

1. DL Inter Band(2CC)

1. DL Inter Band(2CC)

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-2A-12A	(0)	Band 2	2A-2A BCS 0						50
		Band 12			Yes	Yes			
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			
2A-5A-66A	(0)	Band 2			Yes	Yes	Yes	Yes	50
		Band 5			Yes	Yes			
		Band 66			Yes	Yes	Yes	Yes	
2A-66A-66A	(0)	Band 2			Yes	Yes	Yes	Yes	60
		Band 66	66A-66A BCS 0						
4A-4A-5A	(0)	Band 4	4A-4A BCS 0						50
		Band 5			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	66A-66A BCS 0						
5A-66C	(0)	Band 5			Yes	Yes			50
		Band 66	66C 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						

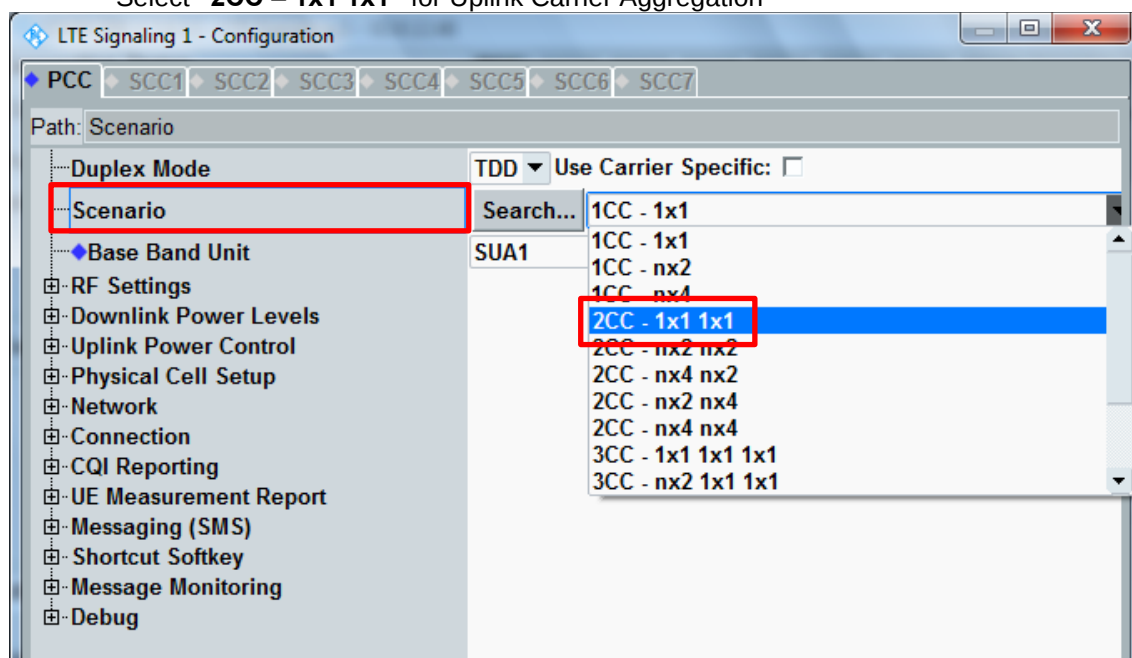
LTE Downlink Carrier Aggregation configurations (Continued)

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
41A-41C	(0)	Band 41	5, 10, 15, 20	41C BCS 1			60
			41C BCS 1		5, 10, 15, 20		
41A-41D	(0)	Band 41	5, 10, 15, 20	41D BCS 1			80
			41D BCS 0		5, 10, 15, 20		
41C-41C	(0)	Band 41	41C BCS 0		41C BCS 0		80

