

## 5.2.5 Frequency Stability

Test Date: Sep 12, 2014 to Sep 15, 2014

Ambient Temp: 28.3°C

Humid : 61%

Atmospheric Pressure: 101kPa

Test Method: FCC part 2.1055

Test Requirement:

700MHz Lower ABC Band FCC part 27. 54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation, The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency.

700MHz Upper C Band FCC part 27. 54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation, The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency

800MHz Band FCC part 90. 213

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation, The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency

850MHz Band FCC part 22. 355

The frequency stability of the transmitter shall be maintained within  $\pm 0.00025$  percent ( $\pm 2.5$  ppm) of the center frequency over a temperature variation of  $-30^{\circ}$  Celsius to  $+50^{\circ}$  Celsius at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of  $20^{\circ}$  Celsius.

1900MHz Band FCC part 24. 135

The frequency stability of the transmitter shall be maintained within  $\pm 0.0001$  percent ( $\pm 1$  ppm) of the center frequency over a temperature variation of  $-30^{\circ}$  Celsius to  $+50^{\circ}$  Celsius at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of  $20^{\circ}$  Celsius.

AWS-1 Band FCC part 27. 54

The frequency stability shall be sufficient to ensure that the

fundamental emissions stay within the authorized bands of operation, The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency

EUT Operation:

The output power of EUT be set to maximum value, the gain of EUT be set to maximum value by software through the manufacture

Test conditions:

Temperature conditions, Voltage condition

Test configuration:

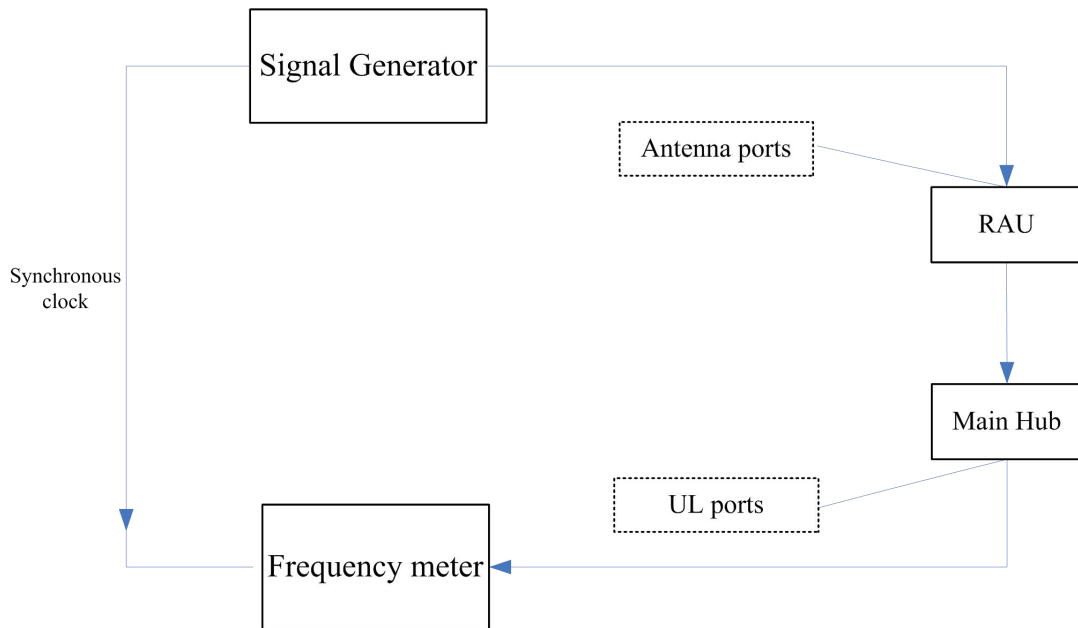


Figure 5: Uplink Frequency Stability Configuration

Test Procedure:

Frequency Stability test procedure:

- 1) Temperature condition:
  - a) Connect the equipment as illustrated
  - b) The RF output port of the EUT was connected to frequency meter;
  - c) Set the working frequency in the middle channel;
  - d) Record the 20°C and nominal voltage frequency value as reference point;
  - e) Vary the temperature from -30°C to 50°C with step 10°C;
  - f) When reach a temperature point, keep the temperature banlance at least 1 hour to make the product working in this status;
  - g) Read the frequency at the relative temperature;
- 2) Correct for all losses in the RF path
  - a) Record the 20°C and nominal voltage frequency value as reference point;
  - b) Vary the voltage from -15% nominal voltage to +15%

voltage;

Read the frequency at the relative voltage;

## 5.2.5.1 Measurement Record

### 5.2.5.1.1 Frequency Stability vs temperature

#### (1) 700MHz Lower ABC Band

(1.1) Test Lower A, The center frequency is 701MHz

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	700.9999997	-0.00043
40	701.0000001	-0.00014
30	701.0000003	+0.00043
20	701.0000002	+0.00027
10	701.0000005	+0.00071
0	701.0000010	+0.00142
-10	701.0000018	+0.00257
-20	701.0000027	+0.00385
-30	701.0000041	+0.00584

(1.2) Test Lower B, The center frequency is 707MHz

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	706.9999995	-0.00071
40	706.9999999	-0.00014
30	706.9999998	-0.00028
20	707.0000001	+0.00014
10	707.0000005	+0.00071
0	707.0000011	+0.00156
-10	707.0000019	+0.00269
-20	707.0000032	+0.00452
-30	707.0000048	+0.00679

## (1.3) Test Lower C, The center frequency is 713MHz

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	712.9999997	-0.00042
40	713.0000001	-0.00014
30	713.0000002	+0.00028
20	713.0000004	+0.00056
10	713.0000002	+0.00028
0	713.0000011	+0.00154
-10	713.0000021	+0.00295
-20	713.0000029	+0.00407
-30	713.0000043	+0.00603

## (2) 700MHz Upper C Band, The center frequency is 781.5MHz

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	781.4999992	-0.00102
40	781.4999995	-0.00064
30	781.4999997	-0.00038
20	781.4999997	-0.00038
10	781.4999999	-0.00013
0	781.5000004	+0.00051
-10	781.5000012	+0.00153
-20	781.5000026	+0.00332
-30	781.5000039	+0.00499

## (3) 800MHz Band, The center frequency is 820.5MHz

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	820.4999998	-0.00024
40	820.5000001	+0.00012
30	820.5000003	+0.00037
20	820.5000005	+0.00061

10	820.5000009	+0.00109
0	820.5000015	+0.00183
-10	820.5000028	+0.00341
-20	820.5000040	+0.00488
-30	820.5000049	+0.00597

## (4) 850MHz Band, The center frequency is 836.5MHz

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	836.4999999	-0.00012
40	836.5000001	+0.00012
30	836.5000002	+0.00024
20	836.5000003	+0.00036
10	836.5000007	+0.00084
0	836.5000010	+0.00119
-10	836.5000019	+0.00227
-20	836.5000031	+0.00370
-30	836.5000046	+0.00550

## (5) 1900MHz Band, The center frequency is 1882.5MHz

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	1882.499996	-0.00212
40	1882.499997	-0.00159
30	1882.499999	-0.00053
20	1882.500002	+0.00106
10	1882.500003	+0.00159
0	1882.500005	+0.00265
-10	1882.500007	+0.00372
-20	1882.500008	+0.00425
-30	1882.500009	+0.00478

## (6) AWS-1 Band, The center frequency is 1732.5MHz

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	1732.499999	-0.00058
40	1732.500002	+0.00115
30	1732.500001	+0.00058
20	1732.500002	+0.00115
10	1732.500004	+0.00231
0	1732.500005	+0.00288
-10	1732.500007	+0.00404
-20	1732.500010	+0.00577
-30	1732.500013	+0.00750

### 5.2.5.1.2 Frequency Stability vs voltage

#### (1) 700MHz Lower ABC Band

(1.1) Test Lower A, The center frequency is 701MHz

Voltage(V)	Frequency(MHz)	Tolerance(ppm)
102 (120*0.85)	701.0000003	+0.00043
120	701.0000003	+0.00043
138 (120*1.15)	701.0000003	+0.00043

(1.2) Test Lower B, The center frequency is 707MHz

Voltage(V)	Frequency(MHz)	Tolerance(ppm)
102 (120*0.85)	706.9999998	-0.00028
120	706.9999998	-0.00028
138 (120*1.15)	706.9999998	-0.00028

(1.3) Test Lower C, The center frequency is 713MHz

Voltage(V)	Frequency(MHz)	Tolerance(ppm)
102 (120*0.85)	713.0000002	+0.00028
120	713.0000002	+0.00028
138 (120*1.15)	713.0000002	+0.00028



## (2) 700MHz (Upper C) Band, The center frequency is 781.5MHz

Voltage(V)	Frequency(MHz)	Tolerance(ppm)
102 (120*0.85)	781.4999997	-0.00038
120	781.4999997	-0.00038
138 (120*1.15)	781.4999997	-0.00038

## (3) 800MHz Band, The center frequency is 820.5MHz

Voltage(V)	Frequency(MHz)	Tolerance(ppm)
102 (120*0.85)	820.5000003	+0.00037
120	820.5000003	+0.00037
138 (120*1.15)	820.5000003	+0.00037

## (4) 850MHz Band, The center frequency is 836.5MHz

Voltage(V)	Frequency(MHz)	Tolerance(ppm)
102 (120*0.85)	836.5000002	+0.00024
120	836.5000002	+0.00024
138 (120*1.15)	836.5000002	+0.00024

## (5) 1900MHz Band, The center frequency is 1882.5MHz

Voltage(V)	Frequency(MHz)	Tolerance(ppm)
102 (120*0.85)	1882.499999	-0.00053
120	1882.499999	-0.00053
138 (120*1.15)	1882.499999	-0.00053

## (6) AWS-1 Band, The center frequency is 1732.5MHz

Voltage(V)	Frequency(MHz)	Tolerance(ppm)
102 (120*0.85)	1732.500001	+0.00058
120	1732.500001	+0.00058
138 (120*1.15)	1732.500001	+0.00058

### 5.2.6 Occupied Bandwidth

Test Date: Sep 12, 2014 to Sep 15, 2014

Ambient Temp: 28.3°C

Humid : 61%

Atmospheric Pressure: 101kPa

Power supply: AC 120V 60Hz

Test Method: FCC part 2.1049& 935210 D02 Signal Boosters Certification v02r01

Test Requirement:

700MHz Lower ABC Band	935210 D02 Signal Boosters Certification v02r01
700MHz Upper C Band	935210 D02 Signal Boosters Certification v02r01
800MHz Band	935210 D02 Signal Boosters Certification v02r01
850MHz Band	935210 D02 Signal Boosters Certification v02r01
1900MHz Band	935210 D02 Signal Boosters Certification v02r01
AWS-1 Band	935210 D02 Signal Boosters Certification v02r01

EUT Operation: The output power of EUT be set to maximum value, the gain of EUT be set to maximum value by software through the manufacture

Test conditions: Normal conditions

Test configuration:

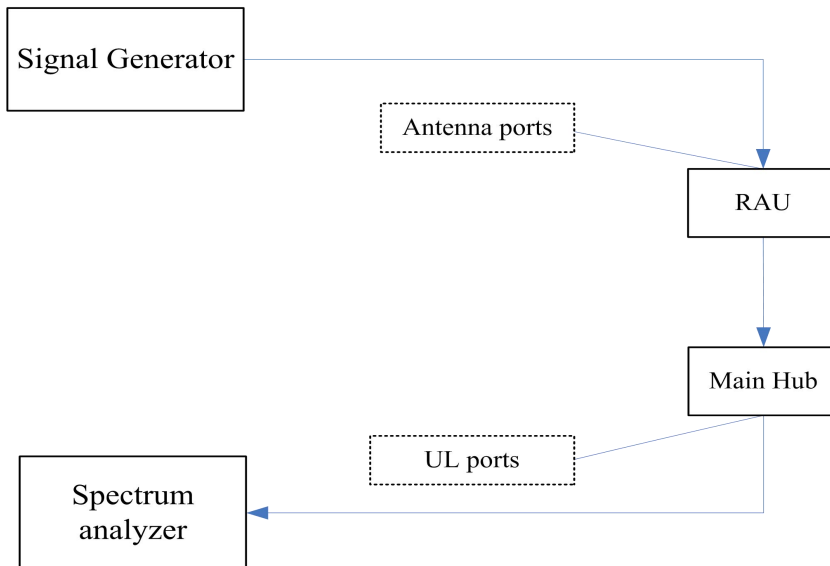


Figure 6: Uplink Occupied Bandwidth Configuration

Test Procedure: Occupied bandwidth test procedure:

- a) Set the spectrum analyzer RBW 300Hz >1%&<2% bandwidth of carrier;
- b) Capture the trace of input signal;

FCC ID: PX8MU01-6100

- c) Connect the equipment as illustrated;
- d) Capture the trace of output signal

