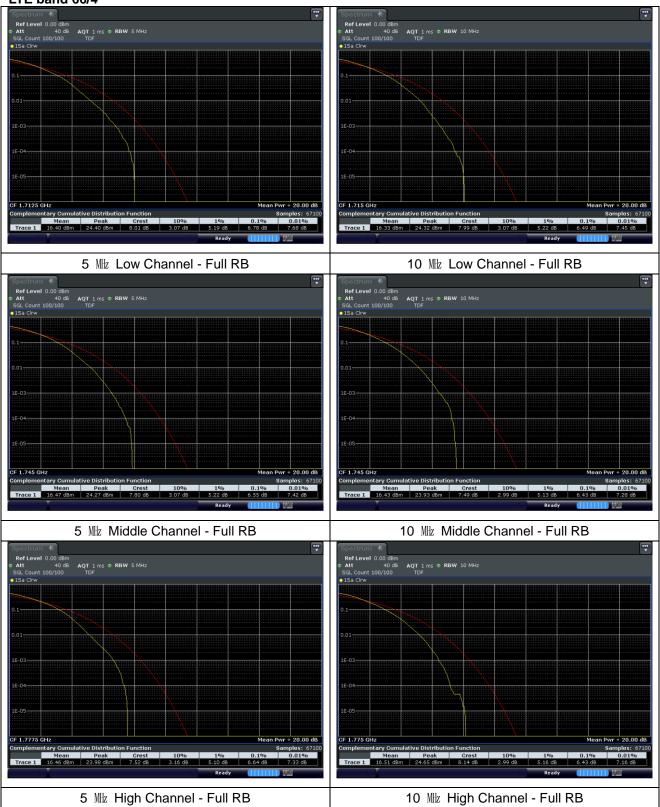


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## LTE band 66/4

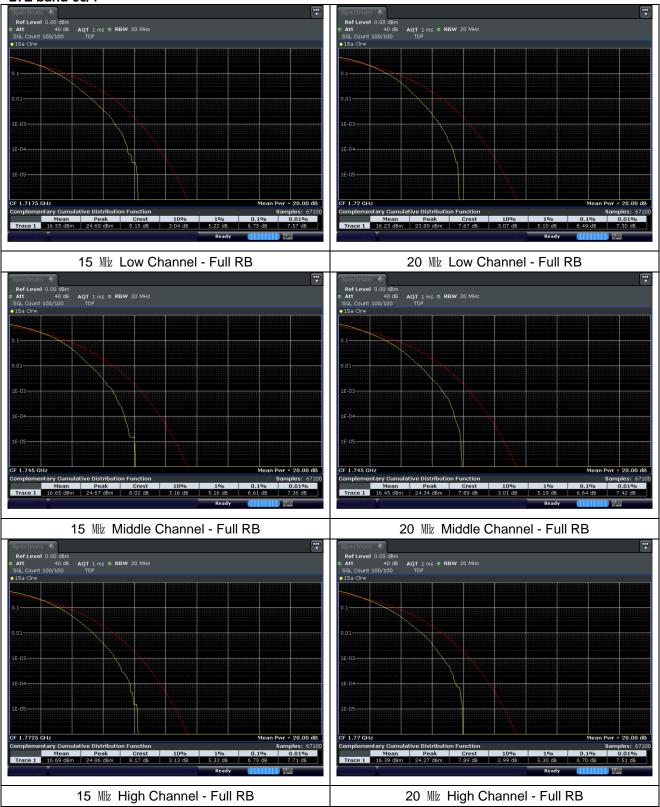




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# LTE band 66/4





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# 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 + 10log(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 Mb 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.
- $\S27.53(g)$ , 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.
- $\S27.53(h)(1)$ , for operations in the 1 695-1 710 Mb, 1 710-1 755 Mb, 1 755-1 780 Mb, 1 915-1 920 Mb, 1 995-2 000 Mb, 2 000-2 020 Mb, 2 110-2 155 Mb, 2 155-2 180 Mb, 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<sub>10</sub> (P) dB.
- $\S27.53(m)(4)$ , for mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log_{10}(P) \, \mathrm{dB}$  on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log_{10}(P) \, \mathrm{dB}$  on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log_{10}(P) \, \mathrm{dB}$  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 that  $43 + 10 \log_{10}(P) \, \mathrm{dB}$  on all frequencies between 2 490.5 Mb and 2 496 Mb and  $55 + 10 \log_{10}(P) \, \mathrm{dB}$  at or below 2 490.5 Mb. Mobile Satellite Service licensees operating on frequencies below 2 495 Mb 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.
- §90.543(e), For operations in the 758-768 Mb and the 788-798 Mb bands, the power of any emission outside the 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, in accordance with the following:
- (1) On all frequencies between 769-775  $\,\text{Mb}$  and 799-805  $\,\text{Mb}$ , by a factor not less than 76 + 10 log (P)  $\,\text{dB}$  in a 6.25  $\,\text{kb}$  band segment, for base and fixed stations.
- (2) On all frequencies between 769-775  $\,\text{Mb}$  and 799-805  $\,\text{Mb}$ , by a factor not less than 65 + 10 log (P)  $\,\text{dB}$  in a 6.25  $\,\text{kb}$  band segment, for mobile and portable stations.
- (3) On any frequency between 775-788 Mb, above 805 Mb, and below 758 Mb, by at least 43 + 10 log (P) dB.
- (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 klz segment.
- (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 klb or greater. However, in the 100 klb bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 klb may be employed.