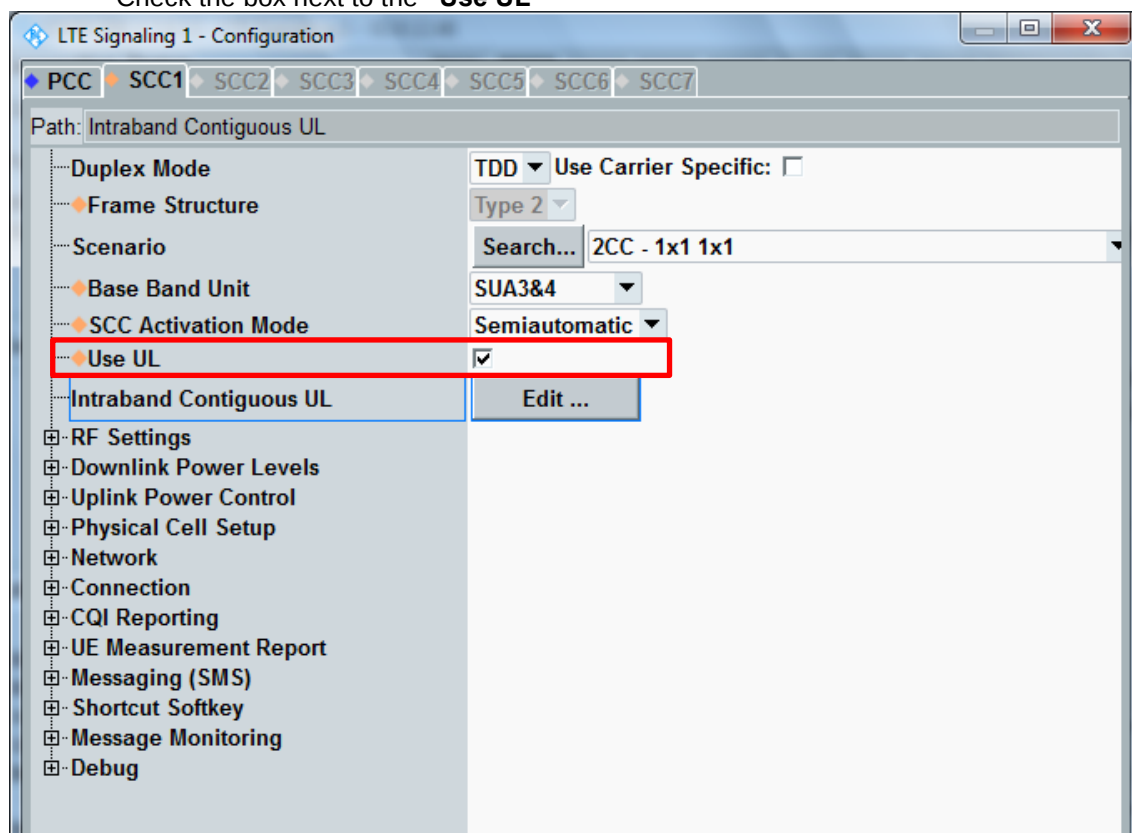
4. DL Intra Band(contiguous)							
E-UTRA CA configuration	Bandwidth Combination Set	E-UTRA Band	Allowed Channel BW Per Carrier (MHz)				Max Aggregated BW
			1st Carrier	2nd Carrier	3rd Carrier	4th Carrier	
2C	(0)	Band 2	5	20			40
			10	15,20			
			15	10,15,20			
			20	5,10,15,20			
41C	(0)	Band 41	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		
Band 66			10	5, 10			
Band 66			15	5			
66C	(0)	Band 66	5	20			40
		Band 66	10	15,20			
		Band 66	15	10,15,20			
		Band 66	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 Carrier Aggregation – Output Power measurement procedures

- Change the Scenario in the Configuration of LTE Signaling
Select **“2CC – 1x1 1x1”** for Uplink Carrier Aggregation



- Check the box next to the **“Use UL”**



- Back to the LTE Signal screen, and then select the PCC tab,
Set operating band, BW, channel and RB configurations for PCC

The screenshot shows the 'PCC' tab selected in the 'LTE Signaling 1' window. The 'Connection Status' section on the left shows 'Cell' as 'ON', 'Packet Switched' as 'ON', 'RRC State' as 'Idle', and 'SCC1 State' as 'OFF'. The 'Event Log' shows a sequence of events from 06:13:39 to 06:13:20. The 'UE Info' section shows fields for IMEI, IMSI, Voice Domain Pr..., UE's Usage Setti..., Default Bearer, and Dedicated Bearer. The main configuration area shows the following settings:

Parameter	Value
Operating Band	Band 41
Channel	40620 Ch
Frequency	2593.0 MHz
Cell Bandwidth	20.0 MHz
RS EPRE	-85.0 dBm/15kHz
Full Cell BW Pow.	-54.2 dBm
PUSCH Open Loop Nom.Power	23 dBm
PUSCH Closed Loop Target Power	24.0 dBm
Sched.	User def. Channels
# RB	100
Start RB	0
Mod / TBSI	QPSK 5
Code Rate / TBS	0.328 8760 0.583 144
Throughput	3.478 Mbit/s 0.057 Mbit/s

The 'LTE Signaling' status is 'ON'.

- Select the SCC1 tab,
Set operating band, BW, channel, and RB configurations for SCC1

The screenshot shows the 'SCC1' tab selected in the 'LTE Signaling 1' window. The 'Connection Status' section on the left shows 'Cell' as 'ON', 'Packet Switched' as 'ON', 'RRC State' as 'Idle', and 'SCC1 State' as 'OFF'. The 'Event Log' shows a sequence of events from 06:13:39 to 06:13:20. The 'UE Info' section shows fields for IMEI, IMSI, Voice Domain Pr..., UE's Usage S..., Default Bearer, and Dedicated Be... The main configuration area shows the following settings:

Parameter	Value
Operating Band	Band 41
Channel	40818 Ch
Frequency	2612.8 MHz
Cell Bandwidth	20.0 MHz
RS EPRE	-85.0 dBm/15kHz
Full Cell BW Pow.	-54.2 dBm
PUSCH Open Loop Nom.Power	23 dBm
PUSCH Closed Loop Target Power	24.0 dBm
Sched.	User def. Channels
# RB	100
Start RB	0
Mod / TBSI	QPSK 5
Code Rate / TBS	0.328 8760 0.583 144
Throughput	3.478 Mbit/s 0.057 Mbit/s

The 'LTE Signaling' status is 'ON'.

