4.5 Channel Edge Measurement

4.5.1 Limits of Band Edge Measurement

For WCDMA Band 4, LTE Band 4, 66
According to FCC 27.53(h) for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log (P) dB.

For LTE Band 41
According to FCC 27.53(m)(4) specified that power of any emission outside of the channel edge must be attenuated below the transmitting power (P) by a factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed.

For LTE Band 12
According to FCC 27.53(g) for operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater.

For LTE Band 13
According to FCC 27.53(c)(2) for on any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

According to 27.53(c)(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations

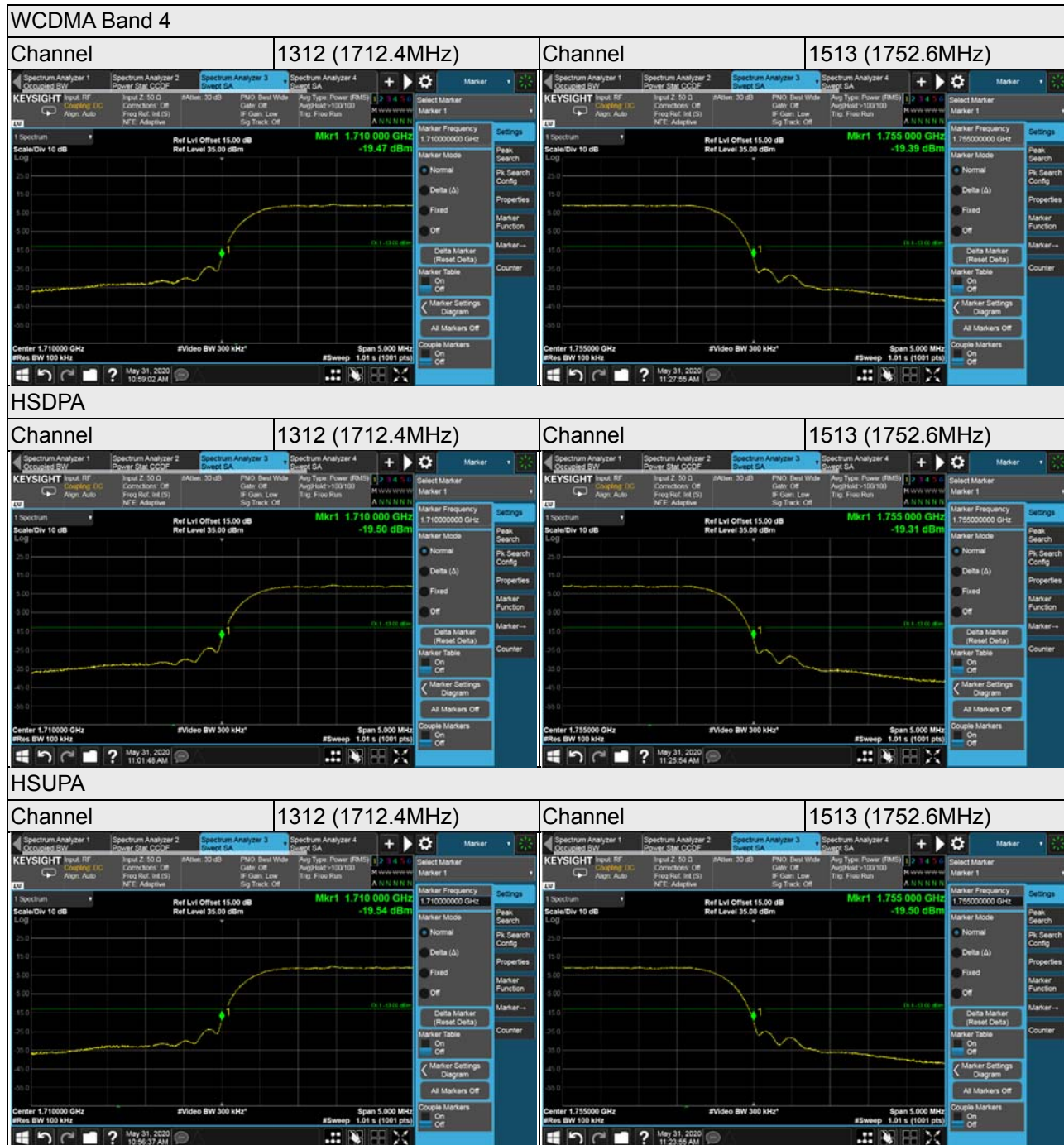### 4.5.2 Test Setup
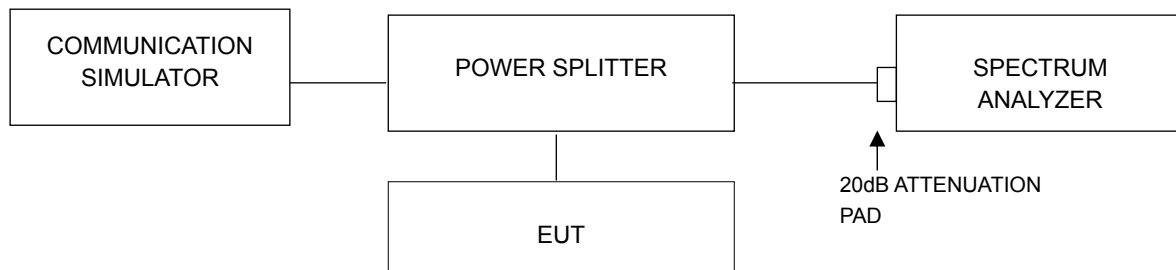
4.5.3 Test Procedures

a. The EUT was set up for the rated peak power. The power was measured with Spectrum Analyzer. Band edge measurements were done at 3 channels: low, middle and high operational frequency range. Emission mask measurements were done at 2 channels: low and high operational frequency range.

b. The center frequency of spectrum is the band edge frequency and span is 5MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (WCDMA / HSDPA / HSUPA).

c. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 30kHz and VB of the spectrum is 100kHz (LTE Channel Bandwidth 1.4MHz / 3MHz).

d. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 51kHz and VB of the spectrum is 160kHz (LTE Channel Bandwidth 5MHz).

e. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (LTE Channel Bandwidth 10MHz).

f. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 150kHz and VB of the spectrum is 470kHz (LTE Channel Bandwidth 15MHz).

g. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 200kHz and VB of the spectrum is 1MHz (LTE Channel Bandwidth 20MHz).

h. Except LTE Band 12 measurement procedure refer 27.53(g).

i. LTE Band 41 operations in the 5 MHz and 10 MHz channel BW mode, extend the 1% range from 1M to 2M above and below the channel edge. As an alternative, the highest power level measured in a narrower RBW (relative to the specified reference bandwidth) can be scaled by applying a correction factor determined from: 10 log [(reference bandwidth) / (resolution or measurement bandwidth)] measurement procedure refer to ANSI 63.26 section 5.7.2 a)

j. Record the max trace plot into the test report.

4.5.4 Test Results

WCDMA Band 4			
Channel	1312 (1712.4MHz)	Channel	1513 (1752.6MHz)

HSDPA			
Channel	1312 (1712.4MHz)	Channel	1513 (1752.6MHz)

HSUPA			
Channel	1312 (1712.4MHz)	Channel	1513 (1752.6MHz)