### 5.2.6.1 Measurement Record

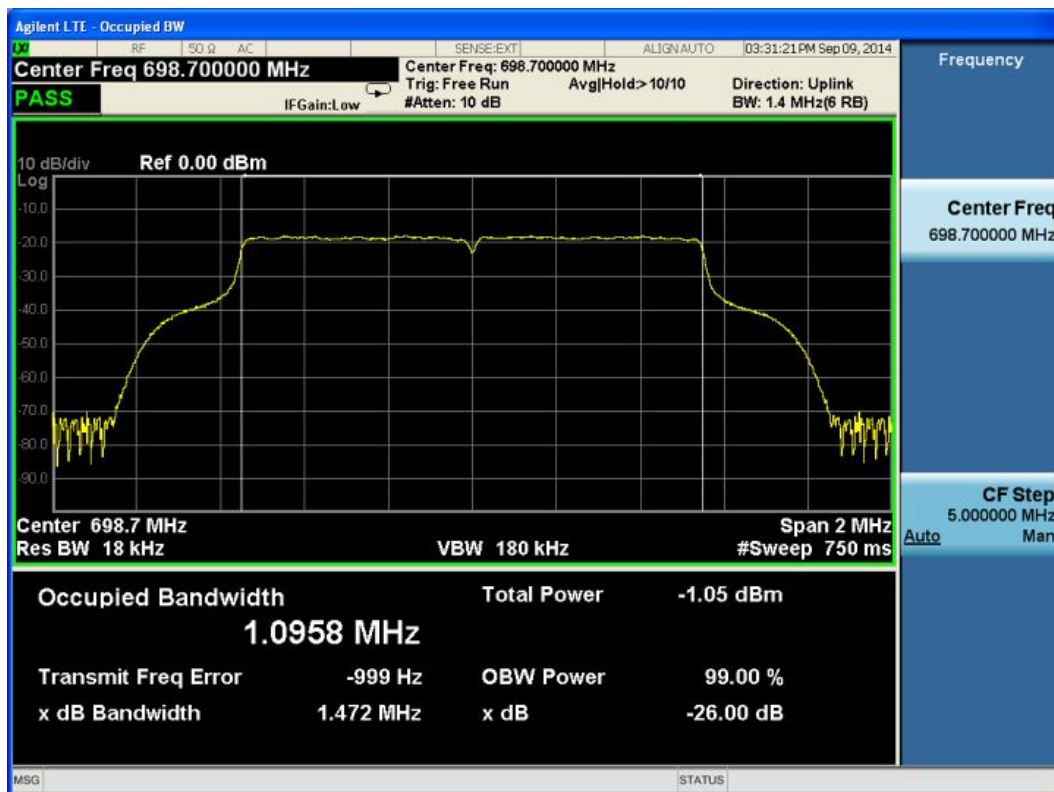
#### 5.2.6.1.1 700MHz Lower ABC Band

#### (1) Test Lower A

#### (1.1) Test for LTE 1.4MHz

#### (1.1.1) Lowest frequency

#### (a) Input signal

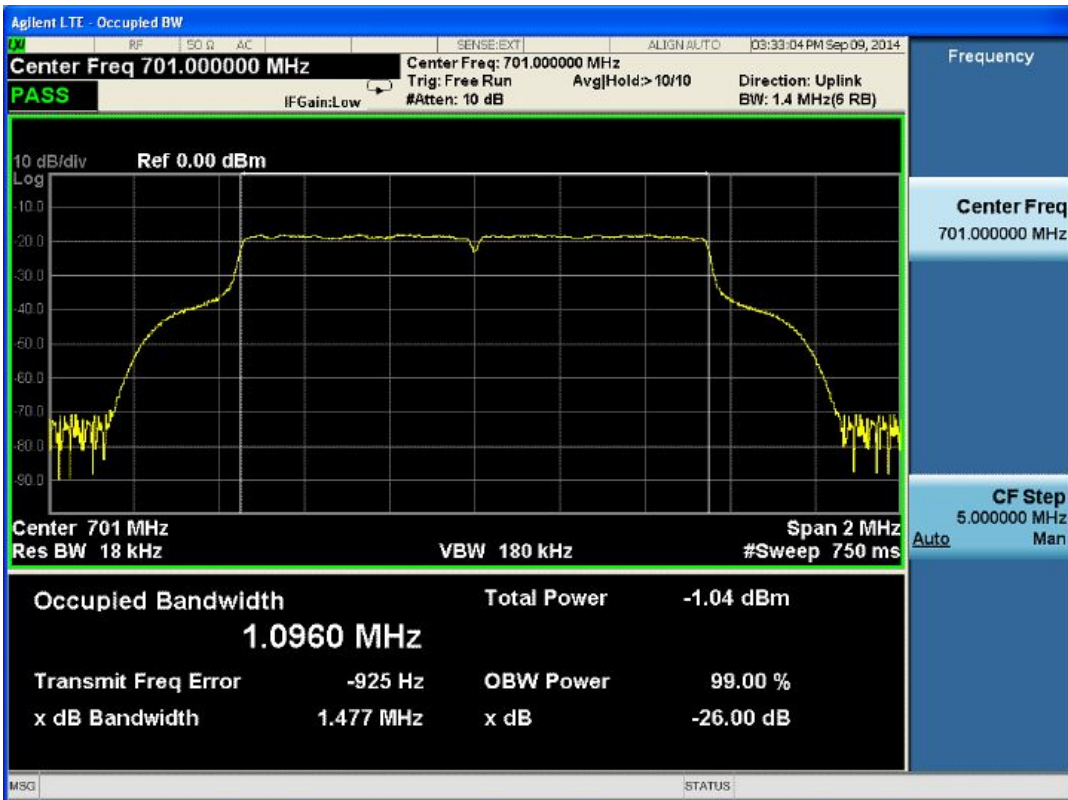


(b) Output signal

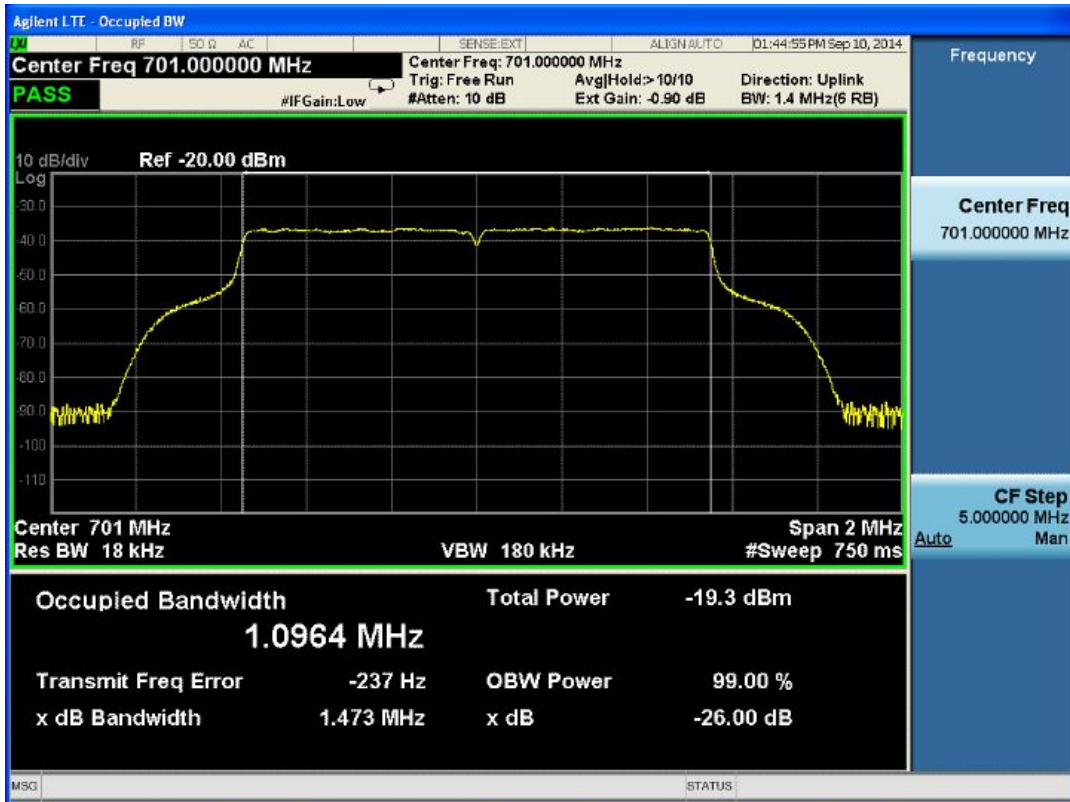


(1.1.2) Middle frequency

(a) Input signal



(b) Output signal

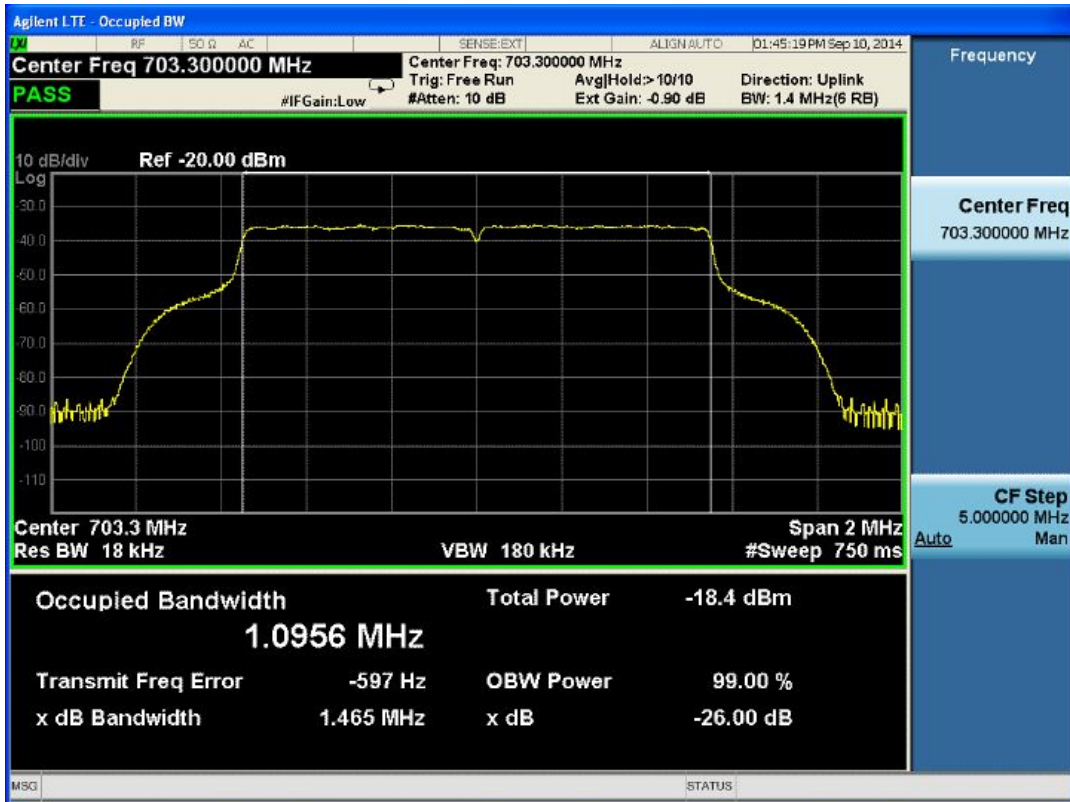


(1.1.3) Highest frequency

(a) Input signal



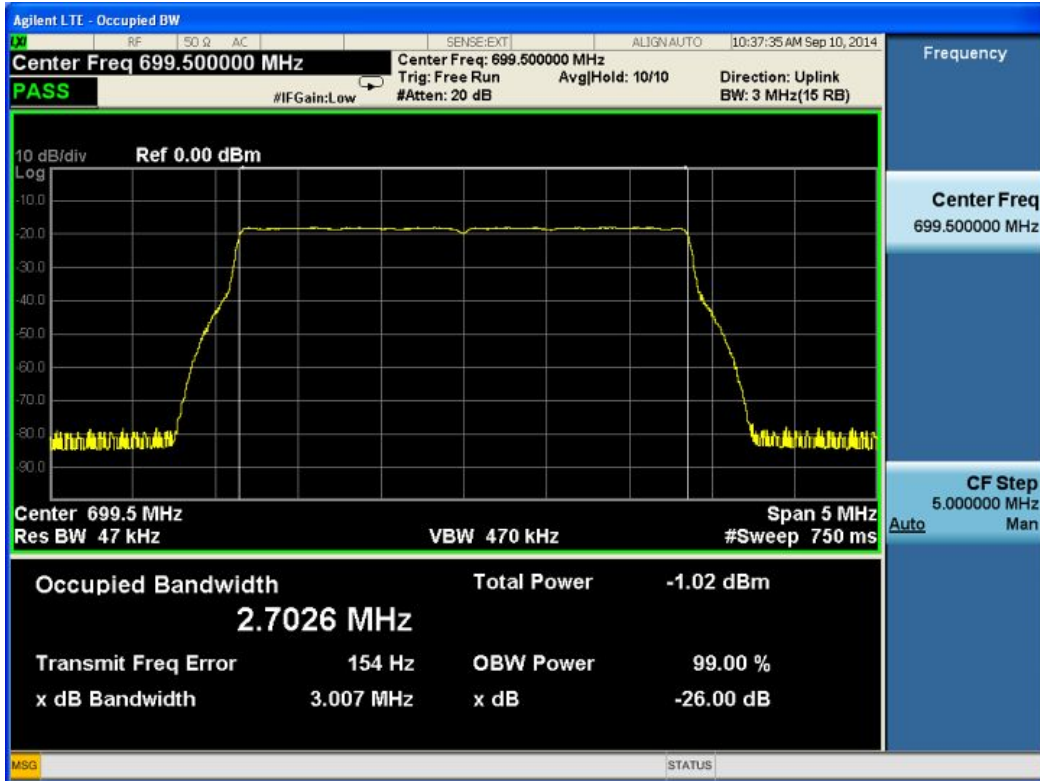
**(b) Output signal**



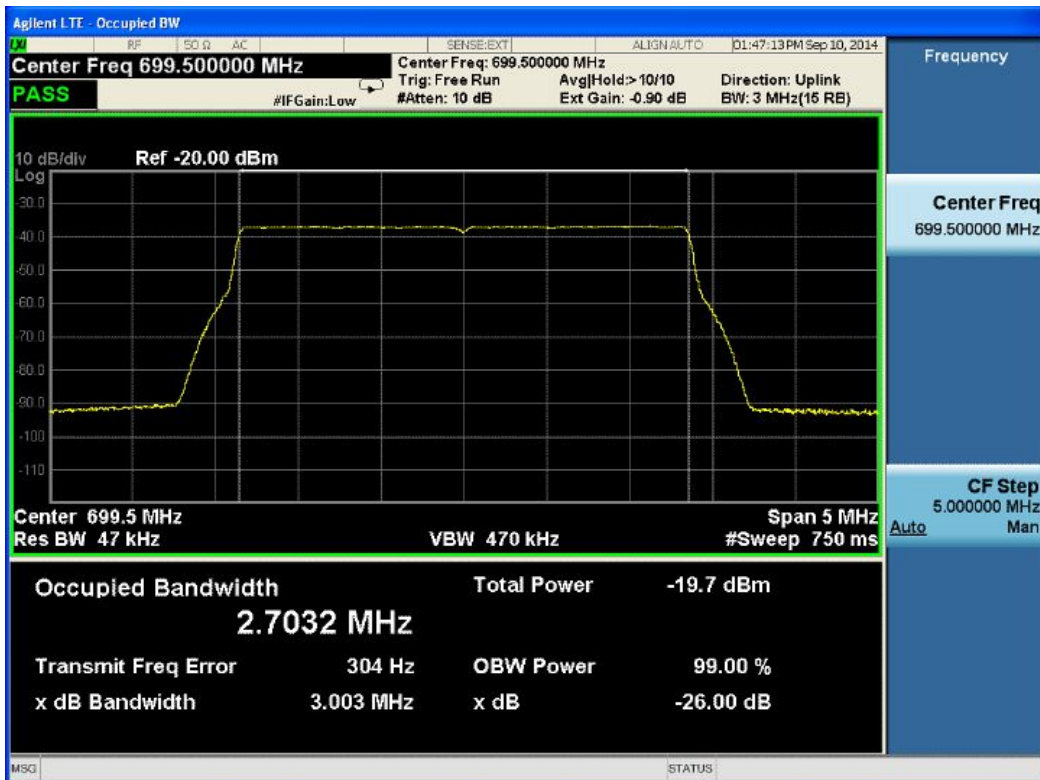
