

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	Yes	Yes	
2A-5A	(0)	Band 2			Yes	Yes	Yes	Yes	40
		Band 5			Yes	Yes	Yes	Yes	30
2A-12A	(0)	Band 2			Yes	Yes	Yes	Yes	30
		Band 12			Yes	Yes	Yes	Yes	
	(1)	Band 2		Yes	Yes	Yes	Yes	Yes	30
		Band 12			Yes	Yes			20
2A-13A	(0)	Band 2			Yes	Yes	Yes	Yes	30
		Band 13			Yes	Yes			
	(1)	Band 2			Yes	Yes			20
		Band 13			Yes	Yes			
2A-17A	(0)	Band 2			Yes	Yes			20
		Band 17			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			
4A-5A	(0)	Band 2			Yes	Yes	Yes	Yes	40
		Band 66			Yes	Yes	Yes	Yes	
	(1)	Band 2			Yes	Yes	Yes	Yes	20
		Band 5			Yes	Yes	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	Yes	30
		Band 12			Yes	Yes			20
	(3)	Band 4			Yes	Yes	Yes	Yes	30
		Band 12			Yes	Yes			
4A-13A	(0)	Band 4			Yes	Yes	Yes	Yes	30
		Band 13			Yes	Yes			
	(1)	Band 4			Yes	Yes			20
		Band 13			Yes	Yes			
4A-17A	(0)	Band 4			Yes	Yes			20
		Band 17			Yes	Yes			
5A-41A	(0)	Band 5			Yes	Yes			30
		Band 41			Yes	Yes		Yes	
5A-66A	(0)	Band 5			Yes	Yes			30
		Band 66			Yes	Yes	Yes	Yes	
12A-25A	(0)	Band 12			Yes	Yes	Yes	Yes	30
		Band 25			Yes	Yes			
12A-66A	(0)	Band 12			Yes	Yes			20
		Band 66	Yes	Yes	Yes	Yes			
	(1)	Band 12	Yes	Yes	Yes	Yes	Yes	Yes	30
		Band 66			Yes	Yes			
	(2)	Band 12		Yes	Yes	Yes			30
		Band 66			Yes	Yes	Yes	Yes	
	(3)	Band 12			Yes	Yes			20
		Band 66			Yes	Yes			
26A-41A	(0)	Band 12			Yes	Yes	Yes		20
		Band 66			Yes	Yes	Yes		
	(1)	Band 26			Yes	Yes	Yes	Yes	35
		Band 41			Yes	Yes	Yes	Yes	

2. DL Inter Band(3CC)

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-5A	(0)	Band 2			Yes	Yes	Yes	Yes	50
		Band 4			Yes	Yes	Yes	Yes	
		Band 5			Yes	Yes			
2A-4A-13A	(0)	Band 2			Yes	Yes	Yes	Yes	50
		Band 4			Yes	Yes	Yes	Yes	
		Band 13				Yes			
4A-4A-13A	(0)	Band 4			4A-4A BCS 0				50
		Band 13				Yes			
5A-66A-66A	(0)	Band 5			Yes	Yes			50
		Band 66			66A-66A BCS 0				
12A-66A-66A	(0)	Band 12			Yes	Yes			50
		Band 66			66A-66A BCS 0				
26A-41C	(0)	Band 26			Yes	Yes	Yes		55
		Band 41			41C BCS 1				

3 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
		Band 4	5, 10, 15, 20	5, 10, 15, 20			40
4A-4A	(1)	Band 4	5, 10	5, 10			20
		Band 4					
41A-41A	(0)	Band 41	10, 15, 20	10, 15, 20			40
		Band 41	5, 10, 15, 20	5, 10, 15, 20			40
66A-66A	(0)	Band 2	5, 10, 15, 20	5, 10, 15, 20			40
		Band 2					
41A-41C	(0)	Band 41	5, 10, 15, 20	41C BCS 1			60
		Band 41	41C BCS 1	5, 10, 15, 20			
41A-41D	(0)	Band 41	5, 10, 15, 20	41D BCS 0			80
		Band 41	41D BCS 0	5, 10, 15, 20			
41C-41C	(0)	Band 41	41C BCS 0	41C BCS 0			80
		Band 41	41C BCS 0	41D BCS 0			
41C-41D	(0)	Band 41	41D BCS 0	41C BCS 0			100
		Band 41	41D BCS 0	41C BCS 0			

4. DL Intra Band(contiguous)

E-UTRA CA configuration	Bandwidth Combination Set	E-UTRA Band	Allowed Channel BW Per Carrier (MHz)					Max Aggregated
			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	15, 20				40
			15	10, 15, 20				
			20	5, 10, 15, 20				
			20	10, 15, 20				
	(1)	Band 41	5, 10	20				40
			15	15, 20				
			20	5, 10, 15, 20				
			20	10, 15, 20				
66B	(0)	Band 66	5	5, 10, 15				20
			10	5, 10				
			15	5				
			20					
66C	(0)	Band 66	5	20				40
			10	15, 20				
			15	10, 15, 20				
			20	5, 10, 15, 20				
41D	(0)	Band 41	10	20	15			60
			10	15, 20	20			
			15	20	10, 15			
			15	10, 15, 20	20			
			20	15, 20	10			
			20	10, 15, 20	15, 20			
41E	(0)	Band 41	15, 20	15, 20	15, 20	20		80

