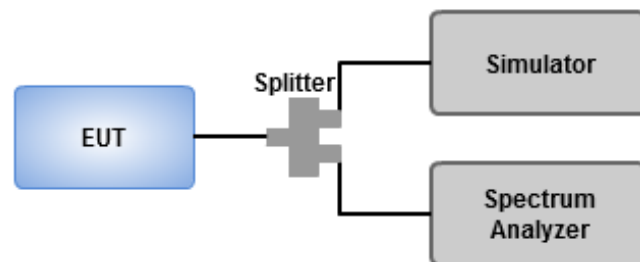


### 3.4 Occupied Bandwidth and 26 dB Bandwidth

#### 3.4.1 Test Procedures

1. Set resolution bandwidth (RBW) = 1% ~ 5 % of OBW, Video bandwidth = 3 x RBW
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Using occupied bandwidth measurement function of spectrum analyzer to measure occupied bandwidth
5. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 26dB relative to the maximum level measured in the fundamental emission.

#### 3.4.2 Test Setup



### 3.4.3 Test Result of Occupied Bandwidth

#### Summary

Mode	Max-OBW (Hz)	ITU-Code	Min-OBW (Hz)
Band 4_LTE-M1_1.4MHz_Nss1_1TX	1.09M	1M09	911.497k
Band 4_LTE-M1_3MHz_Nss1_1TX	1.093	1M09	913.029k
Band 4_LTE-M1_5MHz_Nss1_1TX	1.096M	1M10	923.618k
Band 4_LTE-M1_10MHz_Nss1_1TX	1.097M	1M10	937.285k
Band 4_LTE-M1_15MHz_Nss1_1TX	1.091M	1M09	935.329k
Band 4_LTE-M1_20MHz_Nss1_1TX	1.106M	1M11	927.359k

**Max-N dB** = Maximum 26dB down bandwidth; **Max-OBW** = Maximum 99% occupied bandwidth;

**Min-N dB** = Minimum 26dB down bandwidth; **Min-OBW** = Minimum 99% occupied bandwidth;

#### Result

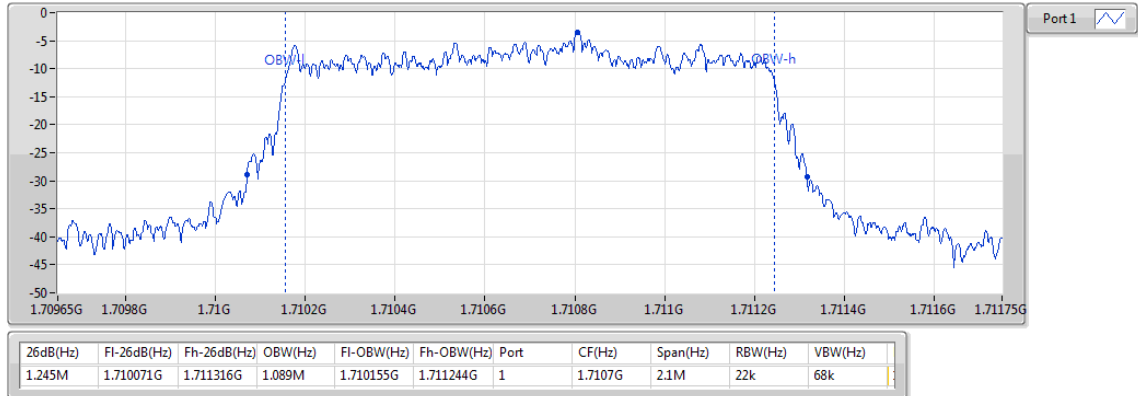
Mode	Result	Limit (Hz)	Port 1-NdB (Hz)	Port 1-OBW (Hz)
LTE-M1_1.4MHz_Nss1_1TX	-	-	-	-
1710.7MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.245M	1.089M
1732.5MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.301M	1.089M
1754.3MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.281M	1.09M
1710.7MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.218M	912.845k
1732.5MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.241M	913.628k
1754.3MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.133M	911.497k
LTE-M1_3MHz_Nss1_1TX	-	-	-	-
1711.5MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.292M	1.093M
1732.5MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.258M	1.092M
1753.5MHz_QPSK_RB 6,#RB 0,NB 1	Pass	Inf	1.253M	1.087M
1711.5MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.233M	913.769k
1732.5MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.208M	916.574k
1753.5MHz_16QAM_RB 5,#RB 0,NB 1	Pass	Inf	1.244M	913.029k
LTE-M1_5MHz_Nss1_1TX	-	-	-	-
1712.5MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.283M	1.09M
1732.5MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.268M	1.091M
1752.5MHz_QPSK_RB 6,#RB 0,NB 3	Pass	Inf	1.283M	1.096M
1712.5MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.234M	925.319k
1732.5MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.241M	923.618k
1752.5MHz_16QAM_RB 5,#RB 0,NB 3	Pass	Inf	1.211M	926.327k
LTE-M1_10MHz_Nss1_1TX	-	-	-	-

Mode	Result	Limit (Hz)	Port 1-NdB (Hz)	Port 1-OBW (Hz)
1715MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.29M	1.097M
1732.5MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.298M	1.096M
1750MHz_QPSK_RB 6,#RB 0,NB 7	Pass	Inf	1.26M	1.096M
1715MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.23M	941.26k
1732.5MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.29M	956.34k
1750MHz_16QAM_RB 5,#RB 0,NB 7	Pass	Inf	1.215M	937.285k
LTE-M1_15MHz_Nss1_1TX	-	-	-	-
1717.5MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.26M	1.089M
1732.5MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.294M	1.088M
1747.5MHz_QPSK_RB 6,#RB 0,NB 11	Pass	Inf	1.283M	1.091M
1717.5MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.271M	935.329k
1732.5MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.249M	942.34k
1747.5MHz_16QAM_RB 5,#RB 0,NB 11	Pass	Inf	1.238M	942.468k
LTE-M1_20MHz_Nss1_1TX	-	-	-	-
1720MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.275M	1.101M
1732.5MHz_QPSK_RB 6,#RB 0,NB 0	Pass	Inf	1.32M	1.106M
1745MHz_QPSK_RB 6,#RB 0,NB 15	Pass	Inf	1.305M	1.099M
1720MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.35M	945.508k
1732.5MHz_16QAM_RB 5,#RB 0,NB 0	Pass	Inf	1.245M	927.359k
1745MHz_16QAM_RB 5,#RB 0,NB 15	Pass	Inf	1.275M	937.002k

**Port X-N dB** = Port X 26dB down bandwidth; **Port X-OBW** = Port X 99% occupied bandwidth;

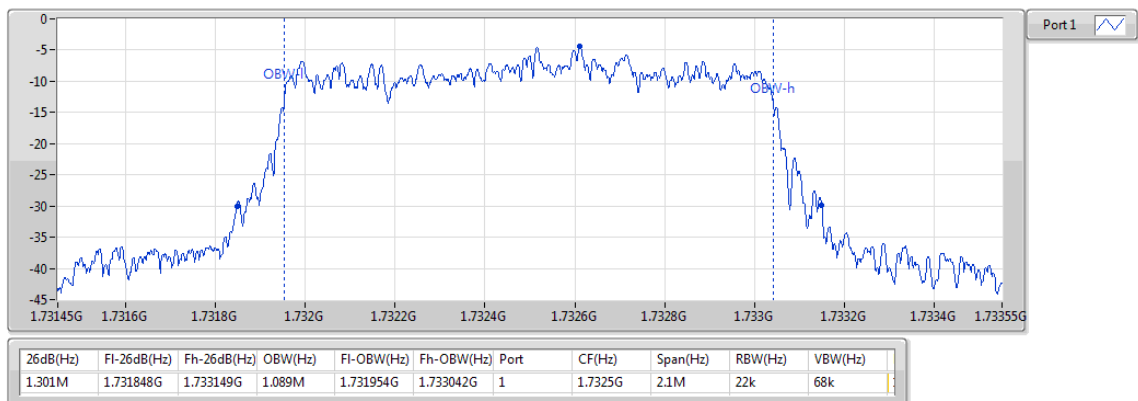
**Band 4\_LTE-M1\_1.4MHz\_Nss1\_1TX**  
**1710.7MHz\_QPSK\_RB 6,#RB 0,NB 0**

EBW



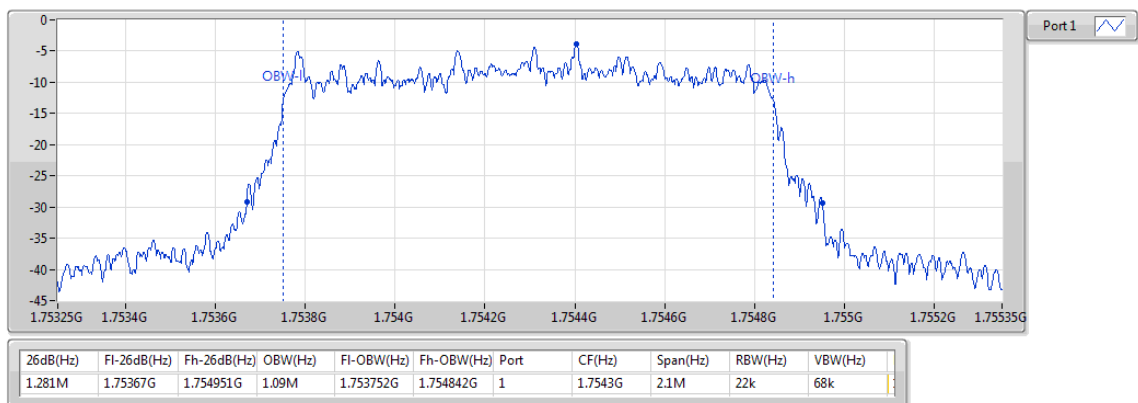
**Band 4\_LTE-M1\_1.4MHz\_Nss1\_1TX**  
**1732.5MHz\_QPSK\_RB 6,#RB 0,NB 0**

