TSG RAN WG4 meeting # 45

Jeju, Korea, 5th – 11th November 2007

Source: Nokia

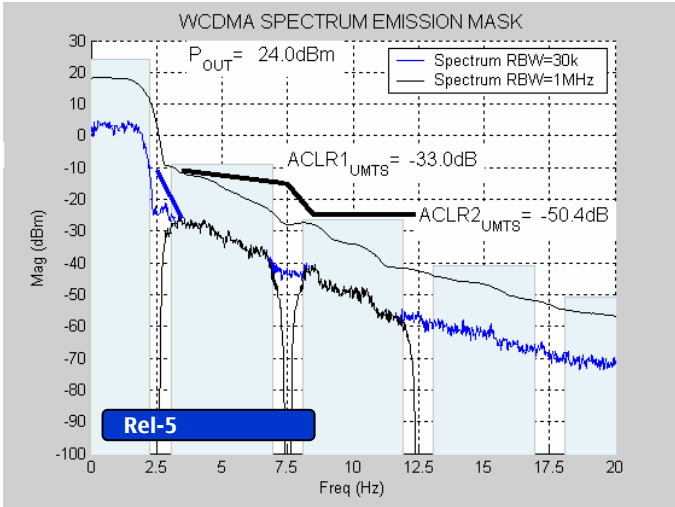
Title: UE MPR simulation results

Agenda Item: 6.2.2

Document for: Discussion

LTE MPR Simulations

- WCDMA Rel-5 reference
  - Pout= +24dBm, No MPR
  - ACLR= 33dB



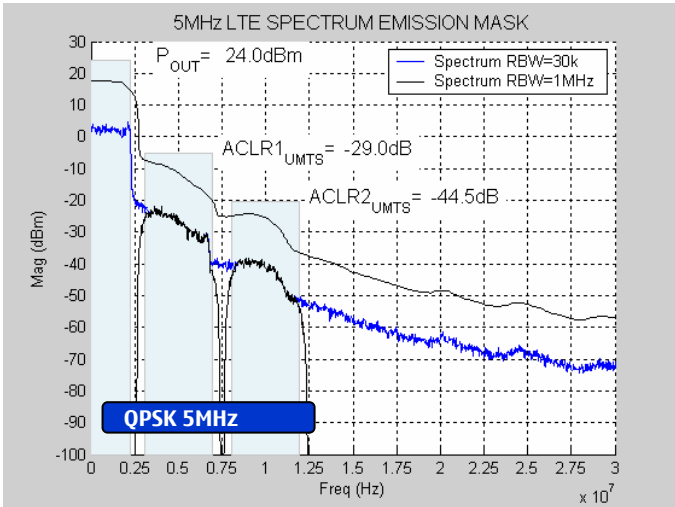
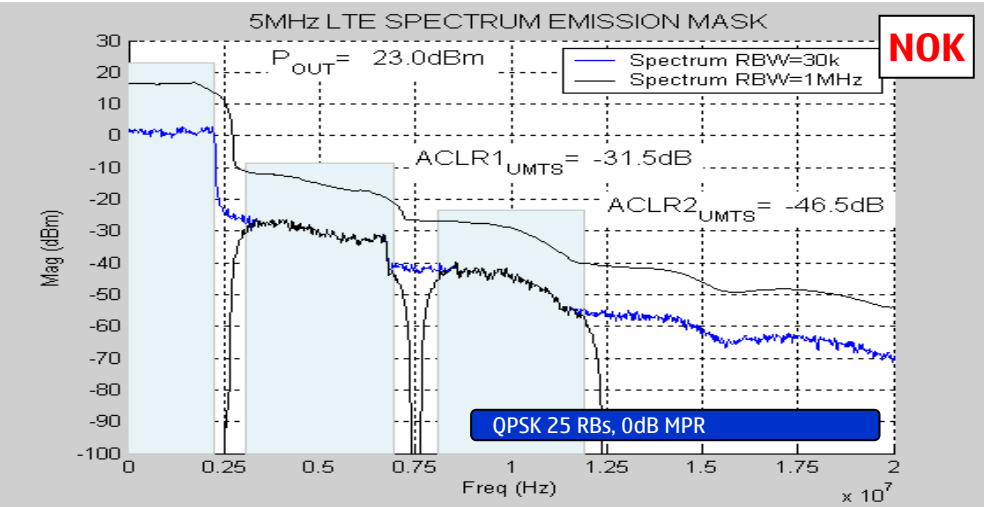
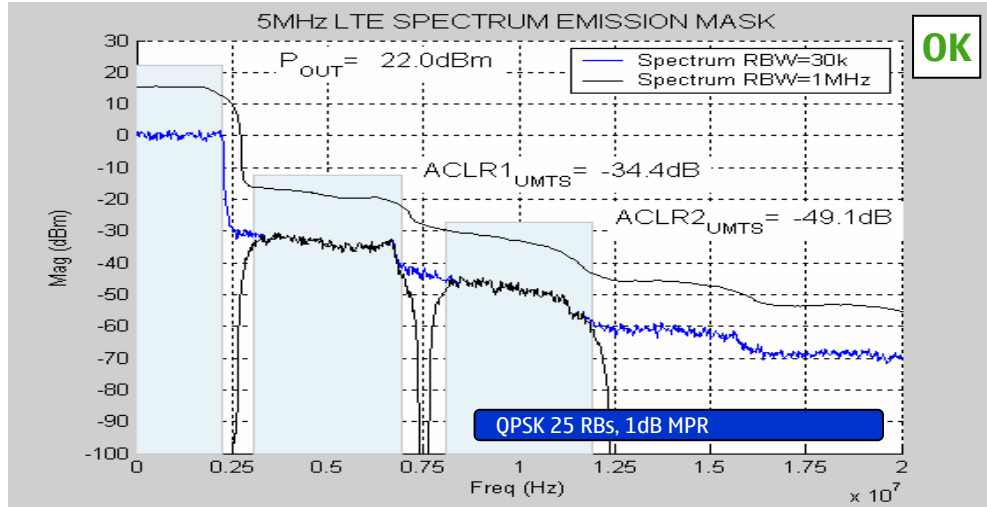


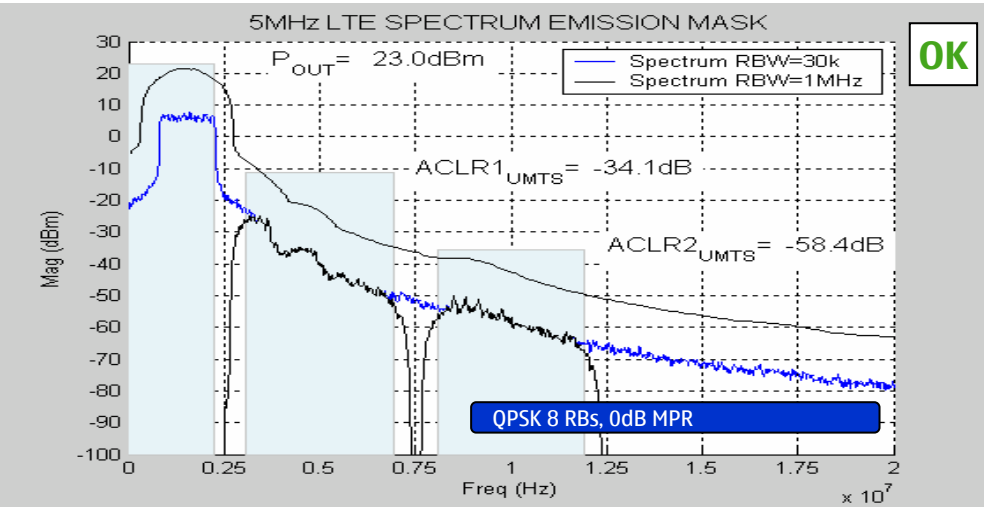
Table 6.2.3-1: Maximum Power Reduction (MPR)