LTE Band 4

Channel Bandwidth: 1.4MHz						

Channel 19957 (1710.7MHz)	QPSK	1 RB / 0 RB Offset		Channel 20393 (1754.3MHz)	QPSK	1 RB / 5 RB Offset
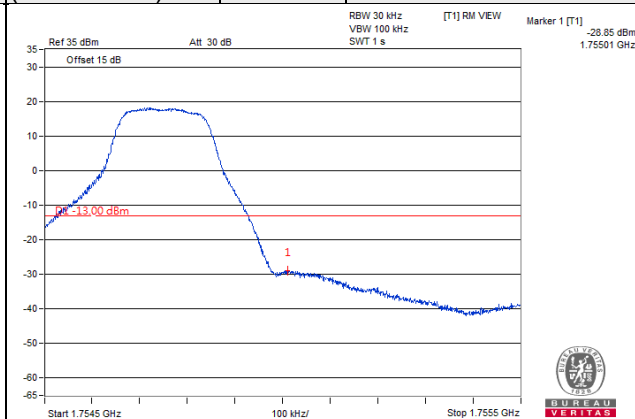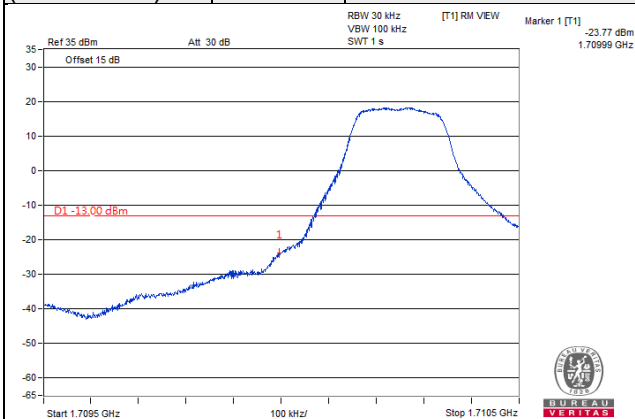
Channel 19957 (1710.7MHz)	QPSK	6 RB / 0 RB Offset		Channel 20393 (1754.3MHz)	QPSK	6 RB / 0 RB Offset
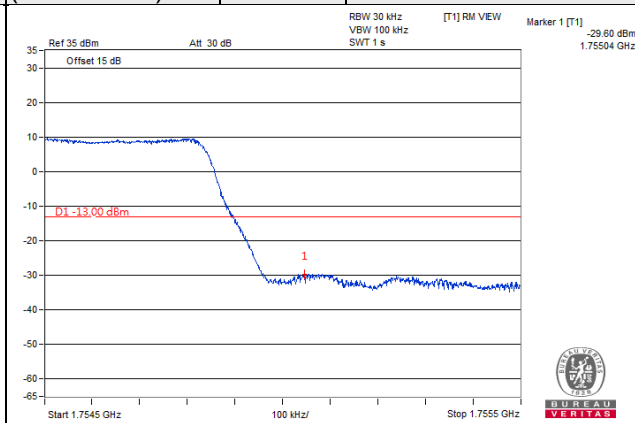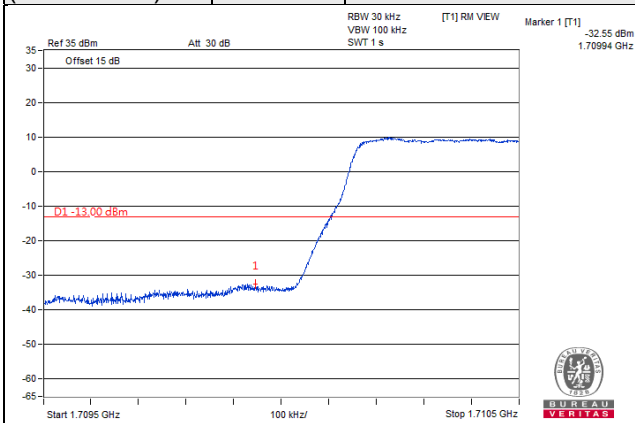
Channel Bandwidth: 3MHz						
Channel 19965 (1711.5MHz)	QPSK	1 RB / 0 RB Offset		Channel 20385 (1753.5MHz)	QPSK	1 RB / 14 RB Offset
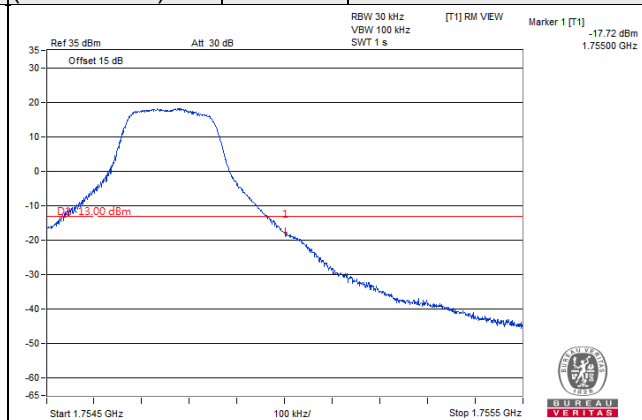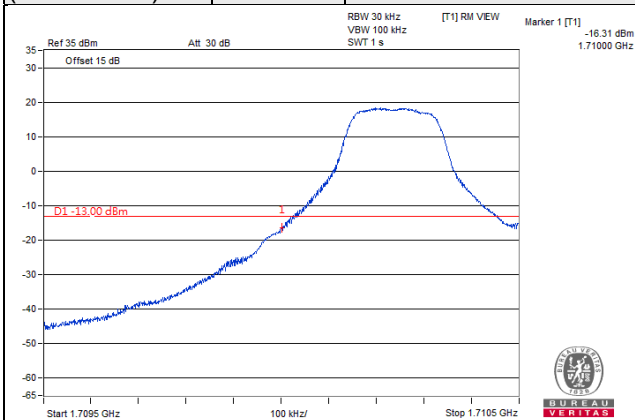
Channel 19965 (1711.5MHz)	QPSK	15 RB / 0 RB Offset		Channel 20385 (1753.5MHz)	QPSK	15 RB / 0 RB Offset
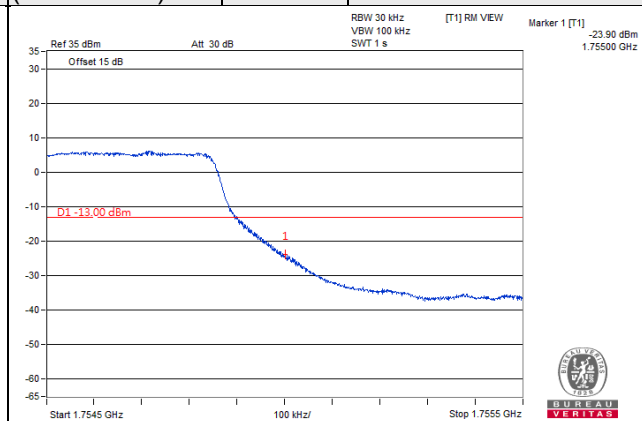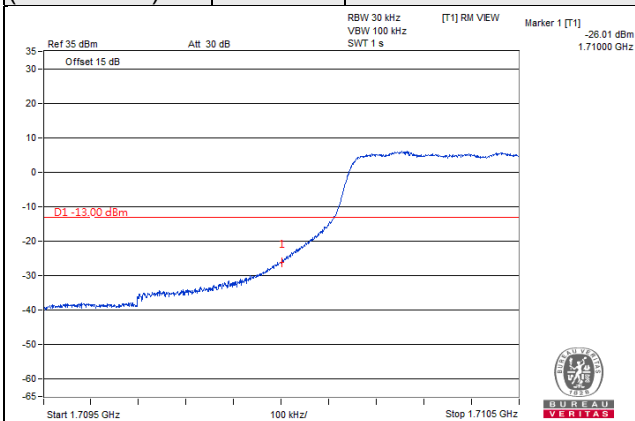
Channel Bandwidth: 5MHz						
Channel 19975 (1712.5MHz)	QPSK	1 RB / 0 RB Offset		Channel 20375 (1752.5MHz)	QPSK	1 RB / 24 RB Offset
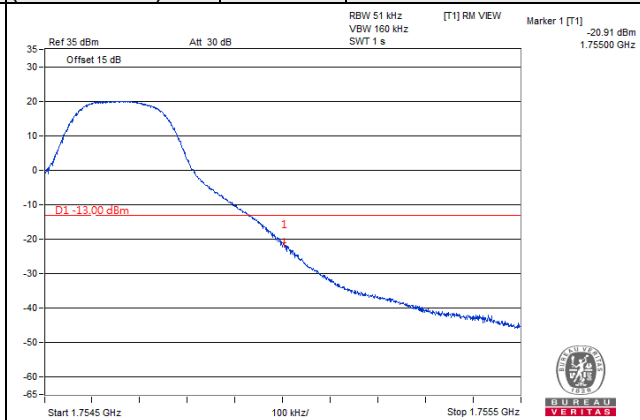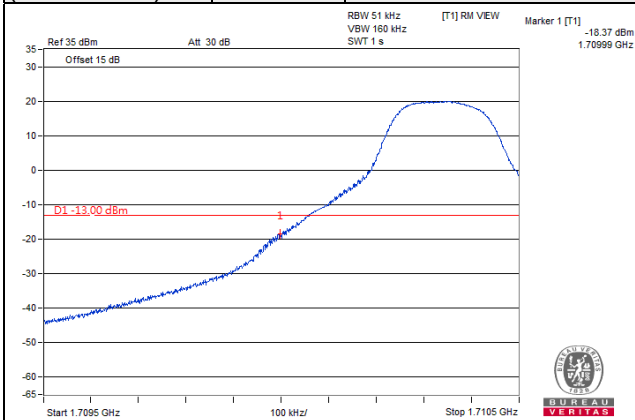
Channel 19975 (1712.5MHz)	QPSK	25 RB / 0 RB Offset		Channel 20375 (1752.5MHz)	QPSK	25 RB / 0 RB Offset
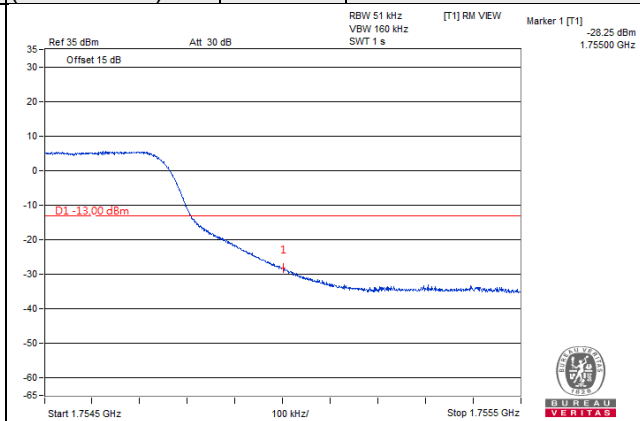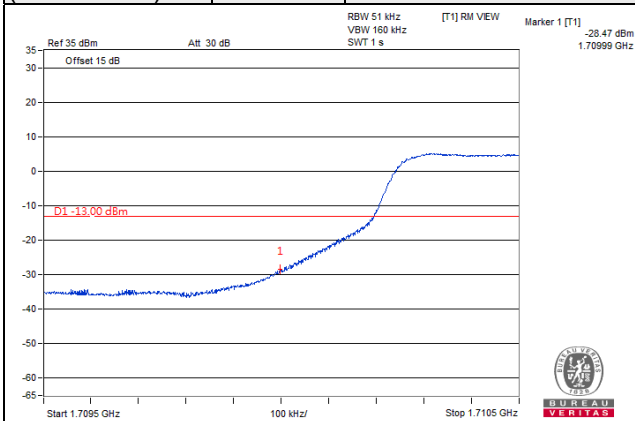
Channel Bandwidth: 10MHz						
Channel 20000 (1715.0MHz)	QPSK	1 RB / 0 RB Offset		Channel 20350 (1750.0MHz)	QPSK	1 RB / 49 RB Offset
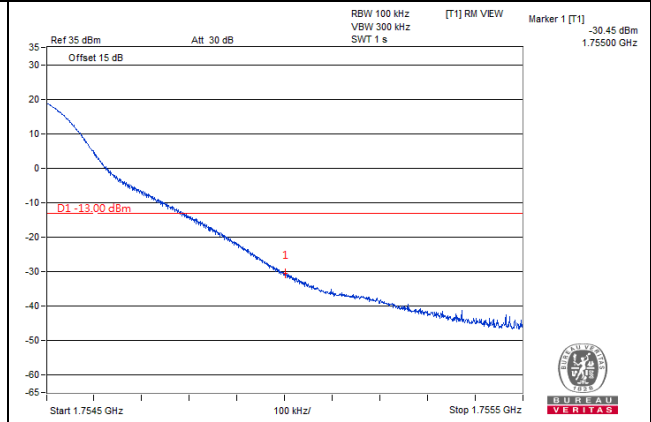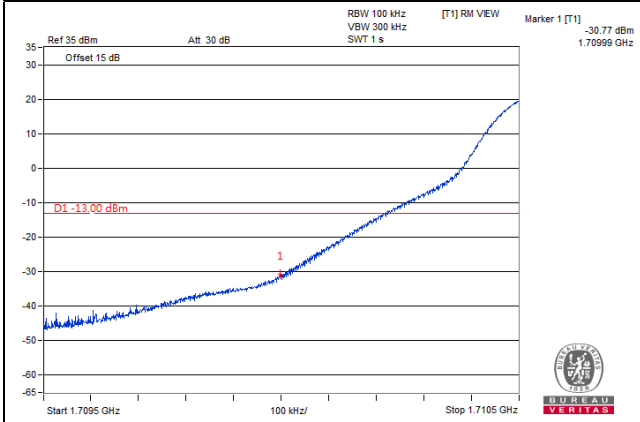
Channel 20000 (1715.0MHz)	QPSK	50 RB / 0 RB Offset		Channel 20350 (1750.0MHz)	QPSK	50 RB / 0 RB Offset
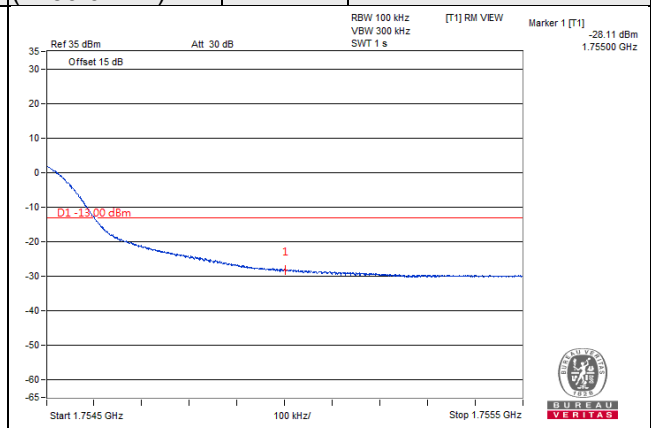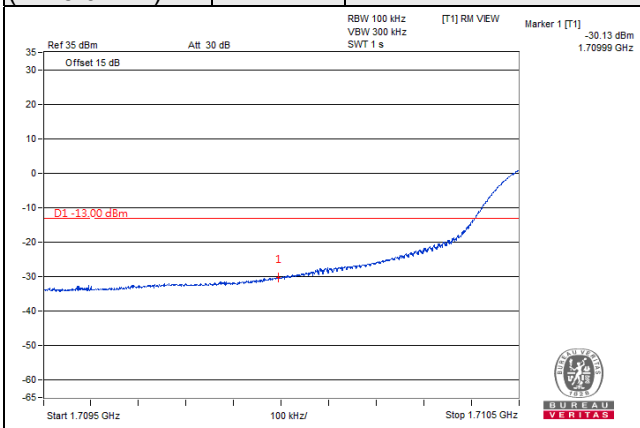
Channel Bandwidth: 15MHz						
Channel 20025 (1717.5MHz)	QPSK	1 RB / 0 RB Offset		Channel 20325 (1747.5MHz)	QPSK	1 RB / 74 RB Offset
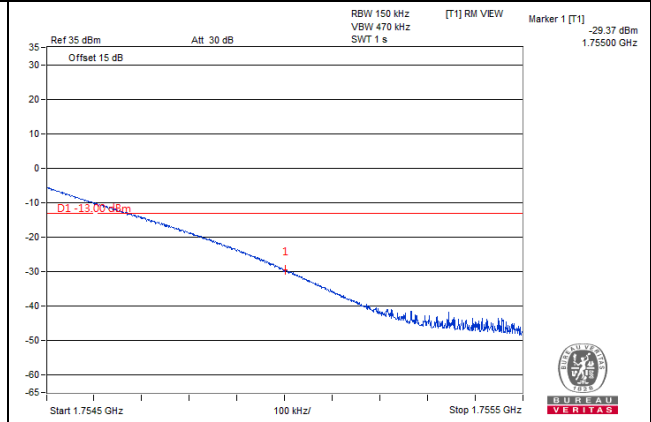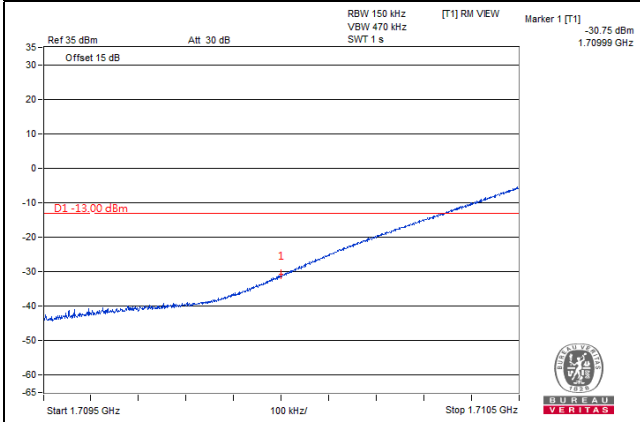
Channel 20025 (1717.5MHz)	QPSK	75 RB / 0 RB Offset		Channel 20325 (1747.5MHz)	QPSK	75 RB / 0 RB Offset
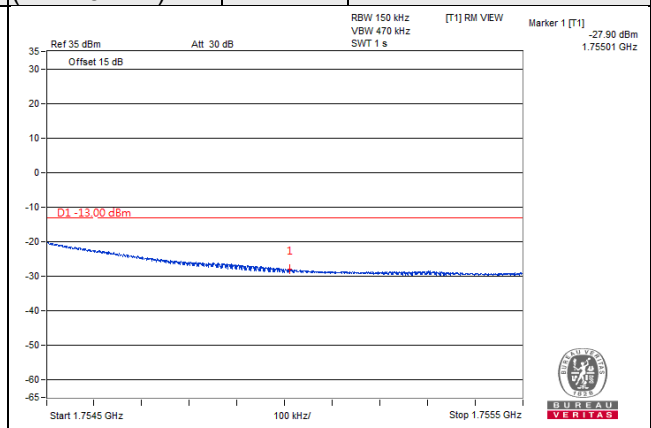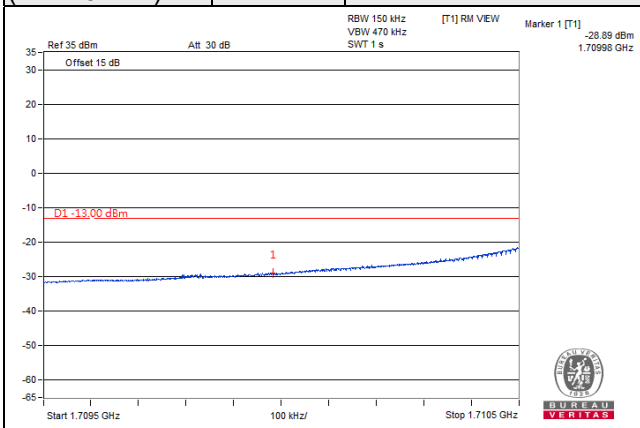
Channel Bandwidth: 20MHz						
Channel 20050 (1720.0MHz)	QPSK	1 RB / 0 RB Offset		Channel 20300 (1745.0MHz)	QPSK	1 RB / 99 RB Offset
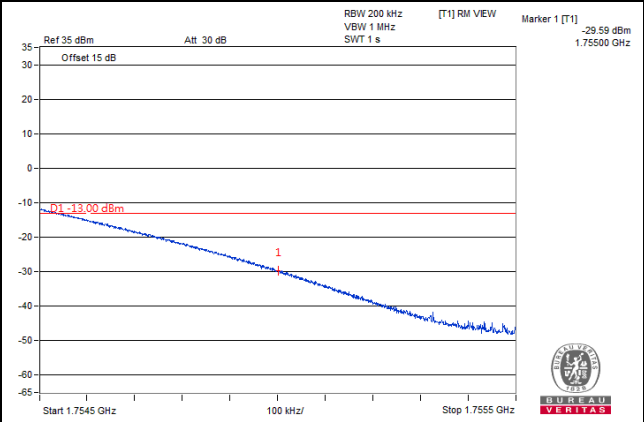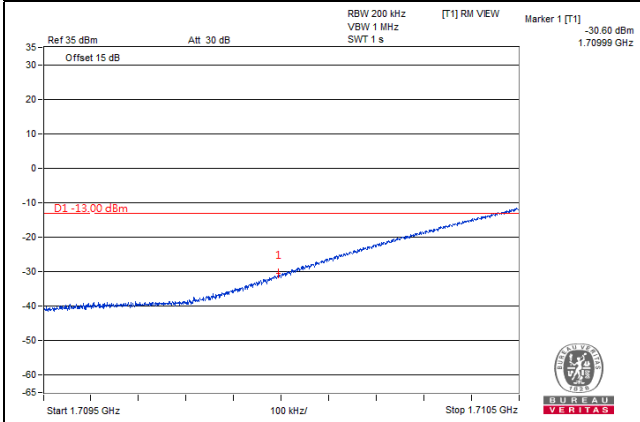
Channel 20050 (1720.0MHz)	QPSK	100 RB / 0 RB Offset		Channel 20300 (1745.0MHz)	QPSK	100 RB / 0 RB Offset
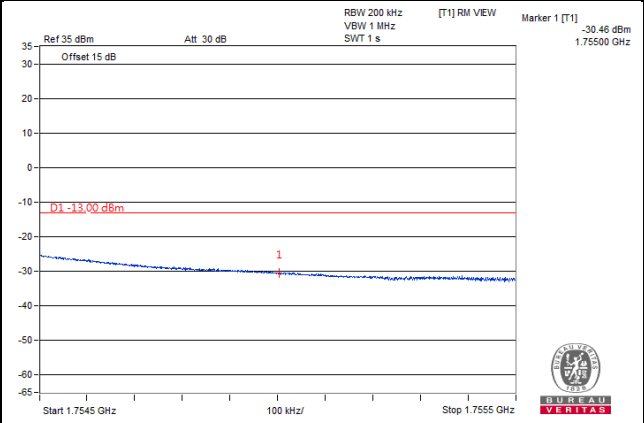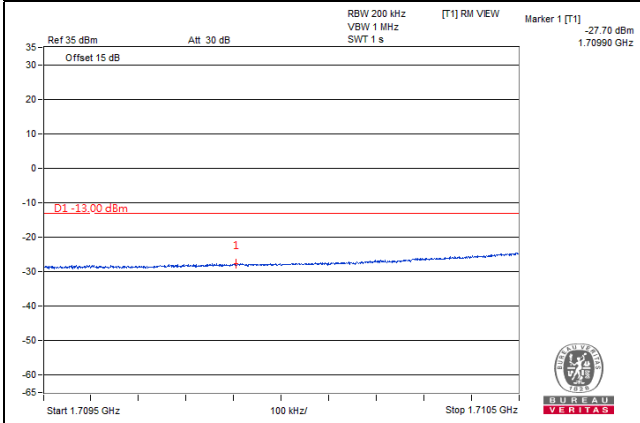
LTE Band 12

