

# APPENDIX I: LTE DOWNLINK ONLY CARRIER AGGREGATION TEST REDUCTION METHODOLOGY

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number of component carriers (CCs) supported by the product implementation. Per April 2018 TCBC Workshop Notes, the following test reduction methodology was applied to determine the combinations required for conducted power measurements.

## LTE DLCA Test Reduction Methodology:

- The supported combinations were arranged by the number of component carriers in columns.
- Any limitations on the PCC or SCC for each combination were identified alongside the combination (e.g. CA\_2A-2A-4A-12A, but B12 can only be configured as a SCC).
- Power measurements were performed for "supersets" (LTE CA combinations with multiple components carriers) and any "subsets" (LTE CA combinations with fewer component carriers) that were not completely covered by the supersets.
- Only subsets that have the exact same components as a superset were excluded for measurement.
- When there were certain restrictions on component carriers that existed in the superset that were not applied for the subset, the subset configuration was additionally evaluated.
- Both inter-band and intra-band downlink carrier aggregation scenarios were considered.
- Downlink CA combinations for SISO and 4x4 Downlink MIMO operations were measured independently, per May 2017 TCBC Workshop notes.

Table I-1 – Example of Exclusion Table for SISO Configurations

Index	BCC	Supported Channel Bandwidth (MHz)				Restriction	Completely Covered by Measurement Superset	Index	BCC	Supported Channel Bandwidth (MHz)				Restriction	Completely Covered by Measurement Superset	Index	BCC	Supported Channel Bandwidth (MHz)				Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4					CC1	CC2	CC3	CC4					CC1	CC2	CC3	CC4		
CC001	CA_2A	5, 10, 15, 20	5, 10, 15, 20			Yes	CC001	CA_2A-2A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		Yes	CC001	CA_2A-2A-4A-6A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		Yes		

Table I-2 – Example of Exclusion Table for 4x4 Downlink MIMO Configurations

Index	BCC	Supported Channel Bandwidth (MHz)				Restriction	Completely Covered by Measurement Superset	Index	BCC	Supported Channel Bandwidth (MHz)				Restriction	Completely Covered by Measurement Superset	Index	BCC	Supported Channel Bandwidth (MHz)				Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4					CC1	CC2	CC3	CC4					CC1	CC2	CC3	CC4		
CC001	CA_12C	5, 10, 15, 20	5, 10, 15, 20			Yes	CC001	CA_12A-2A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		Yes	CC001	CA_12A-2A-4A-6A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		Yes		

Note: [CC] indicates component carrier with 4x4 DL MIMO antenna configuration

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## I.1 LTE Downlink Only Carrier Aggregation Test Selection and Setup

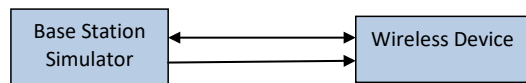
SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number component carriers (CCs) supported by the product implementation. For those configurations required by April 2018 TCBC Workshop Notes, conducted power measurements with LTE Carrier Aggregation (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.

This device supports LAA with downlink carrier aggregation only. It uses carrier aggregation in the downlink to combine LTE in the unlicensed spectrum (i.e. LTE Band 46) with LTE in the licensed band (served as PCC). All uplink communications and acknowledgements on the PCC remain identical to specifications when downlink carrier aggregation is inactive.

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.

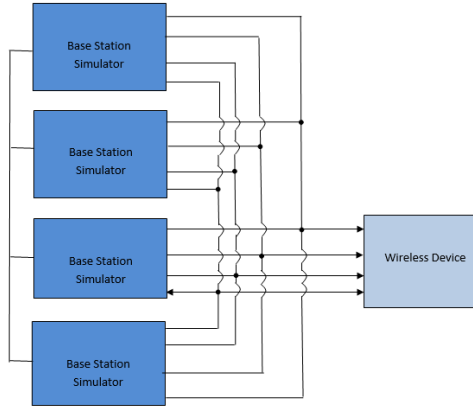
General PCC and SCC configuration selection procedure

- 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 the RF Conducted Powers Section and LTE/NR Lower Bandwidth RF Conducted Power Appendix. 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 I-1**  
**DL CA Power Measurement Setup**

