

1. 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	
2A-4A	(1)	Band 2			Yes	Yes		20	
		Band 4			Yes	Yes			
2A-4A	(2)	Band 2			Yes	Yes	Yes	40	
		Band 4			Yes	Yes	Yes		
2A-5A	(0)	Band 2			Yes	Yes	Yes	30	
		Band 5			Yes	Yes			
	(1)	Band 2			Yes	Yes		20	
2A-12A	(0)	Band 2			Yes	Yes	Yes	40	
		Band 12			Yes	Yes	Yes		
2A-12A	(1)	Band 2			Yes	Yes		40	
		Band 12		Yes	Yes	Yes			
2A-12A	(2)	Band 2			Yes	Yes		40	
		Band 12			Yes	Yes			
2A-13A	(0)	Band 2			Yes	Yes	Yes	30	
		Band 13			Yes				
	(1)	Band 2			Yes	Yes		20	
		Band 13			Yes				
(2)	Band 2			Yes	Yes	Yes	30		
	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	40	
		Band 66			Yes	Yes	Yes		
	(1)	Band 2			Yes	Yes		20	
		Band 66			Yes	Yes			
(2)	Band 2			Yes	Yes	Yes	40		
	Band 66			Yes	Yes	Yes			
4A-5A	(0)	Band 4			Yes	Yes		20	
		Band 5			Yes	Yes			
	(1)	Band 4			Yes	Yes	Yes	30	
4A-12A	(0)	Band 4	Yes	Yes	Yes	Yes		20	
		Band 12			Yes	Yes			
	(1)	Band 4	Yes	Yes	Yes	Yes	Yes	30	
		Band 12			Yes	Yes			
	(2)	Band 4			Yes	Yes	Yes	30	
Band 12			Yes	Yes	Yes				
(3)	Band 4			Yes	Yes		20		
	Band 12			Yes	Yes				
4A-13A	(0)	Band 4			Yes	Yes	Yes	30	
		Band 13			Yes				
	(1)	Band 4			Yes	Yes		20	
		Band 13			Yes	Yes			
	(2)	Band 4			Yes	Yes	Yes	30	
Band 12				Yes	Yes				
(5)	Band 4			Yes	Yes	Yes	20		
	Band 12			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		
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		
	(2)	Band 12			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			
(5)	Band 12			Yes	Yes		20		
	Band 66			Yes	Yes	Yes			
26A-41A	(0)	Band 26			Yes	Yes	Yes	35	
		Band 41			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	Yes			
4A-4A-12A	(0)	Band 4	4A-4A BCS 0						50
		Band 12			Yes	Yes			
5A-66A-66A	(0)	Band 5			Yes	Yes		50	
		Band 66			Yes	Yes			
		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	
4A-4A	(0)	Band 4	5, 10, 15, 20	5, 10, 15, 20		40	
	(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	
	(0)	Band 41	5, 10, 15, 20	41C BCS 1		60	
41A-41C	(0)	Band 41	41C BCS 1	5, 10, 15, 20		80	
		Band 41	5, 10, 15, 20	41D BCS 0			
41A-41D	(0)	Band 41	41D BCS 0	5, 10, 15, 20		80	
		Band 41	41C 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 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				
			5, 10	20				
	(1)	Band 41	15	15, 20				40
			20	5, 10, 15, 20				
			10	15, 20				
			15	10, 15, 20				
(2)	Band 41	20	10, 15, 20				40	
		10	20					
		15	20					
		20	10, 15, 20					
(3)	Band 41	10	20				40	
		20	20					
		5	5, 10, 15					
		10	5, 10					
66B	(0)	Band 66	15	5				20
			5	20				
			10	15, 20				
			15	10, 15, 20				
66C	(0)	Band 66	20	5, 10, 15, 20				40
			10	20				
			15	20				
			20	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			
			10	15, 20	10, 15			
			20	10, 15, 20	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 (5) 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		3CC#1
2CC#4	2A-5A		3CC#1
2CC#5	2A-12A		
2CC#6	2A-13A		3CC#2
2CC#7	2A-17A		
2CC#8	2A-66A		
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	41A SCC only	
2CC#15	5A-66A		3CC#4
2CC#16	12A-66A		3CC#5
2CC#17	26A-41A	41A SCC only	
2CC#18	41A-41A		
2CC#19	41C		
2CC#20	66A-66A		3CC#4
2CC#21	66B		
2CC#22	66C		

