



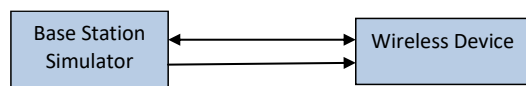
## F.2 LTE Downlink Only Carrier Aggregation Test Selection and Setup

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number component carriers (CCs) supported by the product implementation. For those configurations required by April 2018 TCBC Workshop Notes, conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.




Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for carrier aggregation configurations when the maximum average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive. All bands required for SAR testing per FCC KDB procedures were considered. Based on the measured maximum powers below, no additional SAR tests were required for DLCA SAR configurations.

General PCC and SCC configuration selection procedure

- PCC uplink channel, channel bandwidth, modulation and RB configurations were selected based on section C)3)b)ii) of KDB 941225 D05 V01r02. All LTE bandwidth conducted powers needed for PCC uplink configuration selection can be found in Section 9.3 and appendix H. The downlink PCC channel was paired with the selected PCC uplink channel according to normal configurations without carrier aggregation.
- To maximize aggregated bandwidth, highest channel bandwidth available for that CA combination was selected for SCC. For inter-band CA, the SCC downlink channels were selected near the middle of their transmission bands. For contiguous intra-band CA, the downlink channel spacing between the component carriers was set to multiple of 300 kHz less than the nominal channel spacing defined in section 5.4.1A of 3GPP TS 36.521. For non-contiguous intra-band CA, the downlink channel spacing between the component carriers was set to be larger than the nominal channel spacing and provided maximum separation between the component carriers.
- All selected PCC and SCC(s) remained fully within the uplink/downlink transmission band of the respective component carrier.



**Figure F-1**  
**DL CA Power Measurement Setup**

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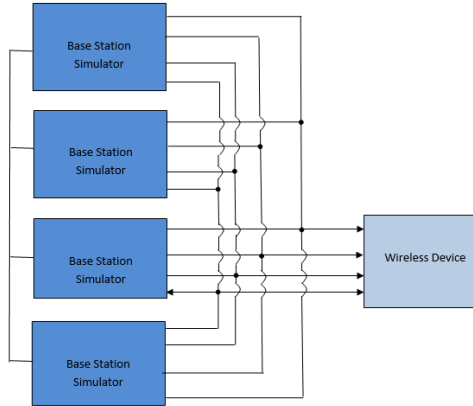


Figure F-2  
DL CA with DL 4x4 MIMO Power Measurement Setup

### F.3 Downlink Carrier Aggregation RF Conducted Powers

#### F.3.1 LTE Band 12 as PCC

Table F-3  
Maximum Output Powers

Combination	PCC									SCC 1			SCC 2			Power			
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA 2A-12A (1)	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B2	20	900	1960	-	-	-	-	24.52	24.36
CA 4A-12A (1)	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B4	20	2175	2132.5	-	-	-	-	24.45	24.36
CA 4A-12A (2)	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B4	20	2175	2132.5	-	-	-	-	24.45	24.36
CA 12A-66A (1)	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B66	20	66786	2145	-	-	-	-	24.55	24.36
CA 12A-66A (2)	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B66	20	66786	2145	-	-	-	-	24.55	24.36
CA 4A-4A-12A	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	24.52	24.36
CA 12A-66A-66A	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B66	20	66786	2145	LTE B66	20	67236	2190	24.47	24.36

#### F.3.2 LTE Band 26 as PCC

Table F-4  
Maximum Output Powers

Combination	PCC									SCC 1			SCC 2			Power			
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA 26A-41A	LTE B26	15	26985	831.5	QPSK	1	0	8865	876.5	LTE B41	20	40620	2593	-	-	-	-	23.39	23.18
CA 26A-41C	LTE B26	15	26985	831.5	QPSK	1	0	8865	876.5	LTE B41	20	40620	2593	LTE B41	20	40422	2573.2	23.30	23.18

#### F.3.3 LTE Band 66 as PCC

Table F-5  
Maximum Output Powers

Combination	PCC									SCC 1			SCC 2			Power			
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA 2A-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B2	20	900	1960	-	-	-	-	23.49	23.47
CA 12A-66A (1)	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B12	10	5095	737.5	-	-	-	-	23.66	23.47
CA 12A-66A (2)	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B12	10	5095	737.5	-	-	-	-	23.66	23.47
CA 66B	LTE B66	5	131997	1712.5	QPSK	1	12	66461	2112.5	LTE B66	15	66554	2121.8	-	-	-	-	23.20	23.22
CA 66C	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	66734	2139.8	-	-	-	-	23.48	23.47
CA 5A-66A-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	67236	2190	LTE B6	10	2525	881.5	23.40	23.47
CA 12A-66A-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	67236	2190	LTE B12	10	5095	737.5	23.44	23.47

