

## 6. Spurious Emissions at Antenna Terminal

### 6.1. Limit

#### FCC

- §22.917(a), 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.

- §24.238(a), 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.

- §27.53(c)(2), 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.

- §27.53(g), 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.

- §27.53(h)(1), for operations in the 1 695-1 710 MHz, 1 710-1 755 MHz, 1 755-1 780 MHz, 1 915-1 920 MHz, 1 995-2 000 MHz, 2 000-2 020 MHz, 2 110-2 155 MHz, 2 155-2 180 MHz, and 2 180-2 200 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  $43 + 10 \log_{10}(P)$  dB.

- §27.53(m)(4), for mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log_{10}(P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log_{10}(P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log_{10}(P)$  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 as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log_{10}(P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log_{10}(P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

- §90.691(a), out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f / 6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

**IC****- RSS-130 Issue 2**

4.7.1, the unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power,  $P$  (dB W), by at least  $43 + 10 \log_{10} p$  (watts), dB. However, in the 100 kHz band immediately outside the equipment's operating frequency block range, a resolution bandwidth of 30 kHz may be employed.

**- RSS-132 Issue 3**

5.5, Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

(i) In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1 % of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power  $P$  (dB W) by at least  $43 + 10 \log_{10} p$  (watts).

(ii) After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power  $P$  (dB W) by at least  $43 + 10 \log_{10} p$  (watts). If the measurement is performed using 1 % of the occupied bandwidth, power integration over 100 kHz is required.

**- RSS-133 Issue 6**

6.5, Equipment shall comply with the limits in (i) and (ii) below.

(i) In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1 % of the emission bandwidth shall be attenuated (in dB) below the transmitter output power  $P$  (dB W) by at least  $43 + 10 \log_{10} p$  (watts).

(ii) After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power  $P$  (dB W) by at least  $43 + 10 \log_{10} p$  (watts). If the measurement is performed using 1 % of the emission bandwidth, power integration over 1.0 MHz is required.

**- RSS-139 Issue 3**

6.6, (i) In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1 % of the emission bandwidth shall be attenuated below the transmitter output power  $P$  (in dB W) by at least  $43 + 10 \log_{10} p$  (watts) dB.

(ii) After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power  $P$  (in dB W) by at least  $43 + 10 \log_{10} p$  (watts) dB.

- RSS-199 Issue 3

4.5, In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% or 2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emission limits:

for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power,  $P$  (dB W), by at least  $43 + 10 \log_{10} p$  for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power,  $P$  (dB W), by at least:

- i.  $40 + 10 \log_{10} p$  from the channel edges to 5 MHz away
- ii.  $43 + 10 \log_{10} p$  between 5 MHz and  $X$  MHz from the channel edges, and
- iii.  $55 + 10 \log_{10} p$  at  $X$  MHz and beyond from the channel edges

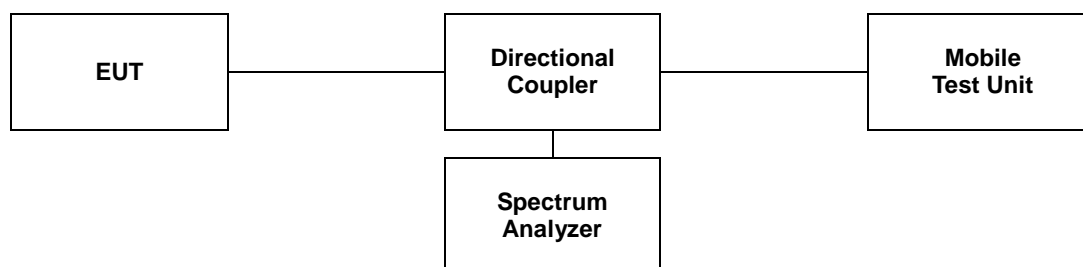
In addition, the attenuation shall not be less than  $43 + 10 \log_{10} p$  on all frequencies between 2 490.5 MHz and 2 496 MHz, and  $55 + 10 \log_{10} p$  at or below 2 490.5 MHz.

In (a) and (b),  $p$  is the transmitter power measured in watts and  $X$  is 6 MHz or the equipment occupied bandwidth, whichever is greater.

## 6.2. Test Procedure

The test follows section 5.7 of ANSI C63.26-2015.

1. Start frequency was set to 9 kHz and stop frequency was set to at least 10\* the fundamental frequency.
2. Detector = Peak.
3. Trace mode = Max hold.
4. Sweep time = Auto couple.
5. The trace was allowed to stabilize.
6. Please see notes below for RBW and VBW settings.
7. For plots showing conducted spurious emissions from 9 kHz to 26 GHz, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as TDF function.



### Note;

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two point, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

### 6.3. Test Results

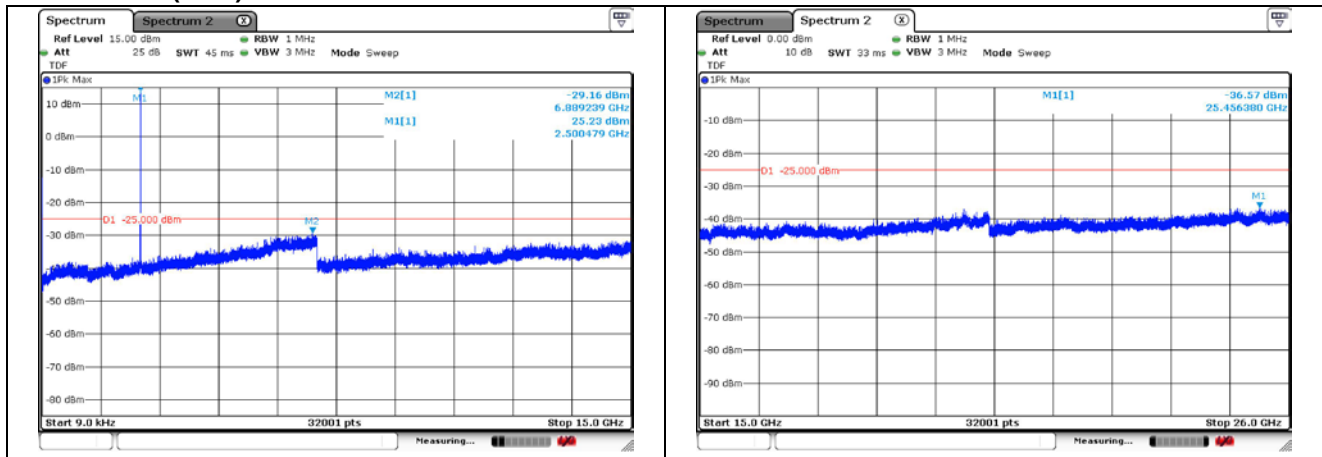
Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

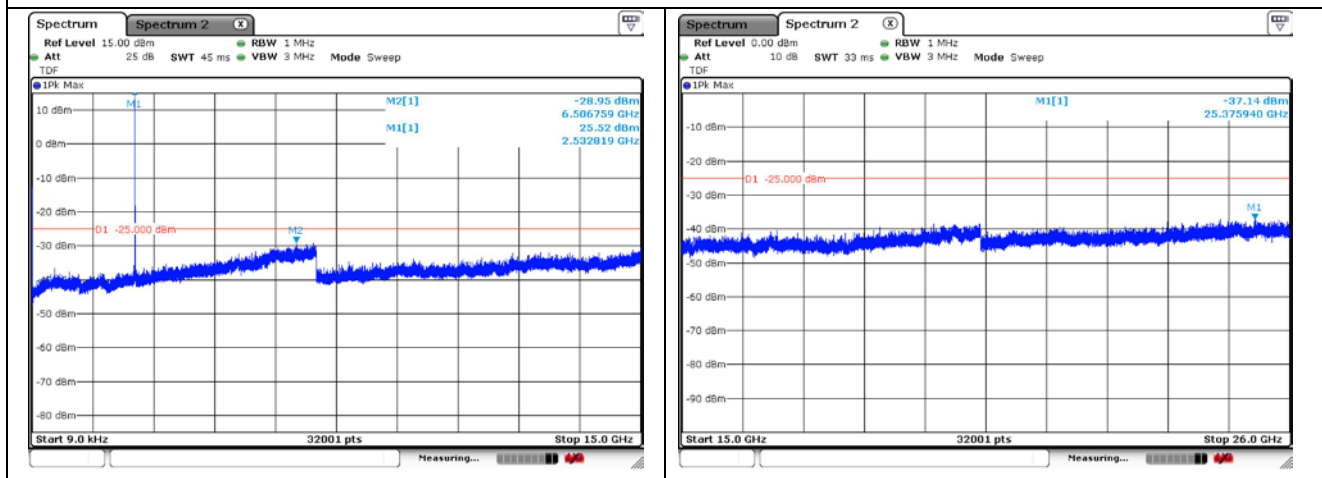
#### - Test plots

##### SIM 1

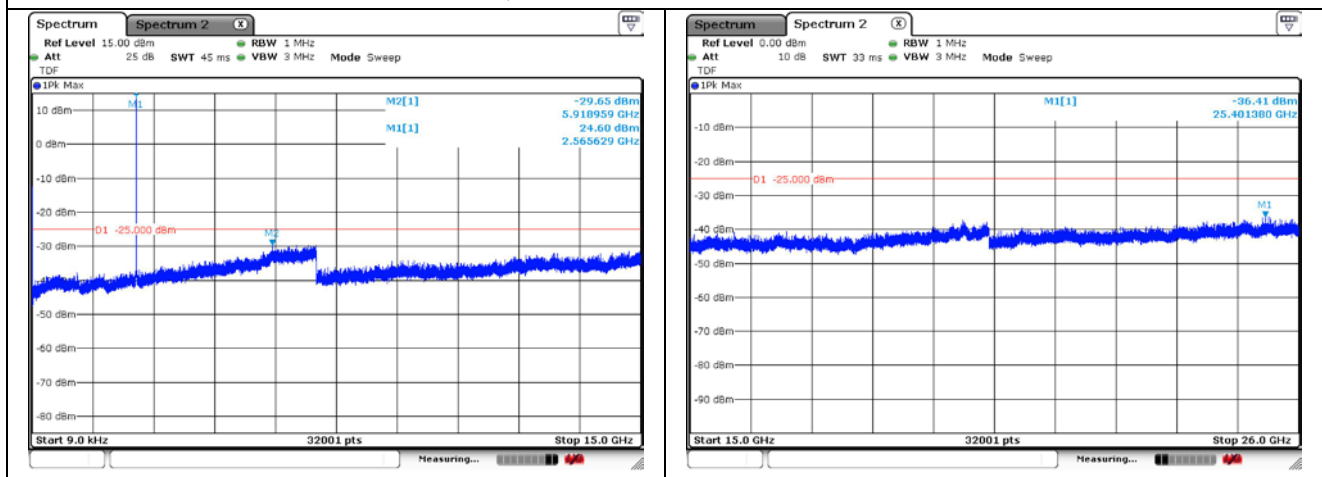
##### LTE band 7 (5 MHz)



