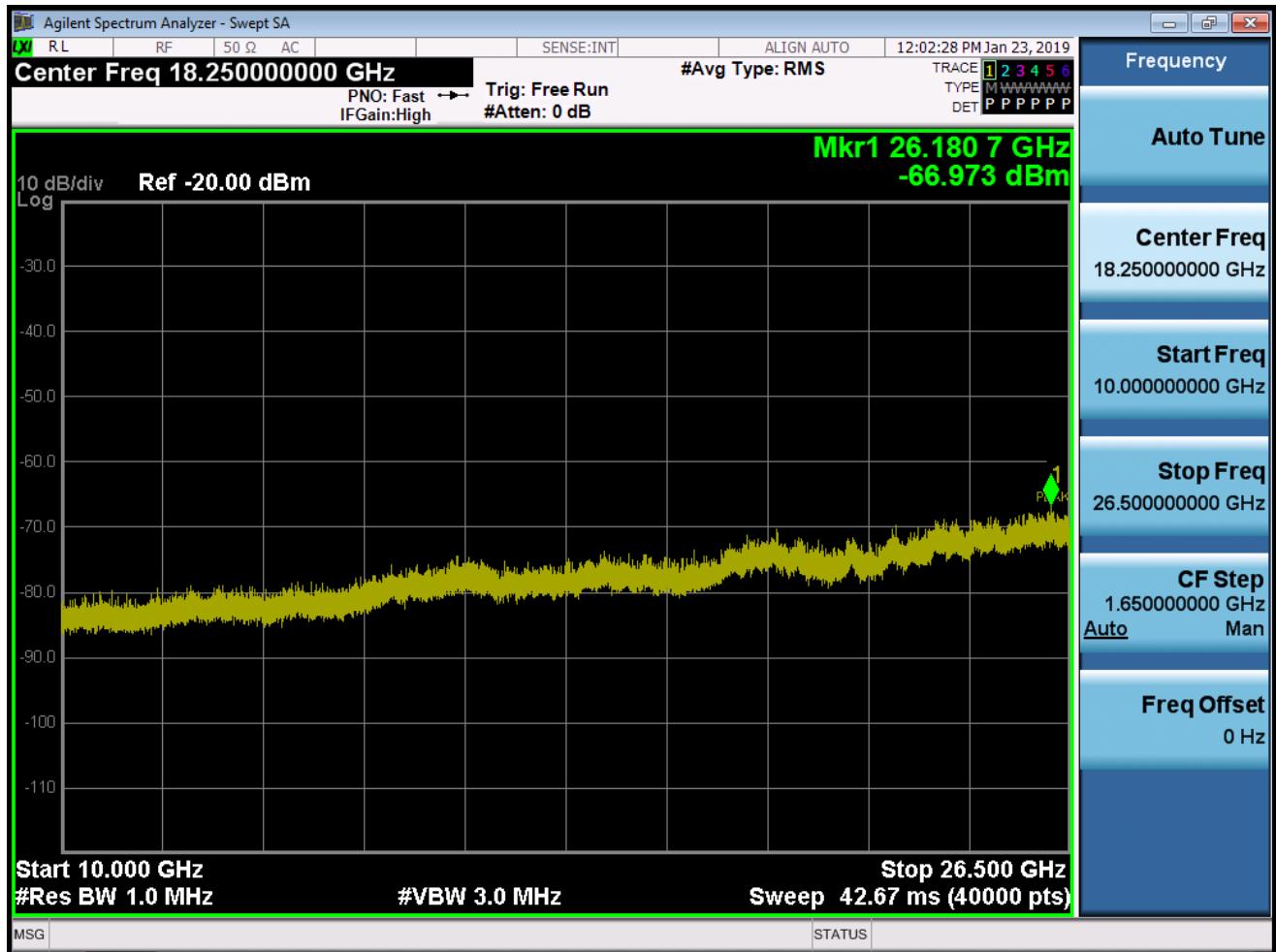
BAND 41. Conducted Spurious Plot 2 (15 MHz Ch. 40620 QPSK RB 1, Offset 0)



