



## 3.4 Band Edge

### 3.4.1 Limit of Band Edge

The 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 equal to -13dBm.

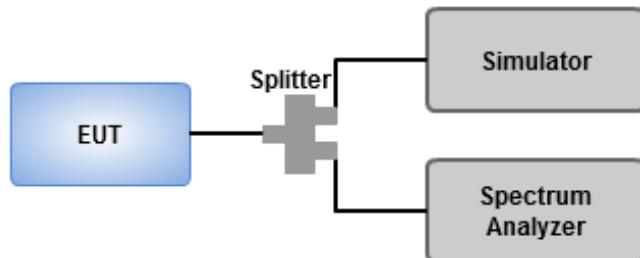
### 3.4.2 Test Procedures

1. Lowest and highest operating channels are tested for this item.
2. The center frequency of spectrum analyzer will be set to 1732.5 MHz and span = 70 MHz.
3. Set RBW and VBW as below setting, detector = RMS, sweep time = auto.

LTE BW(MHz)	RBW (kHz)	VBW(kHz)
1.4	20	100
3	30	100
5	50	200
10	100	300
15	200	1000
20	200	1000

4. Integrate power of the 1MHz bands immediately outside frequency band and record the max trace .

### 3.4.3 Test Setup





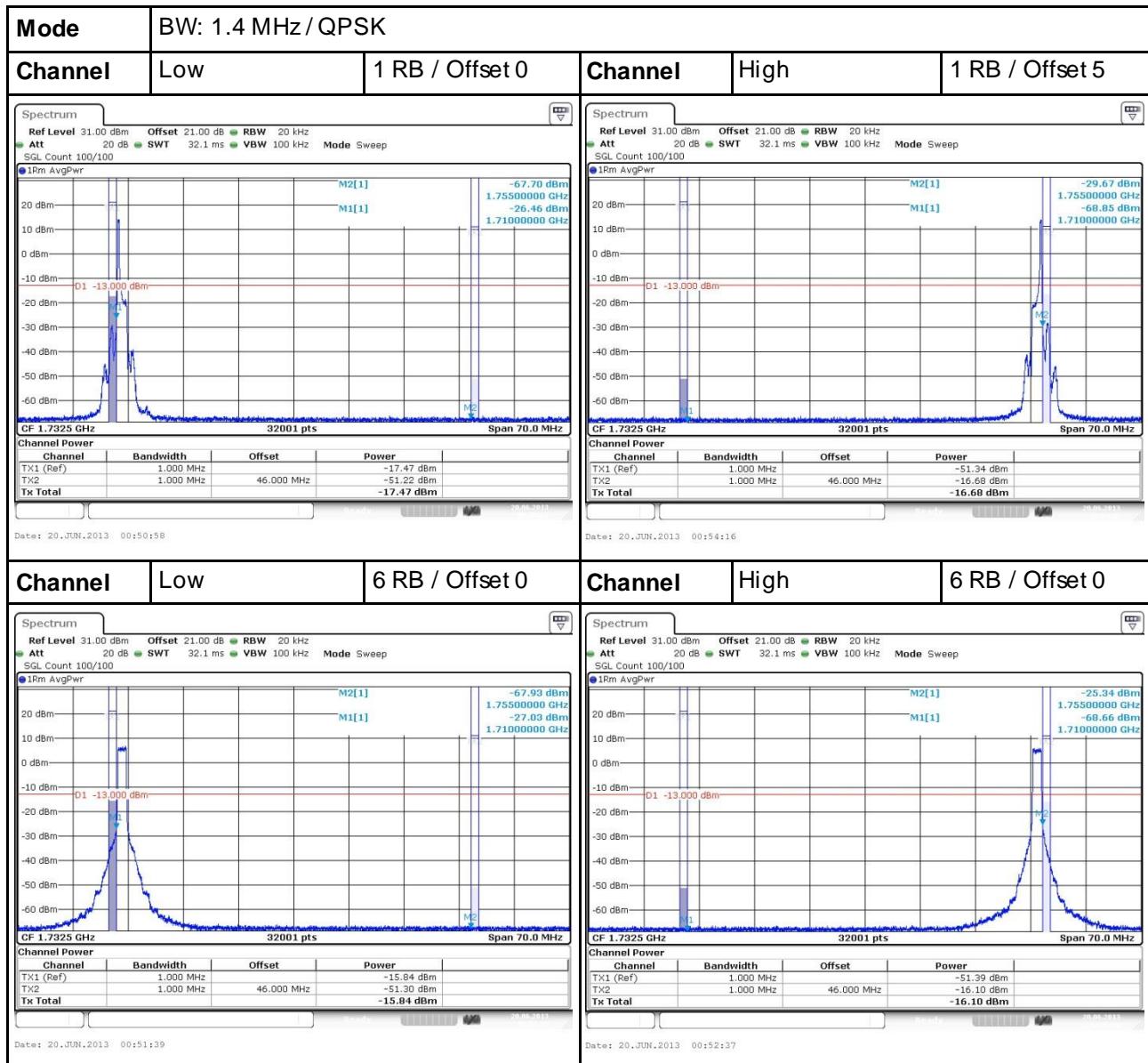
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### 3.4.4 Test Result of Band Edge



