



9. LIMITS AND CONDUCTED RESULTS

9.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded. (KDB 971168 D01 Power Meas License Digital Systems v03r01)

Note

5G NR: All Waveforms (CP-OFDM vs DFT-s OFDM) and modulations (QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

RESULTS

See the following pages.

- WCDMA

Band	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
B5	Rel.99	836.6	4.141	4.698
	HSDPA		4.143	4.697
B4	Rel.99	1732.6	4.132	4.689
	HSDPA		4.140	4.660
B2	Rel.99	1880.0	4.138	4.676
	HSDPA		4.133	4.685

- LTE Band 2

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B2	20M	QPSK	1880.0	17.866	19.290
		16QAM		17.870	19.240
	15M	QPSK	1880.0	13.454	14.480
		16QAM		13.436	14.590
	10M	QPSK	1880.0	8.971	9.698
		16QAM		8.959	9.709
	5M	QPSK	1880.0	4.494	4.907
		16QAM		4.477	4.892
	3M	QPSK	1880.0	2.692	2.971
		16QAM		2.693	3.008
	1.4M	QPSK	1880.0	1.079	1.226
		16QAM		1.084	1.228

- LTE Band 5

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B5	10M	QPSK	836.5	8.978	9.748
		16QAM		8.972	9.752
	5M	QPSK	836.5	4.489	4.922
		16QAM		4.481	4.892
	3M	QPSK	836.5	2.696	2.969
		16QAM		2.689	3.001
	1.4M	QPSK	836.5	1.081	1.226
		16QAM		1.083	1.227

- LTE Band 7

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B7	20M	QPSK	2535.0	17.878	19.260
		16QAM		17.849	19.260
	15M	QPSK	2535.0	13.449	14.480
		16QAM		13.408	14.590
	10M	QPSK	2535.0	8.951	9.704
		16QAM		8.940	9.750
	5M	QPSK	2535.0	4.487	4.932
		16QAM		4.484	4.930

- LTE Band 12

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B12	10M	QPSK	707.5	8.930	9.713
		16QAM		8.926	9.672
	5M	QPSK	707.5	4.486	4.912
		16QAM		4.485	4.900
	3M	QPSK	707.5	2.695	2.979
		16QAM		2.694	2.979
	1.4M	QPSK	707.5	1.088	1.228
		16QAM		1.093	1.233

- LTE Band 13

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B13	10M	QPSK	782.0	8.960	9.678
		16QAM		8.939	9.698
	5M	QPSK	782.0	4.488	4.941
		16QAM		4.483	4.913

- LTE Band 14

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B14	10M	QPSK	793.0	8.927	9.674
		16QAM		8.899	9.599
	5M	QPSK	793.0	4.478	4.917
		16QAM		4.475	4.903

- LTE Band 66

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B66	20M	QPSK	1745.0	17.850	19.230
		16QAM		17.839	19.240
	15M	QPSK	1745.0	13.401	14.580
		16QAM		13.421	14.510
	10M	QPSK	1745.0	8.954	9.708
		16QAM		8.968	9.720
	5M	QPSK	1745.0	4.495	4.902
		16QAM		4.479	4.899
	3M	QPSK	1745.0	2.693	2.976
		16QAM		2.692	2.996
	1.4M	QPSK	1745.0	1.080	1.226
		16QAM		1.083	1.231

- NR Band 2 CP-OFDM

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n2	20M	QPSK	1880.0	18.925	19.750
		16QAM		18.937	19.840
		64QAM		18.915	19.820
		256QAM		18.915	19.840
	15M	QPSK	1880.0	14.107	14.770
		16QAM		14.102	14.870
		64QAM		14.104	14.880
		256QAM		14.129	14.760
	10M	QPSK	1880.0	9.286	10.000
		16QAM		9.300	9.836
		64QAM		9.273	9.897
		256QAM		9.278	9.839
	5M	QPSK	1880.0	4.469	4.927
		16QAM		4.497	4.975
		64QAM		4.475	4.911
		256QAM		4.465	4.838

- NR Band 5 CP-OFDM

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n5	20M	QPSK	836.5	18.898	19.920
		16QAM		18.903	19.770
		64QAM		18.907	19.790
		256QAM		18.881	19.870
	15M	QPSK	836.5	14.111	15.270
		16QAM		14.115	15.590
		64QAM		14.120	16.570
		256QAM		14.105	14.790
	10M	QPSK	836.5	9.268	9.868
		16QAM		9.292	9.892
		64QAM		9.271	9.921
		256QAM		9.269	9.861
	5M	QPSK	836.5	4.469	4.867
		16QAM		4.497	4.994
		64QAM		4.478	4.929
		256QAM		4.471	4.859

- NR Band 66 CP-OFDM

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n66	20M	QPSK	1745.0	18.904	19.790
		16QAM		18.890	19.750
		64QAM		18.870	19.780
		256QAM		18.916	19.750
	15M	QPSK	1745.0	14.050	14.840
		16QAM		14.128	14.820
		64QAM		14.106	14.800
		256QAM		14.091	14.830
	10M	QPSK	1745.0	9.260	9.851
		16QAM		9.308	9.975
		64QAM		9.252	9.837
		256QAM		9.291	9.903
	5M	QPSK	1745.0	4.471	4.961
		16QAM		4.491	4.951
		64QAM		4.475	4.913
		256QAM		4.459	4.858