Index	3CC	Restriction	Completely Covered by Measurement Superset
3CC#1	2A-4A-5A		
3CC#2	2A-4A-13A		
3CC#3	4A-4A-12A		
3CC#4	5A-66A-66A		
3CC#5	12A-66A-66A		
3CC#6	26A-41C	41C SCC only	
3CC#7	41A-41C		
3CC#8	41D		4CC#1

Index	4CC	Restriction	Completely Covered by Measurement Superset
4CC#1	41A-41D		
4CC#2	41C-41C		

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
2CC#1	2A-[4A]		3CC#1
2CC#2	2A-[66A]		
2CC#3	4A-[4A]		3CC#3
2CC#4	[4A]-[4A]		
2CC#5	[4A]-5A		3CC#1
2CC#6	[4A]-12A		3CC#3
2CC#7	[4A]-13A		3CC#2
2CC#8	[4A]-17A		
2CC#9	5A-[41A]	41A SCC only	
2CC#10	5A-[66A]		3CC#4
2CC#11	12A-[66A]		3CC#6
2CC#12	26A-[41A]	41A SCC only	
2CC#13	41A-[41A]		
2CC#14	[41A]-[41A]		
2CC#15	[41C]		
2CC#16	66A-[66A]		3CC#8
2CC#17	[66A]-[66A]		
2CC#18	[66B]		
2CC#19	[66C]		

Index	3CC	Restriction	Completely Covered by Measurement Superset
3CC#1	2A-[4A]-5A		
3CC#2	2A-[4A]-13A		
3CC#3	4A-[4A]-12A		
3CC#4	5A-66A-[66A]		
3CC#5	12A-66A-[66A]		
3CC#6	[41A]-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
Band 4	QPSK	20	20175	1732.5	1/99	23.6	23.7	0.02
Band 41	QPSK	20	39750	2506	1/0	23.3	23.3	0.03
Band 66	QPSK	20	132322	1745	1/0	23.8	23.7	-0.07