- Click the **“Connect”** button at the bottom of the screen, if necessary, turn the Airplane mode on/off in the DUT

CMW 500 V 3.8.12 - LTE Signaling 1 - X3.8.12.48

Connection Status

Cell:  Connection Established

RRC State: Connected

SCC1 State: MAC Activated

Event Log

06:16:44 State 'Connection Established'

06:16:44 EPS Dedicated Bearer Establish

06:16:43 SCC1: MAC Activated

06:16:41 SCC1: RRC Added

06:16:41 SCC1: On

06:16:30 SCC1: Off

UE Info

IMEI: 355346630026654

IMSI: 001010123456063

Voice Domain ... IMS PS Voice preferred CS

UE's Usage S... Data centric

Default Bearer IPv4 address IPv6 prefix

5 (cmw50... 192.168.48.129

Dedicated Be... TFT Port Range DL / UL

6 (->5, Def... 5005 - 5008 / 5005 - 5008

Operating Band Band 41 TDD

Downlink

Channel: 40818 Ch

Frequency: 2612.8 MHz

Cell Bandwidth: 20.0 MHz

RS EPRE: -85.0 dBm/15kHz

Full Cell BW Pow.: -54.2 dBm

PUSCH Open Loop Norm.Power: 23 dBm

PUSCH Closed Loop Target Power: 24.0 dBm

PCC <-> SCC1 Swap

PCC -> SCC1 Copy

Sched. User def. Channels Multicluseter UL

64/256-QAM

Downlink

RB: 100

Start RB: 0

Mod / TBSI: QPSK 5

Code Rate / TBS: 0.328 8760 0.583 144

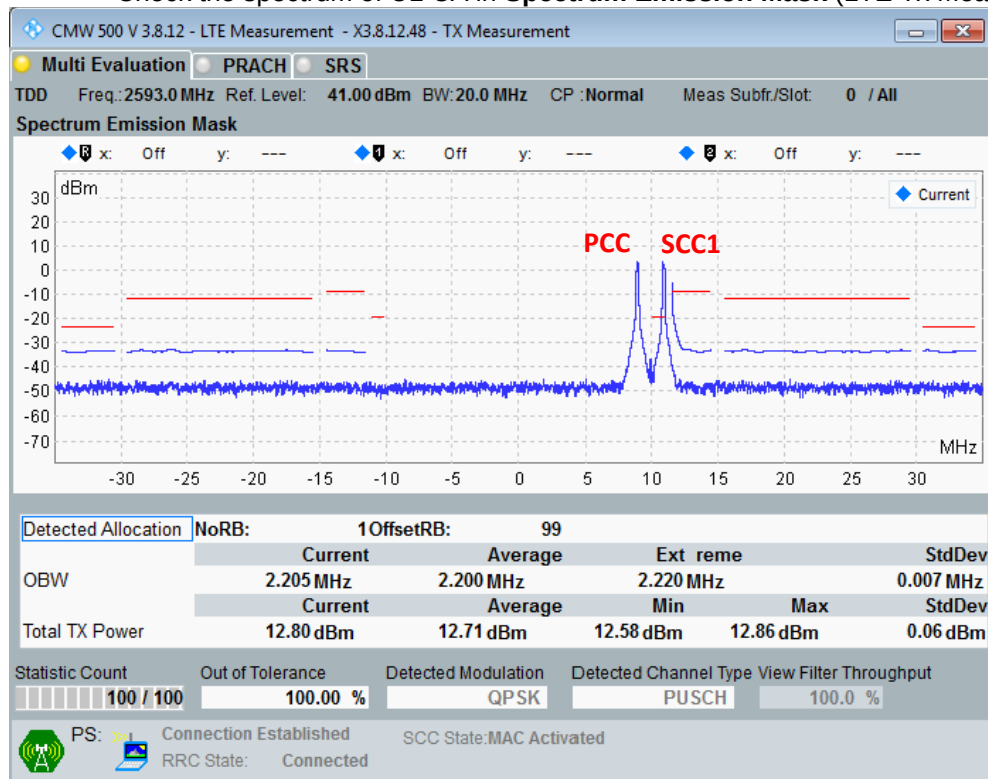
Throughput: 3.478 Mbit/s 0.057 Mbit/s

LTE Signaling ON

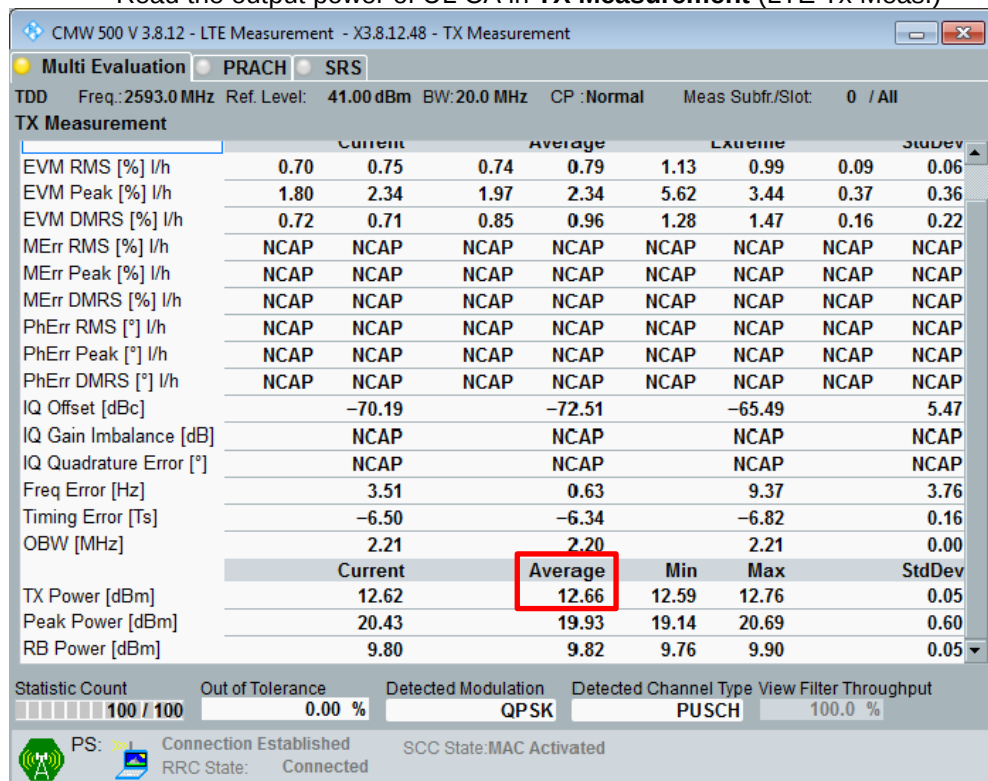
Detach **Disconnect** SCC1 Off

Send SMS **Inter/Intra-RAT ...** **Config ...**

- Check the spectrum of UL CA in **Spectrum Emission Mask** (LTE Tx Meas.)

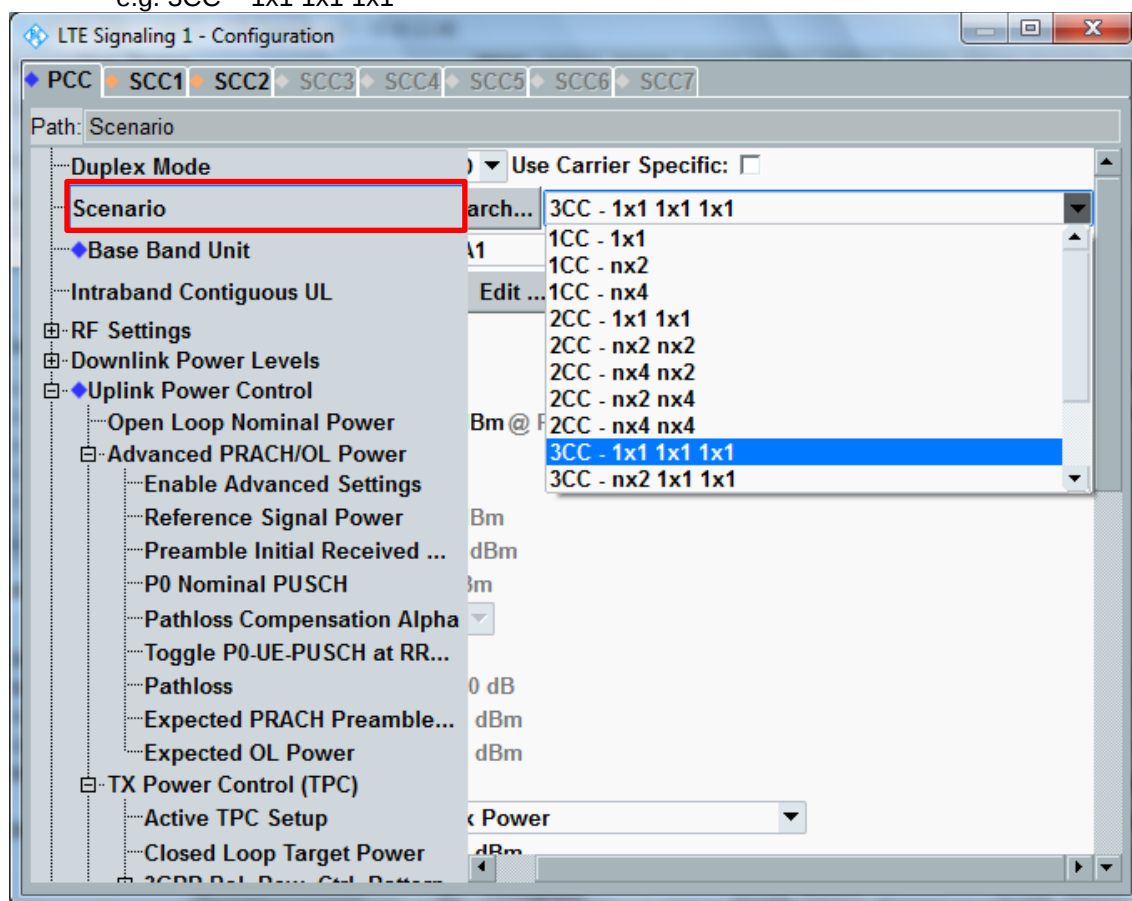


- Read the output power of UL CA in **TX Measurement** (LTE Tx Meas.)

