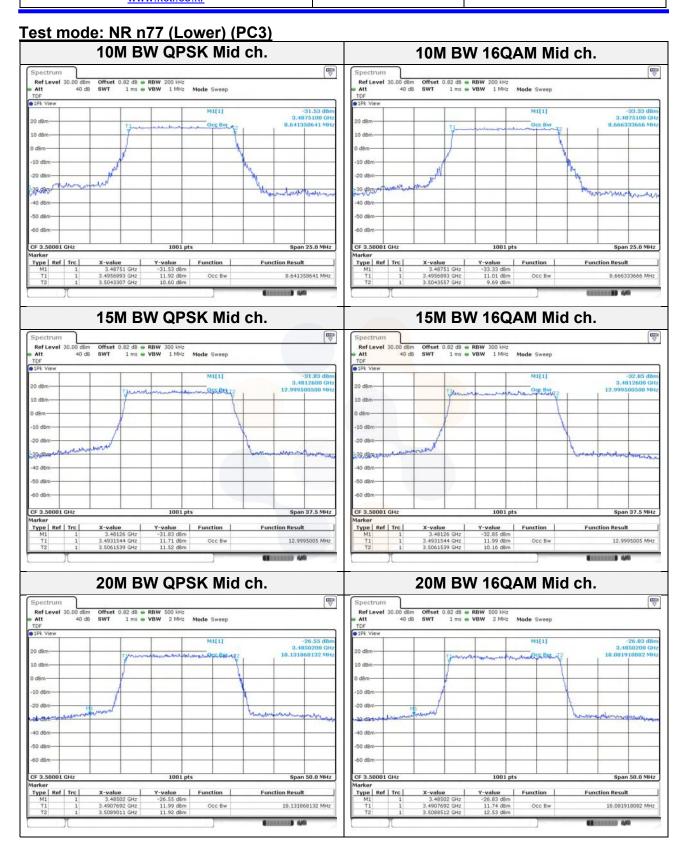
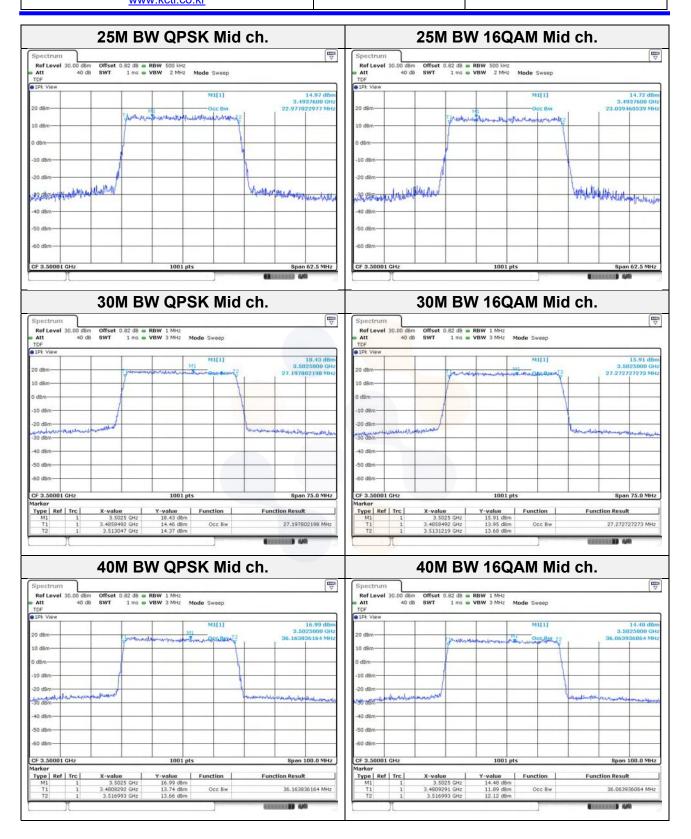
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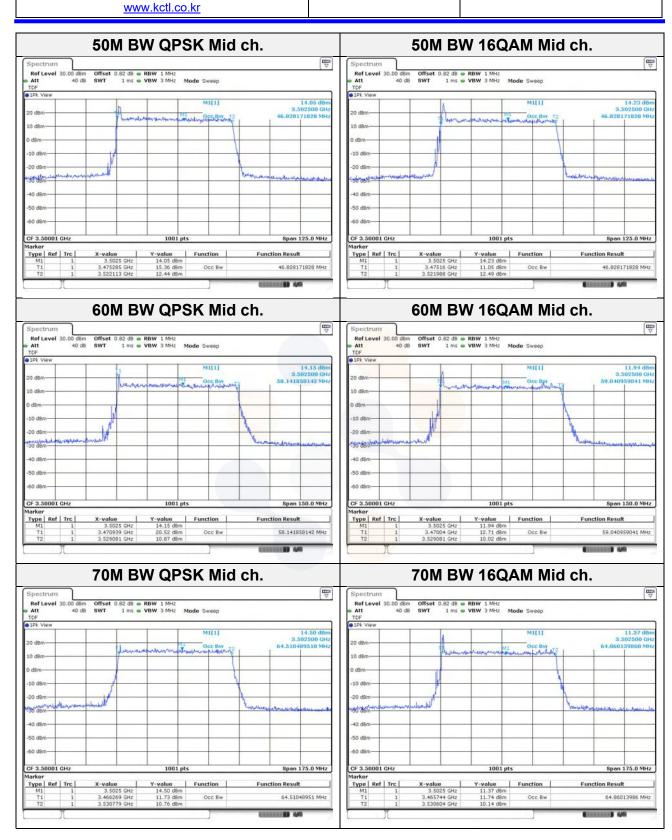
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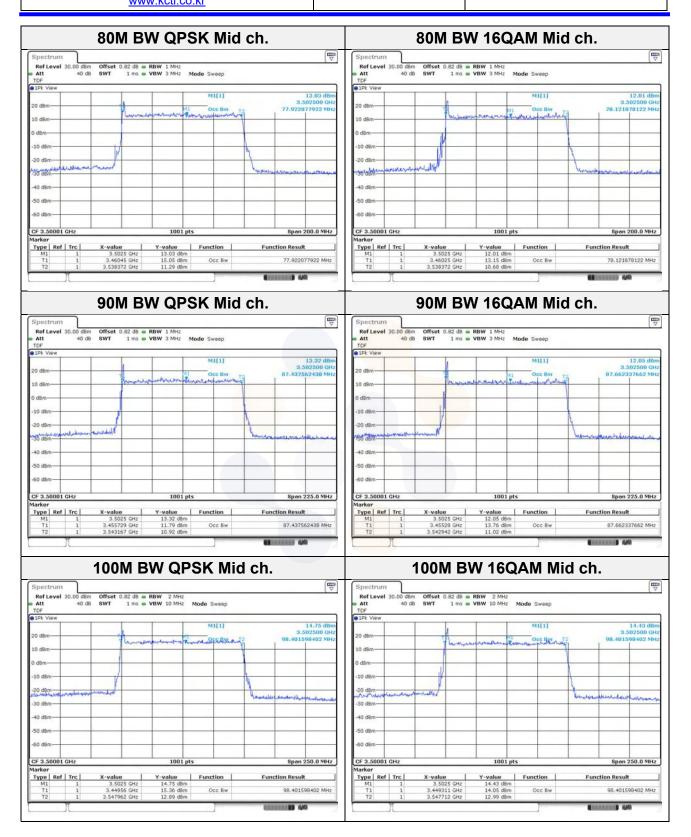
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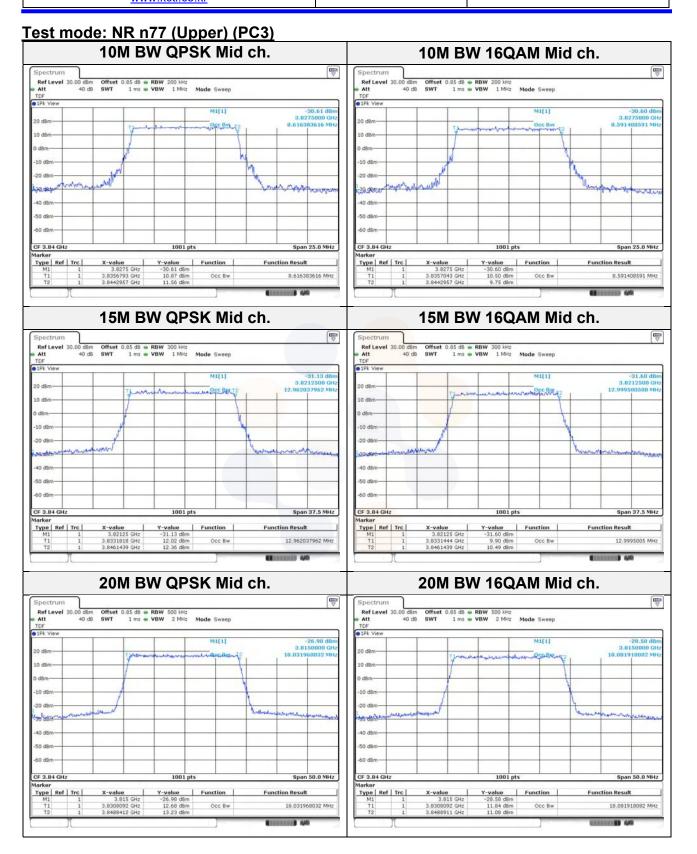