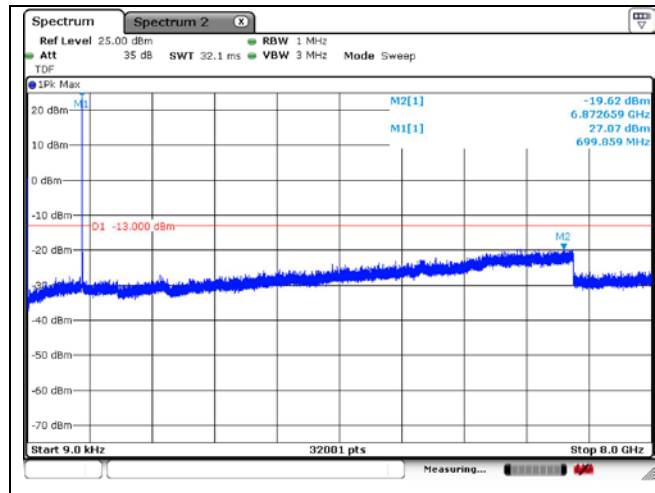
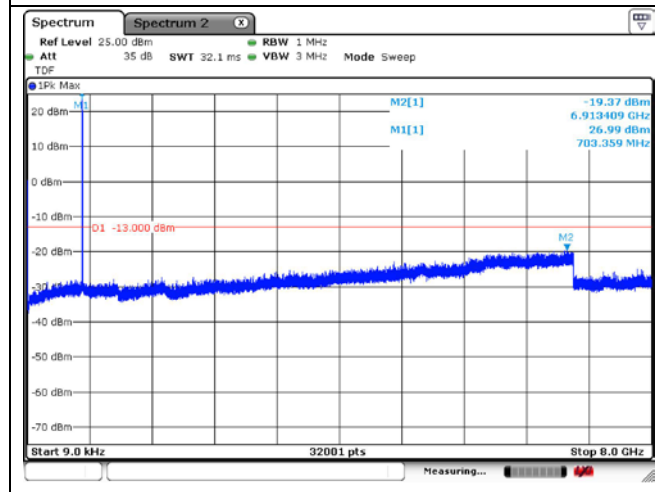
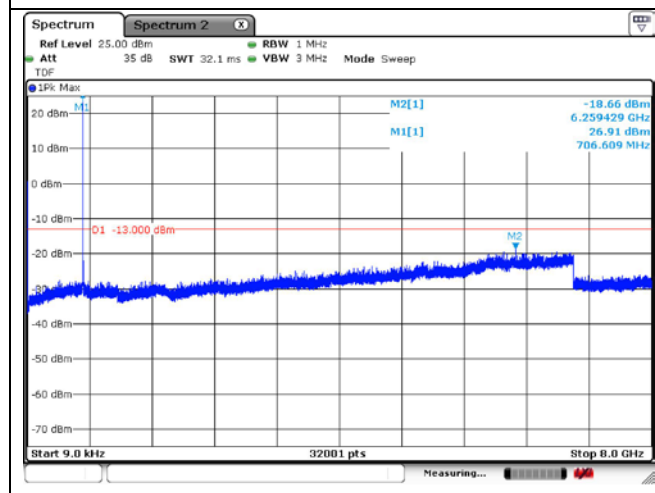
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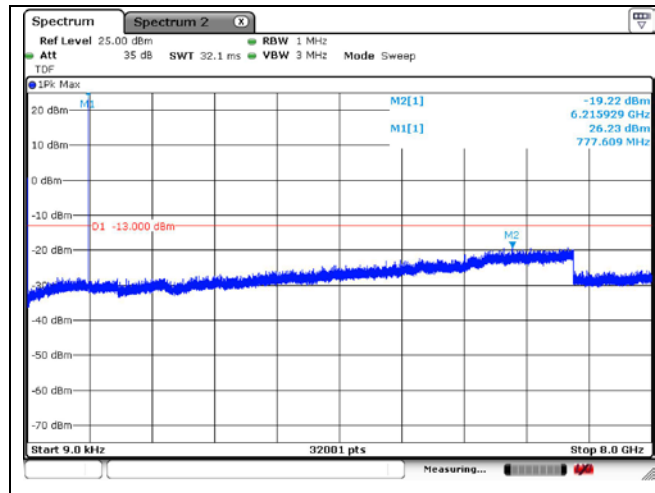
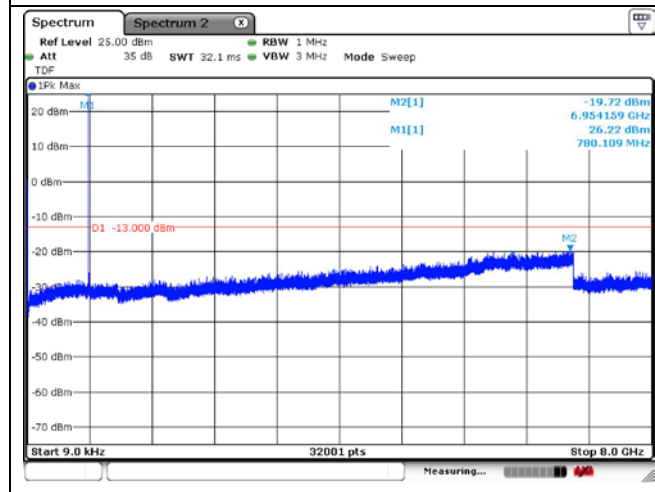
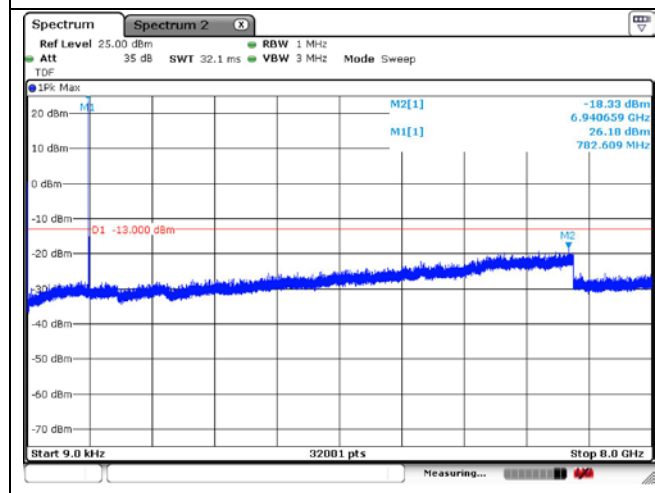


##### QPSK Middle Channel - 1 RB

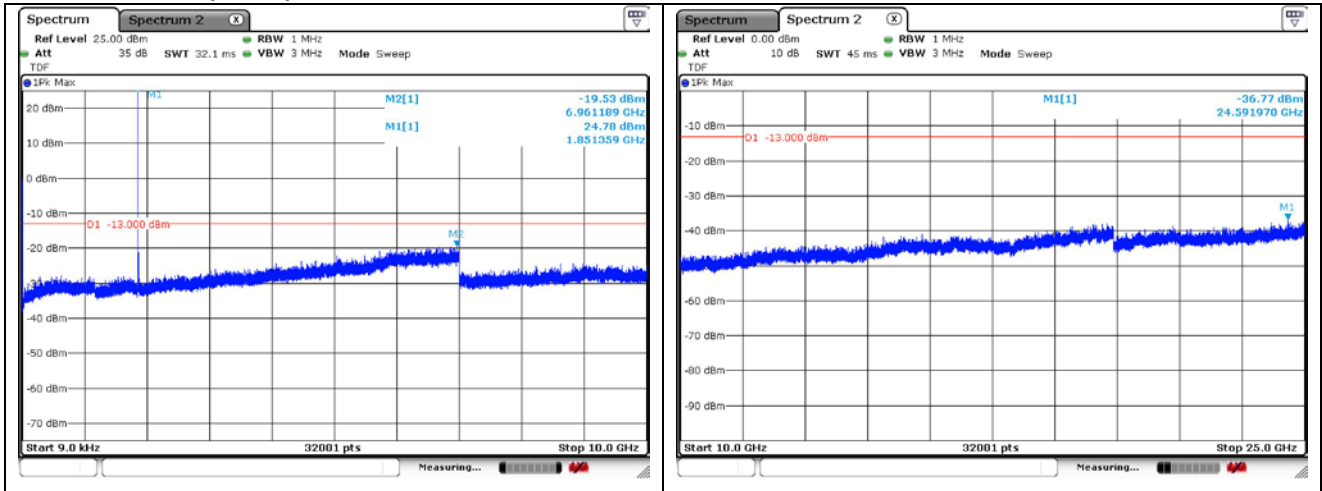


##### QPSK High Channel - 1 RB

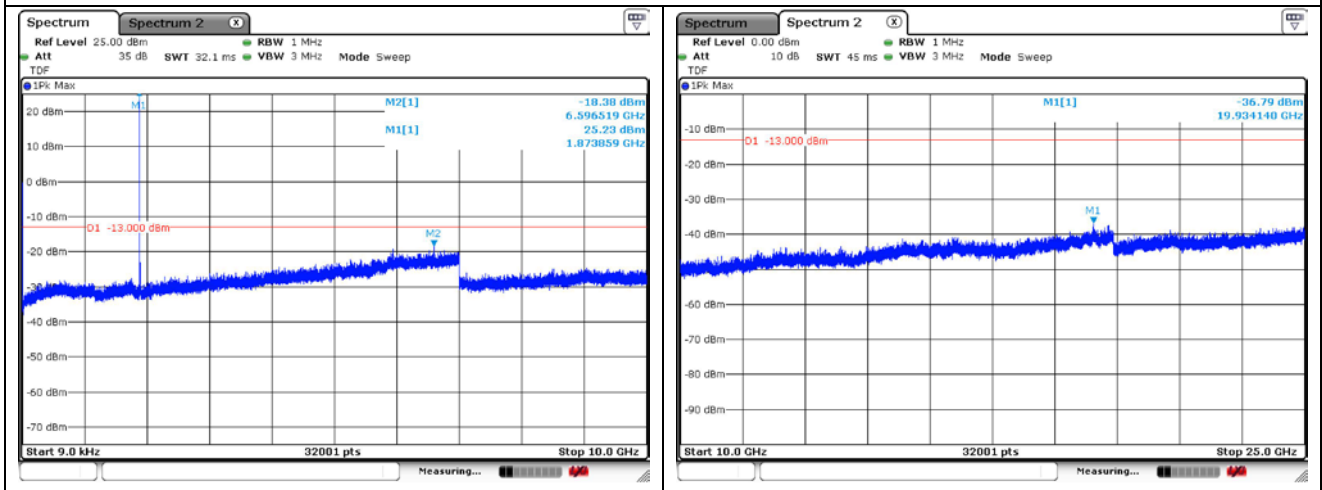
**LTE band 12/17 (10 MHz)**

**QPSK Low Channel - 1 RB**

**QPSK Middle Channel - 1 RB**

**QPSK High Channel - 1 RB**

**LTE band 13 (5 MHz)**

**QPSK Low Channel - 1 RB**

**QPSK Middle Channel - 1 RB**

**QPSK High Channel - 1 RB**

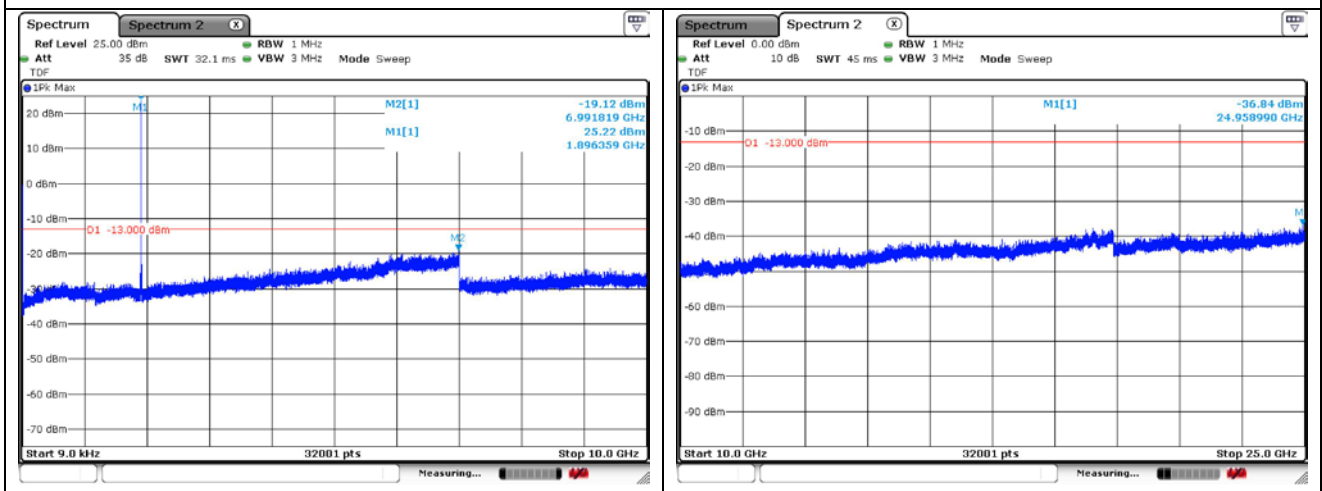
### LTE band 25/2 (20 MHz)