### (1.2) Test for LTE 3 MHz

#### (1.2.1) Lowest frequency

##### (a) Input signal



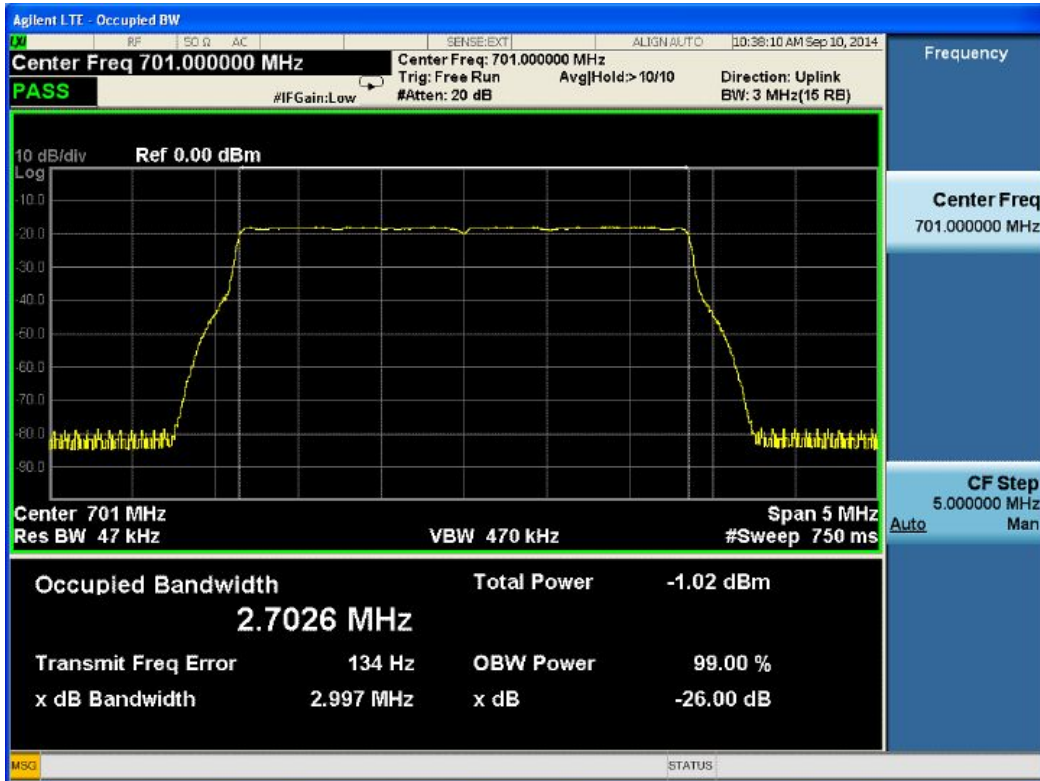
##### (b) Output signal



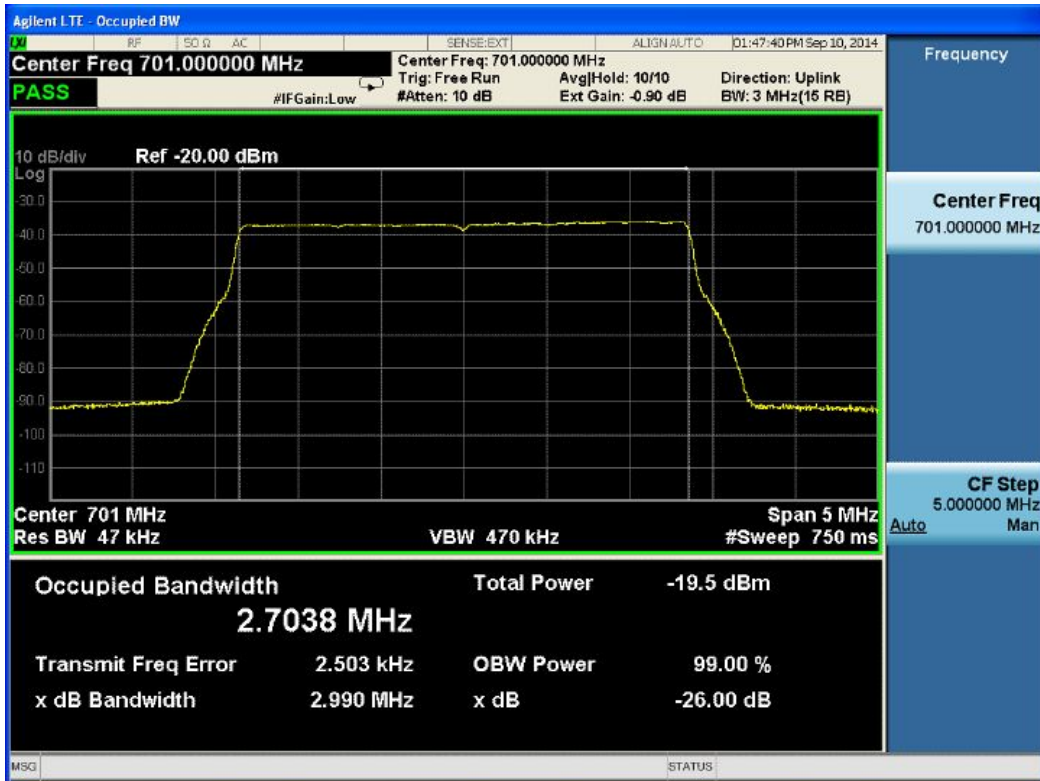


(1.2.2) Middle frequency

(a) Input signal

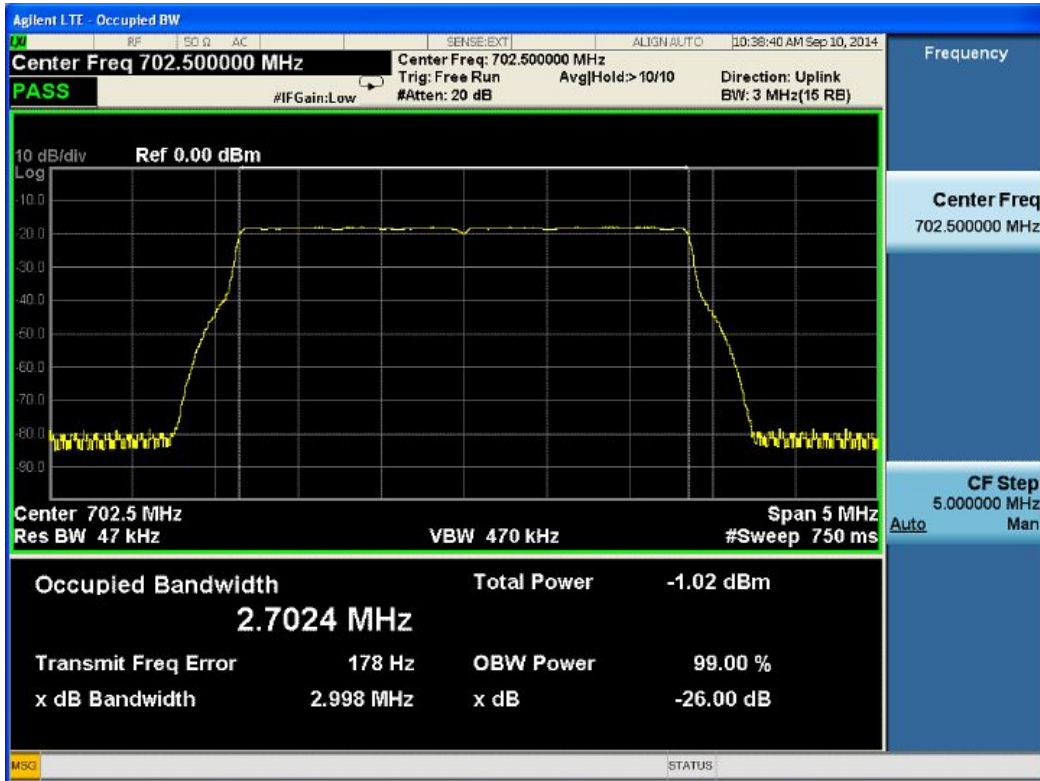


(b) Output signal

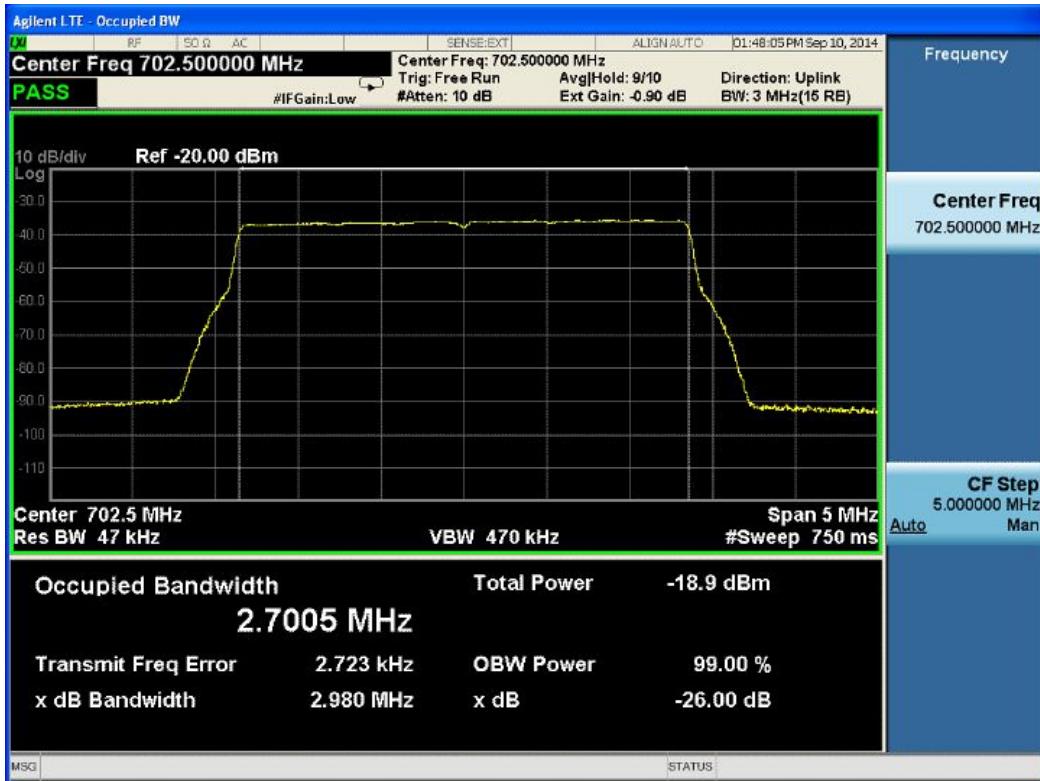


(1.2.3) Highest frequency

(a) Input signal



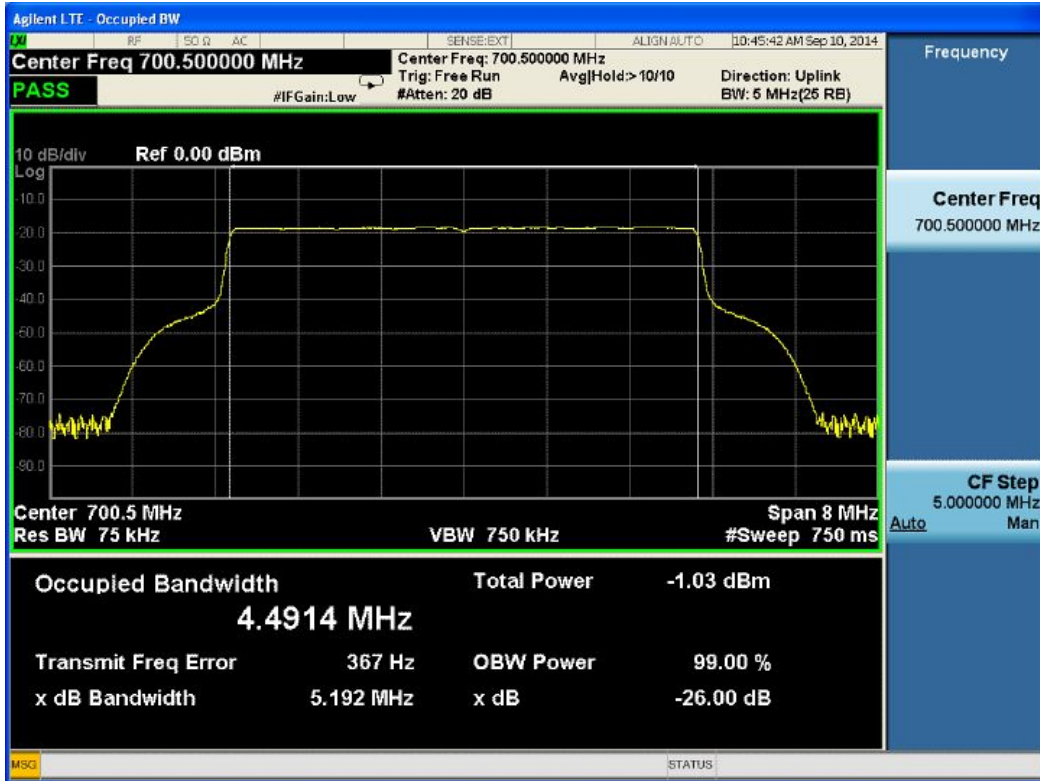
(b) Output signal



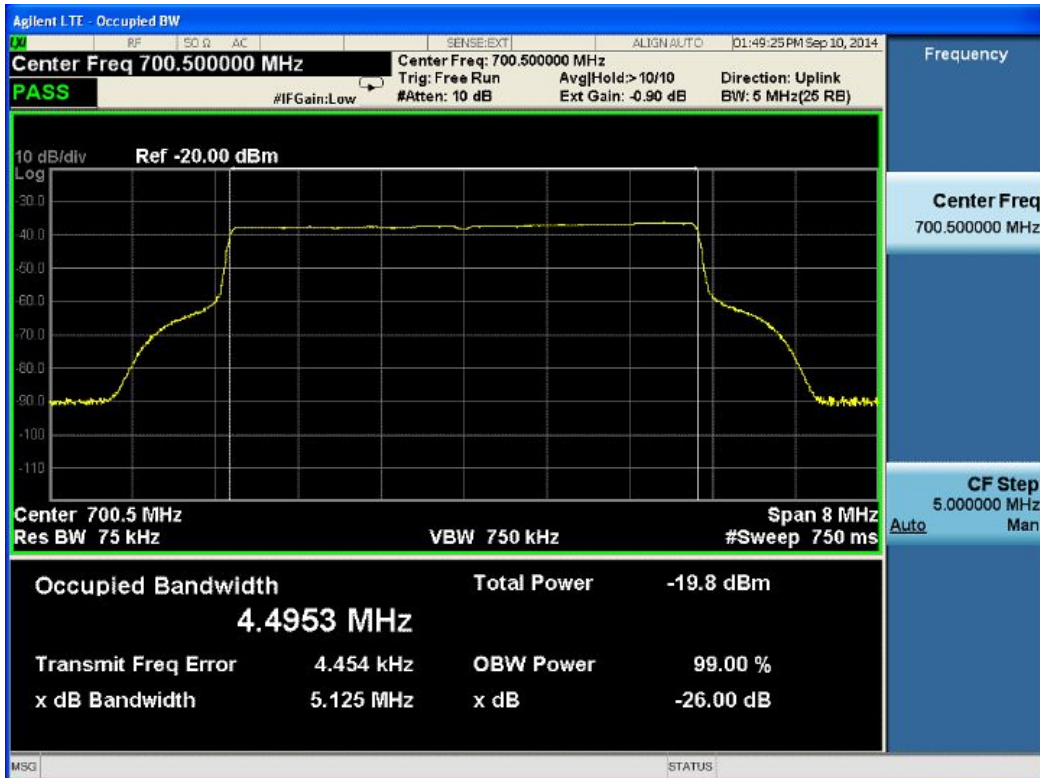
**(1.3) Test for LTE 5 MHz**

**(1.3.1) Lowest frequency**

**(a) Input signal**

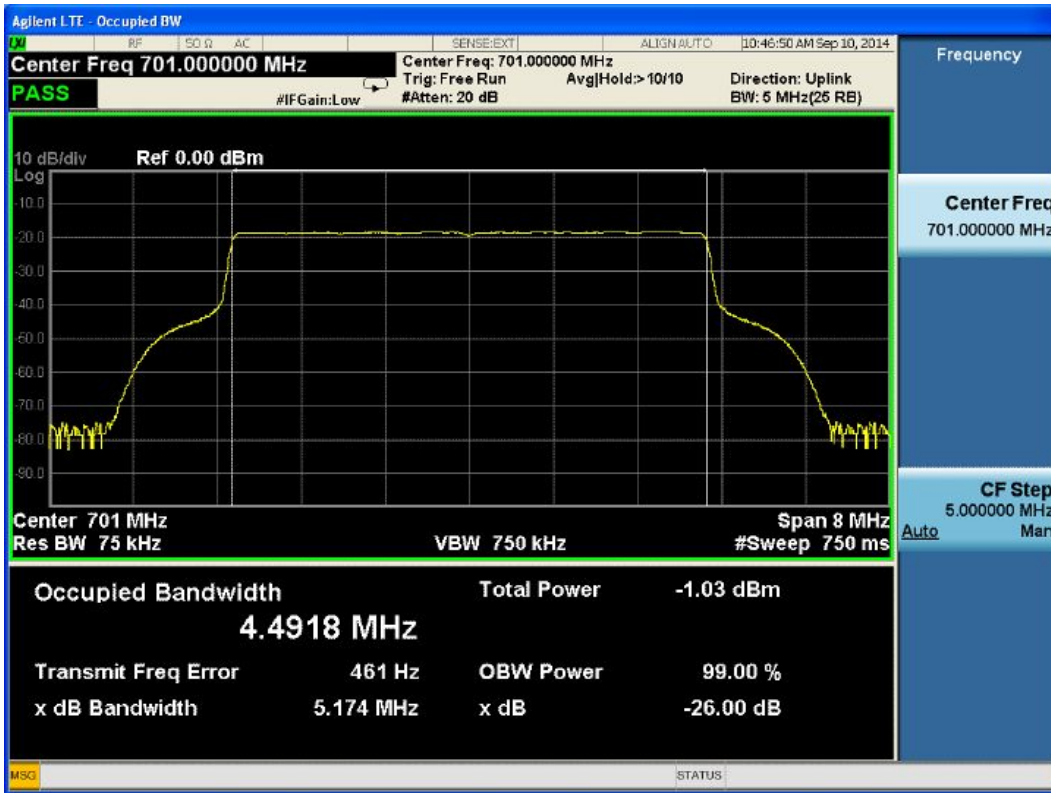