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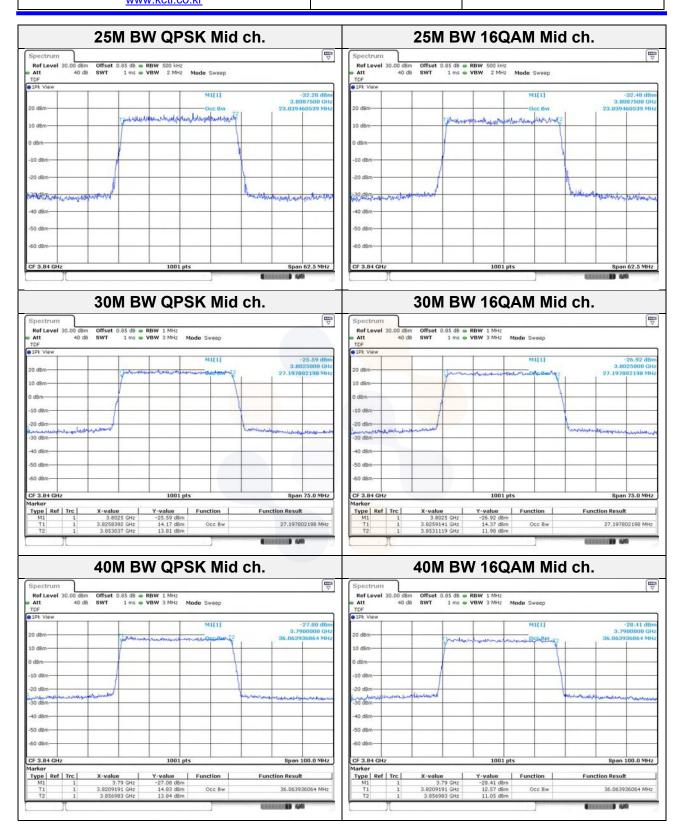
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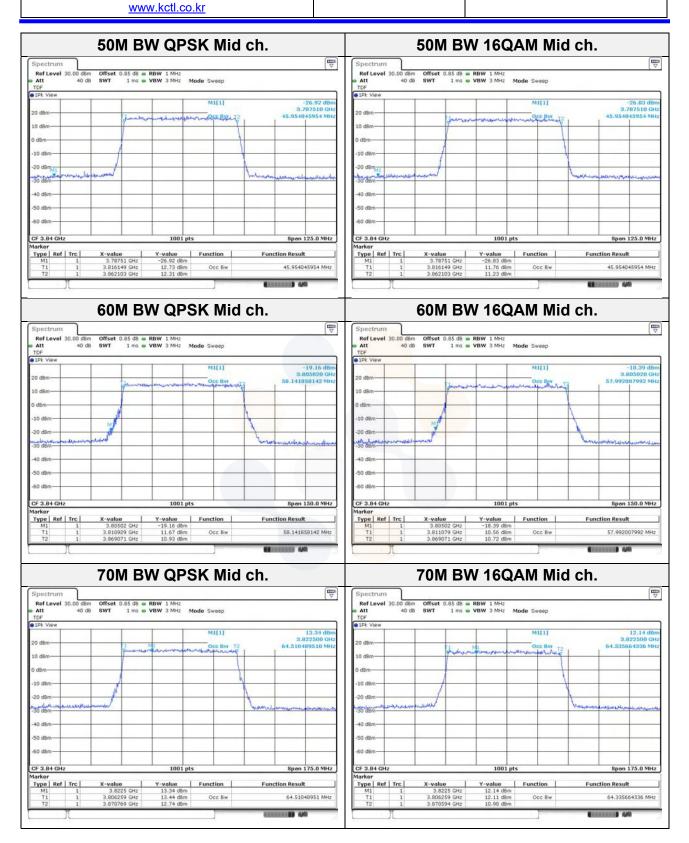
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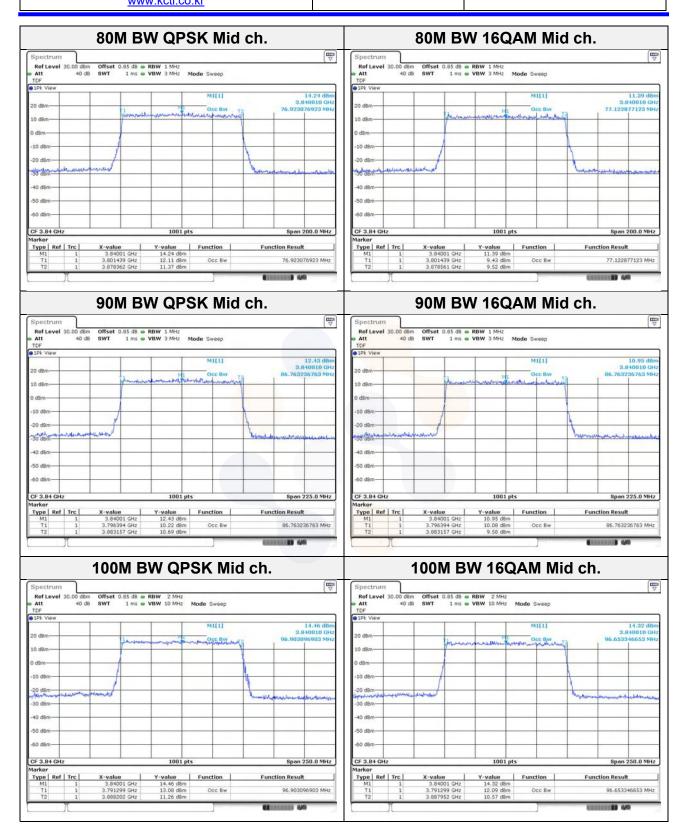
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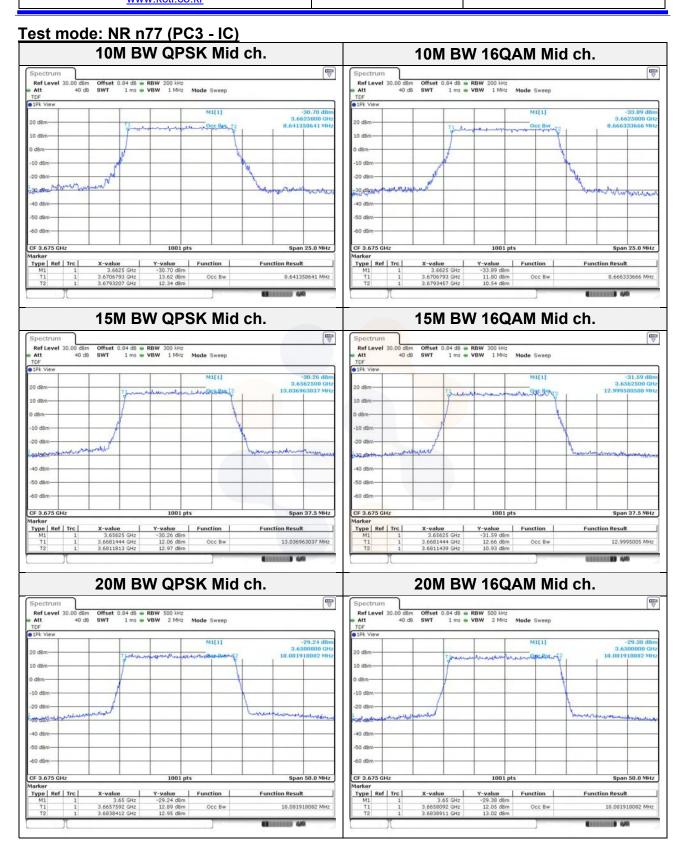