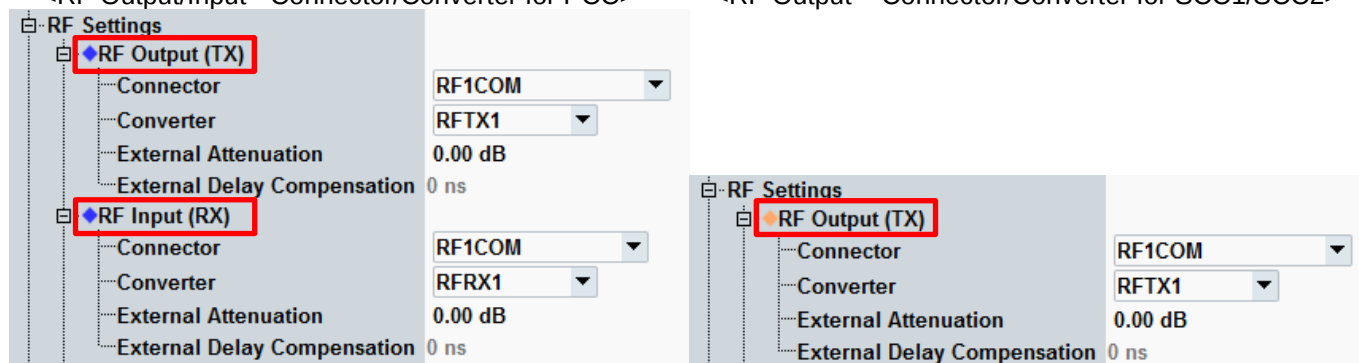


LTE Downlink Carrier Aggregation - Output Power measurement procedures

- Change the Scenario in the Configuration of LTE Signaling
e.g. 3CC – 1x1 1x1 1x1



- Set the RF Output/Input Connector and Converter for PCC/SCC1/SCC2 in each tab.
<RF Output/Input - Connector/Converter for PCC> <RF Output – Connector/Converter for SCC1/SCC2>



- Back to the LTE Signal screen, and then select the PCC tab,
Set operating band, BW, channel and RB configurations for PCC

CMW 500 V 3.8.12 - LTE Signaling 1 - X3.8.12.48

Connection Status

Cell:  Connection Established

RRC State: Connected
 SCC1 State: OFF
 SCC2 State: OFF

Event Log

06:36:17 SCC2: Off
 06:36:17 SCC2: On
 06:36:17 SCC2: RRC Added
 06:36:16 SCC1: Off
 06:36:16 SCC1: On
 06:36:16 SCC1: RRC Added
 06:36:12 SCC2: MAC Activated

UE Info

IMEI: 355346630026654
 IMSI: 001010123456063
 Voice Domain Pr...: IMS PS Voice preferred CS Voi
 UE's Usage Setti...: Data centric
 Default Bearer: IPv4 address IPv6 prefix
 ...5 (cmw500.r...: 192.168.48.129
 Dedicated Bearer: TFT Port Range DL / UL
 ...6 (->5, Default): 5005 - 5008 / 5005 - 5008

Operating Band: Band 66 FDD

Channel: 67036 Ch 132572 Ch

Frequency: 2170.0 MHz 1770.0 MHz

Cell Bandwidth: 20.0 MHz 20.0 MHz

RS EPRE: -85.0 dBm/15kHz

Full Cell BW Pow.: -54.2 dBm

PUSCH Open Loop Nom.Power: 23 dBm

PUSCH Closed Loop Target Power: 24.0 dBm

Sched.: User def. Channels

Downlink Multicenter: ☐ Uplink Multicenter: ☐

RB: 100 1

Start RB: 0 0

Mod / TBSI: QPSK 5 QPSK 10

Code Rate / TBS: 0.330 8760 0.583 144

Throughput: 8.734 Mbit/s 0.144 Mbit/s

64/256-QAM: ☐ **Multicenter**: ☐

LTE Signaling: ON

Buttons: Detach Disconnect SCC1 activate MAC Multiple SCC Actions Send SMS Inter/Intra-RAT ... Config ...

- Select the SCC1/SCC2 tab, set operating band, BW, channel and RB configurations for SCC1/SCC2

CMW 500 V 3.8.12 - LTE Signaling 1 - X3.8.12.48

Connection Status

Cell:  Connection Established

RRC State: Connected
SCC1 State: OFF
SCC2 State: OFF

Event Log

06:36:17 SCC2: Off
06:36:17 SCC2: On
06:36:17 SCC2: RRC Added
06:36:16 SCC1: Off
06:36:16 SCC1: On
06:36:16 SCC1: RRC Added
06:36:12 SCC2: MAC Activated

UE Info

IMEI: 355346630026654
IMSI: 001010123456063
Voice Domain ...: IMS PS Voice preferred CS
UE's Usage S...: Data centric
Default Bearer: IPv4 address IPv6 prefix
5 (cmw50...): 192.168.48.129
Dedicated Be...: TFT Port Range DL / UL
6 (->5, Def...): 5005 - 5008 / 5005 - 5008

Operating Band: Co-location active with PCC: FDD

Channel: 66536 Ch
Frequency: 2120.0 MHz
Cell Bandwidth: 20.0 MHz
RS EPRE: -85.0 dBm/15kHz
Full Cell BW Pow.: -54.2 dBm

PCC <-> SCC1 Swap

PCC -> SCC1 Copy

Sched.: User def. Channels

Downlink: Multicliaster ☐
RB: 100
Start RB: 0
Mod / TBSI: QPSK 5
Code Rate / TBS: 0.330 8760
Throughput: 8.734 Mbit/s

Buttons: Detach, Disconnect, SCC1 activate MAC, Multiple SCC Actions, Send SMS, Inter/Intra-RAT ..., Config ...