### QPSK Low Channel - 1 RB

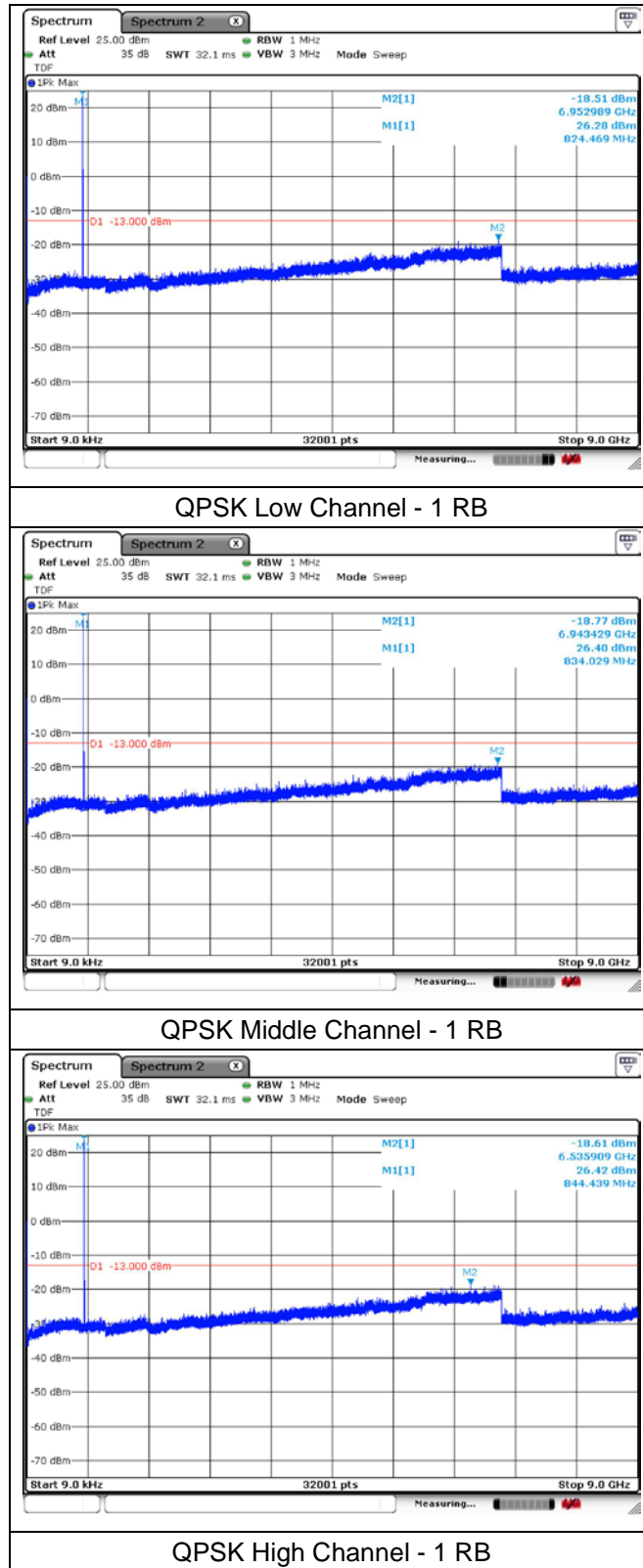


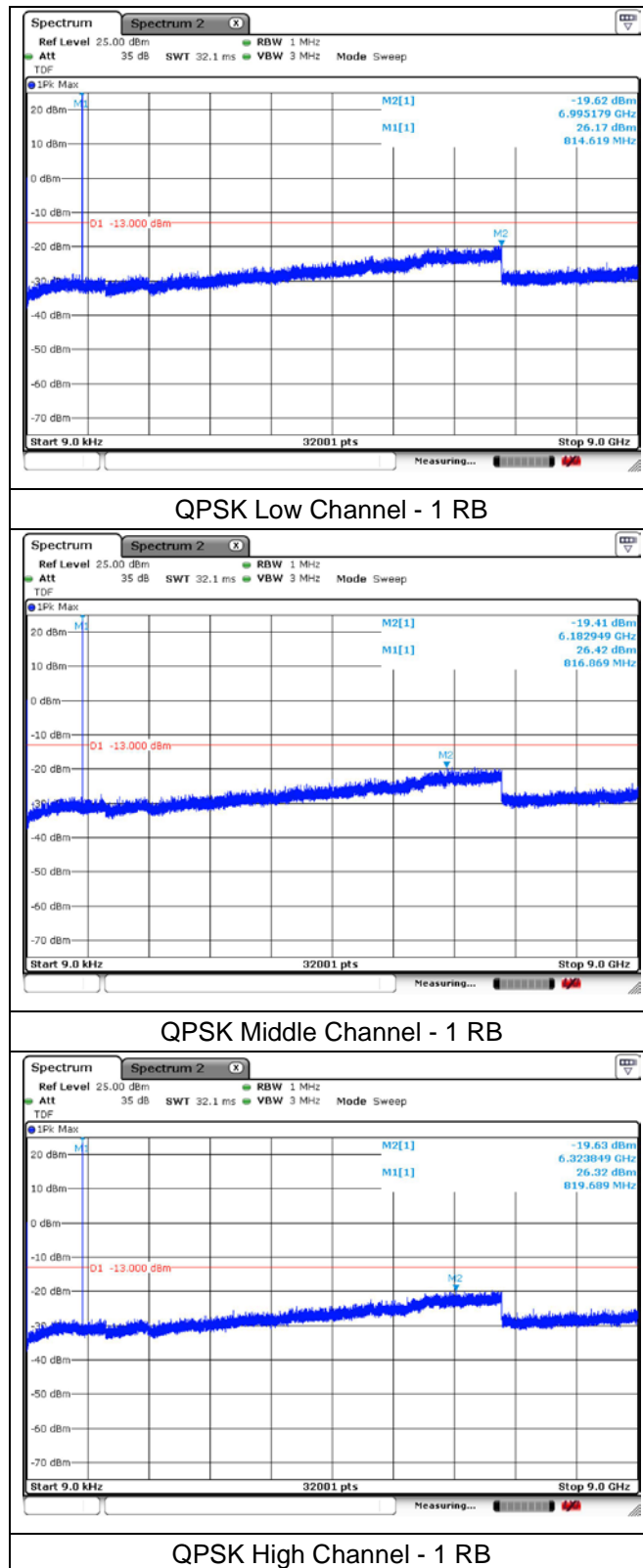
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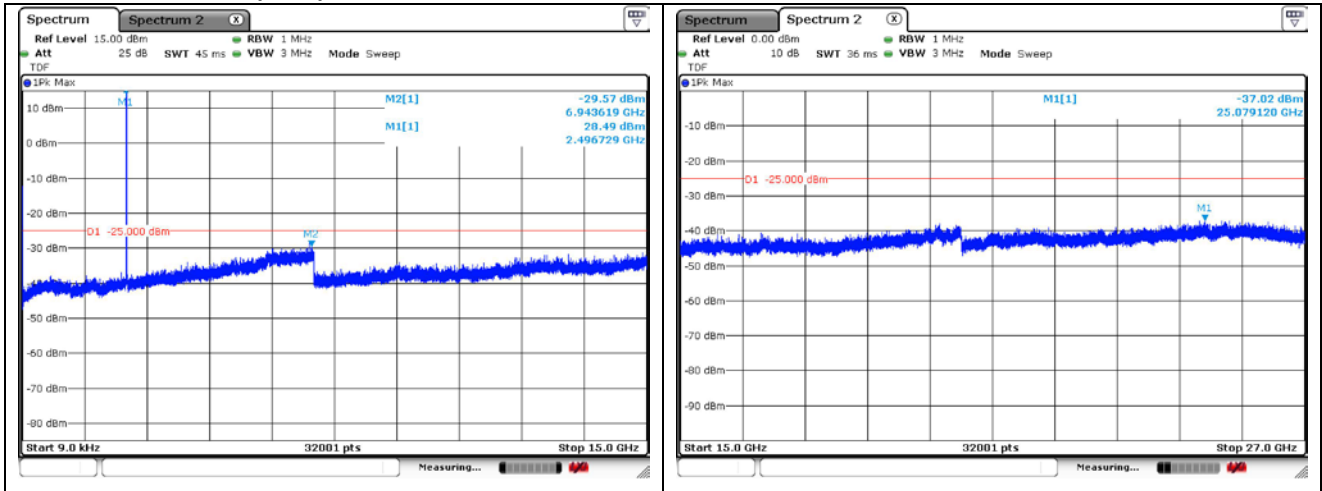
### QPSK High Channel - 1 RB



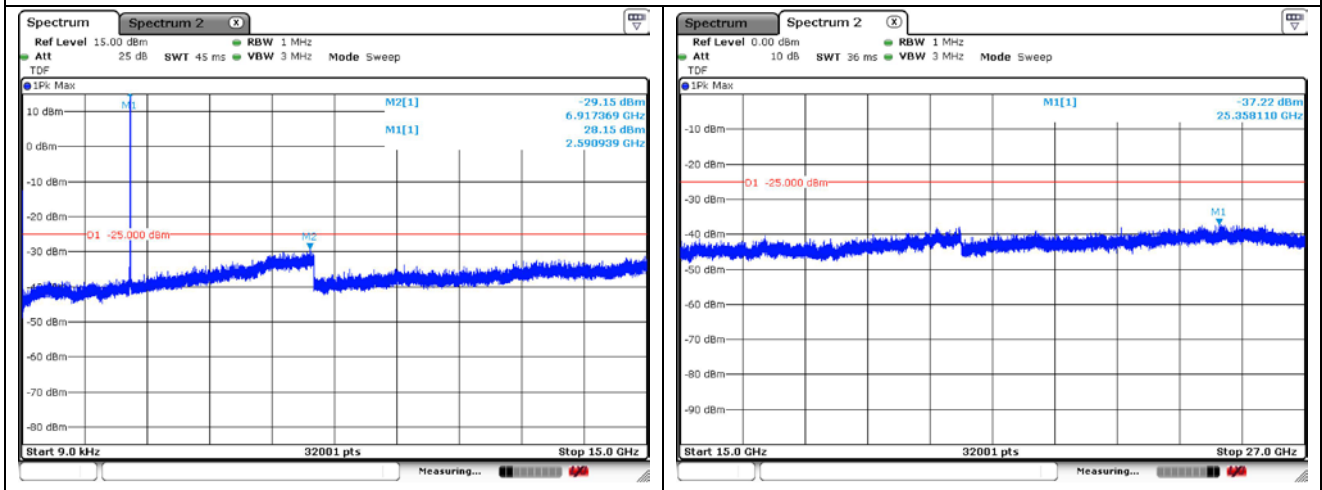
**LTE band 26/5 (5 MHz)  
(Part 22)**


**LTE band 26 (5 MHz)  
(Part 90)**


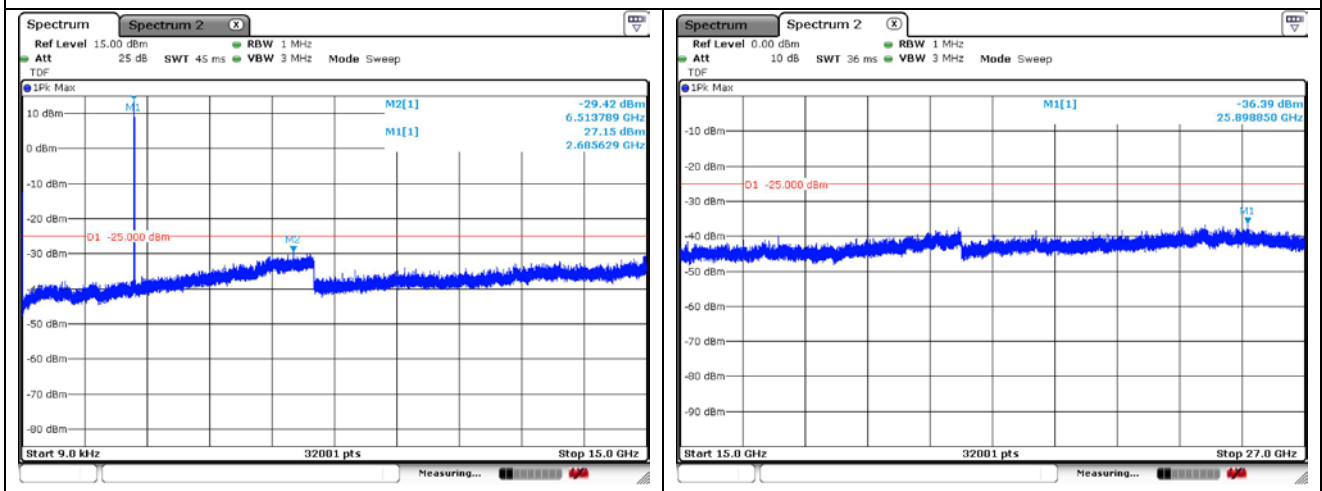
### LTE band 41\_FCC (5 MHz)