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 configuration (BCS)	Bands					UL				DL												LTE Rel 8 Tx. Power [dBm]	LTE Rel 10 Tx. Power [dBm]	Delta					
	PCC	SCC1	SCC2	SCC3	SCC4	PCC				SCC1			SCC2			SCC3			SCC4										
	1st	2nd	3rd	4th	5th	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel				Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)	
2A-2A	2A	2A				QPSK	20	19100	1900	1/0	20	1100	1980	20	700	1940											23.45	23.44	0.01
2C	2A	2A				QPSK	20	19100	1900	1/0	20	1100	1980	20	902	1960.2											23.45	23.50	-0.05
2A-12A	2A	12A				QPSK	20	19100	1900	1/0	20	1100	1980	10	5095	737.5											23.45	23.35	0.10
	12A	2A				QPSK	10	23095	707.5	1/25	10	5095	737.5	20	900	1960											25.11	25.13	-0.02
2A-17A	2A	17A				QPSK	10	18900	1880	1/0	10	1100	1980	10	5790	740											23.24	23.21	0.03
	17A	2A				QPSK	10	23790	710	1/25	10	5790	740	10	900	1960											24.65	24.56	0.09
2A-66A	2A	66A				QPSK	20	19100	1900	1/0	20	1100	1980	20	66786	2145											23.45	23.43	0.02
	66A	2A				QPSK	20	132322	1745	1/0	20	66786	2145	20	900	1960											23.78	23.84	-0.06
4A-17A	4A	17A				QPSK	10	20000	1715	1/49	10	2000	2115	10	5790	740											23.46	23.36	0.10
	17A	4A				QPSK	10	23790	710	1/25	10	5790	740	10	2175	2132.5											24.65	24.56	0.09
5A-41A	5A	41A				QPSK	10	20525	836.5	1/25	10	2525	881.5	20	40620	2593											23.97	23.95	0.02
26A-41A	26A	41A				QPSK	15	26865	831.5	1/74	15	8865	876.5	20	40620	2593											23.92	23.86	0.06
41A-41A	41A	41A				QPSK	20	39750	2506	1/0	20	39750	2506	20	41490	2680											23.29	23.28	0.01
66B	66B	66B				QPSK	15	132597	1772.5	1/0	15	67061	2172.5	5	66461	2112.5											23.65	23.63	0.02
66C	66C	66C				QPSK	20	132322	1745	1/0	20	66786	2145	20	66588	2125.2											23.78	23.77	0.01
2A-4A-5A	2A	4A	5A			QPSK	20	19100	1900	1/0	20	1100	1980	20	2175	2132.5	10	2525	881.5								23.45	23.39	0.06
	4A	2A	5A			QPSK	20	20175	1732.5	1/99	20	2175	2132.5	20	900	1960	10	2525	881.5								23.63	23.56	0.07
	5A	2A	4A			QPSK	10	20525	836.5	1/25	10	2525	881.5	20	900	1960	20	2175	2132.5								23.97	23.93	0.04
2A-4A-13A	2A	4A	13A			QPSK	20	19100	1900	1/0	20	1100	1980	20	2175	2132.5	10	5230	751								23.45	23.59	-0.14
	4A	2A	13A			QPSK	20	20175	1732.5	1/99	20	2175	2132.5	20	900	1960	10	5230	751								23.63	23.52	0.11
	13A	2A	4A			QPSK	10	23230	782	1/0	10	5230	751	20	900	1960	20	2175	2132.5								23.75	23.79	-0.04
4A-4A-12A	4A	4A	12A			QPSK	20	20175	1732.5	1/99	20	2175	2132.5	10	2350	2150	10	5095	737.5								23.63	23.50	0.13
	12A	4A	4A			QPSK	10	23095	707.5	1/25	10	5095	737.5	20	2175	2132.5	10	2350	2150								25.11	25.07	0.04
5A-66A-66A	5A	66A	66A			QPSK	10	20525	836.5	1/25	10	2525	881.5	20	66536	2120	20	67036	2170								23.97	24.05	-0.08
	66A	66A	5A			QPSK	20	132322	1745	1/0	20	66786	2145	20	66536	2120	10	2525	881.5								23.78	23.65	0.13
	12A	66A	66A			QPSK	10	23095	707.5	1/25	10	5095	737.5	20	66536	2120	20	67036	2170								25.11	25.04	0.07
26A-41C	26A	41C	41C			QPSK	15	26865	831.5	1/74	15	8865	876.5	20	40620	2593	20	40818	2612.8								23.92	23.99	-0.07
	41A	41C	41C			QPSK	20	39750	2506	1/0	20	39750	2506	20	41490	2680	20	41292	2660.2								23.29	23.32	-0.03
41A-41C	41C	41C	41A			QPSK	20	39750	2506	1/0	20	39750	2506	20	39948	2525.8	20	41490	2680								23.29	23.19	0.10
	41A	41D	41D	41D		QPSK	20	39750	2506	1/0	20	39750	2506	20	41490	2680	20	41292	2660.2	20	41094	2640.4					23.29	23.41	-0.12
41C-41C	41D	41D	41D	41A		QPSK	20	39750	2506	1/0	20	39750	2506	20	39948	2525.8	20	40146	2545.6	20	41490	2680					23.29	23.22	0.07
	41C	41C	41C	41C		QPSK	20	39750	2506	1/0	20	39750	2506	20	39948	2525.8	20	41490	2680	20	41292	2660.2					23.29	23.15	0.14