**(b) Output signal**

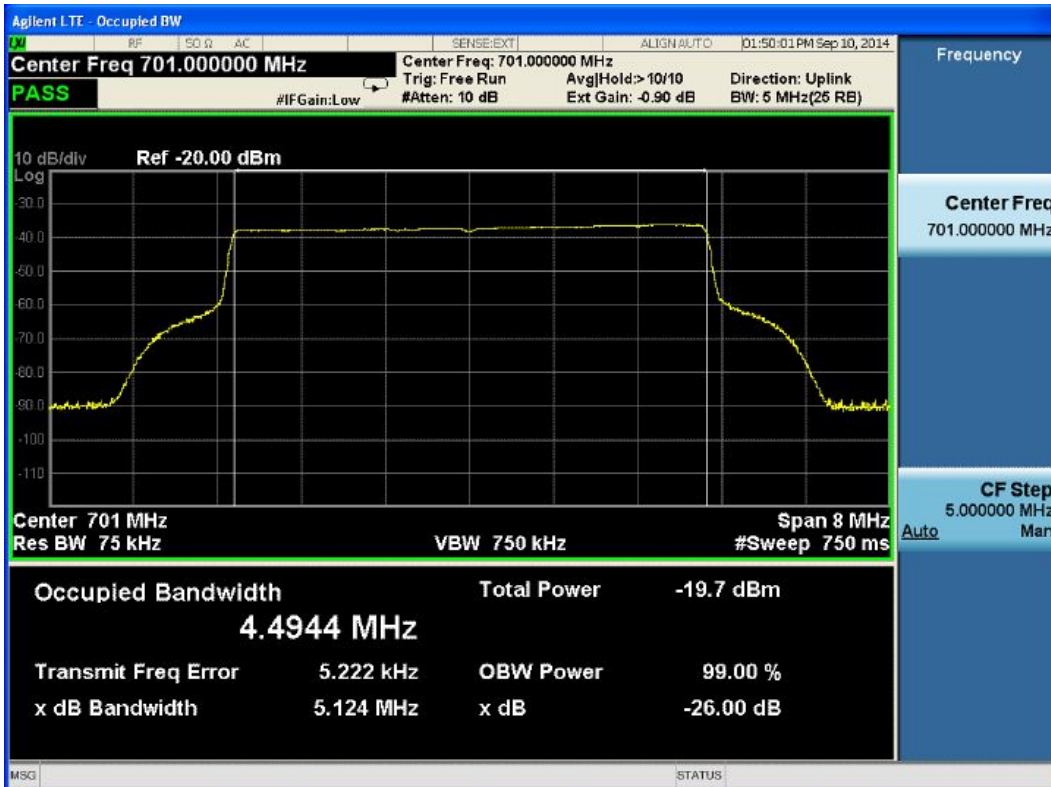


(1.3.2) Middle frequency

(a) Input signal

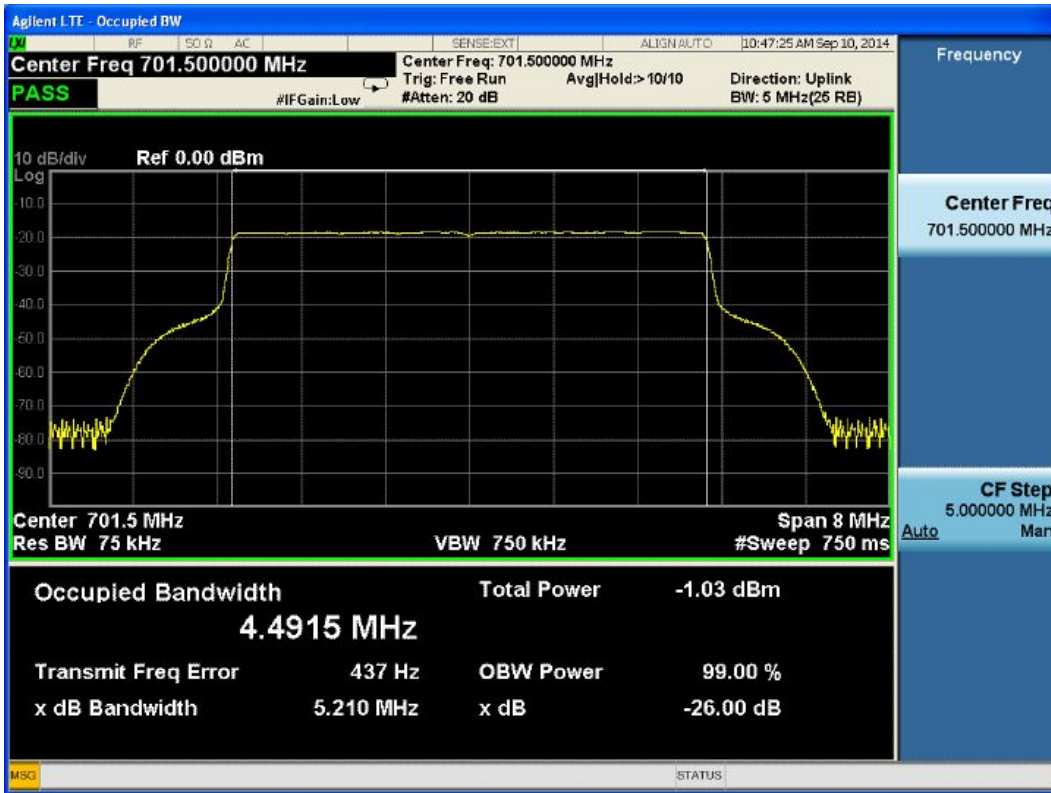


(b) Output signal

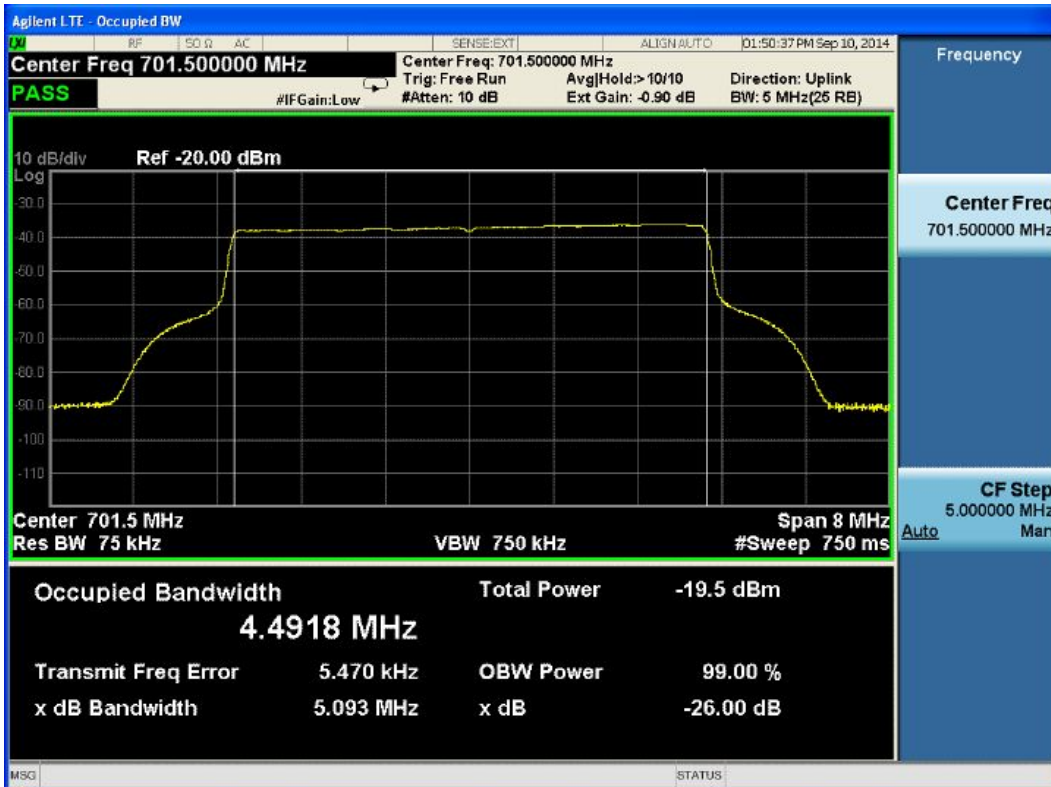


(1.3.3) Highest frequency

(a) Input signal



(b) Output signal

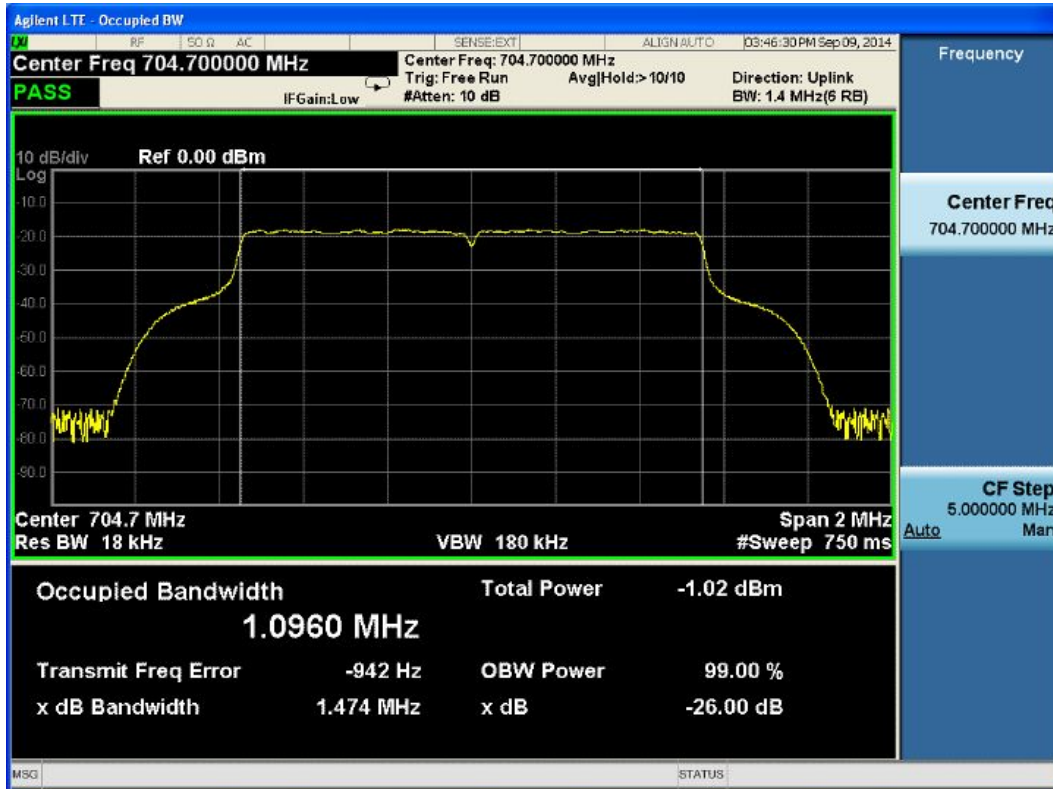


**(2) Test Lower B**

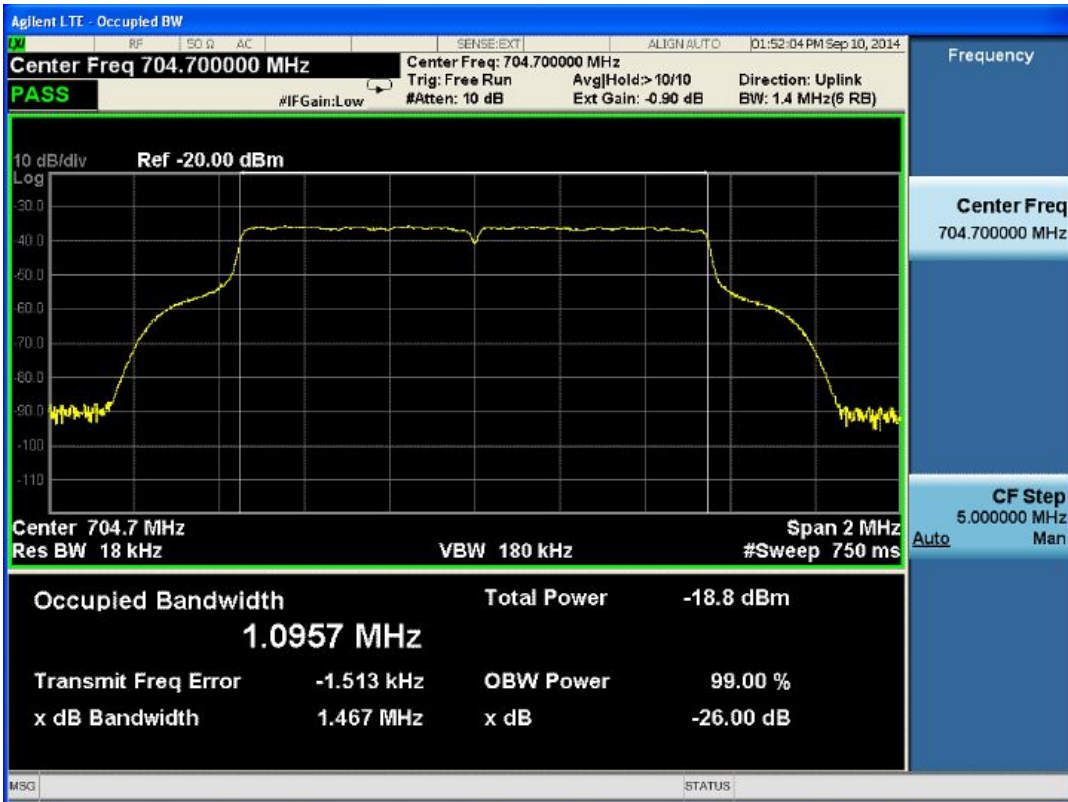
**(2.1) Test for LTE 1.4MHz**

**(2.1.1) Lowest frequency**

**(a) Input signal**

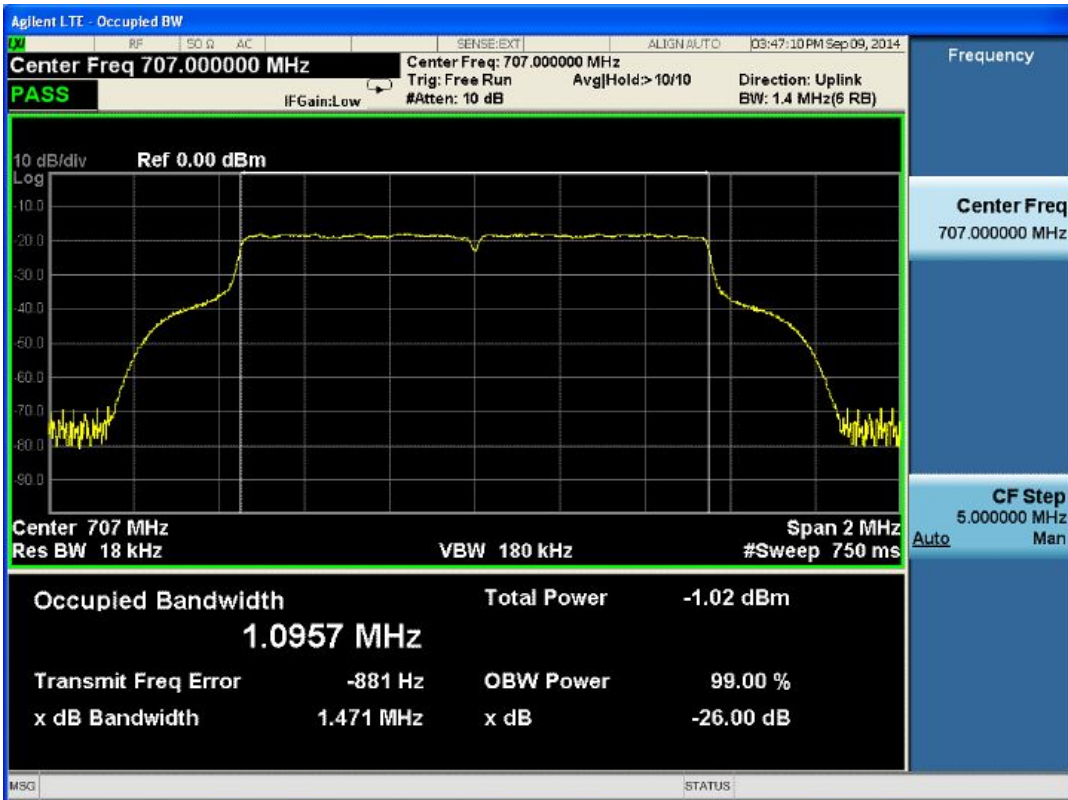


(b) Output signal

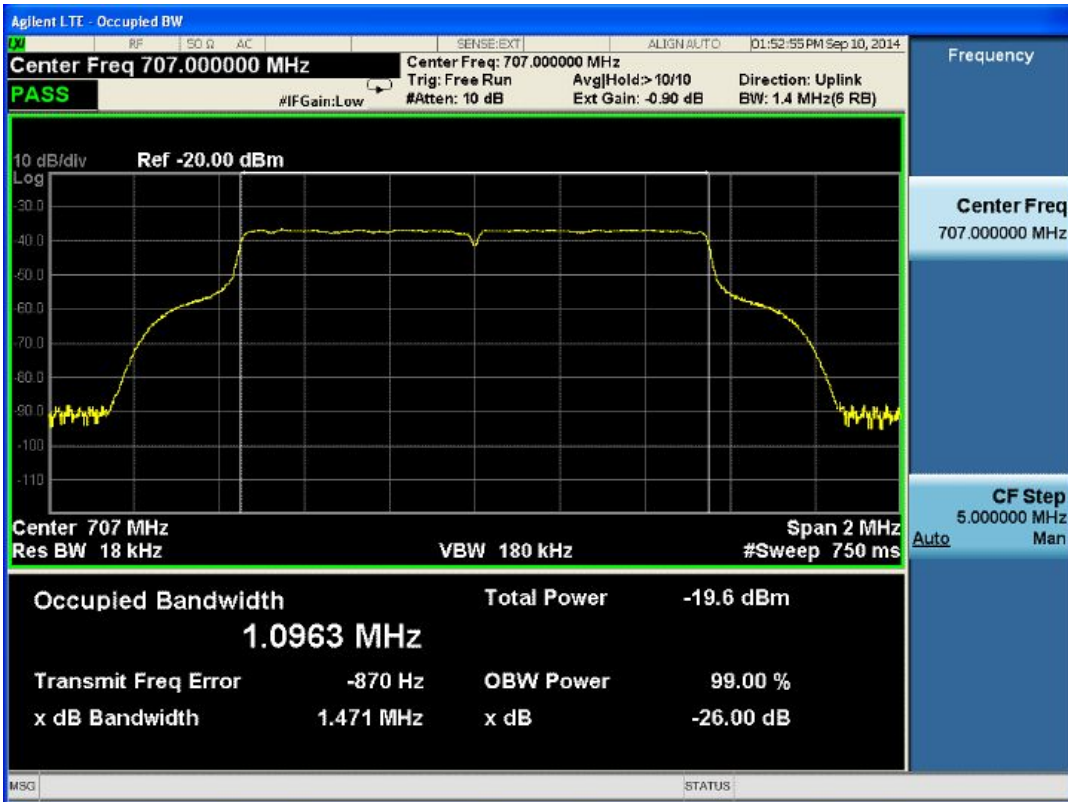