EBW



**Band 4\_LTE-M1\_1.4MHz\_Nss1\_1TX**  
**1754.3MHz\_QPSK\_RB 6,#RB 0,NB 0**

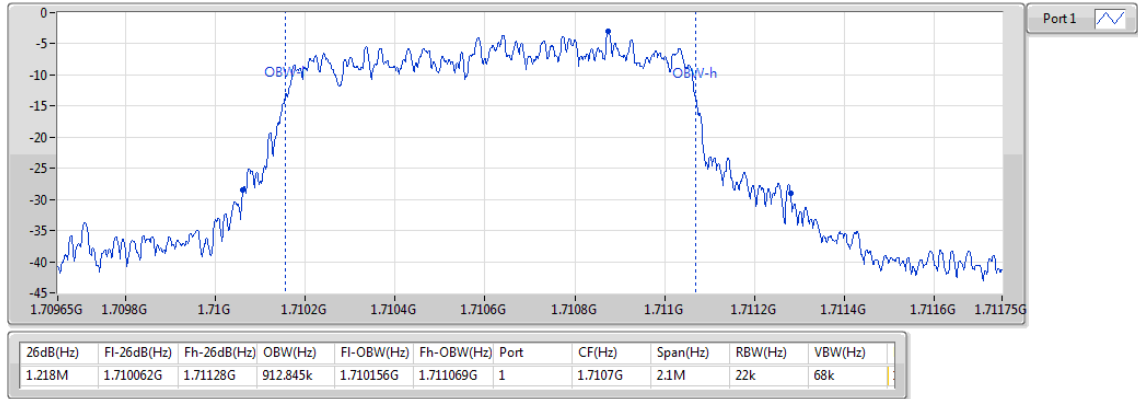
EBW



### Band 4 LTE-M1\_1.4MHz\_Nss1\_1TX

EBW

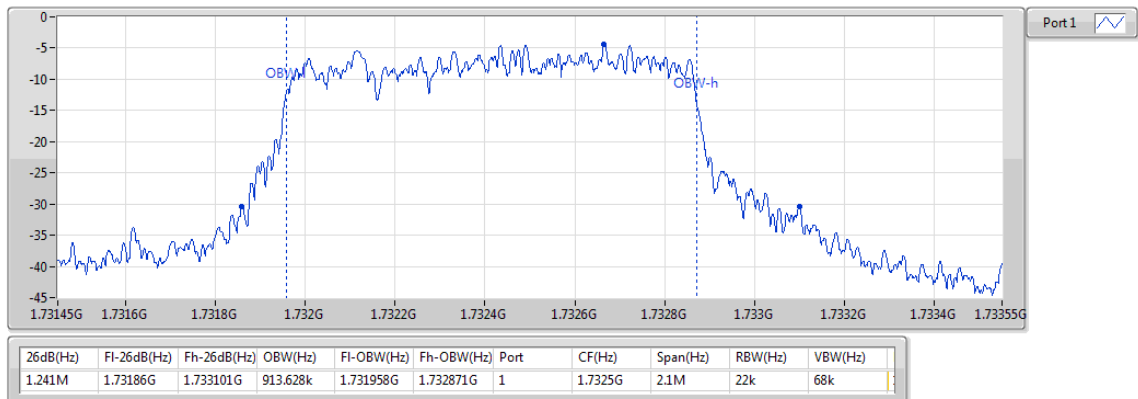
1710.7MHz\_16QAM\_RB 5,#RB 0,NB 0



### Band 4 LTE-M1\_1.4MHz\_Nss1\_1TX

EBW

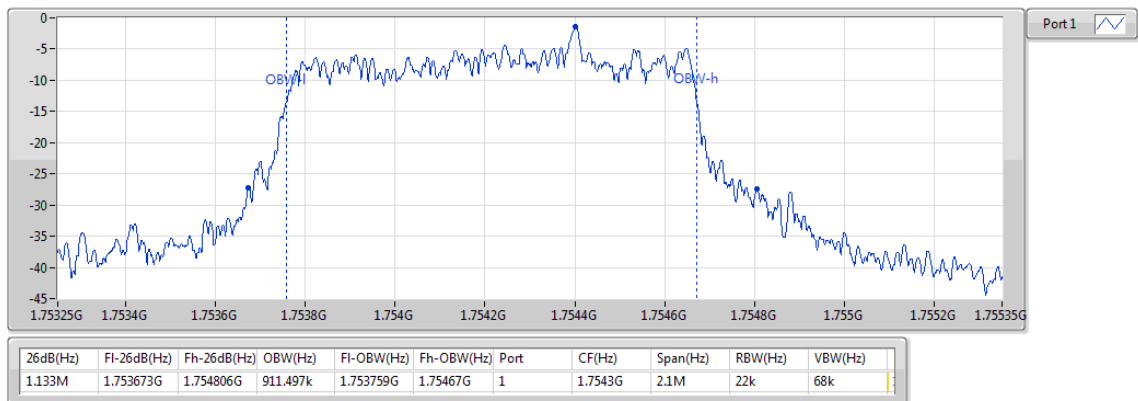
1732.5MHz\_16QAM\_RB 5,#RB 0,NB 0



### Band 4 LTE-M1\_1.4MHz\_Nss1\_1TX

EBW

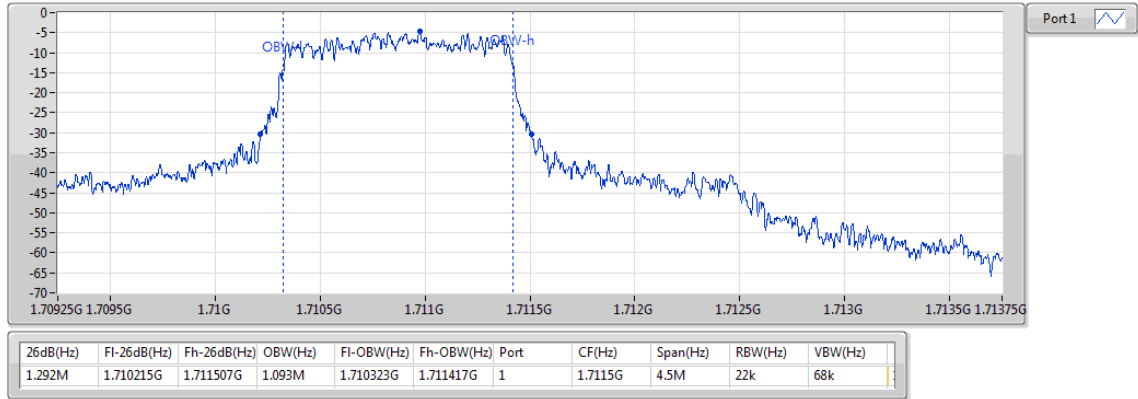
1754.3MHz\_16QAM\_RB 5,#RB 0,NB 0



### Band 4 LTE-M1\_3MHz\_Nss1\_1TX

EBW

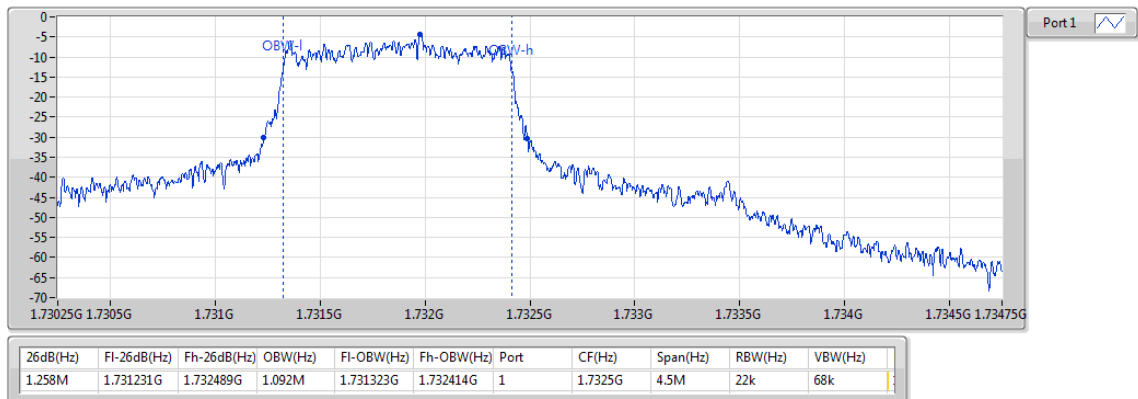
1711.5MHz\_QPSK\_RB 6,#RB 0,NB 0