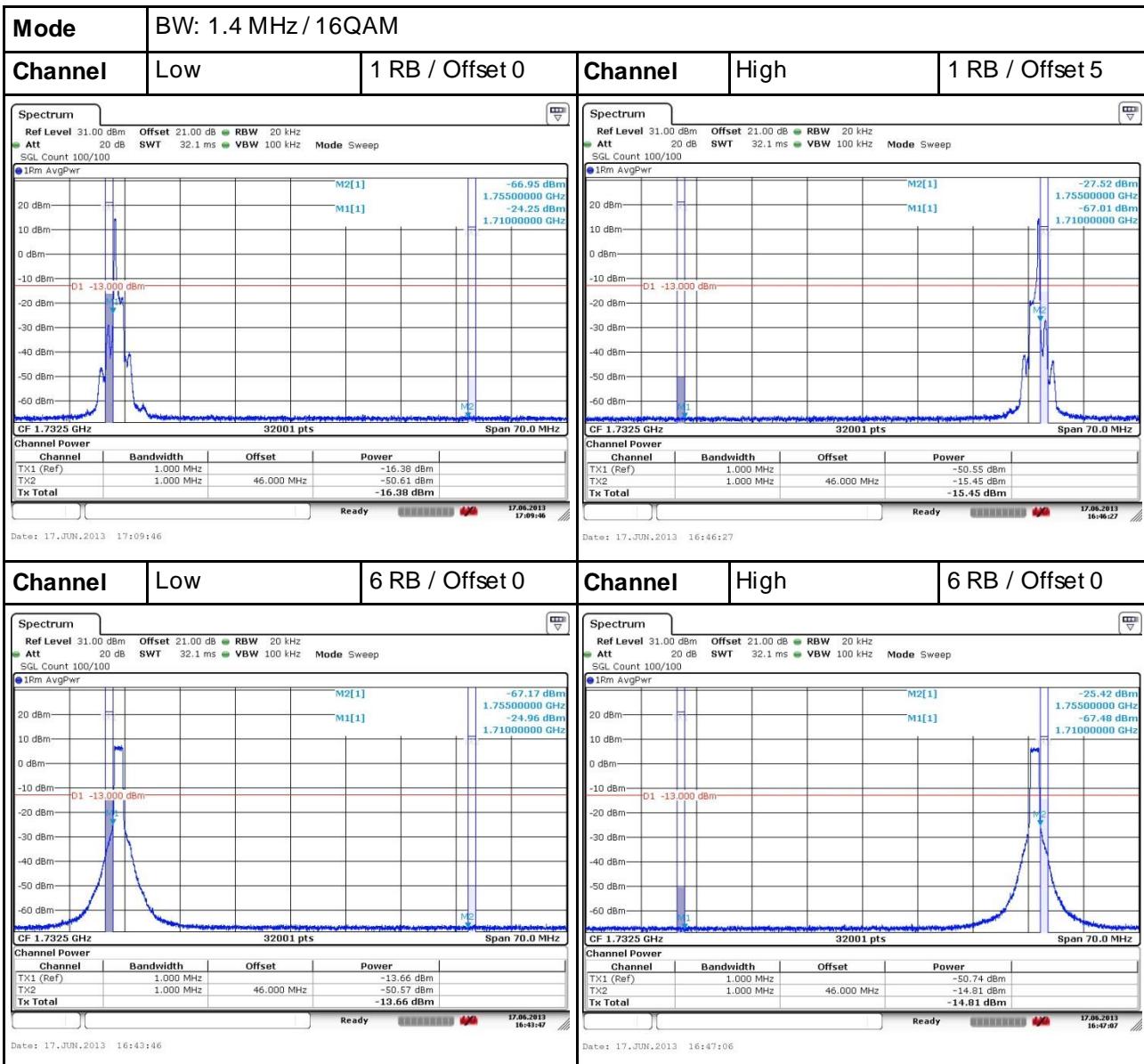


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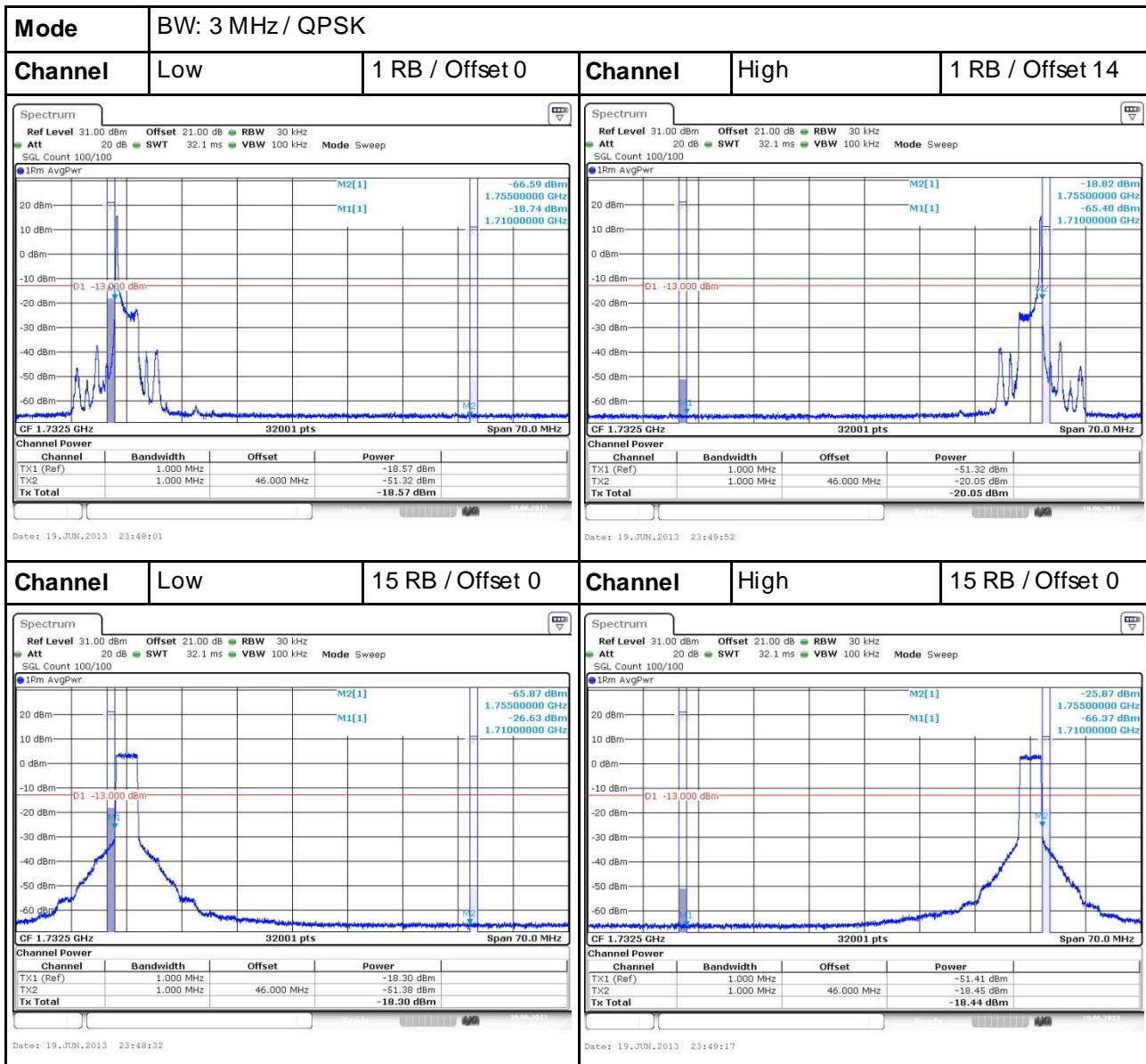


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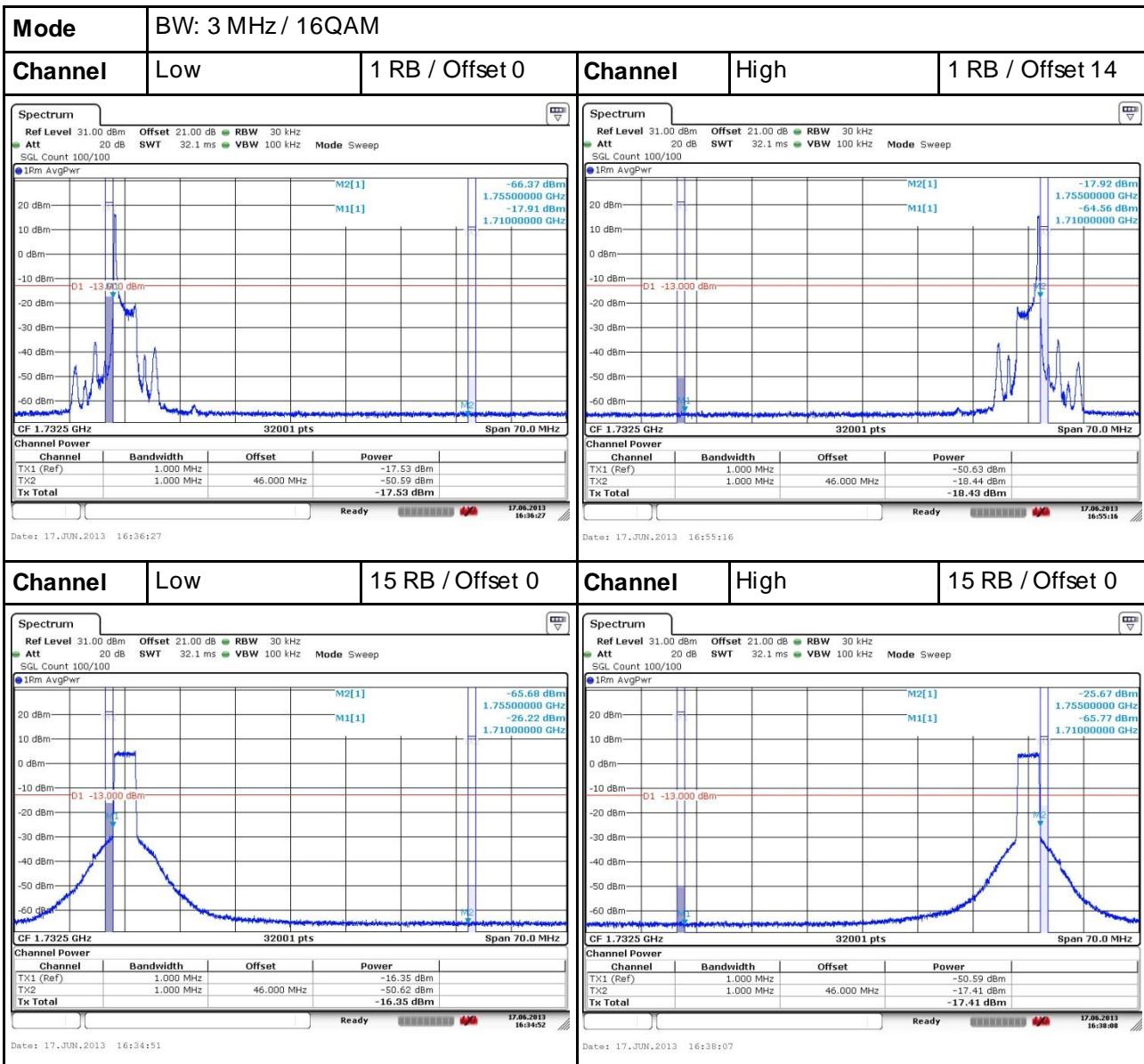


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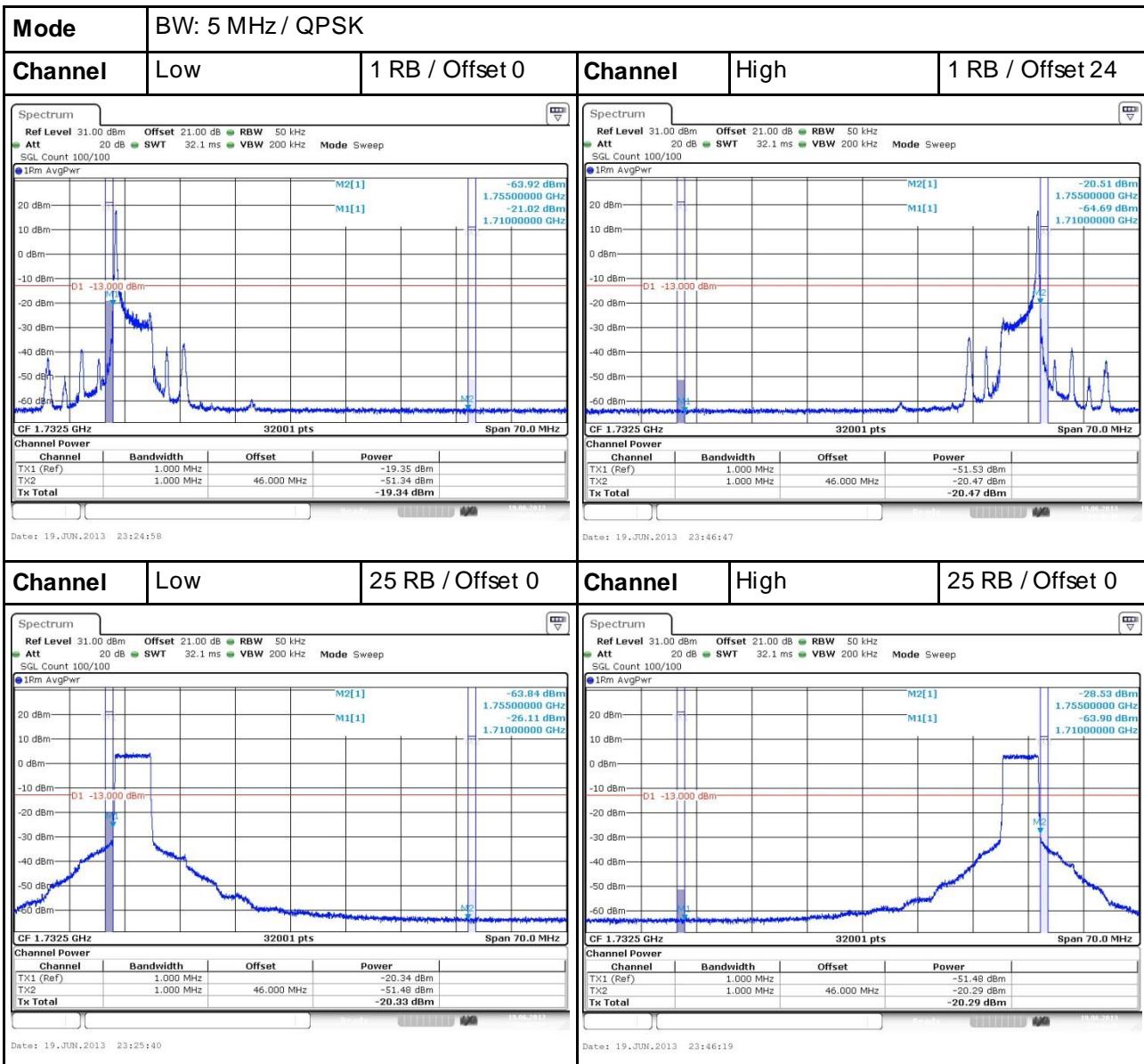