(2.1.2) Middle frequency

(a) Input signal

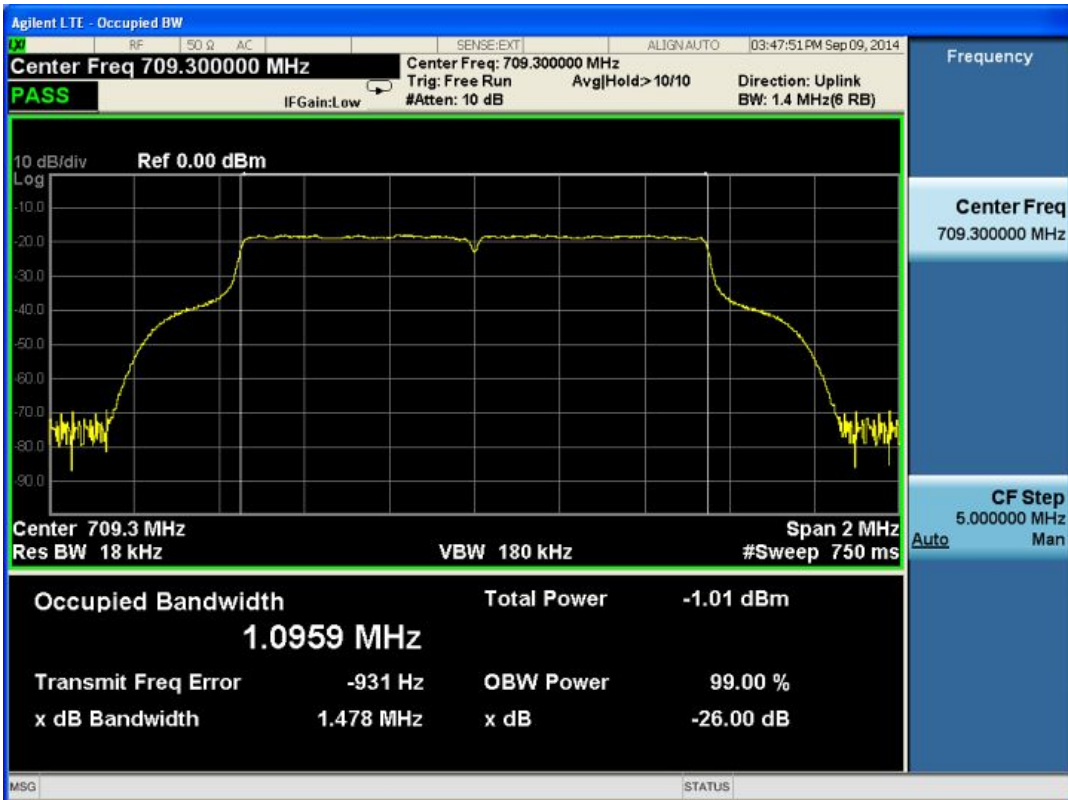


(b) Output signal



(2.1.3) Highest frequency

(a) Input signal





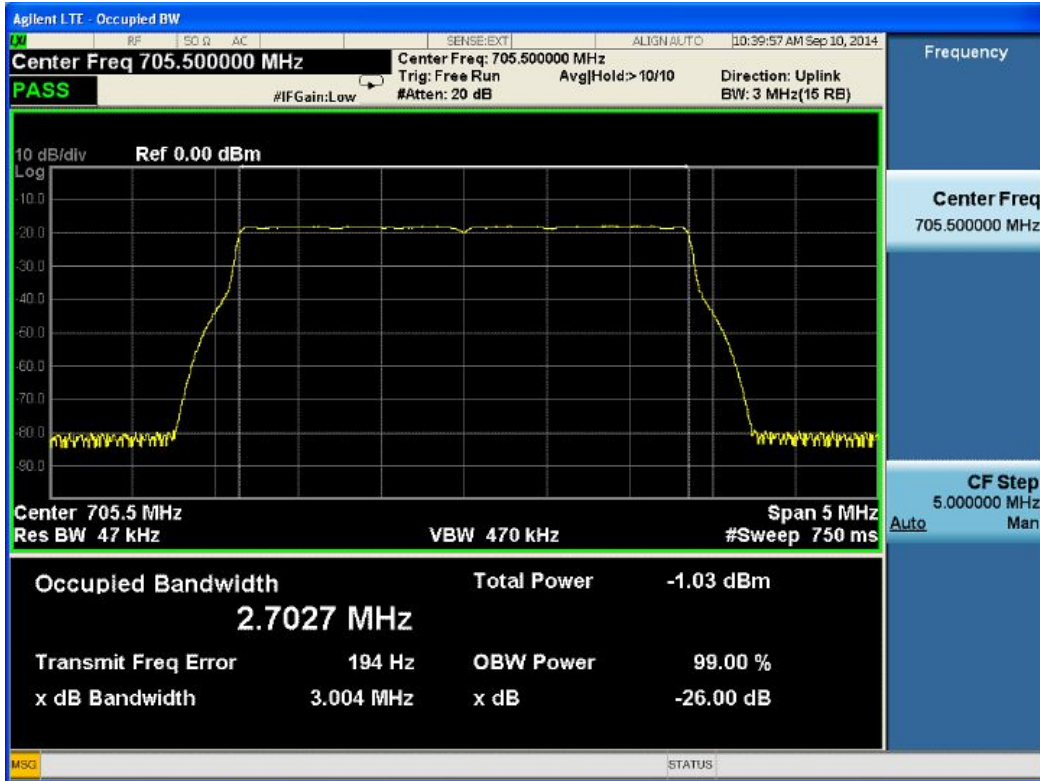
(b) Output signal



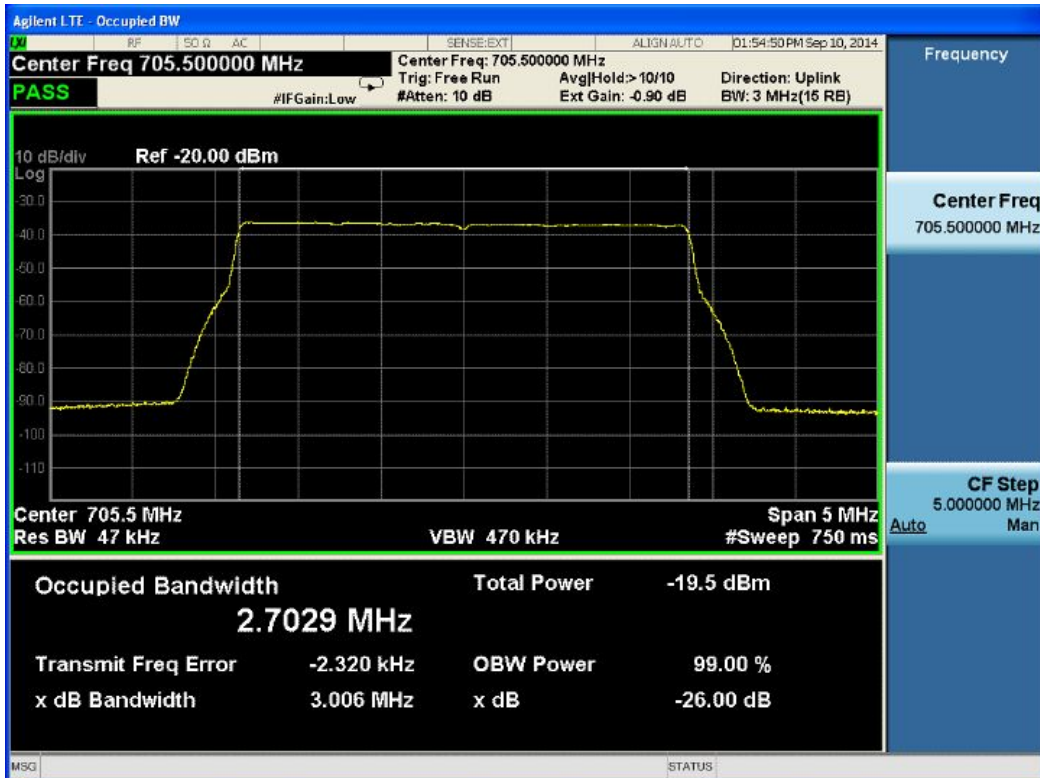
**(2.2) Test for LTE 3 MHz**

**(2.2.1) Lowest frequency**

**(a) Input signal**

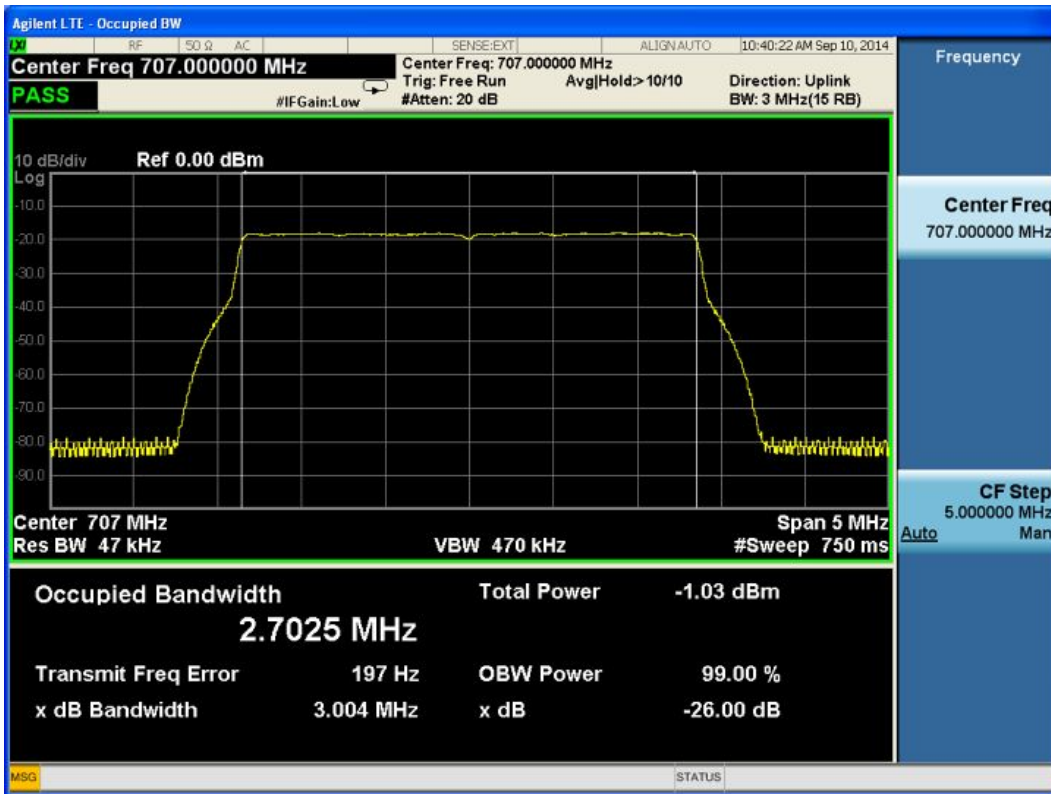


**(b) Output signal**

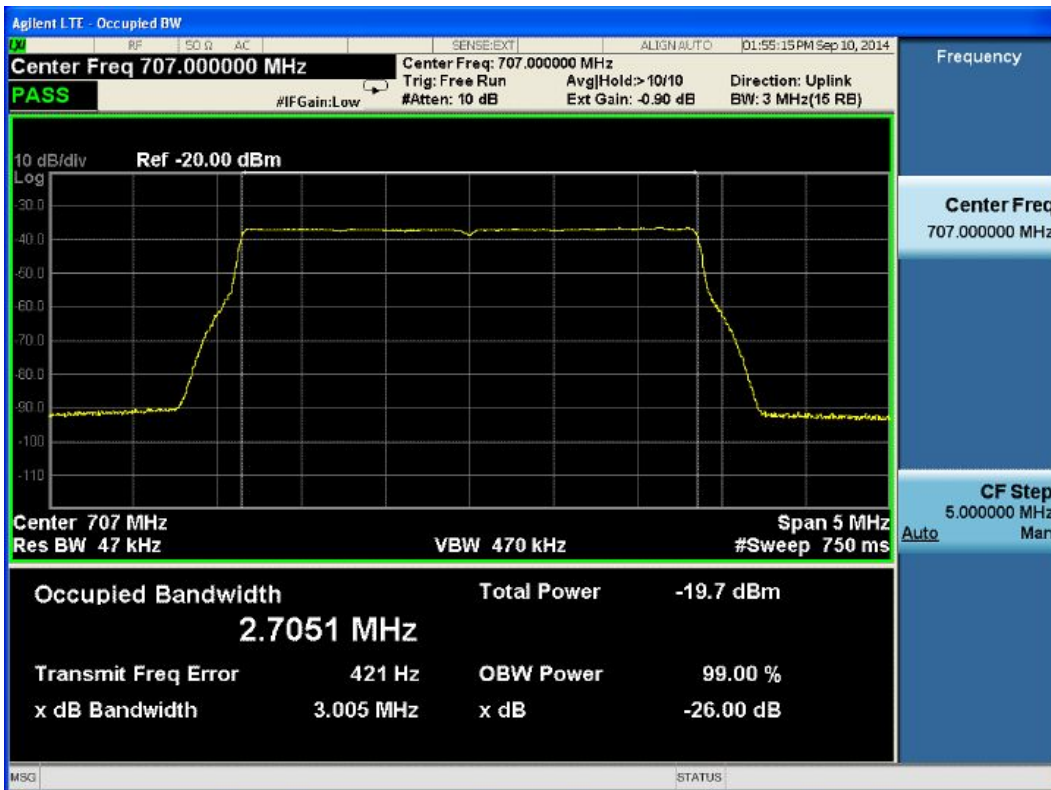


(2.2.2) Middle frequency

(a) Input signal

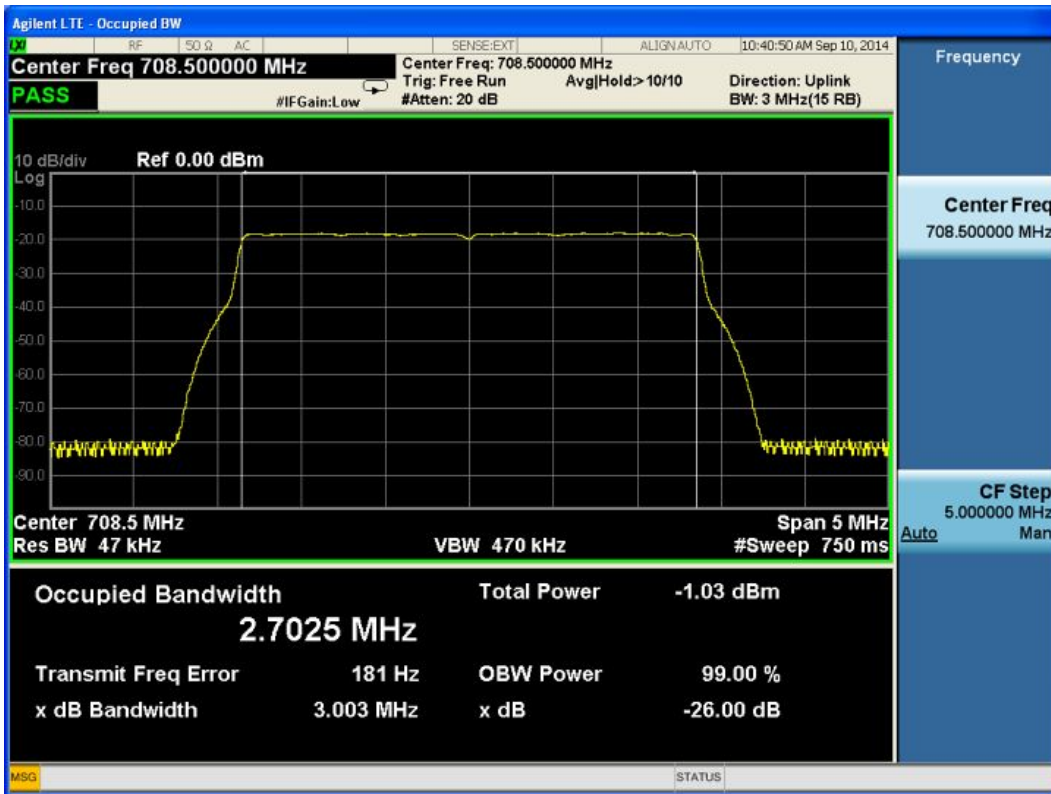


(b) Output signal

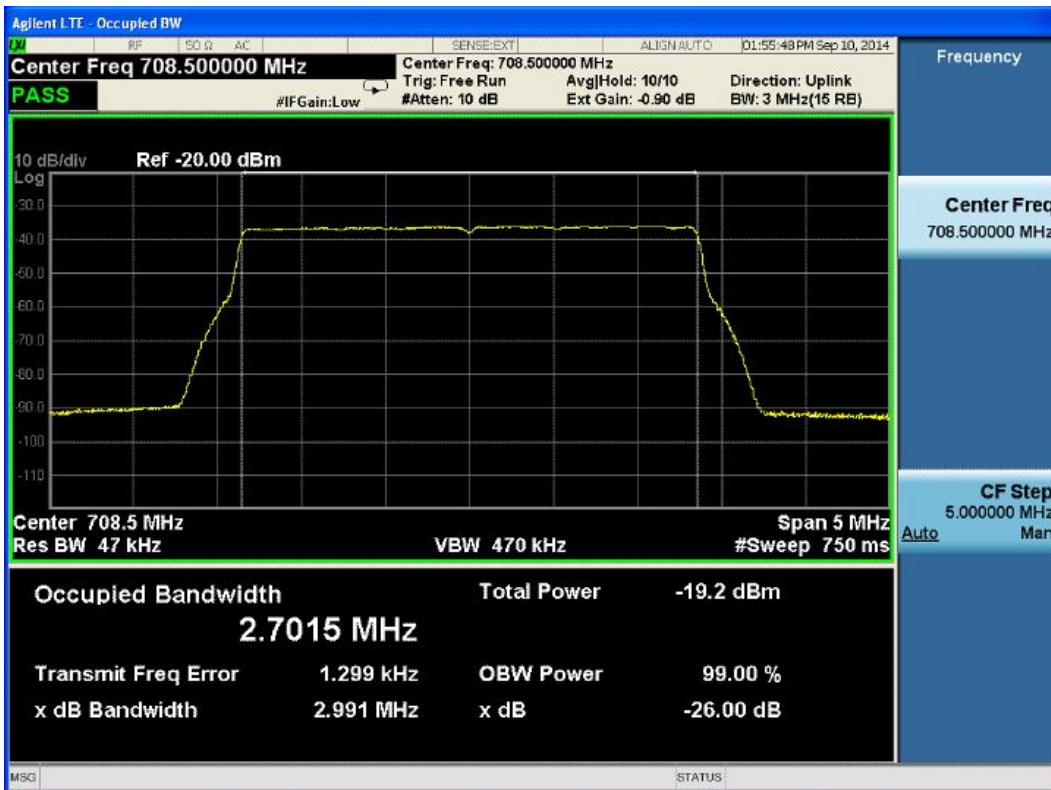