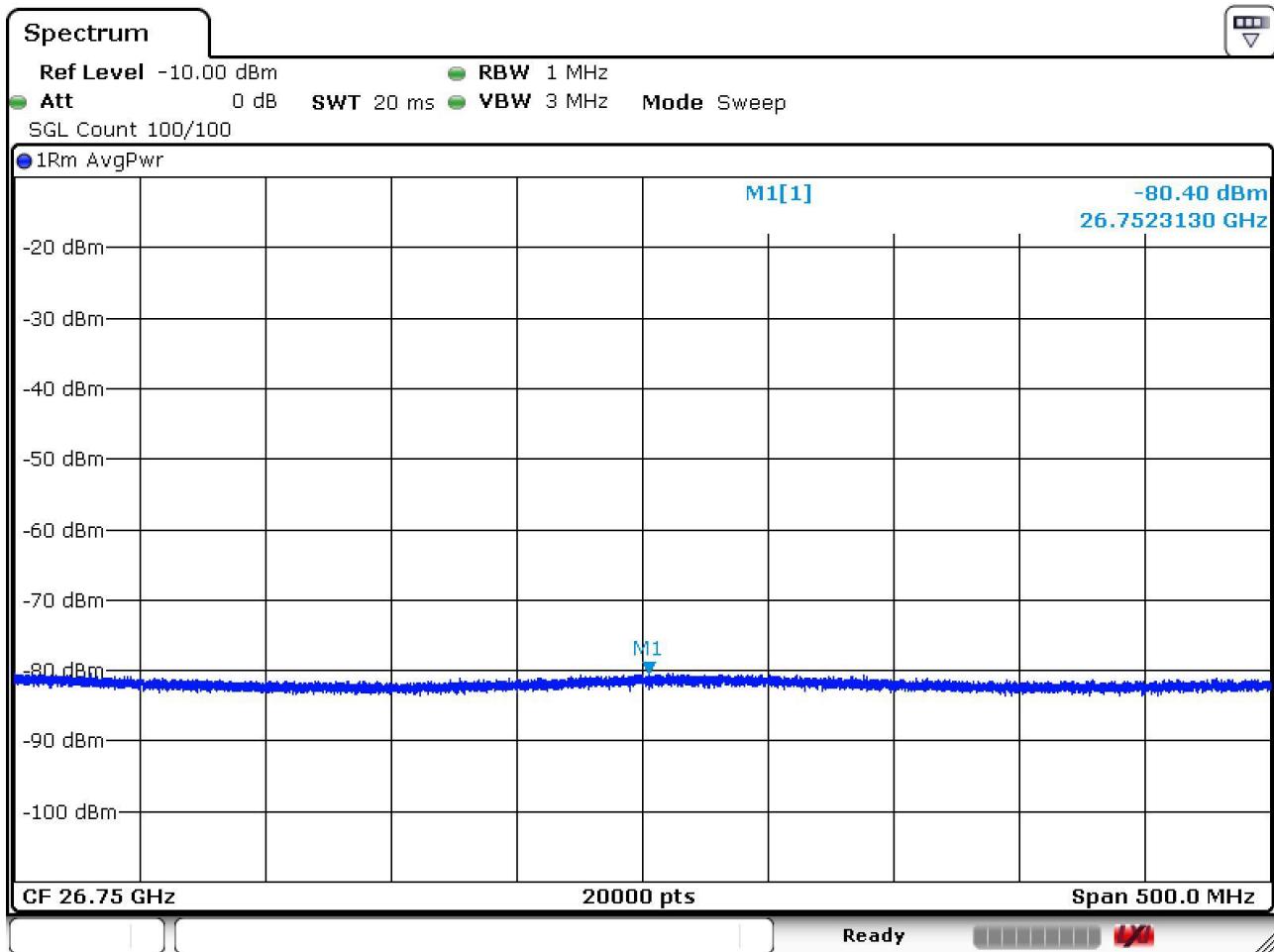
BAND 41. Conducted Spurious Plot 1 (15 MHz Ch.41515 QPSK RB 1, Offset 0)