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#### IC

#### - RSS-130 Issue 2

- 4.7.1, the unwanted emissions in any 100 klb 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<sub>10</sub> p (watts), dB. However, in the 100 klb band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 klb may be employed.
- 4.7.2, In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 Mb and 777-787 Mb shall also comply with the following restrictions:
- a) The power of any unwanted emissions in any 6.25 km bandwidth for all frequencies between 763-775 km and 793-806 km shall be attenuated below the transmitter power, P (dB W), by at least:
- (i) 76 + 10 log10 p (watts), dB, for base and fixed equipment, and
- (ii) 65 + 10 log10 p (watts), dB, for mobile and portable equipment.
- b) The e.i.r.p. in the band 1 559-1 610 Nb shall not exceed -70 dB W/Nb for wideband signal and -80 dB W for discrete emission with bandwidth less than 700 Hz.
- 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 Mb 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<sub>10</sub> p (watts).
- (ii) After the first 1.0 Mb immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kb bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least 43 + 10 log<sub>10</sub> p (watts). If the measurement is performed using 1 % of the occupied bandwidth, power integration over 100 kb is required.
- RSS-133 Issue 6
- 6.5, Equipment shall comply with the limits in (i) and (ii) below.
- (i) In the 1.0 Mb 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<sub>10</sub> p(watts).
- (ii) After the first 1.0 Mb, the emission power in any 1 Mb bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least 43 + 10 log<sub>10</sub> p(watts). If the measurement is performed using 1 % of the emission bandwidth, power integration over 1.0 Mb is required.
- RSS-139 Issue 3
- 6.6, (i) In the first 1.0 Mb 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<sub>10</sub> p (watts) dB.
- (ii) After the first 1.0  $\,\text{Mb}$  outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1  $\,\text{Mb}$  bandwidth shall be attenuated below the transmitter output power P (in  $\,\text{dB}$  W) by at least 43 + 10  $\,\text{log}_{10}$  p (watts)  $\,\text{dB}$ .



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#### - RSS-140 Issue 1

- 4.4, The power of any unwanted emission outside the bands 758-768 № and 788-798 № shall be attenuated below the transmitter output power P in dB W as follows, where p is the transmitter output power in watts:
- a) For any frequency between 769-775 Mb and 799-806 Mb:
- i) 76 + 10 log (p), dB in a 6.25 kHz band for fixed and base station equipment
- ii) 65 + 10 log (p), dB in a 6.25 kb band for mobile and portable/hand-held equipment
- b) For any frequency between 775-788 Mb, above 806 Mb, and below 758 Mb: 43 + 10 log (p), dB in a bandwidth of 100 klb or greater. However, in the 100 klb bands immediately outside and adjacent to the frequency bands 758-768 Mb and 788-798 Mb, a resolution bandwidth of 30 klb may be employed.

#### - RSS-199 Issue 3

4.5, In the 1 Mb 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 Mb band, a resolution bandwidth of 1 Mb 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 Mb, 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 log10 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 log10 p from the channel edges to 5 Mb away
- ii. 43 + 10 log10 p between 5 Mz and X Mz from the channel edges, and
- iii. 55 + 10 log10 p at X № 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 Mb and 2 496 Mb, and  $55 + 10 \log 10 p$  at or below 2 490.5 Mb.

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



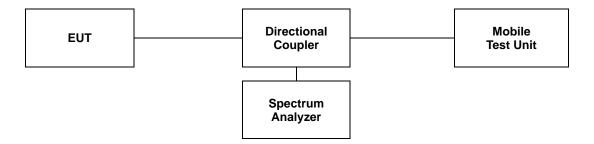
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#### 6.2. Test Procedure

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

- 1. Start frequency was set to 9 klb and stop frequency was set to at least 10\* the fundamental frequency.
- 2. Detector = RMS.
- 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 klb to 26 Glb, 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  $\,\mathrm{klz}$  or greater for frequencies less than 1  $\,\mathrm{Glz}$  and frequencies greater than 1  $\,\mathrm{Glz}$ . However, in the 1  $\,\mathrm{klz}$  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  $\,\mathrm{dB}$  below the transmitter power.



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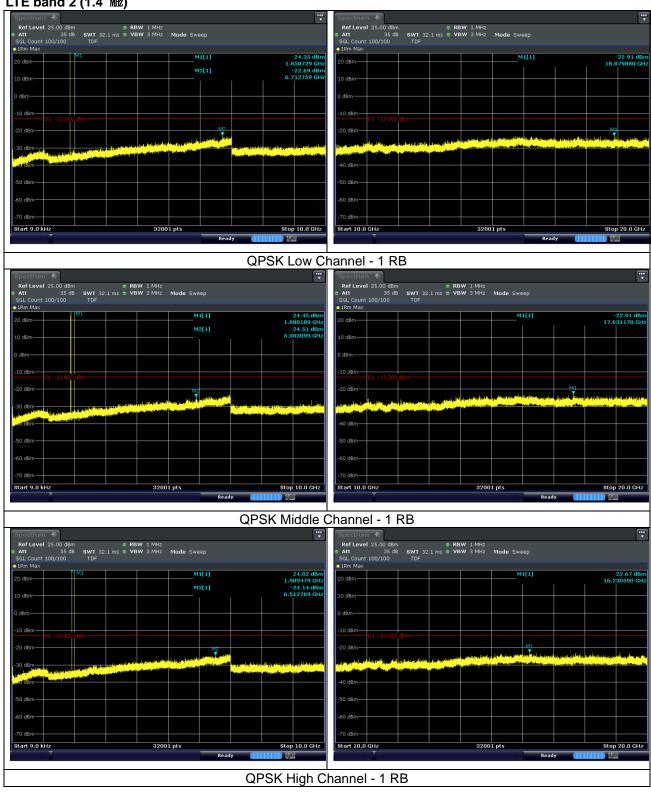
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## 6.3. Test Results