CMW 500 V 3.8.12 - LTE Signaling 1 - X3.8.12.48

Connection Status

Cell:  Connection Established

RRC State: Connected
SCC1 State: OFF
SCC2 State: OFF

Event Log

06:36:17 SCC2: Off
06:36:17 SCC2: On
06:36:17 SCC2: RRC Added
06:36:16 SCC1: Off
06:36:16 SCC1: On
06:36:16 SCC1: RRC Added
06:36:12 SCC2: MAC Activated

UE Info

IMEI: 355346630026654
IMSI: 001010123456063
Voice Domain ...: IMS PS Voice preferred CS
UE's Usage S...: Data centric
Default Bearer: IPv4 address IPv6 prefix
5 (cmw50...): 192.168.48.129
Dedicated Be...: TFT Port Range DL / UL
6 (->5, Def...): 5005 - 5008 / 5005 - 5008

Operating Band: Band 71 FDD

Channel: 68761 Ch
Frequency: 634.5 MHz
Cell Bandwidth: 20.0 MHz
RS EPRE: -85.0 dBm/15kHz
Full Cell BW Pow.: -54.2 dBm

PCC <-> SCC2 Swap

PCC -> SCC2 Copy

Sched.: User def. Channels

Downlink: Multicliaster ☐
RB: 100
Start RB: 0
Mod / TBSI: QPSK 5
Code Rate / TBS: 0.330 8760
Throughput: 8.734 Mbit/s

Buttons: Detach, Disconnect, SCC2 activate MAC, Multiple SCC Actions, Send SMS, Inter/Intra-RAT ..., Config ...

- Connect and Activate MAC for all SCCs

The screenshot shows the CMW 500 V 3.8.12 - LTE Signaling 1 - X3.8.12.48 interface. The 'Connection Status' tab is active, showing the PCC and SCC1, SCC2, SCC3, SCC4, SCC5, SCC6, and SCC7 tabs. The 'Operating Band' is set to Band 71, and the 'Downlink' and 'Uplink' are both set to FDD. The 'Channel' is 68761 Ch, 'Frequency' is 634.5 MHz, 'Cell Bandwidth' is 20.0 MHz, 'RS EPRE' is -85.0 dBm/15kHz, and 'Full Cell BW Pow.' is -54.2 dBm. The 'Event Log' shows the following events:

- 06:36:17 SCC2: Off
- 06:36:17 SCC2: On
- 06:36:17 SCC2: RRC Added
- 06:36:16 SCC1: Off
- 06:36:16 SCC1: On
- 06:36:16 SCC1: RRC Added
- 06:36:12 SCC2: MAC Activated

The 'UE Info' tab shows the following information:

- IMEI: 355346630026654
- IMSI: 001010123456063
- Voice Domain: IMS PS Voice prefer
- UE's Usage S...: Data centric
- Default Bearer: IPv4 address IPv6
- 5 (cmw50...): 192.168.48.129
- Dedicated Be...: TFT Port Range DL
- 6 (->5, Def...): 5005 - 5008 / 500

The 'Multiple SCC Actions' dialog box is open, showing the following actions:

- activate MAC (highlighted in red)
- activate MAC (highlighted in red)
- SynSet A ---
- SCC1 SCC2
- SynSet B ---
- SCC1 SCC2

The 'Multiple SCC Actions' button is highlighted in red. The 'LTE' tab is active, showing the 'LTE 1 TX Meas.' and 'LTE 1 RX Meas.' tabs. The 'Go to...' button is highlighted in red. The 'Routing' tab is active, showing the 'LTE Signaling' tab. The 'Config ...' button is highlighted in red.

- Read the output power of DL CA in TX Measurement (LTE Tx Meas.)