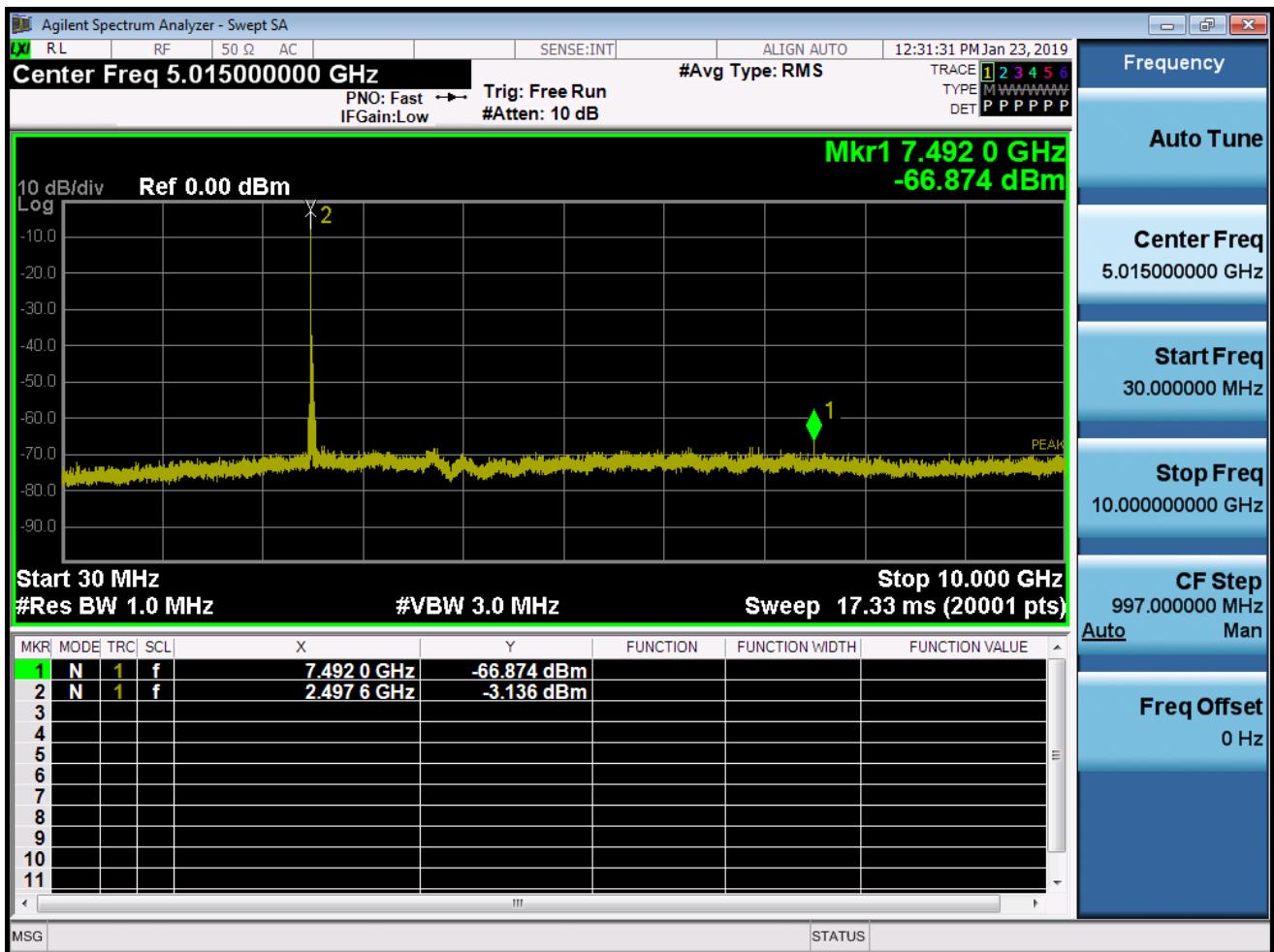
BAND 41. Conducted Spurious Plot 2 (15 MHz Ch. 41515 QPSK RB 1, Offset 0)