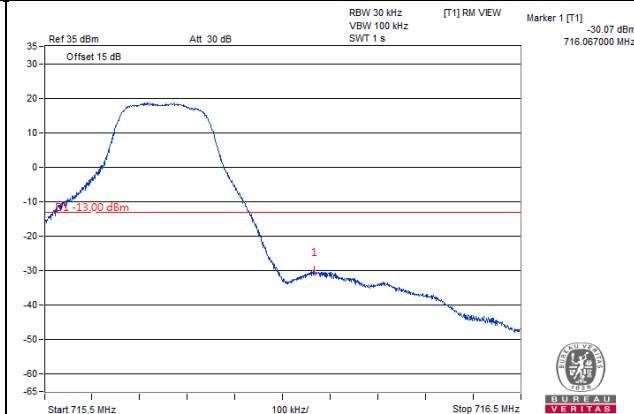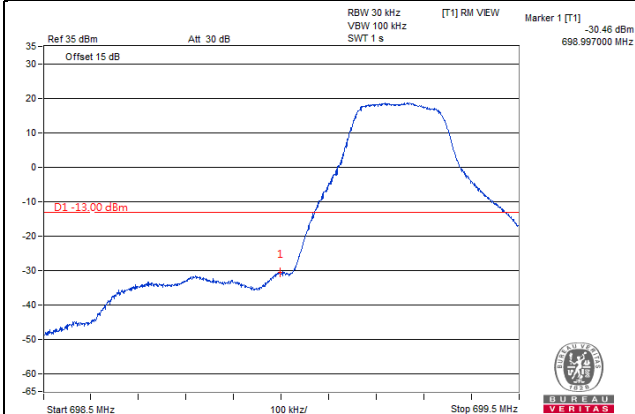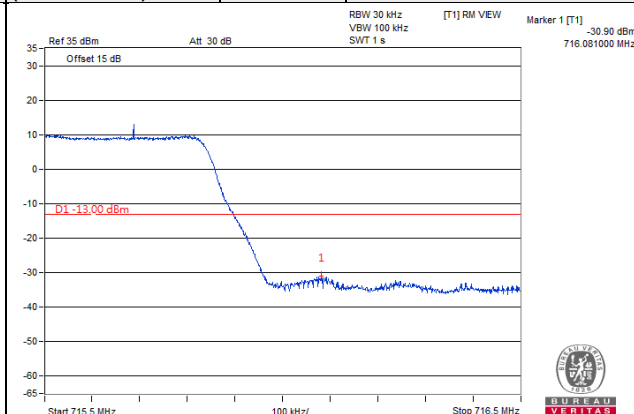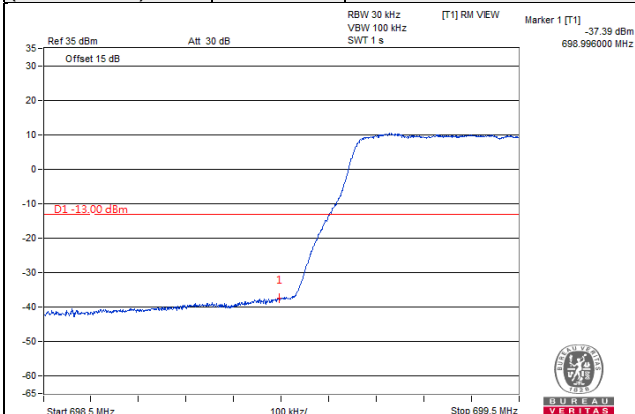| Channel Bandwidth: 1.4MHz						
Channel 23017 (699.7MHz)	QPSK	1 RB / 0 RB Offset		Channel 23173 (715.3MHz)	QPSK	1 RB / 5 RB Offset

