On your side

# TEST REPORT

## FCC Test for PSR-9536-B

## Certification

APPLICANT
TJ innovation Co., Ltd.

REPORT NO.
HCT-RF-2002-FC003-R2

DATE OF ISSUE
February 27, 2020

**HCT Co., Ltd.**
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Tel. +82 31 634 6300 F ax. +82 31 645 6401

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# TEST REPORT

FCC Test for PSR-9536-B

REPORT NO.
HCT-RF-2002-FC003-R2

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Additional Model
VISION78

| | |
|---|---|
| Applicant | **TJ innovation Co., Ltd.**<br>2018, Sambo Techno-tower 122, Jomaru-ro 385beon-gil, Bucheon-si, Gyeonggi-do, Korea |
| Eut Type<br>Model Name | Public Safety Repeater (PSR-9536)<br>PSR-9536-B |
| FCC ID | 2AVNP-PSR-9536-B |
| Output Power | Uplink : 30 dBm / Downlink : 33 dBm |
| Date of Test | January 13, 2020 ~ February 10, 2020 |
| FCC Rule Parts: | Part 2, Part 90 |

This test results were applied only to the test methods required by the standard.

Tested by
Kyung Soo Kang (signature)

Technical Manager
Jong Seok Lee (signature)

HCT CO., LTD.
Soo Chan Lee
SooChan Lee / CEO

## REVISION HISTORY

The revision history for this test report is shown in table.

| Revision No. | Date of Issue | Description |
|---|---|---|
| 0 | February 12, 2020 | Initial Release |
| 1 | February 20, 2020 | Revised antenna peak gain on page 5. |
| 2 | February 27, 2020 | Revised uplink and downlink frequency on page 5, page 7 |

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

## CONTENTS

# 1. GENERAL INFORMATION

## 1.1. APPLICANT INFORMATION

| | |
|---|---|
| Company Name | TJ innovation Co., Ltd. |
| Company Address | 2018, Sambo Techno-tower 122, Jomaru-ro 385beon-gil,<br>Bucheon-si, Gyeonggi-do, Korea |

## 1.2. PRODUCT INFORMATION

| | |
|---|---|
| EUT Type | Public Safety Repeater (PSR-9536) |
| EUT Serial Number | PSR-9536-B-2002-0001 |
| Power Supply | Input : (110 ~ 240) Vac or DC +30.3V, +6.2V<br>Output(Voltage, Current) : 30.3V/3.9A, 10A<br>DC rating: 177W |
| Frequency Range | FirstNet: 788 MHz ~ 798 MHz (Uplink), 758 MHz ~ 768 MHz (Downlink)<br>PS700: 799 MHz ~ 805 MHz (Uplink), 769 MHz ~ 775 MHz (Downlink)<br>PS800: 806 MHz ~ 816 MHz (Uplink), 851 MHz ~ 861 MHz (Downlink) |
| Tx Output Power | Uplink : 30 dBm / Downlink : 33 dBm |
| Antenna Peak Gain | Downlink (service side) : Omni antenna, Gain: 2.9dBi<br>Uplink (donor side) : Panel antenna, Gain: 5.9dBi |

## 1.3. TEST INFORMATION

| | |
|---|---|
| FCC Rule Parts | Part 2, Part 90 |
| Measurement Standards | KDB 935210 D05 v01r03, ANSI C63.26-2015 |
| Test Location | HCT CO., LTD.<br>74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do,<br>17383, Rep. of KOREA |

## 2. TEST STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 2, 90.

| Description | Reference |
|---|---|
| AGC threshold | KDB 935210 D05 v01r03 3.2<br>KDB 935210 D05 v01r03 4.2 |
| Out-of-band rejection | KDB 935210 D05 v01r03 3.3<br>KDB 935210 D05 v01r03 4.3 |
| Occupied Bandwidth | § 2.1049<br>§ 90.219(e)(4)(ii) |
| Input-versus-output signal comparison | § 90.210, § 90.219(e)(4)(iii) |
| Input/output power and amplifier/booster gain | § 2.1046,<br>§ 90.219, § 90.541, § 90.542, § 90.635 |
| Noise figure | § 90.219(e)(2) |
| Emission masks<br>Out-of-band/out-of-block emissions and spurious emissions | § 2.1051,<br>§ 90.219(e)(3), § 90.543 |
| Spurious emissions radiated | § 2.1053 |

# 3. TEST SPECIFICATIONS

## 3.1. ADDITIONAL DESCRIPTIONS ABOUT TEST

Except for the following cases, EUT was tested under normal operating conditions.

: Out-of-band rejection test requires maximum gain condition without AGC

: Noise figure test requires any AGC circuitry be disabled over the duration of the measurement.

This EUT is supported power supply both of AC and DC. Test results are only attached worst cases.

The test was generally based on the method of KDB 935210 D05 v01r03 and only followed ANSI C63.26-2015 if there was no test method in KDB standard.

EUT was tested with following modulated signals provide by applicant.

| Band Name | Link | Frequency | Tested signals |
|---|---|---|---|
| FirstNet | Uplink | (788 ~ 798) MHz | LTE 5 MHz, LTE 10 MHz |
| | Downlink | (758 ~ 768) MHz | |
| PS700 | Uplink | (799 ~ 805) MHz | P25 Phase 1, P25 Phase 2, TETRA |
| | Downlink | (769 ~ 775) MHz | |
| PS800 | Uplink | (806 ~ 816) MHz | P25 Phase 1, P25 Phase 2, TETRA |
| | Downlink | (851 ~ 861) MHz | |

Below channels greater than 25 kHz in EUT specification are not tested because it could consist of a combination of P25 Phase 1, P25 Phase 2 and TETRA signals.

| Channelizing | P25 Phase 1 combinations | P25 Phase 2 combinations | TETRA combinations |
|---|---|---|---|
| 100 kHz | n = 8 | n = 16 | n = 4 |
| 200 kHz | n = 16 | n = 32 | n = 8 |

The frequency stability measurement has been omitted in accordance with section 3.7 of KDB 935210 D05 v01r03.

: It can be confirmed through input-versus-output spectrum test that EUT does not alter the input signal.

The tests results included actual loss value for attenuator and cable combination as shown in the table below.

: Input Path

| Correction factor table | | | |
|---|---|---|---|
| Frequency (MHz) | Factor (dB) | Frequency (MHz) | Factor (dB) |
| 600 | 0.723 | 850 | 0.756 |
| 700 | 0.763 | 900 | 0.728 |
| 750 | 0.756 | 1 000 | 0.739 |
| 800 | 0.795 | 1 050 | 0.703 |

: Output Path

| Correction factor table | | | |
|---|---|---|---|
| Frequency (MHz) | Factor (dB) | Frequency (MHz) | Factor (dB) |
| 30 | 29.772 | 1500 | 31.413 |
| 50 | 29.780 | 2000 | 31.603 |
| 100 | 29.858 | 2500 | 31.931 |
| 150 | 29.939 | 3000 | 32.272 |
| 200 | 30.053 | 3500 | 32.387 |
| 250 | 30.195 | 4000 | 32.685 |
| 300 | 30.409 | 4500 | 32.517 |
| 350 | 30.491 | 5000 | 32.662 |
| 400 | 30.536 | 5500 | 33.296 |
| 450 | 30.532 | 6000 | 33.361 |
| 500 | 30.682 | 6500 | 34.388 |
| 550 | 30.602 | 7000 | 33.551 |
| 600 | 30.773 | 7500 | 33.924 |
| 650 | 30.819 | 8000 | 33.681 |
| 700 | 30.855 | 8500 | 33.775 |
| 750 | 30.842 | 9000 | 34.452 |
| 800 | 30.878 | | |
| 850 | 30.890 | | |
| 900 | 30.890 | | |
| 950 | 30.947 | | |
| 1000 | 30.920 | | |

## 3.2. MEASUREMENTUNCERTAINTY

| Description | Reference | Results |
|---|---|---|
| AGC threshold | - | ±0.87 dB |
| Out-of-band rejection | - | ±0.58 MHz |
| Occupied Bandwidth | OBW ≤ 25 kHz | ±0.16 MHz |
| | OBW > 5 MHz | ±0.58 MHz |
| Input-versus-output signal comparison | - | ±0.87 dB |
| Input/output power and amplifier/booster gain | - | ±0.87 dB |
| Out-of-band/out-of-block emissions and spurious emissions | - | ±1.08 dB |
| Spurious emissions radiated | f ≤ 1 GHz | ±4.80 dB |
| | f > 1 GHz | ±6.07 dB |

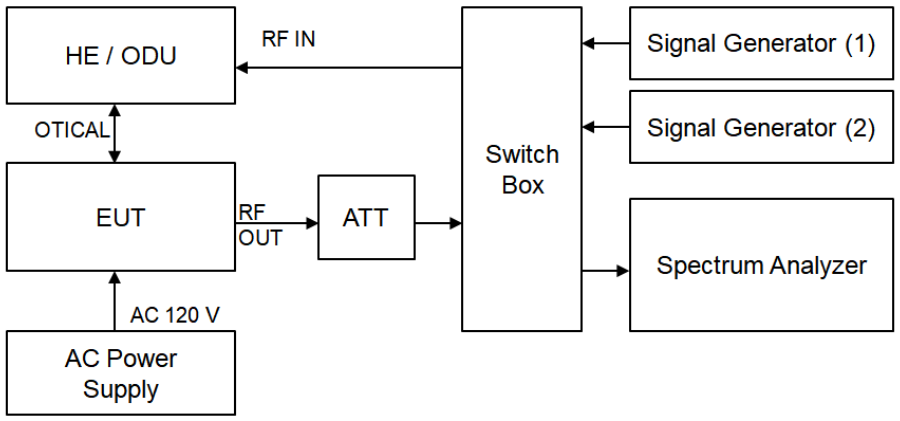
** Coverage factor k = 2, Confidence levels of 95 %*

## 3.3. STANDARDS ENVIRONMENTAL TEST CONDITIONS

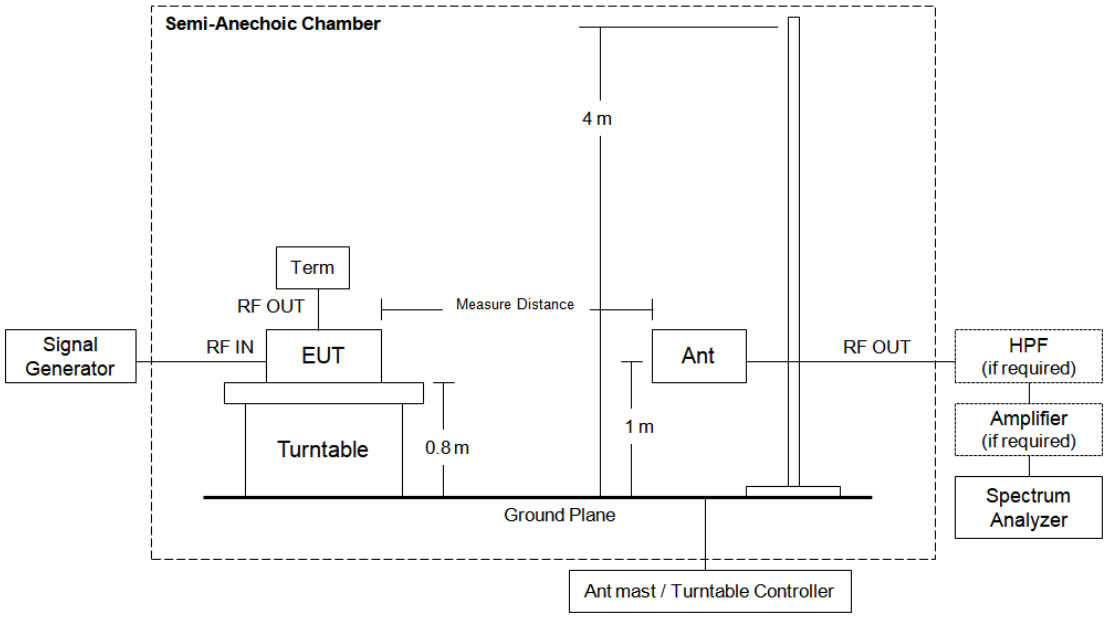
| | |
|---|---|
| Temperature | +15 °C to +35 °C |
| Relative humidity | 30 % to 60 % |
| Air pressure | 860 mbar to 1 060 mbar |

## 3.4. TEST DIAGRAMS

Conducted Test




Radiated Test




※ EUT position is adopted by placement of floor-standing refer to section 5.5.2.3.2 of ANSI C63.26-2015

## 4. TEST EQUIPMENTS

| Manufacturer | Model / Equipment | Calibration Date | Calibration Interval | Serial No. |
|---|---|---|---|---|
| Agilent | N9020A / MXA Signal Analyzer | 05/08/2019 | Annual | MY51110063 |
| Agilent | N5182A / MXG Vector Signal Generator | 12/23/2019 | Annual | MY46240523 |
| Agilent | N5182A / MXG Vector Signal Generator | 01/17/2020 | Annual | MY47070406 |
| Agilent | 8498A / 30 dB Attenuator | 02/18/2019 | Annual | 51161 |
| KEITHLEY | S46 / Switch | N/A | N/A | 1088024 |
| Deayoung ENT | DFSS60 / AC Power Supply | 04/04/2019 | Annual | 1003030-1 |
| Innco system | CO3000 / Controller(Antenna mast) | N/A | N/A | CO3000-4p |
| Innco system | MA4640/800-XP-EP / Antenna Position Tower | N/A | N/A | N/A |
| Audix | EM1000 / Controller | N/A | N/A | 060520 |
| Audix | - / Turn Table | N/A | N/A | N/A |
| Rohde&Schwarz | - / Loop Antenna | 04/26/2019 | Biennial | 1513-175 |
| Schwarzbeck | VULB 9168 / Hybrid Antenna | 03/22/2019 | Biennial | 760 |
| Schwarzbeck | BBHA 9120D / Horn Antenna | 04/29/2019 | Biennial | 9120D-937 |
| Rohde & Schwarz | FSP(9 kHz ~ 30 GHz) / Spectrum Analyzer | 05/09/2019 | Annual | 100854 |
| Wainwright Instruments | WHKX10-900-1000-15000-40SS | 07/15/2019 | Annual | 5 |
| CERNEX | CBLU1183540 / Power Amplifier | 07/01/2019 | Annual | 22964 |
| CERNEX | CBL06185030 / Power Amplifier | 07/01/2019 | Annual | 22965 |

# 5. TEST RESULT

## 5.1. AGC THRESHOLD

**Test Requirement:**

**KDB 935210 D05 v01r03**

Testing at and above the AGC threshold is required.

**Test Procedures:**

Measurements were in accordance with the test methods section 3.2 of KDB 935210 D05 v01r03.

In the case of fiber-optic distribution systems, the RF input port of the equipment under test (EUT) refers to the RF input of the supporting equipment RF to optical convertor; see also descriptions and diagrams for typical DAS booster systems in KDB Publication 935210 D02

Devices intended to be directly connected to an RF source (donor port) only need to be evaluated for any over-the-air transmit paths.

a) Connect a signal generator to the input of the EUT.
b) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
c) The signal generator should initially be configured to produce either of the required test signals.
d) Set the signal generator frequency to the center frequency of the EUT operating band.
e) While monitoring the output power of the EUT, measured using the methods of ANSI C63.26-2015 subclause 5.2.4.4.1, increase the input level until a 1 dB increase in the input signal power no longer causes a 1 dB increase in the output signal power.
f) Record this level as the AGC threshold level.
g) Repeat the procedure with the remaining test signal.

Measurements were in accordance with the test methods section 4.2 of KDB 935210 D05 v01r03.

Testing at and above the AGC threshold will be required. The AGC threshold shall be determined by applying the procedure of 3.2, but with the signal generator configured to produce a test signal defined in Table 1, a CW input signal, or a digitally modulated signal, consistent with the discussion about signal types in 4.1.

