

LTE Downlink Carrier Aggregation configurations

1. DL Inter Band(2CC)

E-UTRA CA configuration	Bandwidth Combination Set	E-UTRA Band	Bandwidth						Max Aggregated BW
			1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
2A-4A	(0)	Band 2	Yes	Yes	Yes	Yes	Yes	Yes	40
		Band 4			Yes	Yes	Yes	Yes	
	(1)	Band 2			Yes	Yes			20
		Band 4			Yes	Yes			
2A-5A	(0)	Band 2			Yes	Yes	Yes	Yes	30
		Band 5			Yes	Yes			
	(1)	Band 2			Yes	Yes	Yes	Yes	30
		Band 12			Yes	Yes			
2A-12A	(0)	Band 2			Yes	Yes	Yes	Yes	30
		Band 12			Yes	Yes			
	(1)	Band 2		Yes	Yes	Yes			20
		Band 12			Yes	Yes			
2A-13A	(0)	Band 2			Yes	Yes	Yes	Yes	30
		Band 13			Yes				
	(1)	Band 2			Yes	Yes			20
		Band 13			Yes	Yes	Yes	Yes	
2A-66A	(0)	Band 2	Yes	Yes	Yes	Yes	Yes	Yes	40
		Band 66			Yes	Yes	Yes	Yes	
	(1)	Band 2			Yes	Yes			20
		Band 66			Yes	Yes	Yes	Yes	
4A-5A	(0)	Band 4			Yes	Yes			20
		Band 5			Yes	Yes			
	(1)	Band 4			Yes	Yes	Yes	Yes	30
		Band 5			Yes	Yes			
4A-12A	(0)	Band 4	Yes	Yes	Yes	Yes			20
		Band 12			Yes	Yes			
	(1)	Band 4	Yes	Yes	Yes	Yes	Yes	Yes	30
		Band 12			Yes	Yes			
	(2)	Band 4			Yes	Yes	Yes	Yes	30
		Band 12		Yes	Yes	Yes			
	(3)	Band 4			Yes	Yes			20
		Band 12			Yes	Yes			
	(4)	Band 4			Yes	Yes	Yes	Yes	30
		Band 12			Yes	Yes			
4A-13A	(0)	Band 4			Yes	Yes	Yes	Yes	30
		Band 13				Yes			
	(1)	Band 4			Yes	Yes			20
		Band 13				Yes			
5A-41A	(0)	Band 5			Yes	Yes			30
		Band 41					Yes		
5A-66A	(0)	Band 5			Yes	Yes			30
		Band 66			Yes	Yes	Yes	Yes	
12A-66A	(0)	Band 12			Yes	Yes			20
		Band 66	Yes	Yes	Yes	Yes			
	(1)	Band 12			Yes	Yes			30
		Band 66	Yes	Yes	Yes	Yes	Yes	Yes	
	(2)	Band 12			Yes	Yes	Yes	Yes	30
		Band 66			Yes	Yes			
	(3)	Band 12			Yes	Yes			20
		Band 66			Yes	Yes			
	(4)	Band 12			Yes	Yes	Yes	Yes	30
		Band 66			Yes	Yes			
26A-41A	(0)	Band 26			Yes	Yes	Yes		35
		Band 41			Yes	Yes	Yes	Yes	

2. DL Intra Band(non-contiguous)

E-UTRA CA configuration	Bandwidth Combination Set	E-UTRA Band	Allowed Channel BW Per Carrier (MHz)				Max Aggregated BW
			1st Carrier	2nd Carrier	3rd Carrier	4th Carrier	
2A-2A	(0)	Band 2	5, 10, 15, 20	5, 10, 15, 20			40
4A-4A	(0)	Band 4	5, 10, 15, 20	5, 10, 15, 20			20
	(1)	Band 4	5, 10	5, 10			20
41A-41A	(0)	Band 41	10, 15, 20	10, 15, 20			40
	(1)	Band 41	5, 10, 15, 20	5, 10, 15, 20			40
66A-66A	(0)	Band 66	5, 10, 15, 20	5, 10, 15, 20			40

3. DL Intra Band(contiguous)

E-UTRA CA configuration	Bandwidth Combination Set	E-UTRA Band	Allowed Channel BW Per Carrier (MHz)					Max Aggregated BW
			1st Carrier	2nd Carrier	3rd Carrier	4th Carrier	5th Carrier	
2C	(0)	Band 2	5	20				40
			10	15,20				
			15	10,15,20				
			20	5,10,15,20				
41C	(0)	Band 41	10	20				40
			15	15, 20				
			20	10, 15, 20				
	(1)	Band 41	5, 10	20				40
			15	15, 20				
			20	5, 10, 15, 20				
	(2)	Band 41	10	15, 20				40
			15	10, 15, 20				
			20	10, 15, 20				
	(3)	Band 41	10	20				40
			20	20				
66B	(0)	Band 66	5	5, 10, 15				20
			10	5, 10				
			15	5				
66C	(0)	Band 66	5	20				40
			10	15,20				
			15	10,15,20				
		Band 66	20	5,10,15,20				

LTE Downlink Carrier Aggregation Combinations

The DL CA power measurement conditions for various CC's combinations were determined according LTE DL CA SAR Test Exclusion guidance in TCB workshop note (April 2018). Only yellow highlighted cells need power measurement. The following power measurements were performed with a single carrier uplink; CA for this particular project only supports one (1) uplink and up to four (4) downlinks.