- NR Band 77 CP-OFDM

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n77 (Lower)	100M	QPSK	3500	97.301	101.400
		16QAM		97.351	101.700
		64QAM		97.643	101.500
		256QAM		97.396	101.500
	90M	QPSK	3500	87.369	91.140
		16QAM		87.531	91.080
		64QAM		87.448	91.340
		256QAM		87.483	91.010
	80M	QPSK	3500	77.429	80.860
		16QAM		77.339	80.660
		64QAM		77.377	80.700
		256QAM		77.436	80.710
	60M	QPSK	3500	57.782	60.290
		16QAM		57.726	60.310
		64QAM		57.734	60.250
		256QAM		57.883	60.330
	50M	QPSK	3500	47.383	49.540
		16QAM		47.505	49.770
		64QAM		47.401	49.700
		256QAM		47.496	49.570
	40M	QPSK	3500	37.843	39.570
		16QAM		37.825	39.660
		64QAM		37.820	39.780
		256QAM		37.873	39.620
	20M	QPSK	3500	18.197	19.600
		16QAM		18.367	19.490
		64QAM		18.249	19.570
		256QAM		18.230	19.390

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n77 (Upper)	100M	QPSK	3840	97.420	101.300
		16QAM		97.459	101.600
		64QAM		97.579	101.600
		256QAM		97.468	101.400
	90M	QPSK	3840	87.356	91.090
		16QAM		87.501	91.060
		64QAM		87.356	91.190
		256QAM		87.621	91.010
	80M	QPSK	3840	77.394	80.810
		16QAM		77.448	80.720
		64QAM		77.414	80.710
		256QAM		77.640	80.780
	60M	QPSK	3840	57.854	60.570
		16QAM		57.748	60.380
		64QAM		57.831	60.410
		256QAM		57.864	60.350
	50M	QPSK	3840	47.375	49.800
		16QAM		47.558	49.550
		64QAM		47.442	49.690
		256QAM		47.457	49.540
	40M	QPSK	3840	37.842	39.740
		16QAM		37.875	39.770
		64QAM		37.824	39.520
		256QAM		37.857	39.640
	20M	QPSK	3840	18.253	19.480
		16QAM		18.207	19.640
		64QAM		18.254	19.420
		256QAM		18.199	19.500

9.1.1. OCCUPIED BANDWIDTH RESULTS

WCDMA

<p>Band 5</p>	 <p>Center Freq 836.600000 MHz #Res BW 51 kHz #VBW 510 kHz Span 10 MHz Sweep 5 ms</p> <p>Occupied Bandwidth 4.1410 MHz Total Power 33.0 dBm Transmit Freq Error 1.868 kHz x dB Bandwidth 4.698 MHz</p> <p>OBW Power 99.00 % x dB -26.00 dB</p>	 <p>Center Freq 836.600000 MHz #Res BW 51 kHz #VBW 510 kHz Span 10 MHz Sweep 5 ms</p> <p>Occupied Bandwidth 4.1432 MHz Total Power 32.0 dBm Transmit Freq Error 863 Hz x dB Bandwidth 4.697 MHz</p> <p>OBW Power 99.00 % x dB -26.00 dB</p>
<p>Band 4</p>	 <p>Center Freq 1.732600000 GHz #Res BW 51 kHz #VBW 510 kHz Span 10 MHz Sweep 5 ms</p> <p>Occupied Bandwidth 4.1320 MHz Total Power 31.8 dBm Transmit Freq Error 8.916 kHz x dB Bandwidth 4.689 MHz</p> <p>OBW Power 99.00 % x dB -26.00 dB</p>	 <p>Center Freq 1.732600000 GHz #Res BW 51 kHz #VBW 510 kHz Span 10 MHz Sweep 5 ms</p> <p>Occupied Bandwidth 4.1402 MHz Total Power 30.8 dBm Transmit Freq Error 13.179 kHz x dB Bandwidth 4.660 MHz</p> <p>OBW Power 99.00 % x dB -26.00 dB</p>
<p>Band 2</p>	 <p>Center Freq 1.880000000 GHz #Res BW 51 kHz #VBW 510 kHz Span 10 MHz Sweep 5 ms</p> <p>Occupied Bandwidth 4.1378 MHz Total Power 31.9 dBm Transmit Freq Error 2.361 kHz x dB Bandwidth 4.676 MHz</p> <p>OBW Power 99.00 % x dB -26.00 dB</p>	 <p>Center Freq 1.880000000 GHz #Res BW 51 kHz #VBW 510 kHz Span 10 MHz Sweep 5 ms</p> <p>Occupied Bandwidth 4.1329 MHz Total Power 30.9 dBm Transmit Freq Error -4.937 kHz x dB Bandwidth 4.685 MHz</p> <p>OBW Power 99.00 % x dB -26.00 dB</p>

LTE Band 2





LTE Band 5



LTE Band 7



LTE Band 12



LTE Band 13



LTE Band 14



LTE Band 66





LTE Band 4

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

NR Band 2 CP-OFDM



NR Band 5 CP-OFDM



NR Band 66 CP-OFDM



NR Band 77 (Lower) CP-OFDM





NR Band 77 (Upper) CP-OFDM