Output power measurement in subclause 5.2.4.4.1 of ANSI C63.26

a) Set span to 2 × to 3 × the OBW.
b) Set RBW = 1% to 5% of the OBW.
c) Set VBW ≥ 3 × RBW.
d) Set number of measurement points in sweep ≥ 2 × span / RBW.
e) Sweep time: auto-couple

f) Detector = power averaging (rms).

g) If the EUT can be configured to transmit continuously, then set the trigger to free run.

h) Omit

i) Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over multiple symbols, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.

j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

**Test Results:**

| Test Band | Link | Tested signals | Measured Frequency (MHz) | AGC Threshold Level (dBm) | Output Level (dBm) |
|---|---|---|---|---|---|
| FirstNet | Uplink | LTE 5 MHz | 793.00 | -65 | 29.59 |
| | | LTE 10 MHz | 793.00 | -65 | 29.44 |
| | Downlink | LTE 5 MHz | 763.00 | -62 | 33.16 |
| | | LTE 10 MHz | 763.00 | -62 | 33.09 |
| PS700 | Uplink | P25 Phase 1 | 802.00 | -65 | 29.94 |
| | | P25 Phase 2 | 802.00 | -65 | 30.05 |
| | | TETRA | 802.00 | -65 | 30.05 |
| | Downlink | P25 Phase 1 | 772.00 | -62 | 32.98 |
| | | P25 Phase 2 | 772.00 | -61 | 32.84 |
| | | TETRA | 772.00 | -62 | 32.99 |
| PS800 | Uplink | P25 Phase 1 | 811.00 | -65 | 30.62 |
| | | P25 Phase 2 | 811.00 | -65 | 30.15 |
| | | TETRA | 811.00 | -65 | 30.03 |
| | Downlink | P25 Phase 1 | 856.00 | -62 | 32.67 |
| | | P25 Phase 2 | 856.00 | -62 | 32.71 |
| | | TETRA | 856.00 | -62 | 32.70 |

## 5.2. OUT-OF-BAND REJECTION

**Test Requirement:**

**KDB 935210 D05 v01r03**

Out-of-band rejection required.

**Test Procedures:**

Measurements were in accordance with the test methods section 3.3 of KDB 935210 D05 v01r03.

Adjust the internal gain control of the EUT to the maximum gain for which equipment certification is sought.

a) Connect a signal generator to the input of the EUT.
b) Configure a swept CW signal with the following parameters:
   1) Frequency range = ±250 % of the passband, for each applicable CMRS band.
   2) Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor and will not engage the AGC during the entire sweep.
   3) Dwell time = approximately 10 ms.
   4) Number of points = SPAN/(RBW/2).
c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
d) Set the span of the spectrum analyzer to the same as the frequency range of the signal generator.
e) Set the resolution bandwidth (RBW) of the spectrum analyzer to be 1 % to 5 % of the EUT passband, and the video bandwidth (VBW) shall be set to ≥ 3 × RBW.
f) Set the detector to Peak Max-Hold and wait for the spectrum analyzer's spectral display to fill.
g) Place a marker to the peak of the frequency response and record this frequency as $f_0$.
h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the −20 dB down amplitude, to determine the 20 dB bandwidth.
i) Capture the frequency response of the EUT.
j) Repeat for all frequency bands applicable for use by the EUT.

Measurements were in accordance with the test methods section 4.3 of KDB 935210 D05 v01r03.

Adjust the internal gain control of the EUT to the maximum gain for which equipment certification is sought.

a) Connect a signal generator to the input of the EUT.
b) Configure a swept CW signal with the following parameters:
   1) Frequency range = ± 250 % of the manufacturer's specified pass band.
   2) The CW amplitude shall be 3 dB below the AGC threshold (see 4.2), and shall not activate the AGC threshold throughout the test.
   3) Dwell time = approximately 10 ms.

4) Frequency step = 50 kHz.

c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

d) Set the RBW of the spectrum analyzer to between 1 % and 5 % of the manufacturer's rated passband, and VBW = 3 × RBW.

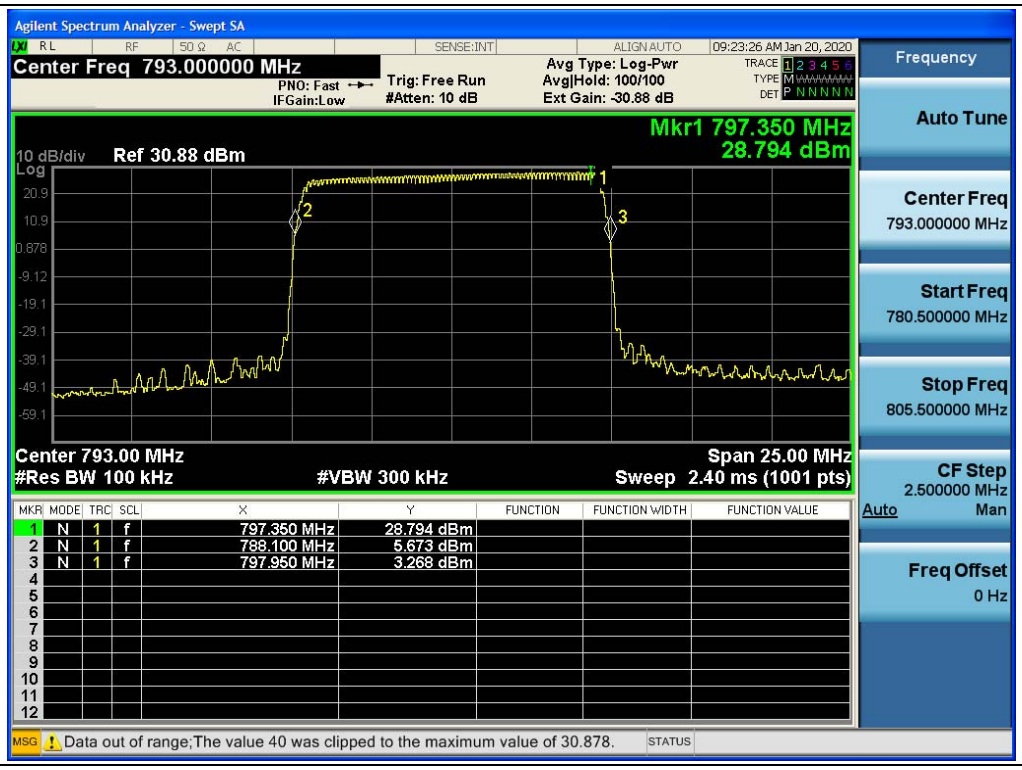
e) Set the detector to Peak and the trace to Max-Hold.

f) After the trace is completely filled, place a marker at the peak amplitude, which is designated as f0, and with two additional markers (use the marker-delta method) at the 20 dB bandwidth (i.e., at the points where the level has fallen by 20 dB).

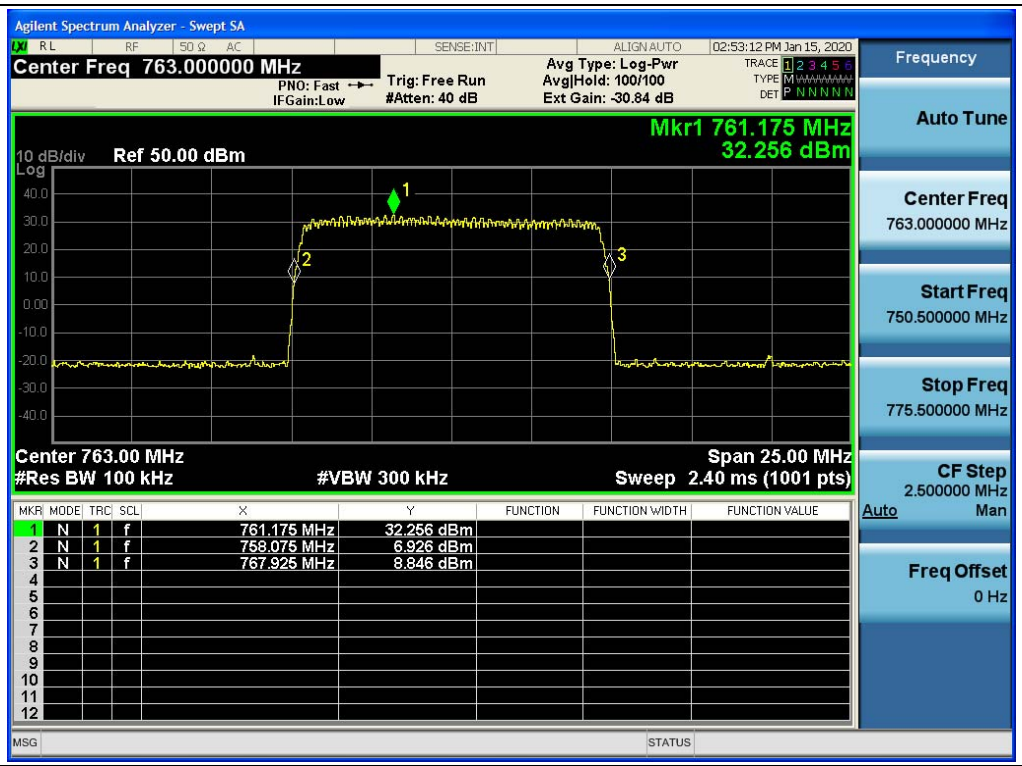
g) Capture the frequency response plot for inclusion in the test report.