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]								MPR (dB)
	1.4 MHz	1.6 MHz	3 MHz	3.2 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	-	> [TBD]	> [TBD]	> [TBD]	> [8]	> [16]	> [24]	> [32]	≤ [1]
16 QAM	≤ [TBD]	≤ [TBD]	≤ [TBD]	≤ [TBD]	≤ [8]	≤ [16]	≤ [24]	≤ [32]	≤ [1]
16 QAM	> [TBD]	> [TBD]	> [TBD]	> [TBD]	> [8]	> [16]	> [24]	> [32]	≤ [2]

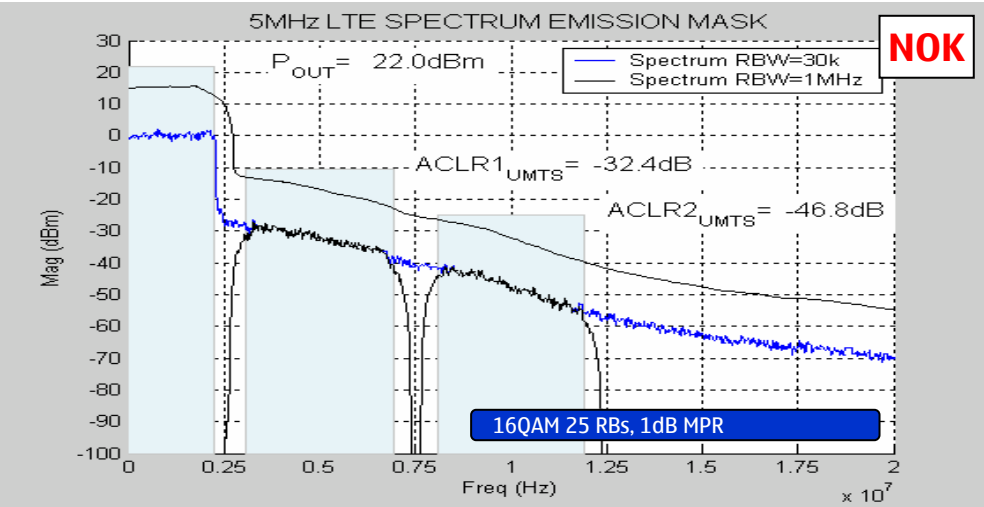
5MHz, QPSK

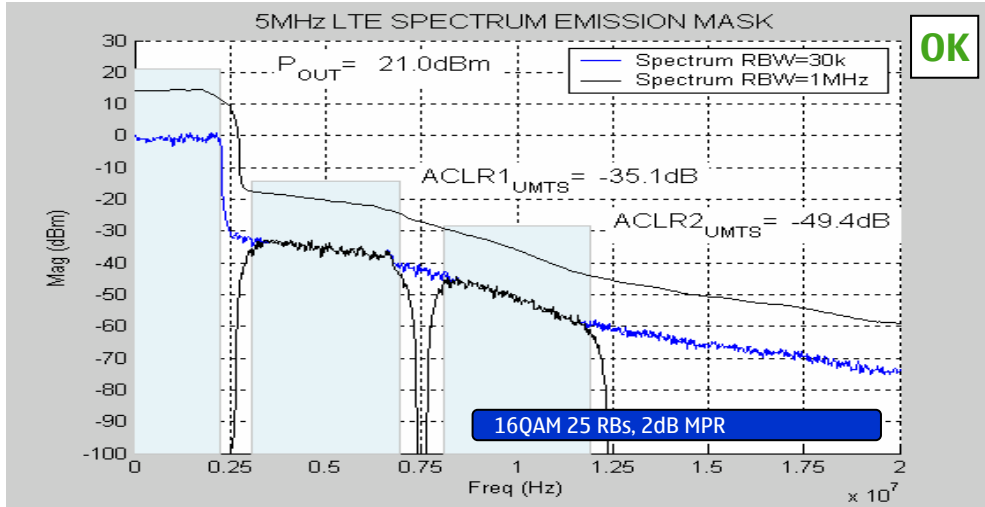

5MHz LTE SPECTRUM EMISSION MASK
NOK
P_{OUT}= 23.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
$ACLR1_{UMTS}$= -31.5dB
$ACLR2_{UMTS}$= -46.5dB
QPSK 25 RBs, 0dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

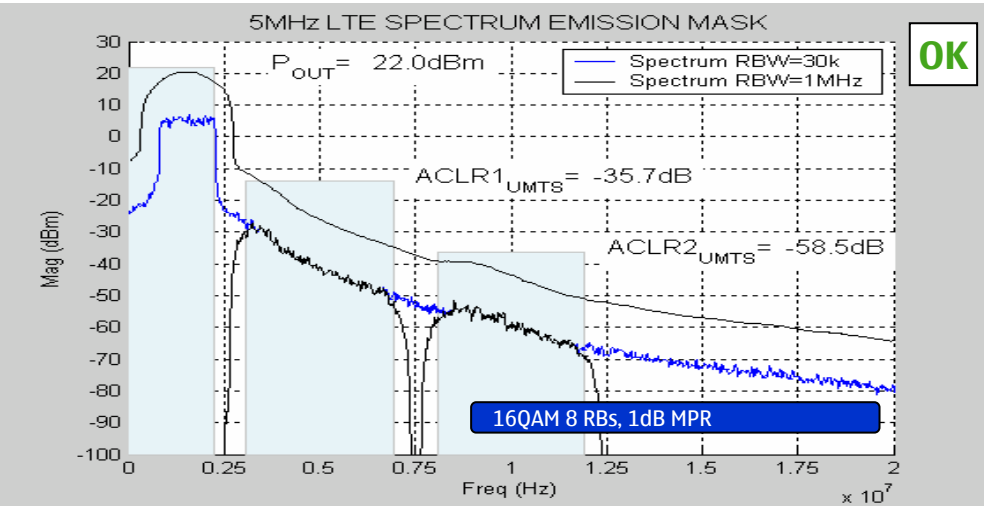

5MHz LTE SPECTRUM EMISSION MASK
OK
P_{OUT}= 22.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
$ACLR1_{UMTS}$= -34.4dB
$ACLR2_{UMTS}$= -49.1dB
QPSK 25 RBs, 1dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

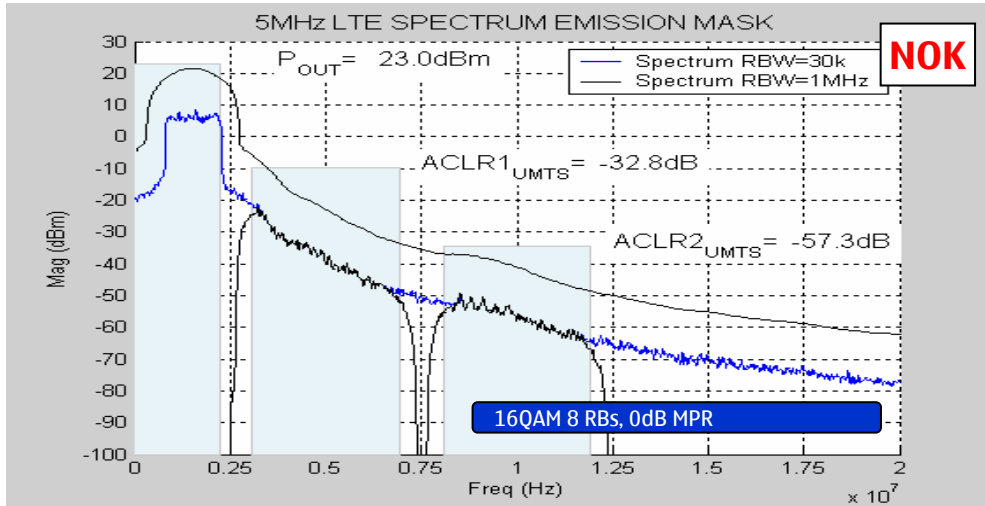

5MHz LTE SPECTRUM EMISSION MASK
OK
P_{OUT}= 23.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
$ACLR1_{UMTS}$= -34.1dB
$ACLR2_{UMTS}$= -58.4dB
QPSK 8 RBs, 0dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