Ambient temperature : (23 ± 1) °C : 47 % R.H. Relative humidity

## - Test plots

## LTE band 2 (1.4 脈)

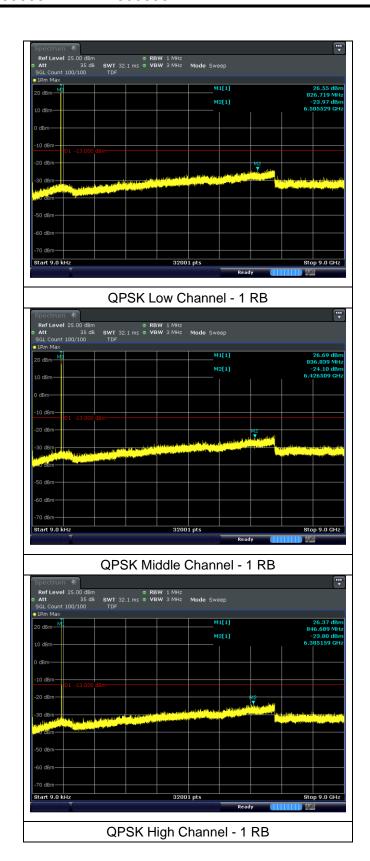




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## LTE band 5 (5 ) (5 )

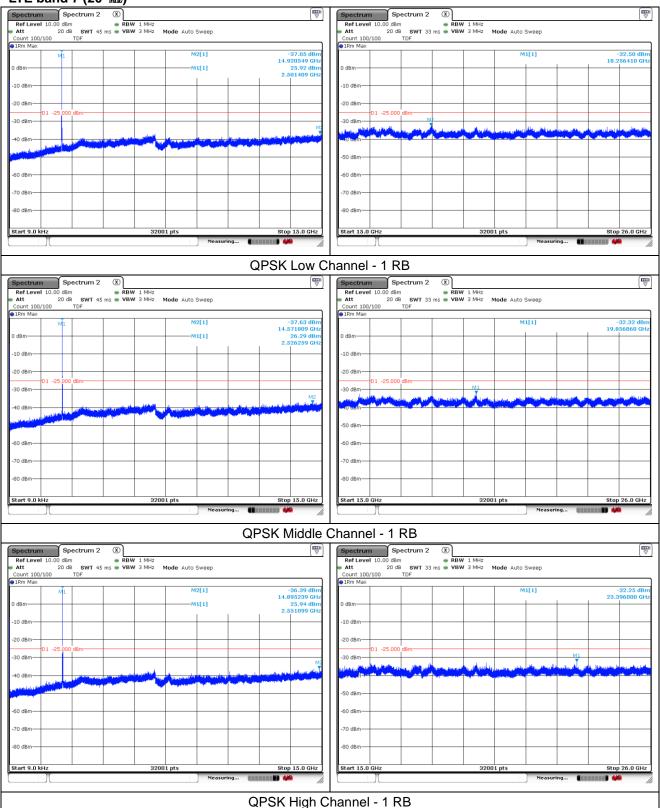




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## LTE band 7 (20 11位)

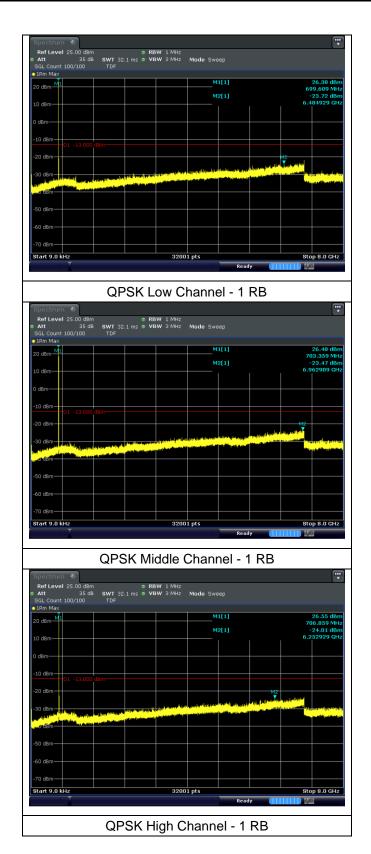




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## LTE band 12 (10 11位)

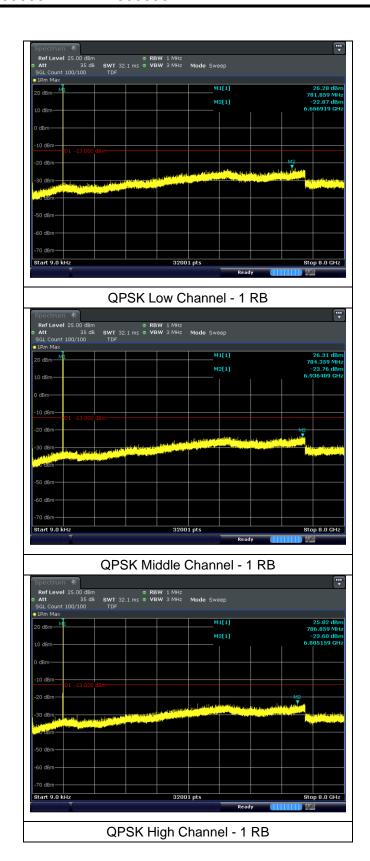




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## LTE band 13 (5 Mb)

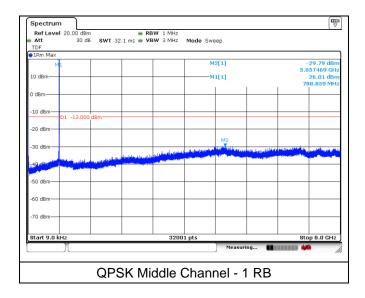




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# LTE band 14 (10 Mb)