### Band 4 LTE-M1\_3MHz\_Nss1\_1TX

EBW

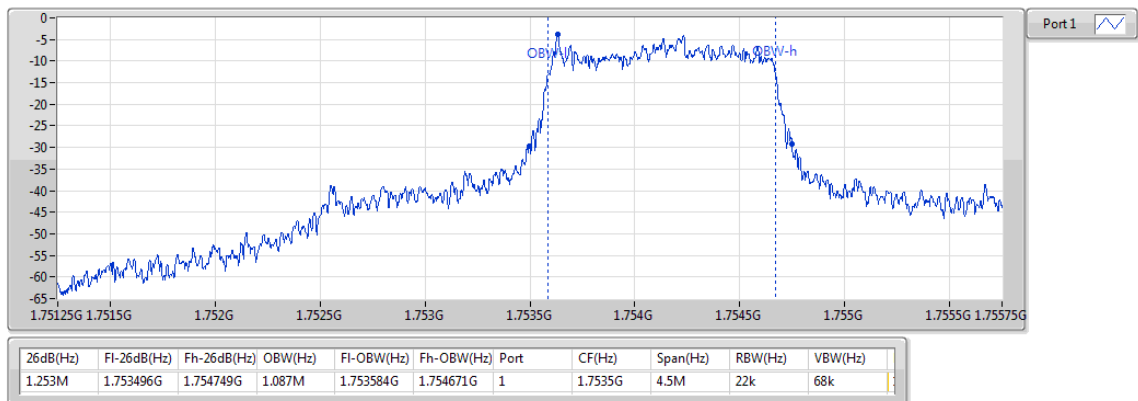
1732.5MHz\_QPSK\_RB 6,#RB 0,NB 0



### Band 4 LTE-M1\_3MHz\_Nss1\_1TX

EBW

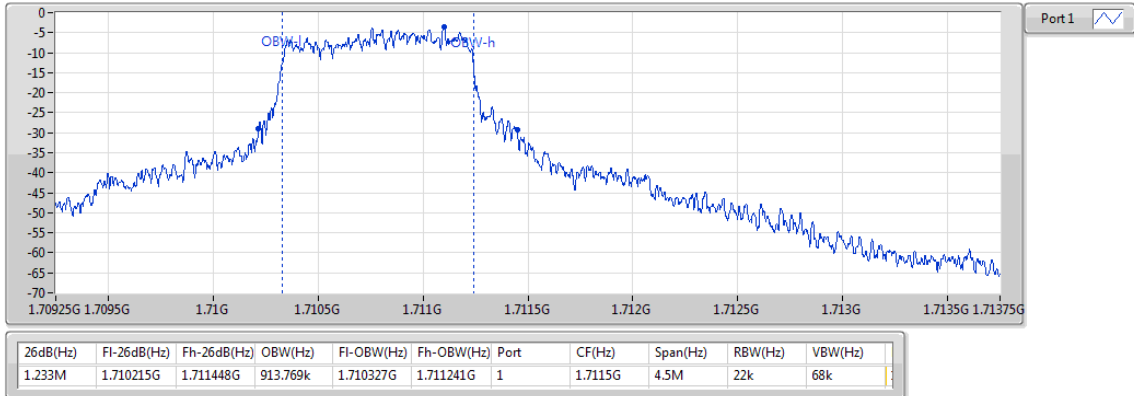
1753.5MHz\_QPSK\_RB 6,#RB 0,NB 1



**Band 4 LTE-M1\_3MHz\_Nss1\_1TX**

EBW

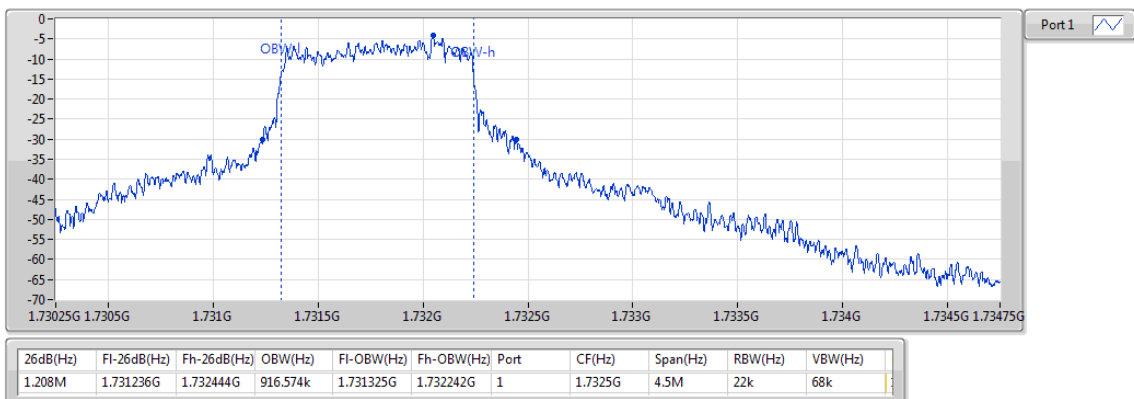
**1711.5MHz\_16QAM\_RB 5,#RB 0,NB 0**



**Band 4 LTE-M1\_3MHz\_Nss1\_1TX**

EBW

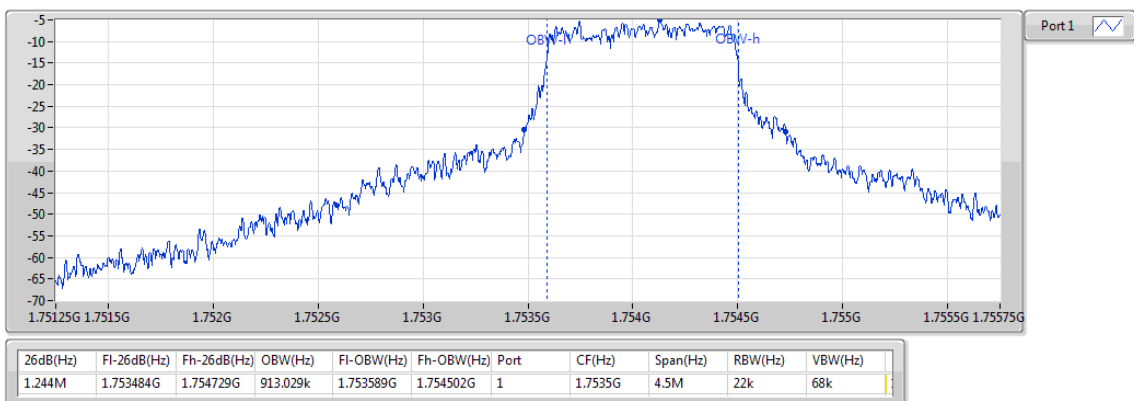
**1732.5MHz\_16QAM\_RB 5,#RB 0,NB 0**



**Band 4 LTE-M1\_3MHz\_Nss1\_1TX**

EBW

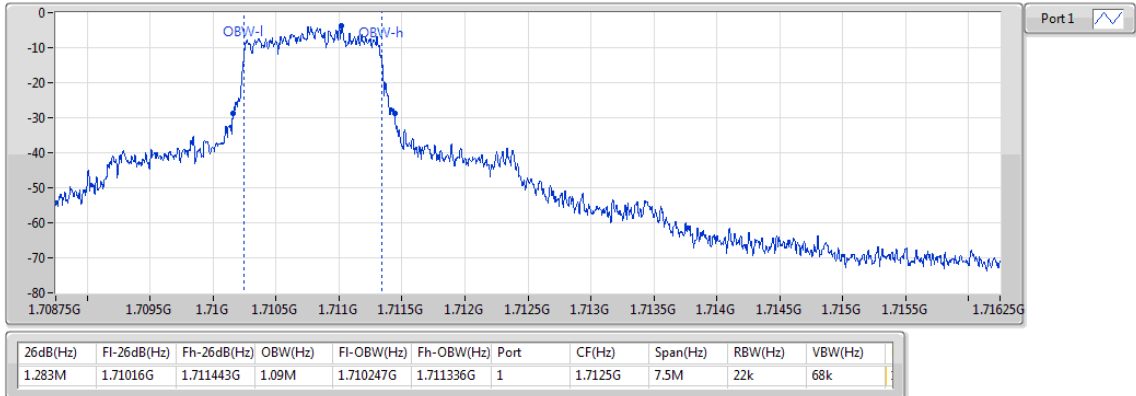
**1753.5MHz\_16QAM\_RB 5,#RB 0,NB 1**



**Band 4 LTE-M1\_5MHz\_Nss1\_1TX**

EBW