5MHz, 16QAM

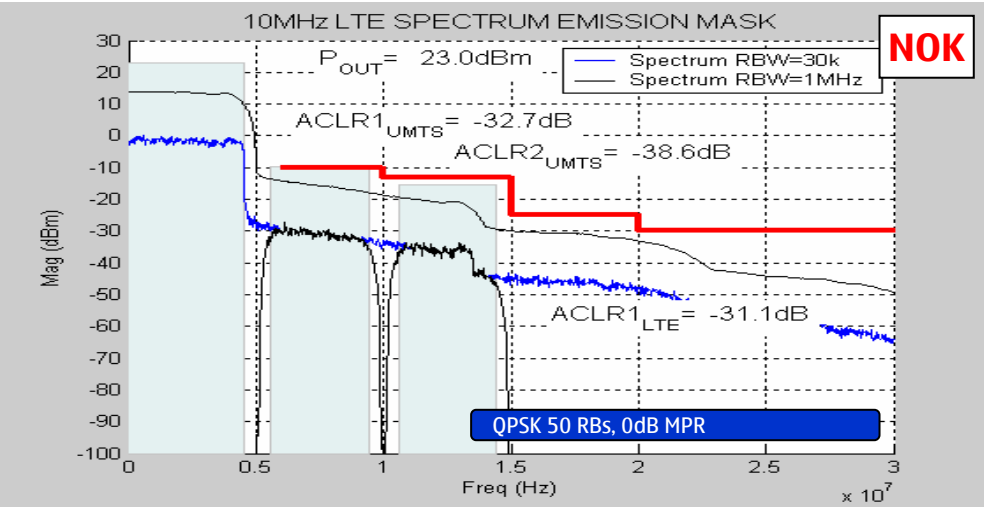

5MHz LTE SPECTRUM EMISSION MASK
NOK
P_OUT= 22.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS= -32.4dB
ACLR2_UMTS= -46.8dB
16QAM 25 RBs, 1dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

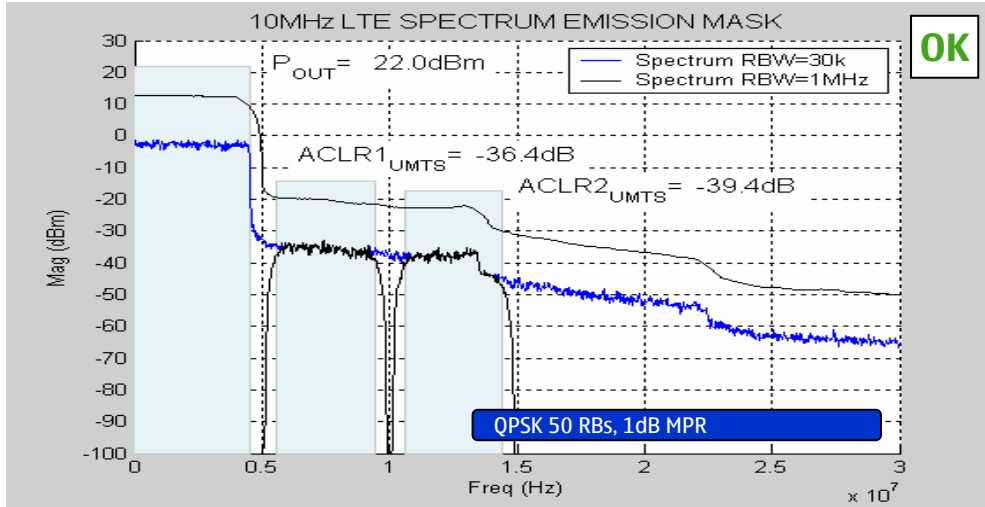

5MHz LTE SPECTRUM EMISSION MASK
OK
P_OUT= 21.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS= -35.1dB
ACLR2_UMTS= -49.4dB
16QAM 25 RBs, 2dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

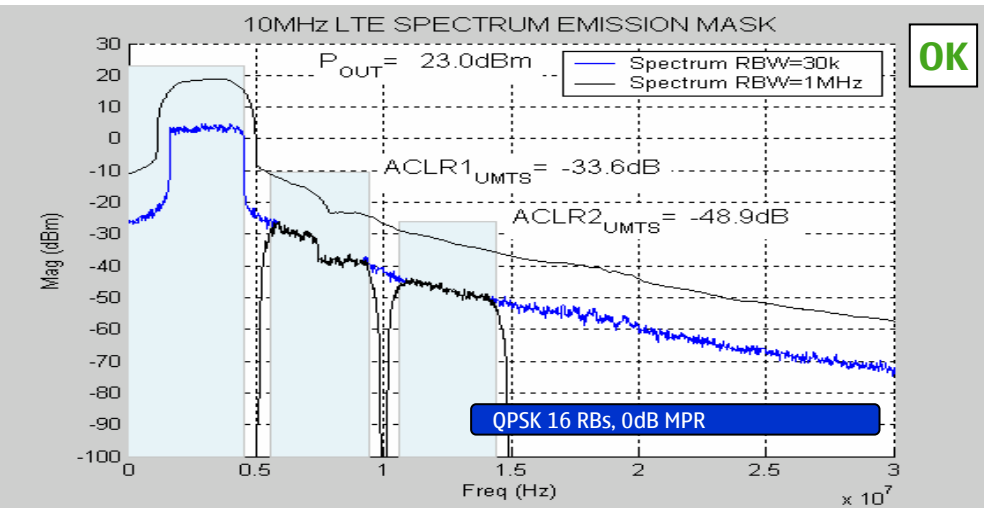

5MHz LTE SPECTRUM EMISSION MASK
OK
P_OUT= 22.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS= -35.7dB
ACLR2_UMTS= -58.5dB
16QAM 8 RBs, 1dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

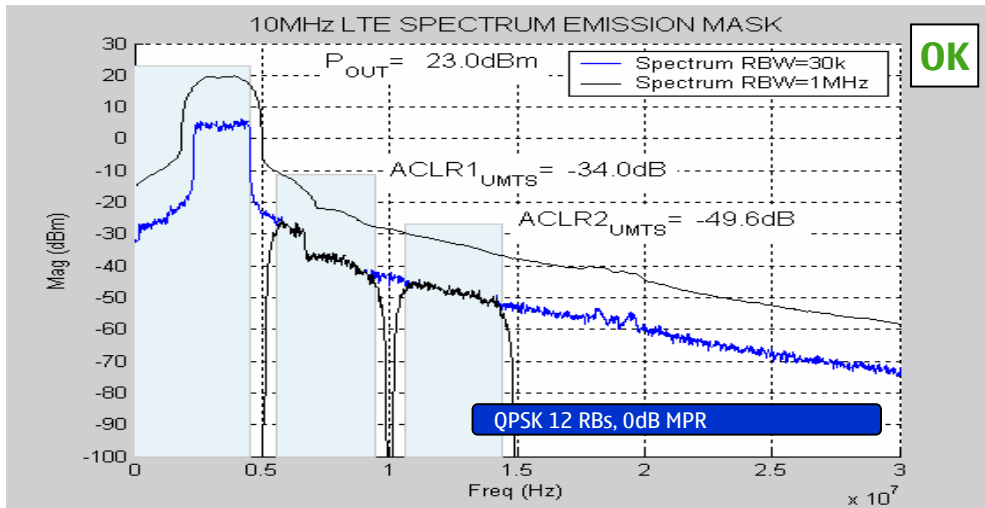

5MHz LTE SPECTRUM EMISSION MASK
NOK
P_OUT= 23.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS= -32.8dB
ACLR2_UMTS= -57.3dB
16QAM 8 RBs, 0dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