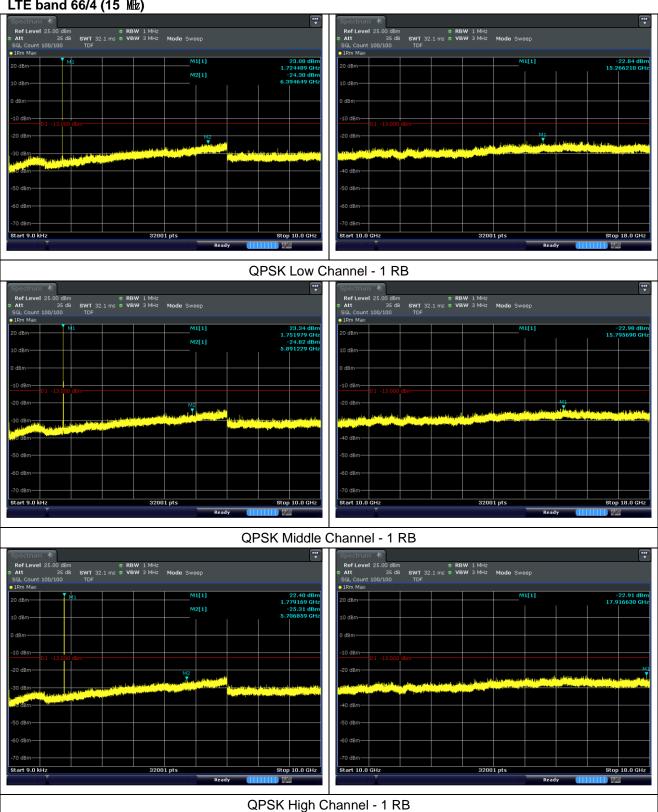




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## LTE band 66/4 (15 Mb)





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# 7. Band Edge and Emission Mask

#### **7.1. 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 + 10log(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 Mb 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(c)(4), on all frequencies between 763-775 Mb and 793-805 Mb, by a factor not less than 65 + 10 log (P) dB in a 6.25 kb band segment, for mobile and portable stations;
- $\S27.53(g)$ , 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 Mb, 1 710-1 755 Mb, 1 755-1 780 Mb, 1 915-1 920 Mb, 1 995-2 000 Mb, 2 000-2 020 Mb, 2 110-2 155 Mb, 2 155-2 180 Mb, 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<sub>10</sub> (P) dB.
- $\S27.53(m)(4)$ , for mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log_{10}(P) \, \mathrm{dB}$  on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log_{10}(P) \, \mathrm{dB}$  on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log_{10}(P) \, \mathrm{dB}$  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 that  $43 + 10 \log_{10}(P) \, \mathrm{dB}$  on all frequencies between 2 490.5 Mb and 2 496 Mb and  $55 + 10 \log_{10}(P) \, \mathrm{dB}$  at or below 2 490.5 Mb. Mobile Satellite Service licensees operating on frequencies below 2 495 Mb 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.
- §90.543(e), For operations in the 758-768 Mb and the 788-798 Mb bands, the power of any emission outside the 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, in accordance with the following:
- (1) On all frequencies between 769-775  $\,\text{Mb}$  and 799-805  $\,\text{Mb}$ , by a factor not less than 76 + 10 log (P)  $\,\text{dB}$  in a 6.25  $\,\text{kb}$  band segment, for base and fixed stations.
- (2) On all frequencies between 769-775  $\,\text{Mb}$  and 799-805  $\,\text{Mb}$ , by a factor not less than 65 + 10 log (P)  $\,\text{dB}$  in a 6.25  $\,\text{kb}$  band segment, for mobile and portable stations.
- (3) On any frequency between 775-788 Mz, above 805 Mz, and below 758 Mz, by at least 43 + 10 log (P) dB.
- (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25  $\,\mathrm{klz}\,$  segment.
- (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.



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#### IC

- RSS-130 Issue 2
- 4.7.1, the unwanted emissions in any 100  $\,\mathrm{kllz}\,$  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 ( $\,\mathrm{dB}\,$  W), by at least 43 + 10  $\,\mathrm{log_{10}}\,$  p (watts),  $\,\mathrm{dB}.$  However, in the 100  $\,\mathrm{kllz}\,$  band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30  $\,\mathrm{kllz}\,$  may be employed.
- 4.7.2, In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 Mb and 777-787 Mb shall also comply with the following restrictions:
- a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 kHz and 793-806 kHz shall be attenuated below the transmitter power, P (dB W), by at least:
- (i) 76 + 10 log10 p (watts), dB, for base and fixed equipment, and
- (ii) 65 + 10 log10 p (watts), dB, for mobile and portable equipment.
- b) The e.i.r.p. in the band 1 559-1 610 New shall not exceed -70 dB W/Mex for wideband signal and -80 dB W for discrete emission with bandwidth less than 700 Hz.
- 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 Mb 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<sub>10</sub> p (watts).
- (ii) After the first 1.0  $\,\text{Mz}\,$  immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100  $\,\text{kHz}\,$  bandwidth shall be attenuated (in  $\,\text{dB}$ ) below the transmitter output power P ( $\,\text{dB}\,$  W) by at least 43 + 10  $\,\text{log}_{10}$  p (watts). If the measurement is performed using 1 % of the occupied bandwidth, power integration over 100  $\,\text{kHz}\,$  is required.
- RSS-133 Issue 6
- 6.5, Equipment shall comply with the limits in (i) and (ii) below.
- (i) In the 1.0 Mb 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<sub>10</sub> p(watts).
- (ii) After the first 1.0 Mb, the emission power in any 1 Mb 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 Mb is required.
- RSS-139 Issue 3
- 6.6, (i) In the first 1.0 Mb 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<sub>10</sub> p (watts) dB.
- (ii) After the first 1.0 Mb outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 Mb bandwidth shall be attenuated below the transmitter output power P (in dB W) by at least 43 + 10  $\log_{10}$  p (watts) dB.



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#### - RSS-140 Issue 1

- 4.4, The power of any unwanted emission outside the bands 758-768 № and 788-798 № shall be attenuated below the transmitter output power P in dB W as follows, where p is the transmitter output power in watts:
- a) For any frequency between 769-775 Mb and 799-806 Mb:
- i) 76 + 10 log (p), dB in a 6.25 kHz band for fixed and base station equipment
- ii) 65 + 10 log (p), dB in a 6.25 kb band for mobile and portable/hand-held equipment
- b) For any frequency between 775-788 Mb, above 806 Mb, and below 758 Mb: 43 + 10 log (p), dB in a bandwidth of 100 klb or greater. However, in the 100 klb bands immediately outside and adjacent to the frequency bands 758-768 Mb and 788-798 Mb, a resolution bandwidth of 30 klb may be employed.