(2.2.3) Highest frequency

(a) Input signal



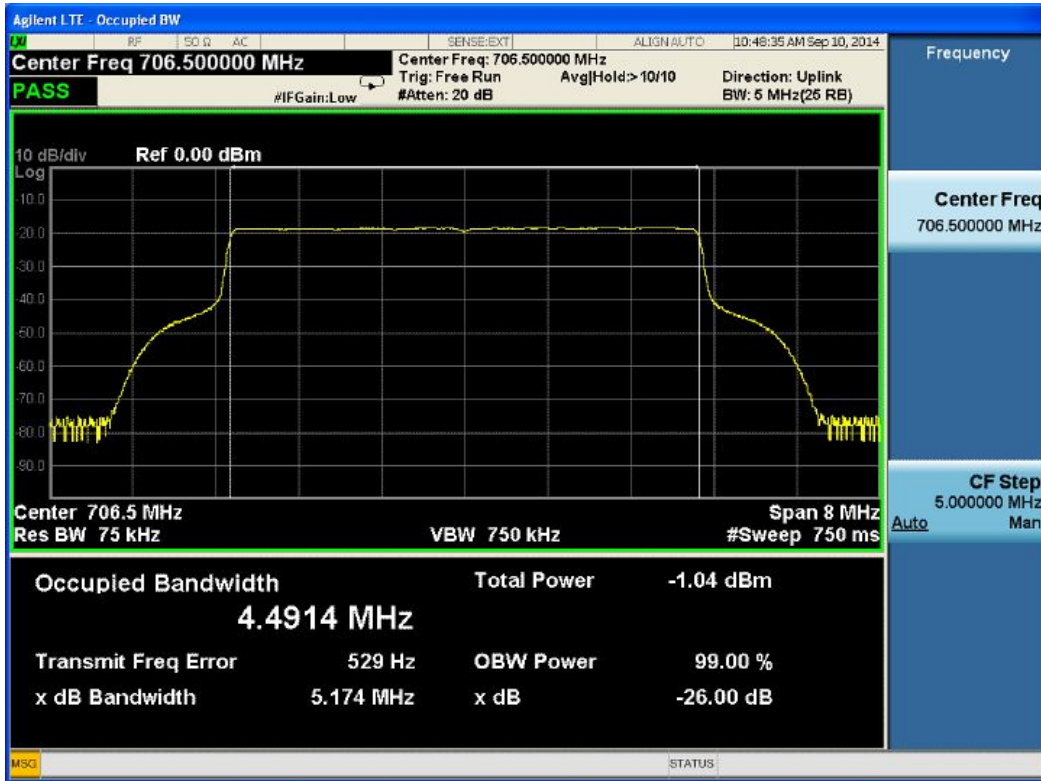
(b) Output signal



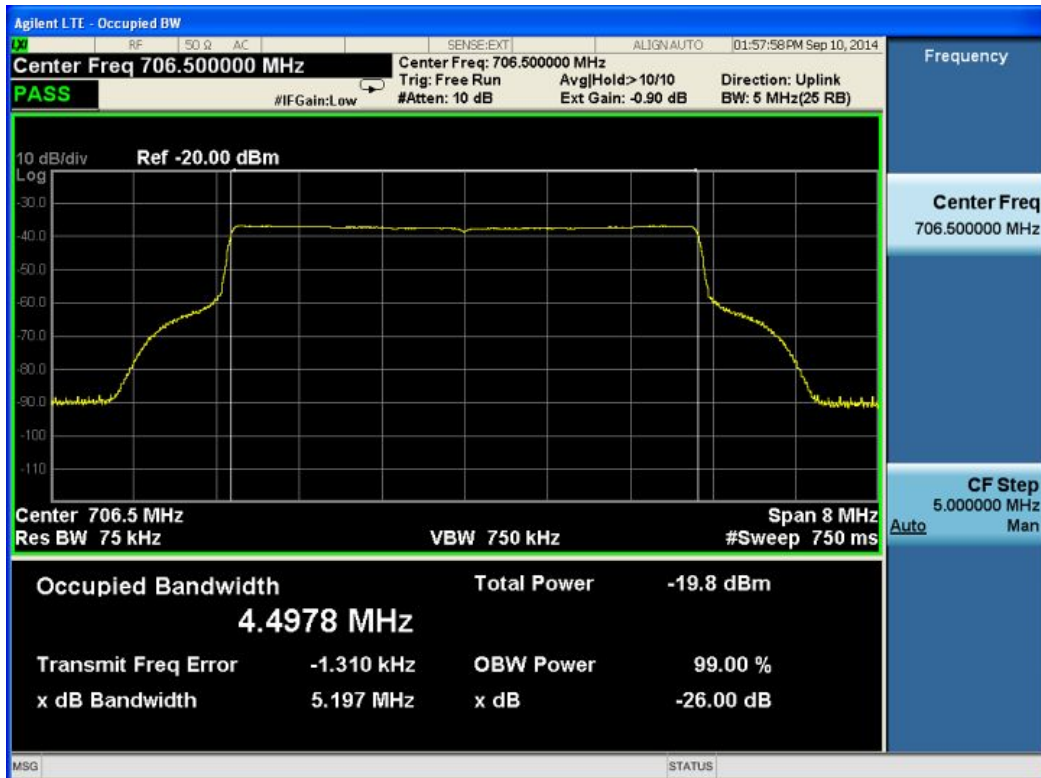
**(2.3) Test for LTE 5 MHz**

**(2.3.1) Lowest frequency**

**(a) Input signal**

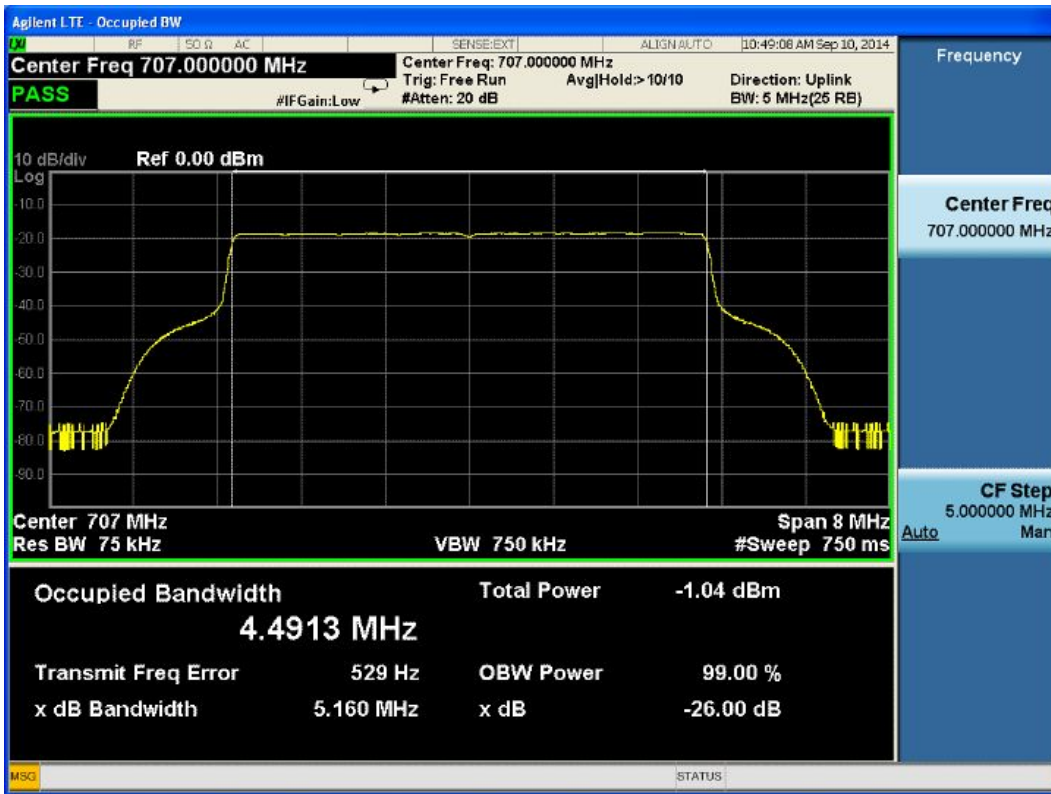


**(b) Output signal**

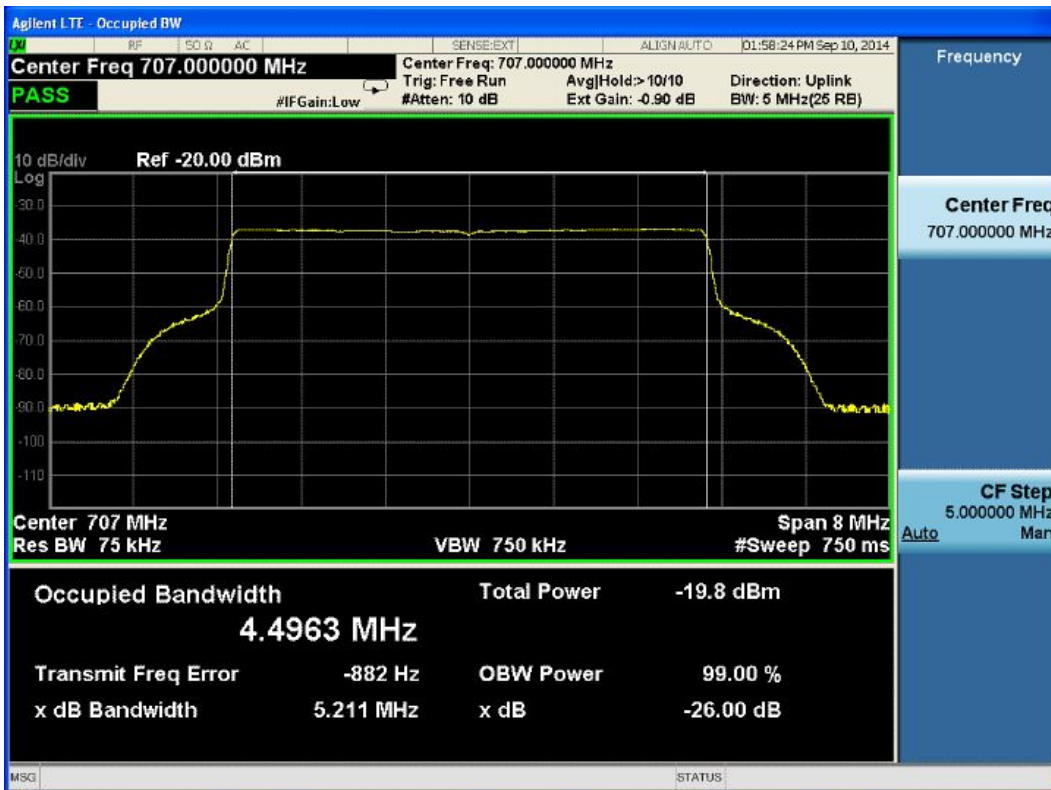


(2.3.2) Middle frequency

(a) Input signal

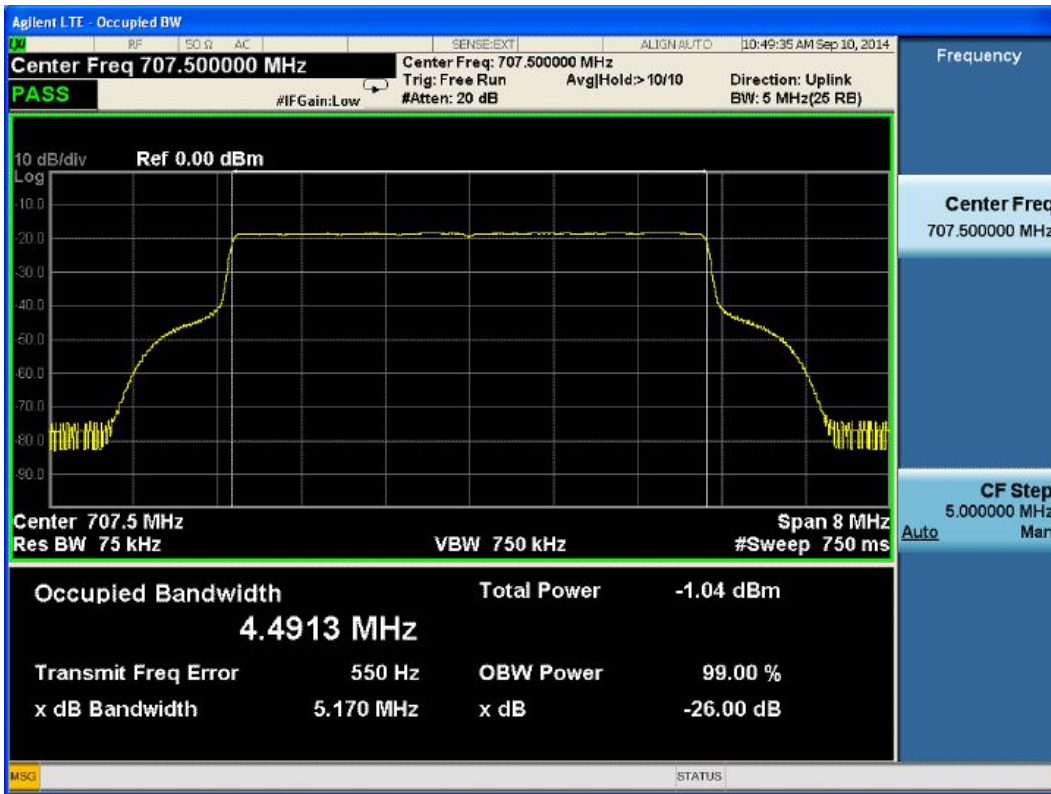


(b) Output signal

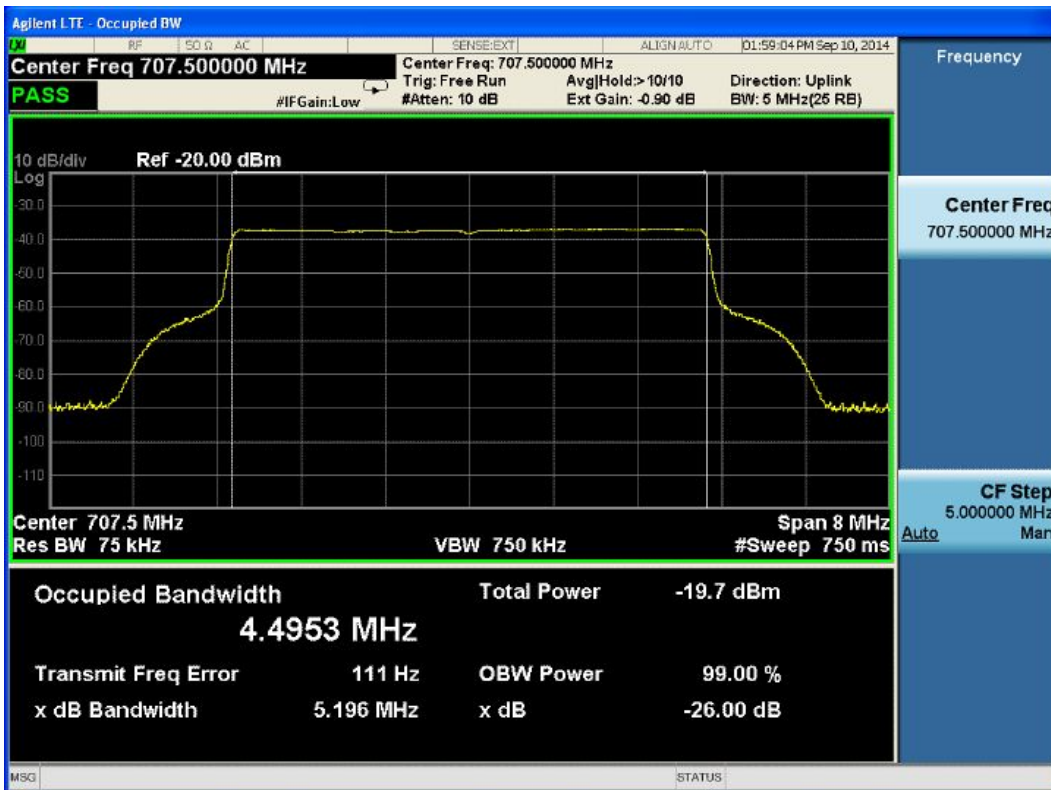


(2.3.3) Highest frequency

(a) Input signal



(b) Output signal

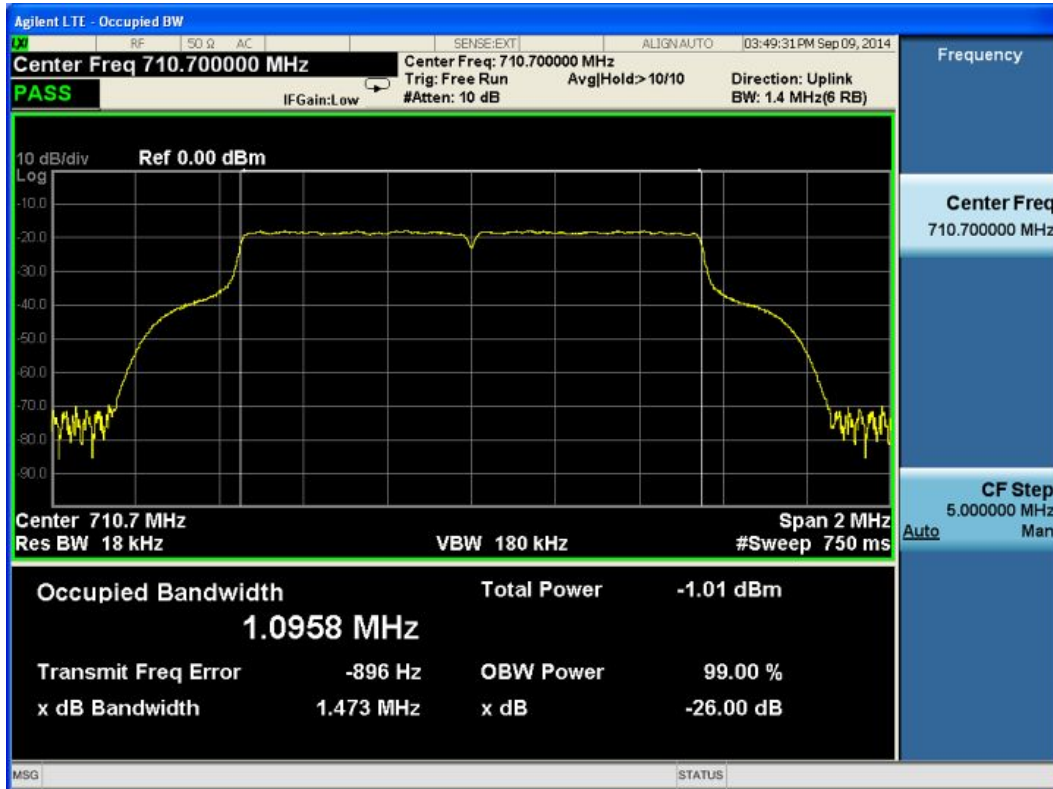