10MHz, QPSK



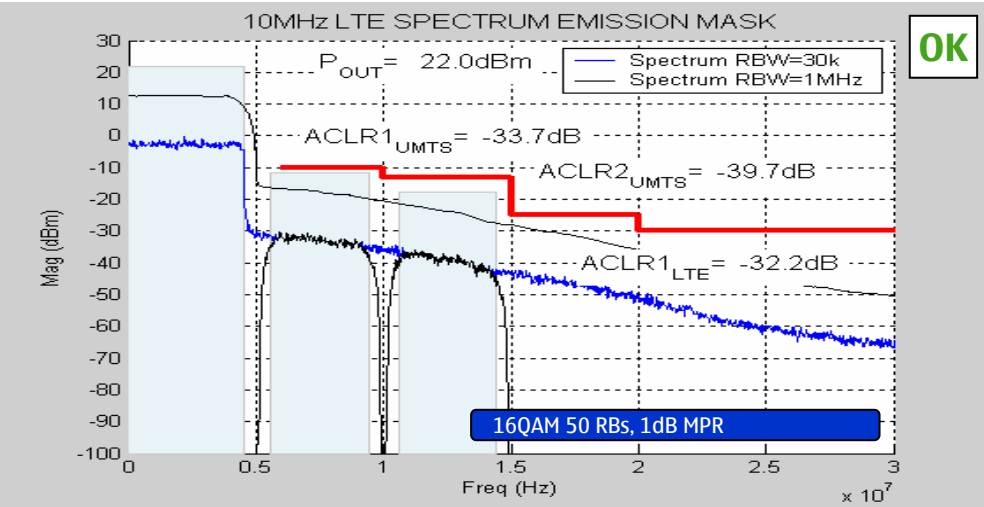


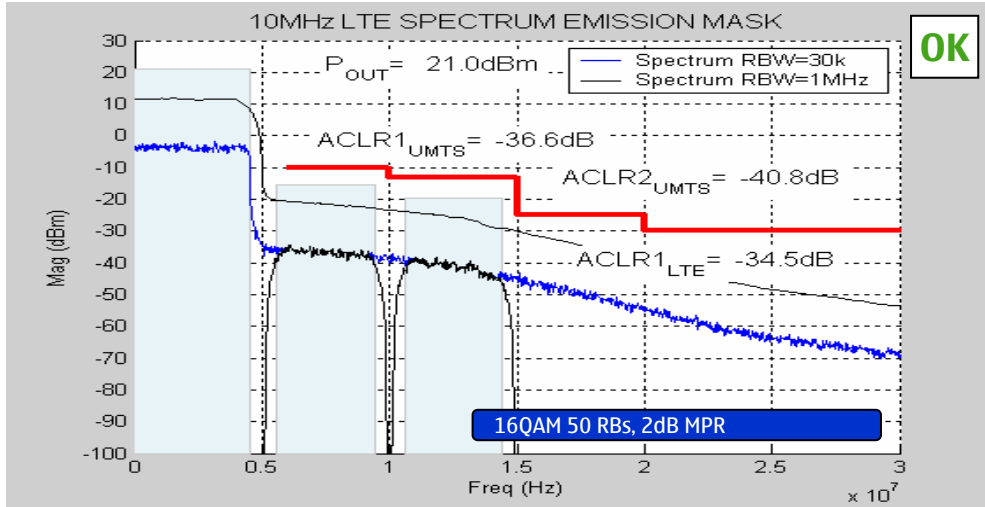


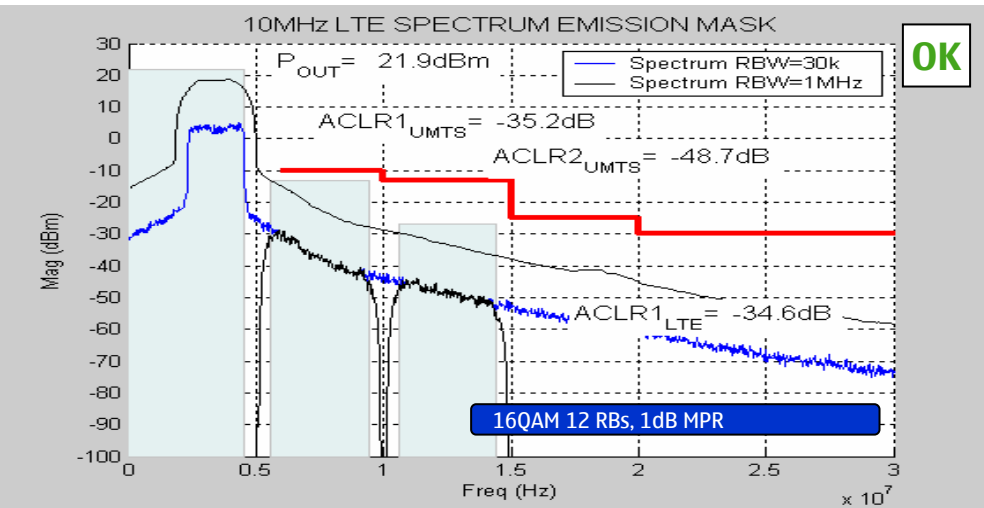


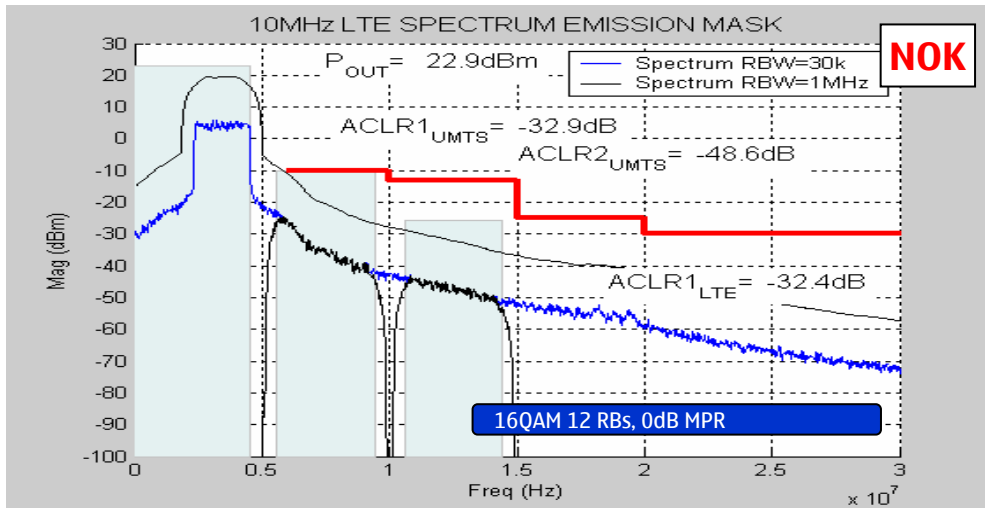
Conclusion: 12RB break point gives the same margin as 8RB @5MHz with QPSK.