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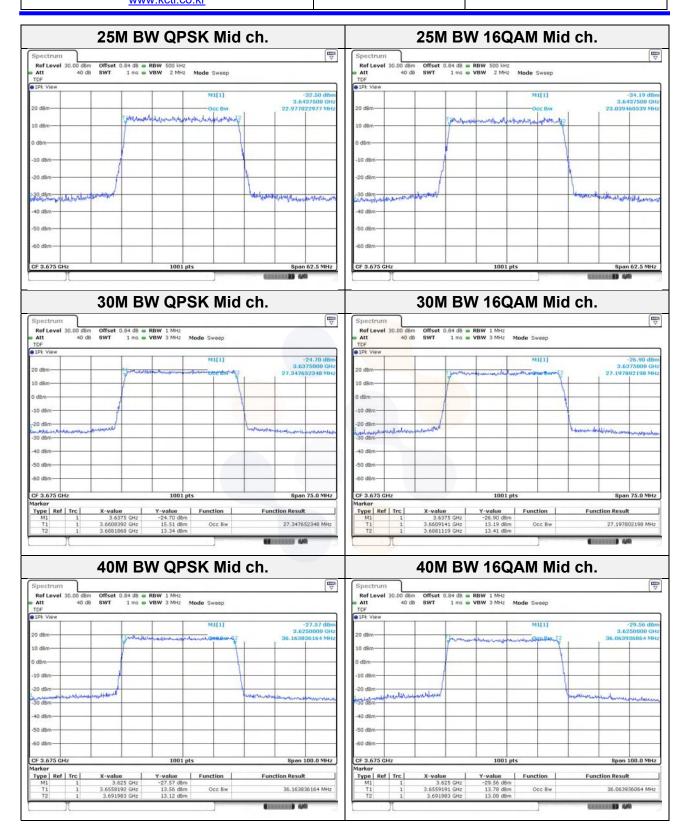
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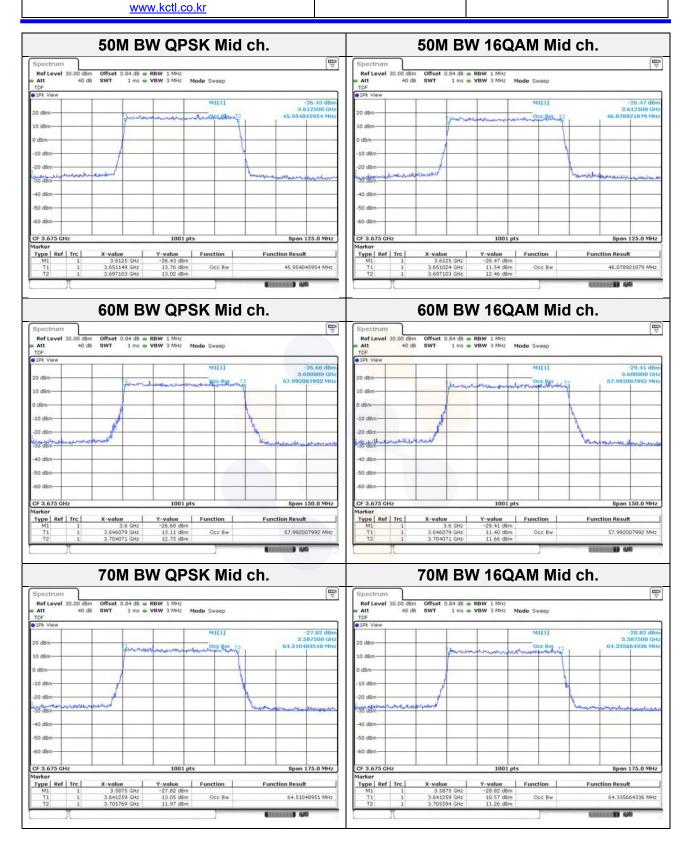
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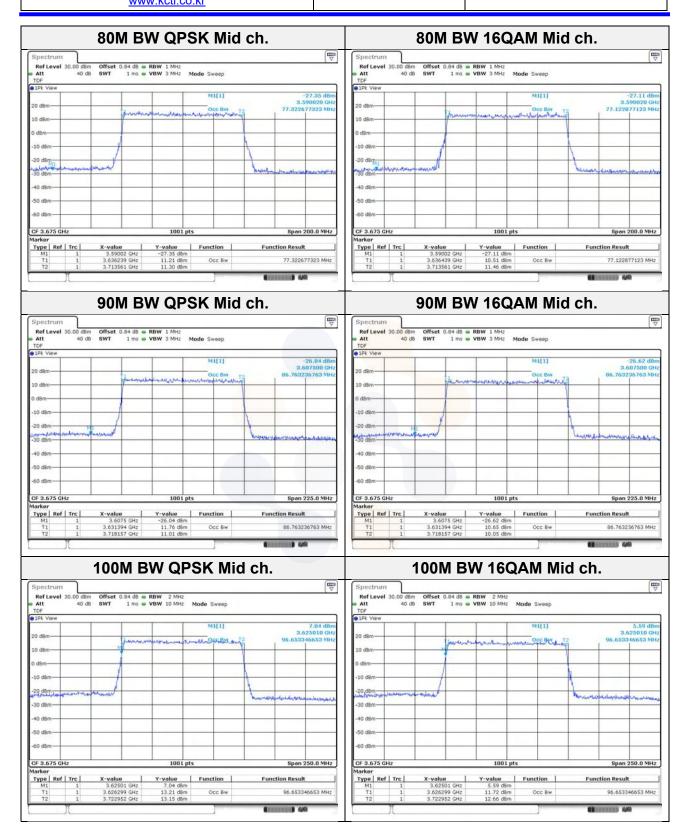
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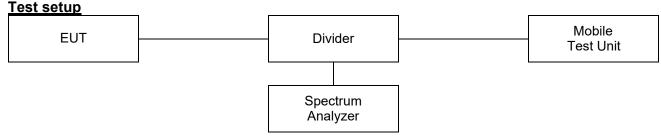