#### - RSS-199 Issue 3

4.5, In the 1 Mb 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 Mb band, a resolution bandwidth of 1 Mb 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 Mb, 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 log10 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 log10 p from the channel edges to 5 Mb away
- ii. 43 + 10 log10 p between 5 Mb and X Mb from the channel edges, and
- iii. 55 + 10 log10 p at X № 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 Mb and 2 496 Mb, and  $55 + 10 \log 10 p$  at or below 2 490.5 Mb.

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



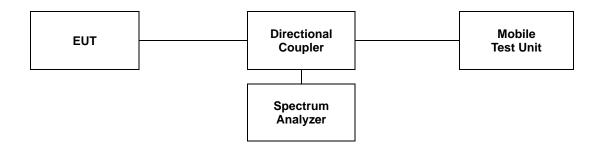
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## 7.2. Test Procedure

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

- a. Span was set large enough so as to capture all out of band emissions near the band edge.
- b. RBW ≥ 1 % of OBW
- c. VBW ≥ 3 x RBW.
- d. Detector = RMS.
- e. Trace mode = Average.
- f. Sweep time = Auto.
- g. The trace was allowed to stabilize.
- h. All path loss of frequency range was investigated and compensated to spectrum analyzer as TDF function.





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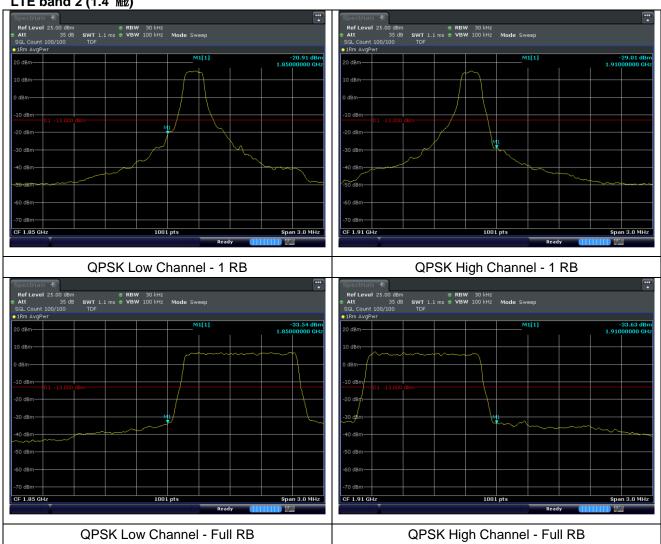
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## 7.3. Test Results

Ambient temperature : (23 ± 1) °C Relative humidity : 47 % R.H.

## - Test plots

## LTE band 2 (1.4 账)

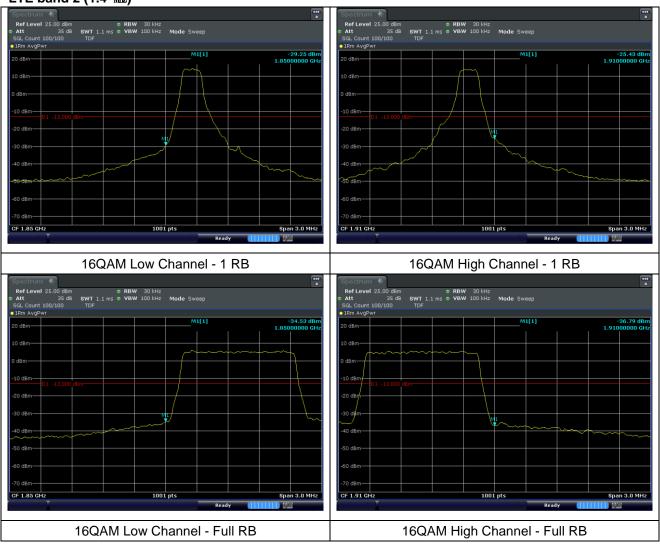




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## LTE band 2 (1.4 账)

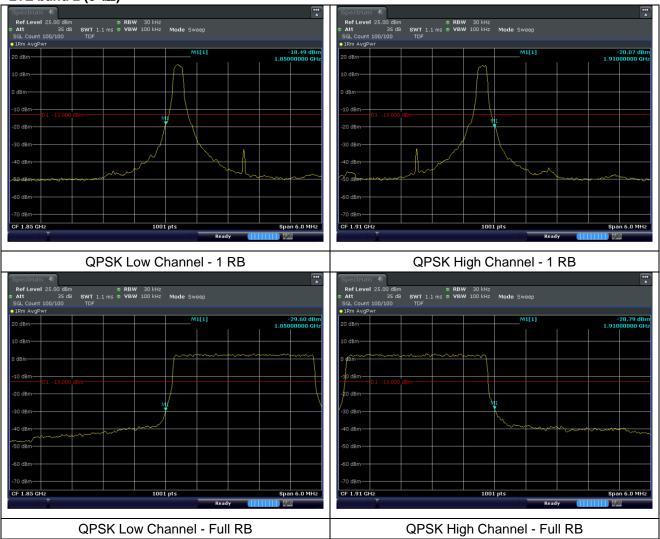




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## LTE band 2 (3 脈)

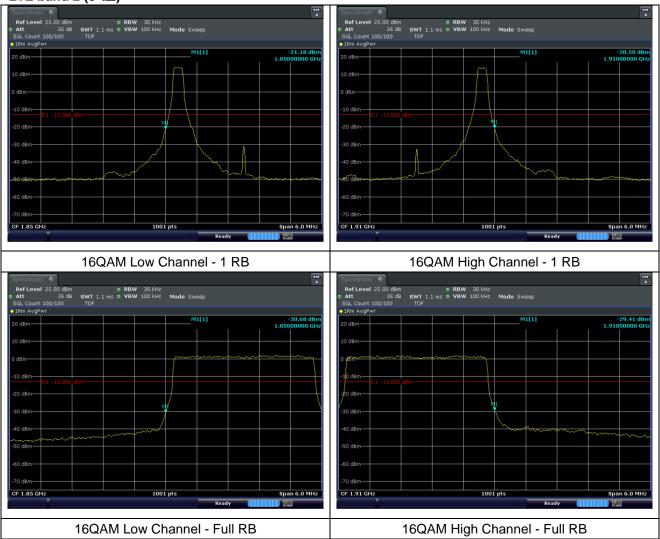




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# LTE band 2 (3 脈)