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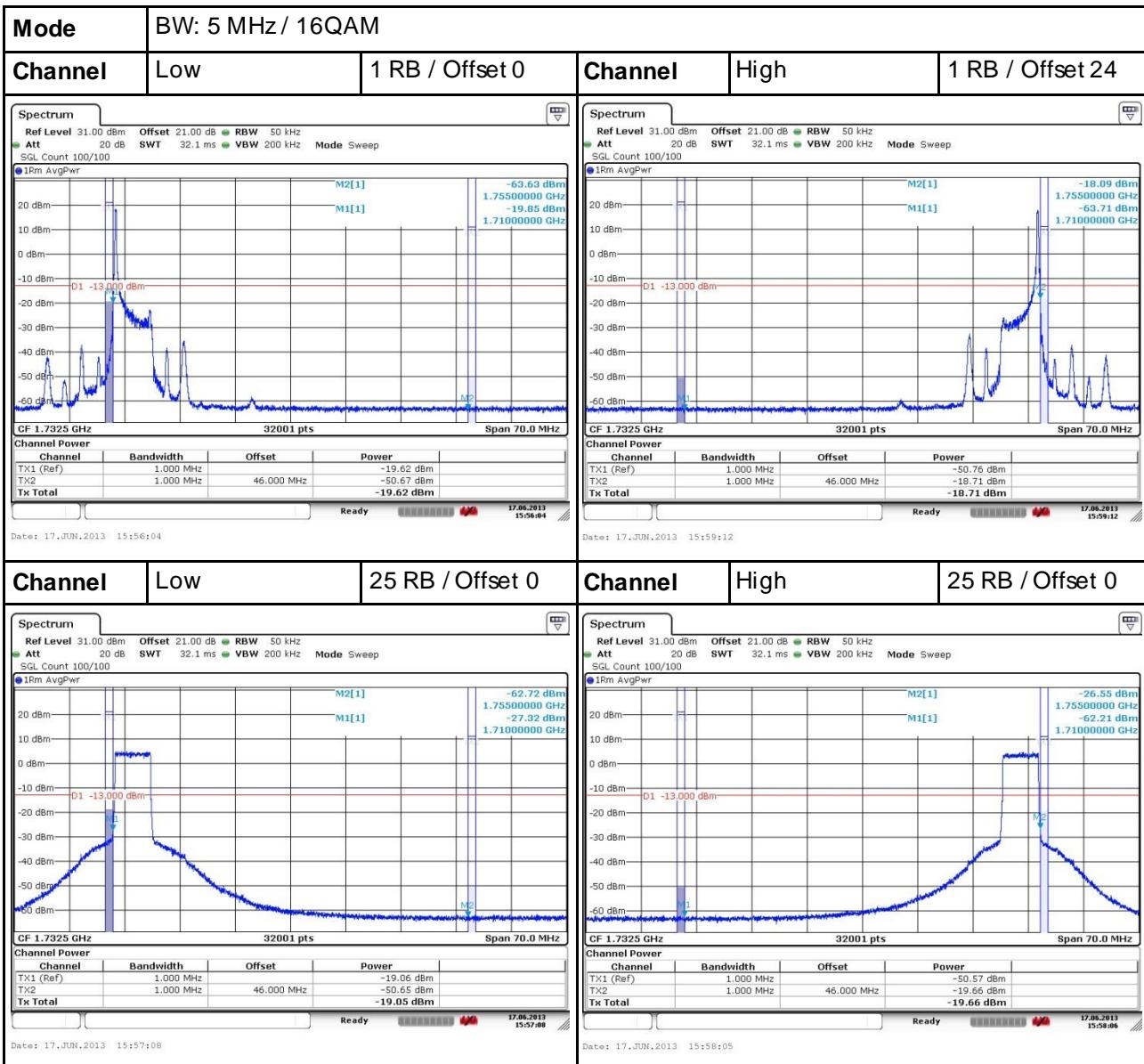


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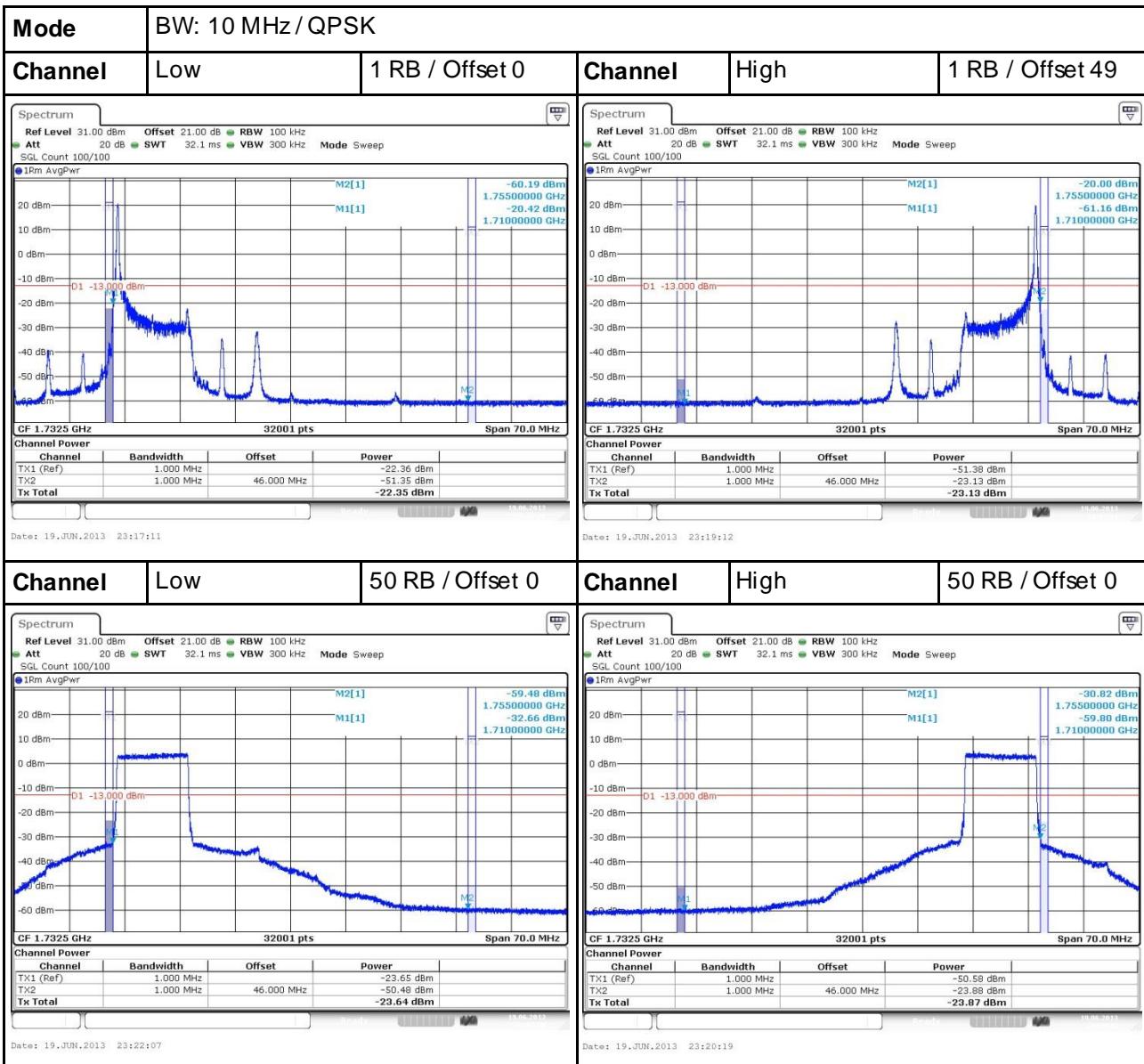