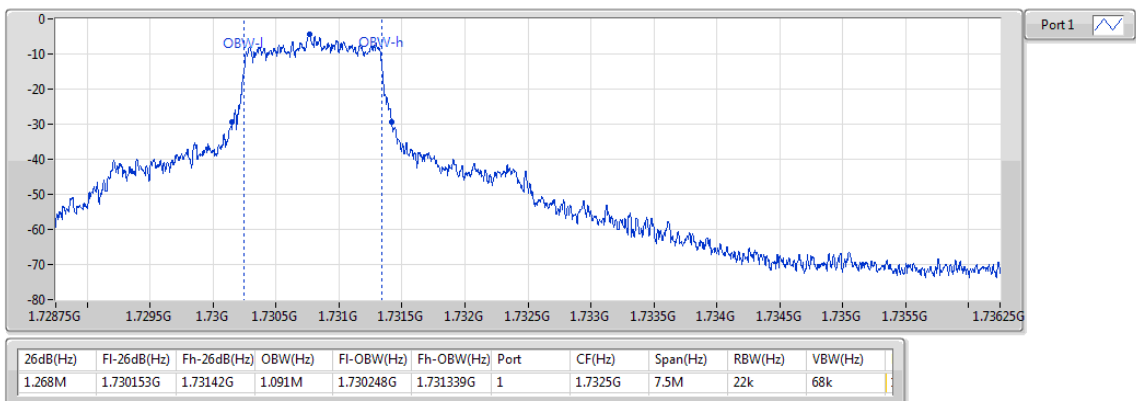
**1712.5MHz\_QPSK\_RB 6,#RB 0,NB 0**



**Band 4 LTE-M1\_5MHz\_Nss1\_1TX**

EBW

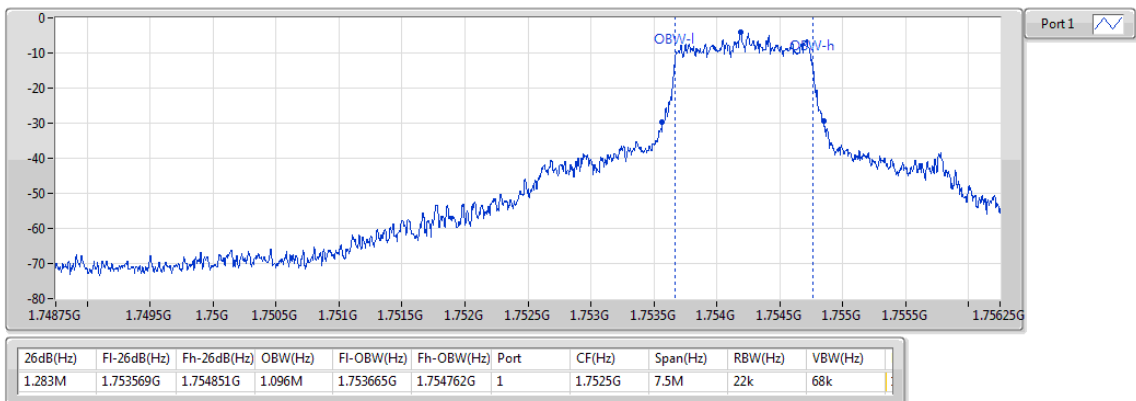
**1732.5MHz\_QPSK\_RB 6,#RB 0,NB 0**



**Band 4 LTE-M1\_5MHz\_Nss1\_1TX**

EBW

**1752.5MHz\_QPSK\_RB 6,#RB 0,NB 3**

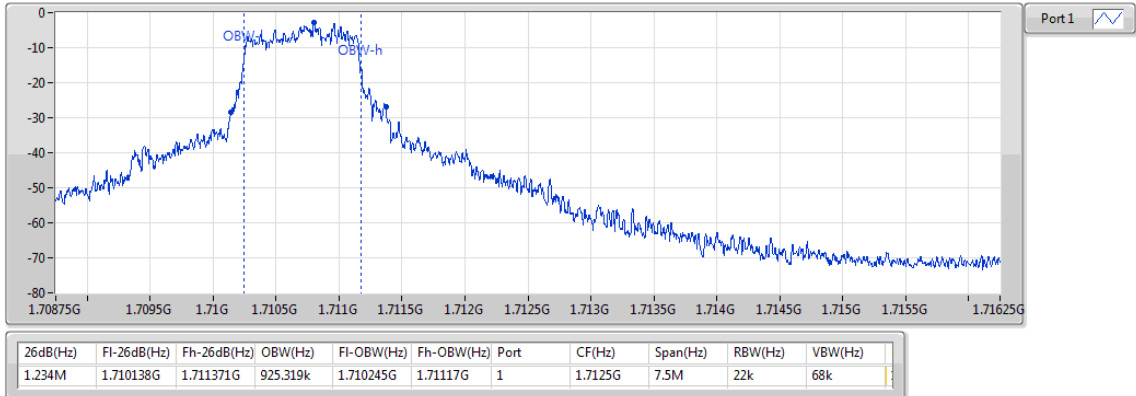




### Band 4 LTE-M1\_5MHz\_Nss1\_1TX

EBW

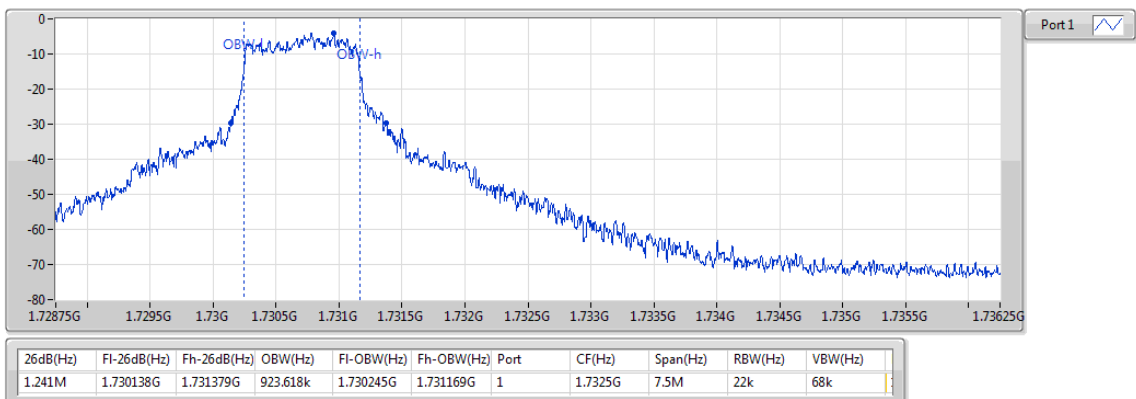
1712.5MHz\_16QAM\_RB 5,#RB 0,NB 0



### Band 4 LTE-M1\_5MHz\_Nss1\_1TX

EBW

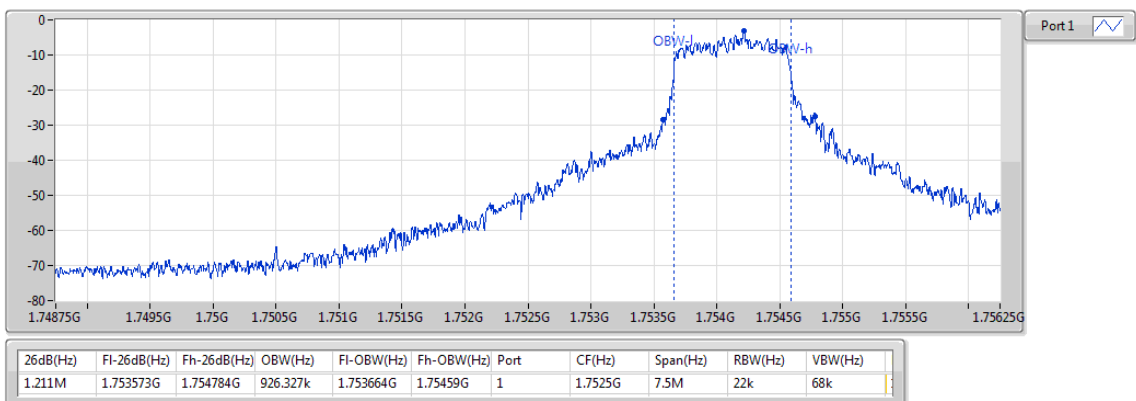
1732.5MHz\_16QAM\_RB 5,#RB 0,NB 0



### Band 4 LTE-M1\_5MHz\_Nss1\_1TX

EBW

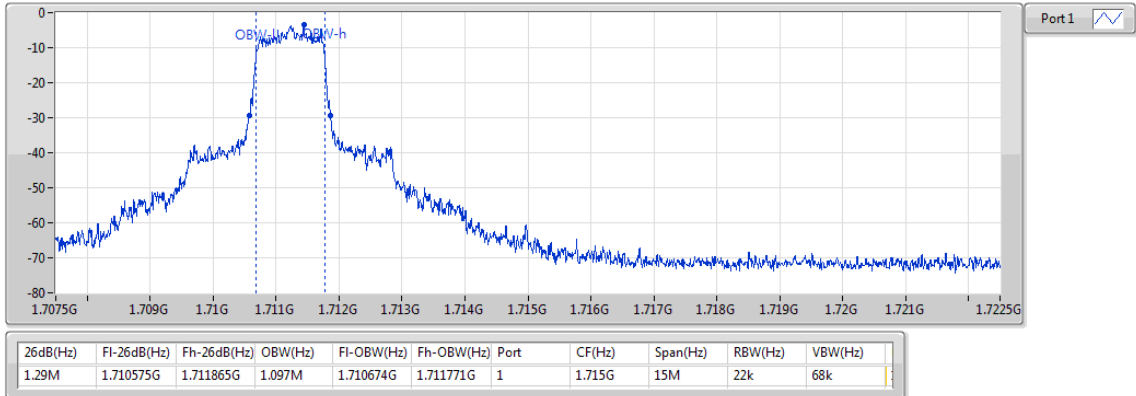