### QPSK Low Channel - 1 RB

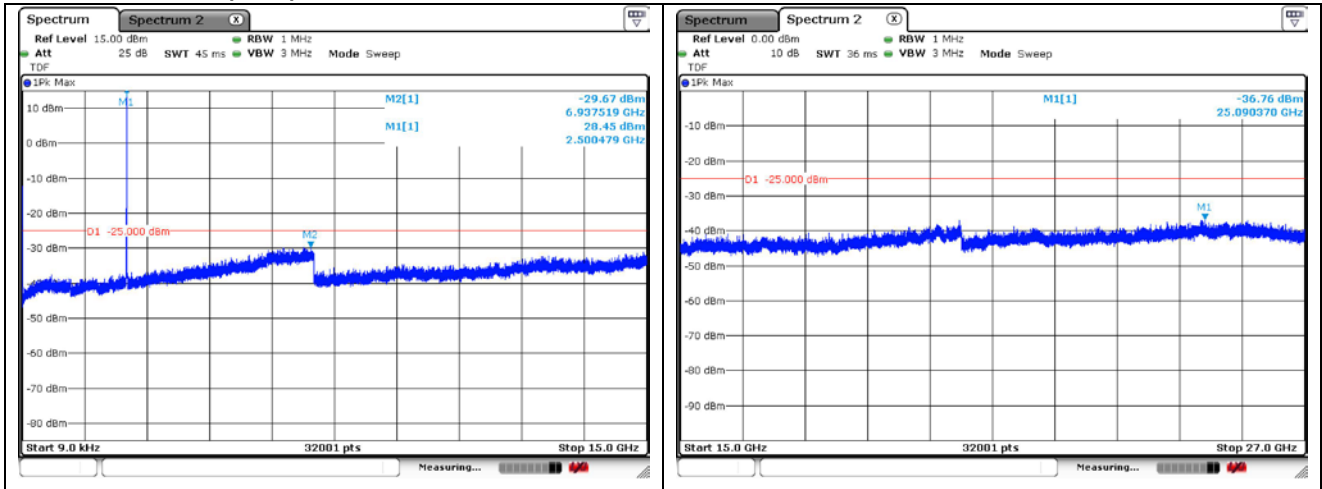


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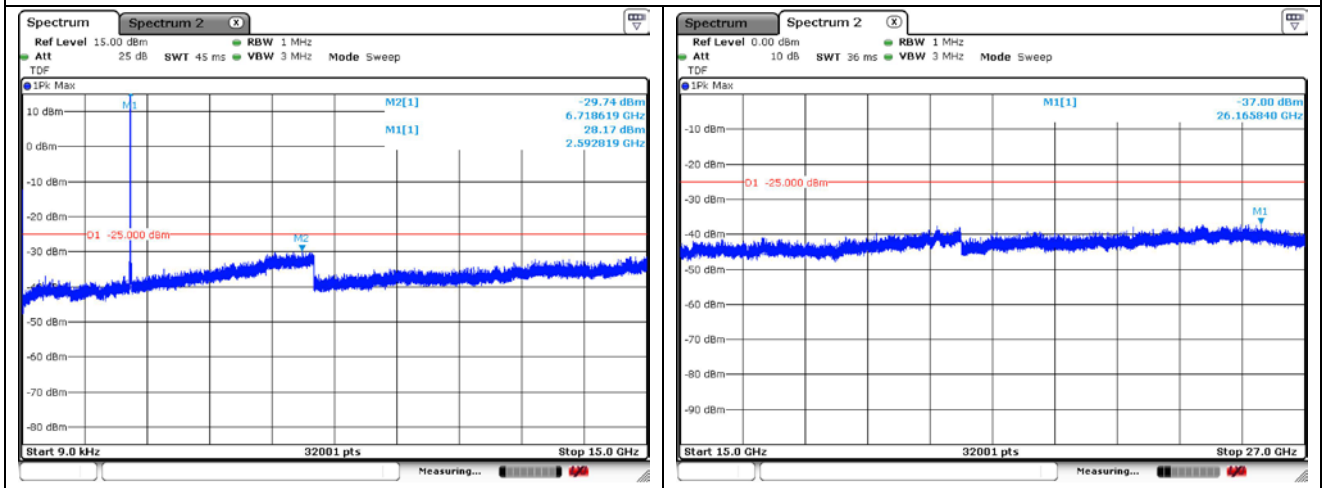


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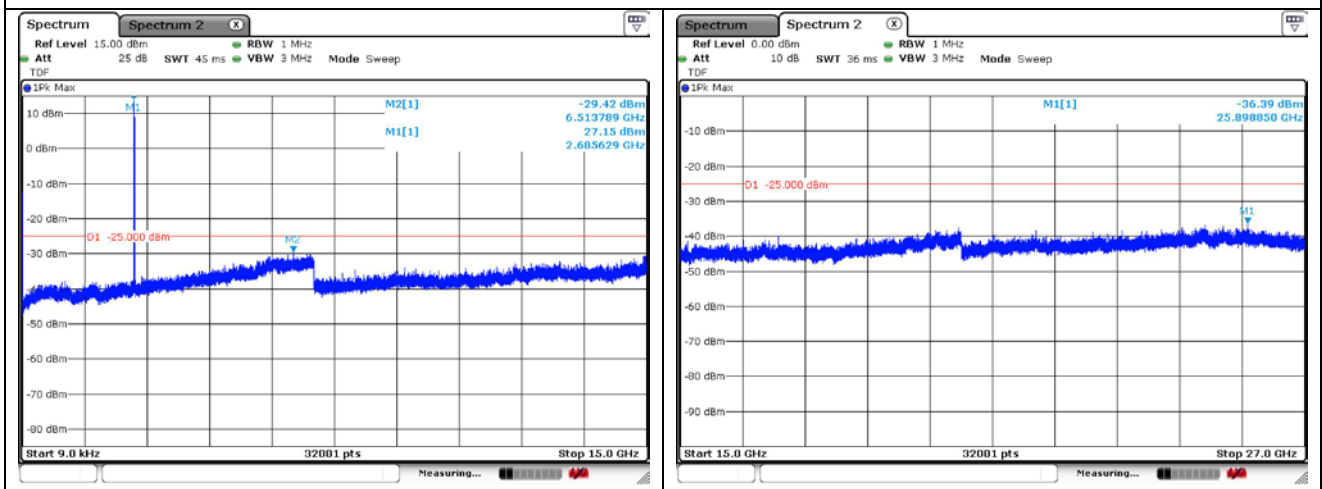
### LTE band 41\_IC (5 MHz)



### QPSK Low Channel - 1 RB

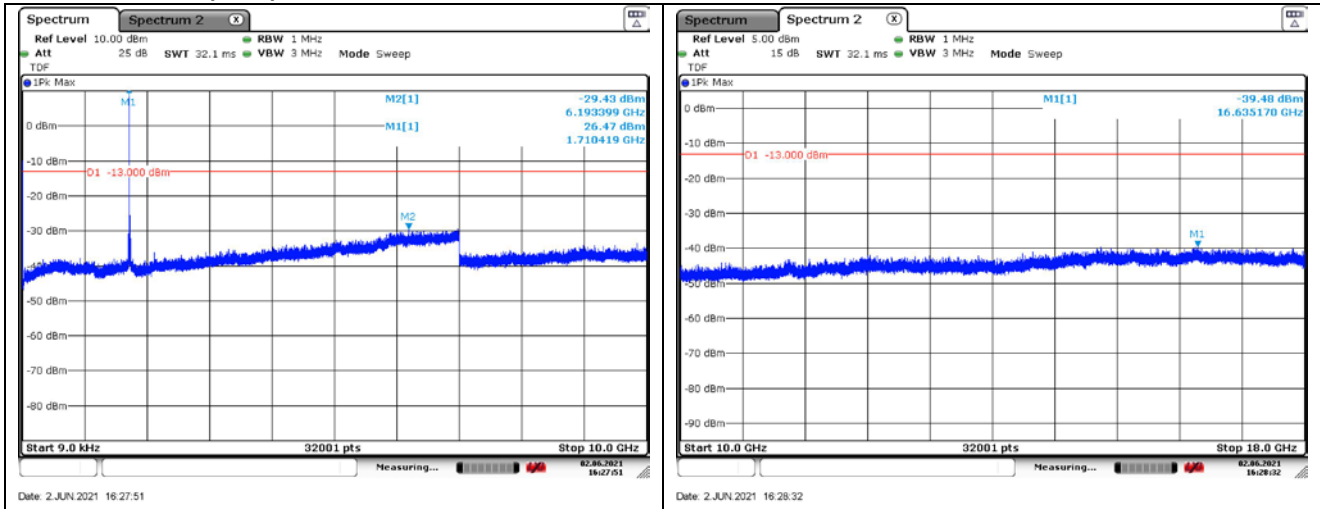


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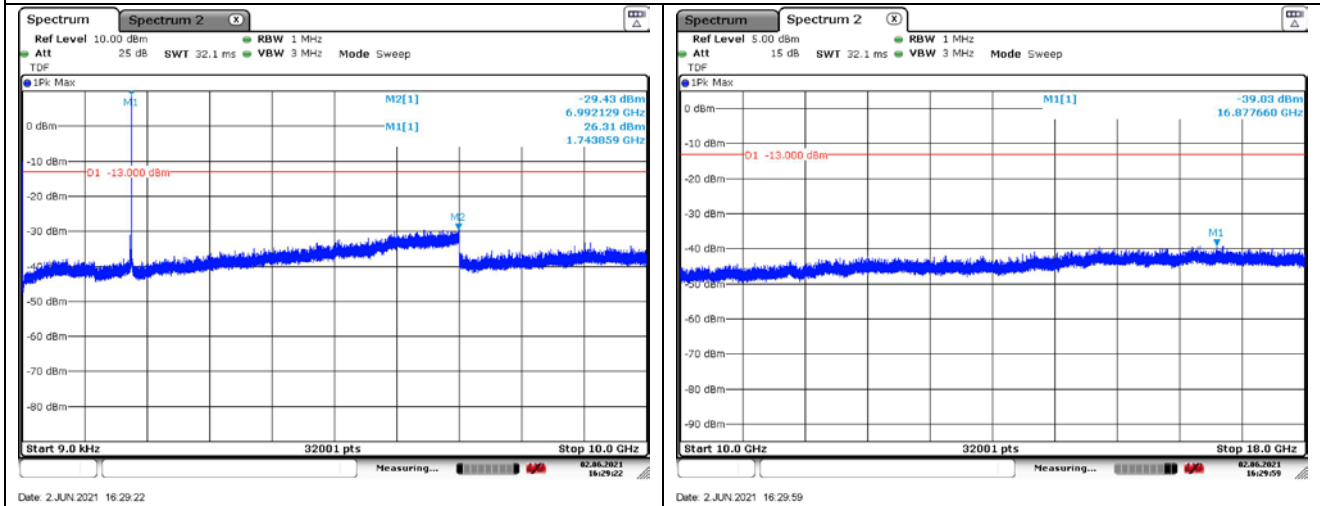