**Test Results:**

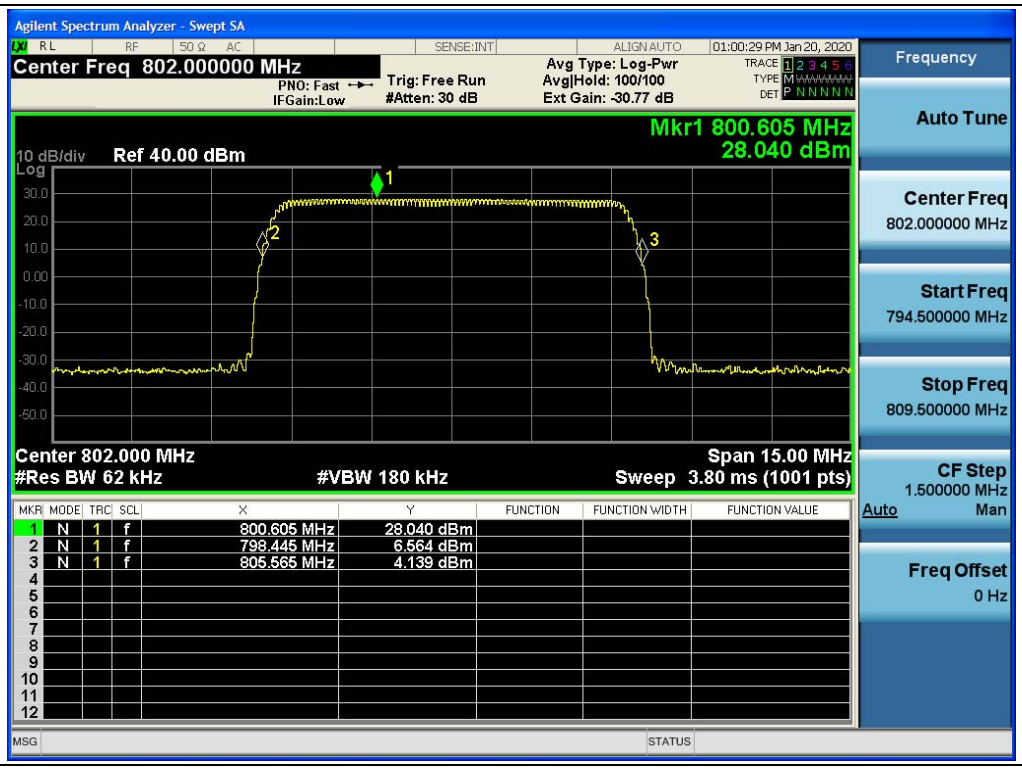
FirstNet / Uplink



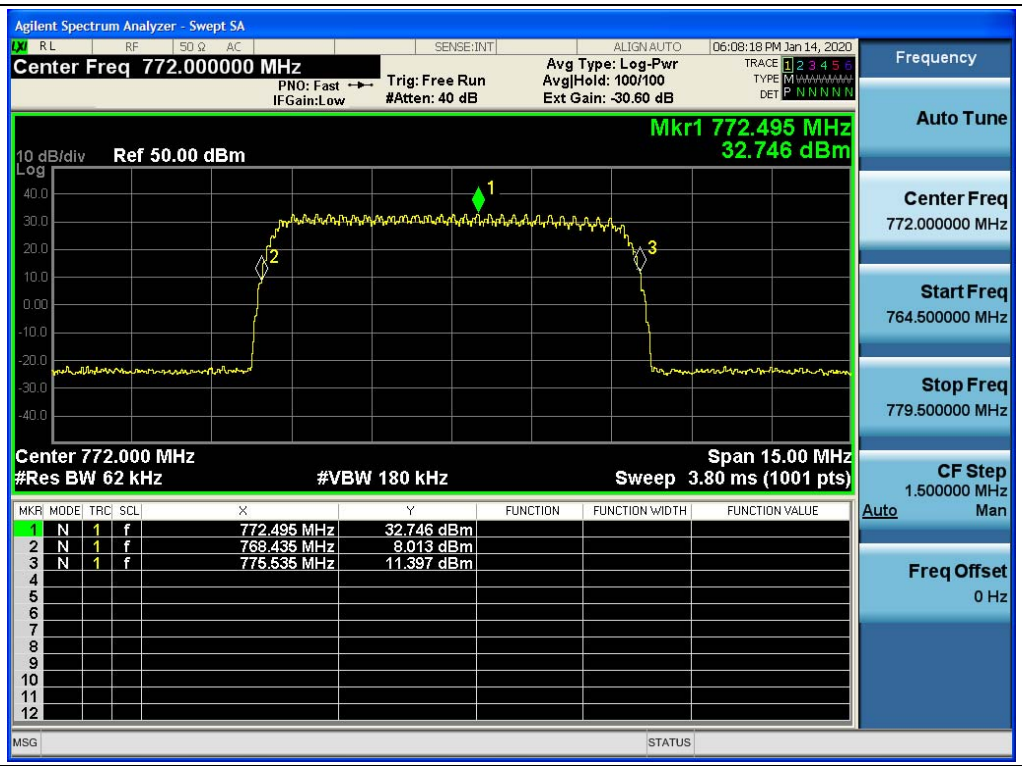

FirstNet / Downlink



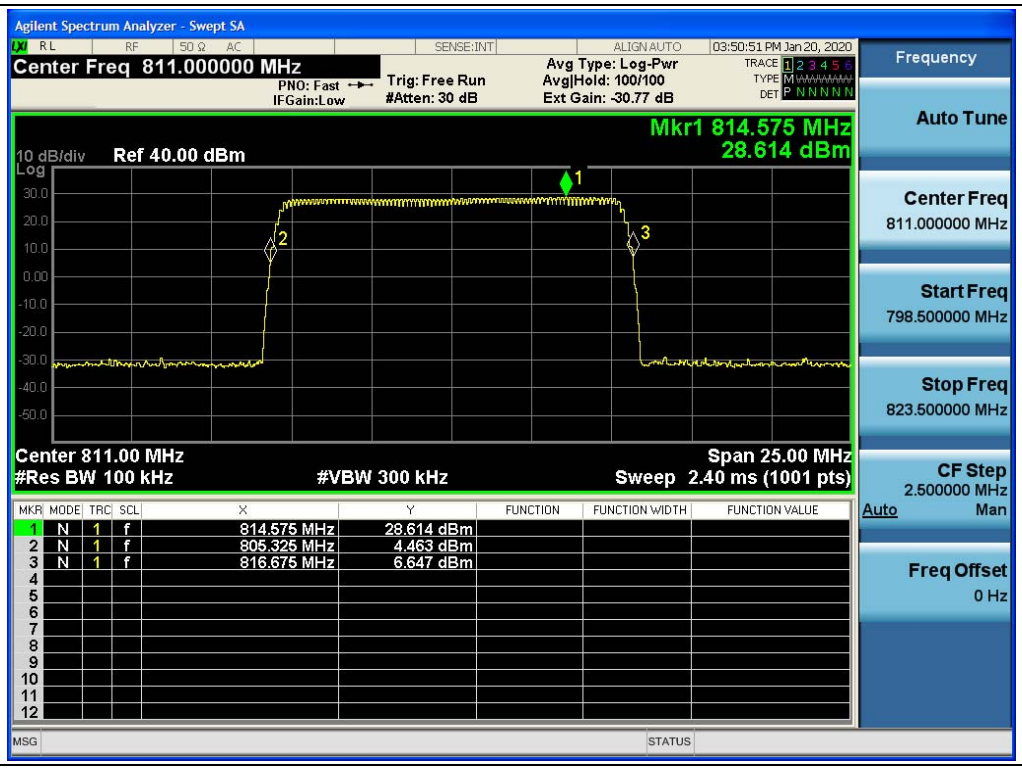
PS700 / Uplink



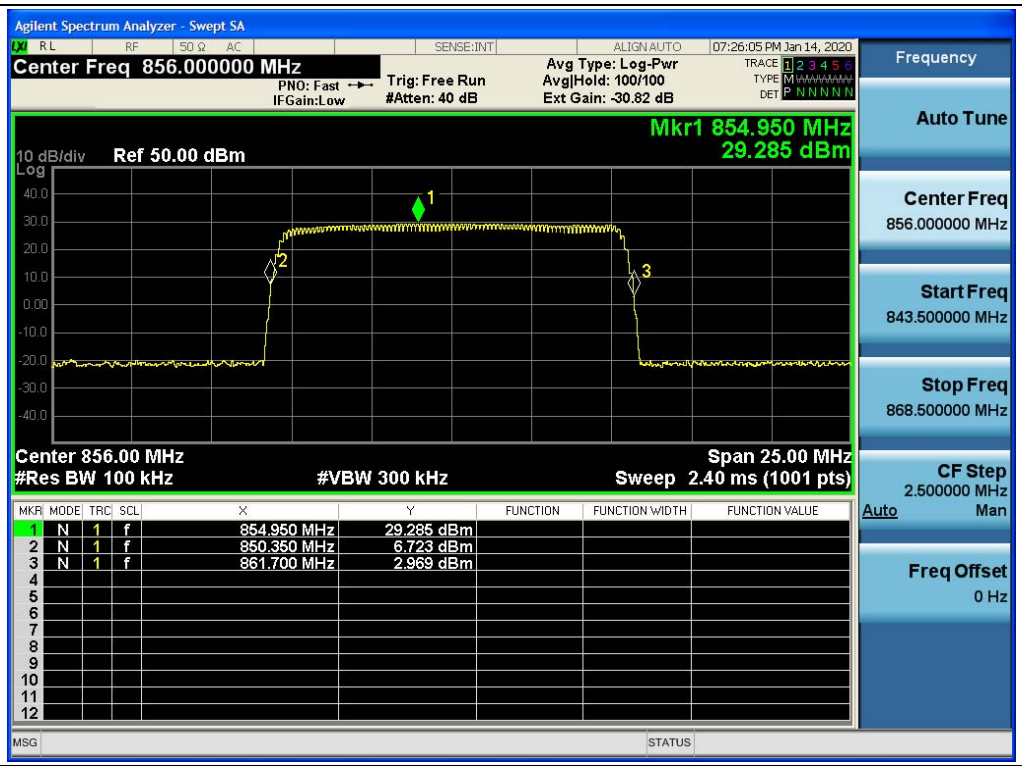

PS700 / Downlink



PS800 / Uplink




PS800 / Downlink



## 5.3. OCCUPIED BANDWIDTH

**Test Requirement:**

**§ 2.1049 Measurements required: Occupied bandwidth.**

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 under the specified conditions of § 2.1049 (a) through (i) as applicable.

**§ 90.219 Use of signal boosters.**

(e) Device Specifications. In addition to the general rules for equipment certification in § 90.203(a)(2) and part 2, subpart J of this chapter, a signal booster must also meet the rules in this paragraph.

(4) A signal booster must be designed such that all signals that it retransmits meet the following requirements:

(ii) There is no change in the occupied bandwidth of the retransmitted signals.

**Test Procedures:**

Measurements were in accordance with the test methods section 3.4 of KDB 935210 D05 v01r03.

a) Connect a signal generator to the input of the EUT.

b) Configure the signal generator to transmit the AWGN signal.

c) Configure the signal amplitude to be just below the AGC threshold level (see 3.2), but not more than 0.5 dB below.

d) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

e) Set the spectrum analyzer center frequency to the center frequency of the operational band under test. The span range of the spectrum analyzer shall be between 2 times to 5 times the emission bandwidth (EBW) or alternatively, the OBW.

f) The nominal RBW shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be ≥ 3 × RBW.

g) Set the reference level of the instrument as required to preclude the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than [10 log (OBW / RBW)] below the reference level.

h) Steps f) and g) may require iteration to enable adjustments within the specified tolerances.

i) The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference level.

j) Set spectrum analyzer detection function to positive peak.

k) Set the trace mode to max hold.

l) Determine the reference value: Allow the trace to stabilize. Set the spectrum analyzer marker to the highest amplitude level of the displayed trace (this is the reference value) and record the associated frequency.

m) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the −26 dB down amplitude. The 26 dB EBW (alternatively OBW) is the positive frequency difference between the two markers. If the spectral envelope crosses the −26 dB down amplitude at multiple points, the lowest or highest frequency shall be selected as the frequencies that

are the furthest removed from the center frequency at which the spectral envelope crosses the −26 dB down amplitude point.

n) Repeat steps e) to l) with the input signal connected directly to the spectrum analyzer (i.e., input signal measurement).

o) Compare the spectral plot of the input signal (determined from step m) to the output signal (determined from step l) to affirm that they are similar (in passband and rolloff characteristic features and relative spectral locations), and include plot(s) and descriptions in test report.

A. Repeat the procedure [steps e) to n)] with the input signal amplitude set to 3 dB above the AGC threshold.

p) Repeat steps e) to o) with the signal generator set to the narrowband signal.

q) Repeat steps e) to p) for all frequency bands authorized for use by the EUT.

Measurements were in accordance with the test methods section 5.4.4 of ANSI C63.26-2015.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 × OBW is sufficient).

b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances.

d) Set the detection mode to peak, and the trace mode to max-hold.

e) Omit

f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

**Test Results:**

**Tabular data of Output Occupied Bandwidth**

| Test Band | Link | Tested signals | Measured Frequency (MHz) | 99 % OBW (MHz) | 26 dB OBW (MHz) |
|---|---|---|---|---|---|
| FirstNet | Uplink | LTE 5 MHz | 793.00 | 4.5142 | 4.986 |
| | | LTE 10 MHz | 793.00 | 8.9197 | 9.577 |
| | Downlink | LTE 5 MHz | 763.00 | 4.5122 | 5.053 |
| | | LTE 10 MHz | 763.00 | 8.9445 | 9.482 |
| Test Band | Link | Tested signals | Measured Frequency (MHz) | 99 % OBW (kHz) | 26 dB OBW (MHz) |
| PS700 | Uplink | P25 Phase 1 | 802.000 | 8.241 | 11.00 |
| | | P25 Phase 2 | 802.000 | 4.830 | 5.458 |
| | | TETRA | 802.000 | 21.071 | 23.86 |
| | Downlink | P25 Phase 1 | 772.000 | 8.325 | 11.79 |
| | | P25 Phase 2 | 772.000 | 4.876 | 5.446 |
| | | TETRA | 772.000 | 20.998 | 23.83 |
| PS800 | Uplink | P25 Phase 1 | 811.000 | 8.310 | 11.48 |
| | | P25 Phase 2 | 811.000 | 4.855 | 5.465 |
| | | TETRA | 811.000 | 21.025 | 23.77 |
| | Downlink | P25 Phase 1 | 856.000 | 8.148 | 10.52 |
| | | P25 Phase 2 | 856.000 | 4.860 | 5.452 |
| | | TETRA | 856.000 | 21.068 | 23.79 |

**Tabular data of Input Occupied Bandwidth**

| Test Band | Link | Tested signals | Measured Frequency (MHz) | 99 % OBW (MHz) | 26 dB OBW (MHz) |
|---|---|---|---|---|---|
| FirstNet | Uplink | LTE 5 MHz | 793.00 | 4.5229 | 5.054 |
| | | LTE 10 MHz | 793.00 | 9.0203 | 9.911 |
| | Downlink | LTE 5 MHz | 763.00 | 4.5178 | 5.029 |
| | | LTE 10 MHz | 763.00 | 8.9889 | 9.972 |
| Test Band | Link | Tested signals | Measured Frequency (MHz) | 99 % OBW (kHz) | 26 dB OBW (MHz) |
| PS700 | Uplink | P25 Phase 1 | 802.000 | 8.270 | 11.09 |
| | | P25 Phase 2 | 802.000 | 4.871 | 5.450 |
| | | TETRA | 802.000 | 20.932 | 23.86 |
| | Downlink | P25 Phase 1 | 772.000 | 8.215 | 11.44 |
| | | P25 Phase 2 | 772.000 | 4.861 | 5.461 |
| | | TETRA | 772.000 | 21.152 | 23.84 |
| PS800 | Uplink | P25 Phase 1 | 811.000 | 8.261 | 11.16 |
| | | P25 Phase 2 | 811.000 | 4.884 | 5.392 |
| | | TETRA | 811.000 | 21.032 | 23.76 |
| | Downlink | P25 Phase 1 | 856.000 | 8.355 | 11.68 |
| | | P25 Phase 2 | 856.000 | 4.856 | 5.445 |
| | | TETRA | 856.000 | 21.091 | 23.82 |

**Tabular data of 3 dB above the AGC threshold Output Occupied Bandwidth**

| Test Band | Link | Tested signals | Measured Frequency (MHz) | 99 % OBW (MHz) | 26 dB OBW (MHz) |
|---|---|---|---|---|---|
| FirstNet | Uplink | LTE 5 MHz | 793.00 | 4.5029 | 4.960 |
| | | LTE 10 MHz | 793.00 | 8.9479 | 9.541 |
| | Downlink | LTE 5 MHz | 763.00 | 4.5304 | 5.037 |
| | | LTE 10 MHz | 763.00 | 8.9648 | 9.544 |
| Test Band | Link | Tested signals | Measured Frequency (MHz) | 99 % OBW (kHz) | 26 dB OBW (MHz) |
| PS700 | Uplink | P25 Phase 1 | 802.000 | 8.177 | 10.90 |
| | | P25 Phase 2 | 802.000 | 4.877 | 5.431 |
| | | TETRA | 802.000 | 20.947 | 23.83 |
| | Downlink | P25 Phase 1 | 772.000 | 8.247 | 10.75 |
| | | P25 Phase 2 | 772.000 | 4.865 | 5.455 |
| | | TETRA | 772.000 | 21.205 | 23.79 |
| PS800 | Uplink | P25 Phase 1 | 811.000 | 8.333 | 11.83 |
| | | P25 Phase 2 | 811.000 | 4.846 | 5.465 |
| | | TETRA | 811.000 | 21.076 | 23.89 |
| | Downlink | P25 Phase 1 | 856.000 | 8.344 | 10.75 |
| | | P25 Phase 2 | 856.000 | 4.877 | 5.438 |
| | | TETRA | 856.000 | 21.010 | 23.78 |

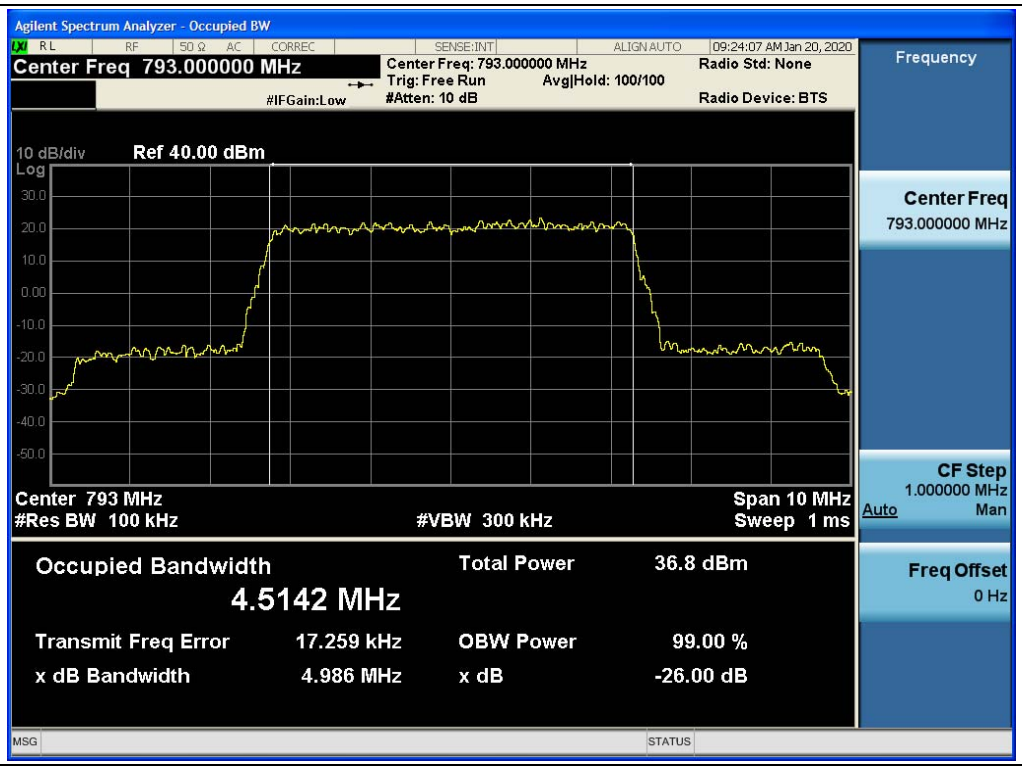
**Measured Occupied Bandwidth Comparison**

| Test Band | Link | Tested signals | Variant of Input and output Occupied Bandwidth (%) | Variant of Input and 3 dB above the AGC threshold output Occupied Bandwidth (%) |
|---|---|---|---|---|
| FirstNet | Uplink | LTE 5 MHz | -1.345 | -1.860 |
| | | LTE 10 MHz | -3.370 | -3.733 |
| | Downlink | LTE 5 MHz | 0.477 | 0.159 |
| | | LTE 10 MHz | -4.914 | -4.292 |
| PS700 | Uplink | P25 Phase 1 | -0.345 | -1.127 |
| | | P25 Phase 2 | -0.848 | 0.118 |
| | | TETRA | 0.664 | 0.072 |
| | Downlink | P25 Phase 1 | 1.341 | 0.397 |
| | | P25 Phase 2 | 0.318 | 0.077 |
| | | TETRA | -0.728 | 0.251 |
| PS800 | Uplink | P25 Phase 1 | 0.597 | 0.868 |
| | | P25 Phase 2 | -0.584 | -0.768 |
| | | TETRA | -0.033 | 0.209 |
| | Downlink | P25 Phase 1 | -2.471 | -0.126 |
| | | P25 Phase 2 | 0.071 | 0.438 |
| | | TETRA | -0.109 | -0.384 |