## BAND 41. Conducted Spurious Plot 3 (15 MHz Ch. 41515 QPSK RB 1, Offset 0)



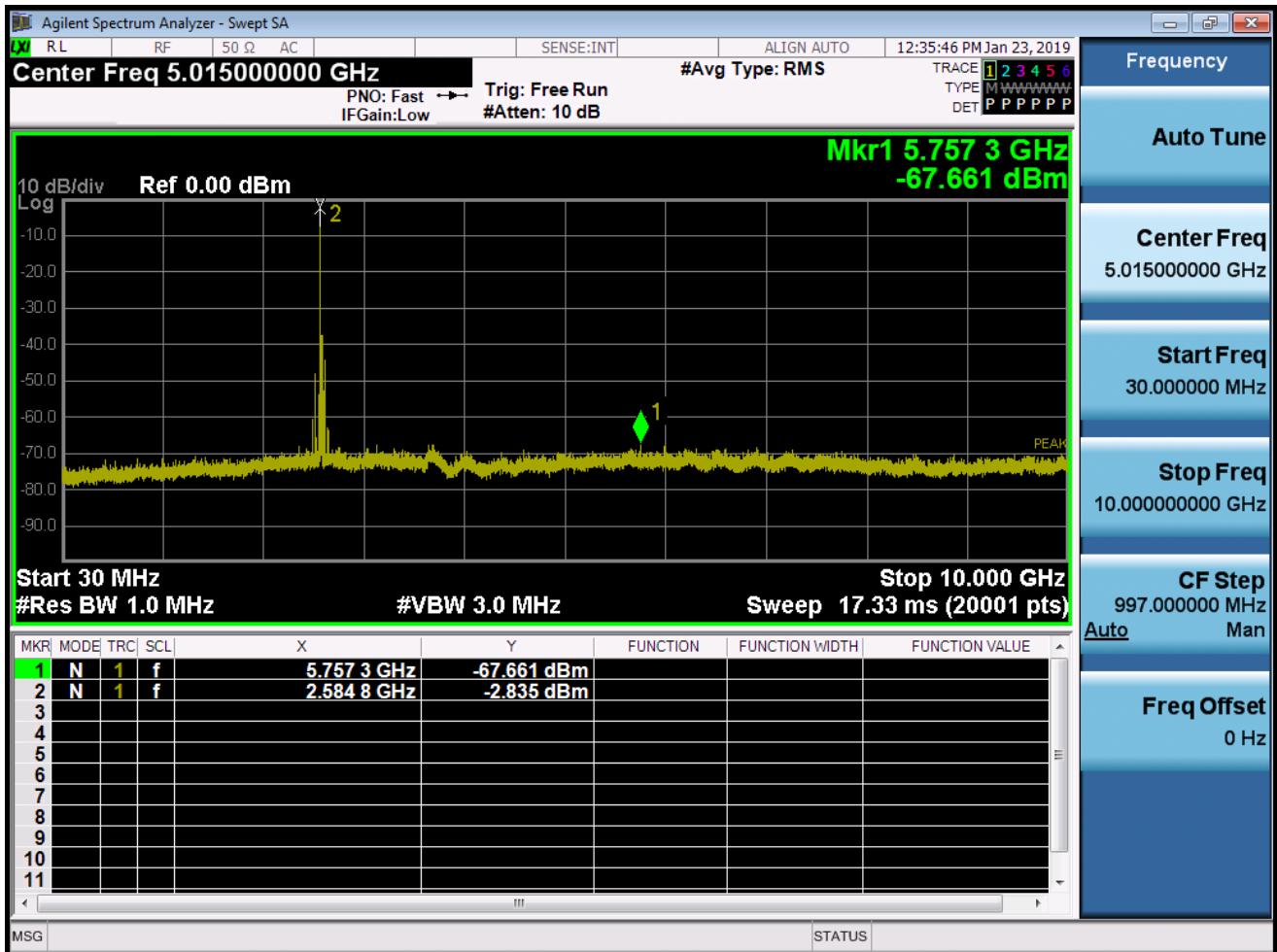
BAND 41. Conducted Spurious Plot 1 (20 MHz Ch.39750 QPSK RB 1, Offset 0)



BAND 41. Conducted Spurious Plot 2 (20 MHz Ch. 39750 QPSK RB 1, Offset 0)