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	SCC2	SCC3	PCC				PCC			SCC1			SCC2			SCC3						
	1st	2nd	3rd	4th	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)				Channel	Freq. (MHz)
2A-[66A]	2A	[66A]			QPSK	20	19100	1900	1/0	20	1100	1980	20	66786	2145							23.45	23.42	0.03
	[66A]	2A			QPSK	20	132322	1745	1/0	20	66786	2145	20	900	1960							23.78	23.83	-0.05
[4A]-[4A]	[4A]	[4A]			QPSK	20	20175	1732.5	1/99	20	2175	2132.5	10	2350	2150							23.63	23.59	0.04
[4A]-17A	[4A]	17A			QPSK	10	20000	1715	1/49	10	2000	2115	10	5790	740							23.46	23.35	0.11
	17A	[4A]			QPSK	10	23790	710	1/25	10	5790	740	10	2175	2132.5							24.65	24.60	0.05
5A-[41A]	5A	[41A]			QPSK	10	20525	836.5	1/25	10	2525	881.5	20	40620	2593							23.97	23.90	0.07
26A-[41A]	26A	[41A]			QPSK	15	26865	831.5	1/74	15	8865	876.5	20	40620	2593							23.92	23.93	-0.01
[41A]-[41A]	[41A]	[41A]			QPSK	20	39750	2506	1/0	20	39750	2506	20	41490	2680							23.29	23.28	0.01
66A-[66A]	66A	[66A]			QPSK	20	132322	1745	1/0	20	66786	2145	20	66536	2120							23.78	23.70	0.08
	[66B]	66A			QPSK	20	132322	1745	1/0	20	66786	2145	20	66536	2120							23.78	23.71	0.07
[66B]	[66B]	[66B]			QPSK	15	132597	1772.5	1/0	15	67061	2172.5	5	66461	2112.5							23.65	23.58	0.07
[66C]	[66C]	[66C]			QPSK	20	132322	1745	1/0	20	66786	2145	20	66588	2125.2							23.78	23.74	0.04
2A-[4A]-5A	2A	[4A]	5A		QPSK	20	19100	1900	1/0	20	1100	1980	20	2175	2132.5	10	2525	881.5				23.45	23.56	-0.11
	[4A]	2A	5A		QPSK	20	20175	1732.5	1/99	20	2175	2132.5	20	900	1960	10	2525	881.5				23.63	23.61	0.02
	5A	2A	[4A]		QPSK	10	20525	836.5	1/25	10	2525	881.5	20	900	1960	20	2175	2132.5				23.97	23.95	0.02
2A-[4A]-13A	2A	[4A]	13A		QPSK	20	19100	1900	1/0	20	1100	1980	20	2175	2132.5	10	5230	751				23.45	23.40	0.05
	[4A]	2A	13A		QPSK	20	20175	1732.5	1/99	20	2175	2132.5	20	900	1960	10	5230	751				23.63	23.75	-0.12
	13A	2A	[4A]		QPSK	10	23230	782	1/0	10	5230	751	20	900	1960	20	2175	2132.5				23.75	23.80	-0.05
4A-[4A]-12A	4A	[4A]	12A		QPSK	20	20175	1732.5	1/99	20	2175	2132.5	10	2350	2150	10	5095	737.5				23.63	23.55	0.08
	[4A]	4A	12A		QPSK	20	20175	1732.5	1/99	20	2175	2132.5	10	2350	2150	10	5095	737.5				23.63	23.56	0.07
	12A	[4A]	4A		QPSK	10	23095	707.5	1/25	10	5095	737.5	20	2175	2132.5	10	2350	2150				25.11	25.22	-0.11
5A-66A-[66A]	5A	66A	[66A]		QPSK	10	20525	836.5	1/25	10	2525	881.5	20	66536	2120	20	67036	2170				23.97	23.94	0.03
	66A	[66A]	5A		QPSK	20	132322	1745	1/0	20	66786	2145	20	66536	2120	10	2525	881.5				23.78	23.83	-0.05
	[66A]	66A	5A		QPSK	20	132322	1745	1/0	20	66786	2145	20	66536	2120	10	2525	881.5				23.78	23.75	0.03
12A-66A-[66A]	12A	66A	[66A]		QPSK	10	23095	707.5	1/25	10	5095	737.5	20	66536	2120	20	67036	2170				25.11	25.04	0.07
	66A	[66A]	12A		QPSK	20	132322	1745	1/0	20	66786	2145	20	66536	2120	10	5095	737.5				23.78	23.82	-0.04
	[66A]	66A	12A		QPSK	20	132322	1745	1/0	20	66786	2145	20	66536	2120	10	5095	737.5				23.78	23.72	0.06
[41A]-41C	[41A]	41C	41C		QPSK	20	39750	2506	1/0	20	39750	2506	20	41490	2680	20	41292	2660.2				23.29	23.26	0.03
	41C	41C	[41A]		QPSK	20	39750	2506	1/0	20	39750	2506	20	39948	2525.8	20	41490	2680				23.29	23.21	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.

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