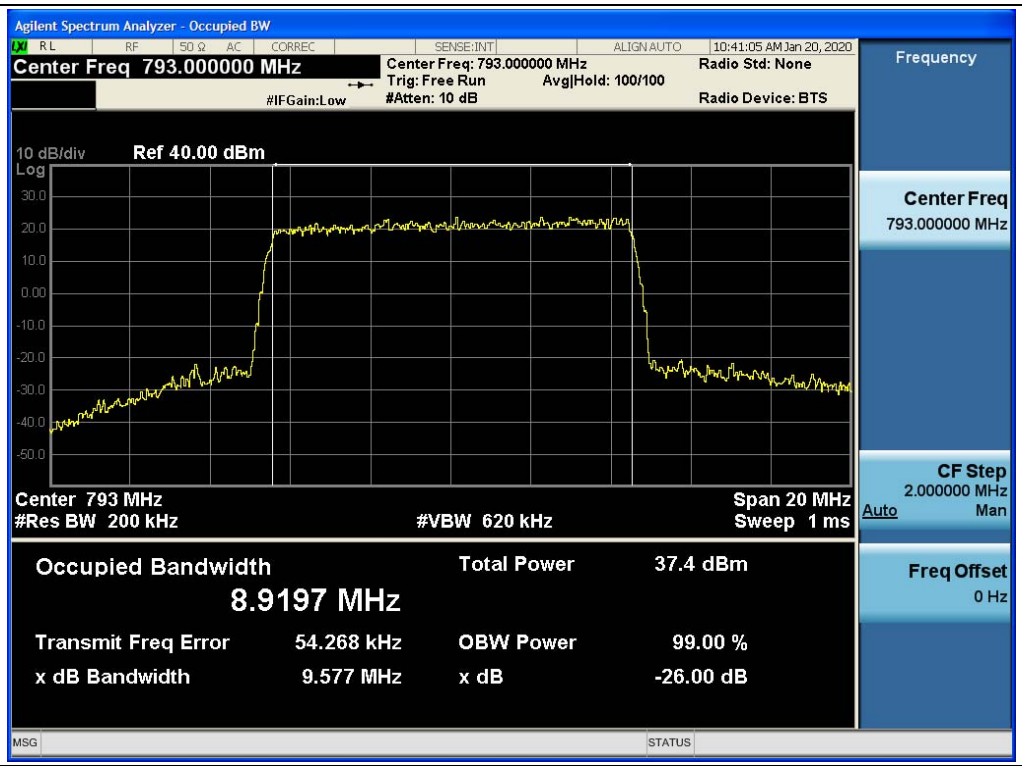
** Change in input-output OBW is less than ±5 %.*

## Plot data of Occupied Bandwidth

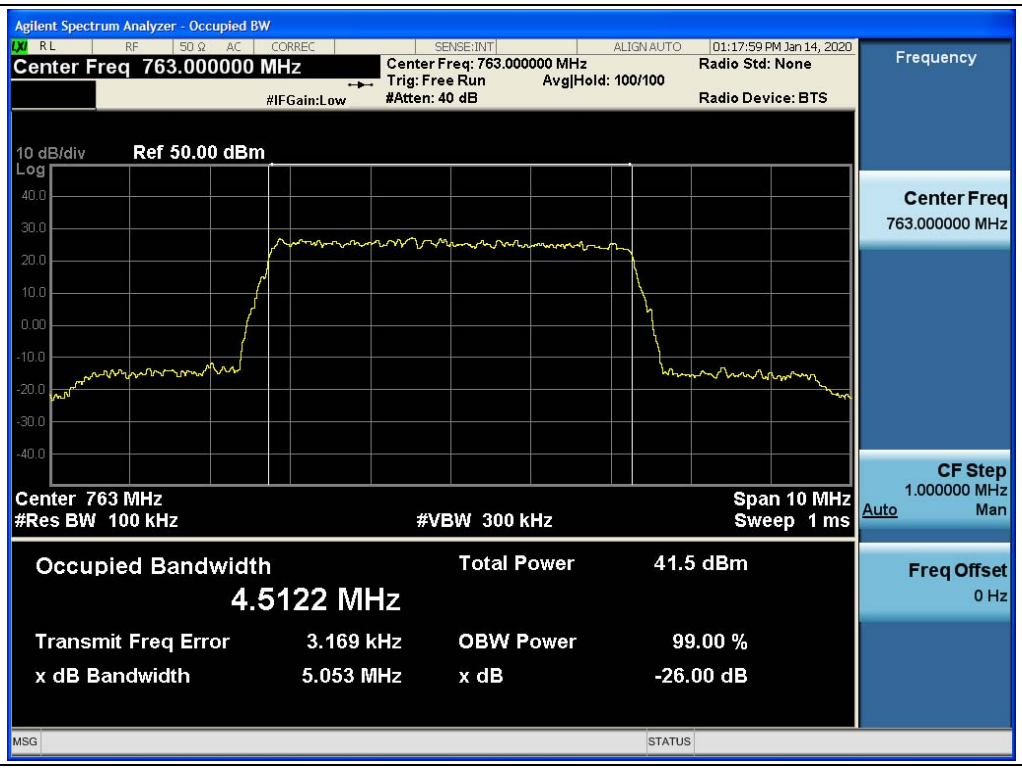
Output / FirstNet / LTE 5 MHz / Uplink



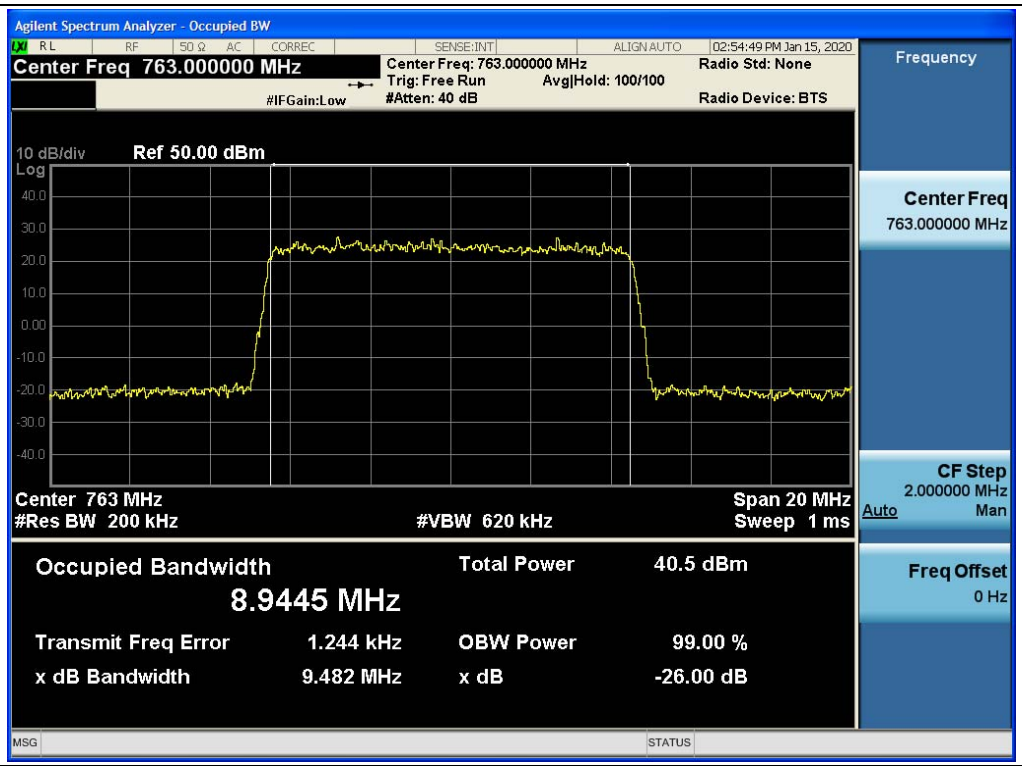

Output / FirstNet / LTE 10 MHz / Uplink



Output / FirstNet / LTE 5 MHz / Downlink

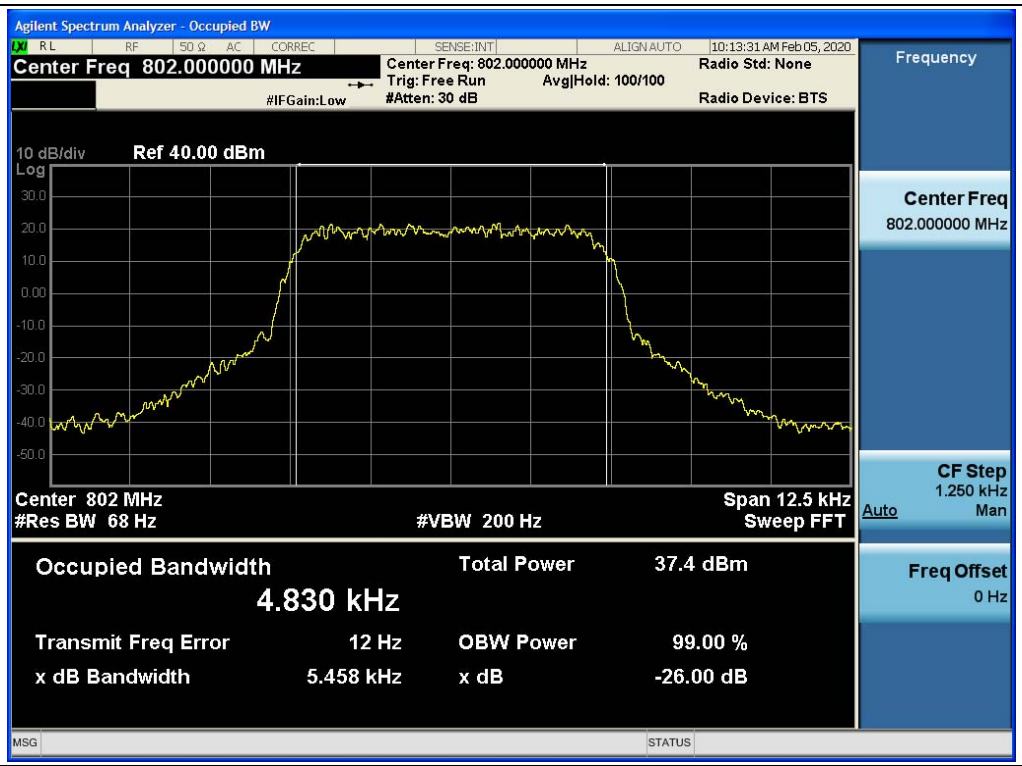


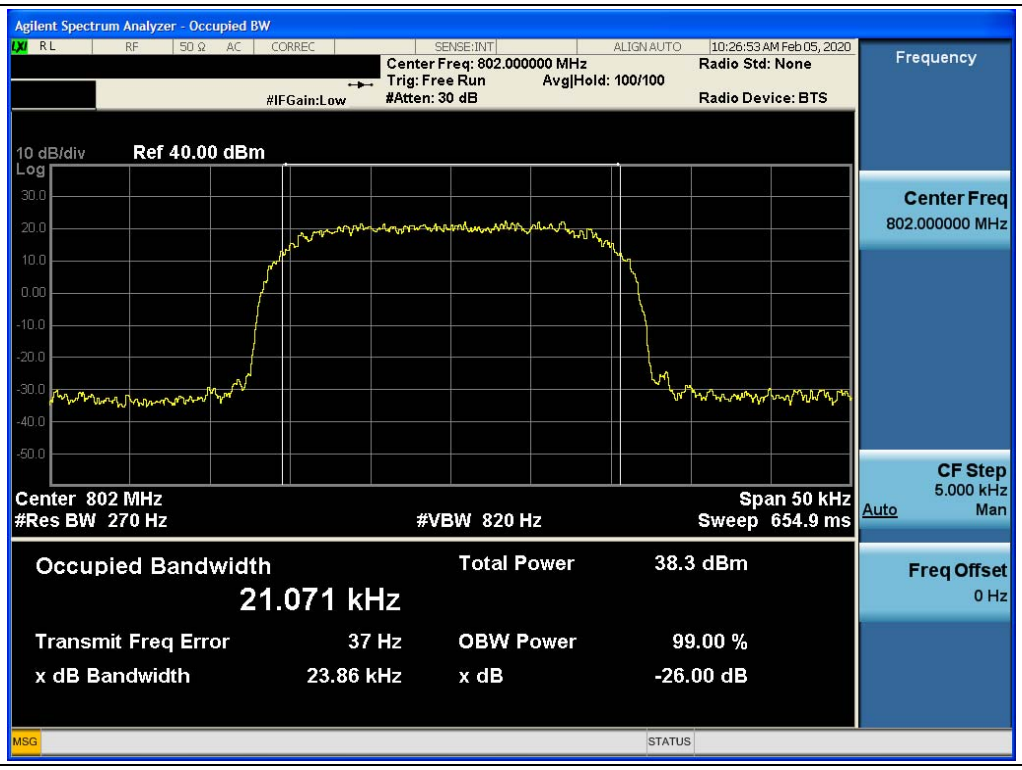

Output / FirstNet / LTE 10 MHz / Downlink



Output / PS700 / P25 Phase 1 / Uplink

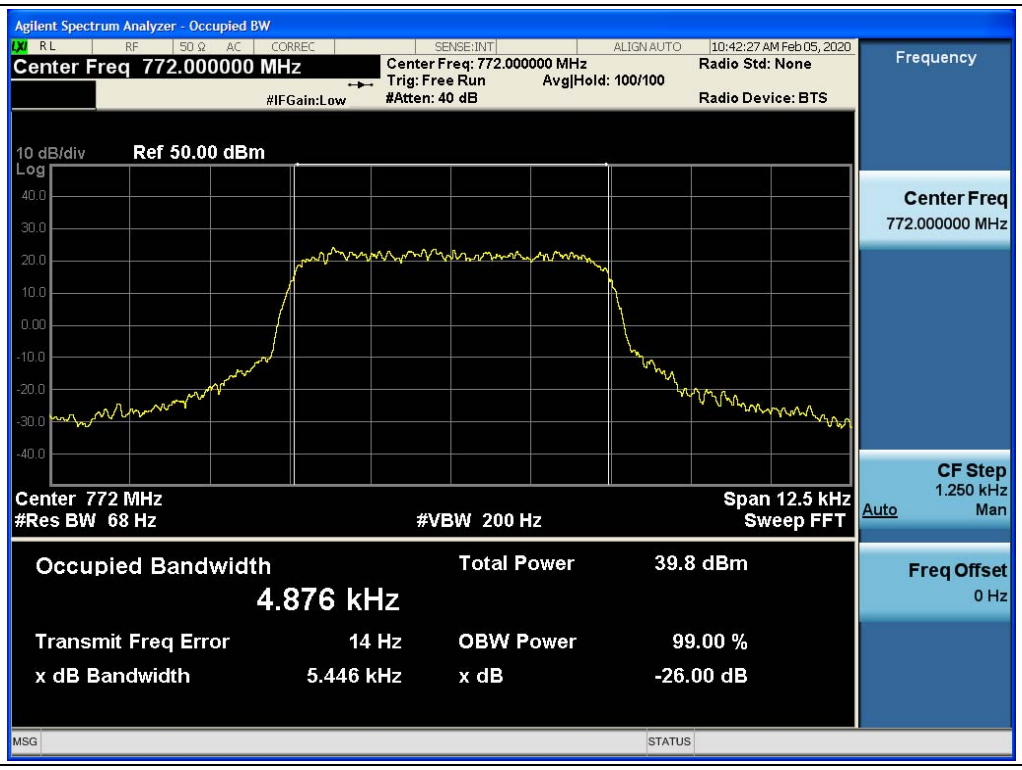

Output / PS700 / P25 Phase 2 / Uplink



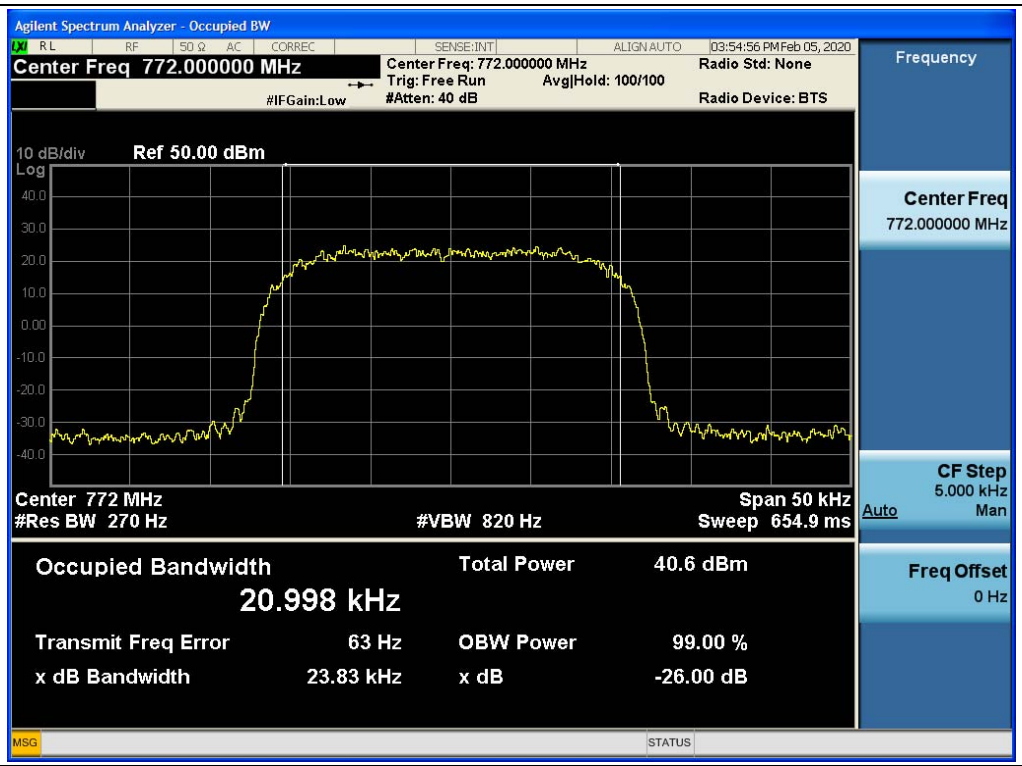
| Output / PS700 / TETRA / Uplink |
|---|
|  |