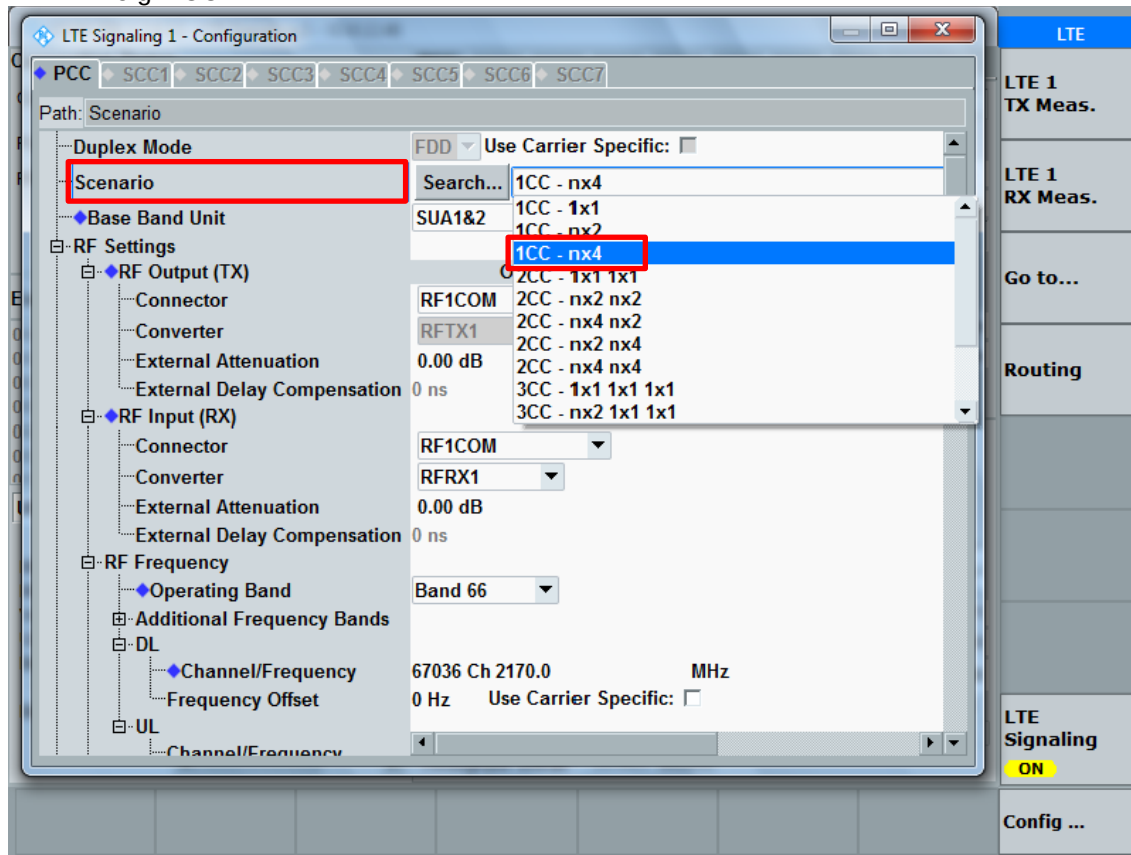
The screenshot shows the CMW 500 V 3.8.12 - LTE Measurement - X3.8.12.48 - TX Measurement interface. The 'Multi Evaluation' tab is active, showing the 'PRACH' and 'SRS' tabs. The 'FDD' frequency is 1770.0 MHz, 'Ref. Level' is 41.00 dBm, 'BW' is 20.0 MHz, 'CP' is Normal, and 'Meas Subfr/Slot' is 0 / All. The 'TX Measurement' table shows the following results:

	Current	Average	Extreme	StdDev
EVM RMS [%] I/h	0.64	0.71	0.68	0.71
EVM Peak [%] I/h	1.51	2.64	1.96	2.23
EVM DMRS [%] I/h	0.61	0.65	0.61	0.60
MErr RMS [%] I/h	NCAP	NCAP	NCAP	NCAP
MErr Peak [%] I/h	NCAP	NCAP	NCAP	NCAP
MErr DMRS [%] I/h	NCAP	NCAP	NCAP	NCAP
PhErr RMS [°] I/h	NCAP	NCAP	NCAP	NCAP
PhErr Peak [°] I/h	NCAP	NCAP	NCAP	NCAP
PhErr DMRS [°] I/h	NCAP	NCAP	NCAP	NCAP
IQ Offset [dBc]	-52.22	-52.32	-49.92	0.85
IQ Gain Imbalance [dB]	NCAP	NCAP	NCAP	NCAP
IQ Quadrature Error [°]	NCAP	NCAP	NCAP	NCAP
Freq Error [Hz]	0.51	0.09	-5.38	1.33
Timing Error [Ts]	-6.30	-5.63	-8.52	2.54
OBW [MHz]	0.27	0.27	0.32	0.02
	Current	Average	Min	Max
TX Power [dBm]	13.51	13.48	13.30	13.59
Peak Power [dBm]	18.40	18.60	17.80	19.50
RB Power [dBm]	13.48	13.46	13.37	13.50

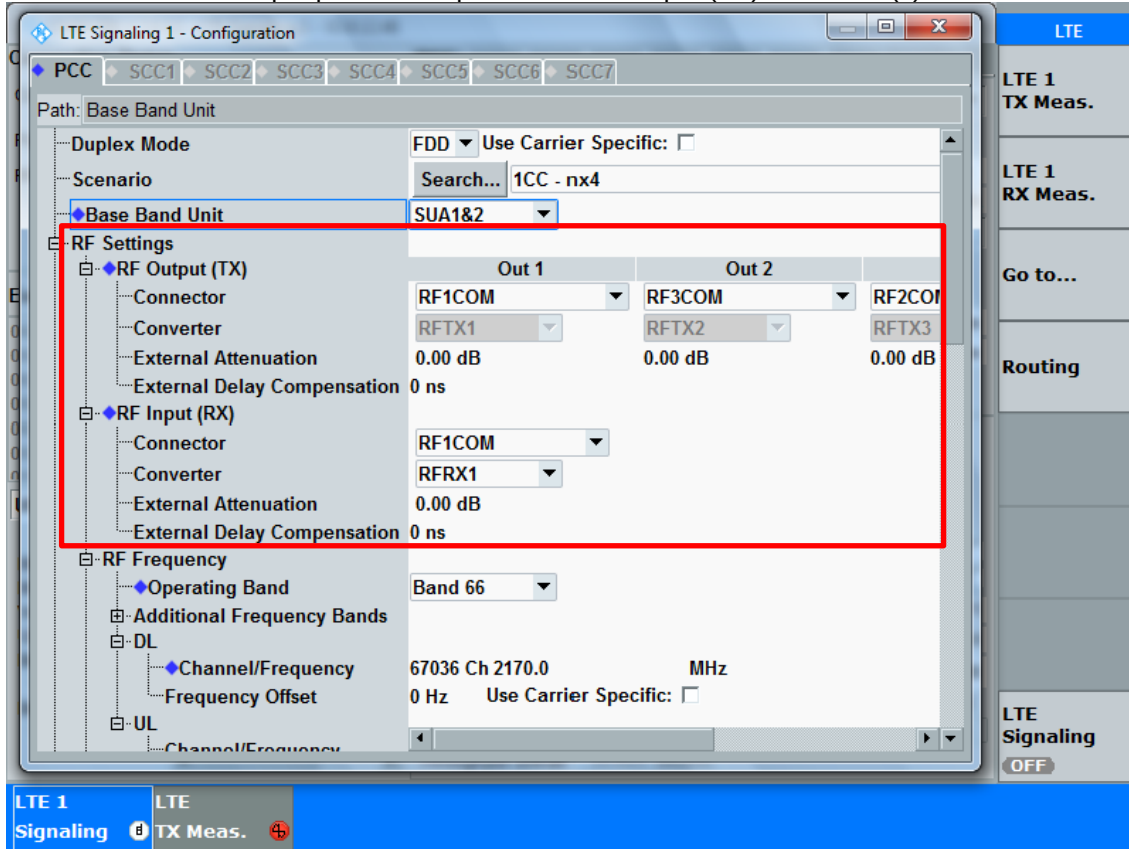
The 'Average' value for TX Power is highlighted in red. The 'Statistic Count' is 100 / 100, 'Out of Tolerance' is 0.00 %, 'Detected Modulation' is QPSK, 'Detected Channel Type' is PUSCH, and 'View Filter Throughput' is 100.0 %. The 'LTE' tab is active, showing the 'Multi Evaluation' tab. The 'Display' button is highlighted in red. The 'Signaling Parameter' tab is active, showing the 'LTE Signaling' tab. The 'Config ...' button is highlighted in red.