Channel 23017 (699.7MHz)	QPSK	6 RB / 0 RB Offset		Channel 23173 (715.3MHz)	QPSK	6 RB / 0 RB Offset

Channel Bandwidth: 3MHz					
Channel 23025 (700.5MHz)	QPSK	1 RB / 0 RB Offset	Channel 23165 (714.5MHz)	QPSK	1 RB / 14RB Offset
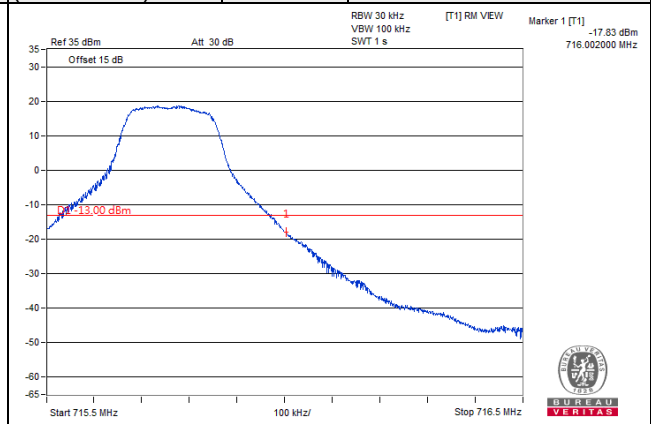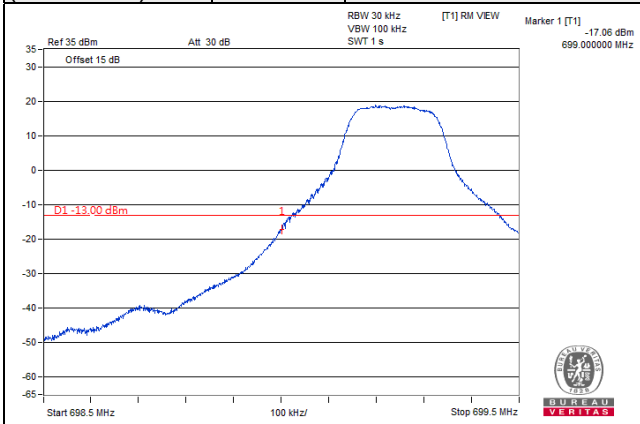
Channel 23025 (700.5MHz)	QPSK	15 RB / 0 RB Offset	Channel 23165 (714.5MHz)	QPSK	15 RB / 0 RB Offset
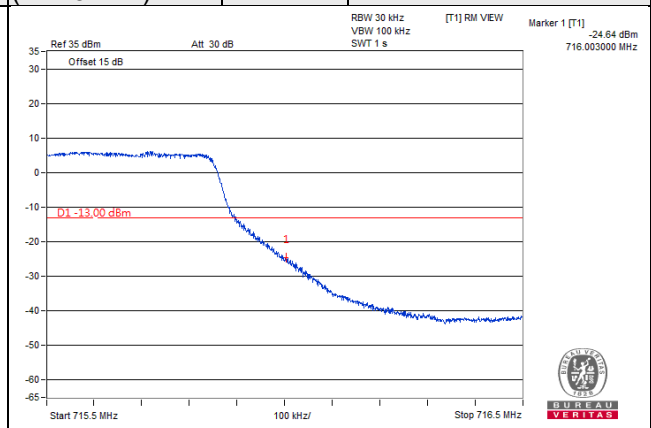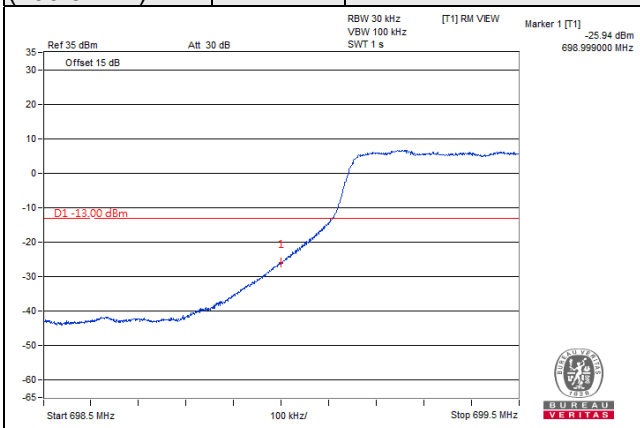
Channel Bandwidth: 5MHz						
Channel 23035 (701.5MHz)	QPSK	1 RB / 0 RB Offset		Channel 23155 (713.5MHz)	QPSK	1 RB / 24RB Offset
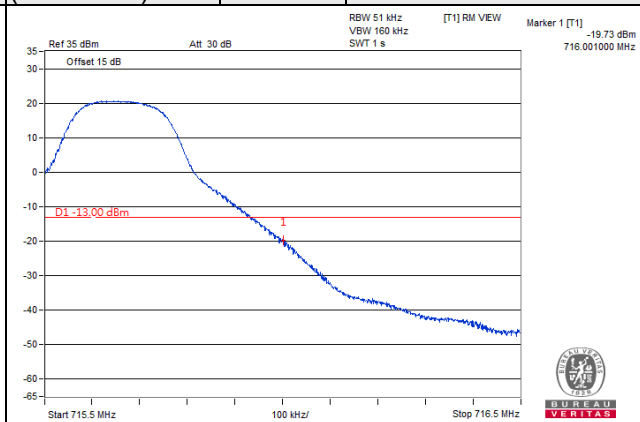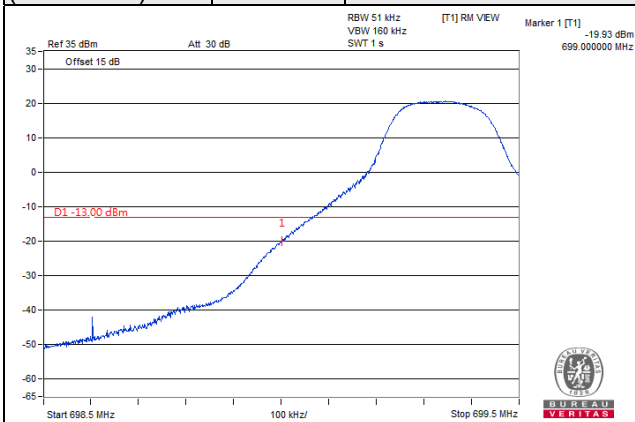
Channel 23035 (701.5MHz)	QPSK	25 RB / 0 RB Offset		Channel 23155 (713.5MHz)	QPSK	25 RB / 0 RB Offset
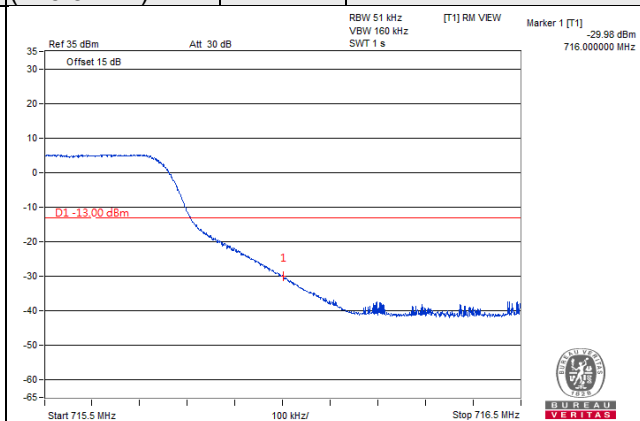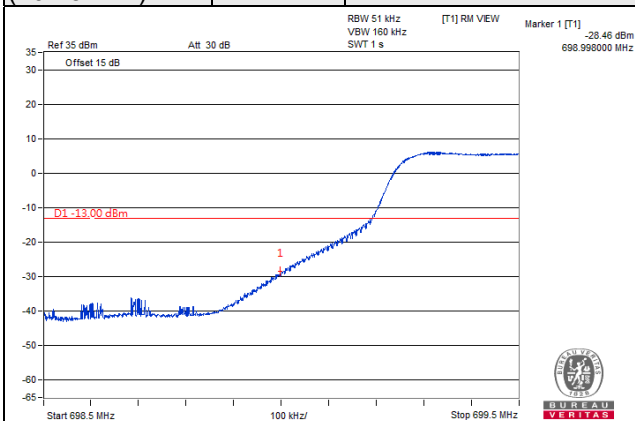
Channel Bandwidth: 10MHz						
Channel 23060 (704MHz)	QPSK	1 RB / 0 RB Offset		Channel 23130 (711MHz)	QPSK	1 RB / 24RB Offset
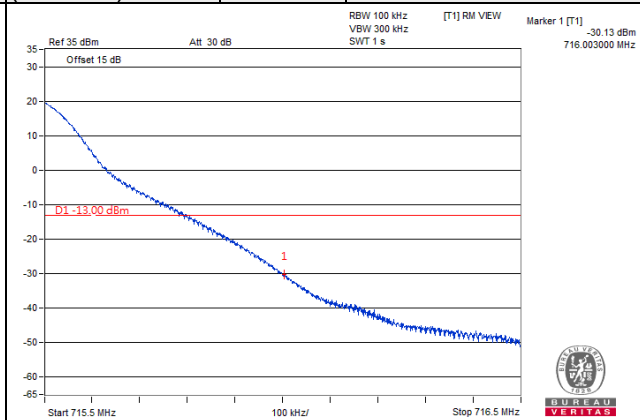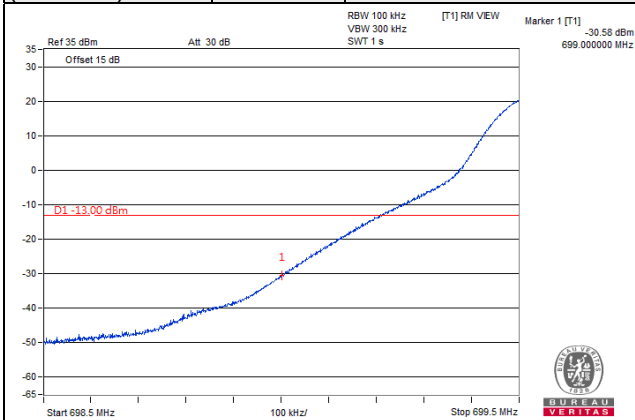
Channel 23060 (704MHz)	QPSK	50 RB / 0 RB Offset		Channel 23130 (711MHz)	QPSK	25 RB / 0 RB Offset
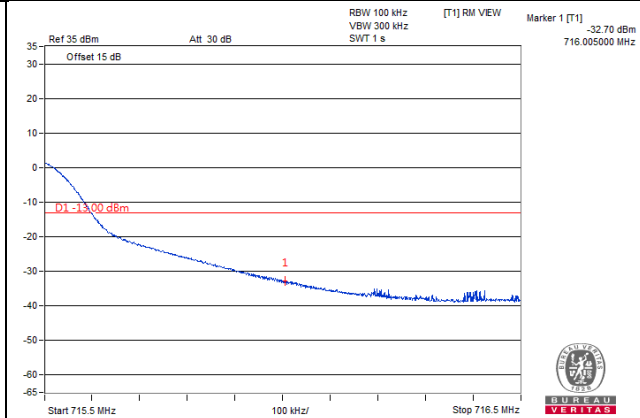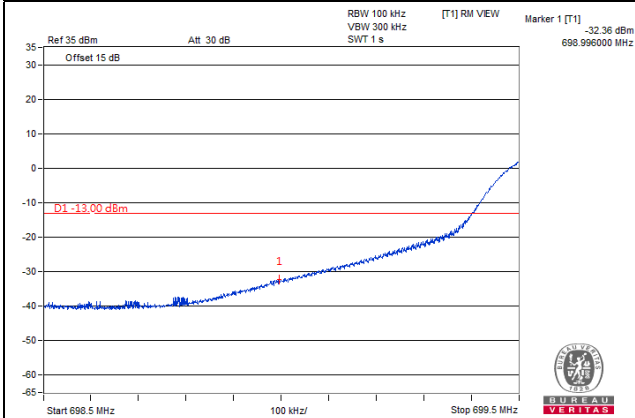
LTE Band 13