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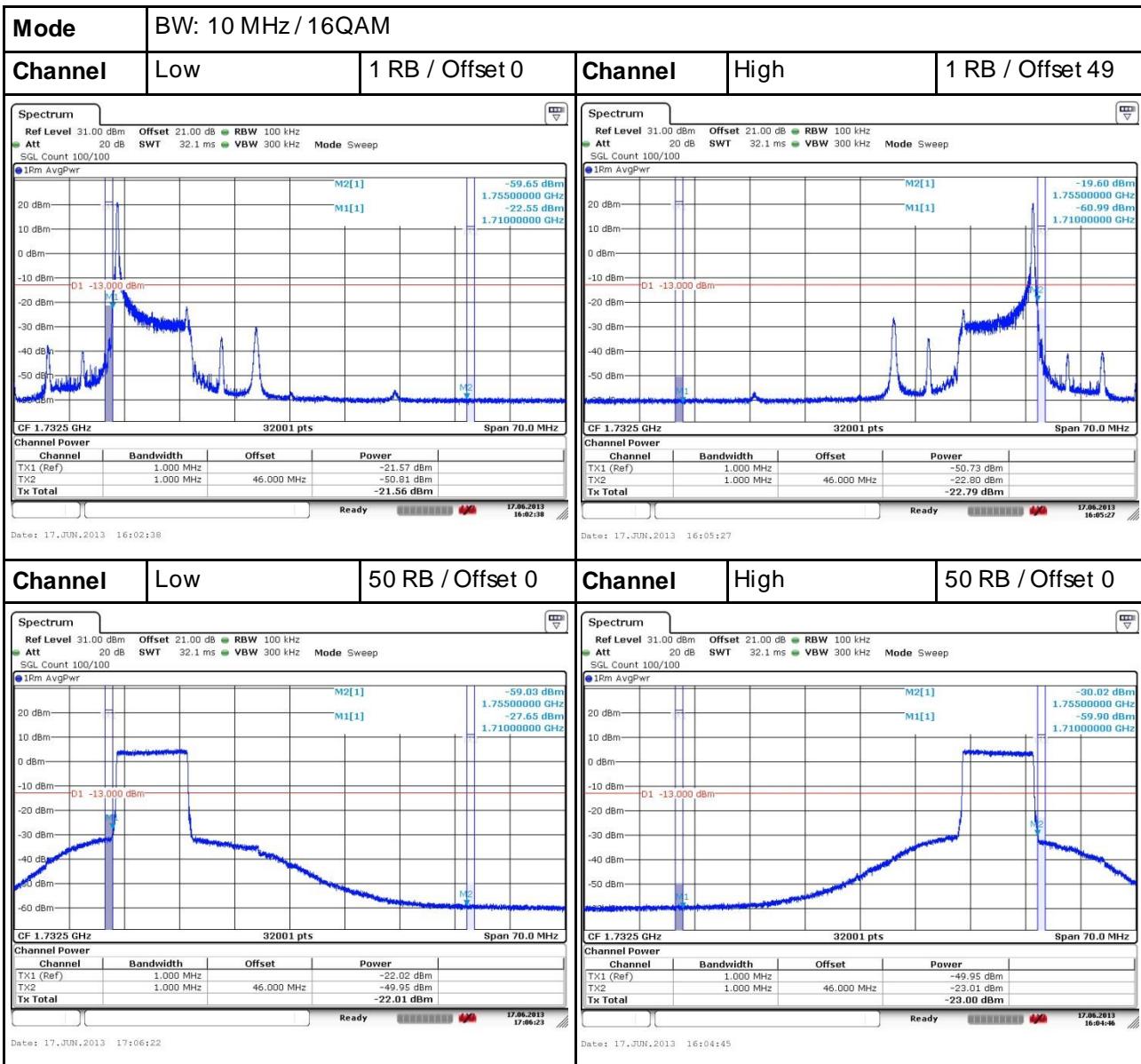


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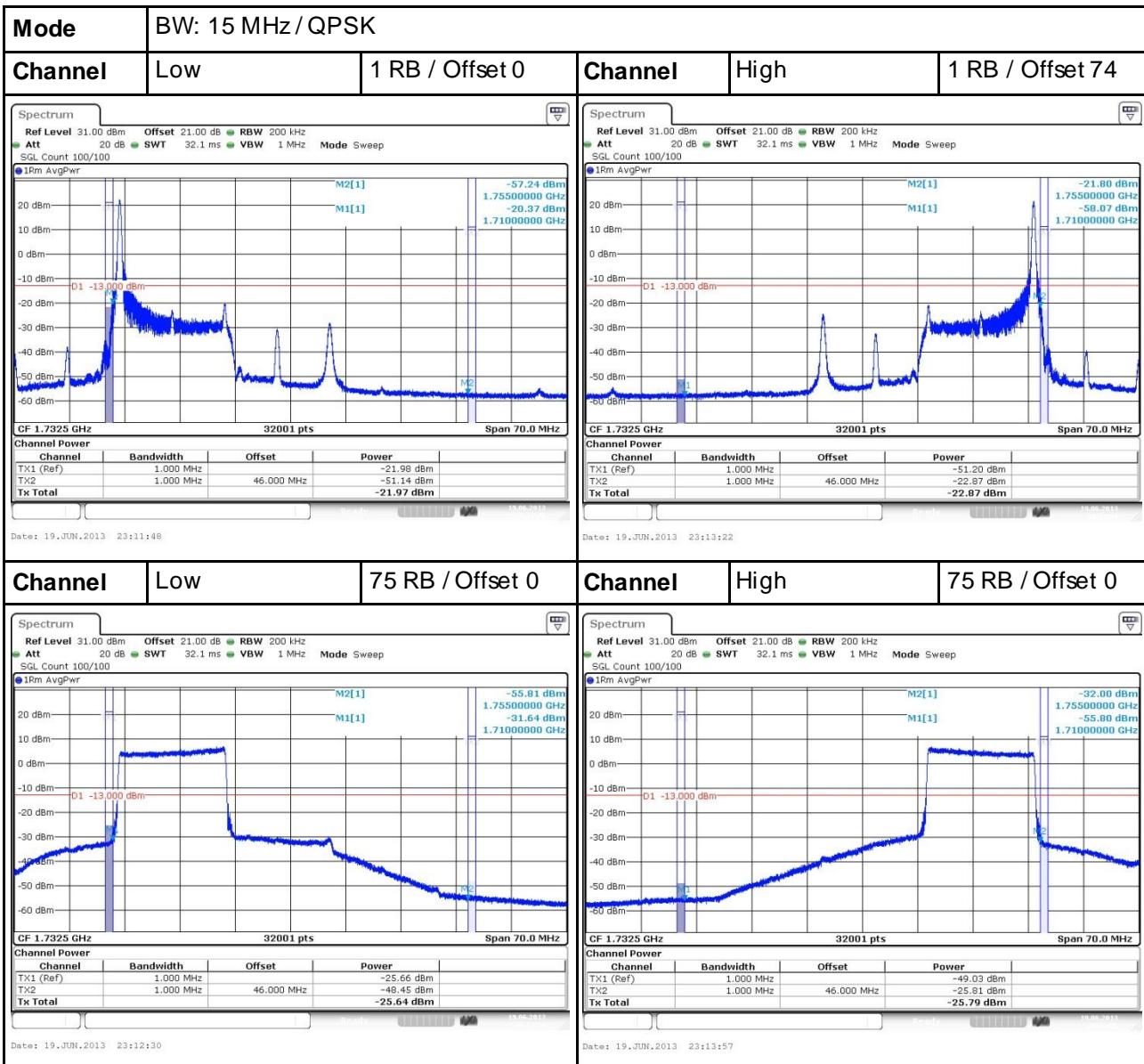


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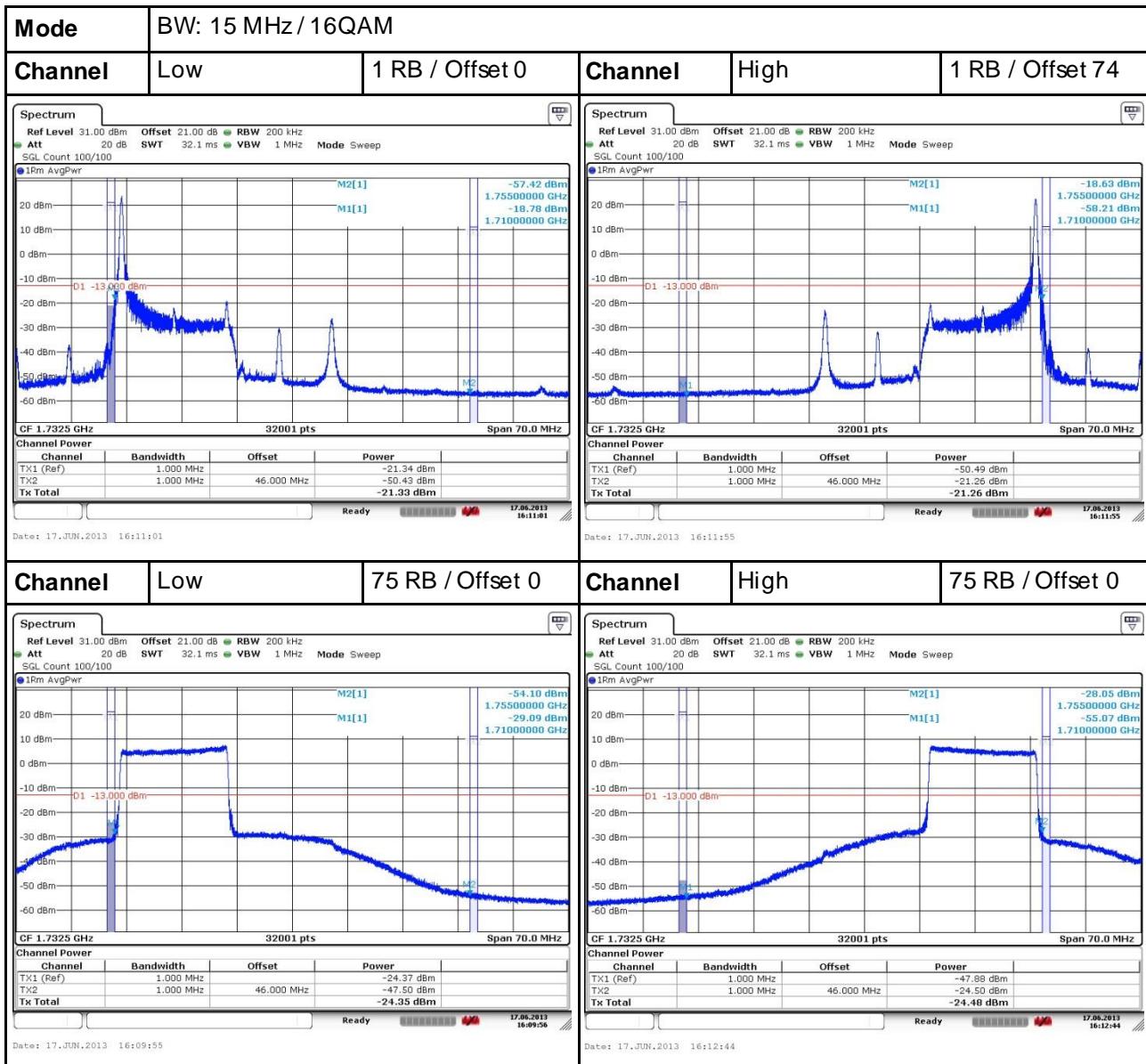