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

## I.2 Downlink Carrier Aggregation RF Conducted Powers

### I.2.1 LTE Band 71 as PCC

**Table I-3**  
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) 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 4A-4A-71A	LTE B71	5	13347	695.5	QPSK	1	12	68911	649.5	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	-	-	-	-	24.33	24.50	
CA 4B-4B-71A	LTE B71	5	13347	695.5	QPSK	1	12	68911	649.5	LTE B4B	20	55990	3625	LTE B4B	20	56640	3630	-	-	-	-	24.50	24.50	
CA 4B-71A	LTE B71	5	13347	695.5	QPSK	1	12	68911	649.5	LTE B4B	20	55990	3625	LTE B4B	20	56168	3644.8	-	-	-	-	24.53	24.50	
CA 2A-2A-4A-71A	LTE B71	5	13347	695.5	QPSK	1	12	68911	649.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B4	20	2175	2132.5	24.30	24.50	
CA 2A-66A-71A	LTE B71	5	13347	695.5	QPSK	1	12	68911	649.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B6B	20	66786	2145	24.31	24.50	
CA 2A-66A-66A-71A	LTE B71	5	13347	695.5	QPSK	1	12	68911	649.5	LTE B2	20	900	1960	LTE B6B	20	66786	2145	LTE B6B	20	67236	2190	24.30	24.50	
CA 2A-66C-71A	LTE B71	5	13347	695.5	QPSK	1	12	68911	649.5	LTE B2	20	900	1960	LTE B6B	20	66786	2145	LTE B6B	20	66984	2164.8	24.32	24.50	

### I.2.2 LTE Band 12 as PCC

**Table I-4**  
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) 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 3A-12A (1)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	24.48	24.53				
CA 4A-12A (1)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	24.54	24.53				
CA 4A-12A (2)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	24.54	24.53				
CA 12A-12A	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B6B	20	66990	3635	-	-	-	-	-	-	-	-	24.50	24.53				
CA 12A-4B (1)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B6B	20	66786	2145	-	-	-	-	-	-	-	-	24.52	24.53				
CA 12A-66A (1)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B6B	20	66786	2145	-	-	-	-	-	-	-	-	24.52	24.53				
CA 12A-4B (2)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B4B	20	55990	3635	LTE B4B	20	56188	3644.8	-	-	-	-	24.52	24.53				
CA 2A-2A-4A-12A	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B4	20	2175	2132.5	24.33	24.53				
CA 2A-4A-4A-12A	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	24.53	24.53				
CA 2A-4A-12B	LTE B12	5	23095	707.5	QPSK	1	12	6095	737.5	LTE B12	5	5047	732.7	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	24.57	24.50				
CA 2A-12A-66C	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B6B	20	66786	2145	LTE B6B	20	66984	2164.8	-	-	-	-	24.48	24.53				
CA 4A-4A-12B	LTE B12	5	23095	707.5	QPSK	1	12	6095	737.5	LTE B12	5	5047	732.7	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	24.48	24.50				
CA 12A-4B (3)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B6B	20	66990	3635	LTE B4B	20	56188	3644.8	-	-	-	-	24.48	24.50				
CA 2A-2A-12A-30A-66A	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B3D	10	9820	2355	LTE B6B	20	66786	2145	24.42	24.53
CA 2A-2A-12A-66A-66A	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B6B	20	66786	2145	LTE B6B	20	67236	2190	24.43	24.53
CA 2A-2A-12B-66A	LTE B12	5	23095	707.5	QPSK	1	12	6095	737.5	LTE B12	5	5047	732.7	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B6B	20	66786	2145	24.51	24.50
CA 2A-12A-30A-66A-66A	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B2	20	900	1960	LTE B3D	10	9820	2355	LTE B6B	20	66786	2145	LTE B6B	20	67236	2190	24.50	24.53
CA 2A-12B-66A-66A	LTE B12	5	23095	707.5	QPSK	1	12	6095	737.5	LTE B12	5	5047	732.7	LTE B2	20	900	1960	LTE B6B	20	66786	2145	LTE B6B	20	67236	2190	24.37	24.50