LTE Release 10 Carrier Aggregation

Index	2CC	Restriction	Completely Covered by Measurement Superset
2CC#1	2A-2A		
2CC#2	2C		
2CC#3	2A-4A		
2CC#4	2A-5A		
2CC#5	2A-12A		
2CC#6	2A-13A		
2CC#7	2A-66A		
2CC#8	4A-4A		
2CC#9	4A-5A		
2CC#10	4A-12A		
2CC#11	4A-13A		
2CC#12	5A-41A	B41 SCC Only	
2CC#13	41A-41A		
2CC#14	41C		
2CC#15	66A-66A		
2CC#16	66B		
2CC#17	66C		

Note:

Only yellow highlight cells need power measurement according to LTE DL CA SAR test Exclusion in TCB workshop (April.2018).
highlight cells need power measurement according to LTE DL CA SAR test Exclusion in TCB workshop (April.2018).

LTE Release 10 Carrier Aggregation with 4x4 MIMO

Index	2CC	Restriction	Completely Covered by Measurement Superset
2CC#1	5A-[41A]	B41 SCC only	
2CC#2	26A-[41A]	B41 SCC only	
2CC#3	[41A]-41A		
2CC#4	[41A]-[41A]		
2CC#5	[41C]		

Note:

Only yellow highlight cells need power measurement according to LTE DL CA SAR test Exclusion in TCB workshop (April.2018).

Single Carrier Downlink 4x4 MIMO output power results

LTE Bands	Modulation	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	LTE Rel 8 Tx. Power [dBm]	DL 4x4 MIMO Tx. Power [dBm]	Delta
41	QPSK	20	39750	2506	1/49	18.78	18.72	-0.06

Note:

According to LTE Test Conditions in TCB workshop (May, 2017), SAR is excluded for LTE downlink 4x4 MIMO operation when uplink output with DL MIMO does not exceed highest uplink output power configuration without DL MIMO by more than 1/4 dB. And for DL MIMO with carrier aggregation, the same SAR test exclusion procedure is considered.

DL CA output power results

E-UTRA CA configutation (BCS)	Bands		UL							DL								LTE Rel 8 Tx. Power [dBm]	LTE Rel 10 Tx. Power [dBm]	Delta
	PCC	SCC1	PCC							PCC				SCC1						
	1st	2nd	Band	Mode	BW (MHz)	Channel	Freq. (MHz)	RB Allocation	RB offset	Band	BW (MHz)	Channel	Freq. (MHz)	Band	BW (MHz)	Channel	Freq. (MHz)			
2A-2A	2A	2A	2A	QPSK	20	18700	1860	1	0	2A	20	700	1940	2A	20	1100	1980	22.93	22.89	-0.04
2C	2C	2C	2C	QPSK	20	18900	1880	1	0	2C	20	900	1960	2C	20	1098	1979.8	22.98	22.96	-0.02
2A-4A	2A	4A	2A	QPSK	20	18900	1880	1	0	2A	20	900	1960	4A	20	2175	2132.5	22.98	22.93	-0.05
	4A	2A	4A	QPSK	20	20175	1732.5	1	99	4A	20	2175	2132.5	2A	20	900	1960	22.23	22.21	-0.02
2A-5A	2A	5A	2A	QPSK	20	18900	1880	1	0	2A	20	900	1960	5A	10	2525	881.5	22.98	22.91	-0.07
	5A	2A	5A	QPSK	10	20525	836.5	1	0	5A	10	2525	881.5	2A	20	900	1960	24.47	24.41	-0.06
2A-12A	2A	12A	2A	QPSK	20	18900	1880	1	0	2A	20	900	1960	12A	10	5095	737.5	22.98	22.91	-0.07
	12A	2A	12A	QPSK	10	23095	707.5	1	49	12A	10	5095	737.5	2A	20	900	1960	23.28	23.23	-0.05
2A-13A	2A	13A	2A	QPSK	20	18900	1880	1	0	2A	20	900	1960	13A	10	5230	751	22.98	22.91	-0.07
	13A	2A	13A	QPSK	20	23230	782	1	25	13A	10	5230	751	2A	20	900	1960	21.86	21.83	-0.03
2A-66A	2A	66A	2A	QPSK	20	18900	1880	1	0	2A	20	900	1960	66A	20	66786	2145	22.98	22.91	-0.07
	66A	2A	66A	QPSK	20	132322	1745	1	0	66A	20	66786	2145	2A	20	900	1960	24.47	24.42	-0.05
4A-4A	4A	4A	4A	QPSK	20	20175	1732.5	1	99	4A	20	2175	2132.5	4A	10	2319	2146.9	22.23	22.16	-0.07
4A-5A	4A	5A	4A	QPSK	20	20175	1732.5	1	99	4A	20	2175	2132.5	5A	10	2525	881.5	22.23	22.17	-0.06
	5A	4A	5A	QPSK	10	20525	836.5	1	0	5A	10	2525	881.5	4A	20	2175	2132.5	24.47	24.39	-0.08
4A-12A	4A	12A	4A	QPSK	20	20175	1732.5	1	99	4A	20	2175	2132.5	12A	10	5095	737.5	22.23	22.21	-0.02
	12A	4A	12A	QPSK	10	23095	707.5	1	49	12A	10	5095	737.5	4A	20	2175	2132.5	23.28	23.25	-0.03
4A-13A	4A	13A	4A	QPSK	20	20175	1732.5	1	99	4A	20	2175	2132.5	13A	10	5230	751	22.23	22.15	-0.08
	13A	4A	13A	QPSK	20	23230	782	1	25	13A	10	5230	751	4A	20	2175	2132.5	21.86	21.82	-0.04
5A-41A	5A	41A	5A	QPSK	10	20600	844	1	0	5A	10	2600	889	41A	20	40620	2593	24.58	24.52	-0.06
5A-66A	5A	66A	5A	QPSK	10	20525	836.5	1	0	5A	10	2525	881.5	66A	20	66786	2145	24.47	24.47	0.00
	66A	5A	66A	QPSK	20	132322	1745	1	0	66A	20	66786	2145	5A	10	2525	881.5	24.47	24.43	-0.04
12A-66A	12A	66A	12A	QPSK	10	23130	711	1	49	12A	10	5130	741	66A	20	66786	2145	23.45	23.39	-0.06
	66A	12A	66A	QPSK	20	132322	1745	1	0	66A	20	66786	2145	12A	10	5095	737.5	24.47	24.41	-0.06
26A-41A	26A	41A	26A	QPSK	15	26865	831.5	1	0	26A	15	8865	876.5	41A	20	40620	2593	23.25	23.24	-0.01
41A-41A	41A	41A	41A	QPSK	20	39750	2506	1	99	41A	20	39750	2506	41A	20	40620	2593	18.78	18.76	-0.02
41C	41C	41C	41C	QPSK	20	39750	2506	1	99	41C	20	39750	2506	41C	20	39948	2525.8	18.78	18.70	-0.08