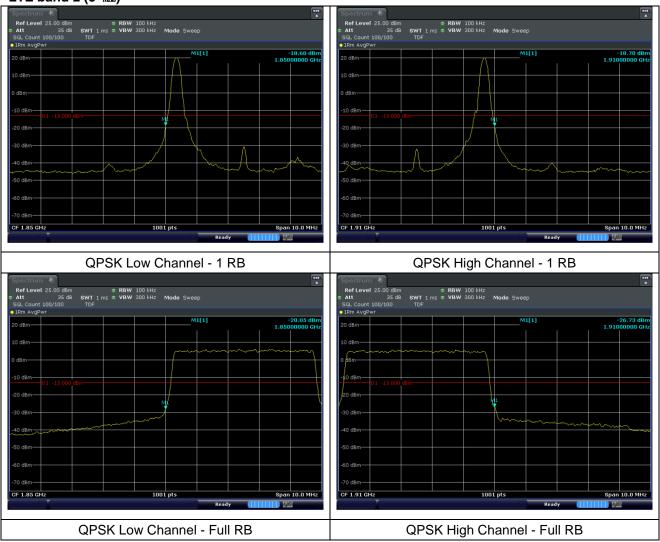




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# LTE band 2 (5 脈)

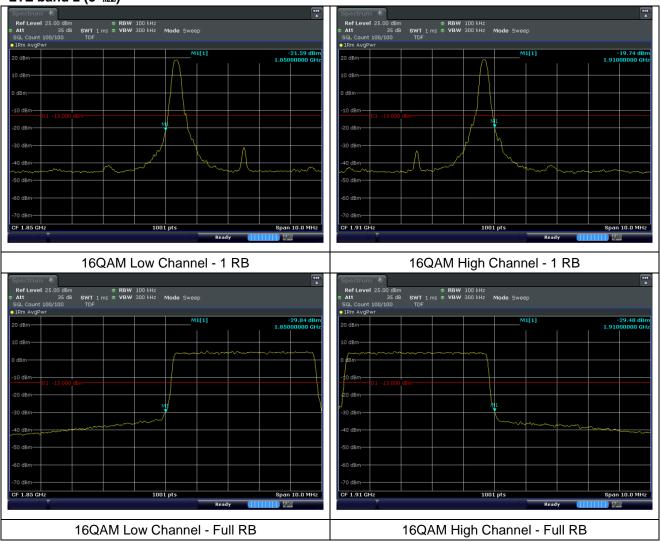




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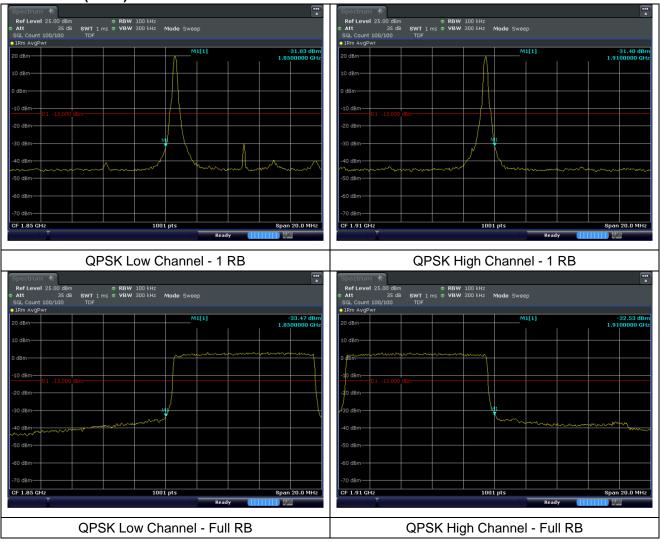




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## LTE band 2 (10 脈)

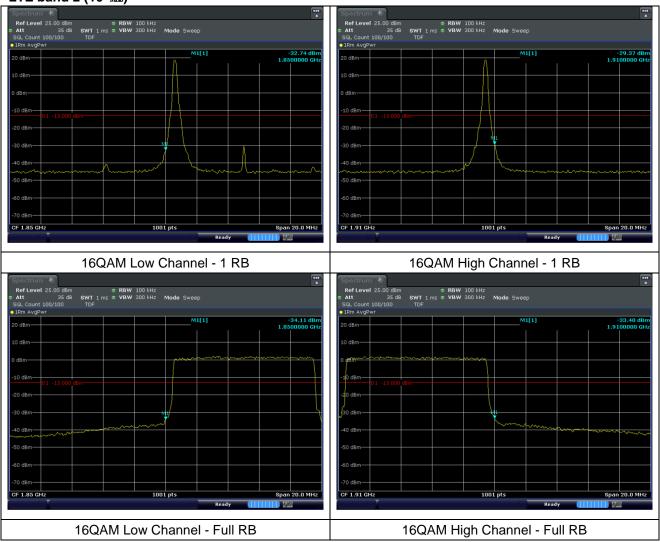




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## LTE band 2 (10 脈)