## I.2.2 LTE Band 41 as PCC

**Table I-12**  
**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 41A-41A (1)	LTE B41	10		41055	QPSK	1	25	41055	2636.5	LTE B41	20	39750	2506	-	-	-	-	24.29	24.33
CA 41A-41C	LTE B41	10		41055	QPSK	1	25	41055	2636.5	LTE B41	20	39948	2525.8	LTE B41	20	39750	2506	24.33	24.33
CA 41C-41A	LTE B41	10		41055	QPSK	1	25	41055	2636.5	LTE B41	20	40911	2622.1	LTE B41	20	39750	2506	24.33	24.33
CA 41D	LTE B41	10		41055	QPSK	1	25	41055	2636.5	LTE B41	20	40911	2622.1	LTE B41	20	40713	2602.3	24.32	24.33

## I.2.3 LTE Band 48 as PCC

**Table I-13**  
**Maximum Output Powers**

Combination	PCC								SCC 1				SCC 2				SCC 3				SCC 4				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]	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 48A-48A	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9530	3560	-	-	-	-	-	-	-	-	-	-	-	-	-	20.15	20.15	
CA 48A-48C	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9530	3560	LTE B48	20	9538	3579.8	-	-	-	-	-	-	-	-	-	-	20.21	20.39
CA 48C-48A	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9542	3670.2	LTE B48	20	9530	3560	-	-	-	-	-	-	-	-	-	-	20.22	20.39
CA 48A-48D	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9530	3560	LTE B48	20	9538	3579.8	LTE B48	20	9538	3579.8	-	-	-	-	-	-	20.25	20.39
CA 48C-48D	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9542	3670.2	LTE B48	20	9534	3582.4	LTE B48	20	9530	3560	-	-	-	-	-	-	20.19	20.39
CA 48C-48C	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9542	3670.2	LTE B48	20	9530	3560	LTE B48	20	9538	3579.8	-	-	-	-	-	-	20.11	20.39
CA 48A-48E	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9530	3560	LTE B48	20	9538	3579.8	LTE B48	20	9536	3599.6	LTE B48	20	9534	3589.4	20.35	20.39		
CA 48E-48A	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9542	3670.2	LTE B48	20	9534	3582.4	LTE B48	20	9536	3599.6	LTE B48	20	9530	3560	20.16	20.39		
CA 48C-48D	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9542	3670.2	LTE B48	20	9538	3579.8	LTE B48	20	9536	3599.6	LTE B48	20	9536	3599.6	20.18	20.39		
CA 48D-48C	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9542	3670.2	LTE B48	20	9534	3582.4	LTE B48	20	9530	3560	LTE B48	20	9538	3579.8	20.13	20.39		
CA 48F	LTE B48	20		9560	16QAM	1	50	9560	3690	LTE B48	20	9542	3670.2	LTE B48	20	9534	3582.4	LTE B48	20	9536	3599.6	LTE B48	20	9548	3620.8	20.15	20.39		

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### I.3 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 I.1 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.

#### I.3.1 LTE 4x4 MIMO DL Standalone Powers

Table I-14  
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	5	132322	1745	QPSK	1	12	24.04	23.97
25	5	26065	1852.5	QPSK	1	12	24.26	24.14
30	10	27710	2310	QPSK	1	25	21.96	21.98
41	10	41055	2636.5	QPSK	1	25	24.35	24.33
48	20	56640	3690	16QAM	1	50	20.35	20.39