| Output / PS700 / P25 Phase 1 / Downlink |
|---|
|  |

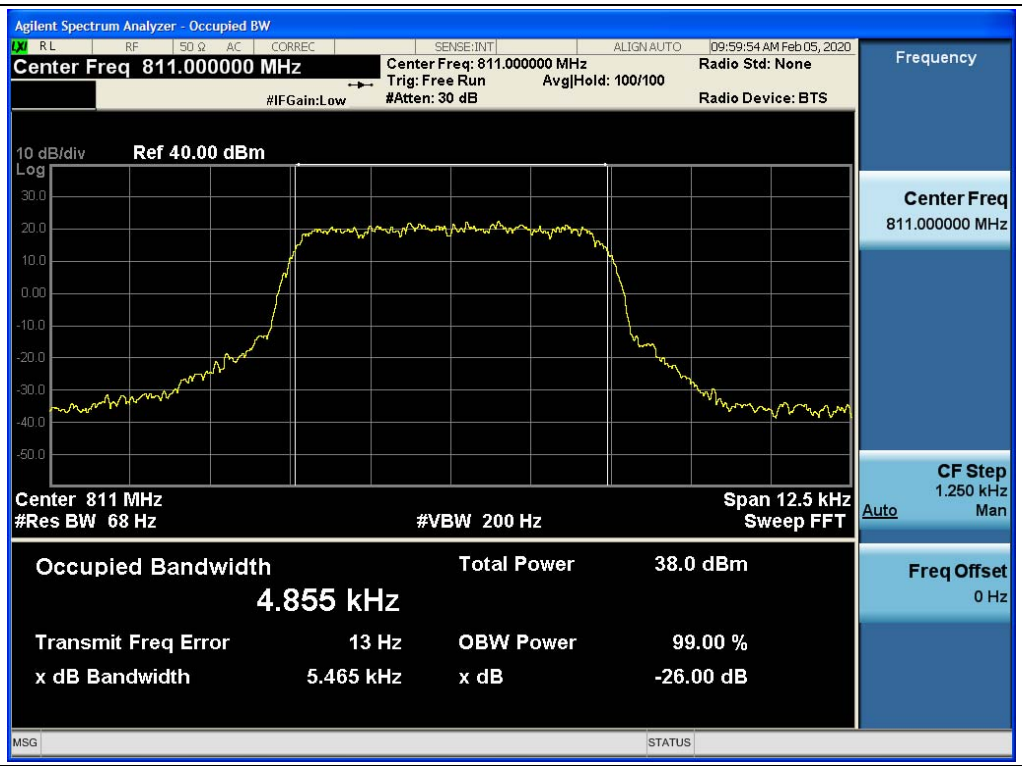
| Output / PS700 / P25 Phase 2 / Downlink |
|---|
|  |

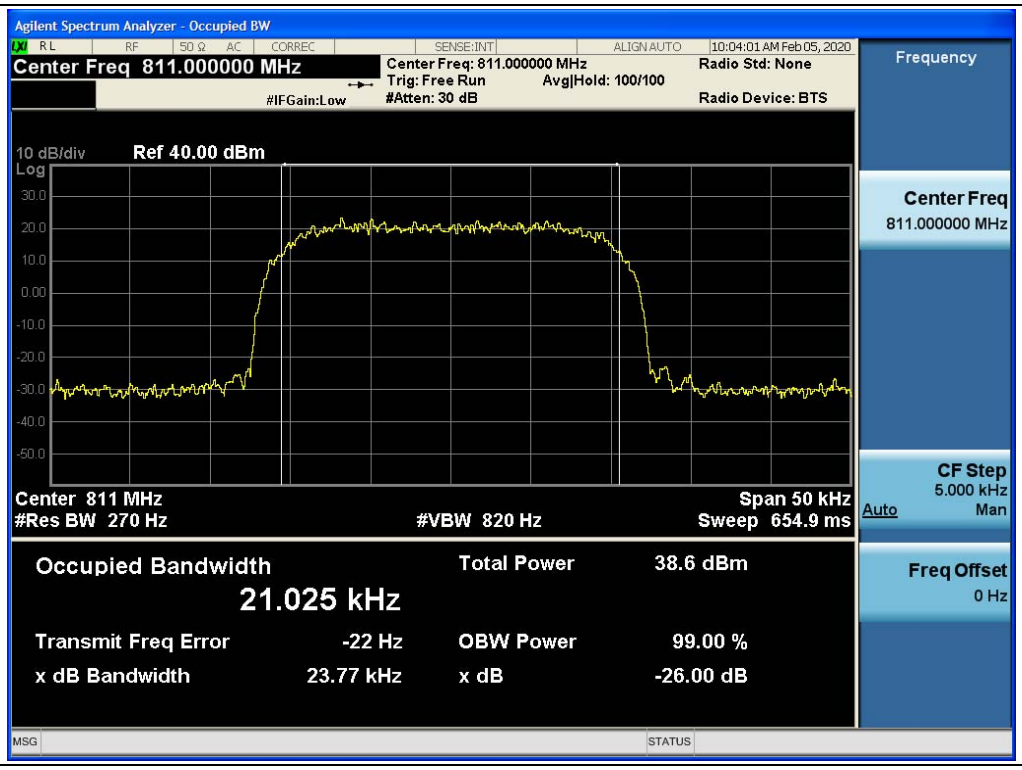


| Output / PS700 / TETRA / Downlink |
|---|
|  |

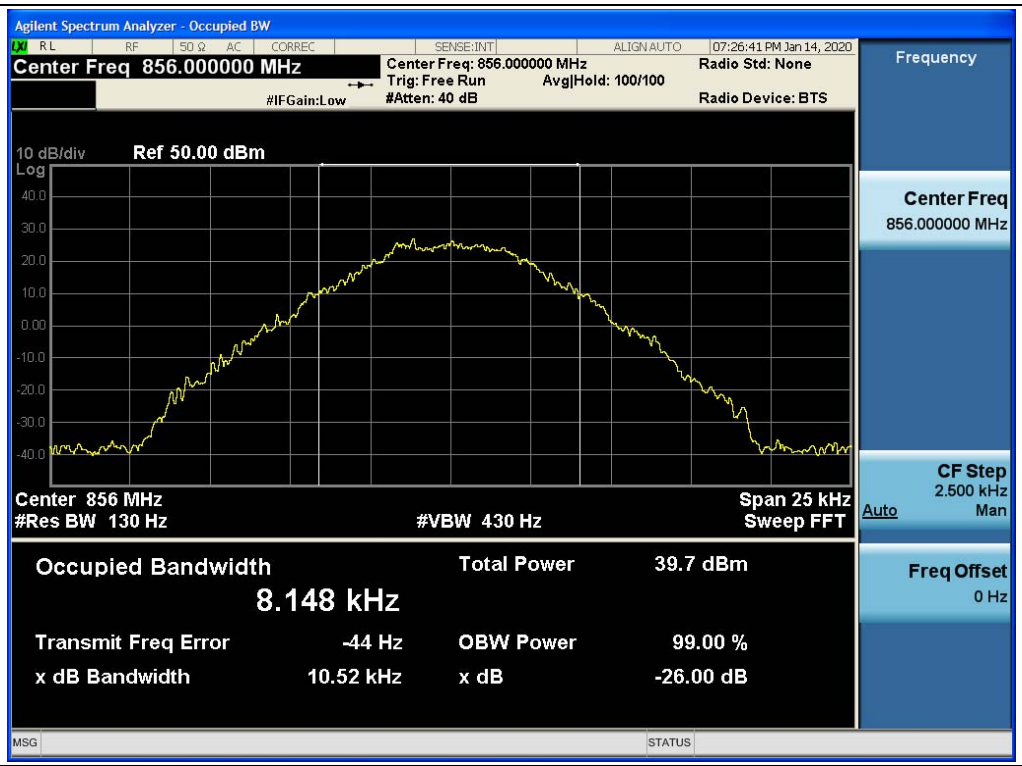
Output / PS800 / P25 Phase 1 / Uplink

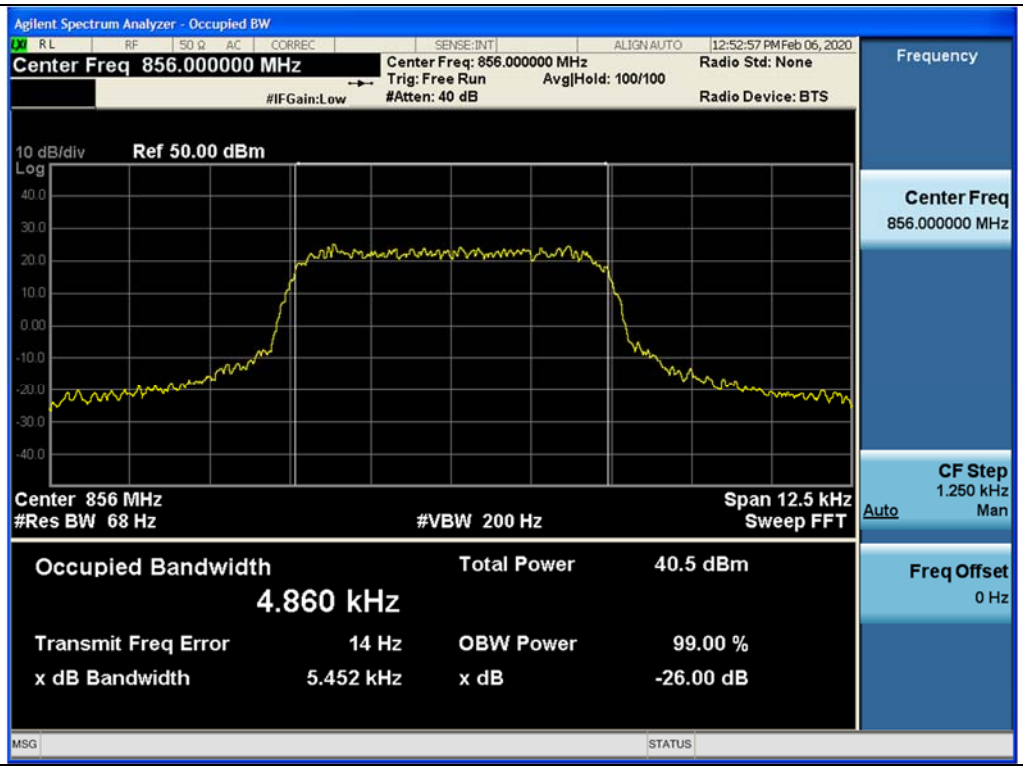

Output / PS800 / P25 Phase 2 / Uplink



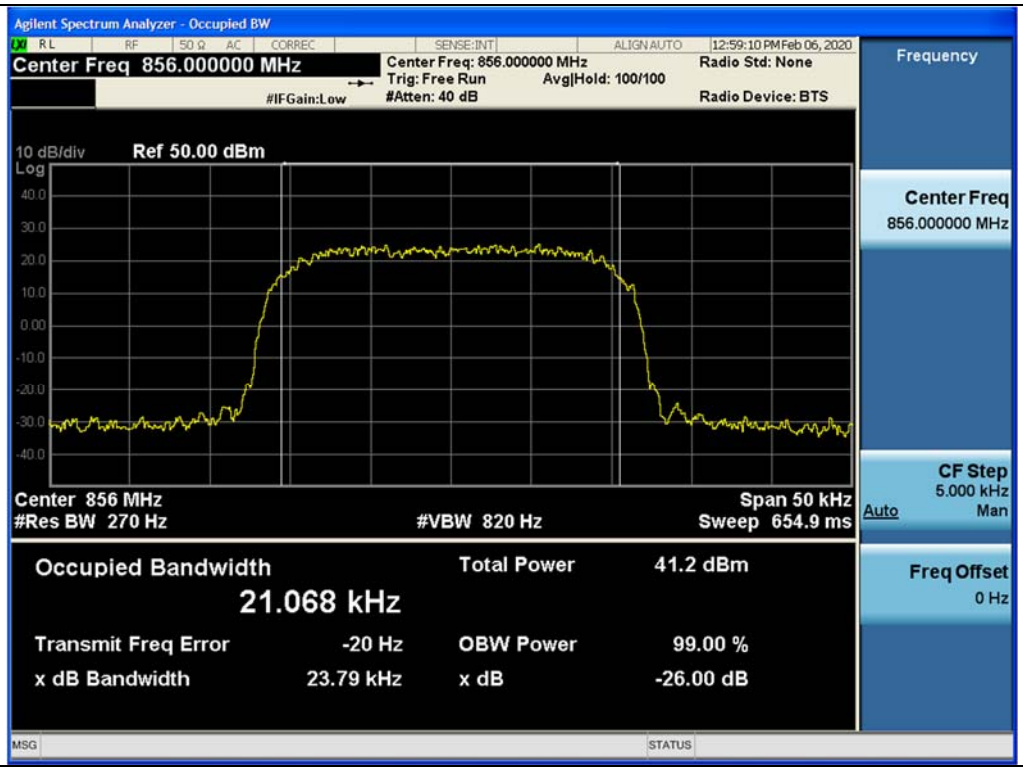
| Output / PS800 / TETRA / Uplink |
|---|
|  |