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7.3. Band Edge Emissions at Antenna Terminal



<u>Limit</u>

According to §22.917(a), §24.238(a) and RSS-132(5.5), RSS-133(6.5),

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 + $10\log(P_{[Watts]})$ dB.

According to §27.53(a),

For operations in the 2305–2320 M_Z band and the 2345–2360 M_Z band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

(4) For mobile and portable stations operating in the 2305–2315 № and 2350–2360 № bands:

(i) By a factor of not less than: $43 + 10 \log (P) dB$ on all frequencies between 2305 and 2320 Mb and on all frequencies between 2345 and 2360 Mb that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 Mb and on all frequencies between 2341 and 2345 Mb, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 Mb and on all frequencies between 2337 and 2341 Mb, and not less than 67 + 10 log (P) dB on all frequencies between 2328 mb and on all frequencies between 2327 Mb ;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 Mb, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 Mb, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 Mb , 67 + 10 log (P) dB on all frequencies between 2288 and 2292 Mb, and 70 + 10 log (P) dB below 2288 Mb;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 Mb, and not less than 70 + 10 log (P) dB above 2365 Mb.

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According to §27.53(g), and RSS-130(4.7)

For operations in the 600 Mb band and the 698-746 Mb 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 + $10\log(P_{Watts})$ dB.

According to §27.53(h) and RSS-139(5.6),

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 + $10\log(P_{[Watts]})$ dB.

According to §27.53(I)(2),

The following emission limits apply to stations transmitting in the 3700-3980 Mb band:

(2) For mobile operations in the 3700-3980 Mz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/Mz.

According to §27.53(n)(2),

The following emission limits apply to stations transmitting in the 3450-3550 Mb band:

(2) For mobile operations in the 3450-3550 Mb band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/Mb.



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According to RSS-192(5.6)

Subscriber equipment shall have the TRP or conducted power (per antenna), where applicable, of unwanted emission not exceeding the following:

- a. The limits in table 6
- b. a limit of -30 dBm/Mb in the frequency range greater than (B+5) MHz from the edge of the frequency band

Frequency block	Offset frequency from the edge of the frequency block group (Mb)							
group (B)	0 to 1	1 to 5	5 to B	>B				
10₩z, 20₩z, 30₩z and 40₩z	-13 dBm/1% of B	-10 dBm/Młz	-13 dBm/Młz	-25 dBm/Mb				
>40M±	-13 dB m/400 kHz	-10 dB m/ ∰z	-13 dB m/ ∰z	-25 dB m/ ∰z				

Table 6: Unwanted emission limits for subscriber equipment

According to §27.53(m)(4),

The attenuation factor shall be not less than $40 + 10log(P_{[Watts]}) dB$ on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10log(P_{[Watts]}) dB$ on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + $10log(P_{[Watts]}) dB$ 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 $43 + 10log(P_{[Watts]}) dB$ on all frequencies between 2490.5 Mtz and 2496 Mtz and 55 + $10log(P_{[Watts]}) dB$ at or below 2490.5 Mtz.

According to RSS-199 (5.6),

Table 5: Unwanted emission limits for subscriber equipment other than fixed subscriber equipment

Offset from the edge of the frequency block or frequency block group (Mz)	Unwanted emission limits	
0-1	-10 dBm/(2% of OB*)	
1-5	-10 dBm/Mz	
5-X**	-13 dBm/Mtz	
≥X	-25 dBm/Mz	

*OB is the occupied bandwidth

** X is 6 Mb or the equipment occupied bandwidth, whichever is greater

In additions to complying with the limits in table 5, subscriber equipment other than fixed subscriber equipment shall not exceed -13 dB m/ Mz on all frequencies between 2490.5 Mz and 2496 Mz , and - 25 dBm/Mz at or below 2490.5 Mz.

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<u>Test procedure</u>

971168 D01 v03r01 - Section 6 ANSI C63.26-2015 - Section 5.7

<u>Test settings</u>

- 1) Start frequency was set to 30 Mb and stop frequency was set to at least 10th the fundamental frequency.
- 2) Span was set large enough so as to capture all out of band emissions near the band edge.
- 3) Set the RBW > 1% of the emission bandwidth.
- 4) Set the VBW \ge 3 x RBW.
- 5) Set the number of sweep points $\ge 2 \times \text{Span/RBW}$
- 6) Detector = RMS
- 7) Trace mode = trace average
- 8) Sweep time should be auto for peak detection. For RMS detection the sweep time should be set as follows:
 - a) If the device can be configured to transmit continuously (duty cycle ≥ 98%), set the (sweep time) > (number of points in sweep) x (symbol period) (e.g., by a factor of 10 x symbol period x number of points) Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols.
 - b) If the device cannot transmit continuously (duty cycle < 98%), a gated sweep shall be used when possible (i.e., gate triggered such that the analyzer only sweeps when the device is transmitting at full power), set the sweep time > (number of points in sweep) x (symbol period) but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time
 - c) If the device cannot be configured to transmit continuously (duty cycle > 98%), and a free-running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) × (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by [10 log (1/duty cycle)]. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation ≤ ±2%).
 - d) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations > ±2%), set the sweep time so that the averaging is performed over the on-period by setting the sweep time > (symbol period) × (number of points), while also maintaining the sweep time < (transmitter on-time). The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold art necessary to ensure that the maximum power is measured.
- 9) Allow trace to fully stabilize.