#### I.3.2 LTE Band 71 as PCC

Table I-15  
Maximum Output Powers

Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC			DL Ant. Config.	SCC 1			SCC 2			SCC 3			LTE Tx Power with DL CA Enabled (dBm)	Power LTE Single Carrier Tx Power (dBm)											
						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.			
CA [4A]-[4A]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B4	20	2175	2132.5	4x4	LTE B4	10	2350	2150	2x2	-	-	-	-	-	-	-	-	-	24.62	24.50
CA [4A]-[4A]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B4	20	2175	2132.5	4x4	LTE B4	10	2350	2150	4x4	-	-	-	-	-	-	-	-	-	24.64	24.50
CA [4B]-[4B]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B4B	20	5590	3625	4x4	LTE B4B	20	5660	3690	2x2	-	-	-	-	-	-	-	-	-	24.54	24.50
CA [4BA]-[4BA]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B4B	20	5590	3625	4x4	LTE B4B	20	5530	3560	4x4	-	-	-	-	-	-	-	-	-	24.53	24.50
CA [4BC]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B4B	20	5590	3625	4x4	LTE B4B	20	5618	3648	4x4	-	-	-	-	-	-	-	-	-	24.38	24.50
CA [2A]-2A-[4A]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	2x2	LTE B2	20	700	1940	2x2	LTE B4	20	2175	2132.5	4x4	-	-	-	-	24.48	24.50
CA [2A]-2A-[4A]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	2x2	LTE B4	20	2175	2132.5	2x2	-	-	-	-	24.51	24.50
CA [2A]-2A-[4A]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	2x2	LTE B4	20	2175	2132.5	4x4	-	-	-	-	24.57	24.50
CA [2A]-2A-[4A]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B4	20	2175	2132.5	2x2	-	-	-	-	24.60	24.50
CA [2A]-2A-[4A]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B4	20	2175	2132.5	4x4	-	-	-	-	24.62	24.50
CA [2A]-2A-[6BA]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	2x2	LTE B2	20	700	1940	2x2	LTE B6B	20	66786	2145	4x4	-	-	-	-	24.58	24.50
CA [2A]-2A-[6BA]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	2x2	LTE B6B	20	66786	2145	2x2	-	-	-	-	24.60	24.50
CA [2A]-2A-[6BA]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	2x2	LTE B6B	20	66786	2145	4x4	-	-	-	-	24.62	24.50
CA [2A]-2A-[6BA]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B6B	20	66786	2145	2x2	-	-	-	-	24.60	24.50
CA [2A]-2A-[6BA]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B6B	20	66786	2145	4x4	-	-	-	-	24.60	24.50
CA [2A]-2A-[6BA]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	2x2	LTE B6B	20	66786	2145	4x4	LTE B6B	20	67236	2190	2x2	-	-	-	-	24.65	24.50
CA [2A]-2A-[6BA]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	2x2	LTE B6B	20	66786	2145	4x4	LTE B6B	20	67236	2190	4x4	-	-	-	-	24.63	24.50
CA [2A]-2A-[6BA]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B6B	20	66786	2145	2x2	LTE B6B	20	67236	2190	2x2	-	-	-	-	24.50	24.50
CA [2A]-2A-[6BA]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B6B	20	66786	2145	4x4	LTE B6B	20	67236	2190	4x4	-	-	-	-	24.63	24.50
CA [2A]-[6BC]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	2x2	LTE B6B	20	66786	2145	2x2	LTE B6B	20	66984	2164.8	4x4	-	-	-	-	24.47	24.50
CA [2A]-[6BC]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B6B	20	66786	2145	2x2	LTE B6B	20	66984	2164.8	2x2	-	-	-	-	24.53	24.50
CA [2A]-[6BC]-71A	LTE B71	5	133447	695.5	QPSK	1	12	68911	649.5	2x2	LTE B2	20	900	1960	4x4	LTE B6B	20	66786	2145	4x4	LTE B6B	20	66984	2164.8	4x4	-	-	-	-	24.57	24.50

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I.3.3 LTE Band 12 as PCC

Table I-16 Maximum Output Powers

Table with columns for Combination, PCC, SCC1-3, and Power. It lists various antenna configurations and their corresponding maximum output powers in dBm.

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### I.3.4 LTE Band 13 as PCC