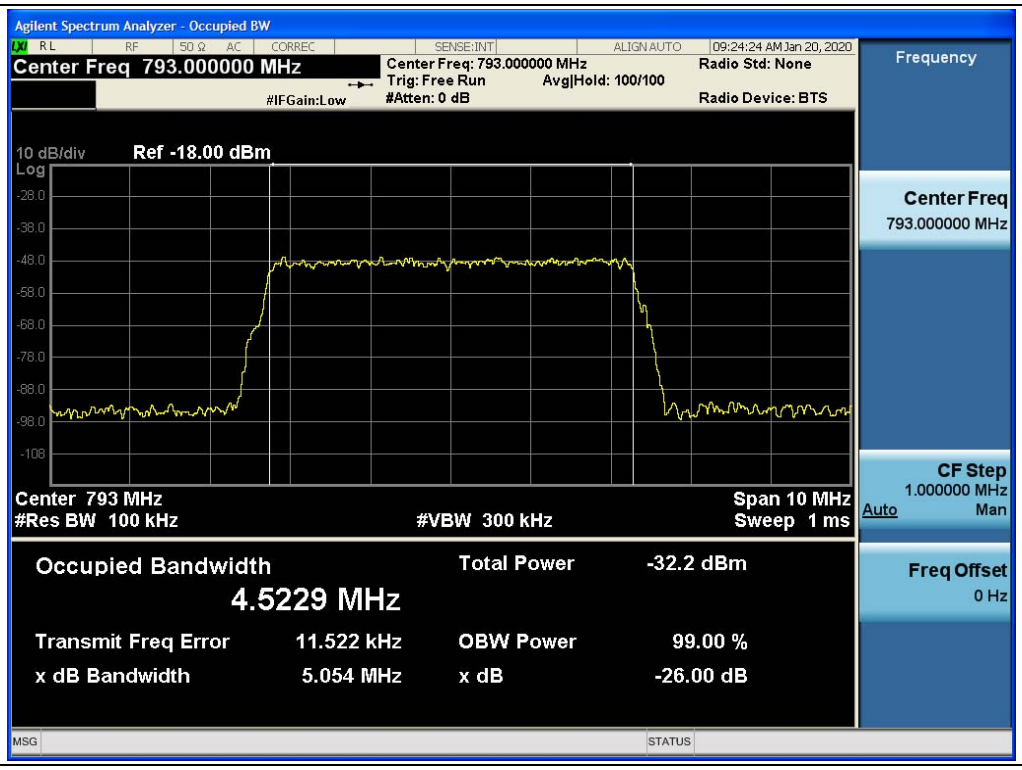


| Output / PS800 / P25 Phase 1 / Downlink |
|---|
|  |

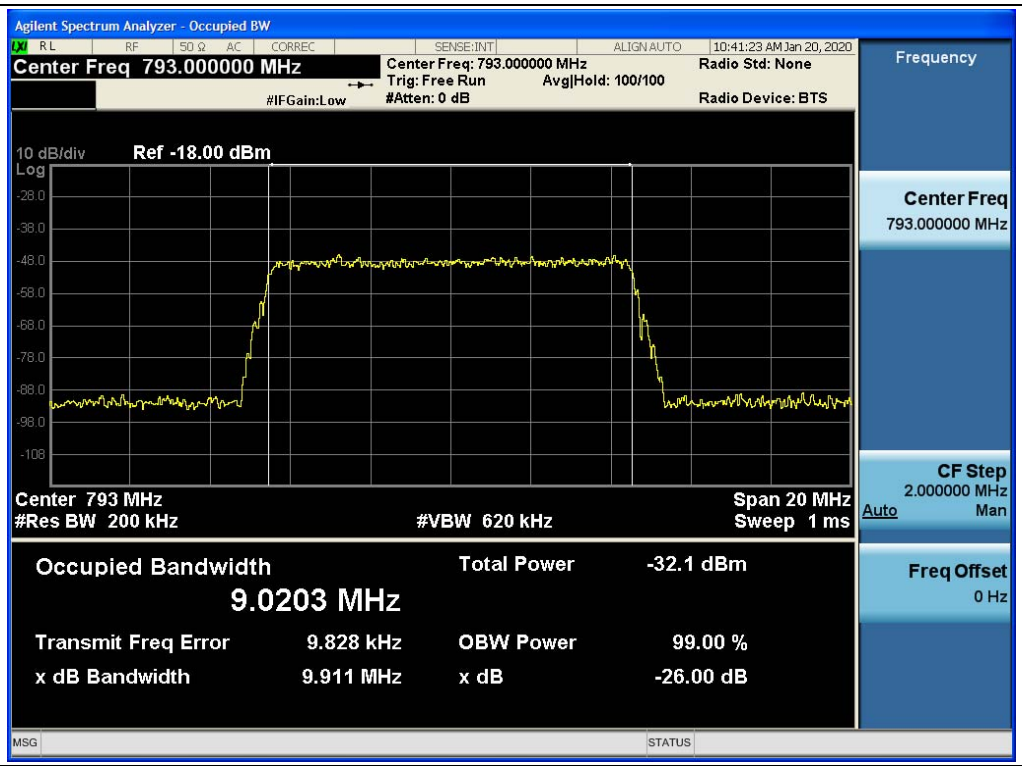
| Output / PS800 / P25 Phase 2 / Downlink |
|---|
|  |



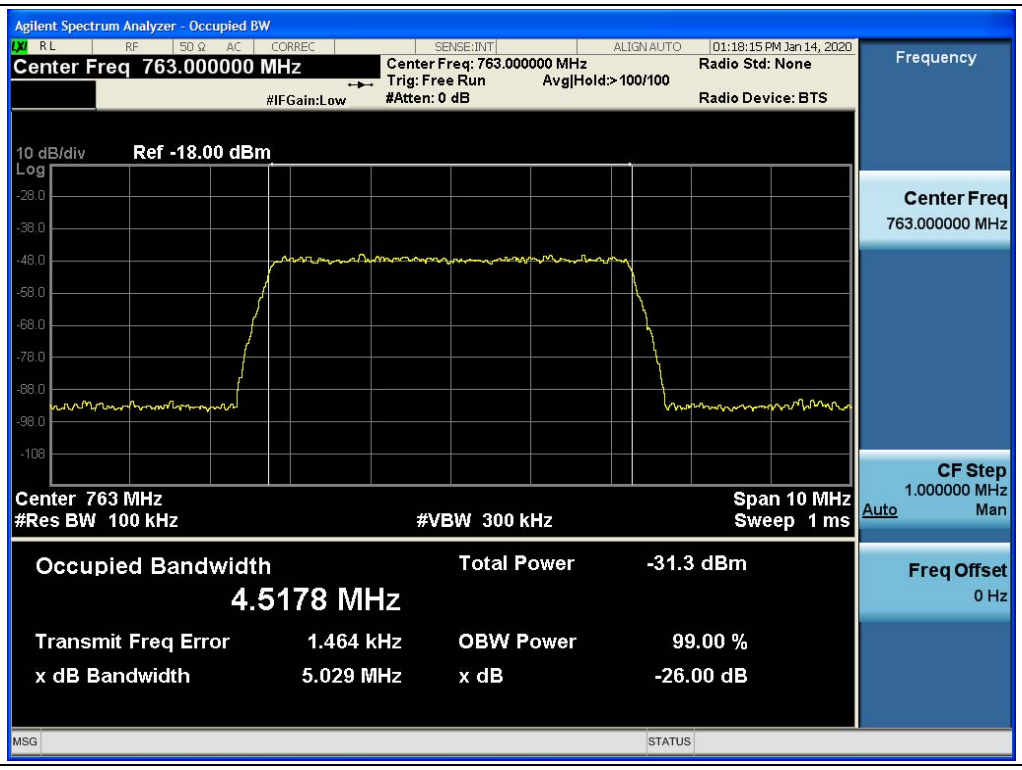
| Output / PS800 / TETRA / Downlink |
|---|
|  |

| Input / FirstNet / LTE 5 MHz / Uplink |
|---|
|  |

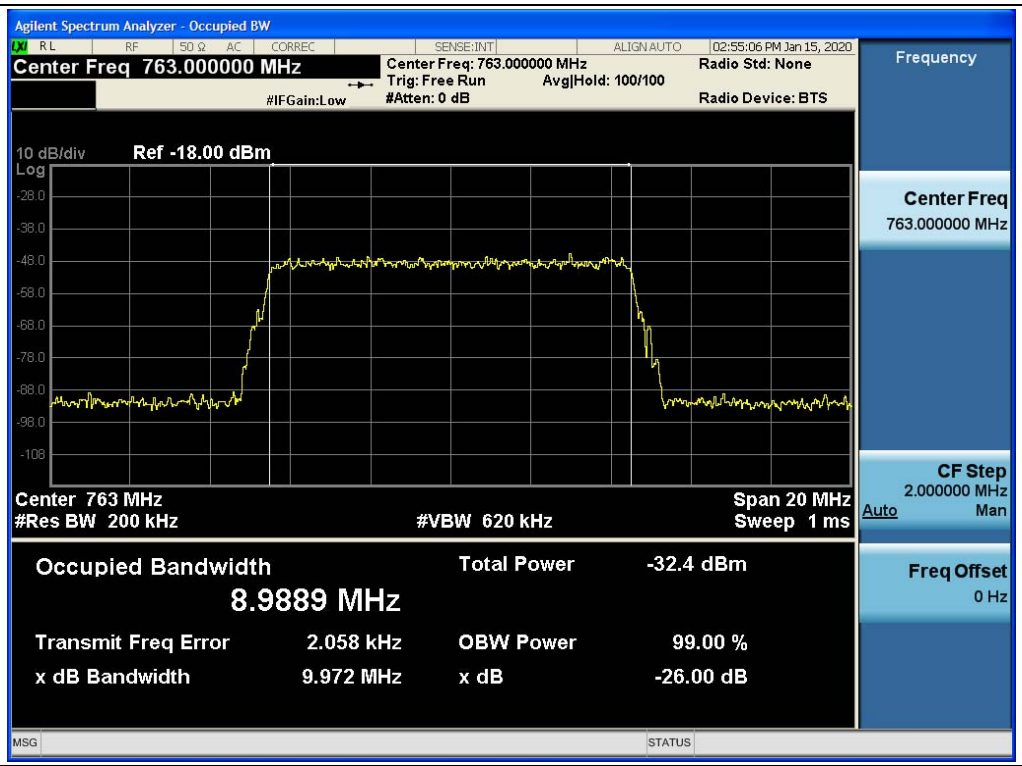


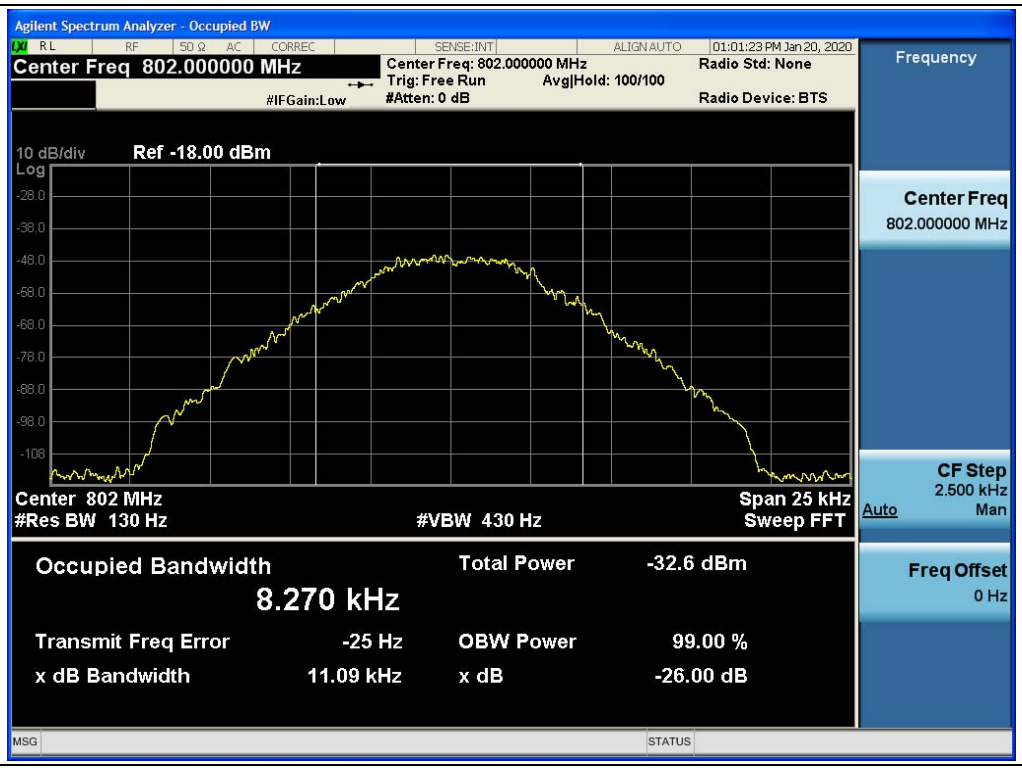
| Input / FirstNet / LTE 10 MHz / Uplink |
|---|
|  |