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Notes:

- 1. Per 22.917(b), 24.238(b), 27.53(a)(5), 27.53(h)(3) and RSS-132(5.5), RSS-133(6.5), RSS-139(5.6), RSS-195(5.6), compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 Mb or greater. however in the 1 Mb 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 may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
- 2. Per 27.25(g) and RSS-130(4.7), compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kl may be employed.
- 3. Per 27.53(I)(2) and RSS-192(5.6), Compliance with this paragraph (I)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
- 4. Per 27.53(n)(2) and RSS-192(5.6), Compliance with this paragraph (n)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
- 5. Per 27.53(m)(6) in the 1 megahertz 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 Mb, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 Mb).
- 6. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, modulation and RB configurations.
- 7. The measurement bandwidth is less than the reference bandwidth of 1MHz no additional correction to be applied as ANSI C63.26 section 4.2.3 only requires the correction to be applied when the OBW of the emission being measured is wider than the measurement bandwidth (Where the OBW of the signal under measurement is less than the RBW of the measuring instrument, no bandwidth correction or integration will be required). Plots for low and high channels show the level of the emission measured with the reduced bandwidth and the level of the emission measured with the reduced bandwidth and the level of the emission measured with the reduced bandwidth and the level of the and width and the level of the same emission measured using the integration method over the 1MHz reference bandwidth are very close, indicating the emissions are narrowband.

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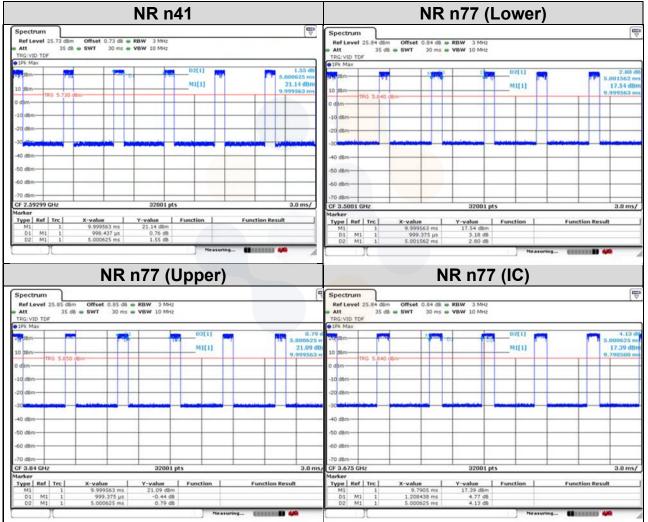
8. Duty cycle factor

Band	Period	On time (ms)	Duty cycle		Duty Cycle Factor
	(ms)		(Linear)	(%)	(dB)
NR n41	5.000 625	0.998 437	0.199 624	19.96	7.00
NR n77 (Lower)	5.001 562	0.999 375	0.199 813	19.98	6.99
NR n77 (Upper)	5.000 625	0.999 375	0.199 850	19.99	6.99
NR n77 (IC)	5.000 625	1.208 438	0.241 657	24.17	6.17

1) Duty cycle (Linear) = Ton time / Period

2) DCF (Duty cycle factor) = 10log(1/duty cycle)

3) Offset (dB) = RF cable loss (dB) + Divider (dB) + Duty Cycle Factor (dB)

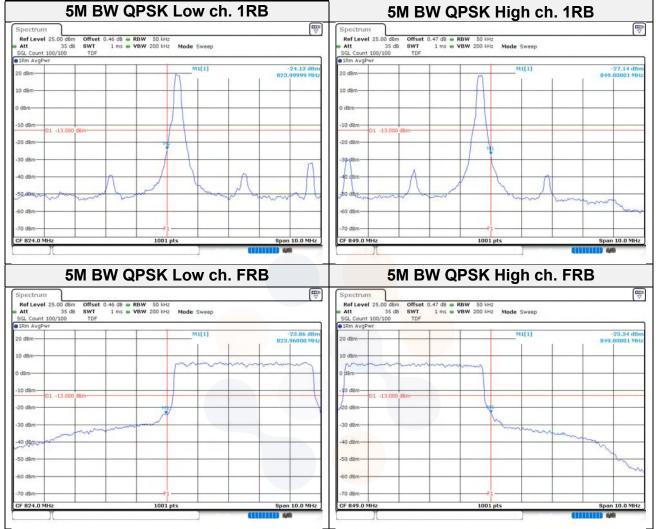


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<u>Test results</u>

Test mode: NR n5



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5M BW QPSK Upper extended 1RB 5M BW QPSK Lower extended 1RB d₽ ¢ Ref Level 25.00 dBr Spectrum Spectrum
 Ref Level 25.00 dBm
 Offset
 0.46 dB
 RBW 100 kHz

 Att
 35 dB
 SWT
 1 ms
 VBW 300 kHz
 Mode
 Sweep

 SGL Count 100/100
 TDF
 TDF
 Imm AvgPwr
 Mode
 Sweep
 Offset 0.47 dB
 RBW 100 kHz
 SWT 1 ms
 VBW 300 kHz
 TDF Att 35 dB SGL Count 100/100 IRm AvgPwr Mode Sweep -36.11 dBr 822.19330 MH -36.81 dBn 850.81670 MH mah Do 0 dB -10 dBm 10 d -20 dBr 20 d 30 df MI 40 dBm 40 dB Số dêm 60 d 70 dBr 70 dB Stop 823.0 MHz Stop 855.0 MHz 1001 pts Start 850.0 MHz 1001 pt Start 818.0 MHz 5M BW QPSK Lower extended FRB 5M BW QPSK Upper extended FRB Ref Level 25.00 dBm Offset Att 35 dB SWT SGL Count 100/100 TDF IRm AvgPwr E ∏ ∏ Spectrum Ref Level 25.00 d8m Offset Att 35 d8 SWT SGL Count 100/100 TDF IRm AvgPwr Offset 0.47 dB • RBW 100 kHz SWT 1 ms • VBW 300 kHz Mode Sweep Offset 0.46 dB
 RBW 100 kHz
SWT 1 ms
 VBW 300 kHz
 Mode Sweep MIE1] -26.59 dB 822.93260 MH MIEI 29.08 dB 0 dBm n dan 850 250 MI 10 dB 10 dBn 10 d 1 -13.0 -20 dBr 20 dE 30 dBr 40. dBn 40 d 60 dBm 60 dBn 70 dB 70 dBr Start 850.0 MHz Start 818.0 MHz Stop 823.0 MHz 1001 pt Stop 855.0 MHz 1001 pts --------