LTE Uplink Inter-band Carrier Aggregation

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			
	(2)	Band 2			Yes	Yes	Yes	Yes	40
		Band 4			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			
	(5)	Band 4			Yes	Yes	Yes		20
		Band 12			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			30
		Band 66			Yes	Yes	Yes	Yes	
	(3)	Band 12			Yes	Yes			20
		Band 66			Yes	Yes			
	(4)	Band 12			Yes	Yes			30
		Band 66			Yes	Yes	Yes	Yes	
	(5)	Band 12			Yes				20
		Band 66			Yes	Yes	Yes		

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 (5) downlinks.

LTE Release 10 Carrier Aggregation

Index	2CC	Restriction	Completely Covered by Measurement Superset	Index	3CC	Restriction	Completely Covered by Measurement Superset	Index	4CC	Restriction	Completely Covered by Measurement Superset	Index	5CC	Restriction	Completely Covered by Measurement Superset
2CC#1	2A-2A			3CC#1	2A-4A-5A			4CC#1	41A-41D			5CC#1	41C-41D		
2CC#2	2C			3CC#2	2A-4A-13A			4CC#2	41C-41C						
2CC#3	2A-4A		3CC#1	3CC#3	4A-4A-12A			4CC#3	41E						
2CC#4	2A-5A		3CC#1	3CC#4	5A-66A-66A										
2CC#5	2A-12A			3CC#5	12A-66A-66A										
2CC#6	2A-13A		3CC#2	3CC#6	26A-41C	B41 SCC only									
2CC#7	2A-17A			3CC#7	41A-41C										
2CC#8	2A-66A			3CC#8	41D		4CC#1								
2CC#9	4A-4A		3CC#3												
2CC#10	4A-5A		3CC#1												
2CC#11	4A-12A		3CC#3												
2CC#12	4A-13A		3CC#2												
2CC#13	4A-17A														
2CC#14	5A-41A	B41 SCC only													
2CC#15	5A-66A		3CC#4												
2CC#16	12A-25A														
2CC#17	12A-66A		3CC#5												
2CC#18	26A-41A	B41 SCC only													
2CC#19	41A-41A														
2CC#20	41C		3CC#7												
2CC#21	66A-66A		3CC#5												
2CC#22	66B														
2CC#23	66C														

Note:

Only yellow 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	Index	3CC	Restriction	Completely Covered by Measurement Superset	Index	4CC	Restriction	Completely Covered by Measurement Superset	Index	5CC	Restriction	Completely Covered by Measurement Superset
2CC#1	2A-[4A]		3CC#1	3CC#1	2A-[4A]-5A			4CC#1	[41A]-[41D]			5CC#1	[41C]-[41D]		
2CC#2	2A-[66A]			3CC#2	2A-[4A]-13A			4CC#1	[41C]-[41C]						
2CC#3	[4A]-[4A]		3CC#3	3CC#3	[4A]-[4A]-12A			4CC#2	[41E]						
2CC#4	[4A]-5A		3CC#1	3CC#4	5A-[66A]-[66A]										
2CC#5	[4A]-12A		3CC#3	3CC#5	12A-[66A]-[66A]										
2CC#6	[4A]-13A		3CC#2	3CC#6	26A-[41C]	B41 SCC only									
2CC#7	[4A]-17A			3CC#7	[41A]-[41C]										
2CC#8	5A-[41A]	B41 SCC only		3CC#8	[41D]		4CC#1								
2CC#9	5A-[66A]		3CC#4												
2CC#10	12A-[66A]		3CC#5												
2CC#11	26A-[41A]	B41 SCC only													
2CC#12	[41A]-[41A]														
2CC#13	[41C]		3CC#6												
2CC#14	[66A]-[66A]		3CC#5												
2CC#15	[66B]														
2CC#16	[66C]														

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
Band 4	QPSK	20	20175	1732.5	1/0	22.71	22.68	-0.03
Band 41	QPSK	20	39750	2506	1/0	23.89	23.84	-0.05
Band 66	QPSK	20	132072	1720	1/0	22.64	22.72	0.08

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.