Input / FirstNet / LTE 5 MHz / Downlink

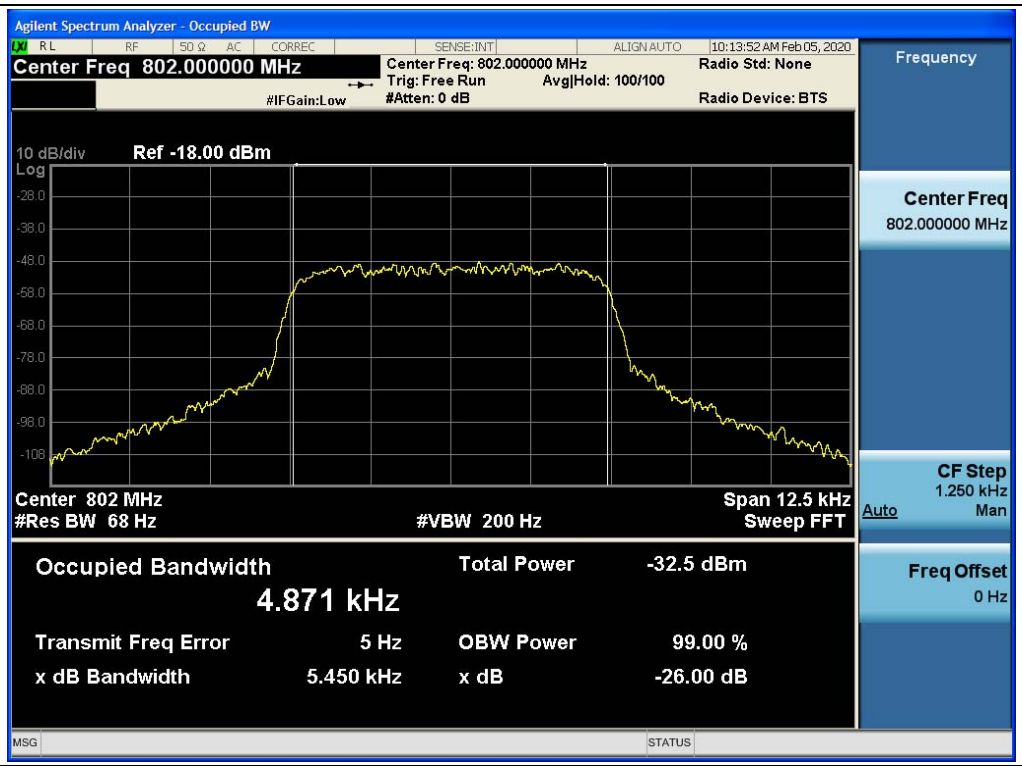



Input / FirstNet / LTE 10 MHz / Downlink

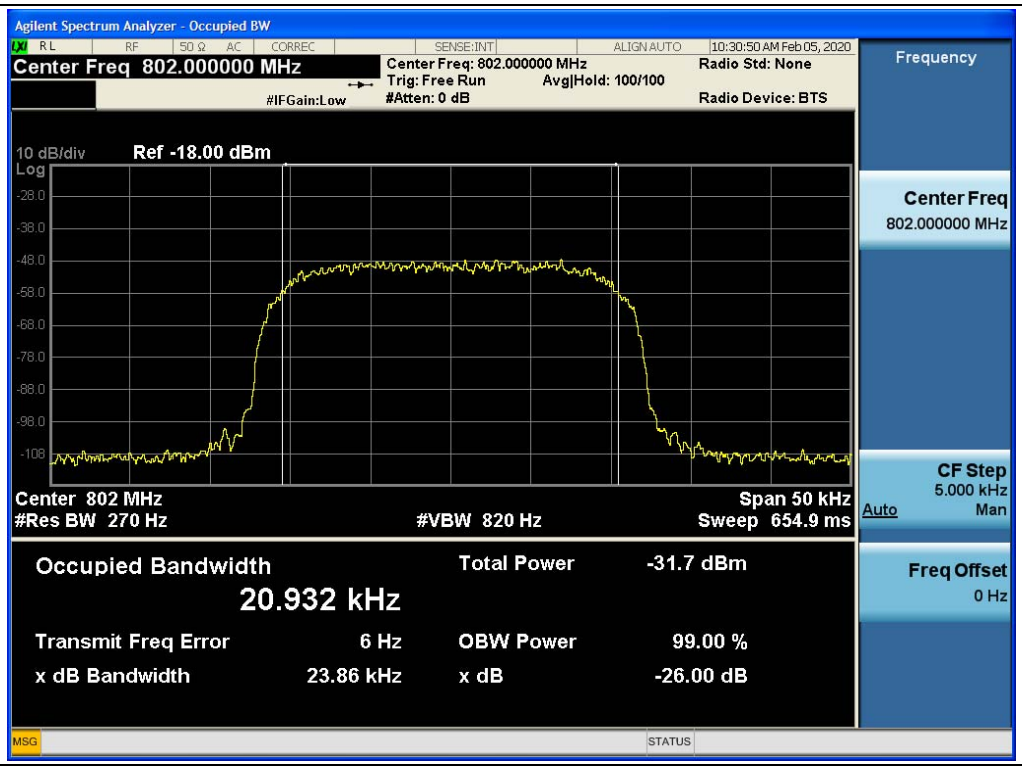


| Input / PS700 / P25 Phase 1 / Uplink |
|---|
|  |

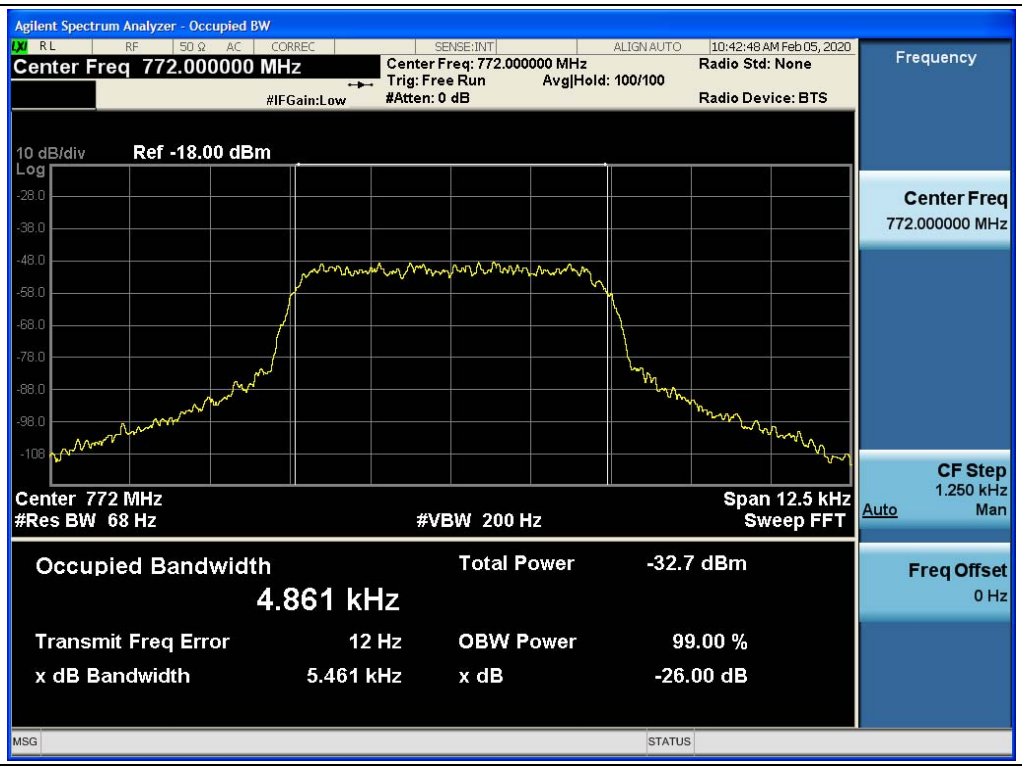


| Input / PS700 / P25 Phase 2 / Uplink |
|---|
|  |

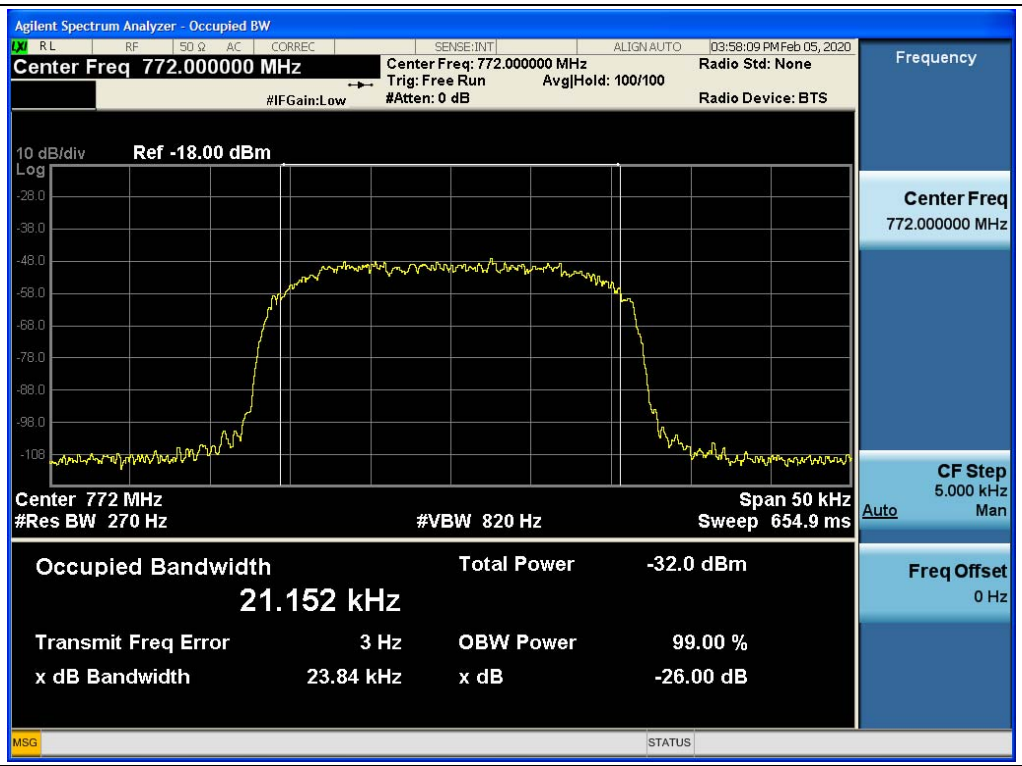
Input / PS700 / TETRA / Uplink




Input / PS700 / P25 Phase 1 / Downlink

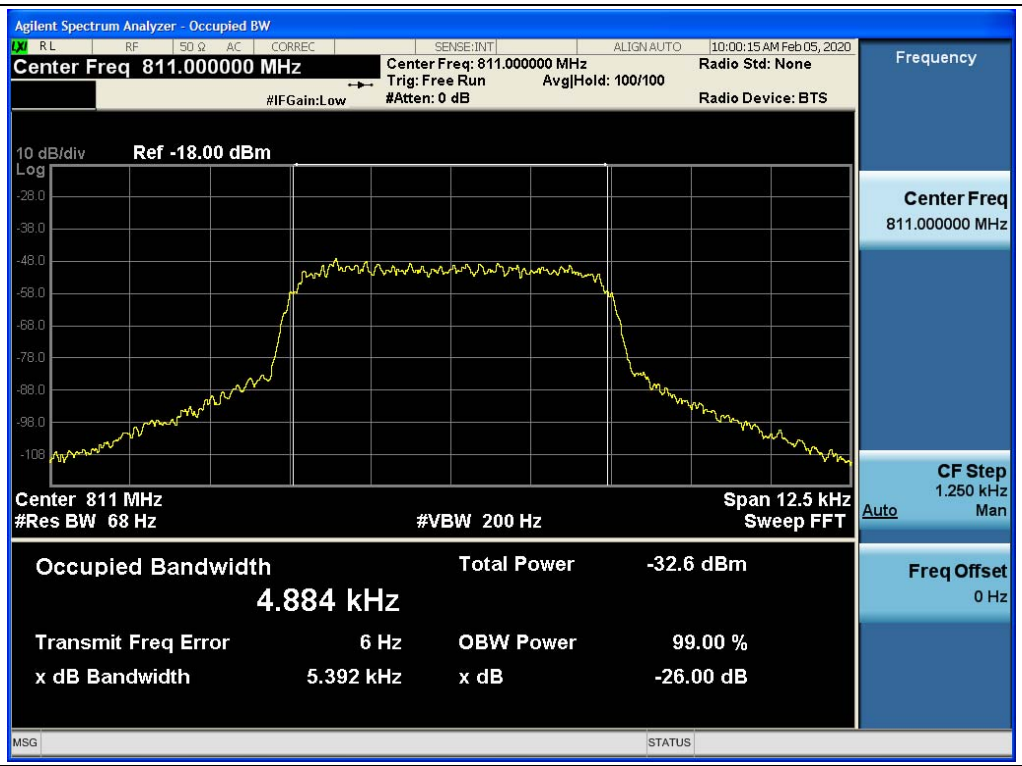
| Input / PS700 / P25 Phase 2 / Downlink |
|---|
|  |

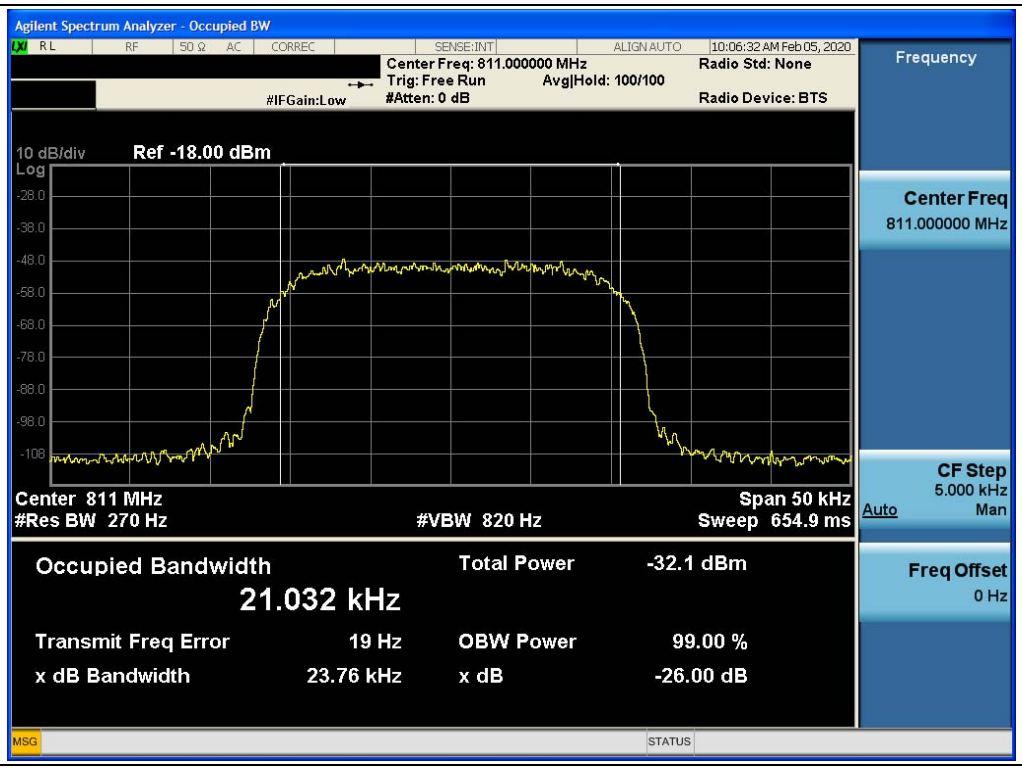


| Input / PS700 / TETRA / Downlink |
|---|
|  |

| Input / PS800 / P25 Phase 1 / Uplink |
|---|
|  |

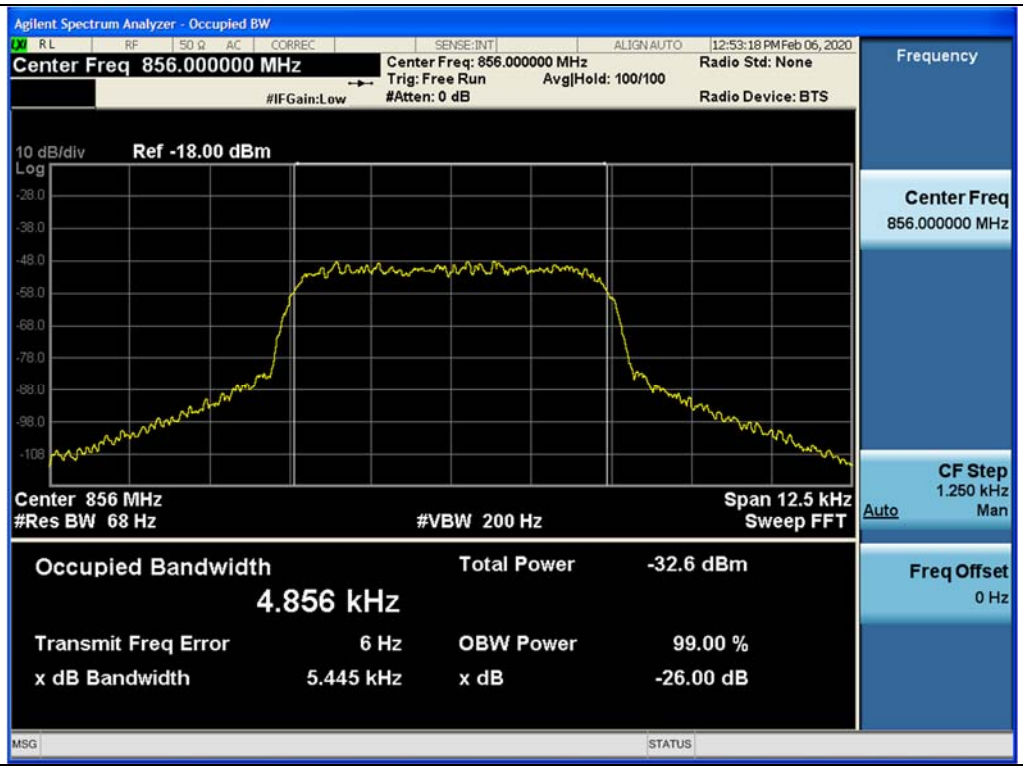


| Input / PS800 / P25 Phase 2 / Uplink |
|---|
|  |

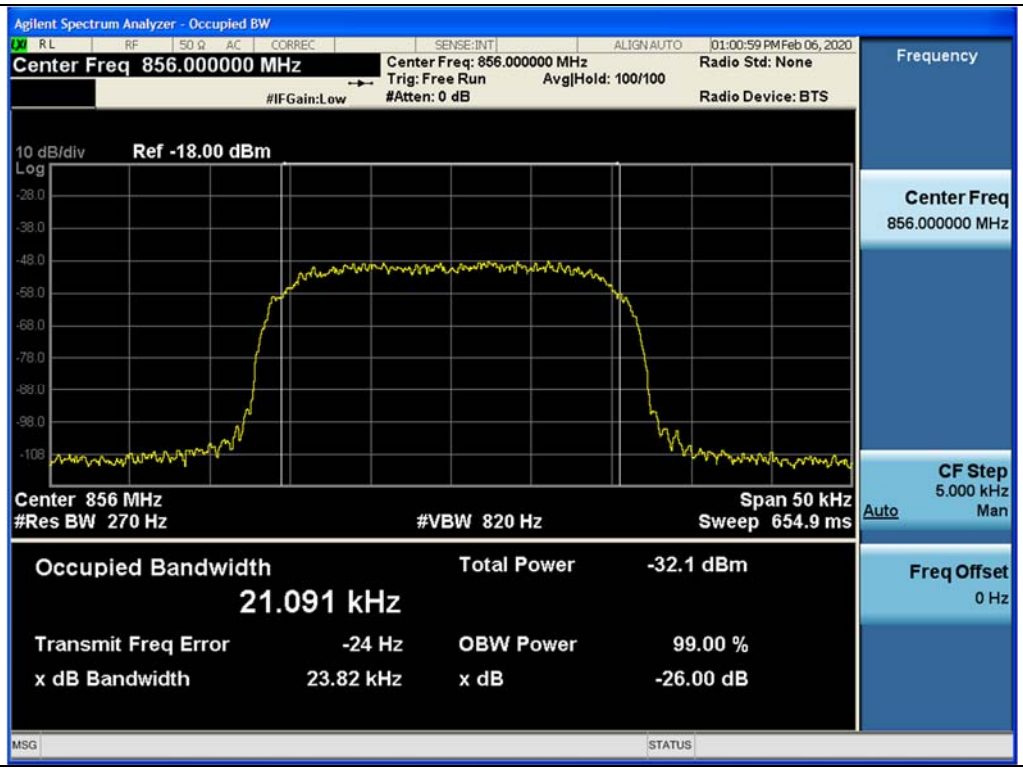
| Input / PS800 / TETRA / Uplink |
|---|
|  |