### QPSK High Channel - 1 RB

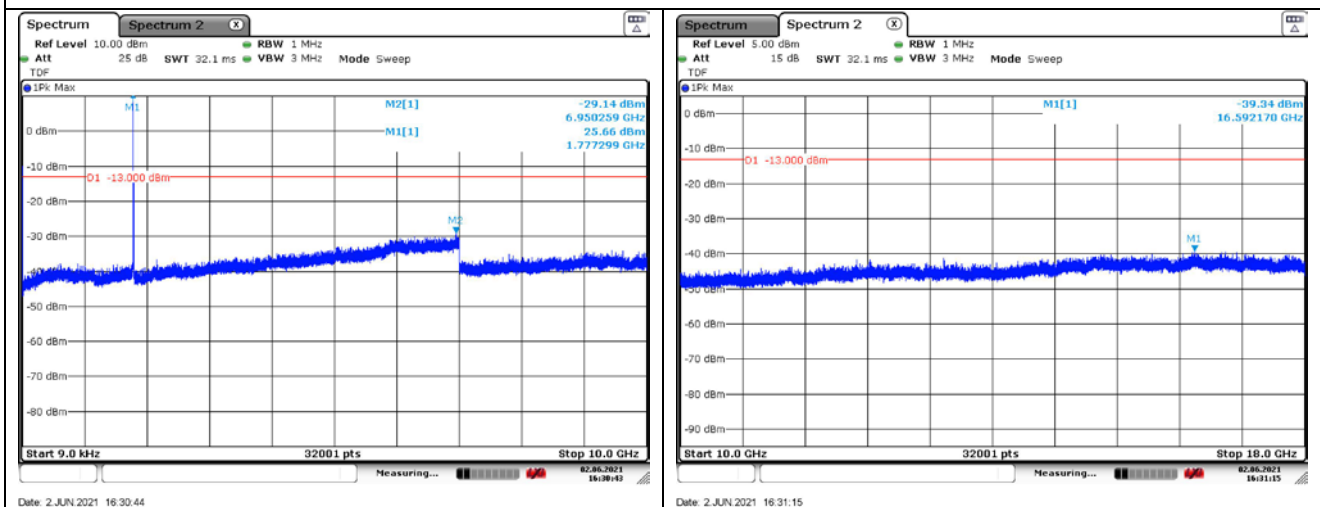
**LTE band 66/4 (3 MHz)**



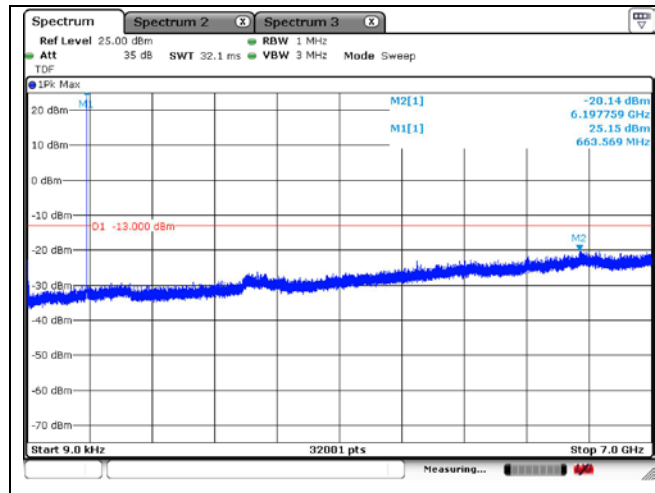
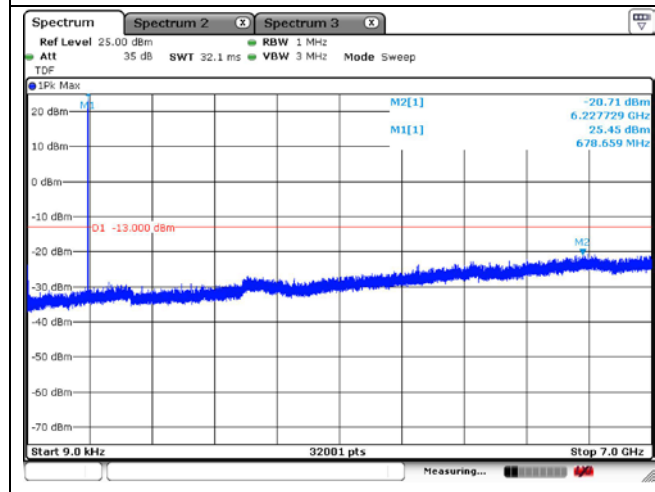
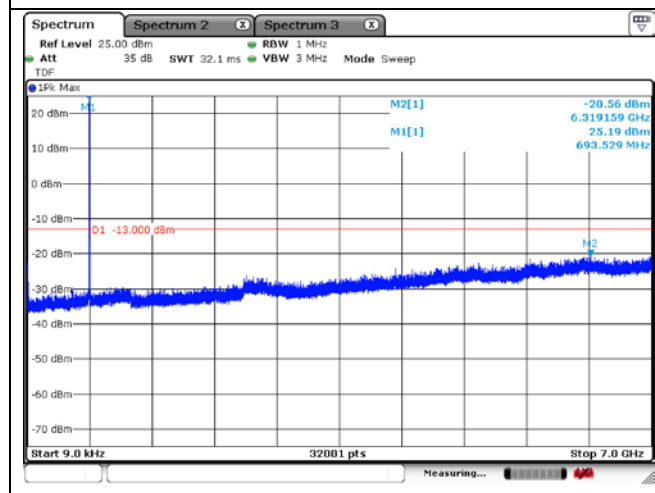
**QPSK Low Channel - 1 RB**



**QPSK Middle Channel - 1 RB**

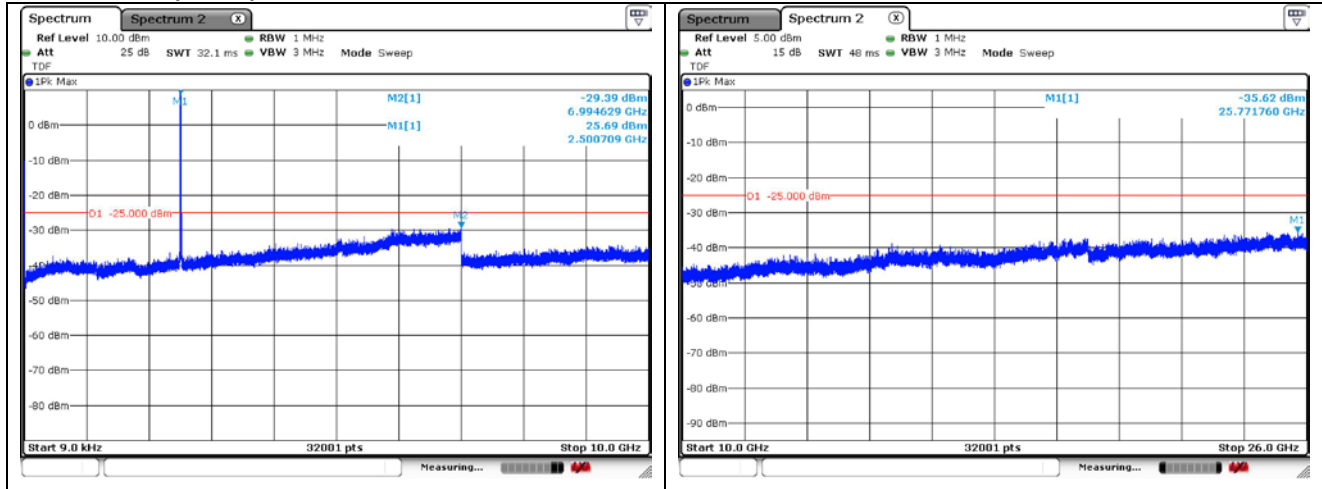


**QPSK High Channel - 1 RB**

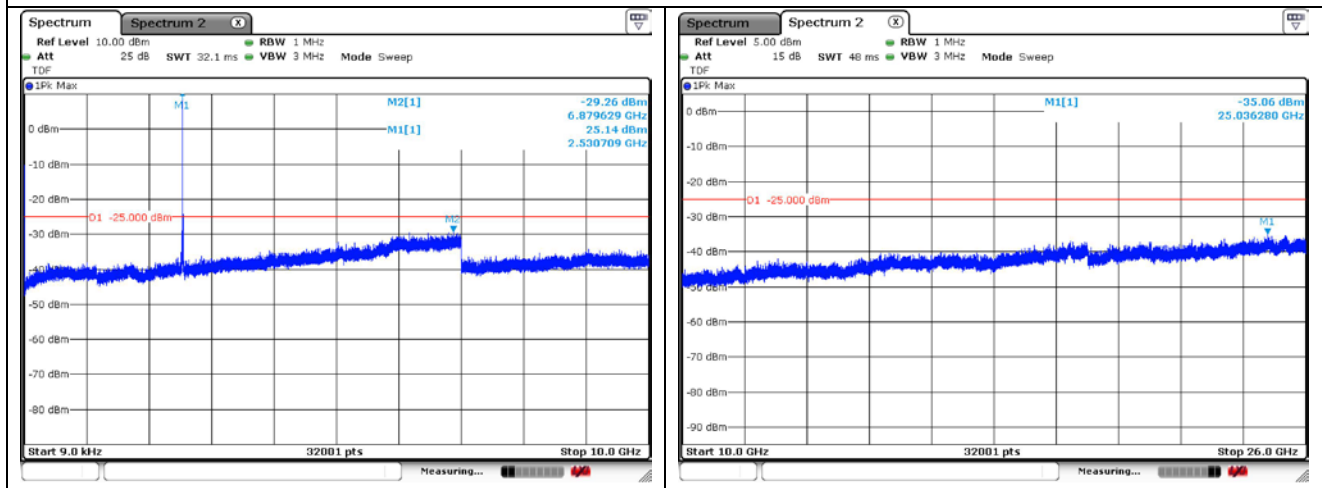
**LTE band 71 (5 MHz)**

**QPSK Low Channel - 1 RB**

**QPSK Middle Channel - 1 RB**

**QPSK High Channel - 1 RB**

**SIM 2**

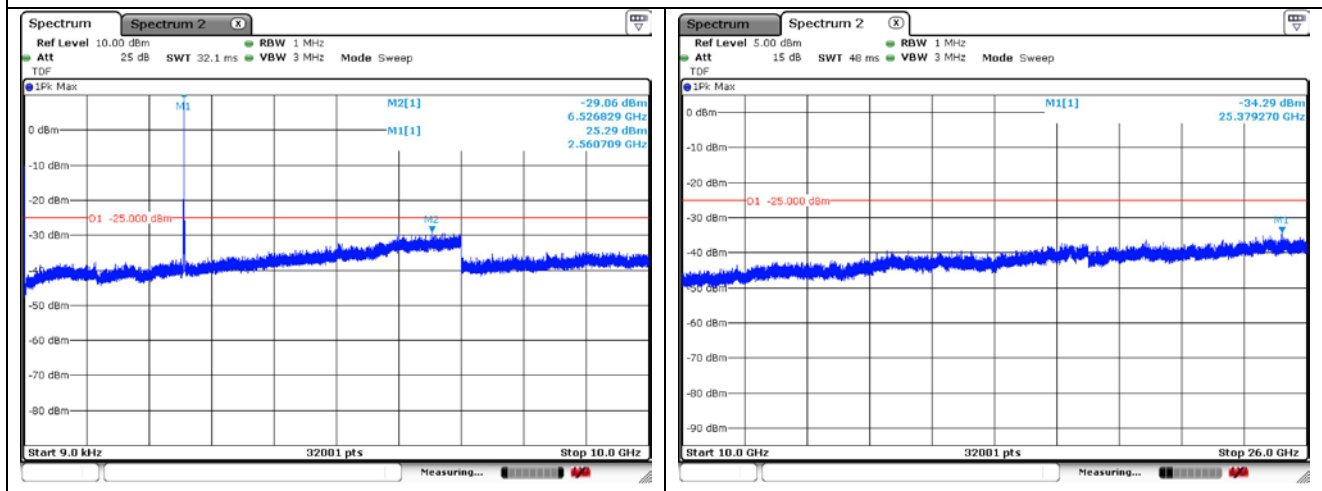
**LTE band 7 (10 MHz)**



**QPSK Low Channel - 1 RB**



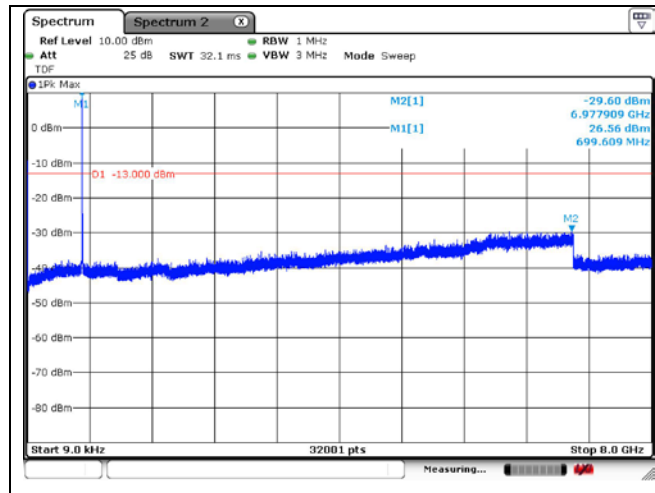
**QPSK Middle Channel - 1 RB**



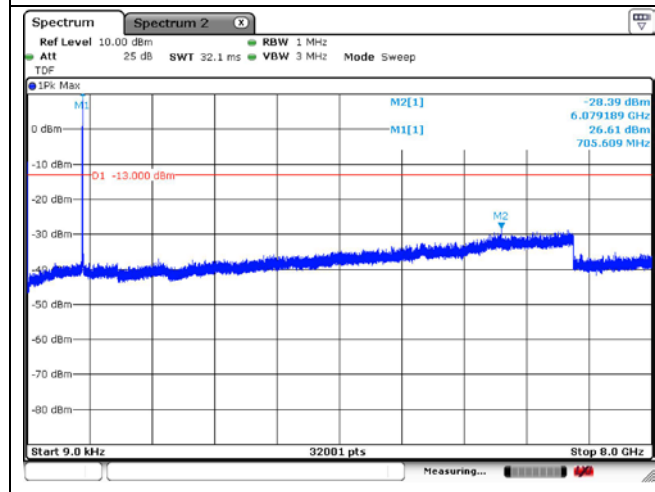
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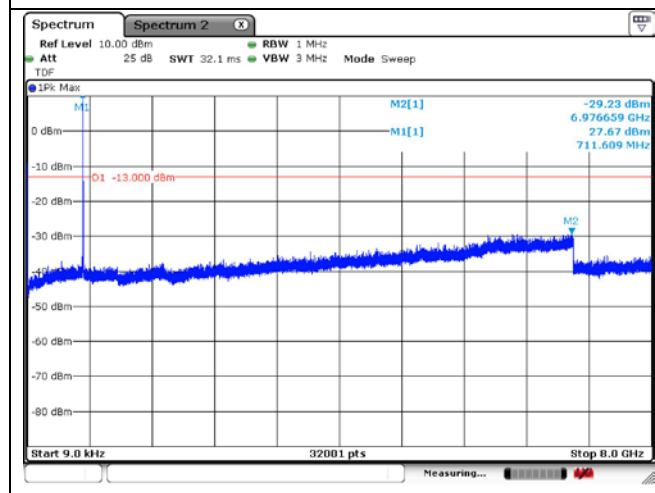
**LTE band 12/17 (5 MHz)**