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10M BW QPSK Low ch. 1RB 10M BW QPSK High ch. 1RB E
 Spectrum

 Ref Level 25.00 d8m
 Offset 0.46 d8 • RBW 100 kHz

 Att
 35 d8
 SWT
 1 ms • VBW 300 kHz

 Spectrum

 Ref Level 25.00 dBm
 Offset 0.47 dB • RBW 100 kHz

 Att
 35 dB

 SWT
 1 ms • VBW 300 kHz
 Mode Sweep SGL Cou SGL Count 100/100 IRm AvgPwr nt 100/100 -27.53 dB 824.0000 Mi 29,50 de 20 d8m in da 84 -10 dBm 10 dE 20 dE 30 dBr 40 dB V Λ Λ -50 deg home -60 dBri 60 d 70 de CF 824.0 M 1001 pts 20.0 MHz CF 849.0 M 1001 pts 20.0 MHz Span COLUMN AND 10M BW QPSK High ch. FRB 10M BW QPSK Low ch. FRB
 Ref Lavel
 25.00 dBm
 Offset
 0.46 dB
 RBW
 100 kHz

 # Att
 35 dB
 SWT
 1 ms
 WBW
 300 kHz
 Mode
 Sweep

 SGL Count 100/100
 TDF
 IDF
 IDF
 IDF
 IDF
 IDF
 E spectru
 Ref Level
 25.00 dBm
 Offset
 0.47 dB
 RBW
 100 kHz

 Att
 35 dB
 SWT
 1 ms
 WBW 300 kHz
 Mode
 Sweep

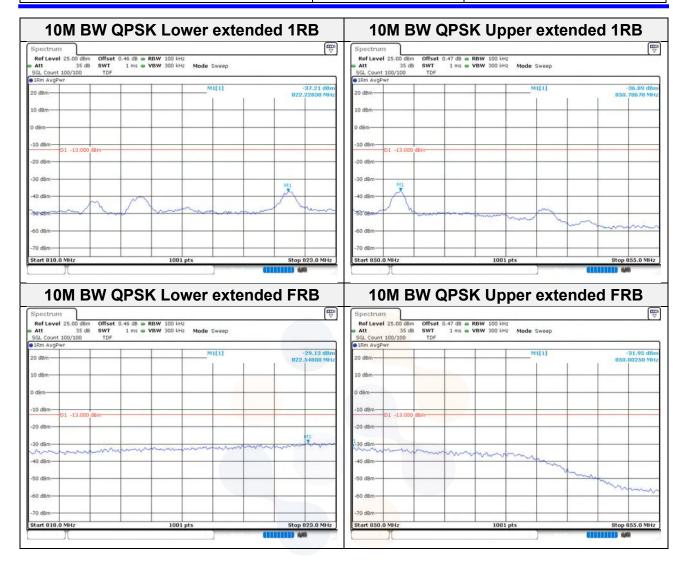
 SGL Count 100/100
 TDF
 TDF
 TDF
 TDF
 TDF
 TDF
 SGL Count 100/100 IRm AvgPwr M1[1] 29,15 de 26.32 di 0 d8r 82 84 2.4.8 -10 dB 20 di 30 dBr 40 dBm 50 df 60 dBr 60 dB 70 dB 70 dB CF 849.0 M CF 824.0 M 1001 pts 20.0 MHz 1001 pt: 20.0 MHz Sp Sp (111111) 440 CTTTTTTTTTTTTT

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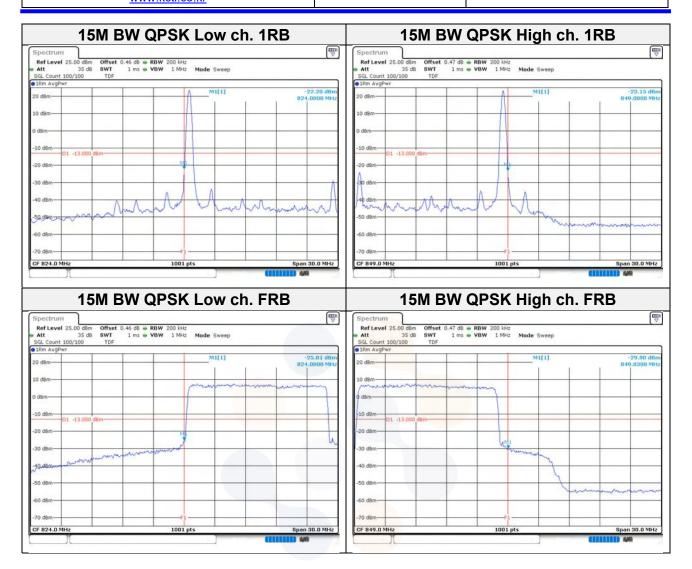
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15M BW QPSK Upper extended 1RB 15M BW QPSK Lower extended 1RB d₽ ¢ Spectrum Spectrum Ref Level 25.00 dB
 Ref Level 25.00 dBm
 Offset
 0.46 dB
 RBW 100 kHz