1752.5MHz\_16QAM\_RB 5,#RB 0,NB 3



### Band 4 LTE-M1\_10MHz\_Nss1\_1TX

EBW

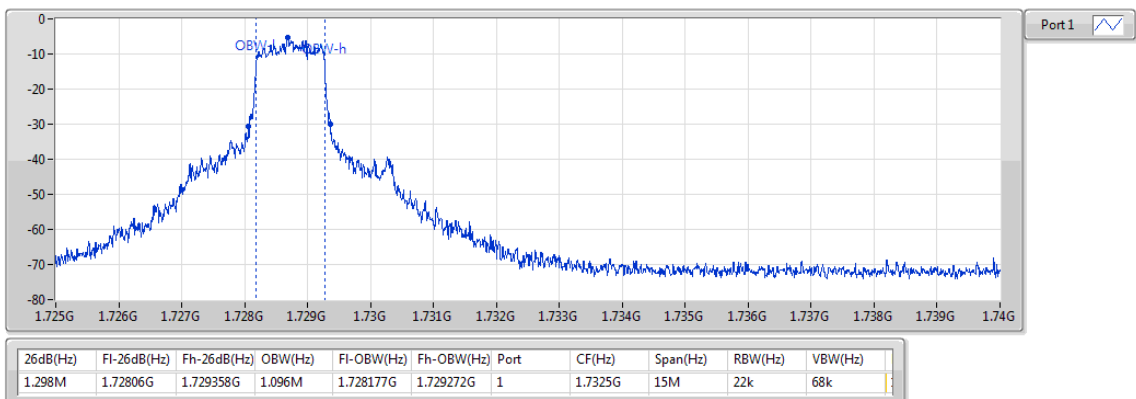
1715MHz\_QPSK\_RB 6,#RB 0,NB 0



### Band 4 LTE-M1\_10MHz\_Nss1\_1TX

EBW

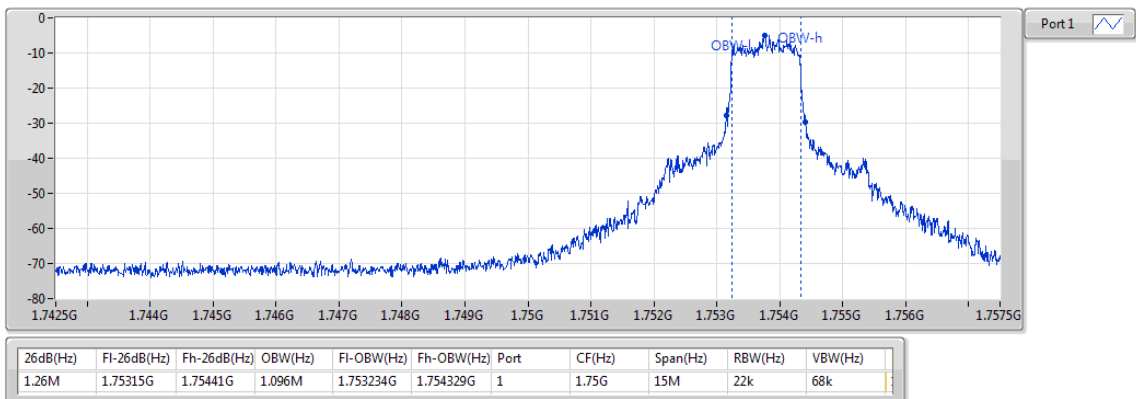
1732.5MHz\_QPSK\_RB 6,#RB 0,NB 0



### Band 4 LTE-M1\_10MHz\_Nss1\_1TX

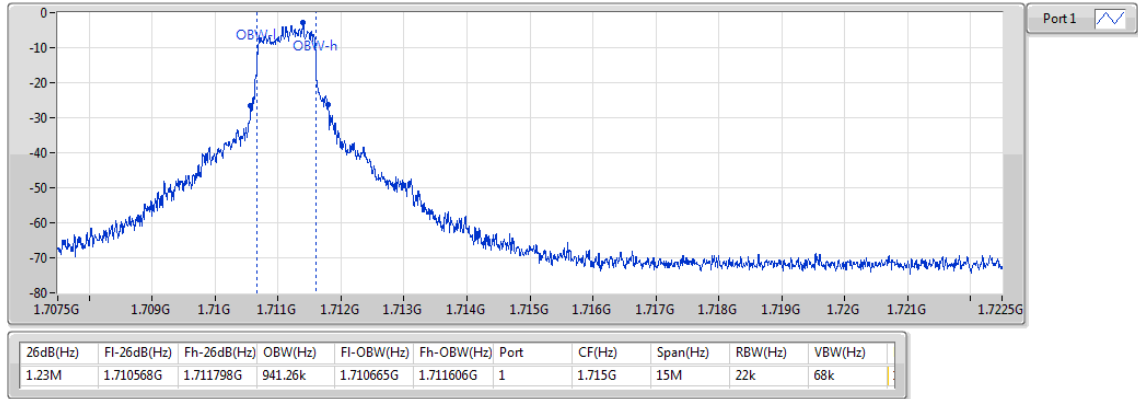
EBW

1750MHz\_QPSK\_RB 6,#RB 0,NB 7



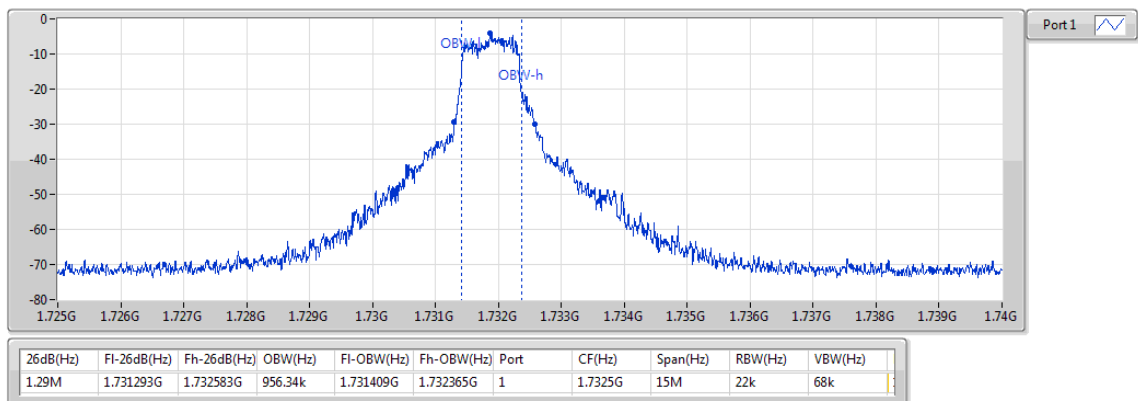
**Band 4 LTE-M1\_10MHz\_Nss1\_1TX**  
**1715MHz\_16QAM\_RB 5,#RB 0,NB 0**

EBW



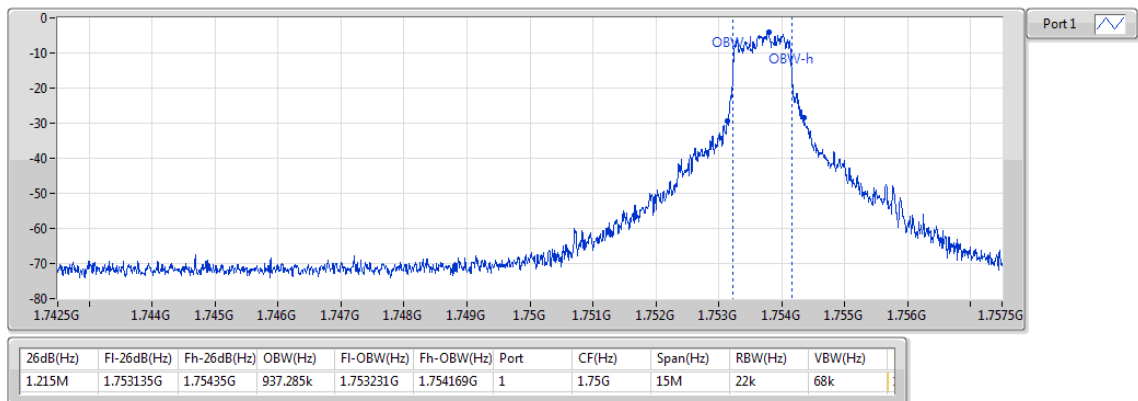
**Band 4 LTE-M1\_10MHz\_Nss1\_1TX**  
**1732.5MHz\_16QAM\_RB 5,#RB 0,NB 0**