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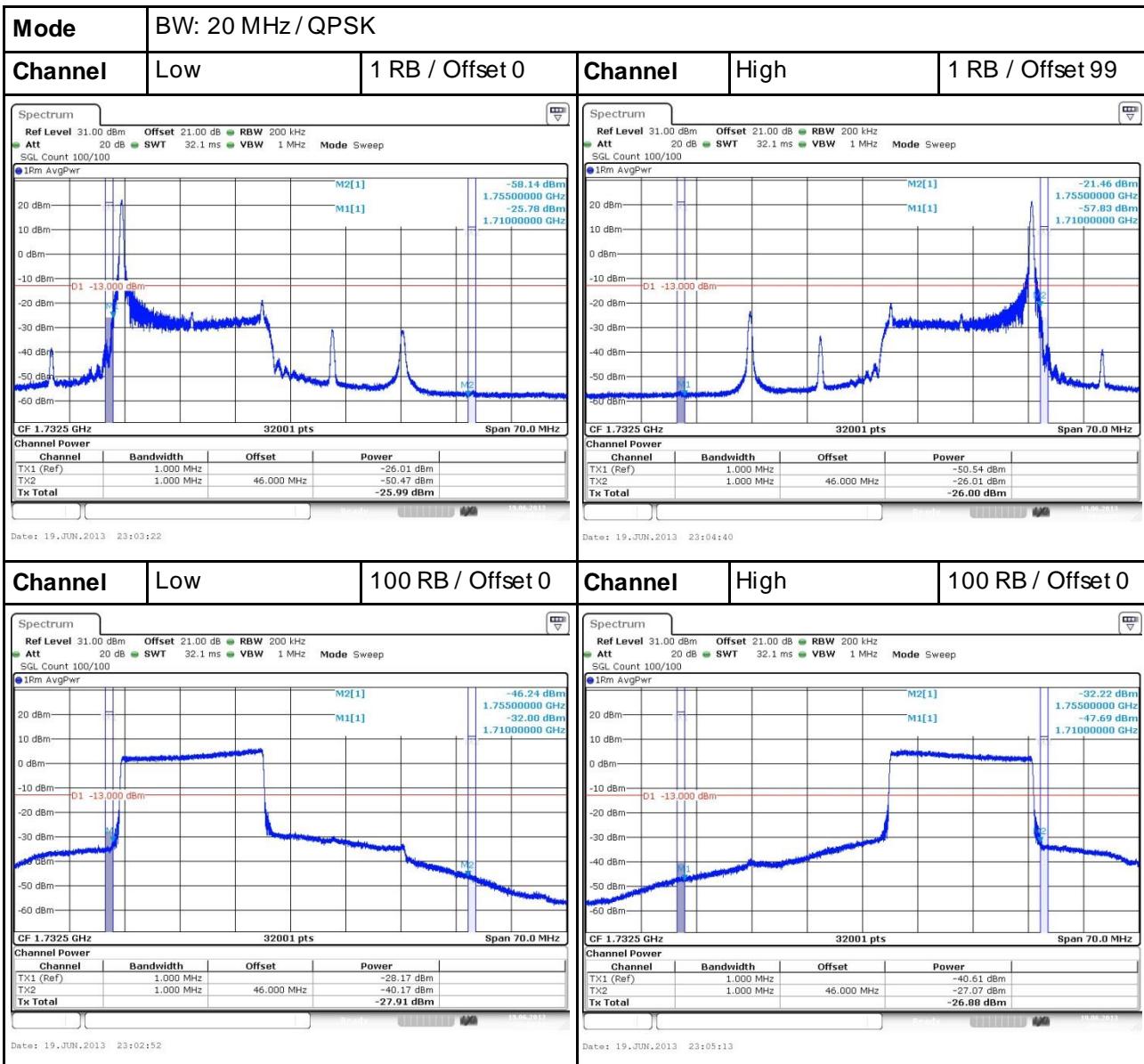


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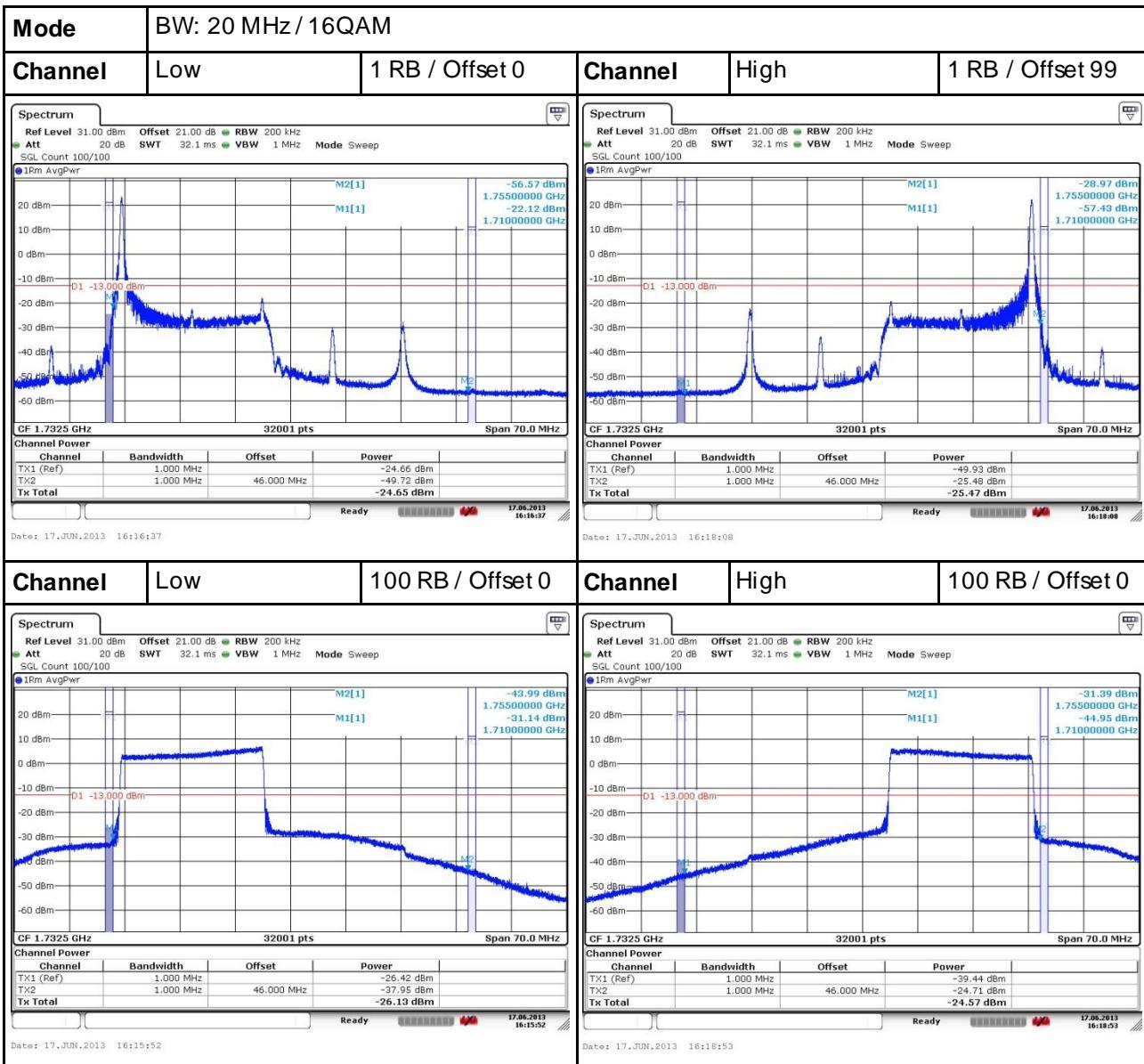


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## 3.5 Occupied Bandwidth

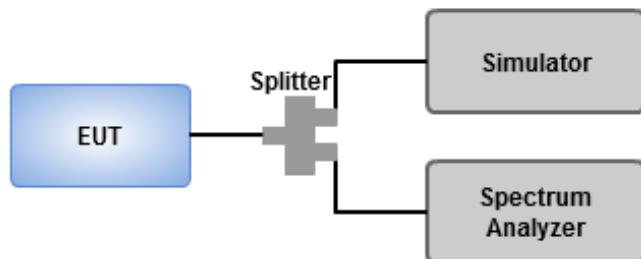
### 3.5.1 Test Procedures

1. Set RBW,VBW as below setting

LTE BW(MHz)	RBW (kHz)	VBW(kHz)
1.4	20	100
3	50	200
5	100	300
10	200	1000
15	200	1000
20	300	1000

2. Detector = Peak, Trace mode = max hold, Sweep = auto couple, Allow the trace to stabilize.
3. Using occupied bandwidth measurement function of spectrum analyzer to measure occupied bandwidth.