10MHz, 16QAM

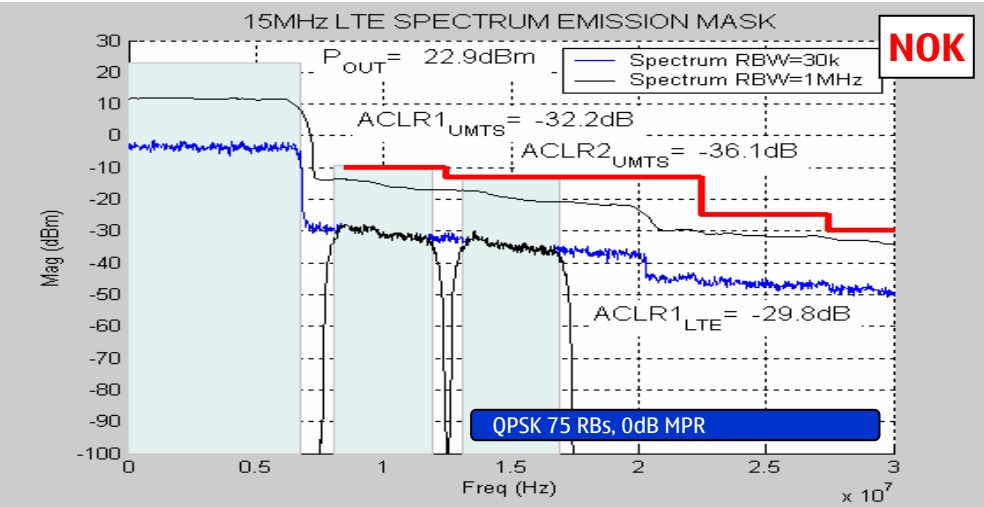

10MHz LTE SPECTRUM EMISSION MASK
OK
P_OUT = 22.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS = -33.7dB
ACLR2_UMTS = -39.7dB
ACLR1_LTE = -32.2dB
16QAM 50 RBs, 1dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

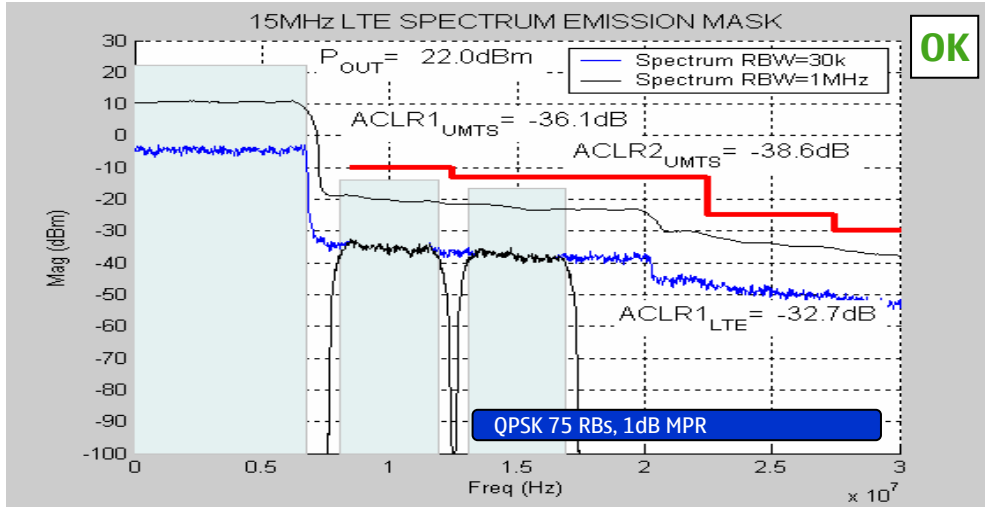

10MHz LTE SPECTRUM EMISSION MASK
OK
P_OUT = 21.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS = -36.6dB
ACLR2_UMTS = -40.8dB
ACLR1_LTE = -34.5dB
16QAM 50 RBs, 2dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

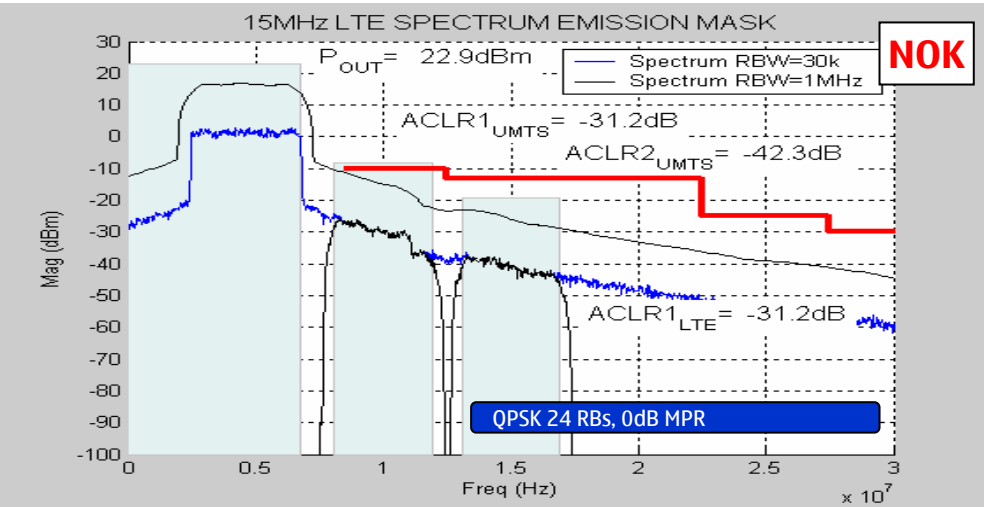

10MHz LTE SPECTRUM EMISSION MASK
OK
P_OUT = 21.9dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS = -35.2dB
ACLR2_UMTS = -48.7dB
ACLR1_LTE = -34.6dB
16QAM 12 RBs, 1dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

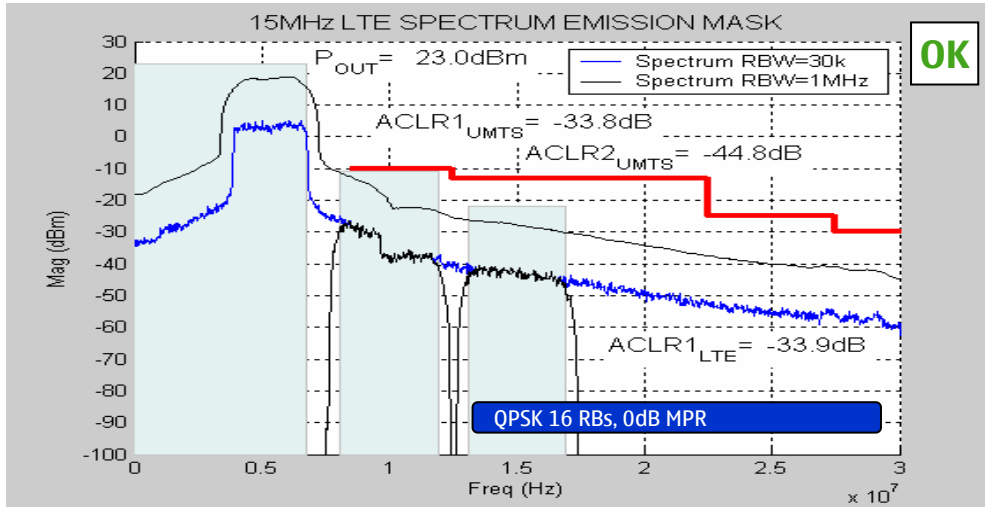

10MHz LTE SPECTRUM EMISSION MASK
NOK
P_OUT = 22.9dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS = -32.9dB
ACLR2_UMTS = -48.6dB
ACLR1_LTE = -32.4dB
16QAM 12 RBs, 0dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