**QPSK Low Channel - 1 RB**



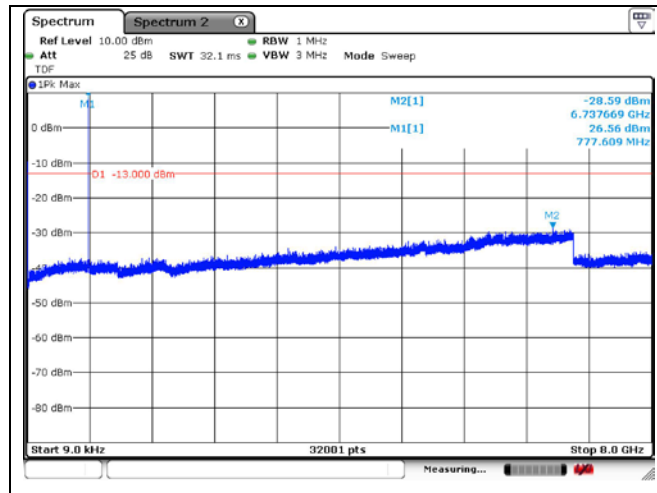
**QPSK Middle Channel - 1 RB**



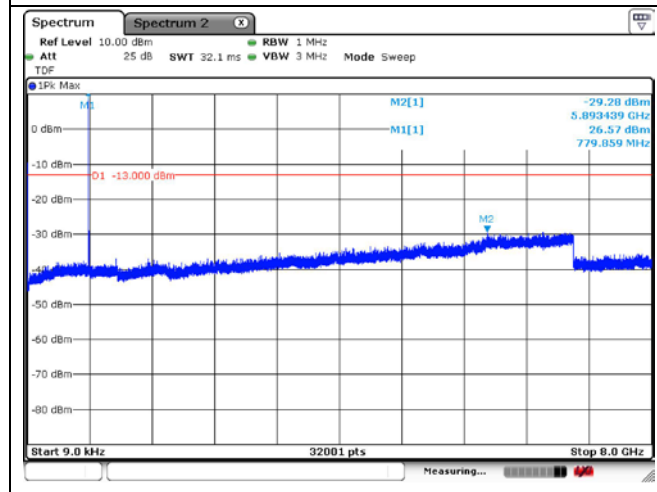
**QPSK High Channel - 1 RB**



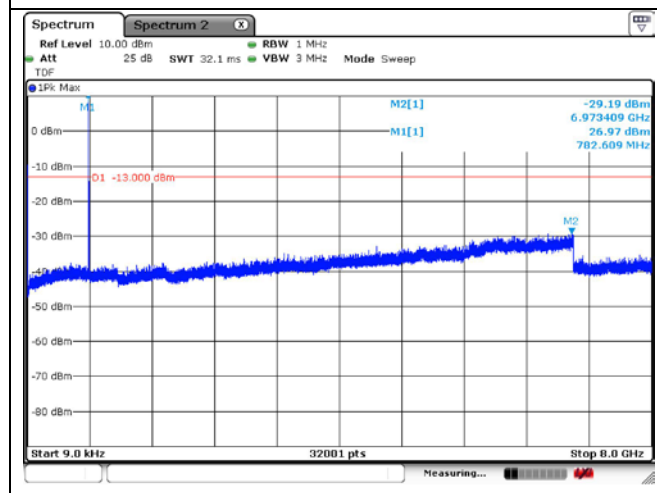
**LTE band 13 (5 MHz)**



**QPSK Low Channel - 1 RB**

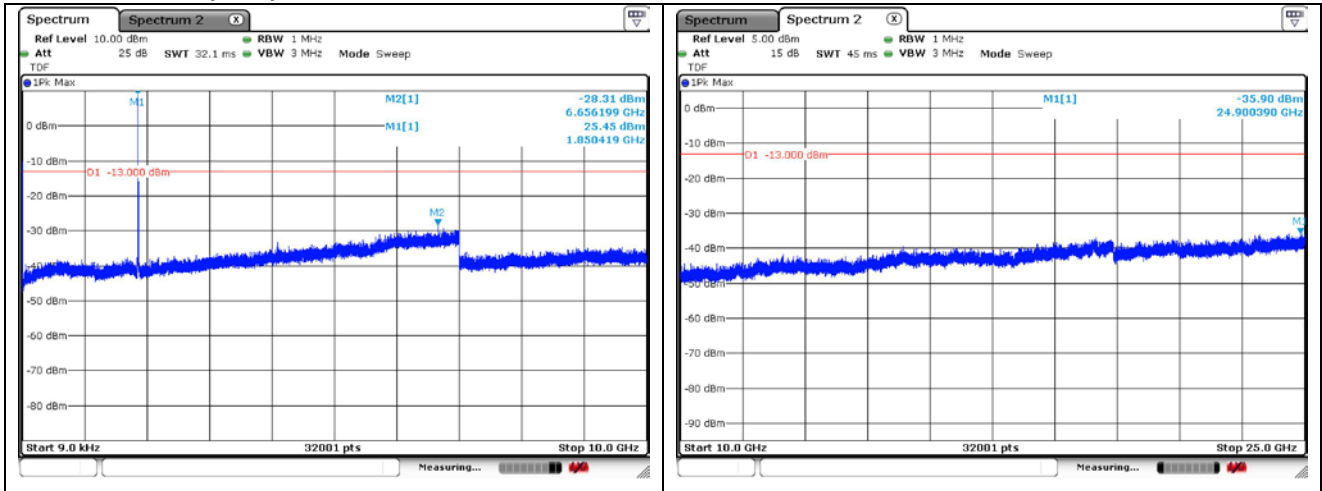


**QPSK Middle Channel - 1 RB**

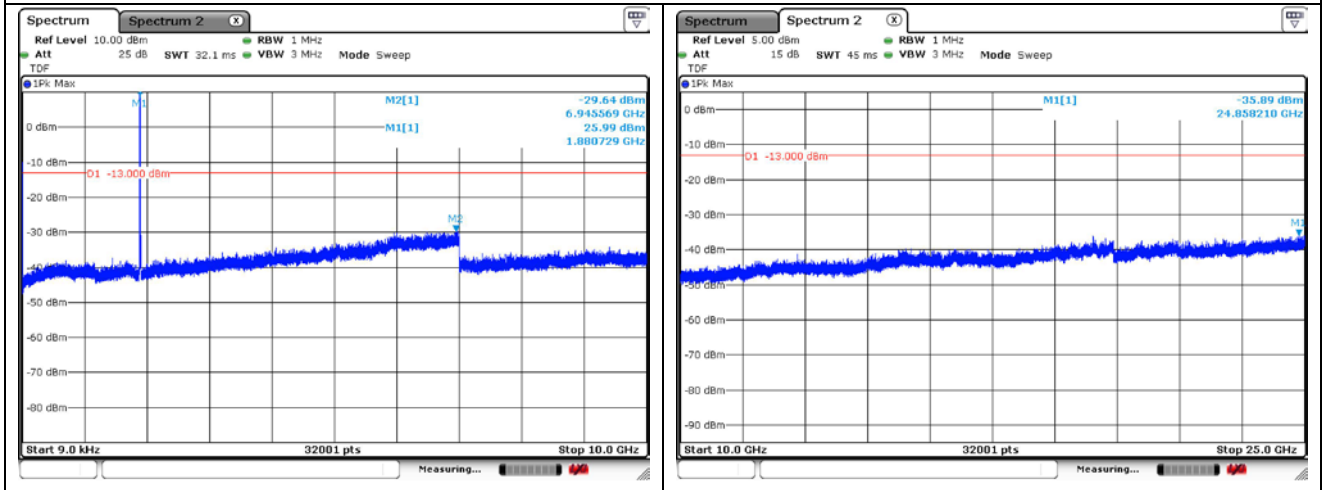


**QPSK High Channel - 1 RB**

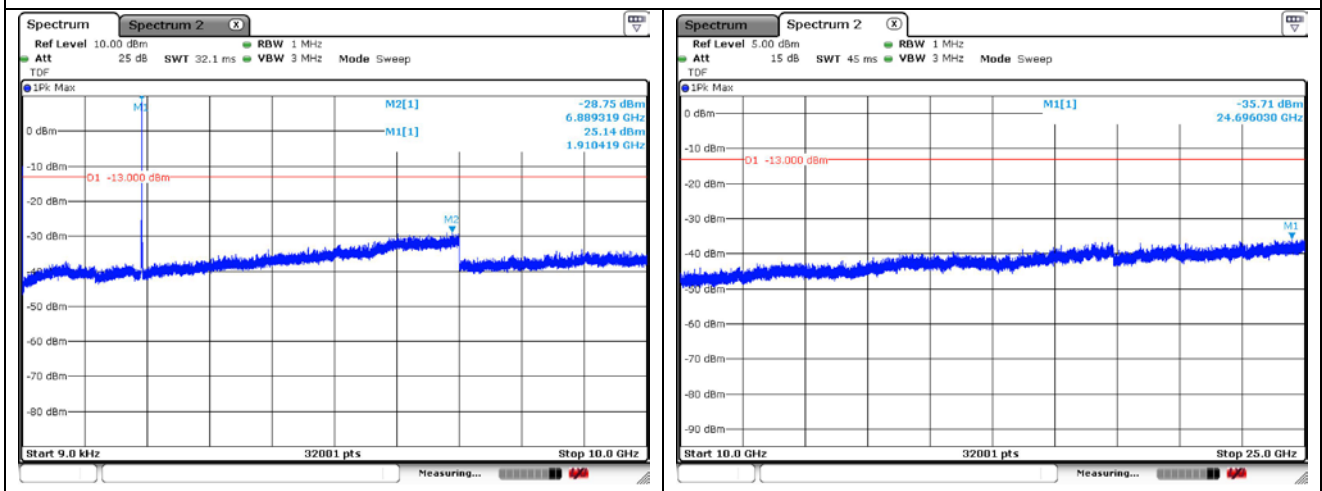