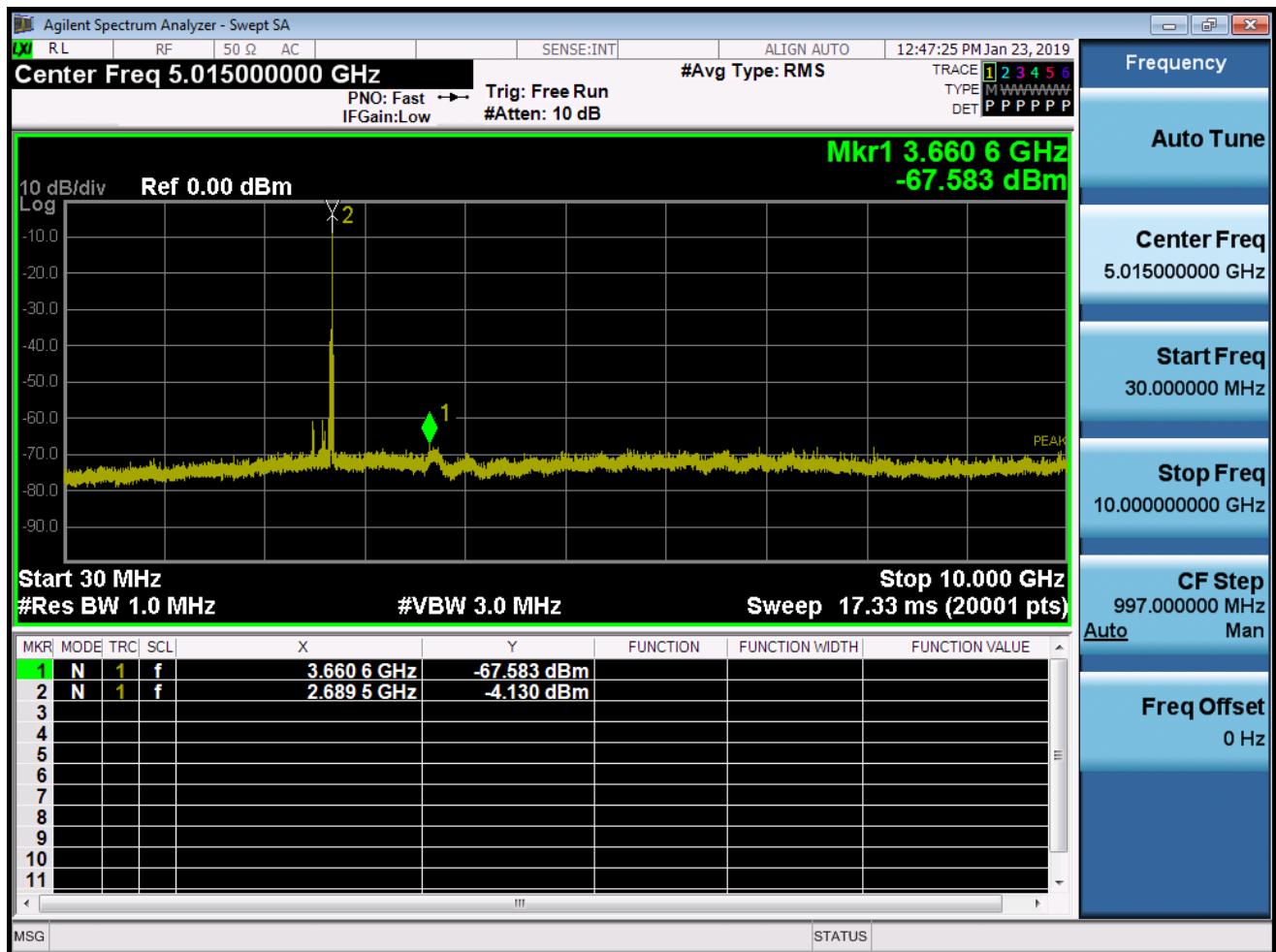
BAND 41. Conducted Spurious Plot 1 (20 MHz Ch.40620 QPSK RB 1, Offset 0)



BAND 41. Conducted Spurious Plot 2 (20 MHz Ch. 40620 QPSK RB 1, Offset 0)