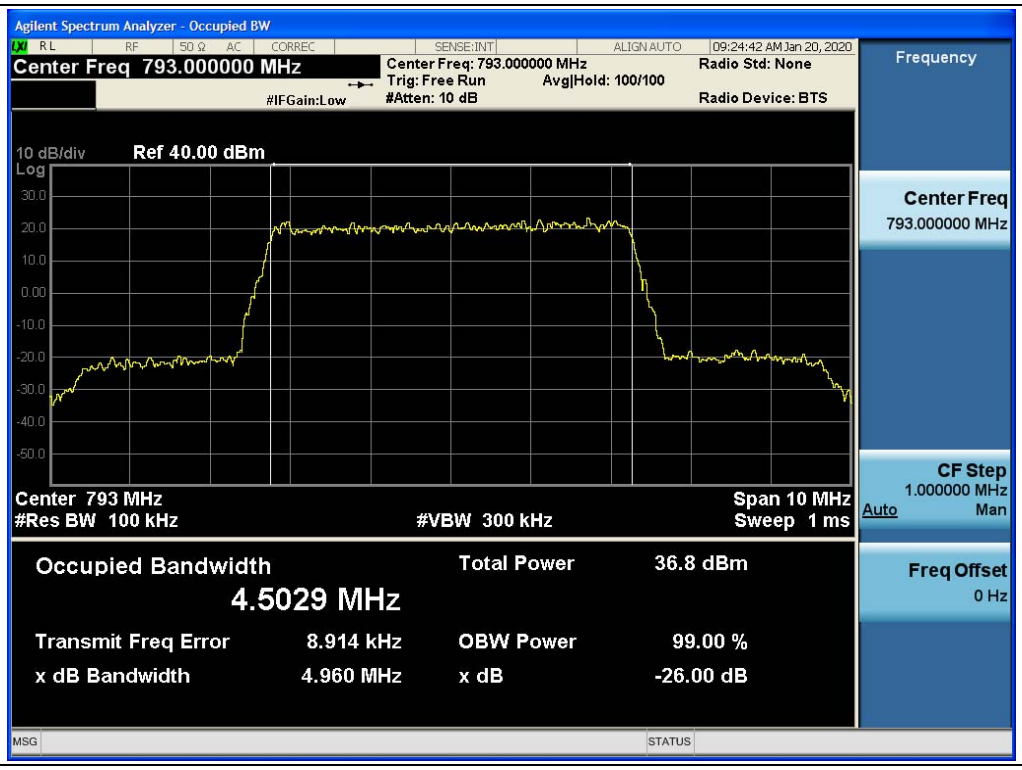


| Input / PS800 / P25 Phase 1 / Downlink |
|---|
|  |

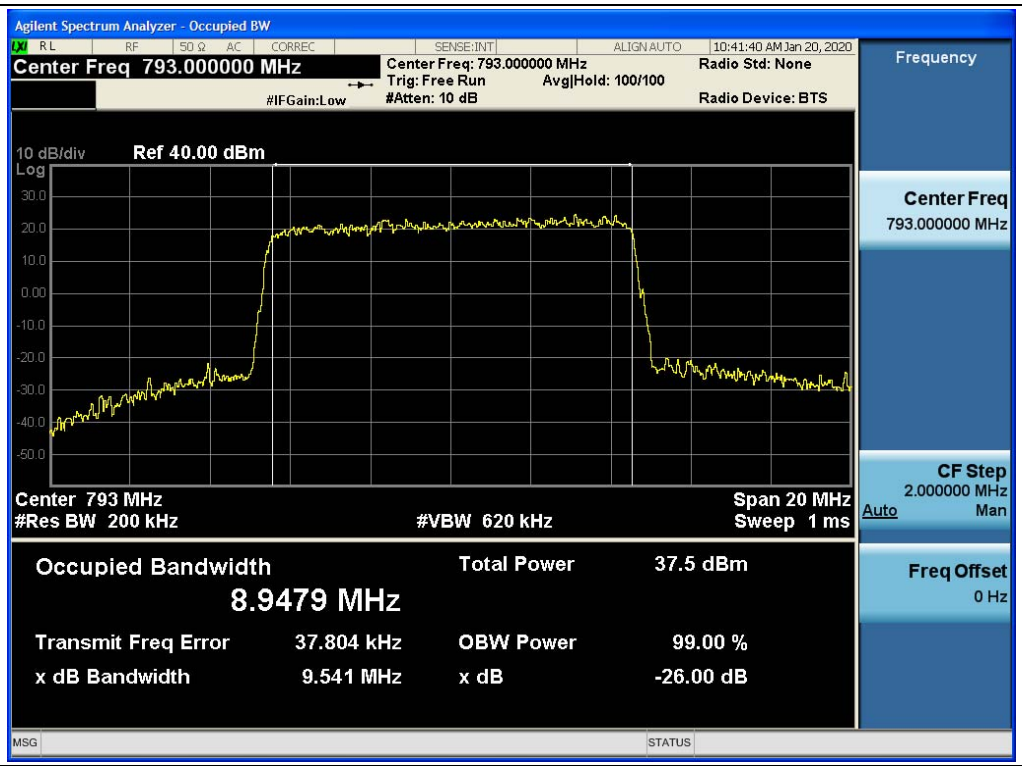
| Input / PS800 / P25 Phase 2 / Downlink |
| --- |
|  |

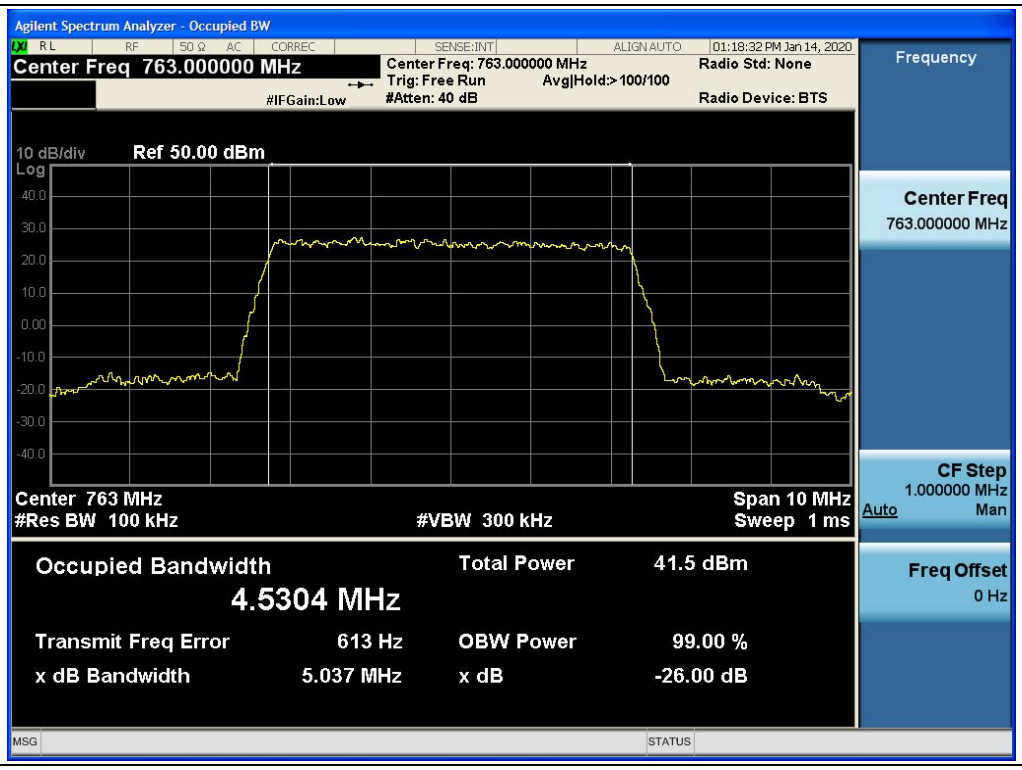


| Input / PS800 / TETRA / Downlink |
| --- |
|  |

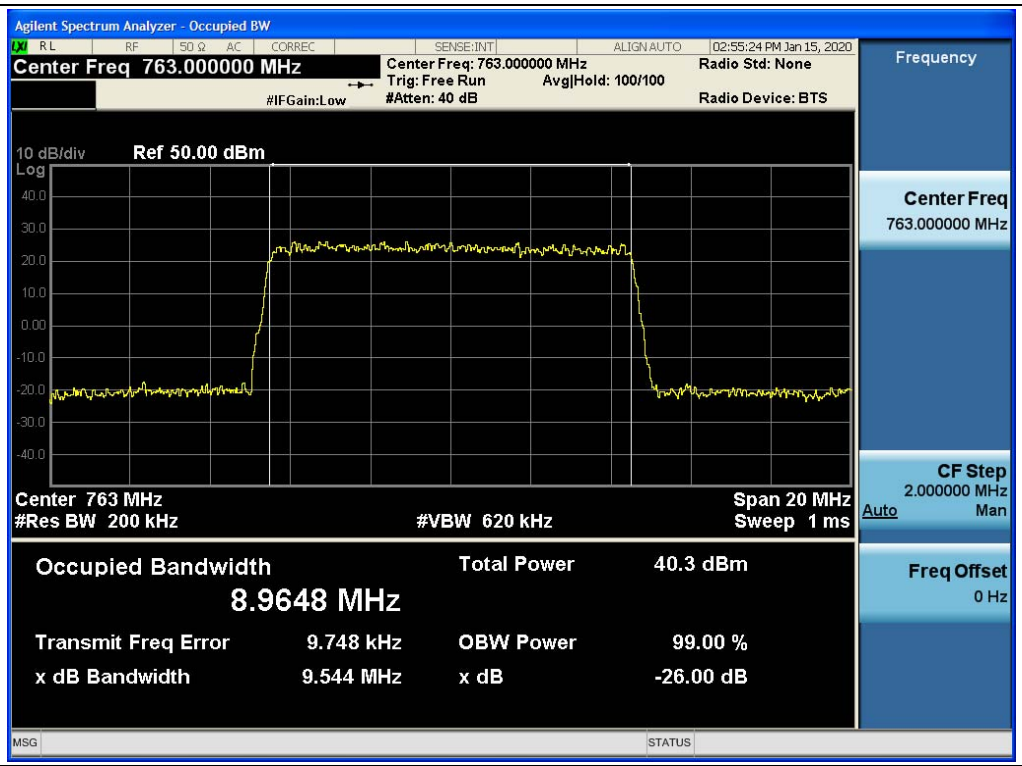
| 3 dB above the AGC threshold output / FirstNet / LTE 5 MHz / Uplink |
|---|
|  |

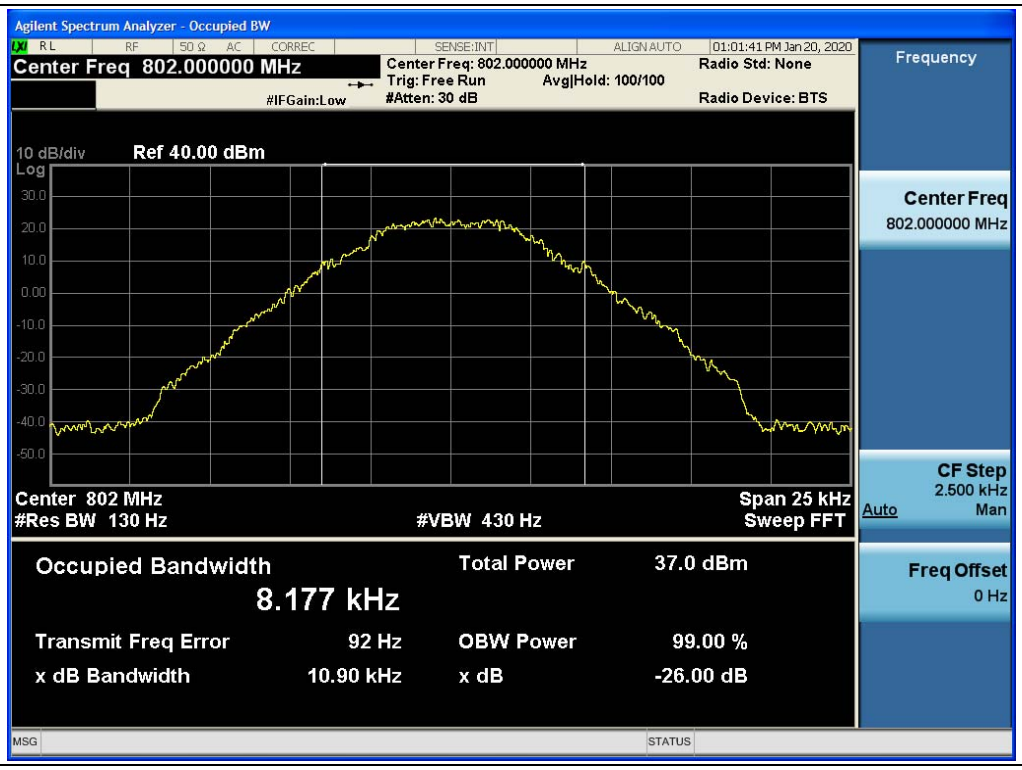


| 3 dB above the AGC threshold output / FirstNet / LTE 10 MHz / Uplink |
|---|
|  |

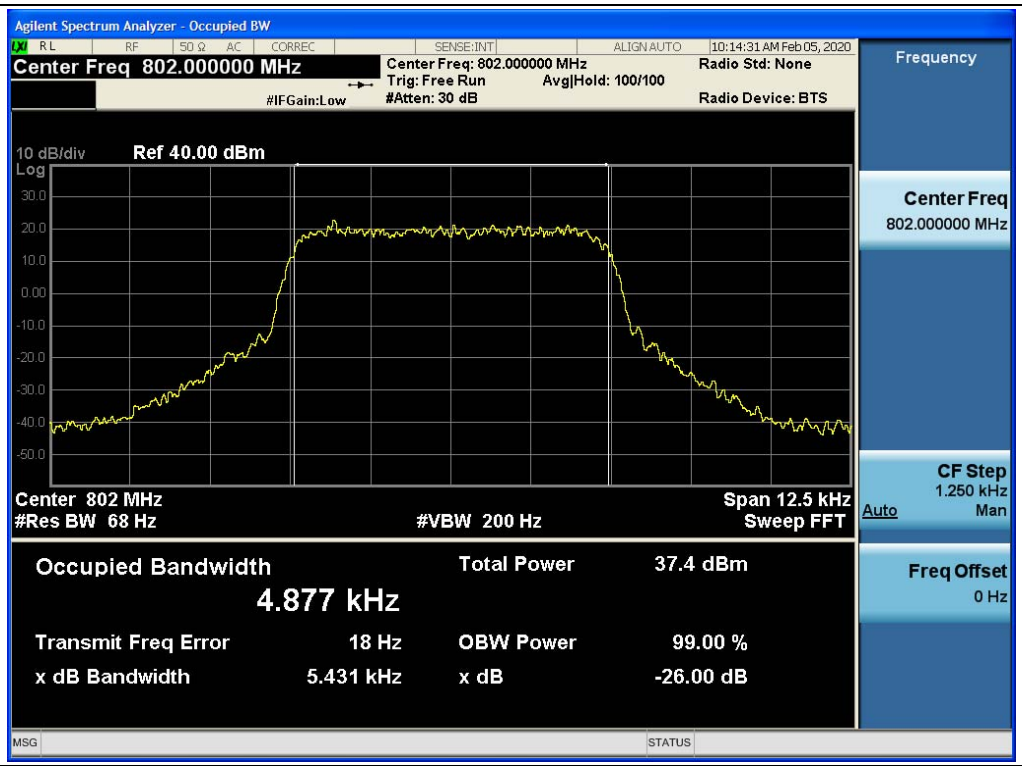
| 3 dB above the AGC threshold output / FirstNet / LTE 5 MHz / Downlink |
|---|
|  |



| 3 dB above the AGC threshold output / FirstNet / LTE 10 MHz / Downlink |
|---|
|  |

| 3 dB above the AGC threshold output / PS700 / P25 Phase 1 / Uplink |
|---|
|  |



| 3 dB above the AGC threshold output / PS700 / P25 Phase 2 / Uplink |
|---|
|  |