15MHz, QPSK



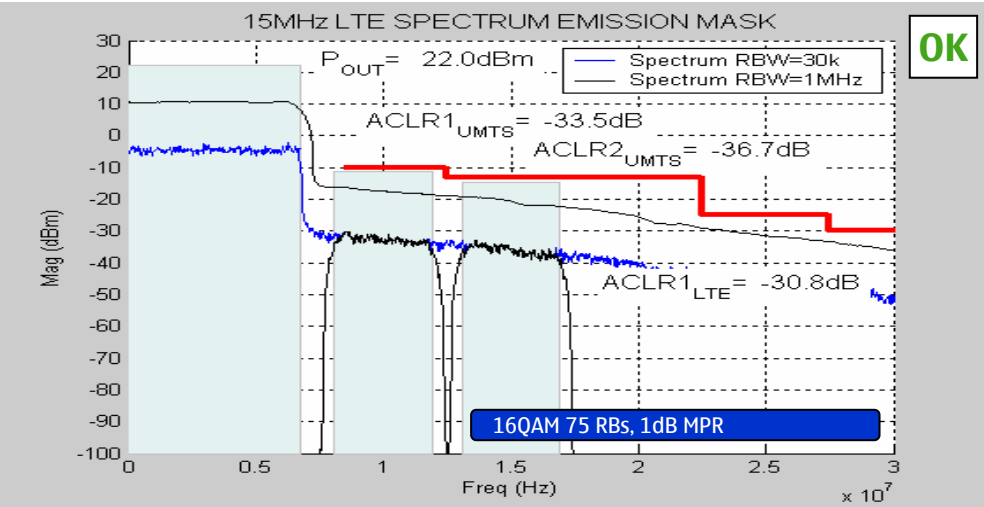


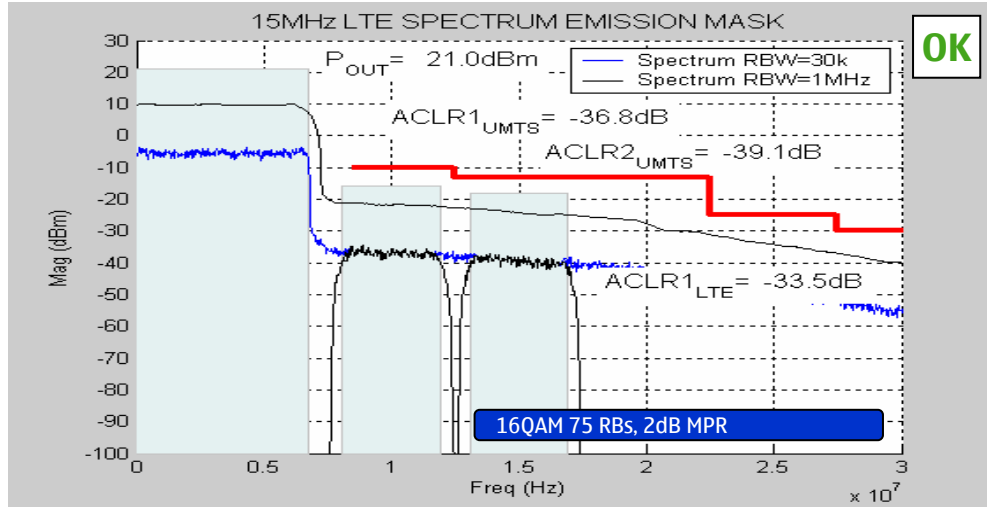


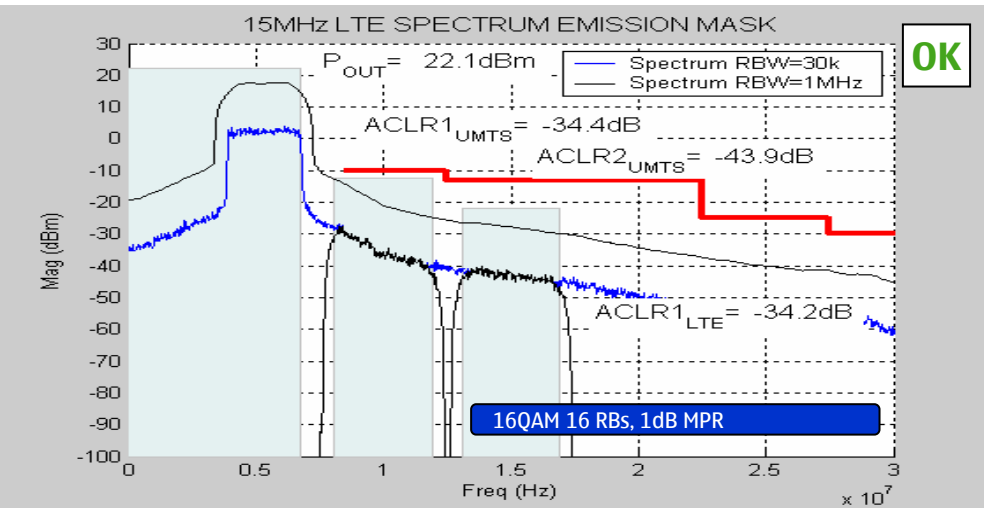


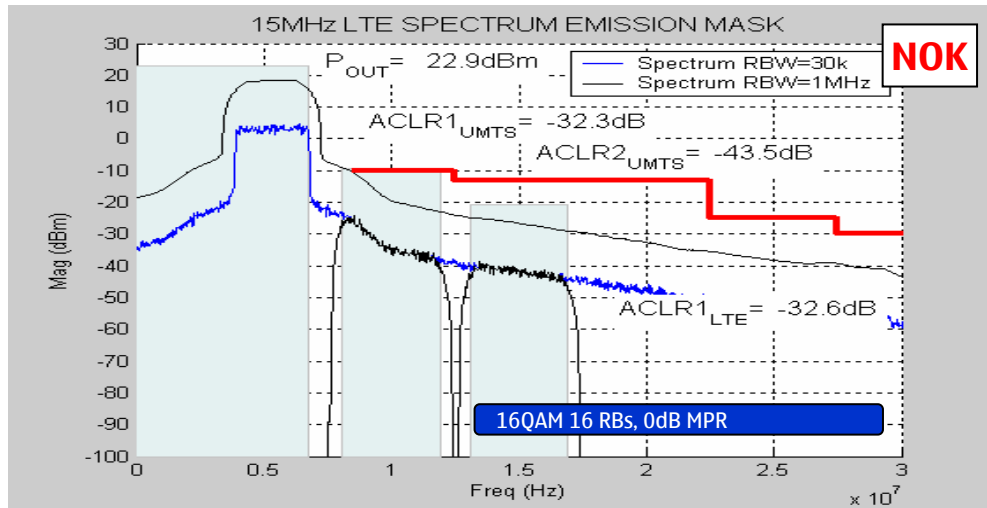
Conclusion: 16RB break point gives the same margin as 8RB @5MHz with QPSK.

15MHz, 16QAM

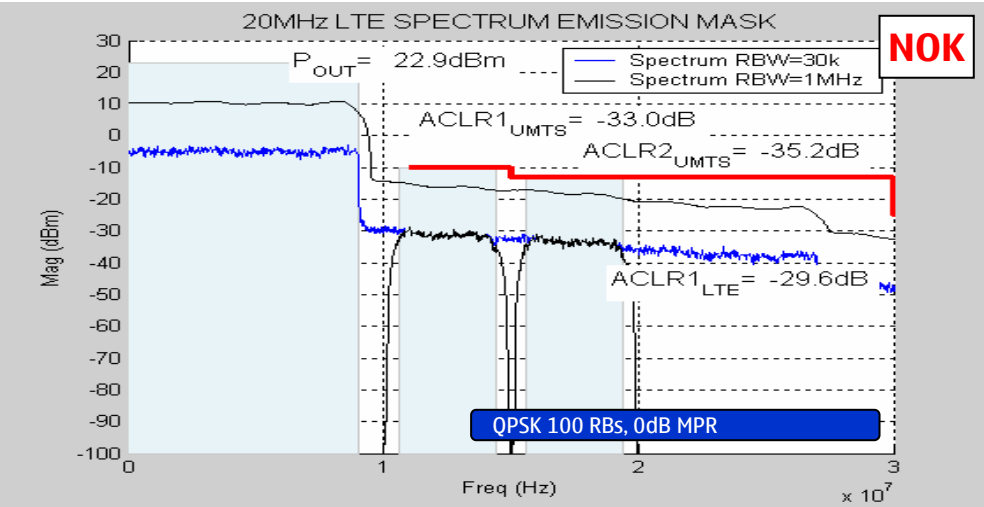

15MHz LTE SPECTRUM EMISSION MASK
OK
P_{OUT}= 22.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
$ACLR1_{UMTS}$= -33.5dB
$ACLR2_{UMTS}$= -36.7dB
$ACLR1_{LTE}$= -30.8dB
16QAM 75 RBs, 1dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