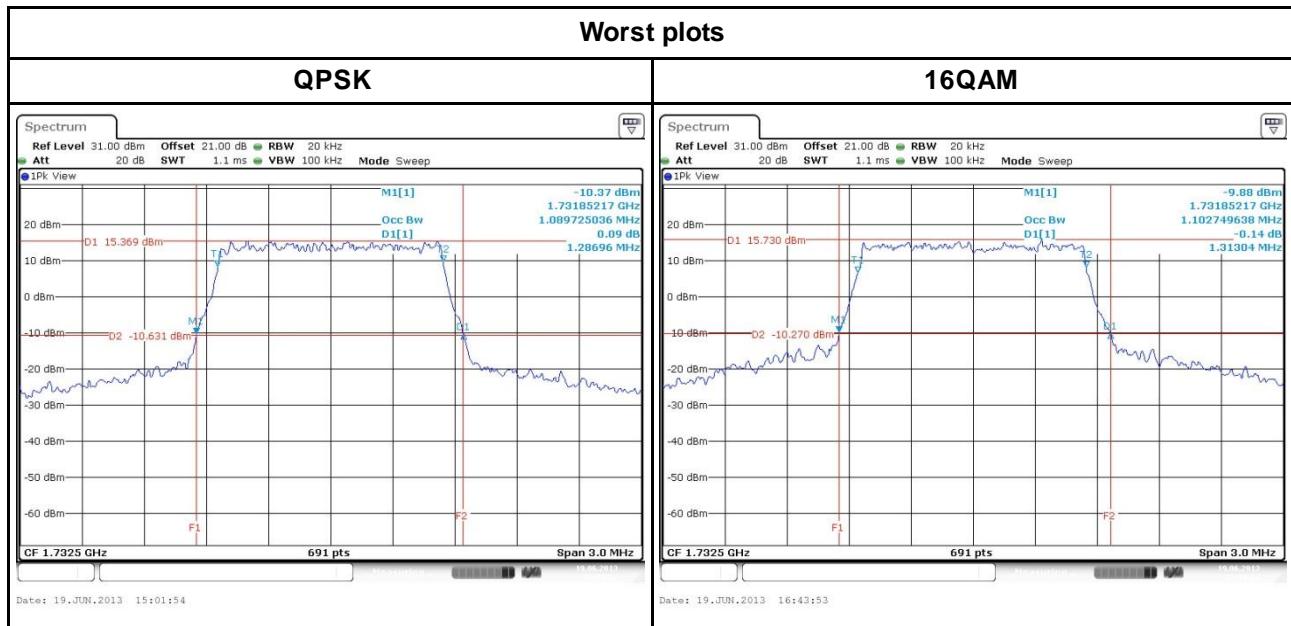
### 3.5.2 Test Setup





### 3.5.3 Test Result of Occupied Bandwidth

BW (MHz)	Modulation	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% OBW (MHz)
1.4	QPSK	19957	1710.7	1.28	1.09
1.4	QPSK	20175	1732.5	1.29	1.09
1.4	QPSK	20393	1754.3	1.29	1.09
1.4	16QAM	19957	1710.7	1.31	1.09
1.4	16QAM	20175	1732.5	1.31	1.10
1.4	16QAM	20393	1754.3	1.29	1.09





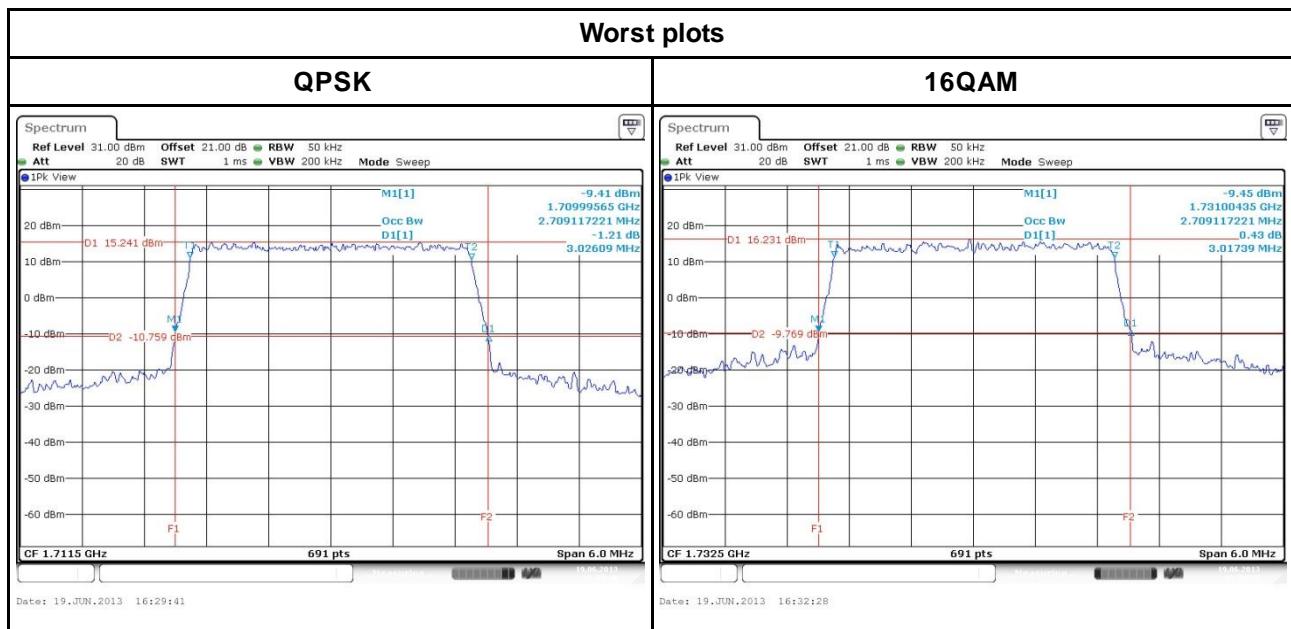
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BW (MHz)	Modulation	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% OBW (MHz)
3	QPSK	19965	1711.5	3.03	2.71
3	QPSK	20175	1732.5	3.02	2.71
3	QPSK	20385	1753.5	3.02	2.71
3	16QAM	19965	1711.5	3.01	2.72
3	16QAM	20175	1732.5	3.02	2.71
3	16QAM	20385	1753.5	3.01	2.70





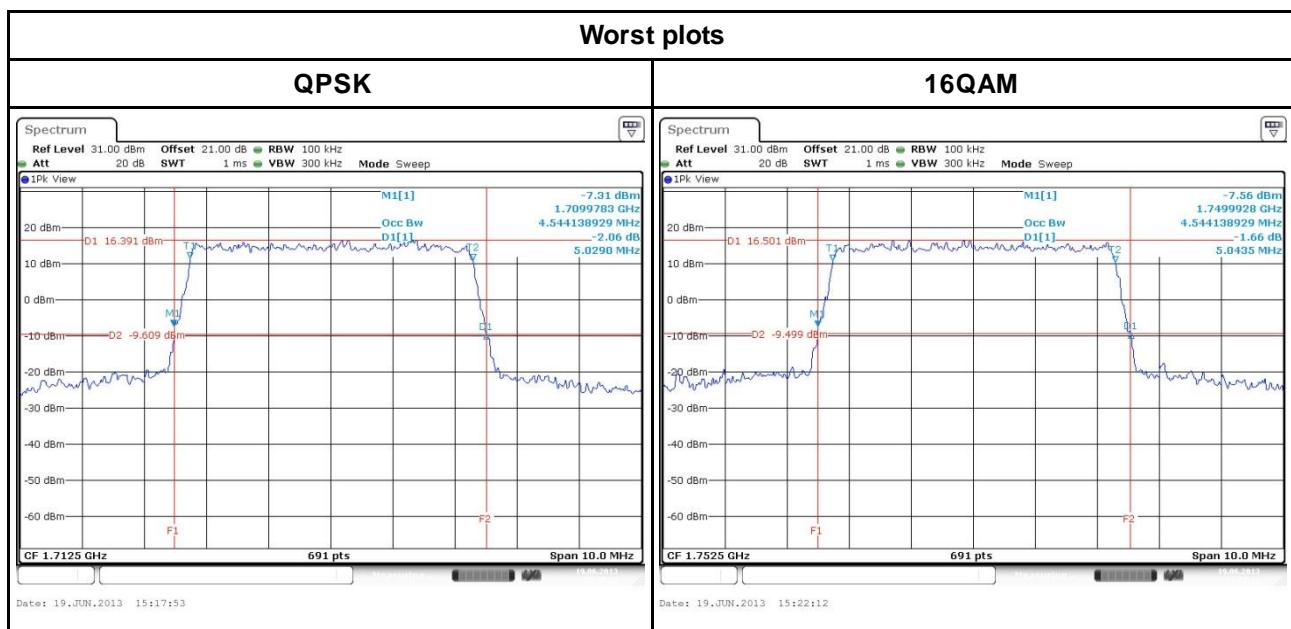
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BW (MHz)	Modulation	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% OBW (MHz)
5	QPSK	19975	1712.5	5.03	4.54
5	QPSK	20175	1732.5	5.01	4.53
5	QPSK	20375	1752.5	5.01	4.53
5	16QAM	19975	1712.5	5.03	4.53
5	16QAM	20175	1732.5	5.03	4.53
5	16QAM	20375	1752.5	5.04	4.54