**LTE band 25/2 (5 MHz)**



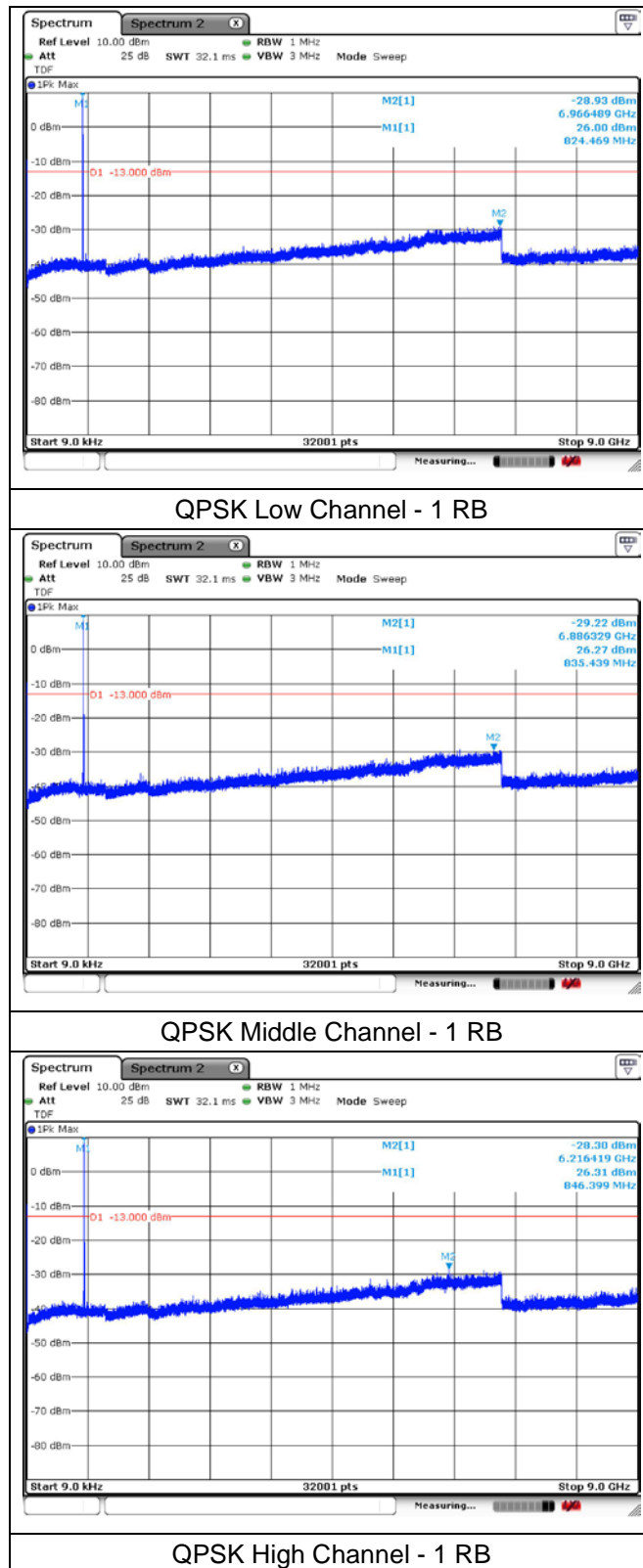
**QPSK Low Channel - 1 RB**

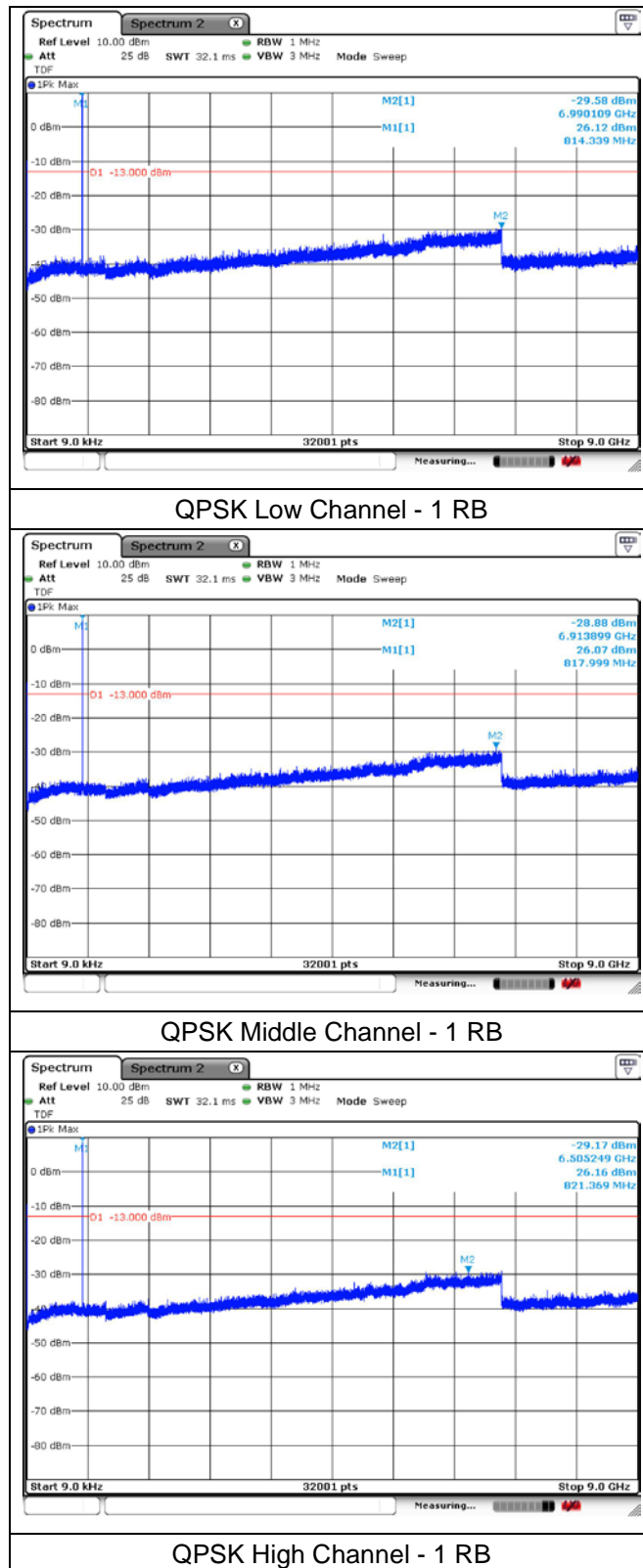


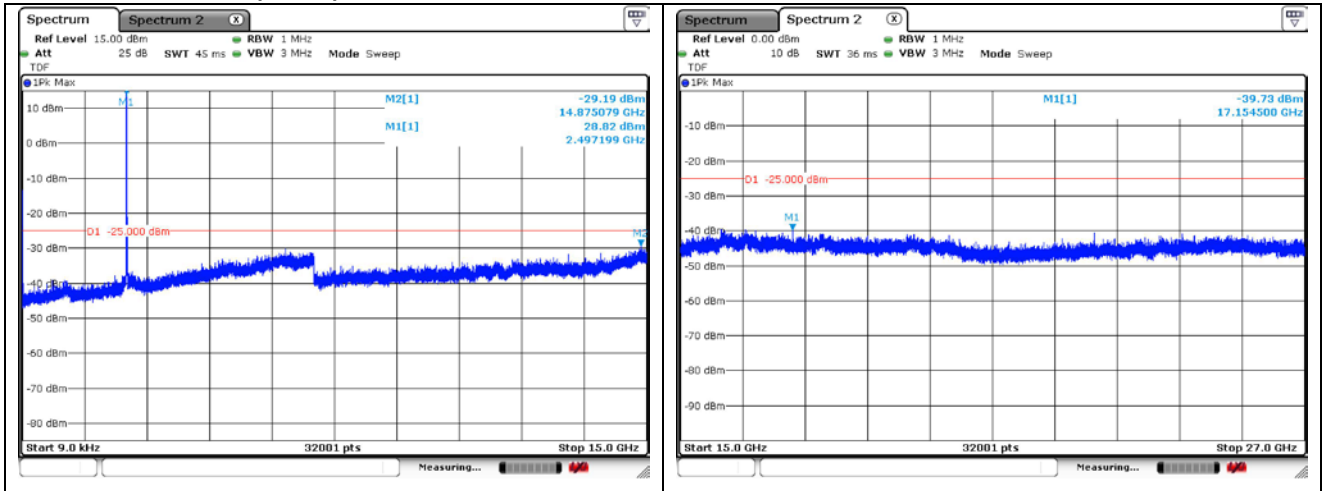
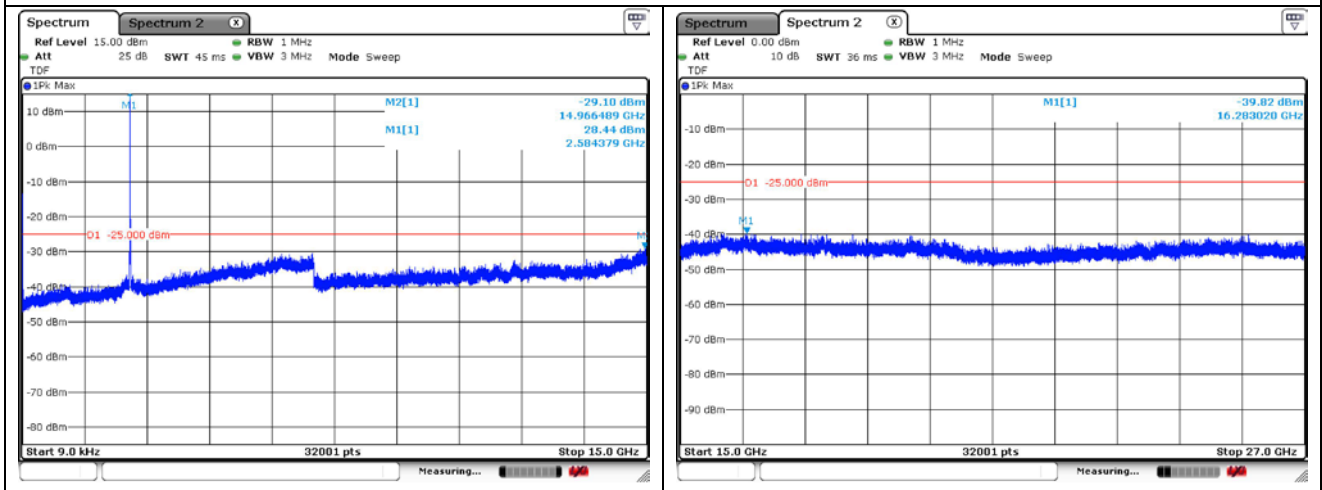
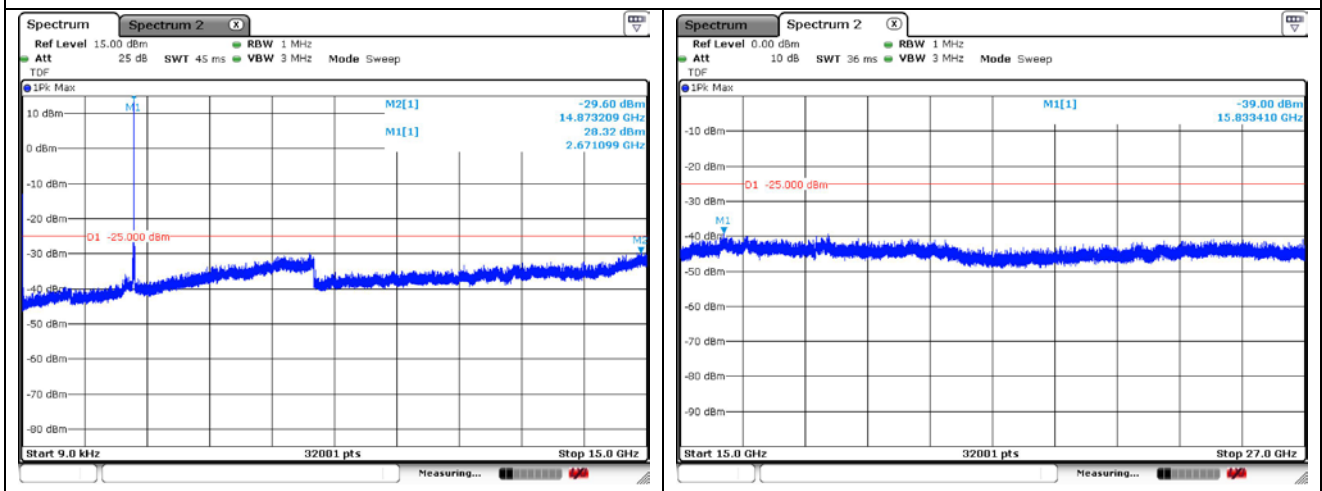
**QPSK Middle Channel - 1 RB**

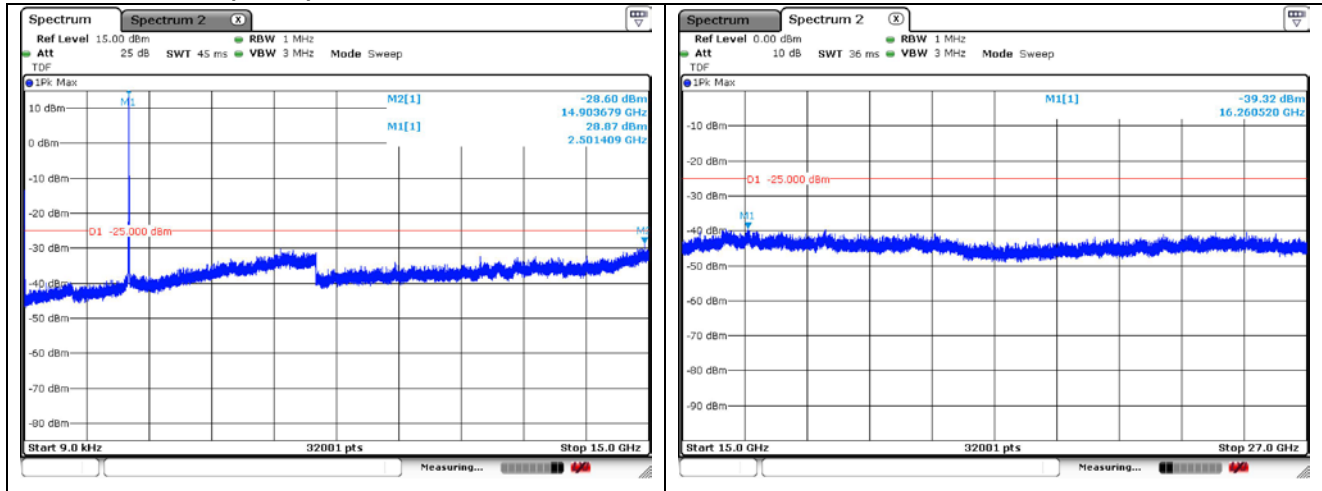
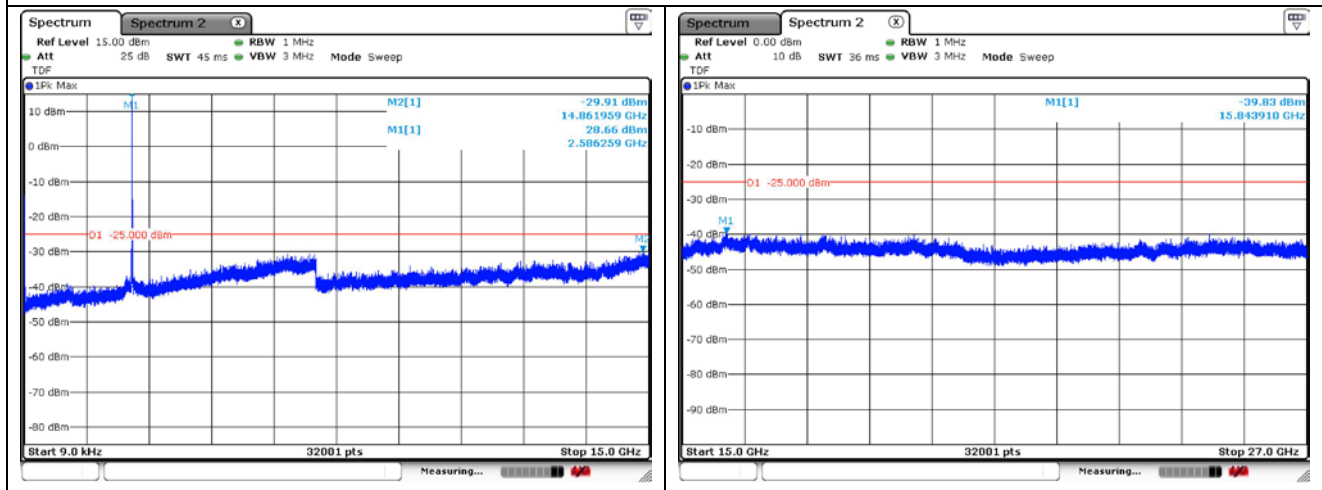
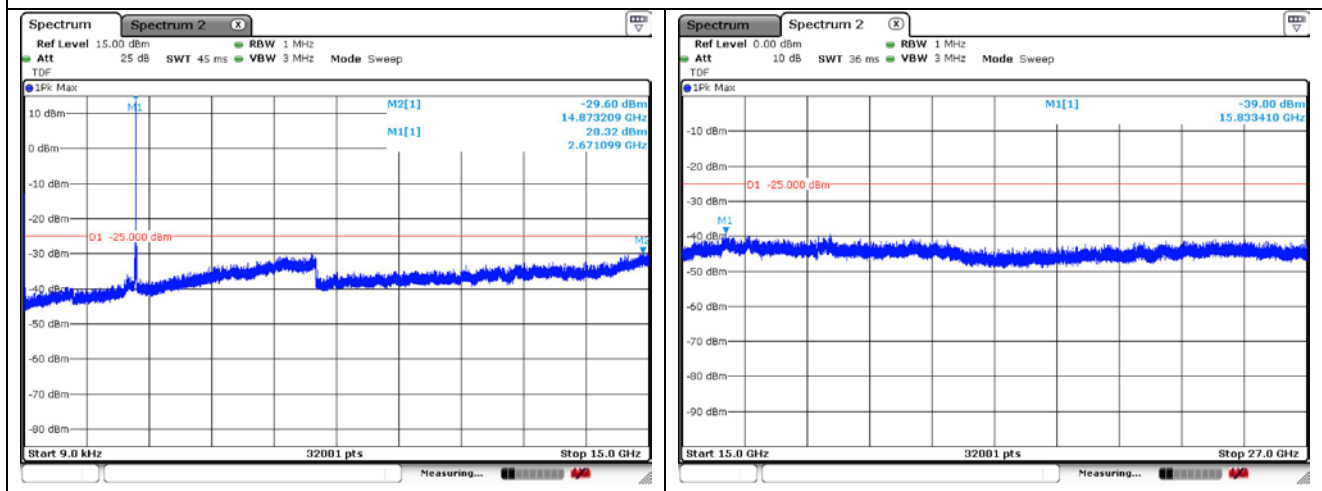