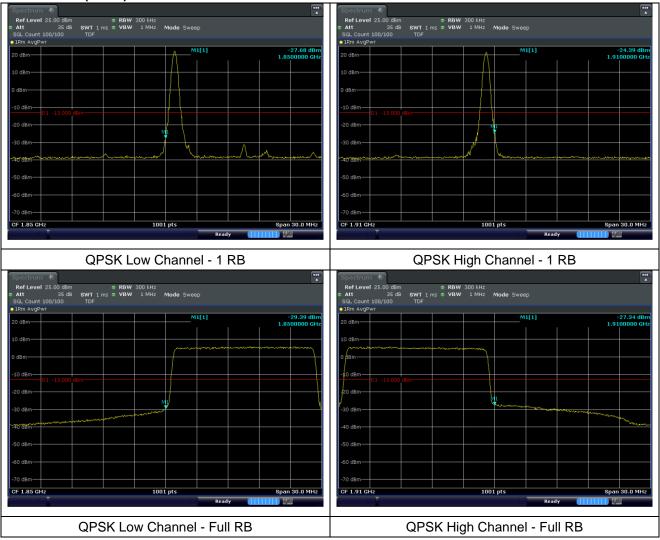




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## LTE band 2 (15 脈)

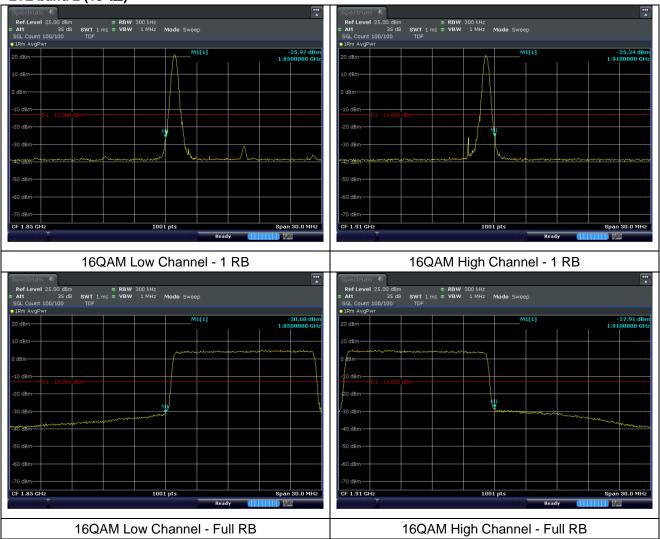




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## LTE band 2 (15 脈)

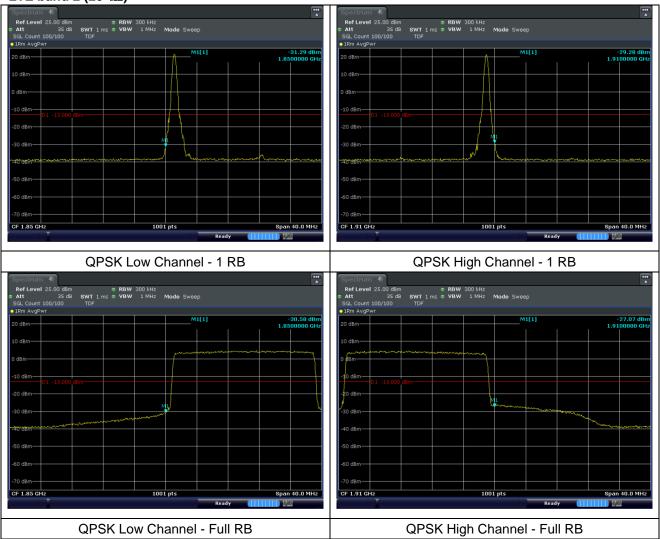




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## LTE band 2 (20 脈)

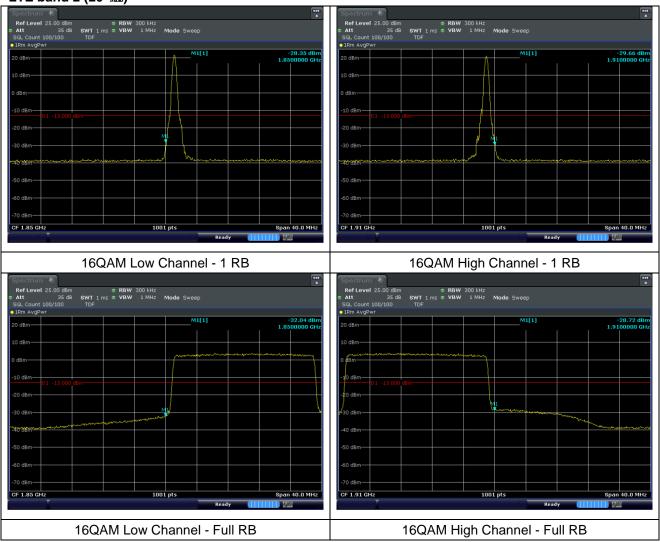




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## LTE band 2 (20 脈)

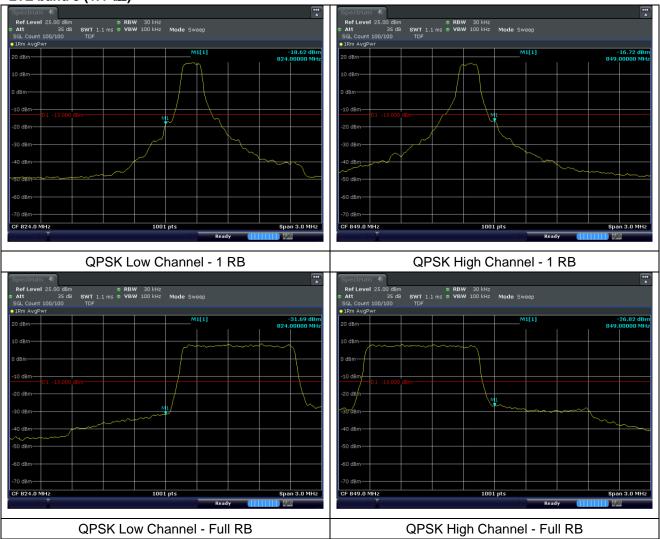




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## LTE band 5 (1.4 账)