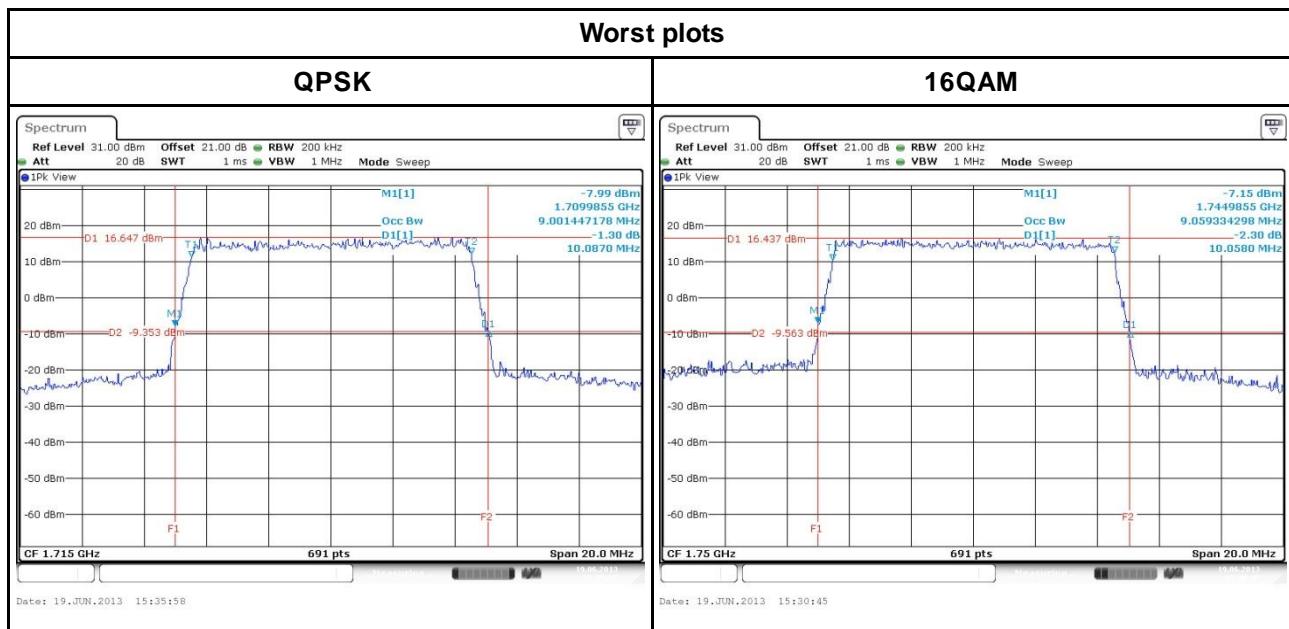
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BW (MHz)	Modulation	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% OBW (MHz)
10	QPSK	20000	1715.0	10.09	9.00
10	QPSK	20175	1732.5	10.03	9.00
10	QPSK	20350	1750.0	10.03	9.03
10	16QAM	20000	1715.0	10.03	9.03
10	16QAM	20175	1732.5	10.03	9.00
10	16QAM	20350	1750.0	10.06	9.06





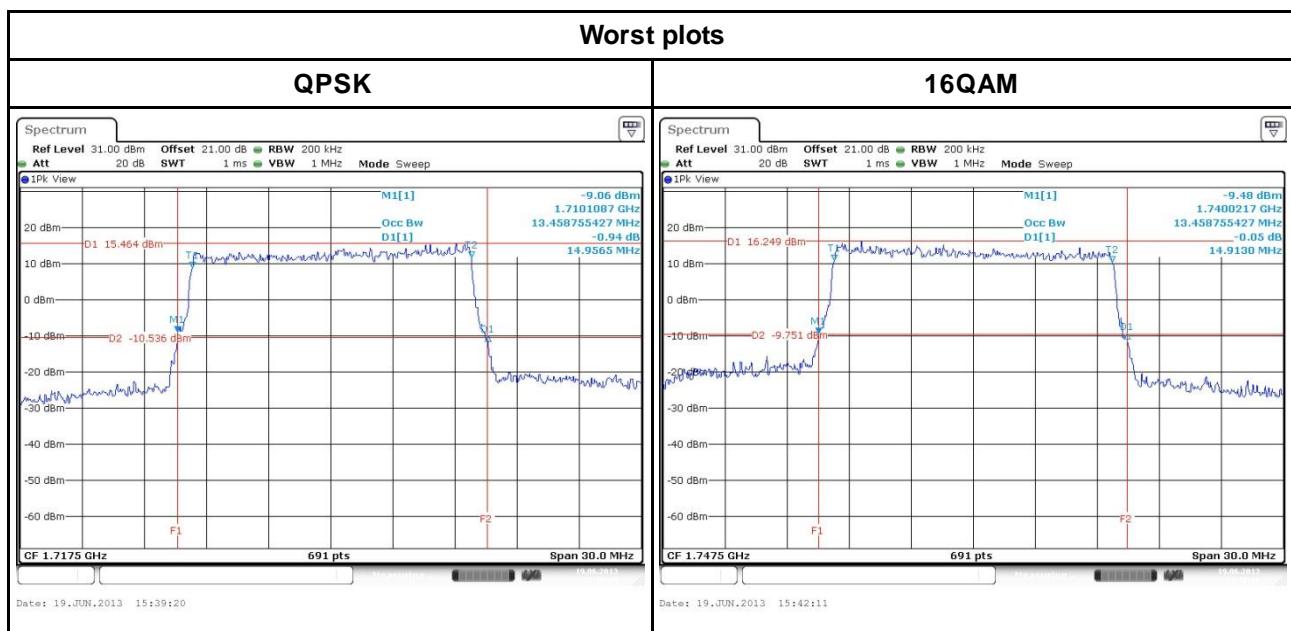
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BW (MHz)	Modulation	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% OBW (MHz)
15	QPSK	20025	1717.5	14.96	13.46
15	QPSK	20175	1732.5	14.83	13.46
15	QPSK	20325	1747.5	14.91	13.46
15	16QAM	20025	1717.5	14.83	13.50
15	16QAM	20175	1732.5	14.78	13.42
15	16QAM	20325	1747.5	14.91	13.46





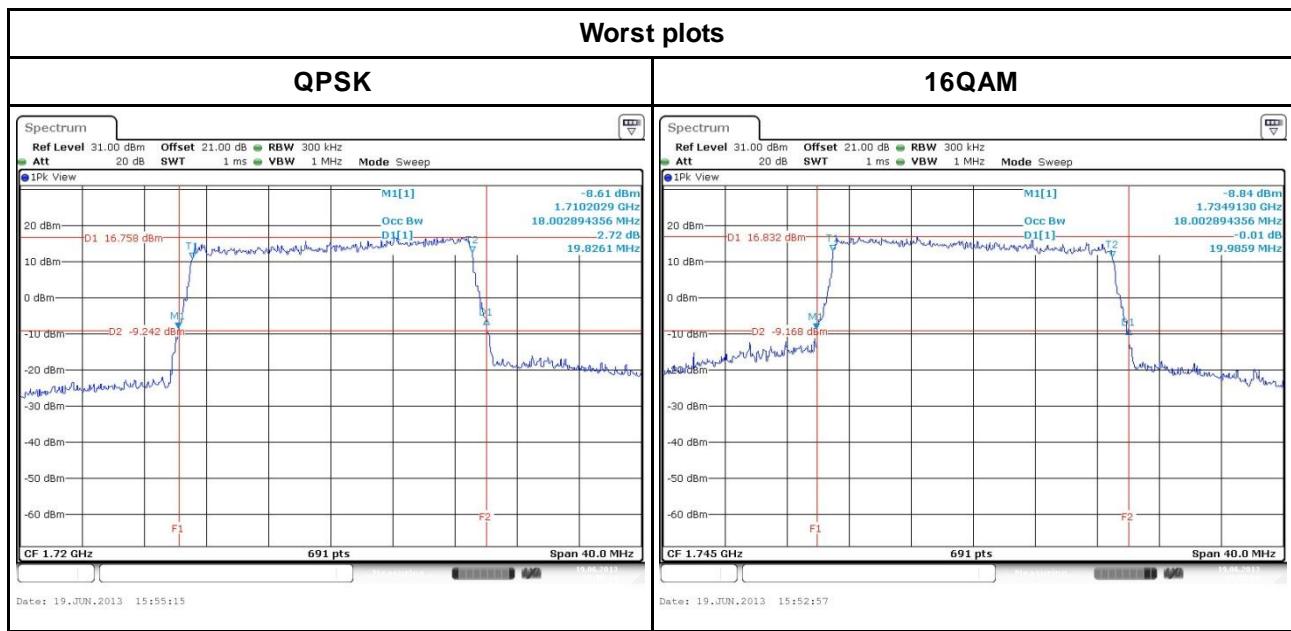
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BW (MHz)	Modulation	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% OBW (MHz)
20	QPSK	20050	1720.0	19.83	18.00
20	QPSK	20175	1732.5	19.71	17.89
20	QPSK	20300	1745.0	19.83	18.00
20	16QAM	20050	1720.0	19.88	18.06
20	16QAM	20175	1732.5	19.77	17.95
20	16QAM	20300	1745.0	19.99	18.00





## 3.6 Frequency Stability

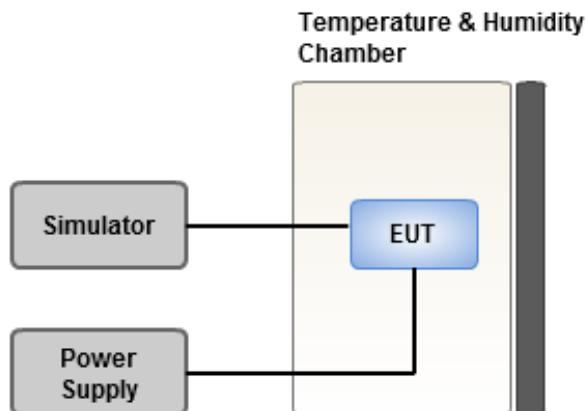
### 3.6.1 Limit of Frequency Stability

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 -30~70°C and voltage range is from lowest to highest working voltage.
4. Tem Linkup EUT and simulator. Confirm frequency drift value of simulator and record it.