**Table I-17**  
**Maximum Output Powers**

Combination	PCC Band	PCC BW [MHz]	PCC UCI [Ch.]	PCC Freq. [MHz]	Mod.	PCC				SCC 1				SCC 2				SCC 3				SCC 4				Power												
						PCC UL RB	PCC UL RB Offset	PCC [DU] Ch.	PCC [DU] Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC [DU] Ch.	SCC [DU] Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC [DU] Ch.	SCC [DU] Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC [DU] Ch.	SCC [DU] Freq. [MHz]	DL Ant. Config.		SCC Band	SCC BW [MHz]	SCC [DU] Ch.	SCC [DU] Freq. [MHz]	DL Ant. Config.	LTE Tx Power with DC CA [dBm]	LTE Single Carrier Tx Power [dBm]					
CA 2A(14A)13A	LTE-B13	5	2330	793	QPSK	1	25	5330	751	2x2	LTE-B13	20	900	1960	2x2	LTE-B13	20	2175	2125.5	4x4													24.4	24.4				
CA 2A(14A)13A	LTE-B13	5	2330	793	QPSK	1	25	5330	751	2x2	LTE-B13	20	900	1960	4x4	LTE-B13	20	2175	2125.5	2x2														24.4	24.4			
CA 2A(14A)13A	LTE-B13	5	2330	793	QPSK	1	25	5330	751	2x2	LTE-B13	20	900	1960	4x4	LTE-B13	20	2175	2125.5	4x4	LTE-B13	20	2175	2125.5	4x4	LTE-B13	20	2175	2125.5	4x4						24.4	24.4	
CA 2A(14A)13A	LTE-B13	5	2330	793	QPSK	1	25	5330	751	2x2	LTE-B13	20	900	1960	4x4	LTE-B13	20	2175	2125.5	4x4	LTE-B13	20	2175	2125.5	4x4	LTE-B13	20	2175	2125.5	4x4							24.4	24.4
CA 2A(14A)13A	LTE-B13	5	2330	793	QPSK	1	25	5330	751	2x2	LTE-B13	20	900	1960	2x2	LTE-B13	20	2175	2125.5	2x2																24.4	24.4	

### I.3.5 LTE Band 14 as PCC

**Table I-18**  
**Maximum Output Powers**

Combination	PCC Band	PCC BW [MHz]	PCC UCI [Ch.]	PCC Freq. [MHz]	Mod.	PCC				SCC 1				SCC 2				SCC 3				SCC 4				Power														
						PCC UL RB	PCC UL RB Offset	PCC [DU] Ch.	PCC [DU] Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC [DU] Ch.	SCC [DU] Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC [DU] Ch.	SCC [DU] Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC [DU] Ch.	SCC [DU] Freq. [MHz]	DL Ant. Config.		SCC Band	SCC BW [MHz]	SCC [DU] Ch.	SCC [DU] Freq. [MHz]	DL Ant. Config.	LTE Tx Power with DC CA [dBm]	LTE Single Carrier Tx Power [dBm]							
CA 2A(2A)14A	LTE-B14	5	2330	793	QPSK	1	12	5330	763	2x2	LTE-B14	20	900	1960	2x2	LTE-B14	20	700	1940	2x2	LTE-B14	20	8620	2355	2x2	LTE-B14	20	8620	2355	2x2	LTE-B14	20	8620	2355	2x2	24.4	24.4			
CA 2A(2A)14A	LTE-B14	5	2330	793	QPSK	1	12	5330	763	2x2	LTE-B14	20	900	1960	2x2	LTE-B14	20	700	1940	2x2	LTE-B14	20	8620	2355	2x2	LTE-B14	20	8620	2355	2x2	LTE-B14	20	8620	2355	2x2			24.4	24.4	
CA 2A(2A)14A	LTE-B14	5	2330	793	QPSK	1	12	5330	763	2x2	LTE-B14	20	900	1960	4x4	LTE-B14	20	700	1940	2x2	LTE-B14	20	8620	2355	2x2	LTE-B14	20	8620	2355	2x2	LTE-B14	20	8620	2355	2x2				24.4	24.4
CA 2A(2A)14A	LTE-B14	5	2330	793	QPSK	1	12	5330	763	2x2	LTE-B14	20	900	1960	4x4	LTE-B14	20	700	1940	2x2	LTE-B14	20	8620	2355	2x2	LTE-B14	20	8620	2355	2x2	LTE-B14	20	8620	2355	2x2				24.4	24.4
CA 2A(2A)14A	LTE-B14	5	2330	793	QPSK	1	12	5330	763	2x2	LTE-B14	20	900	1960	2x2	LTE-B14	20	700	1940	2x2	LTE-B14	20	8620	2355	2x2	LTE-B14	20	8620	2355	2x2	LTE-B14	20	8620	2355	2x2				24.4	24.4

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Combination	PCC										SCC 1										SCC 2										SCC 3										SCC 4										LTE Tx Power with CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
	PCC Band	PCC BW [MHz]	PCC (UL) Freq. [MHz]	PCC (DL) Freq. [MHz]	Mod.	PCC UL RB Offset	PCC DL RB Offset	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]	DL Ant. Config.																			
CA_25A+42C+25A+66A	LTE B25	5	18265	1845	QPSK	1	12	18265	1845	4x4	LTE B25	20	18265	1845	4x4	LTE B25	20	18265	1845	4x4	LTE B25	20	18265	1845	4x4	LTE B25	20	18265	1845	4x4	LTE B25	20	18265	1845	4x4	24.73	24.14															