**(3) Test Lower C**

**(3.1) Test for LTE 1.4MHz**

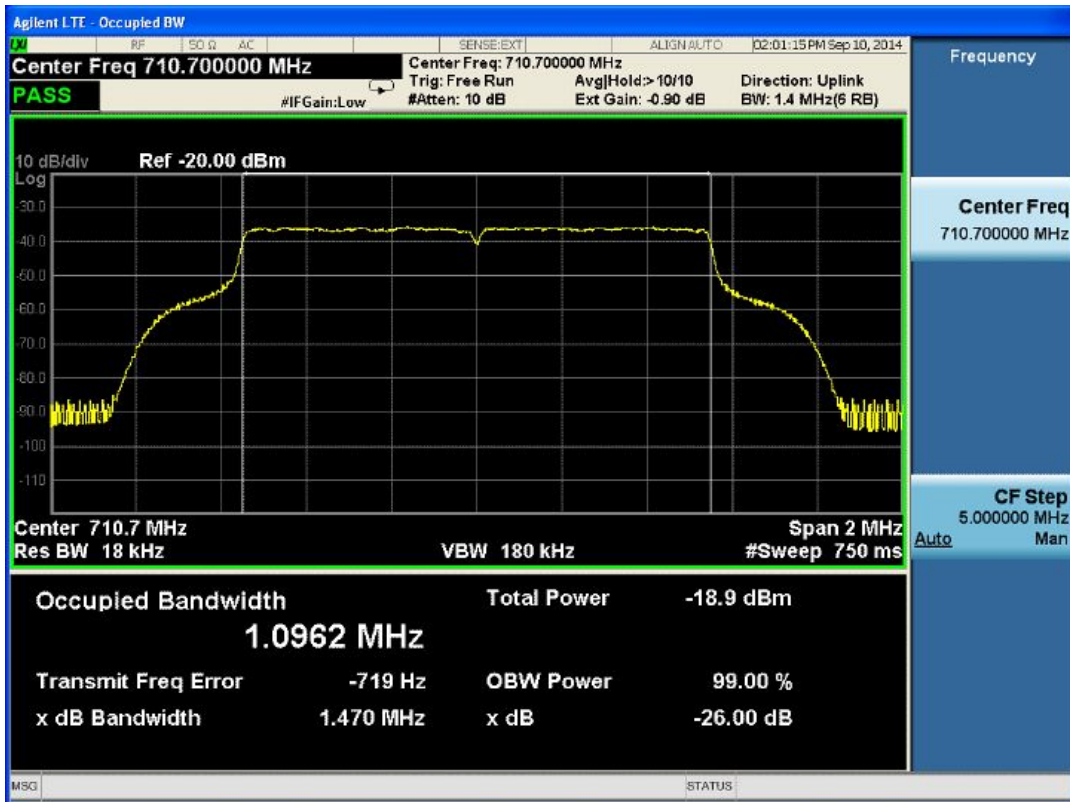
**(3.1.1) Lowest frequency**

**(a) Input signal**



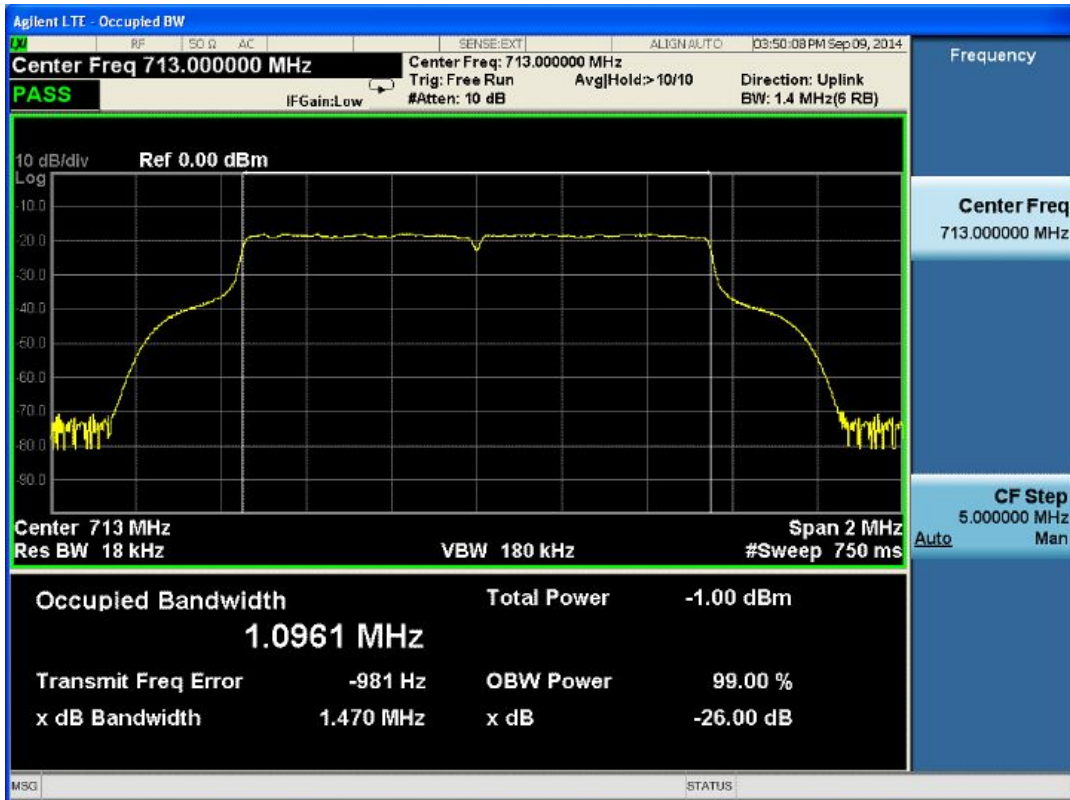


(b) Output signal

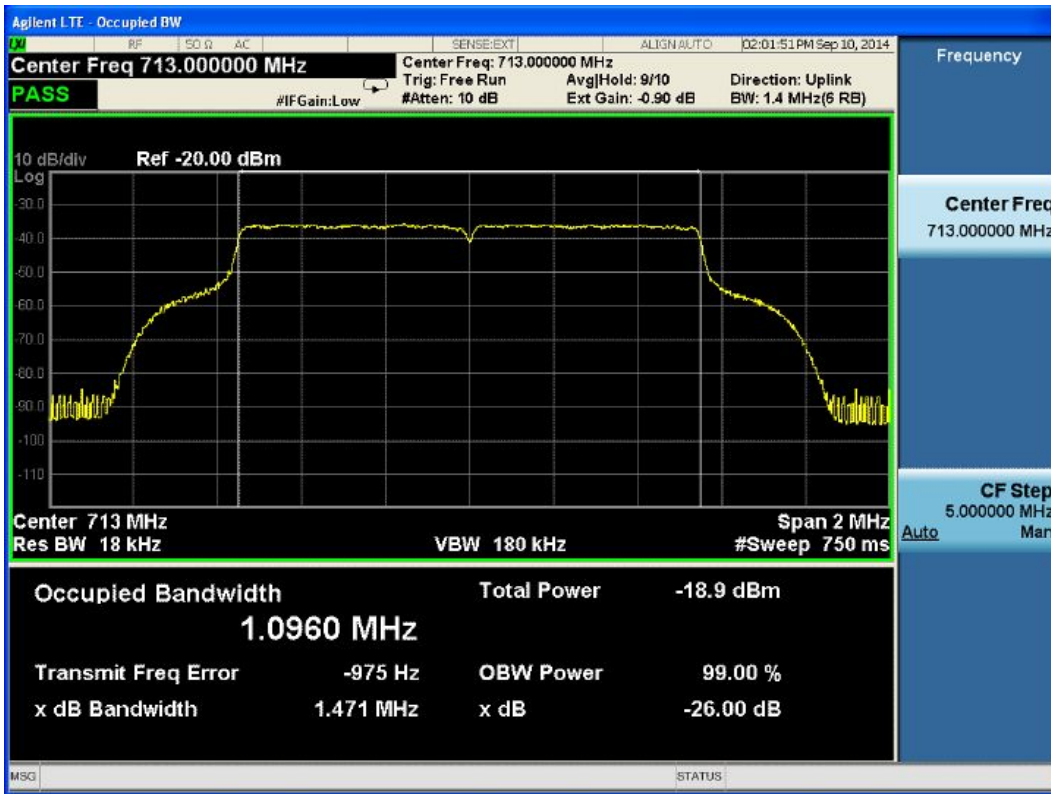


(3.1.2) Middle frequency

(a) Input signal



(b) Output signal



(3.1.3) Highest frequency

(a) Input signal



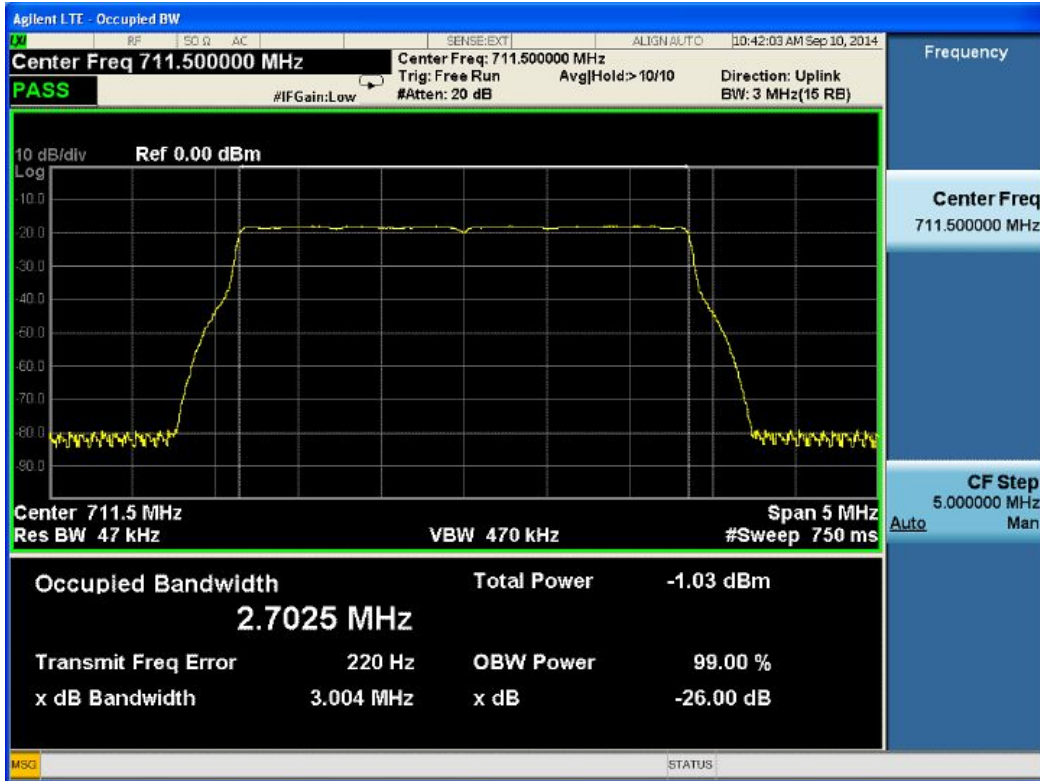
(b) Output signal



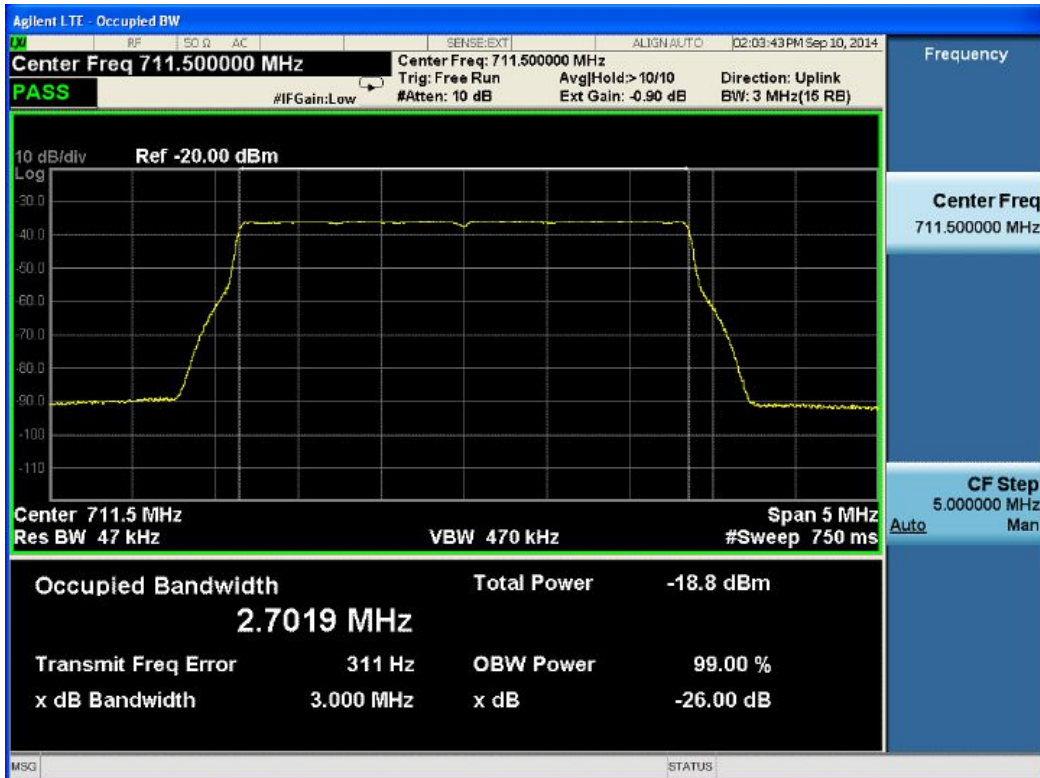
**(3.2) Test for LTE 3 MHz**

**(3.2.1) Lowest frequency**

**(a) Input signal**

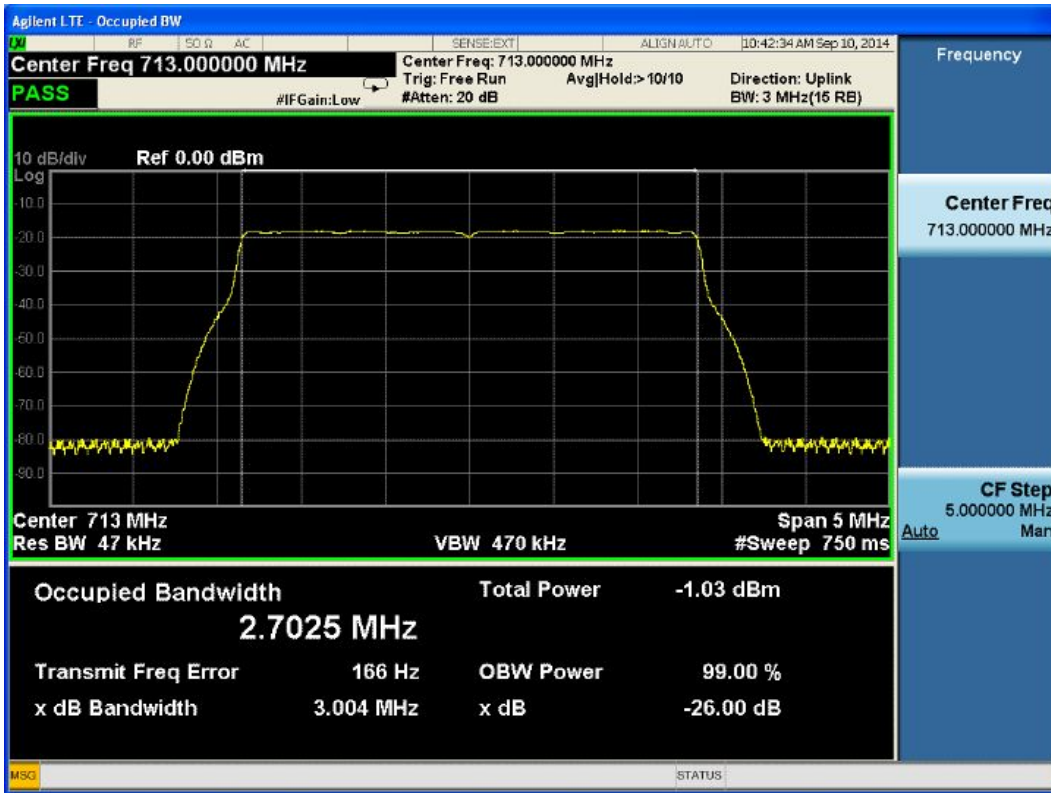