### 3.6.3 Test Setup





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### 3.6.4 Test Result of Frequency Stability

Mode	BW: 1.4 MHz	Channel	20175
<b>Frequency Error v.s. VOLTAGE</b>			
Voltage (Volts)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
126.5	19	0.011	2.5
93.5	22	0.013	2.5
<b>Frequency Error v.s. Temperature</b>			
Temperature (°C )	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
70	19	0.011	2.5
60	17	0.010	2.5
50	16	0.009	2.5
40	15	0.009	2.5
30	12	0.007	2.5
20	13	0.008	2.5
10	10	0.006	2.5
0	8	0.005	2.5
-10	9	0.005	2.5
-20	5	0.003	2.5
-30	6	0.003	2.5



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Mode	BW: 3 MHz	Channel	20175
<b>Frequency Error vs. VOLTAGE</b>			
Voltage (Volts)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
126.5	28	0.016	2.5
93.5	25	0.014	2.5
<b>Frequency Error vs. Temperature</b>			
Temperature (°C)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
70	26	0.015	2.5
60	23	0.013	2.5
50	21	0.012	2.5
40	22	0.013	2.5
30	19	0.011	2.5
20	16	0.009	2.5
10	15	0.009	2.5
0	13	0.008	2.5
-10	9	0.005	2.5
-20	7	0.004	2.5
-30	6	0.003	2.5



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Mode	BW: 5 MHz	Channel	20175
<b>Frequency Error vs. VOLTAGE</b>			
Voltage (Volts)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
126.5	26	0.015	2.5
93.5	23	0.013	2.5
<b>Frequency Error vs. Temperature</b>			
Temperature (°C)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
70	25	0.014	2.5
60	23	0.013	2.5
50	22	0.013	2.5
40	20	0.012	2.5
30	18	0.010	2.5
20	17	0.010	2.5
10	16	0.009	2.5
0	14	0.008	2.5
-10	11	0.006	2.5
-20	9	0.005	2.5
-30	8	0.005	2.5



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Mode	BW: 10 MHz	Channel	20175
<b>Frequency Error vs. VOLTAGE</b>			
Voltage (Volts)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
126.5	25	0.014	2.5
93.5	22	0.013	2.5
<b>Frequency Error vs. Temperature</b>			
Temperature (°C)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
70	27	0.016	2.5
60	29	0.017	2.5
50	26	0.015	2.5
40	24	0.014	2.5
30	21	0.012	2.5
20	20	0.012	2.5
10	18	0.010	2.5
0	17	0.010	2.5
-10	15	0.009	2.5
-20	13	0.008	2.5
-30	11	0.006	2.5



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Mode	BW: 15 MHz	Channel	20175
<b>Frequency Error vs. VOLTAGE</b>			
Voltage (Volts)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
126.5	20	0.012	2.5
93.5	23	0.013	2.5
<b>Frequency Error vs. Temperature</b>			
Temperature (°C)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
70	24	0.014	2.5
60	25	0.014	2.5
50	26	0.015	2.5
40	23	0.013	2.5
30	22	0.013	2.5
20	19	0.011	2.5
10	16	0.009	2.5
0	14	0.008	2.5
-10	13	0.008	2.5
-20	11	0.006	2.5
-30	10	0.006	2.5



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Mode	BW: 20 MHz	Channel	20175
<b>Frequency Error vs. VOLTAGE</b>			
Voltage (Volts)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
126.5	25	0.014	2.5
93.5	26	0.015	2.5
<b>Frequency Error vs. Temperature</b>			
Temperature (°C)	Frequency error (Hz)	Frequency error (ppm)	Limit (ppm)
70	27	0.016	2.5
60	25	0.014	2.5
50	23	0.013	2.5
40	26	0.015	2.5
30	22	0.013	2.5
20	20	0.012	2.5
10	19	0.011	2.5
0	17	0.010	2.5
-10	16	0.009	2.5
-20	15	0.009	2.5
-30	12	0.007	2.5



## 3.7 Peak to Average Ratio

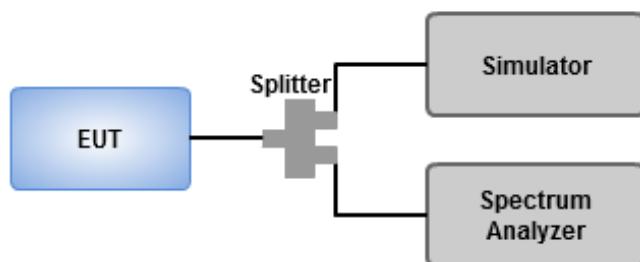
### 3.7.1 Limit of Peak to Average Ratio

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

### 3.7.2 Test Procedures

1. Set the number of counts to a value that stabilizes the measured CCDF curve.
2. Set the measurement interval to 1 ms.
3. Record the maximum PAPR level associated with a probability of 0.1%.

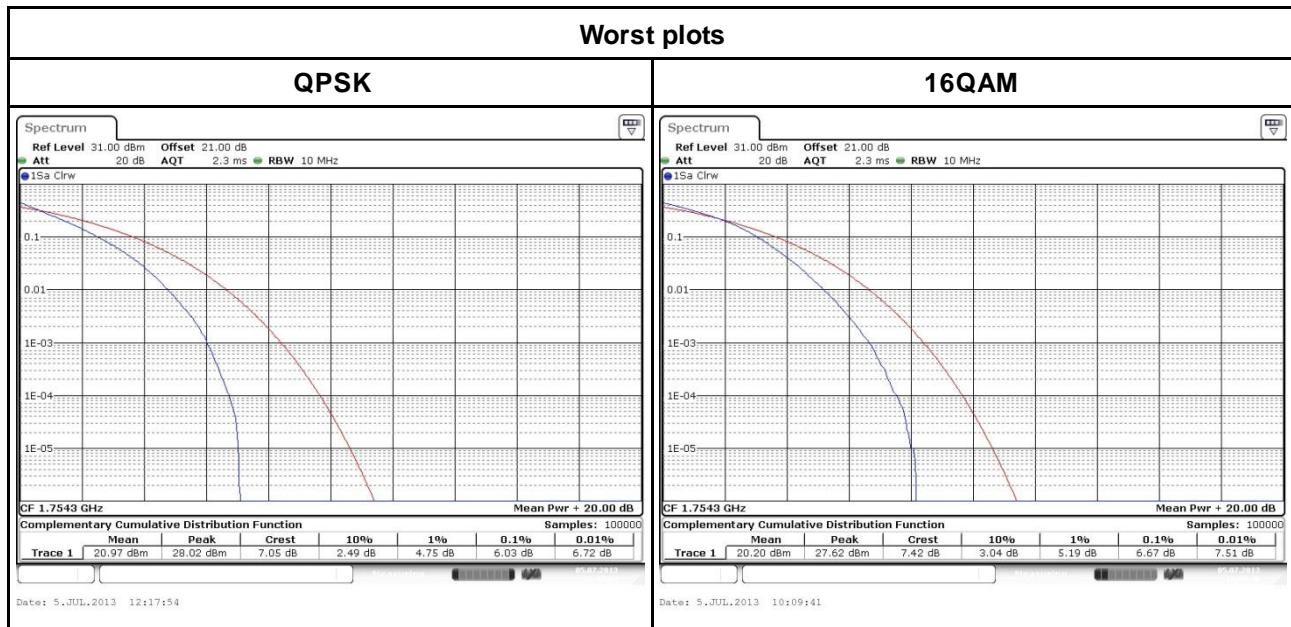
### 3.7.3 Test Setup





### 3.7.4 Test Result of Peak to Average Ratio

BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
1.4	QPSK	19957	1710.7	5.97
1.4	QPSK	20175	1732.5	5.19
1.4	QPSK	20393	1754.3	6.03
1.4	16QAM	19957	1710.7	6.32
1.4	16QAM	20175	1732.5	6.06
1.4	16QAM	20393	1754.3	6.67





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BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
3	QPSK	19965	1711.5	5.77
3	QPSK	20175	1732.5	5.51
3	QPSK	20385	1753.5	6.14
3	16QAM	19965	1711.5	6.70
3	16QAM	20175	1732.5	6.12
3	16QAM	20385	1753.5	6.64





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BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
5	QPSK	19975	1712.5	5.83
5	QPSK	20175	1732.5	5.25
5	QPSK	20375	1752.5	6.32
5	16QAM	19975	1712.5	6.67
5	16QAM	20175	1732.5	6.00
5	16QAM	20375	1752.5	6.46





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BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
10	QPSK	20000	1715.0	5.77
10	QPSK	20175	1732.5	5.39
10	QPSK	20350	1750.0	5.77
10	16QAM	20000	1715.0	6.55
10	16QAM	20175	1732.5	5.94
10	16QAM	20350	1750.0	6.41





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BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
15	QPSK	20025	1717.5	5.28
15	QPSK	20175	1732.5	4.64
15	QPSK	20325	1747.5	5.13
15	16QAM	20025	1717.5	6.29
15	16QAM	20175	1732.5	5.77
15	16QAM	20325	1747.5	6.12





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BW (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
20	QPSK	20050	1720.0	4.64
20	QPSK	20175	1732.5	4.06
20	QPSK	20300	1745.0	4.32
20	16QAM	20050	1720.0	6.06
20	16QAM	20175	1732.5	5.65
20	16QAM	20300	1745.0	5.88



—END—