[illegible]

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.	LTE Rel 10 Tx.	Delta	
	PCC	SCC1	SCC2	SCC3	SCC4	SCC5	SCC6	PCC					PCC			SCC1			SCC2			SCC3			Power [dBm]		Power
	1st	2nd	3rd	4th	5th	6th	7th	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offs et	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)			
[4A]-17A	[4A]	17A						QPSK	10	20175	1732.5	1/99	20	2175	2132.5	10	5790	740							22.71	22.74	0.03
	17A	[4A]						QPSK	10	23790	710	1/25	10	5790	740	10	2175	2132.5							23.65	23.69	0.04
5A-[41A]	5A	[41A]						QPSK	10	20525	836.5	1/0	10	2525	881.5	20	40620	2593							24.57	24.58	0.01
26A-[41A]	26A	[41A]						QPSK	15	26865	831.5	1/0	15	8865	876.5	20	40620	2593							23.90	23.85	-0.05
[41A]-[41A]	[41A]	[41A]						QPSK	20	41055	2636.5	1/0	20	41055	2636.5	20	39750	2506							23.89	23.90	0.01
2A-[4A]-5A	2A	[4A]	5A					QPSK	20	18900	1880	1/99	20	900	1960	20	2175	2132.5	10	2525	881.5	20	2175	2132.5	22.59	22.55	-0.04
	[4A]	5A	2A					QPSK	20	20175	1732.5	1/99	20	2175	2132.5	10	2525	881.5	20	900	1960				22.71	22.76	0.05
	5A	2A	[4A]					QPSK	10	20525	836.5	1/0	10	2525	881.5	20	900	1960	20	2175	2132.5				24.57	24.62	0.05
2A-[4A]-13A	2A	[4A]	13A					QPSK	20	18900	1880	1/99	20	900	1940	20	2175	2132.5	10	5230	751	20	2175	2132.5	22.59	22.65	0.06
	[4A]	13A	2A					QPSK	20	20175	1732.5	1/99	20	2175	2132.5	10	5230	751	20	900	1960				22.71	22.76	0.05
	13A	2A	[4A]					QPSK	10	23230	172	1/49	10	5230	751	20	900	1960	20	2175	2132.5				23.45	23.5	0.05
2A-5A-[66A]	2A	5A	[66A]					QPSK	20	18900	1880	1/99	20	900	1960	10	2525	881.5	20	66786	2145				22.59	22.65	0.06
	5A	[66A]	2A					QPSK	10	20525	836.5	1/0	10	2525	881.5	20	66786	2145	20	900	1960				24.57	24.52	-0.05
	[66A]	2A	5A					QPSK	20	132072	1720	1/0	20	66536	2120	20	900	1960	10	2525	881.5				22.64	22.65	0.01
[4A]-[4A]-12A	[4A]	[4A]	12A					QPSK	20	20050	1720	1/99	20	2050	2120	20	2300	2145	10	5095	737.5				22.71	22.8	0.09
	12A	[4A]	[4A]					QPSK	10	23095	707.5	1/49	10	5095	737.5	20	2050	2120	20	2300	2145				23.22	23.23	0.01
5A-[66A]-[66A]	5A	[66A]	[66A]					QPSK	10	20525	836.5	1/0	10	2525	881.5	20	66536	2120	20	67036	2170				24.57	24.60	0.03
	[66A]	[66A]	5A					QPSK	20	132072	1720	1/49	20	66536	2120	20	67036	2170	10	2525	881.5				22.64	22.68	0.04
12A-[66A]-[66A]	12A	[66A]	[66A]					QPSK	10	23095	707.5	1/49	10	5095	737.5	20	66536	2120	20	67036	2170				23.22	23.23	0.01
	[66A]	[66A]	12A					QPSK	20	132072	1720	1/49	20	66536	2120	20	67036	2170	10	5095	737.5				22.64	22.59	-0.05
26A-[41C]	26A	[41C]	[41C]					QPSK	15	26865	831.5	1/0	15	8865	876.5	20	40620	2593	20	40422	2573.2				23.90	23.91	0.01
[41A]-[41C]	[41A]	[41C]	[41C]					QPSK	20	41055	2636.5	1/0	20	41055	2636.5	20	39750	2506	20	39948	2525.8				23.89	23.9	0.01
	[41C]	[41C]	[41A]					QPSK	20	41055	2635.5	1/0	20	41055	2636.5	20	41253	2656.3	20	39750	2506				23.89	23.88	-0.01
[41A]-[41D]	[41A]	[41D]	[41D]	[41D]				QPSK	20	41055	2636.5	1/0	20	41055	2636.5	20	40185	2549.5	20	39987	2529.7	20	40383	2569.3	23.89	23.94	0.05
	[41D]	[41D]	[41D]	[41A]				QPSK	20	41055	2636.5	1/0	20	41055	2636.5	20	41253	2656.3	20	40857	2616.7	20	39750	2506	23.89	23.92	0.03
[41C]-[41C]	[41C]	[41C]	[41C]	[41C]				QPSK	20	41055	2636.5	1/0	20	41055	2636.5	20	41253	2656.3	20	39948	2525.8	20	39750	2506	23.89	23.91	0.02
[41E]	[41E]	[41E]	[41E]	[41E]				QPSK	20	41055	2636.5	1/0	20	41055	2636.5	20	41253	2656.3	20	40857	2616.7	20	40659	2596.9	23.89	23.87	-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.

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