 Att
 35 dB
 SWT
 1 ms
 VBW 300 kHz
 Mode
 Sweep

 SGL Count 100/100
 TDF
 TDF
 Imm AvgPwr
 Mode
 Sweep
 Sweep

 Offset
 0.47 dB
 RBW
 100 kHz

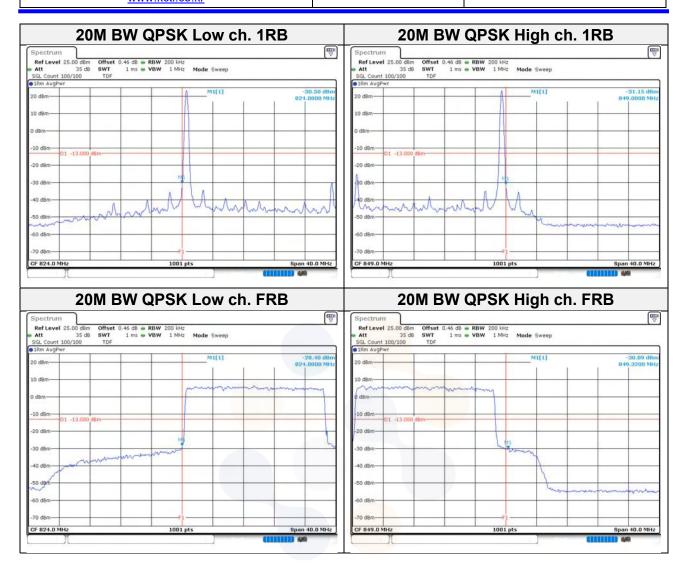
 SWT
 1 ms
 WBW
 300 kHz
 Mode
 Sweep

 TDF

 Att 35 dB SGL Count 100/100
 IRm AvgPwr -37.21 dBr -37.10 dBn 850.70180 MH mah Do 822.27 0 dBr -10 dBm 10 d -20 dBr 20 dE 30 df 30 d£ MI M1 40 dBm 40 dBm 50 d 50 dF 70 dBr 70 dB Stop 823.0 MHz Stop 855.0 MHz 1001 pts Start 850.0 MHz 1001 pt Start 818.0 MHz 15M BW QPSK Upper extended FRB 15M BW QPSK Lower extended FRB E ∏ ∏ Spectrum Spectrum Ref Level 25.00 d8m Offset Att 35 d8 SWT SGL Count 100/100 TDF IRm AvgPwr Ref Level 25.00 dBm Att 35 dB Offset 0.47 dB • RBW 100 kHz SWT 1 ms • VBW 300 kHz Mode Sweep Att 35 dB SWT SGL Count 100/100 TDF IRm AvgPwr Offset 0.46 dB
 RBW 100 kHz
 SWT 1 ms
 VBW 300 kHz
 Mode Sweep M1[1] MIEI -32.40 dB 822.90760 M -34.17 dBr 850.14240 MH 0 dBm 0 dBa 10 dB 10 dBn -10 dB 1 -13.0 01 -13. -20 dBri -20 dBri 30 dBm 30,dB -40 dB 40 dBn 60 dBm -60 dBm 70 dB -70 dBr Start 850.0 MHz Stop 855.0 MHz Start 818.0 MHz Stop 823.0 MHz 1001 pt 1001 pts CTTTTTTTTTTTTTT 1111111 440

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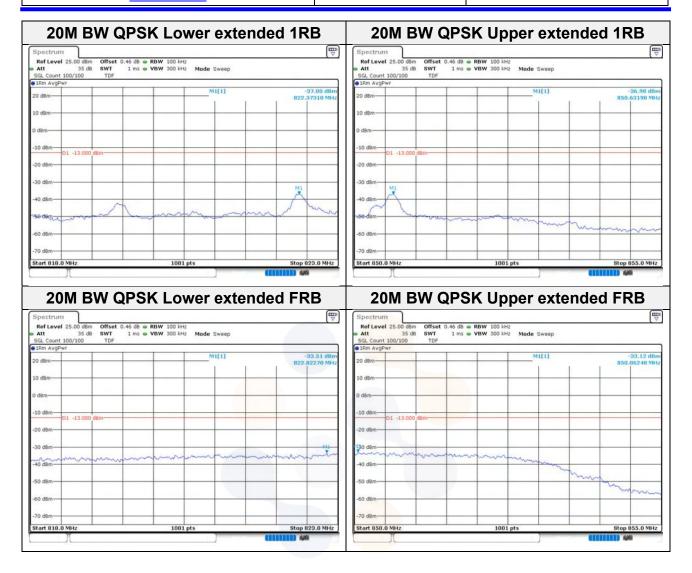




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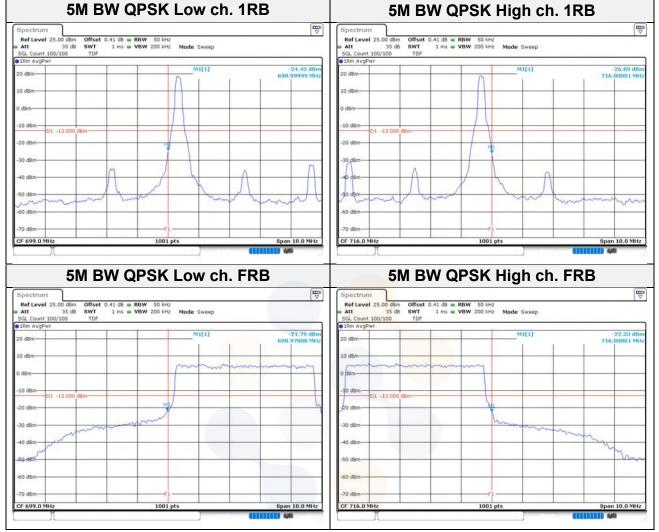


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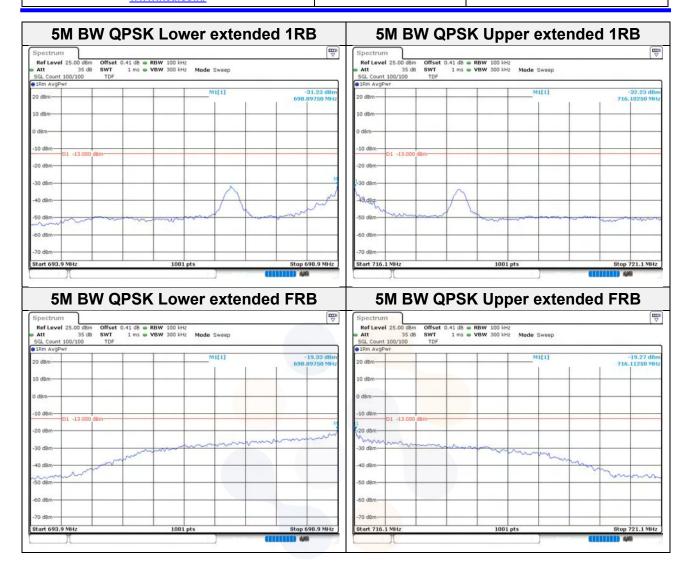
Test mode: NR n12