EBW



**Band 4 LTE-M1\_10MHz\_Nss1\_1TX**  
**1750MHz\_16QAM\_RB 5,#RB 0,NB 7**

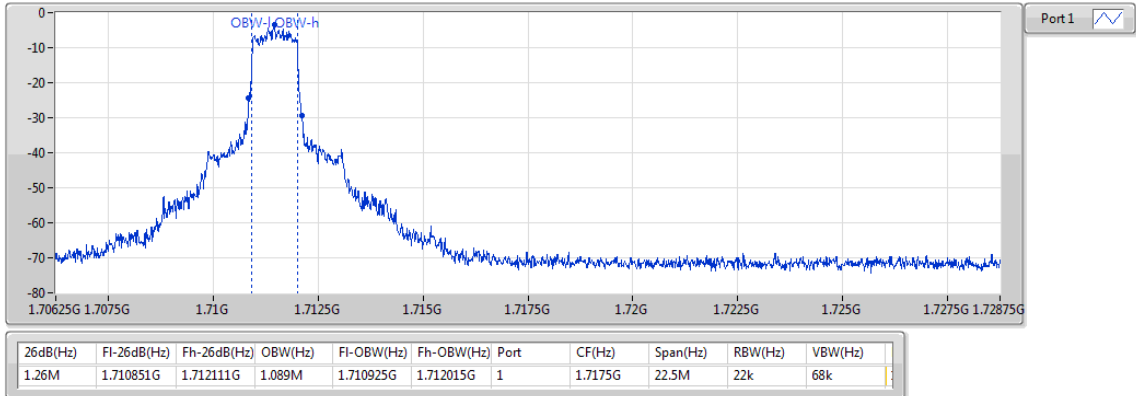
EBW



**Band 4 LTE-M1\_15MHz\_Nss1\_1TX**

EBW

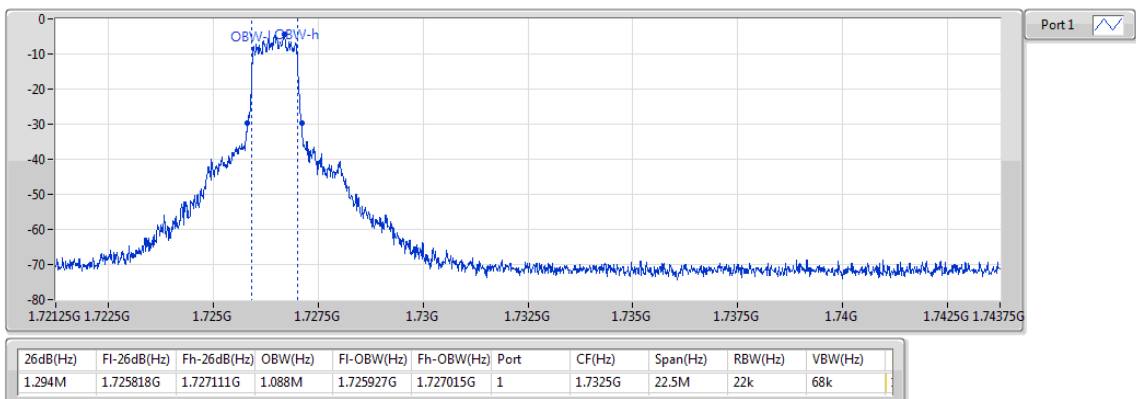
**1717.5MHz\_QPSK\_RB 6,#RB 0,NB 0**



**Band 4 LTE-M1\_15MHz\_Nss1\_1TX**

EBW

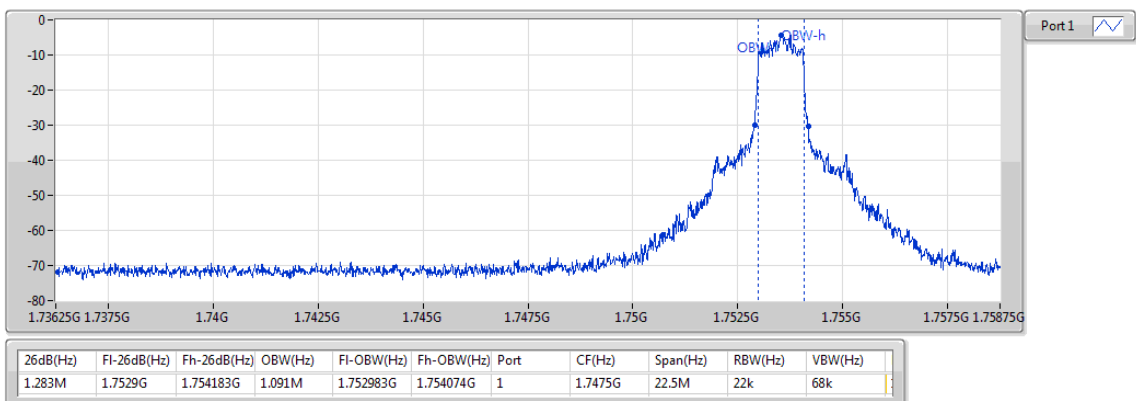
**1732.5MHz\_QPSK\_RB 6,#RB 0,NB 0**



**Band 4 LTE-M1\_15MHz\_Nss1\_1TX**

EBW

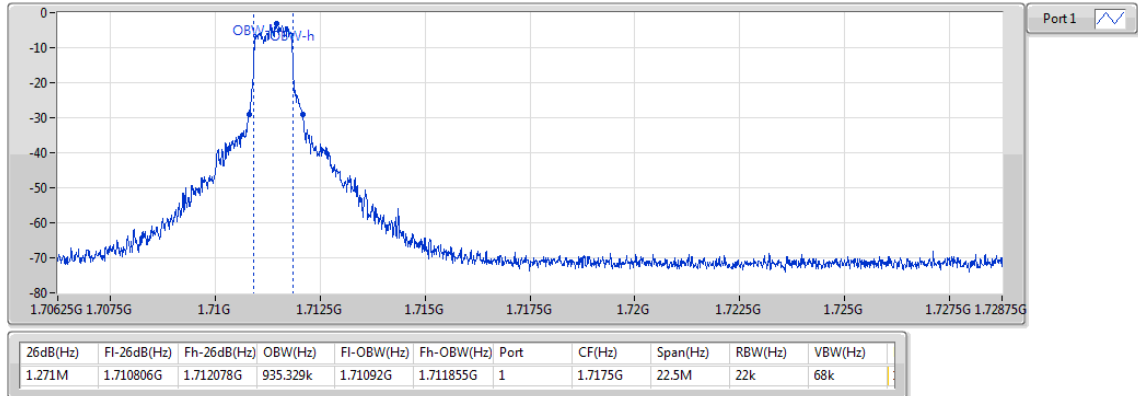
**1747.5MHz\_QPSK\_RB 6,#RB 0,NB 11**



### Band 4 LTE-M1\_15MHz\_Nss1\_1TX

EBW

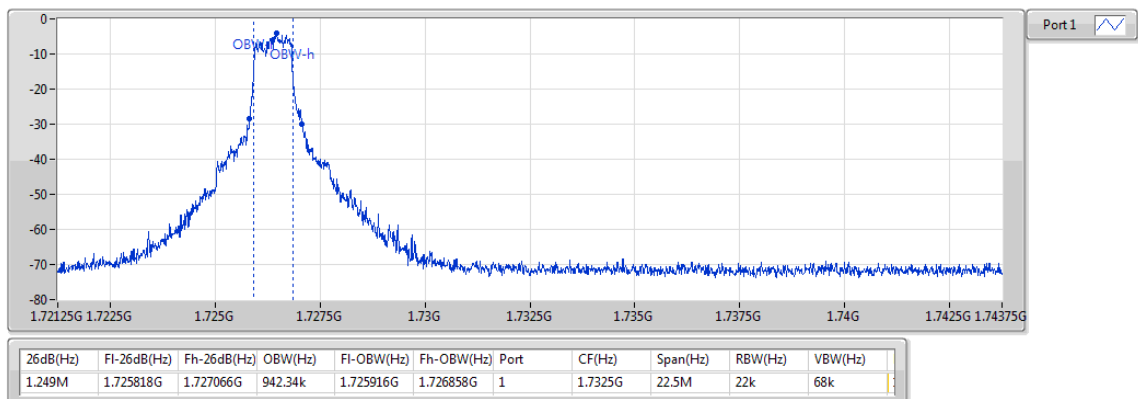
1717.5MHz\_16QAM\_RB 5,#RB 0,NB 0



### Band 4 LTE-M1\_15MHz\_Nss1\_1TX

EBW

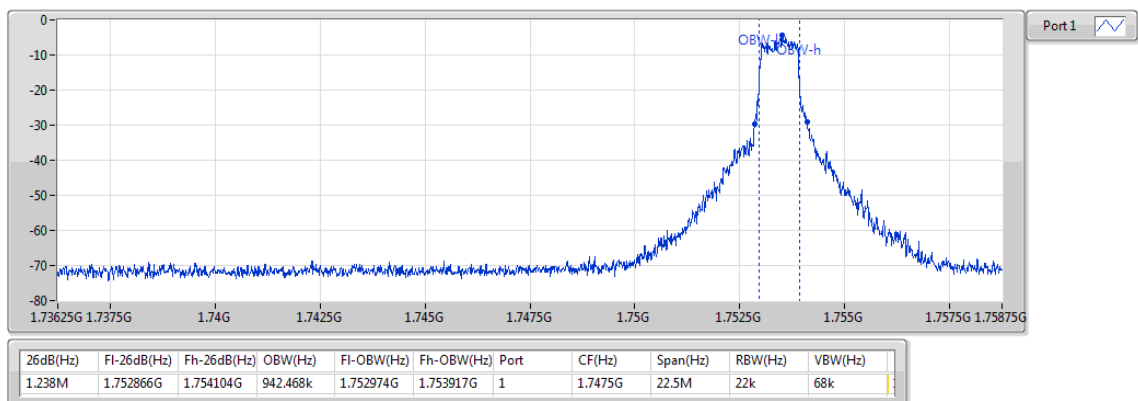
1732.5MHz\_16QAM\_RB 5,#RB 0,NB 0



### Band 4 LTE-M1\_15MHz\_Nss1\_1TX

EBW

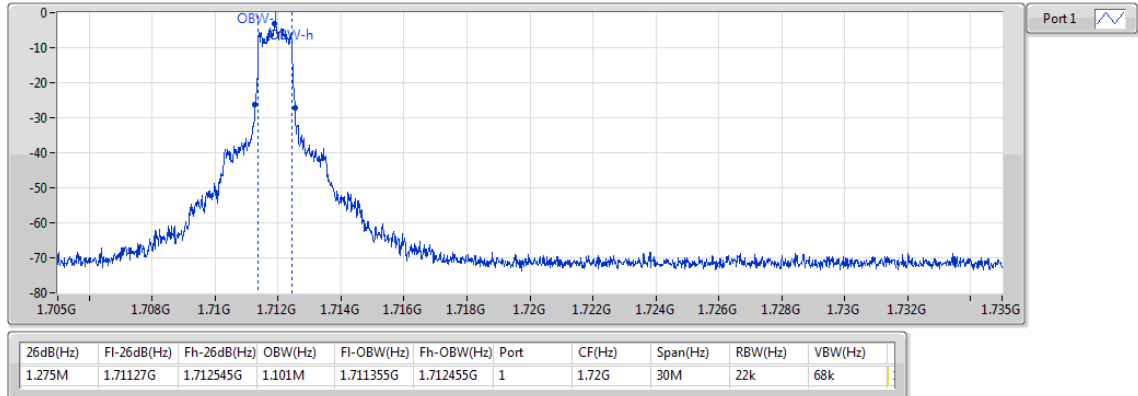
1747.5MHz\_16QAM\_RB 5,#RB 0,NB 11



### Band 4 LTE-M1\_20MHz\_Nss1\_1TX

EBW

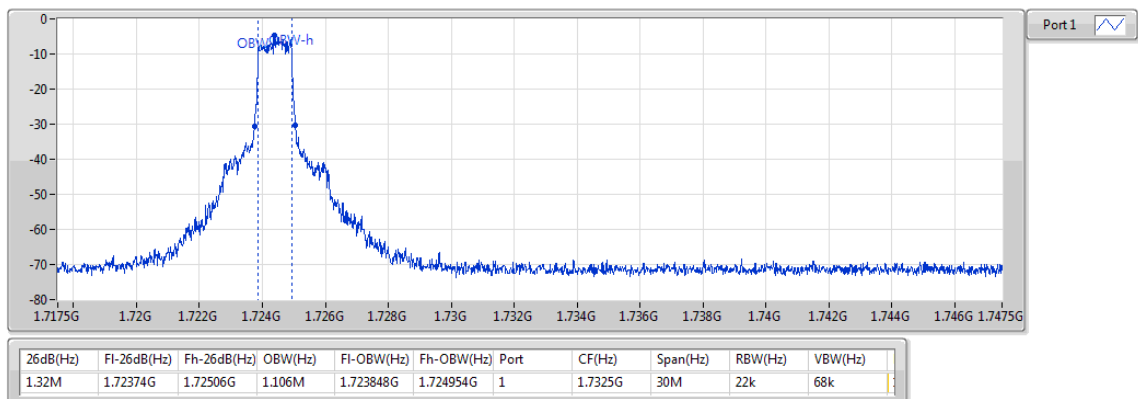
1720MHz\_QPSK\_RB 6,#RB 0,NB 0



### Band 4 LTE-M1\_20MHz\_Nss1\_1TX

EBW

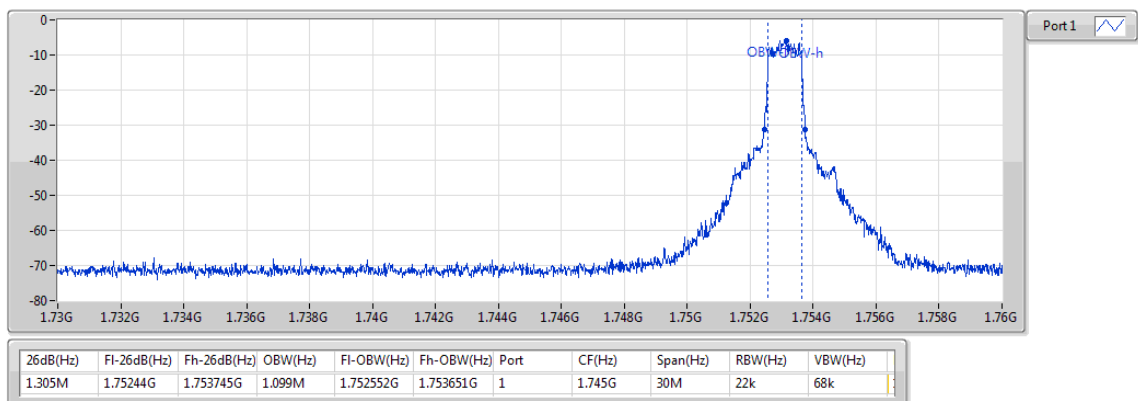
1732.5MHz\_QPSK\_RB 6,#RB 0,NB 0



### Band 4 LTE-M1\_20MHz\_Nss1\_1TX

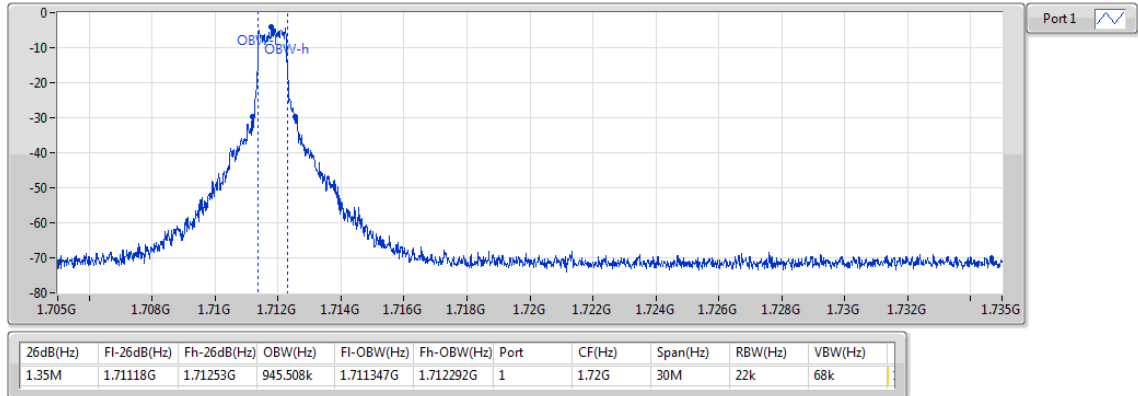
EBW