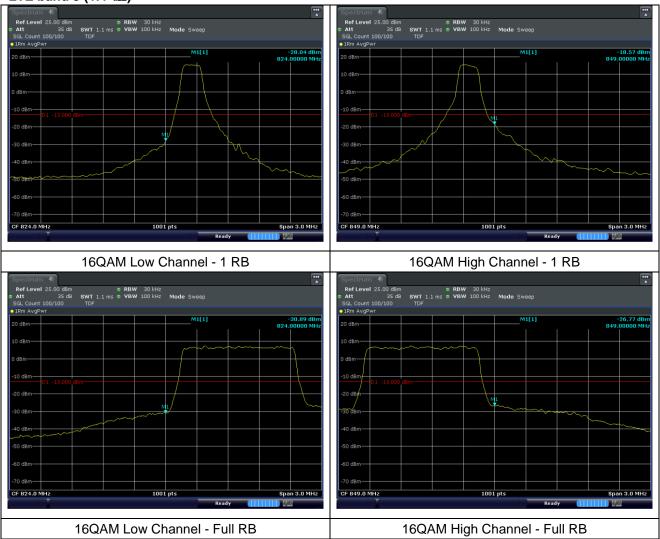




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## LTE band 5 (1.4 账)

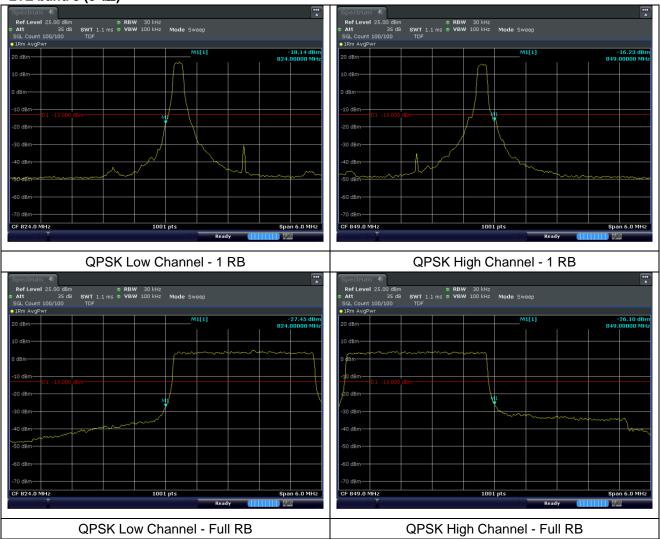




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# LTE band 5 (3 脈)

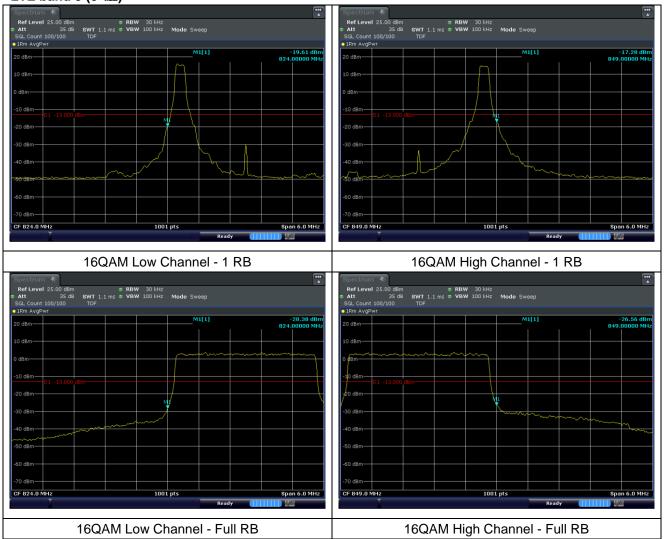




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# LTE band 5 (3 脈)

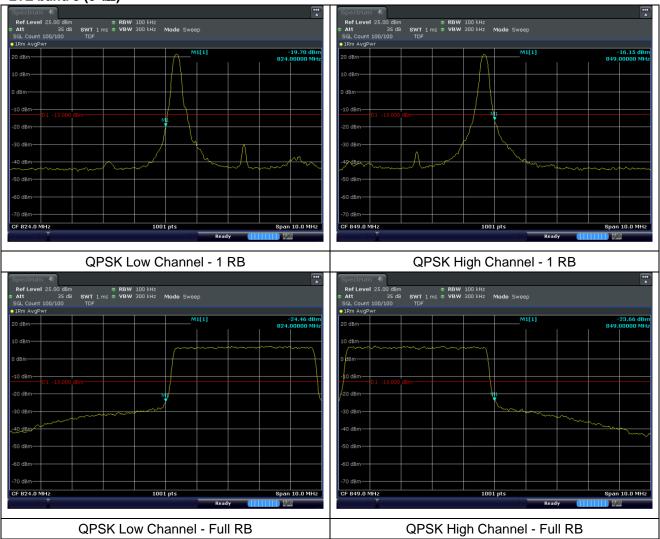




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# LTE band 5 (5 脈)

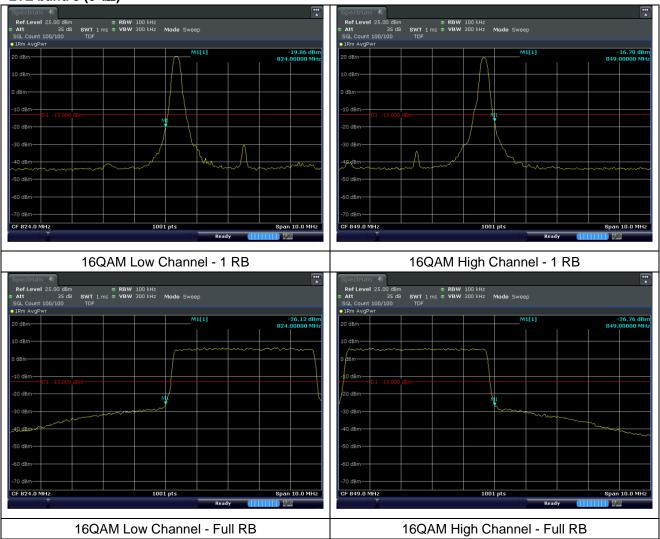




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# LTE band 5 (5 脈)





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## LTE band 5 (10 账)