**(b) Output signal**

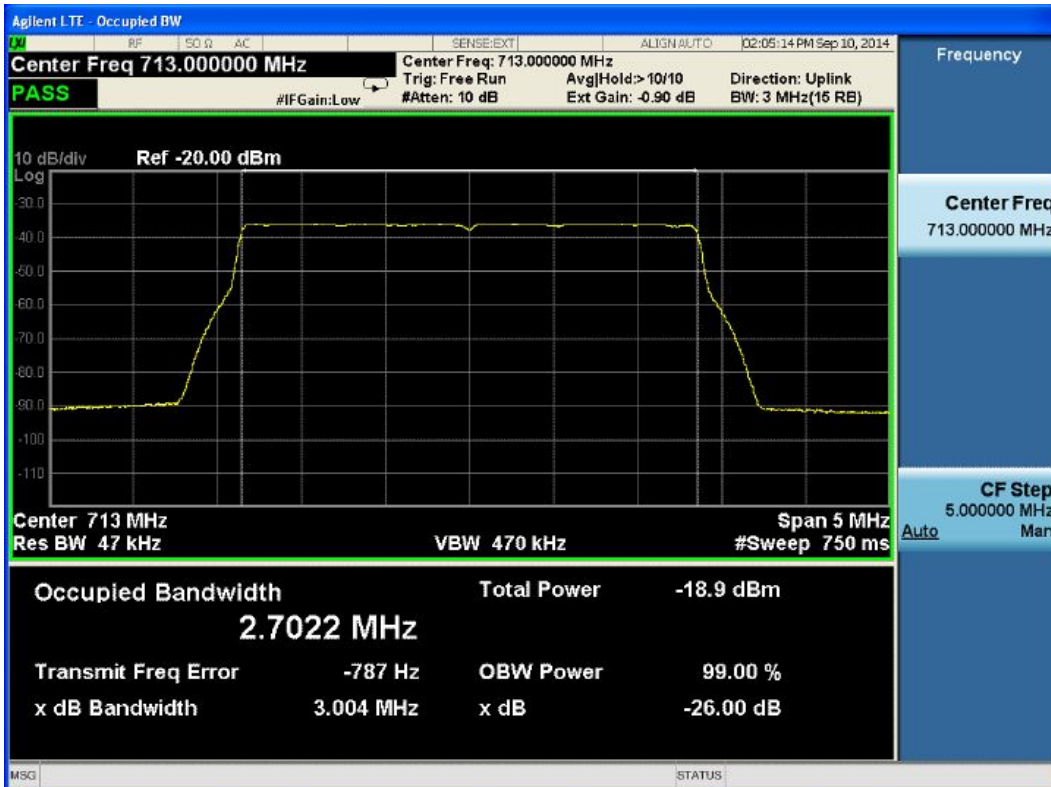


(3.2.2) Middle frequency

(a) Input signal

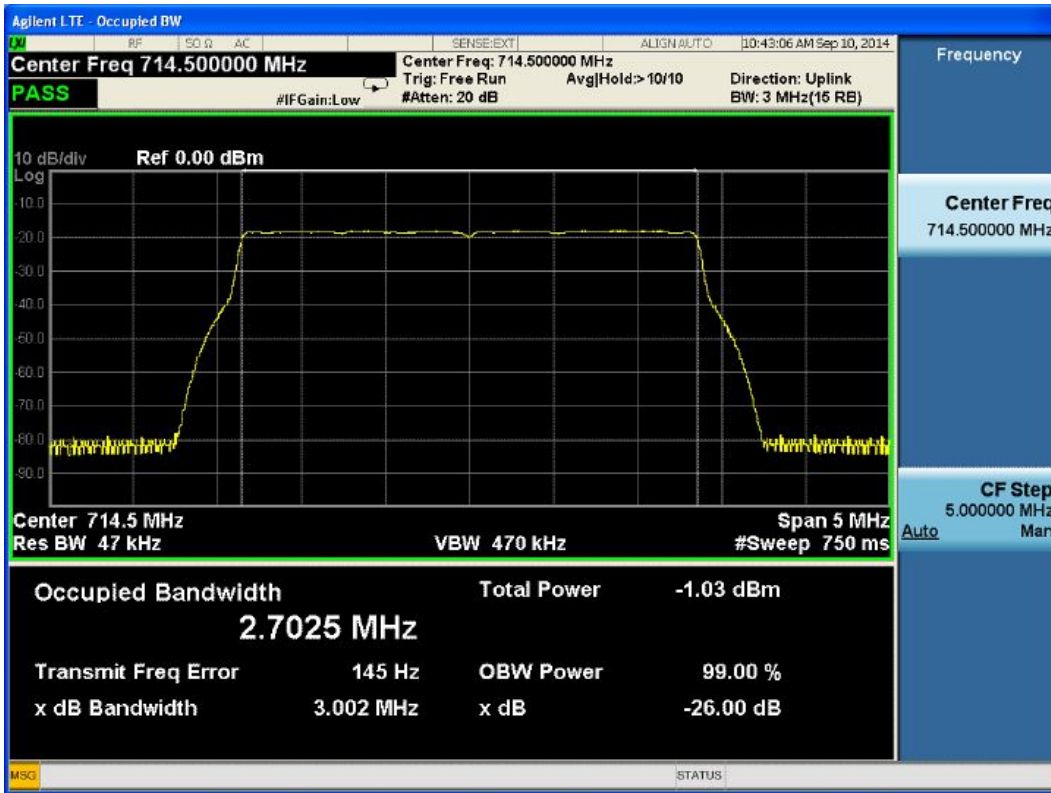


(b) Output signal

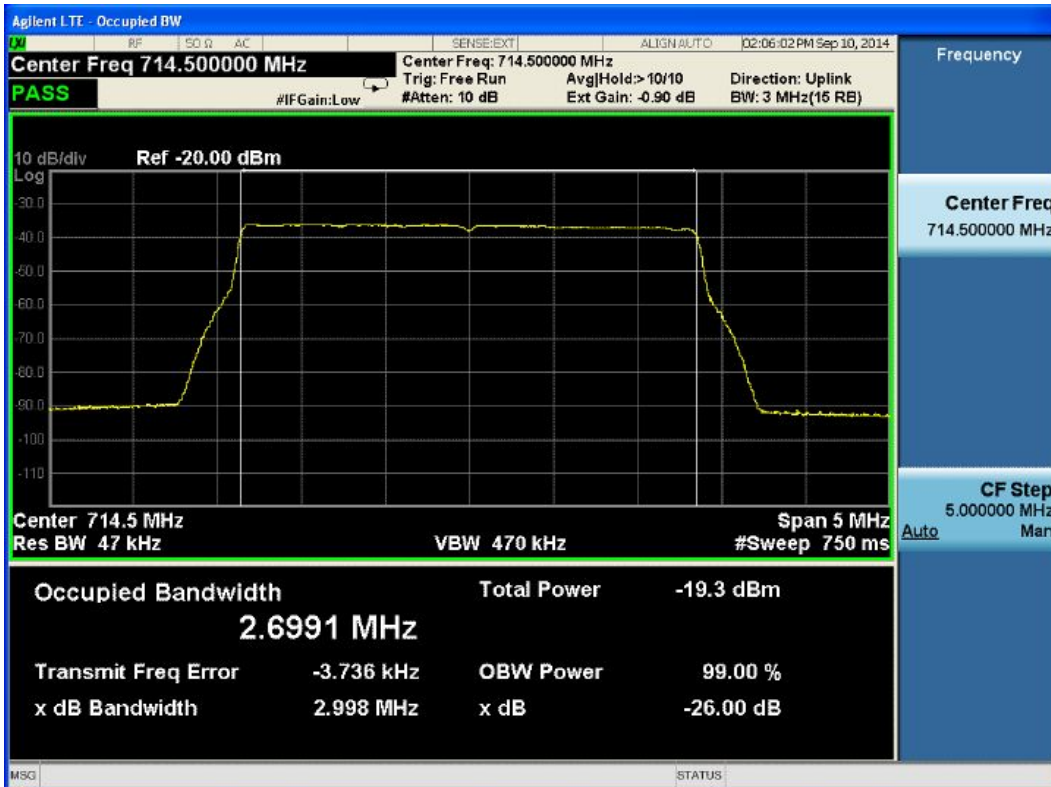


(3.2.3) Highest frequency

(a) Input signal



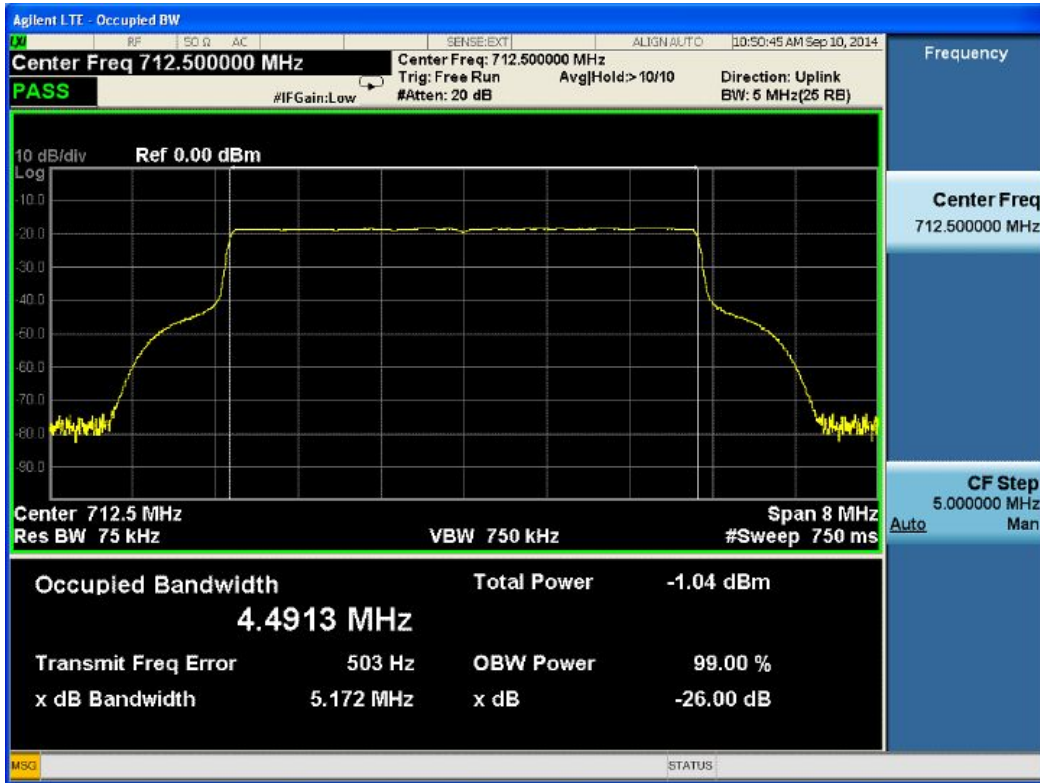
(b) Output signal



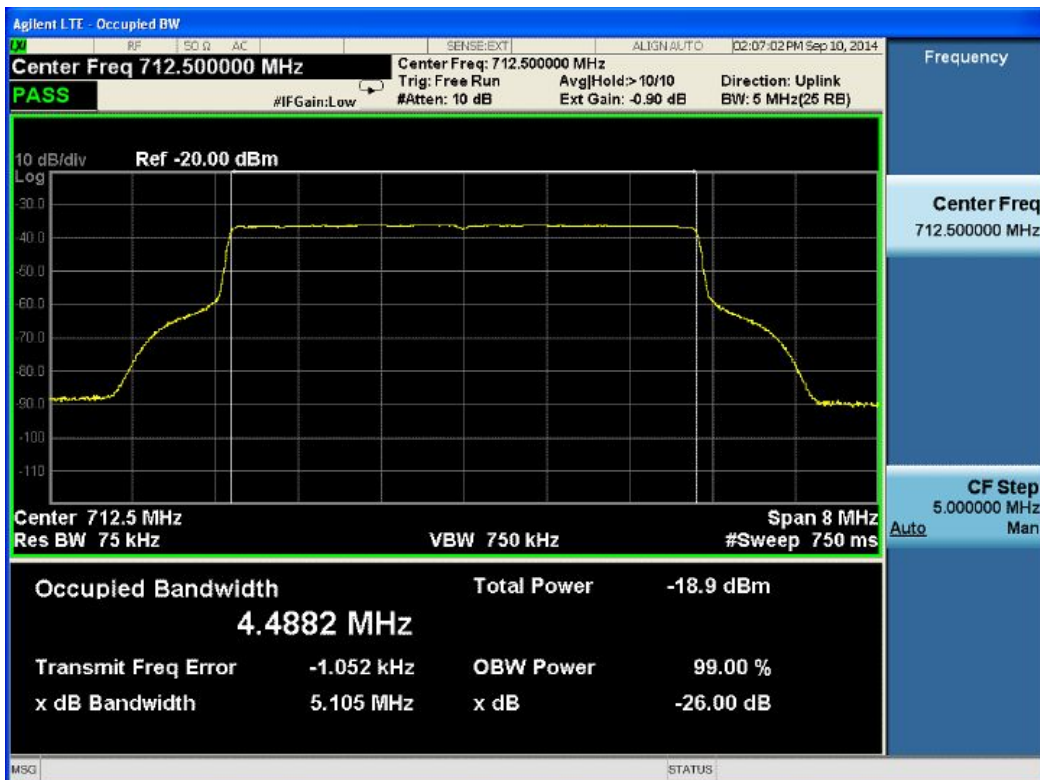
**(3.2) Test for LTE 5 MHz**

**(3.2.1) Lowest frequency**

**(a) Input signal**

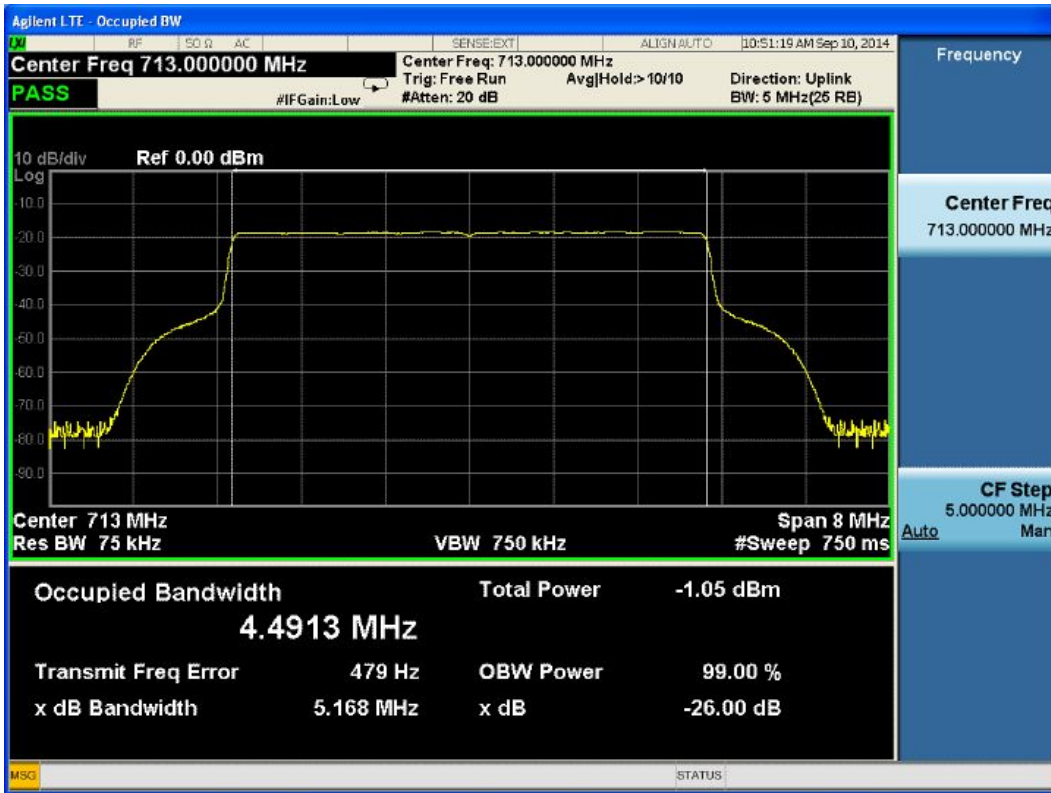


**(b) Output signal**



(3.2.2) Middle frequency

(a) Input signal



(b) Output signal