Channel Bandwidth: 5MHz		
Channel 23205 (779.5MHz)	QPSK	1 RB / 0 RB Offset
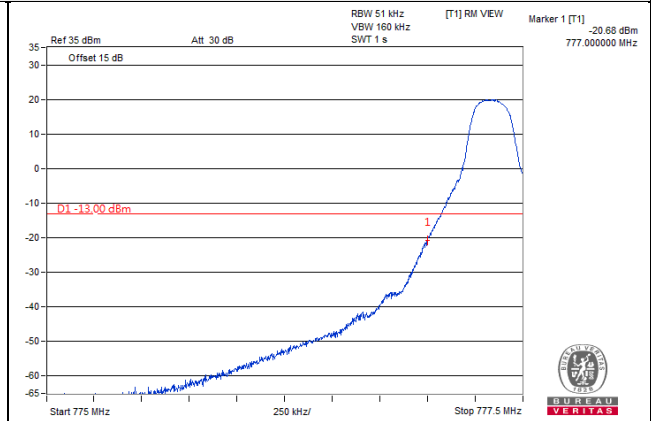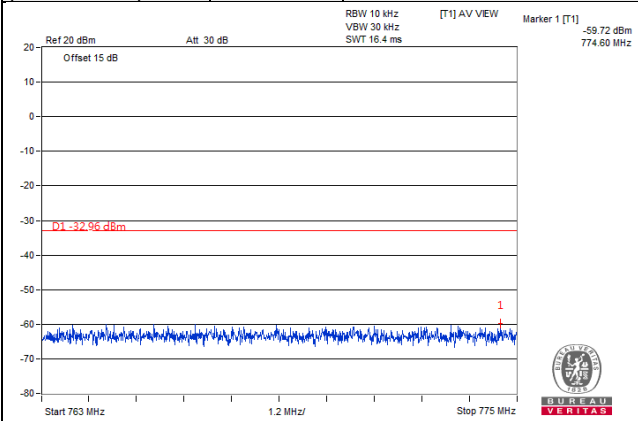
Channel 23205 (779.5MHz)	QPSK	25 RB / 0 RB Offset
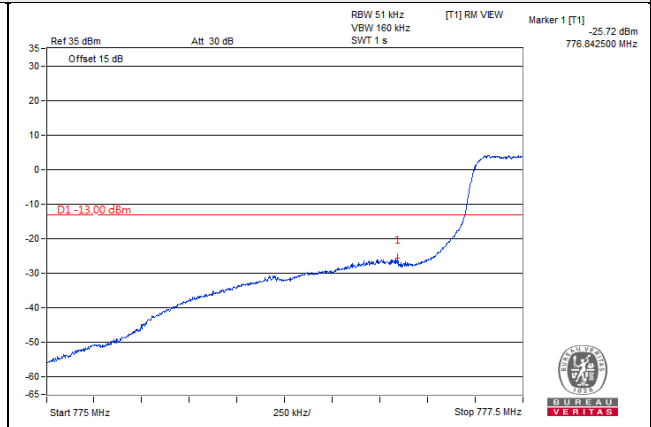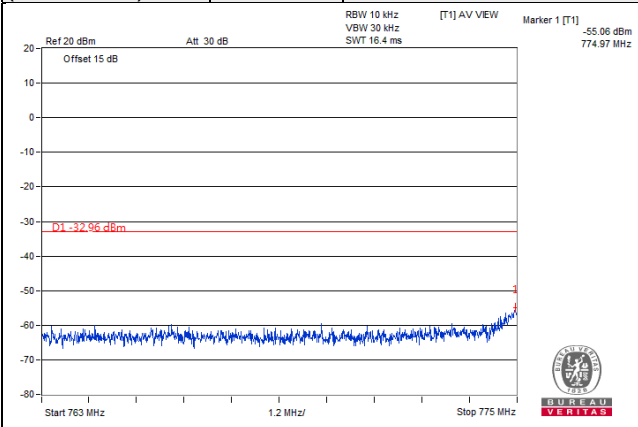
Note: For the 763 - 775 MHz and 793 - 805 MHz band, the FCC by a factor not less 65+10log(P[watt]) in a 6.25 kHz band segment. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer. And Limit line is -35 dBm.

Channel Bandwidth: 5MHz		
Channel 23255 (784.5MHz)	QPSK	1 RB / 24 RB Offset

Channel 23255 (784.5MHz)	QPSK	25 RB / 0 RB Offset

Note: For the 763 - 775 MHz and 793 - 805 MHz band, the FCC by a factor not less 65+10log(P[watt]) in a 6.25 kHz band segment. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer. And Limit line is -35 dBm.

Channel Bandwidth: 10MHz		
Channel 23230 (782.0MHz)	QPSK	1 RB / 0 RB Offset

Channel 23230 (782.0MHz)	QPSK	50 RB / 0 RB Offset

Note: For the 763 - 775 MHz and 793 - 805 MHz band, the FCC by a factor not less 65+10log(P[watt]) in a 6.25 kHz band segment. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer. And Limit line is -35 dBm.

Channel Bandwidth: 10MHz		
Channel 23230 (782.0MHz)	QPSK	1 RB / 49 RB Offset
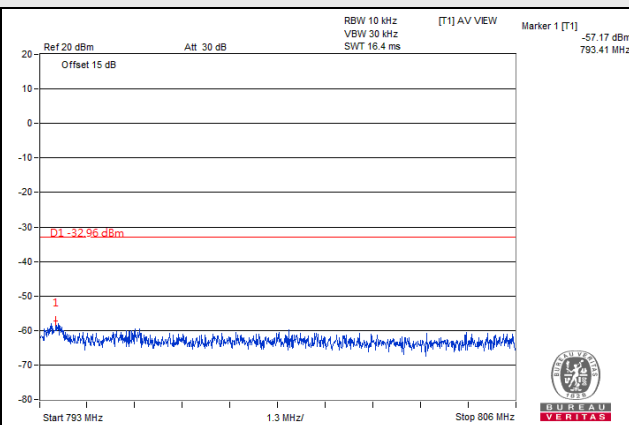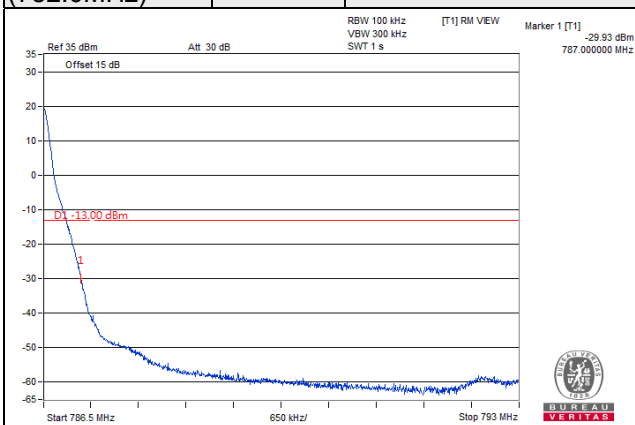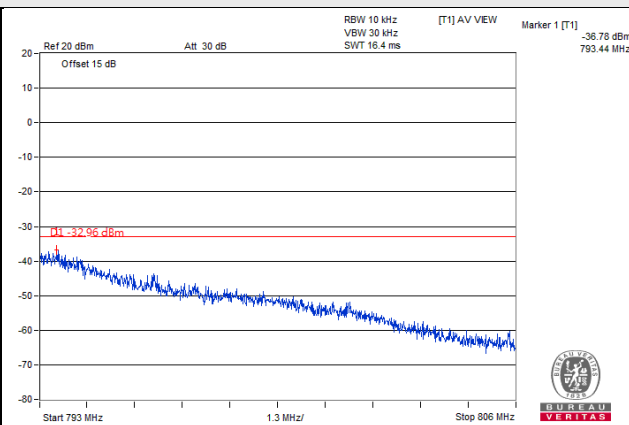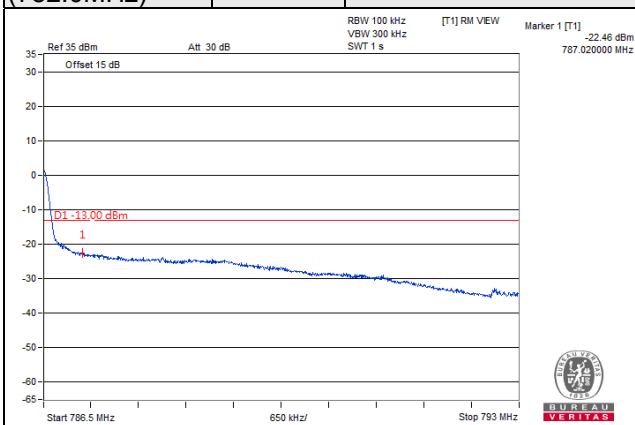
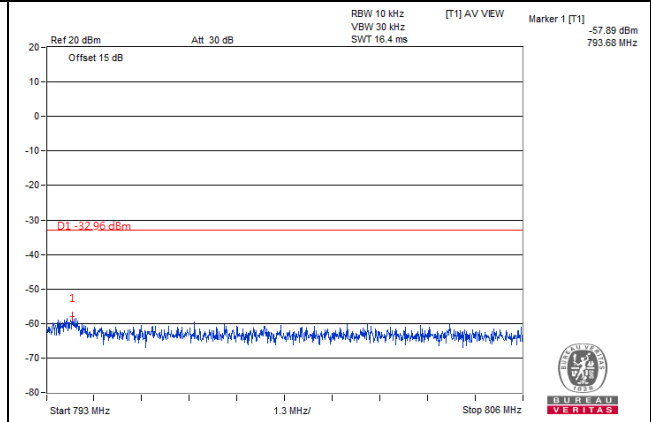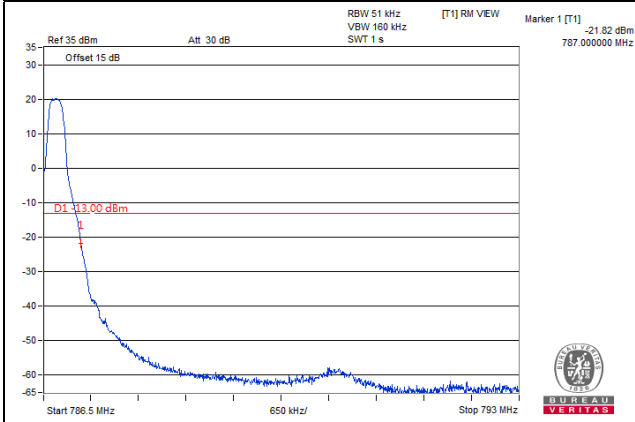| Channel 23230 (782.0MHz)	QPSK	50 RB / 0 RB Offset

Note: For the 763 - 775 MHz and 793 - 805 MHz band, the FCC by a factor not less 65+10log(P[watt]) in a 6.25 kHz band segment. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer. And Limit line is -35 dBm.