Note:

1. Per KDB 941225 D05A LTE Rel. 10 KDB Inquiry Sheet: SAR is excluded for Carrier Aggregation when measured power does not exceed LTE Release 8 by more than a 1/4 dB.
2. When the same frequency band is used for both contiguous and non-contiguous in DL CA Intra band, power was measured using the configuration with the largest aggregated bandwidth and maximum output power among the contiguous and non-contiguous in DL CA Intra band configurations.

DL CA with 4x4 MIMO output power results

E-UTRA CA configuration (BCS)	Bands		UL							DL							LTE Rel 8 Tx. Power [dBm]	LTE Rel 10 Tx. Power [dBm]	Delta	
	PCC	SCC1	PCC							PCC				SCC1						
	1st	2nd	Band	Mode	BW (MHz)	Channel	Freq. (MHz)	RB Allocation	RB offset	Band	BW (MHz)	Channel	Freq. (MHz)	Band	BW (MHz)	Channel	Freq. (MHz)			
5A-[41A]	5A	[41A]	5A	QPSK	10	20600	844	1	0	5A	10	2600	889	[41A]	20	40620	2593	24.58	24.48	-0.10
26A-[41A]	26A	[41A]	26A	QPSK	15	26865	831.5	1	0	26A	15	8865	876.5	[41A]	20	40620	2593	23.25	23.24	-0.01
[41A]-41A	[41A]	41A	[41A]	QPSK	20	39750	2506	1	49	[41A]	20	39750	2506	41A	20	41490	2680	18.78	18.70	-0.08
	41A	[41A]	[41A]	QPSK	20	39750	2506	1	49	[41A]	20	39750	2506	41A	20	41490	2680	18.78	18.73	-0.05
[41A]-[41A]	[41A]	[41A]	[41A]	QPSK	20	39750	2506	1	49	[41A]	20	39750	2506	[41A]	20	41490	2680	18.78	18.71	-0.07
[41C]	[41C]	[41C]	[41C]	QPSK	20	39750	2506	1	49	[41C]	20	39750	2506	[41C]	20	39948	2525.8	18.78	18.76	-0.02

Note:

1. Per KDB 941225 D05A LTE Rel. 10 KDB Inquiry Sheet: SAR is excluded for Carrier Aggregation when measured power does not exceed LTE Release 8 by more than a 1/4 dB.
2. When the same frequency band is used for both contiguous and non-contiguous in DL CA Intra band, power was measured using the configuration with the largest aggregated bandwidth and maximum output power among the contiguous and non-contiguous in DL CA Intra band configurations.

- END -