1745MHz\_QPSK\_RB 6,#RB 0,NB 15



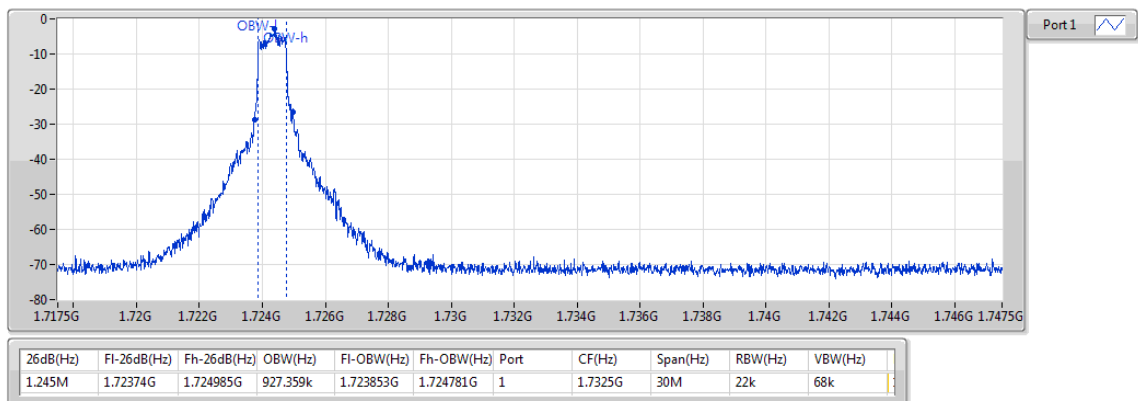
**Band 4 LTE-M1\_20MHz\_Nss1\_1TX**  
**1720MHz\_16QAM\_RB 5,#RB 0,NB 0**

EBW



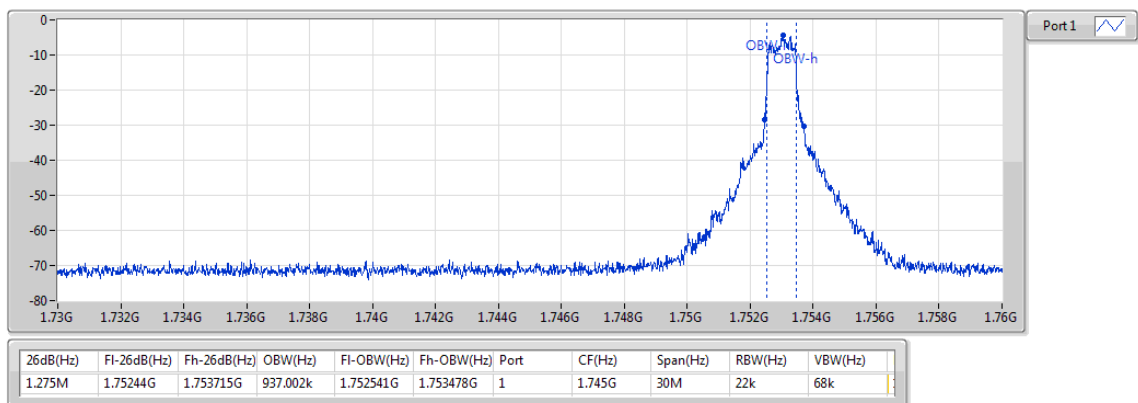
**Band 4 LTE-M1\_20MHz\_Nss1\_1TX**  
**1732.5MHz\_16QAM\_RB 5,#RB 0,NB 0**

EBW



**Band 4 LTE-M1\_20MHz\_Nss1\_1TX**  
**1745MHz\_16QAM\_RB 5,#RB 0,NB 15**

EBW



### 3.5 Peak to Average Ratio

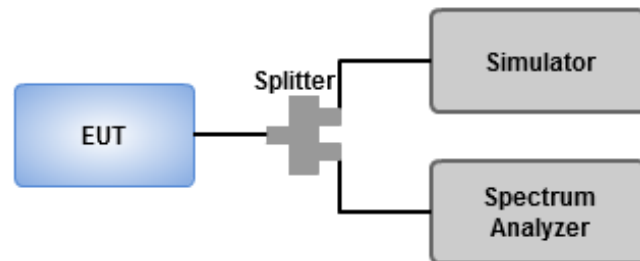
#### 3.5.1 Limit of Peak to Average Ratio

The Peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

#### 3.5.2 Test Procedures

1. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth.
2. Set the number of counts to a value that stabilizes the measured CCDF curve.
3. Set the measurement interval to 1 ms.
4. Record the maximum PAPR level associated with a probability of 0.1%.

#### 3.5.3 Test Setup

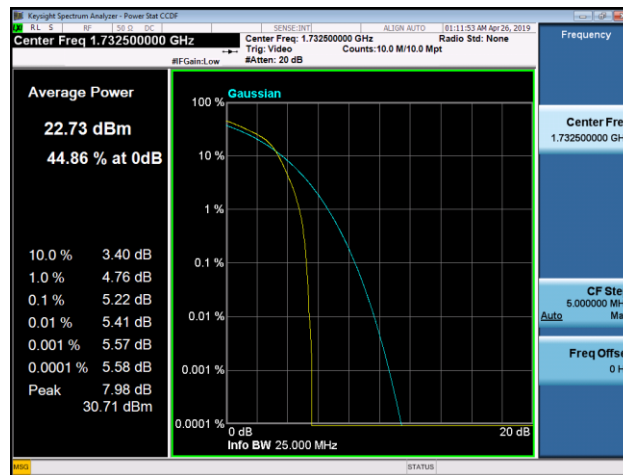




### 3.5.4 Test Result of Peak to Average Ratio

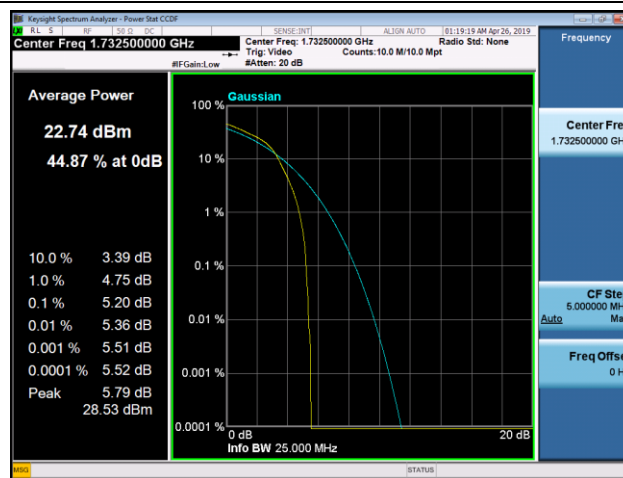
BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
1.4	QPSK	19957	1710.7	4.8200
1.4	QPSK	20175	1732.5	5.2000
1.4	QPSK	20393	1754.3	4.7600
1.4	16QAM	19957	1710.7	5.0800
1.4	16QAM	20175	1732.5	5.2200
1.4	16QAM	20393	1754.3	4.9800