LTE Band 41
Emission Mask:

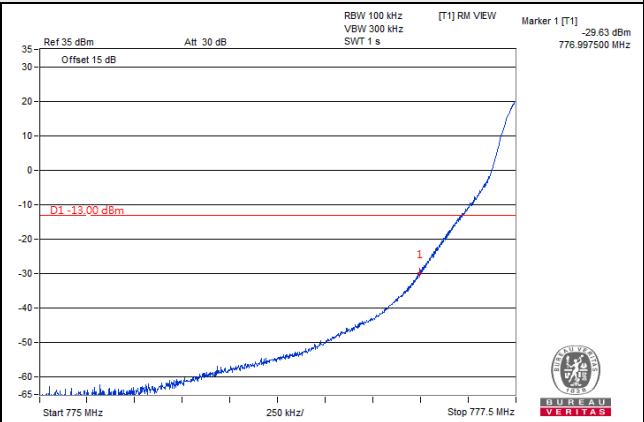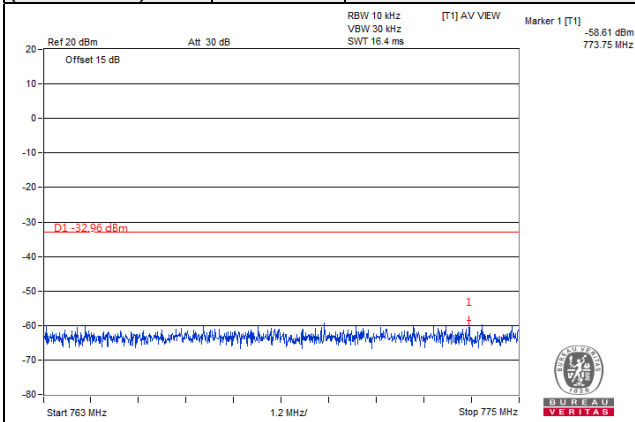| Channel Bandwidth: 5MHz					
Channel 39675 (2498.5MHz)	QPSK	1 RB / 0 RB Offset	Channel 40620 (2593.0MHz)	QPSK	1 RB / 0 RB Offset

Channel 39675 (2498.5MHz)	QPSK	1 RB / 24 RB Offset	Channel 40620 (2593.0MHz)	QPSK	1 RB / 24 RB Offset

Channel 39675 (2498.5MHz)	QPSK	25 RB / 0 RB Offset	Channel 40620 (2593.0MHz)	QPSK	25 RB / 0 RB Offset

Channel Bandwidth: 5MHz					
Channel 41565 (2687.5MHz)	QPSK	1 RB / 0 RB Offset			
Channel 41565 (2687.5MHz)	QPSK	1 RB / 24 RB Offset			
Channel 41565 (2687.5MHz)	QPSK	25 RB / 0 RB Offset			
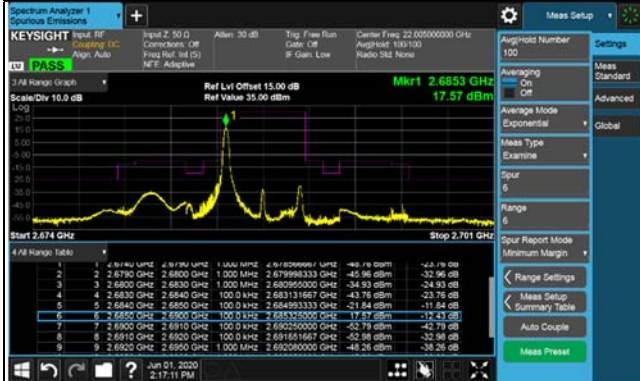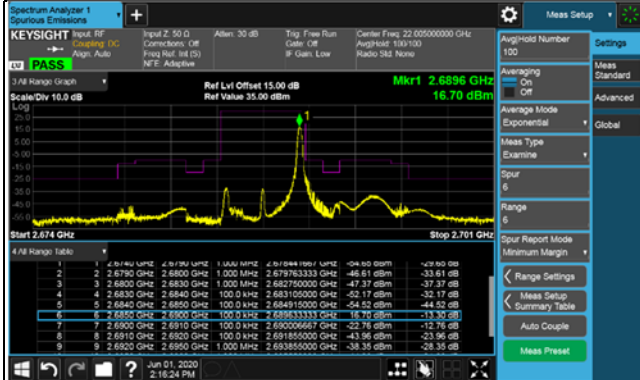
Note: By using a 100 kHz bandwidth on the spectrum analyzer, the correction factor is further improved by 10 log(1000/100) = 10dB

Because the spectrum analyzer cannot supplement the correction factor in stages, the spectrum reading value is added with the correction factor to determine whether the limit is met.

For detailed data, please see the table below

	RB offset	Frequency (GHz)	Reading (dBm)	Correction Factor (dB)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
Channel 39675 (2498.5MHz)	1/0	2.4949667	-37.54	10	-27.54	-13	-14.54
	1/0	2.5023033	-46.52	10	-36.52	-13	-23.52
	1/24	2.4941333	-46.37	10	-36.37	-13	-23.37
	1/24	2.5223667	-38.32	10	-28.32	-13	-15.32
	25/0	2.4949817	-35.94	10	-25.94	-13	-12.94
	25/0	2.5021483	-36.01	10	-26.01	-13	-13.01
Channel 40620 (2593.0MHz)	1/0	2.5894883	-43.42	10	-33.42	-10	-23.42
	1/0	2.5974483	-51.83	10	-41.83	-10	-31.83
	1/24	2.588685	-50.51	10	-40.51	-10	-30.51
	1/24	2.5965217	-43.78	10	-33.78	-10	-23.78
	25/0	2.5894467	-41.56	10	-31.56	-10	-21.56
	25/0	2.5966517	-40.31	10	-30.31	-10	-20.31
Channel 41565 (2687.5MHz)	1/0	2.6831317	-43.76	10	-33.76	-10	-23.76
	1/0	2.6916517	-52.98	10	-42.98	-10	-32.98
	1/24	2.683105	-52.17	10	-42.17	-10	-32.17
	1/24	2.691855	-43.96	10	-33.96	-10	-23.96
	25/0	2.6830683	-39.09	10	-29.09	-10	-19.09
	25/0	2.6913983	-38.07	10	-28.07	-10	-18.07

LTE Band 41

Channel Bandwidth: 10MHz					
Channel 39700 (2501.0MHz)	QPSK	1 RB / 0 RB Offset	Channel 40620 (2593.0MHz)	QPSK	1 RB / 0 RB Offset

Channel 39700 (2501.0MHz)	QPSK	1 RB / 49 RB Offset	Channel 40620 (2593.0MHz)	QPSK	1 RB / 49 RB Offset

Channel 39700 (2501.0MHz)	QPSK	50 RB / 0 RB Offset	Channel 40620 (2593.0MHz)	QPSK	50 RB / 0 RB Offset