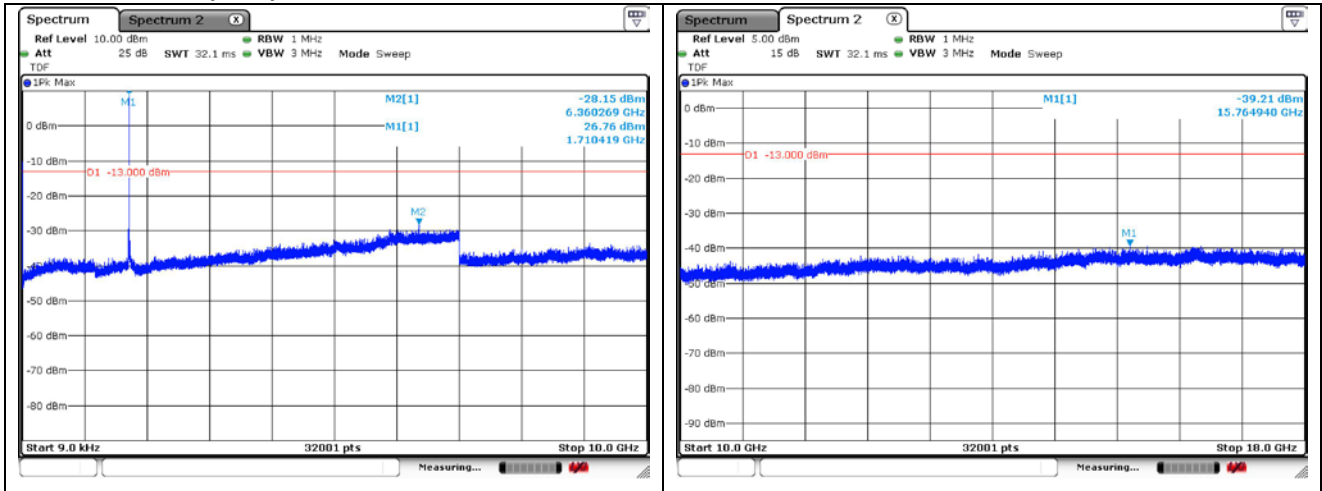
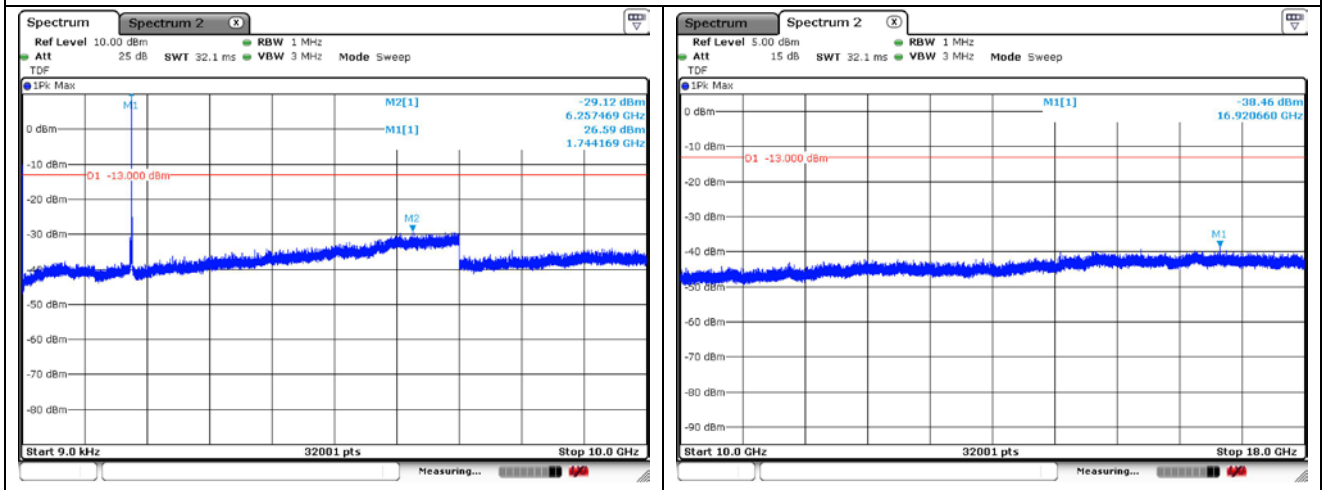
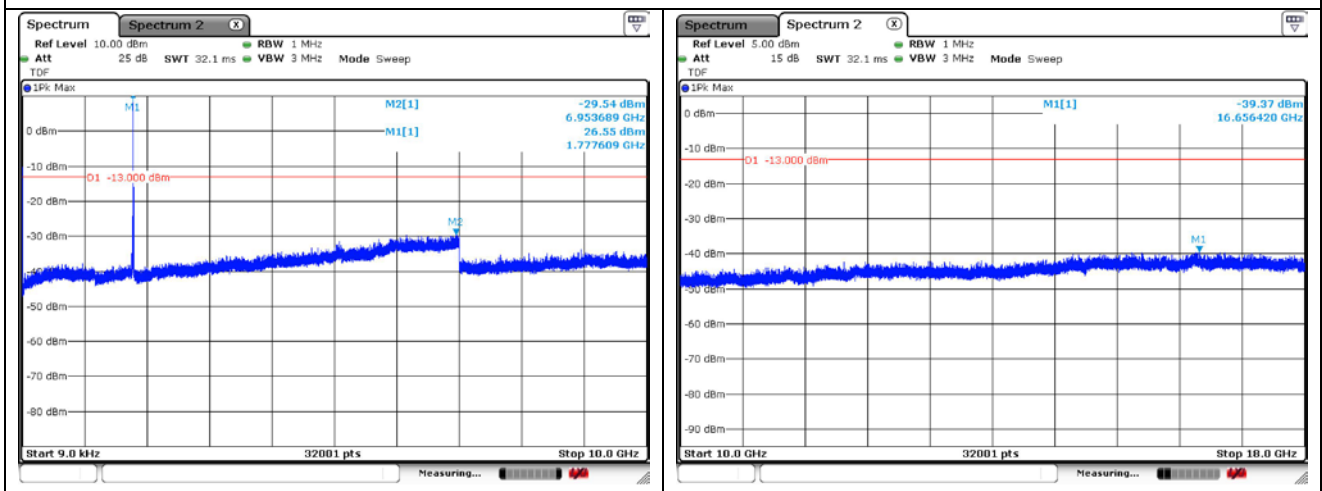
**QPSK High Channel - 1 RB**

**LTE band 26/5 (3 MHz)  
(Part 22)**


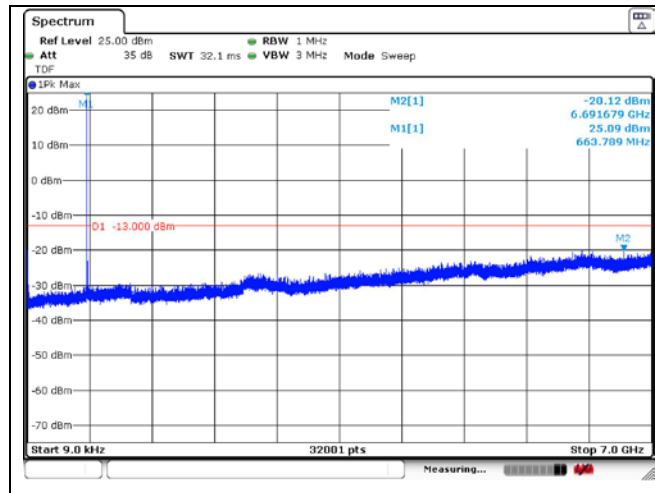
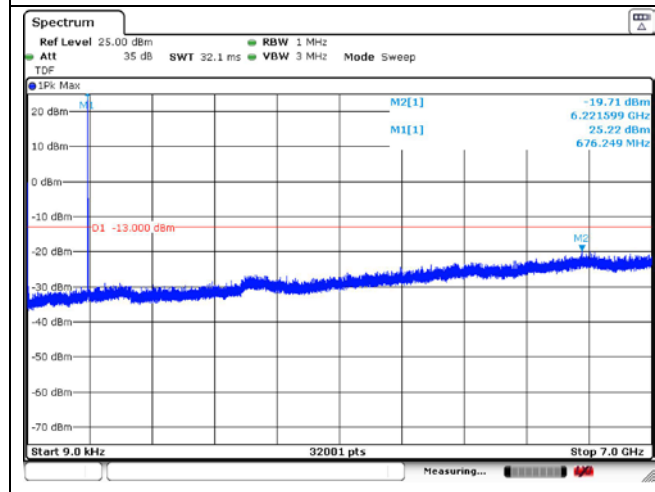
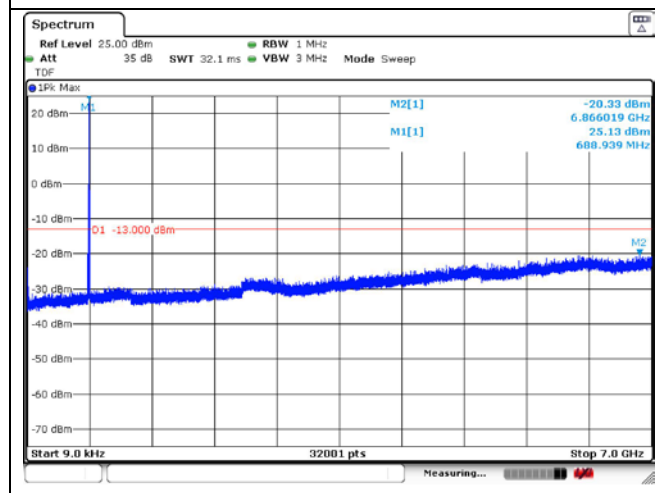
**LTE band 26 (3 MHz)  
(Part 90)**


**LTE band 41\_FCC (20 MHz)**

**QPSK Low Channel - 1 RB**

**QPSK Middle Channel - 1 RB**

**QPSK High Channel - 1 RB**

**LTE band 41\_IC (20 MHz)**

**QPSK Low Channel - 1 RB**

**QPSK Middle Channel - 1 RB**

**QPSK High Channel - 1 RB**

**LTE band 66/4 (3 MHz)**

**QPSK Low Channel - 1 RB**

**QPSK Middle Channel - 1 RB**

**QPSK High Channel - 1 RB**



**LTE band 71 (10 MHz)**

**QPSK Low Channel - 1 RB**

**QPSK Middle Channel - 1 RB**

**QPSK High Channel - 1 RB**