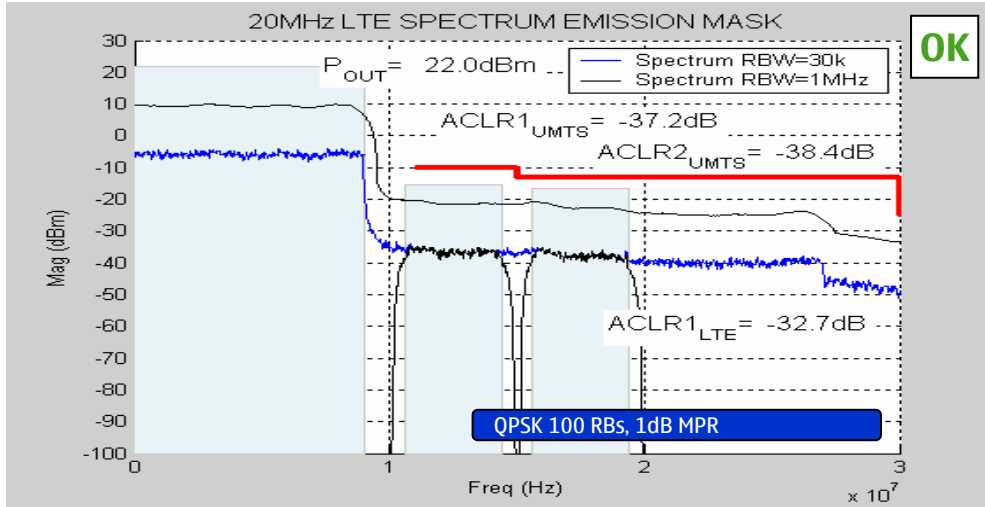

15MHz LTE SPECTRUM EMISSION MASK
OK
P_{OUT}= 21.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
$ACLR1_{UMTS}$= -36.8dB
$ACLR2_{UMTS}$= -39.1dB
$ACLR1_{LTE}$= -33.5dB
16QAM 75 RBs, 2dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

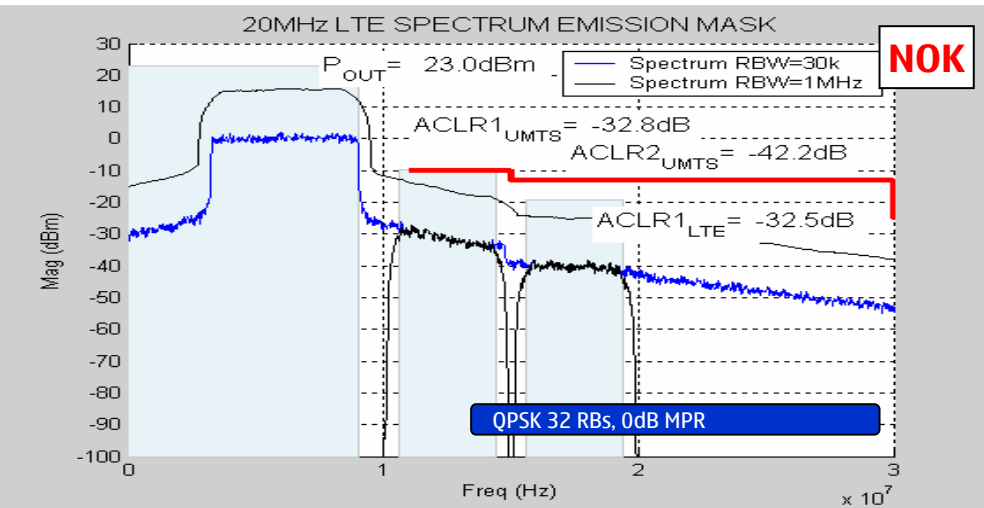

15MHz LTE SPECTRUM EMISSION MASK
OK
P_{OUT}= 22.1dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
$ACLR1_{UMTS}$= -34.4dB
$ACLR2_{UMTS}$= -43.9dB
$ACLR1_{LTE}$= -34.2dB
16QAM 16 RBs, 1dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

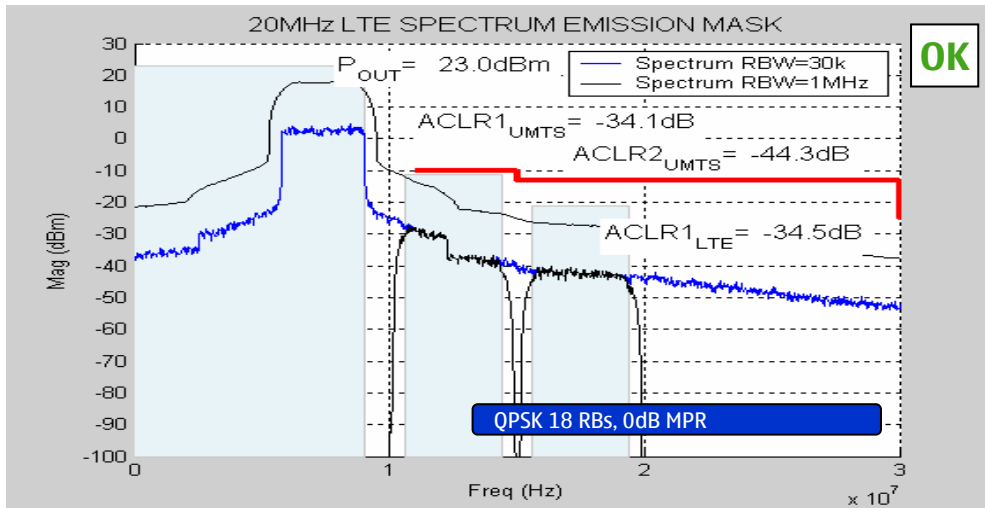

15MHz LTE SPECTRUM EMISSION MASK
NOK
P_{OUT}= 22.9dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
$ACLR1_{UMTS}$= -32.3dB
$ACLR2_{UMTS}$= -43.5dB
$ACLR1_{LTE}$= -32.6dB
16QAM 16 RBs, 0dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