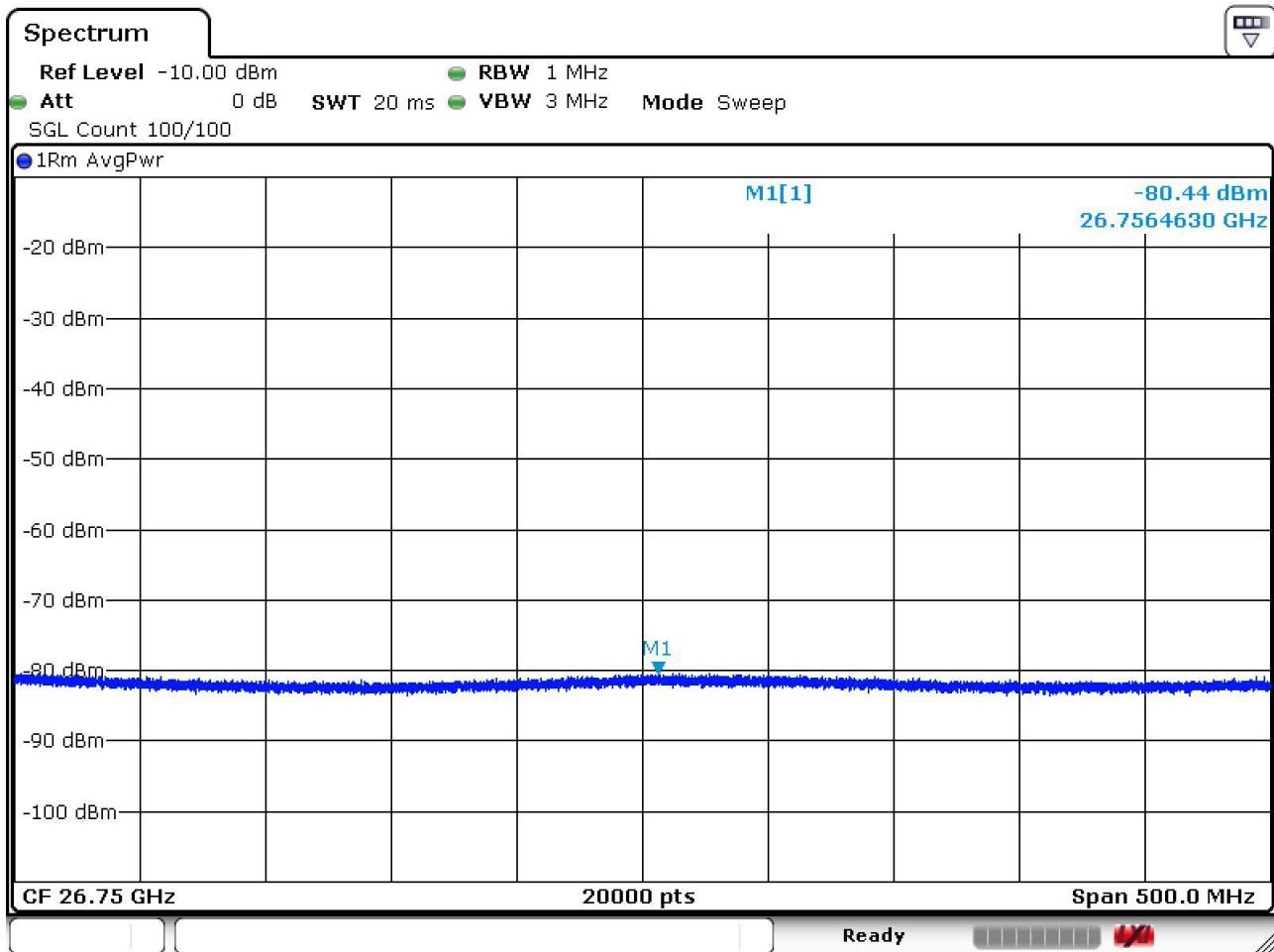
BAND 41. Conducted Spurious Plot 1 (20 MHz Ch.41490 QPSK RB 1, Offset 0)



BAND 41. Conducted Spurious Plot 2 (20 MHz Ch. 41490 QPSK RB 1, Offset 0)



## BAND 41. Conducted Spurious Plot 3 (20 MHz Ch. 41490 QPSK RB 1, Offset 0)



## 10. Annex A\_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

| No. | Description         |
|-----|---------------------|
| 1   | HCT-RF-1902-FC006-P |
| 2   | HCT-RF-1902-FC007-P |
| 3   | HCT-RF-1902-FC008-P |
| 4   | HCT-RF-1902-FC009-P |
| 5   | HCT-RF-1902-FC010-P |