Channel Bandwidth: 10MHz					
Channel 41540 (2685.0MHz)	QPSK	1 RB / 0 RB Offset			
Channel 41540 (2685.0MHz)	QPSK	1 RB / 49 RB Offset			
Channel 41540 (2685.0MHz)	QPSK	50 RB / 0 RB Offset			
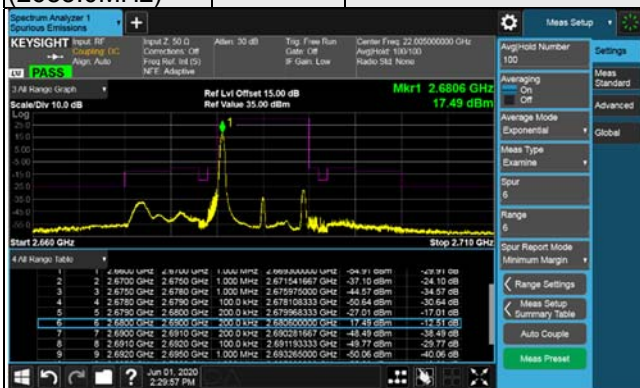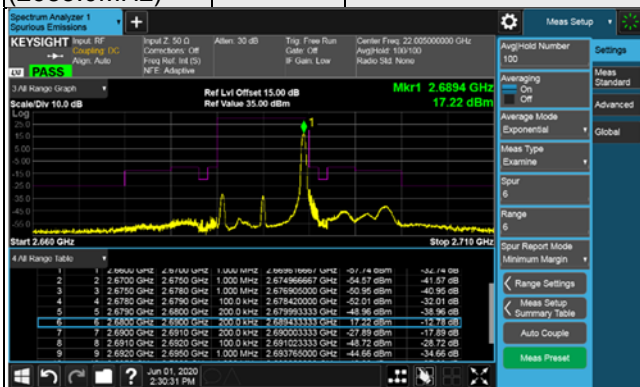
Note: By using a 100 kHz bandwidth on the spectrum analyzer, the correction factor is further improved by 10 log(1000/100) = 10dB
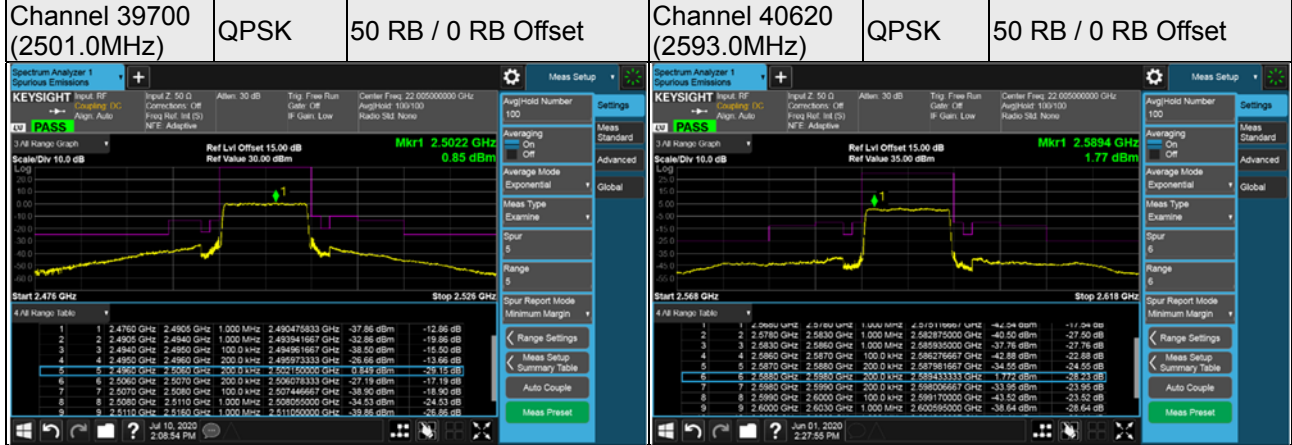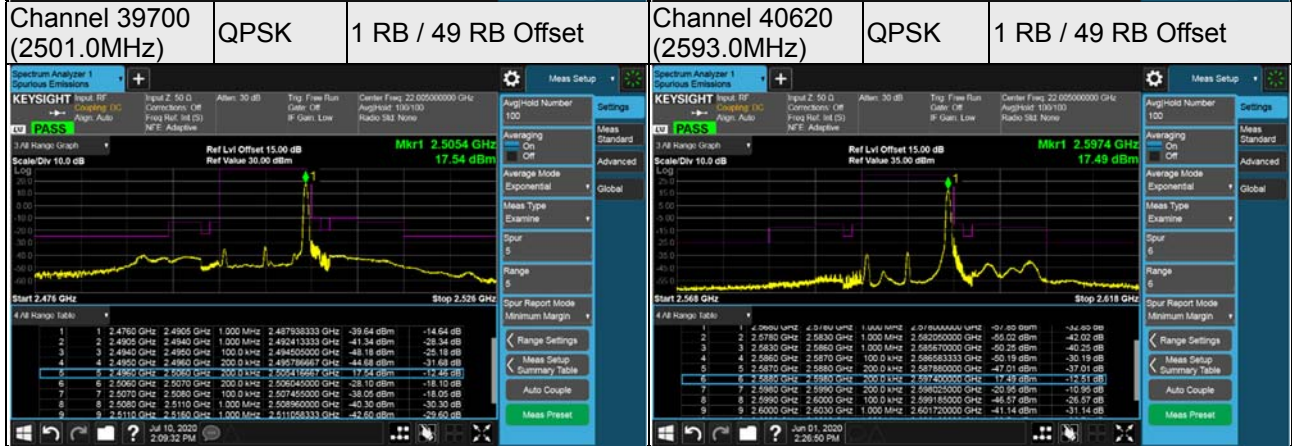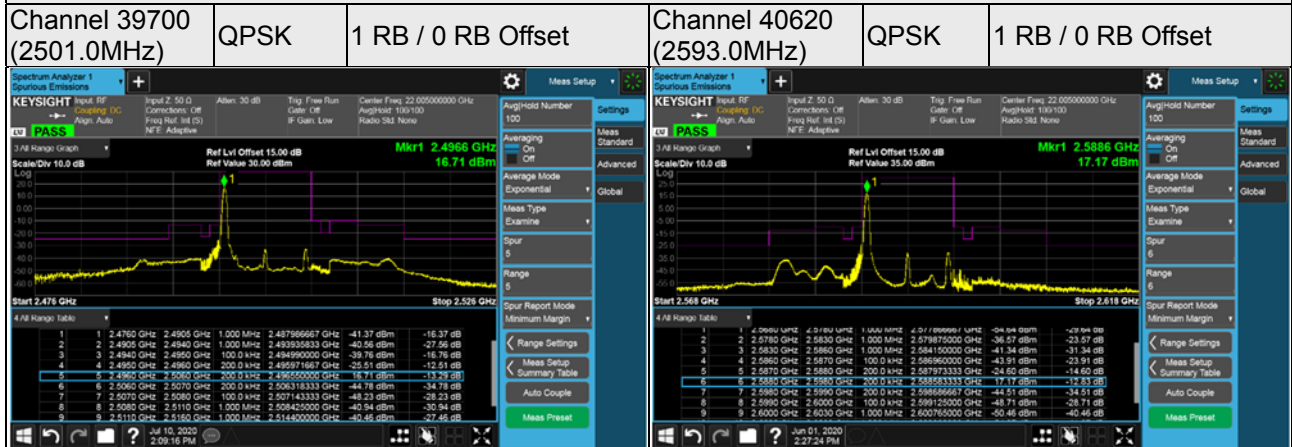
Because the spectrum analyzer cannot supplement the correction factor in stages, the spectrum reading value is added with the correction factor to determine whether the limit is met.

For detailed data, please see the table below

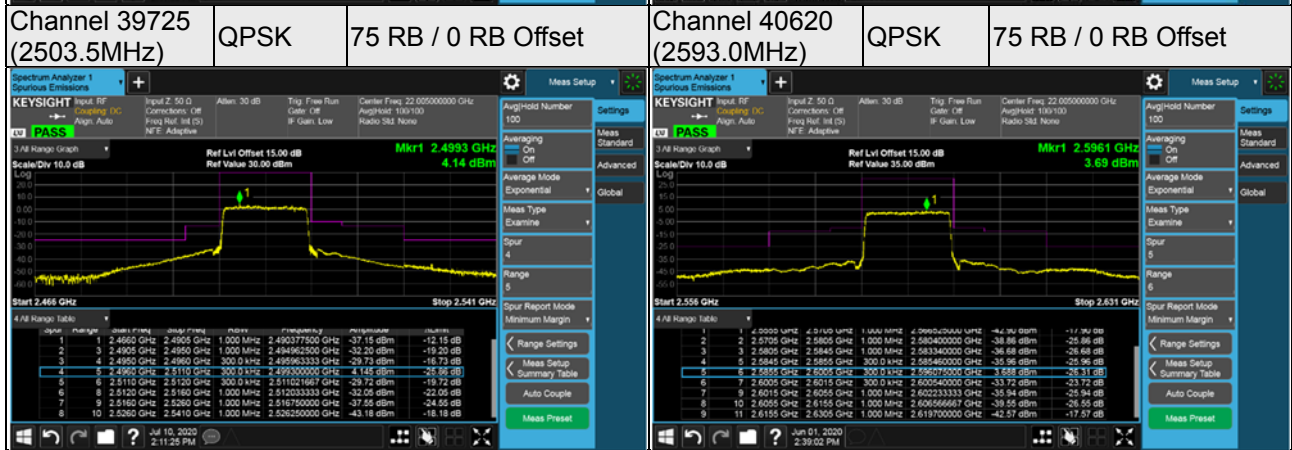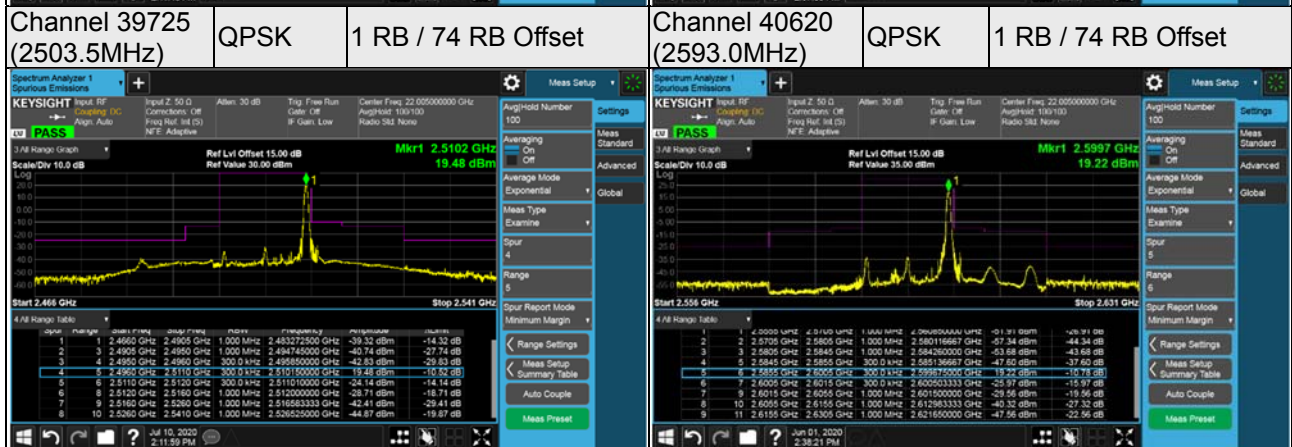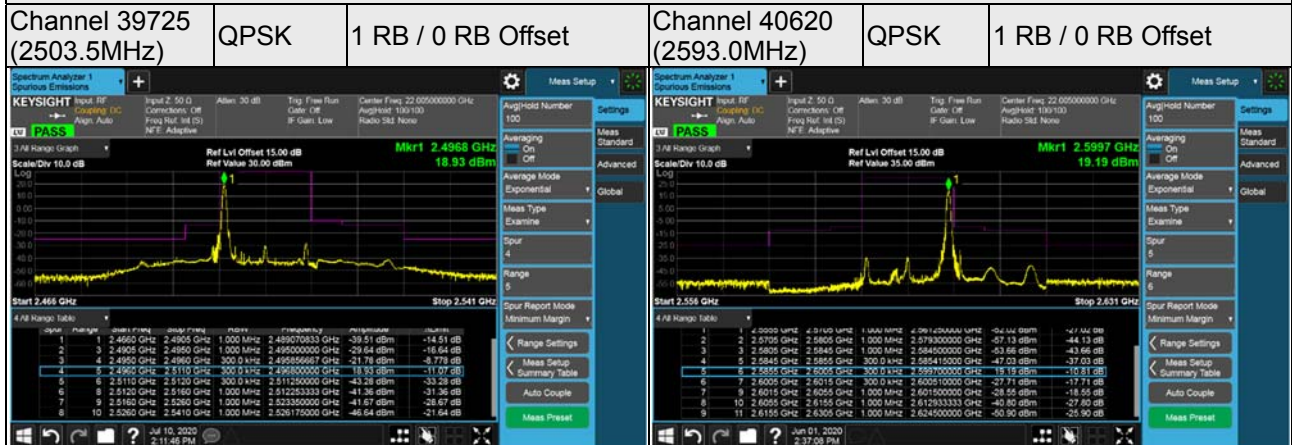|	RB offset	Frequency (GHz)	Reading (dBm)	Correction Factor (dB)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
Channel 39700 (2501.0MHz)	1/0	2.49499	-39.76	10	-29.76	-13	-16.76
	1/0	2.5071433	-48.23	10	-38.23	-13	-25.23
	1/49	2.494505	-48.18	10	-38.18	-13	-25.18
	1/49	2.507455	-38.05	10	-28.05	-13	-15.05
	50/0	2.4949617	-38.5	10	-28.5	-13	-15.5
	50/0	2.5074467	-38.9	10	-28.9	-13	-15.9
Channel 40620 (2593.0MHz)	1/0	2.58696	-43.91	10	-33.91	-10	-23.91
	1/0	2.599125	-48.71	10	-38.71	-10	-28.71
	1/49	2.5865833	-50.19	10	-40.19	-10	-30.19
	1/49	2.599185	-46.57	10	-36.57	-10	-26.57
	50/0	2.5862767	-42.88	10	-32.88	-10	-22.88
	50/0	2.59917	-43.52	10	-33.52	-10	-23.52
Channel 41540 (2685.0MHz)	1/0	2.6781083	-50.64	10	-40.64	-10	-30.64
	1/0	2.6911933	-49.77	10	-39.77	-10	-29.77
	1/49	2.67842	-52.01	10	-42.01	-10	-32.01
	1/49	2.6910233	-48.72	10	-38.72	-10	-28.72
	50/0	2.6781583	-41.63	10	-31.63	-10	-21.63
	50/0	2.6910967	-40.64	10	-30.64	-10	-20.64