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### F.3.4

### LTE Band 2 as PCC

Table F-6  
Maximum Output Powers

Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC				SCC 1				SCC 2				Power	
						PCC UL RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA 2A-2A	LTE B2	10	18650	1855	QPSK	1	25	650	1935	LTE B2	20	1100	1980	-	-	-	-	23.11	23.06
CA 2C	LTE B2	10	18650	1855	QPSK	1	25	650	1935	LTE B2	20	794	1949.4	-	-	-	-	23.08	23.06
CA 2A-4A	LTE B2	1.4	18607	1850.7	QPSK	1	2	607	1930.7	LTE B4	20	2175	2132.5	-	-	-	-	23.21	23.19
CA 2A-12A (1)	LTE B2	10	18650	1855	QPSK	1	25	650	1935	LTE B12	10	5095	737.5	-	-	-	-	23.12	23.06
CA 2A-17A	LTE B2	10	18650	1855	QPSK	1	25	650	1935	LTE B17	10	5790	740	-	-	-	-	23.14	23.06
CA 2A-66A	LTE B2	1.4	18607	1850.7	QPSK	1	2	607	1930.7	LTE B66	20	66786	2145	-	-	-	-	23.18	23.19
CA 2A-4A-5A	LTE B2	10	18650	1855	QPSK	1	25	650	1935	LTE B4	20	2175	2132.5	LTE B5	10	2525	881.5	23.01	23.06

### F.3.5

### LTE Band 41 as PCC

Table F-7  
Maximum Output Powers

Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC				SCC 1				SCC 2				SCC 3				Power				
						PCC UL RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)			
CA 41A-41A (1)	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	LTE B41	20	41490	2690	-	-	-	-	-	-	-	-	-	23.48	23.49		
CA 41A-41C	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	LTE B41	20	41292	2660.2	LTE B41	20	41490	2690	-	-	-	-	-	-	23.35	23.49	
CA 41C-41A	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	LTE B41	20	40737	2604.7	LTE B41	20	41490	2690	-	-	-	-	-	-	23.41	23.49	
CA 41A-41D	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	LTE B41	20	41094	2640.4	LTE B41	20	41292	2660.2	LTE B41	20	41490	2690	-	-	-	23.48	23.49
CA 41D-41A	LTE B41	10	41055	2636.5	QPSK	1	25	41055	2636.5	LTE B41	20	40911	2622.1	LTE B41	20	40713	2602.3	LTE B41	20	39750	2506	-	-	23.37	23.40	
CA 41C-41G	LTE B41	10	41055	2636.5	QPSK	1	25	41055	2636.5	LTE B41	20	40911	2622.1	LTE B41	20	39945	2625.8	LTE B41	20	39750	2506	-	-	23.31	23.40	
CA 41E	LTE B41	20	40620	2593	QPSK	1	50	40620	2593	LTE B41	20	40422	2573.2	LTE B41	20	40818	2612.8	LTE B41	20	41016	2632.6	-	-	23.32	23.28	

## F.4 DL CA with DL 4x4 MIMO RF Conduction Powers

This device supports downlink 4x4 MIMO operations for some LTE bands. Uplink transmission is limited to a single output stream. When carrier aggregation was applicable, the general test selection and setup procedures described in Section F.2 were applied.



Per May 2017 TCB Workshop Notes, SAR for 4x4 DL MIMO was not needed since the maximum average output power in 4x4 DL MIMO mode was not more than 0.25 dB higher than the maximum output power with 4x4 DL MIMO inactive. Additionally, SAR for 4x4 MIMO Downlink Carrier Aggregation was not needed since the maximum average output power in 4x4 MIMO Downlink Carrier Aggregation mode was not more than 0.25 dB higher than the maximum output power with 4x4 MIMO Downlink and downlink carrier aggregation inactive.

### F.4.1

### LTE 4x4 MIMO DL Standalone Powers

Table F-8  
Maximum Output Powers

LTE Band	Bandwidth [MHz]	Channel	Frequency [MHz]	Modulation	RB Size	RB Offset	4x4 DL MIMO Tx. Power [dBm]	Single Antenna Tx. Power [dBm]
66	20	132072	1720	QPSK	1	50	23.58	23.47
41	5	40620	2593	QPSK	1	12	23.50	23.49

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## F.4.2 LTE Band 12 as PCC

Table F-9  
Maximum Output Powers

Combination	PCC										SCC 1				SCC 2				Power			
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_12A-[66A]-66A	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	2x2	24.50	24.36
CA_12A-[66A]-[66A]	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	24.56	24.36