20MHz, QPSK



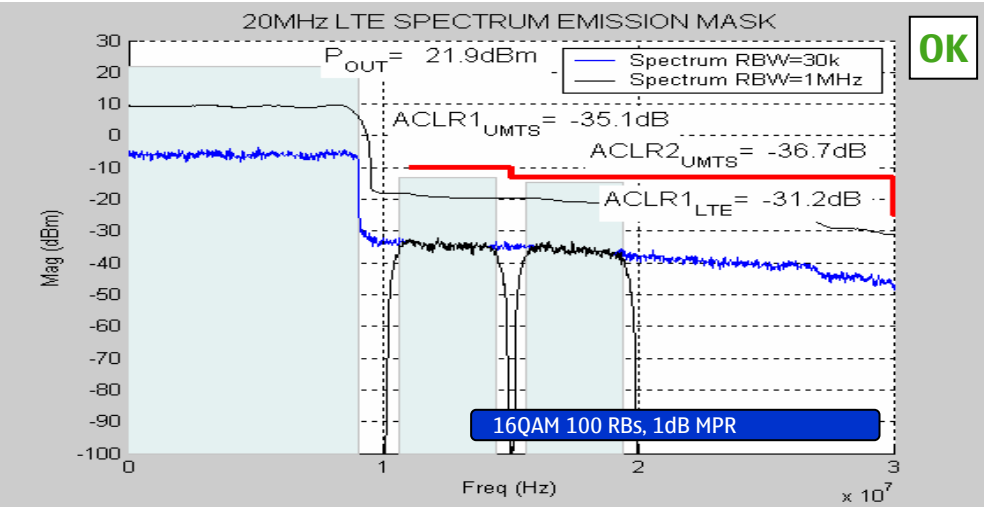


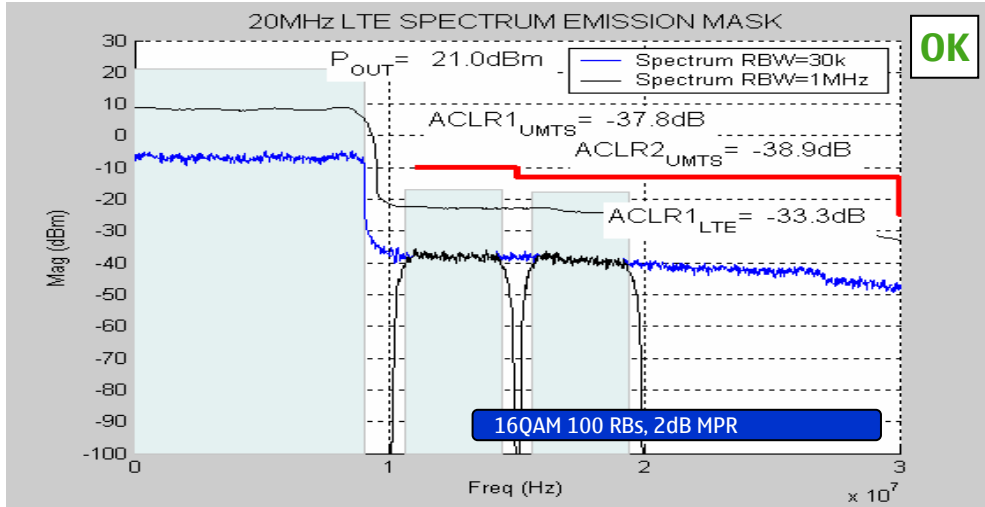


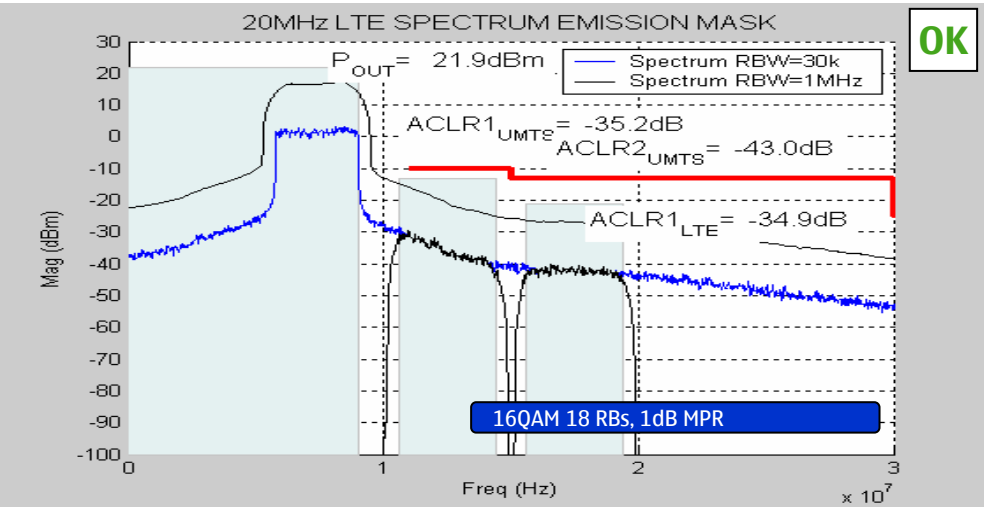


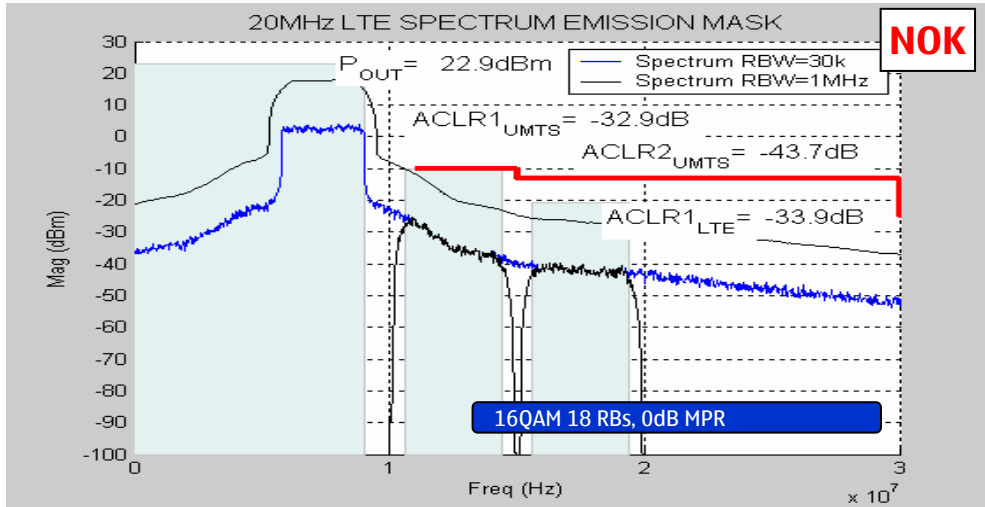
Conclusion: 18RB break point gives the same margin as 8RB @5MHz with QPSK.

20MHz, 16QAM


20MHz LTE SPECTRUM EMISSION MASK
OK
P_OUT= 21.9dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS= -35.1dB
ACLR2_UMTS= -36.7dB
ACLR1_LTE= -31.2dB
16QAM 100 RBs, 1dB MPR
Mag (dBm)
Freq (Hz)
x 10^7


20MHz LTE SPECTRUM EMISSION MASK
OK
P_OUT= 21.0dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS= -37.8dB
ACLR2_UMTS= -38.9dB
ACLR1_LTE= -33.3dB
16QAM 100 RBs, 2dB MPR
Mag (dBm)
Freq (Hz)
x 10^7


20MHz LTE SPECTRUM EMISSION MASK
OK
P_OUT= 21.9dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS= -35.2dB
ACLR2_UMTS= -43.0dB
ACLR1_LTE= -34.9dB
16QAM 18 RBs, 1dB MPR
Mag (dBm)
Freq (Hz)
x 10^7


20MHz LTE SPECTRUM EMISSION MASK
NOK
P_OUT= 22.9dBm
Spectrum RBW=30k
Spectrum RBW=1MHz
ACLR1_UMTS= -32.9dB
ACLR2_UMTS= -43.7dB
ACLR1_LTE= -33.9dB
16QAM 18 RBs, 0dB MPR
Mag (dBm)
Freq (Hz)
x 10^7

MPR Conclusions

- Based on results shown in the document it's proposed that the RB break points in the MPR table are defined as follows

Table 6.2.3-1: Maximum Power Reduction (MPR)

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]								MPR (dB)
	1.4 MHz	1.6 MHz	3 MHz	3.2 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	-	> [TBD]	> [TBD]	> [TBD]	> 8	> 12	> 16	> 18	≤ [1]
16 QAM	≤ [TBD]	≤ [TBD]	≤ [TBD]	≤ [TBD]	≤ 8	≤ 12	≤ 16	≤ 18	≤ [1]
16 QAM	> [TBD]	> [TBD]	> [TBD]	> [TBD]	> 8	> 12	> 16	> 18	≤ [2]