### I.3.8 LTE Band 25 as PCC

Table I-21  
Maximum Output Powers

Combination	PCC Band	PCC BW [MHz]	PCC (UL) Freq. [MHz]	PCC (DL) Freq. [MHz]	Mod.	PCC UL RB Offset	PCC DL RB Offset	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 1		SCC 2		SCC 3		SCC 4		LTE Tx Power with CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)		
										SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]	DL Ant. Config.			SCC Band	SCC BW [MHz]
CA_25A+25A	LTE B25	5	18265	1845	QPSK	1	12	18265	1845	4x4	LTE B25	10	2525	1815	2x2	-	-	-	-	24.24	24.14

### I.3.9 LTE Band 30 as PCC

Table I-22  
Maximum Output Powers

Combination	PCC Band	PCC BW [MHz]	PCC (UL) Freq. [MHz]	PCC (DL) Freq. [MHz]	Mod.	PCC UL RB Offset	PCC DL RB Offset	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 1		SCC 2		SCC 3		SCC 4		LTE Tx Power with CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)			
										SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]	DL Ant. Config.			SCC Band	SCC BW [MHz]	SCC (DL) Freq. [MHz]
CA_25A+30A	LTE B25	5	18265	1845	QPSK	1	12	18265	1845	4x4	LTE B30	20	18265	1845	4x4	LTE B30	20	18265	1845	4x4	24.73	24.14



## I.4 Additional Downlink Carrier Aggregation with Uplink Carrier Aggregation Enabled

This device supports uplink carrier aggregation (ULCA) with additional Carrier Aggregation configurations active in the downlink. Power measurements were performed with ULCA active and additional CA configurations active in the downlink for the configuration per Fall 2017 TCB Workshop Notes.

Per FCC Guidance, additional SAR measurements for these configurations were not required since their maximum output power was not more than 0.25 dB higher than the maximum output power for with only CA\_66B, CA\_66C, CA\_41C, or CA\_48C ULCA active.

### I.4.1 Additional DL Carrier Aggregation RF Conducted Powers with Uplink Carrier Aggregation Enabled

**Table I-25**  
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 (UL) Ch.	SCC (UL) Freq. [MHz]	Mod.	SCC UL# RB	SCC UL RB Offset	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]	ULCA Tx Power with add'l CA config. active (dBm)	ULCA Tx Power (dBm)				
CA 41C-41A	LTE B41	20	39750	2506	QPSK	1	99	39750	2506	LTE B41	20	39948	2525.8	QPSK	1	0	39948	2525.8	LTE B41	20	41490	2690	LTE B41	20	40146	2545.6	23.82	23.87				
CA 41D	LTE B41	20	39750	2506	QPSK	1	99	39750	2506	LTE B41	20	39948	2525.8	QPSK	1	0	39948	2525.8	LTE B41	20	41490	2690	LTE B41	20	40146	2545.6	23.82	23.87				

### I.4.2 Additional 4x4 MIMO DL Carrier Aggregation RF Conducted Powers with Uplink Carrier Aggregation Enabled

Note: 4x4 DL MIMO is only operating in the downlink. Uplink transmission is limited to a single output stream for each component carrier of ULCA.

**Table I-26**  
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]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (UL) Ch.	SCC (UL) Freq. [MHz]	Mod.	SCC UL# RB	SCC UL RB Offset	SCC (DL) Channel	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	DL Ant. Config.	ULCA Tx Power with add'l CA config. active (dBm)	ULCA Tx Power (dBm)
CA [66B]	LTE B66	10	132322	1745	QPSK	1	0	66786	2145	4x4	LTE B66	10	132223	1735.1	QPSK	1	49	66687	2135.1	4x4	LTE B66	10	132124	1725.2	QPSK	1	99	66588	2125.2	4x4	23.70	23.76
CA [66C]	LTE B66	20	132322	1745	QPSK	1	0	66786	2145	4x4	LTE B66	20	132124	1725.2	QPSK	1	99	66588	2125.2	4x4	LTE B66	20	132124	1725.2	QPSK	1	99	66588	2125.2	4x4	23.70	23.76

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