## F.4.3 LTE Band 26 as PCC

Table F-10  
Maximum Output Powers

Combination	PCC										SCC 1				SCC 2				Power			
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_26A-[41A]	LTE B26	15	26865	831.5	QPSK	1	0	8865	876.5	2x2	LTE B41	20	40620	2593	4x4	-	-	-	-	-	23.31	23.18
CA_26A-[41C]	LTE B26	15	26865	831.5	QPSK	1	0	8865	876.5	2x2	LTE B41	20	40620	2593	4x4	LTE B41	20	40422	2573.2	4x4	23.33	23.18

## F.4.4 LTE Band 66 as PCC



Table F-11  
Maximum Output Powers

Combination	PCC										SCC 1				SCC 2				Power			
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-[66A]	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	4x4	LTE B2	20	900	1960	2x2	-	-	-	-	-	23.67	23.47
CA_5A-[66A]-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	4x4	LTE B66	20	67236	2190	2x2	LTE B5	10	2525	881.5	2x2	23.36	23.47
CA_5A-[66A]-[66A]	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	2x2	LTE B66	20	67236	2190	4x4	LTE B5	10	2525	881.5	2x2	23.30	23.47
CA_5A-[66A]-[66A]	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	4x4	LTE B66	20	67236	2190	4x4	LTE B5	10	2525	881.5	2x2	23.47	23.47
CA_12A-[66A]-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	4x4	LTE B66	20	67236	2190	2x2	LTE B12	10	5095	737.5	2x2	23.33	23.47
CA_12A-[66A]-[66A]	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	2x2	LTE B66	20	67236	2190	4x4	LTE B12	10	5095	737.5	2x2	23.37	23.47
CA_12A-[66A]-[66A]	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	4x4	LTE B66	20	67236	2190	4x4	LTE B12	10	5095	737.5	2x2	23.37	23.47

## F.4.5 LTE Band 2 as PCC

Table F-12  
Maximum Output Powers

Combination	PCC										SCC 1				Power		
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-[66A]	LTE B2	1.4	18607	1850.7	QPSK	1	2	607	1930.7	2x2	LTE B66	20	66786	2145	4x4	23.30	23.19



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F.4.6

LTE Band 41 as PCC

Table F-13  
Maximum Output Powers

Combination	PCC										SCC 1				SCC 2				SCC 3				Power						
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)		
CA [41A]-41A (1)	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	4x4	LTE B41	20	41490	2680	2x2	-	-	-	-	-	-	-	-	-	-	-	23.46	23.49	
CA 41A-41A (1)	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	2x2	LTE B41	20	41490	2680	4x4	-	-	-	-	-	-	-	-	-	-	-	23.51	23.49	
CA [41A]-41A (1)	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	-	-	-	-	-	-	23.44	23.49	
CA [41A]-41C	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	4x4	LTE B41	20	41292	2660.2	2x2	LTE B41	20	41490	2680	2x2	-	-	-	-	-	-	-	23.49	23.49
CA 41C-41A	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	2x2	LTE B41	20	40737	2604.7	2x2	LTE B41	20	41490	2680	4x4	-	-	-	-	-	-	-	23.48	23.49
CA 41A-41C	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	2x2	LTE B41	20	41292	2660.2	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	-	-	23.51	23.49
CA [41C]-41A	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	4x4	LTE B41	20	40737	2604.7	4x4	LTE B41	20	41490	2680	2x2	-	-	-	-	-	-	-	23.53	23.49
CA [41A]-41C	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	4x4	LTE B41	20	41292	2660.2	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	-	-	23.52	23.49
CA [41C]-41A	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	4x4	LTE B41	20	40737	2604.7	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	-	-	23.54	23.49
CA [41A]-41D	LTE B41	5	40620	2593	QPSK	1	12	40620	2593	4x4	LTE B41	20	41094	2640.4	2x2	LTE B41	20	41292	2660.2	2x2	LTE B41	20	41490	2680	2x2	-	-	23.36	23.49
CA 41D-41A	LTE B41	10	41055	2636.5	QPSK	1	25	41055	2636.5	2x2	LTE B41	20	40911	2622.1	2x2	LTE B41	20	40913	2603.3	2x2	LTE B41	20	39750	2506	4x4	-	-	23.45	23.40
CA [41C]-41C	LTE B41	10	41055	2636.5	QPSK	1	25	41055	2636.5	4x4	LTE B41	20	40911	2622.1	4x4	LTE B41	20	39848	2525.8	2x2	LTE B41	20	39750	2506	2x2	-	-	23.29	23.40
CA 41C-41C	LTE B41	10	41055	2636.5	QPSK	1	25	41055	2636.5	2x2	LTE B41	20	40911	2622.1	2x2	LTE B41	20	39948	2525.8	4x4	LTE B41	20	39750	2506	4x4	-	-	23.50	23.40

FCC ID: A3LSMA528B	 PCTEST Proud to be part of element	SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 07/04/2021 – 07/25/2021	DUT Type: Portable Handset			APPENDIX F: Page 6 of 6