LTE Band 41

Channel Bandwidth: 15MHz						
Channel 39725 (2503.5MHz)	QPSK	1 RB / 0 RB Offset		Channel 40620 (2593.0MHz)	QPSK	1 RB / 0 RB Offset

Channel 39725 (2503.5MHz)	QPSK	1 RB / 74 RB Offset		Channel 40620 (2593.0MHz)	QPSK	1 RB / 74 RB Offset

Channel 39725 (2503.5MHz)	QPSK	75 RB / 0 RB Offset		Channel 40620 (2593.0MHz)	QPSK	75 RB / 0 RB Offset

Channel Bandwidth: 15MHz					
Channel 41515 (2682.5MHz)	QPSK	1 RB / 0 RB Offset			
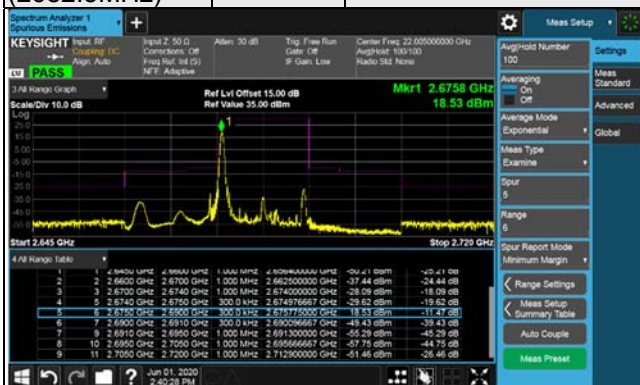
Channel 41515 (2682.5MHz)	QPSK	1 RB / 74 RB Offset			
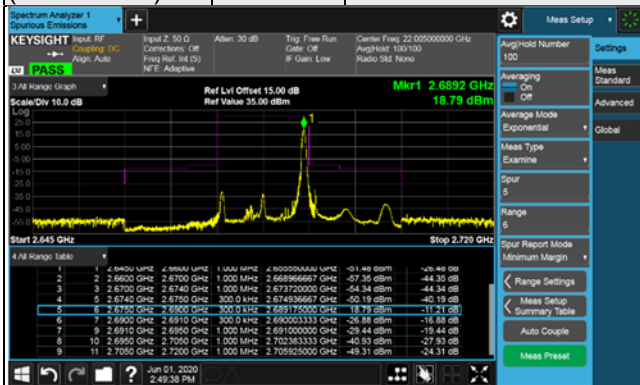
Channel 41515 (2682.5MHz)	QPSK	75 RB / 0 RB Offset			

LTE Band 41

Channel Bandwidth: 20MHz

Channel 39750 (2506.0MHz)	QPSK	1 RB / 0 RB Offset	Channel 40620 (2593.0MHz)	QPSK	1 RB / 0 RB Offset

Channel 39750 (2506.0MHz)	QPSK	1 RB / 99 RB Offset	Channel 40620 (2593.0MHz)	QPSK	1 RB / 99 RB Offset

Channel 39750 (2506.0MHz)	QPSK	100 RB / 0 RB Offset	Channel 40620 (2593.0MHz)	QPSK	100 RB / 0 RB Offset
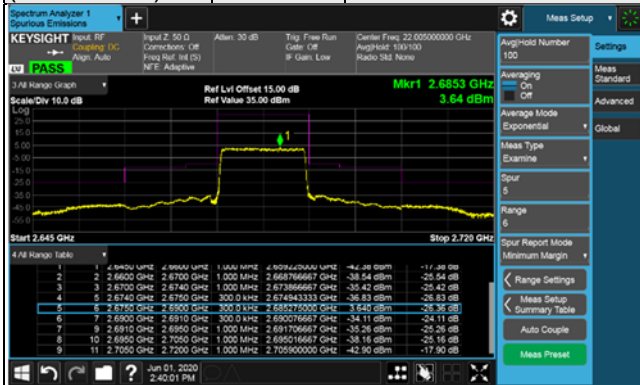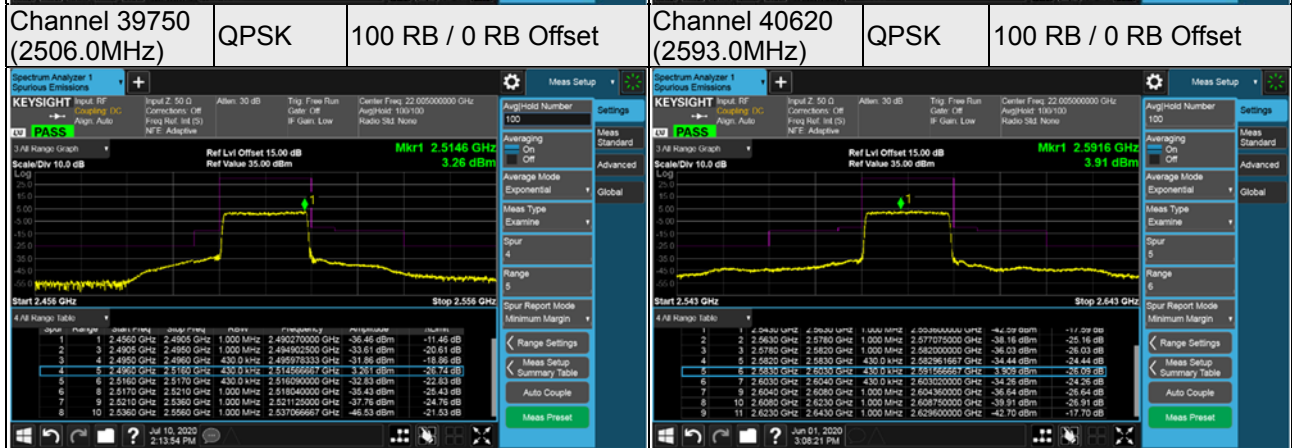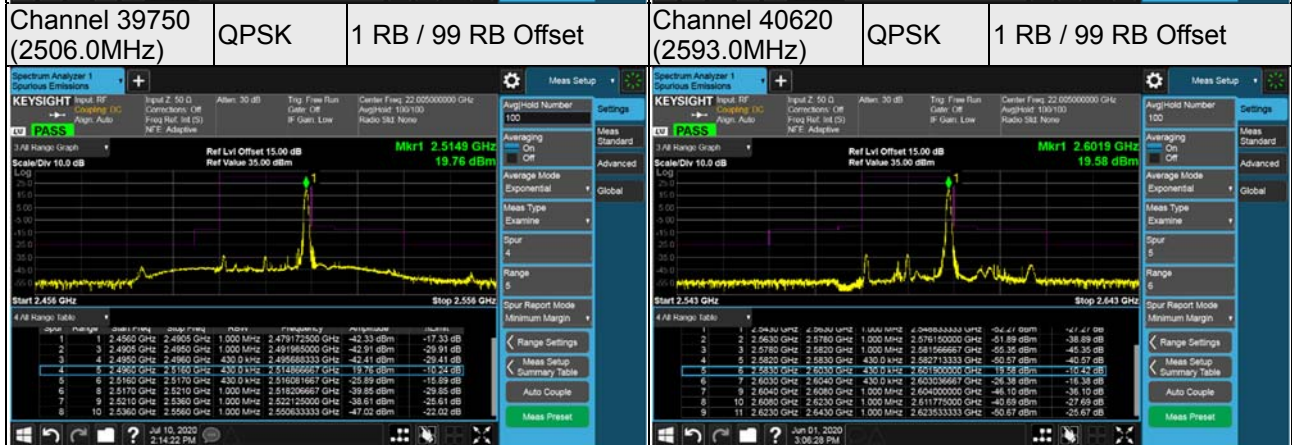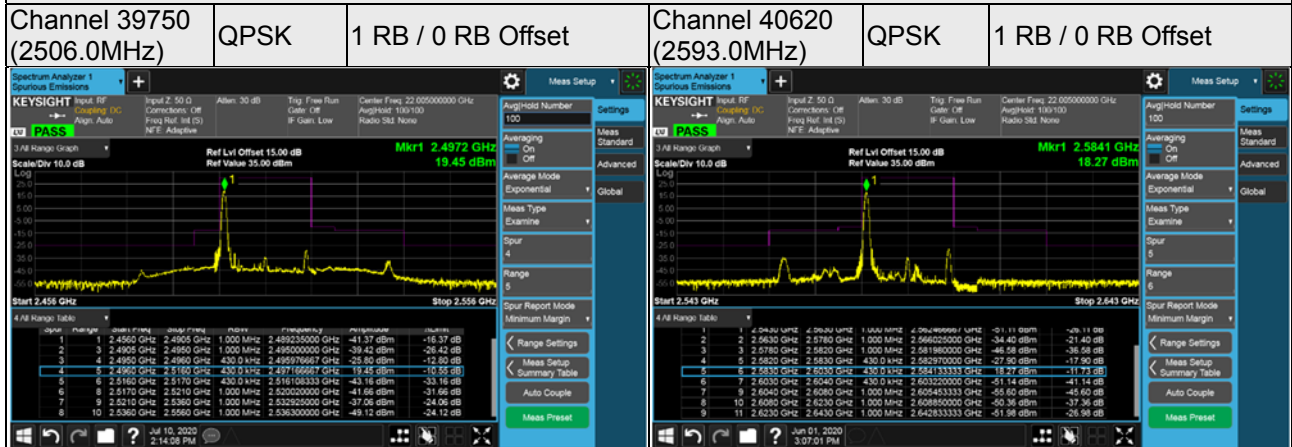
Channel Bandwidth: 20MHz					
Channel 41490 (2680.0MHz)	QPSK	1 RB / 0 RB Offset			
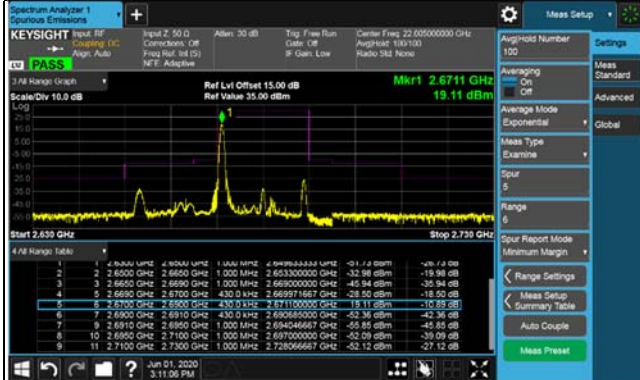
| Channel 41490 (2680.0MHz) | QPSK | 1 RB / 99 RB Offset | | | |

| Channel 41490 (2680.0MHz) | QPSK | 100 RB / 0 RB Offset | | | |