**Worst plot**



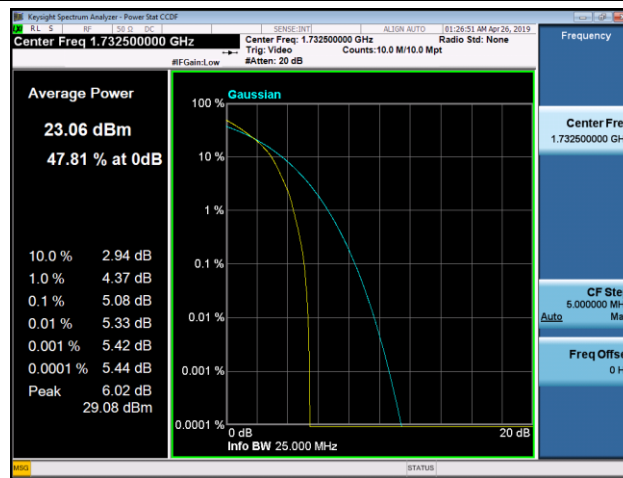
BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
3	QPSK	19965	1711.5	4.8600
3	QPSK	20175	1732.5	4.9700
3	QPSK	20385	1753.5	4.8200
3	16QAM	19965	1711.5	5.0100
3	16QAM	20175	1732.5	5.2000
3	16QAM	20385	1753.5	4.9100

### Worst plot



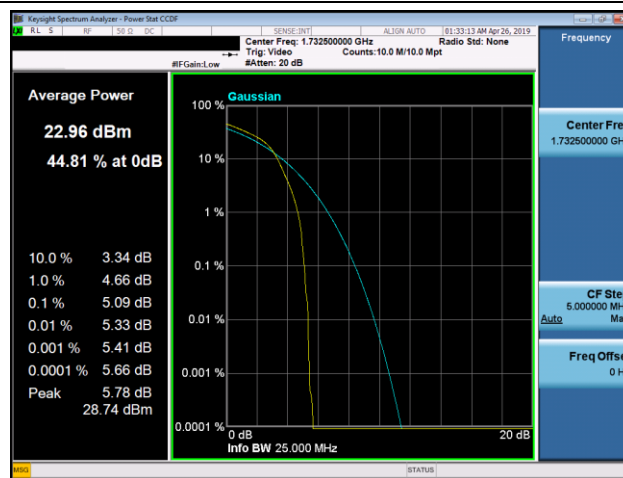
BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
5	QPSK	19975	1712.5	4.7700
5	QPSK	20175	1732.5	5.0800
5	QPSK	20375	1752.5	4.8600
5	16QAM	19975	1712.5	4.9600
5	16QAM	20175	1732.5	5.0000
5	16QAM	20375	1752.5	4.9700

### Worst plot

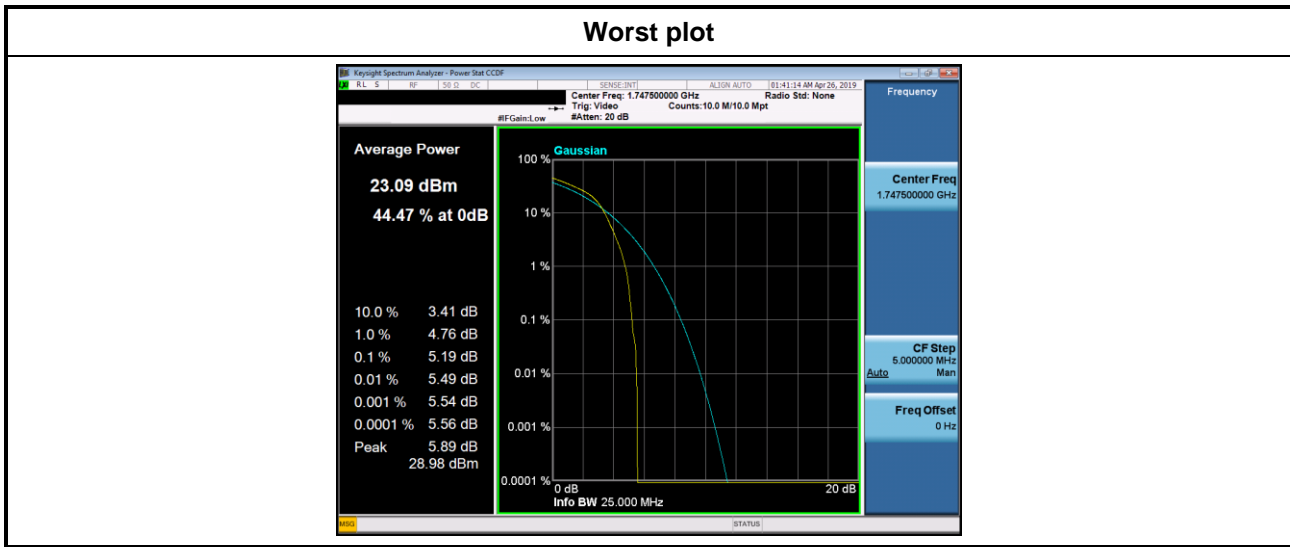


BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
10	QPSK	20000	1715	4.6600
10	QPSK	20175	1732.5	4.8900
10	QPSK	20350	1750	4.9500
10	16QAM	20000	1715	4.9400
10	16QAM	20175	1732.5	5.0900
10	16QAM	20350	1750	5.0700

### Worst plot

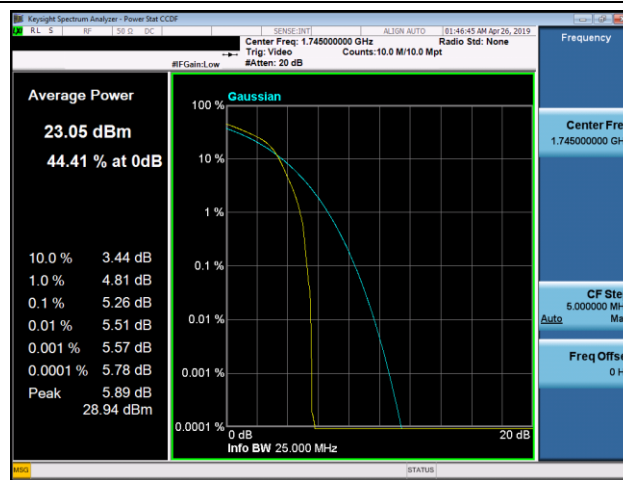


BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
15	QPSK	20025	1717.5	4.5800
15	QPSK	20175	1732.5	4.8900
15	QPSK	20325	1747.5	4.8600
15	16QAM	20025	1717.5	4.8200
15	16QAM	20175	1732.5	5.0800
15	16QAM	20325	1747.5	5.1900



BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
20	QPSK	20050	1720	4.7700
20	QPSK	20175	1732.5	4.9700
20	QPSK	20300	1745	5.0900
20	16QAM	20050	1720	4.8900
20	16QAM	20175	1732.5	5.1300
20	16QAM	20300	1745	5.2600

### Worst plot



## 3.6 Frequency Stability

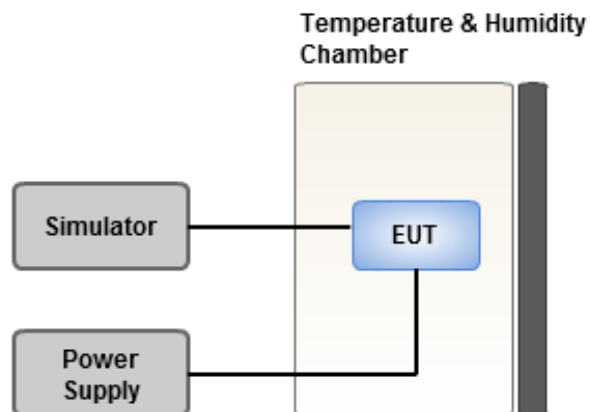
### 3.6.1 Limit of Frequency Stability

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

### 3.6.2 Test Procedures

1. EUT was placed at temperature chamber and connected to an external power supply.
2. Temperature and voltage condition shall be tested to confirm frequency stability.
3. Temperature range is from -30 ~ 85°C and voltage range is from lowest to highest working voltage.
4. Tem Link up EUT and simulator. Confirm frequency drift value of simulator and record it.

### 3.6.3 Test Setup



### 3.6.4 Test Result of Frequency Stability

Temperature (°C)	Frequency Drift (ppm)					
	BW: 1.4 MHz	BW: 3 MHz	BW: 5 MHz	BW: 10 MHz	BW: 15 MHz	BW: 20 MHz
T20°CVmax	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
T20°CVmin	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
T85°CVnom	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05
T80°CVnom	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
T70°CVnom	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04
T60°CVnom	-0.03	-0.03	-0.04	-0.03	-0.03	-0.04
T50°CVnom	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03
T40°CVnom	-0.02	-0.02	-0.04	-0.03	-0.03	-0.03
T30°CVnom	-0.02	-0.02	-0.03	-0.03	-0.03	-0.02
T20°CVnom	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
T10°CVnom	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
T0°CVnom	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
T-10°CVnom	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
T-20°CVnom	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01
T-30°CVnom	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01



## 4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

### **Linkou**

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin  
Kou District, New Taipei City,  
Taiwan, R.O.C.

### **Kwei Shan**

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,  
Kwei Shan District, Tao Yuan City  
333, Taiwan, R.O.C.

### **Kwei Shan Site II**

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd  
St., Kwei Shan District, Tao Yuan  
City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC\_Service@icertifi.com.tw

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