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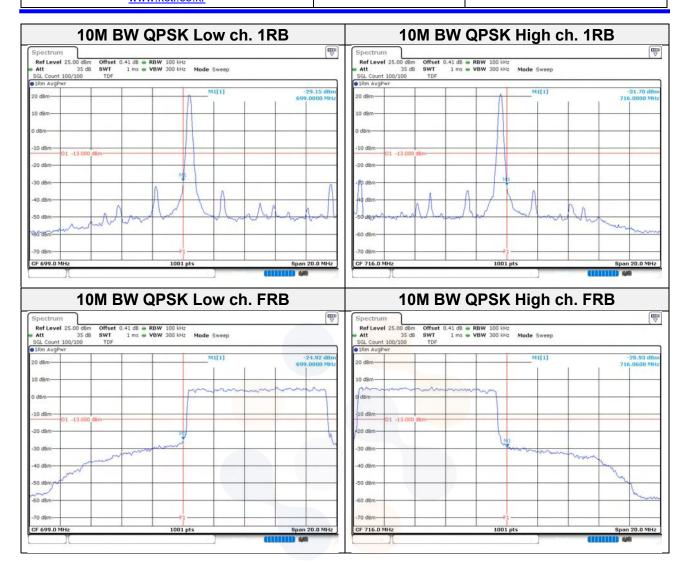
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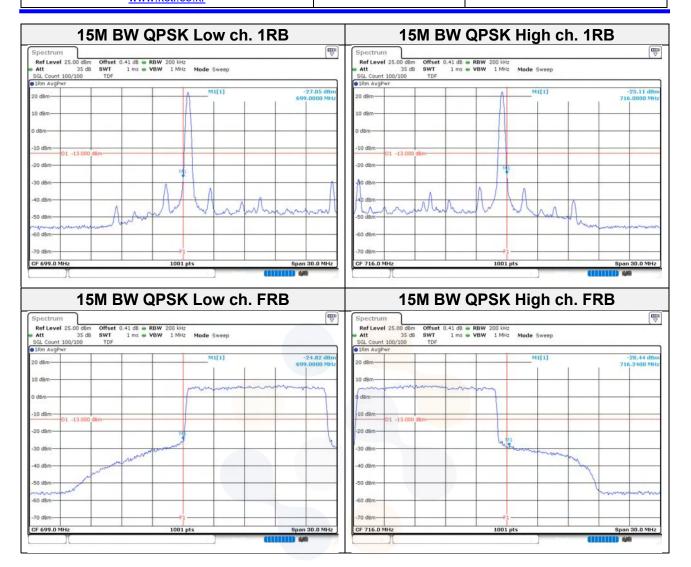
10M BW QPSK Upper extended 1RB 10M BW QPSK Lower extended 1RB Ref Level 25.00 dBm Att 35 dB SGL Count 100/100 91Rm AvgPwr Spectrum
 Ref Level 25.00 dBm
 Offset 0.41 dB
 RBW 100 kHz

 Att
 35 dB
 SWT
 1 ms
 VBW 300 kHz
 Mode Sweep

 SGL Count 100/100
 TDF
 TDF
 Imm AvgPwr
 Mode Sweep
 Offset 0.41 dB
 RBW 100 kHz
 SWT 1 ms
 VBW 300 kHz
 TDF Mode Sweep -32.37 dBr 697.25410 MH 34.44 dBn 75080 MH mah Do ah ne 717. 0 dBr 10 dBn 10 dt -20 dBr 20 dB 30 d£ 30 di 40 dBm AD. dBn -50 d8n SQ de 60 dBm 60 dB 70 dBr 70 dBn Stop 721.1 MHz 1001 pt Stop 698.9 MHz 1001 pt Start 693.9 MHz Start 716.1 MHz 10M BW QPSK Upper extended FRB 10M BW QPSK Lower extended FRB Ref Level 25.00 dBm Offset Att 35 dB SWT SGL Count 100/100 TDF IRM AvgPwr **₩ ₩** Spectrum Ref Level 25.00 d8m Offset Att 35 d8 SWT SGL Count 100/100 TDF IRm AvgPwr Offset 0.41 dB • RBW 100 kHz SWT 1 ms • VBW 300 kHz Mode Sweep Offset 0.41 dB
 RBW 100 kHz
 SWT 1 ms
 VBW 300 kHz
 Mode Sweep -25.77 dBi 698.87250 Mi MIE1] MIEI 29,29 dBr 34230 MH 0 dBm 0 dBa 716 10 dB -10 dBr 10 dt 1 -13.0 1 -13. -20 dBr 20 dB a.t. 30 dBo 40 dBm 40 dB 60 dBm nBb 06 70 de 70 dB Start 716.1 MHz Stop 721.1 MHz 1001 pts Stop 698.9 MHz 1001 pts Start 693.9 MHz CITIZITY 440 -----

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15M BW QPSK Upper extended 1RB 15M BW QPSK Lower extended 1RB
 spectrum

 Ref Level 25.00 dBm
 Offset 0.41 dB
 RBW 100 kHz

 Att
 35 dB
 SWT
 1 ms
 VBW 300 kHz
 Mode Sweep

 SGL Count 100/100
 TDF

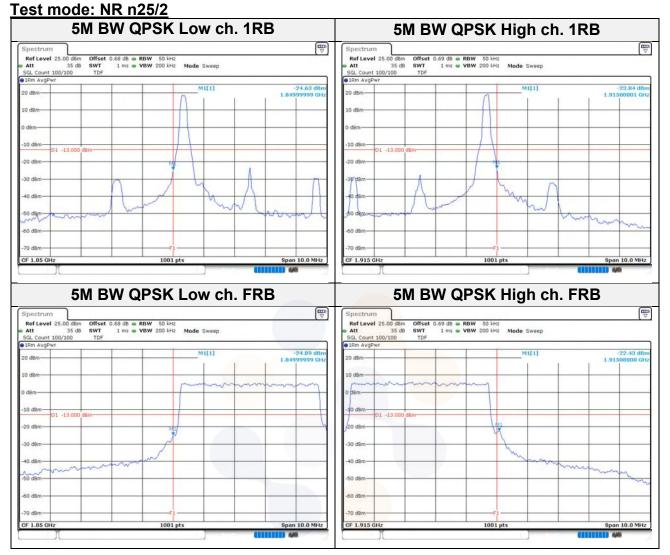
 PIRm AvgPwr
 T
 T
 State
 Node Sweep
 Ref Level 25.00 dB Spectrum Offset 0.41 dB
 RBW 100 kHz
 SWT 1 ms
 VBW 300 kHz
 TDF Att 35 dB SGL Count 100/100 IRm AvgPwr Mode Sweep -32.42 dBr 697.27910 MH 34.56 dBn 66590 MH mah Do ah ne 717. 0 dBr -10 dBm 10 dB -20 dBr -20 dB 30 di 30 di 40 dBm t0 dBm -50 dBr 50 di 60 dBn 60 dB 70 dBr 70 dBn Stop 721.1 MHz Stop 698.9 MHz 1001 pt Start 693.9 MHz 1001 pts Start 716.1 MHz 15M BW QPSK Upper extended FRB 15M BW QPSK Lower extended FRB Ref Level 25.00 dBm Offset Att 35 dB SWT SGL Count 100/100 TDF IRm AvgPwr **₩ ₩** Spectrum Ref Level 25.00 d8m Offset Att 35 d8 SWT SGL Count 100/100 TDF IRm AvgPwr Offset 0.41 dB
 RBW 100 kHz
 SWT 1 ms
 VBW 300 kHz
 Mode Sweep Offset 0.41 dB
 RBW 100 kHz
 SWT 1 ms
 VBW 300 kHz
 Mode Sweep M1[1] MIEI -27.63 dBi .89750 Mi 31.26 dBr 38720 MH 0 dBm 698.6 0 dBa 716 10 dBr -10 dBr -10 dB 1 -13.0 1 -13.0 -20 dBr 20 dBr 30 dBr 30 dam 2 40 dam 40 dB 60 dBn 60 dBm 70 dB 70 dBr Start 716.1 MHz Stop 721.1 MHz Stop 698.9 MHz 1001 pt Start 693.9 MHz 1001 pts CITIZITY 440 -----

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