LTE Downlink 4x4 MIMO - Output Power measurement procedures

- Change the Scenario in the Configuration of LTE Signaling
e.g. 1CC – nx4

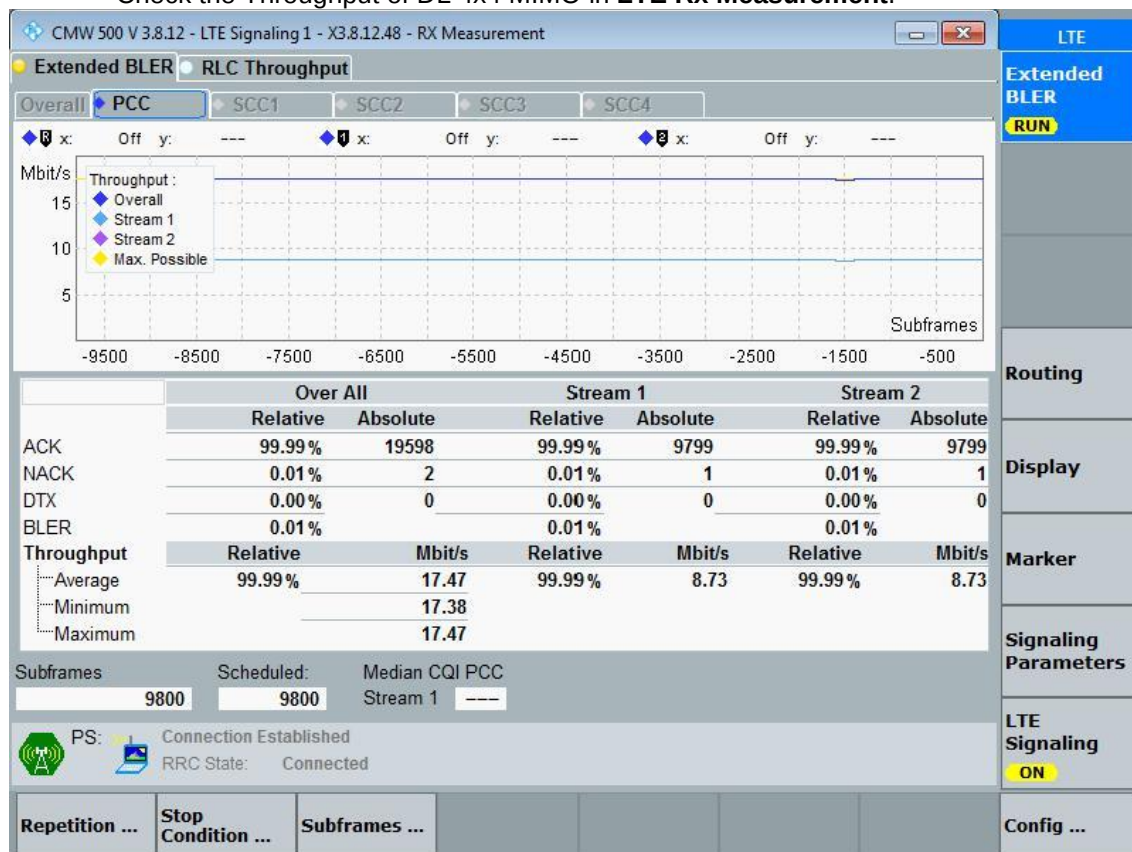


- Set the RF Output/Input Connector and Converter for PCC.
DL MIMO output ports correspond with RF Output (TX) Connector(s).

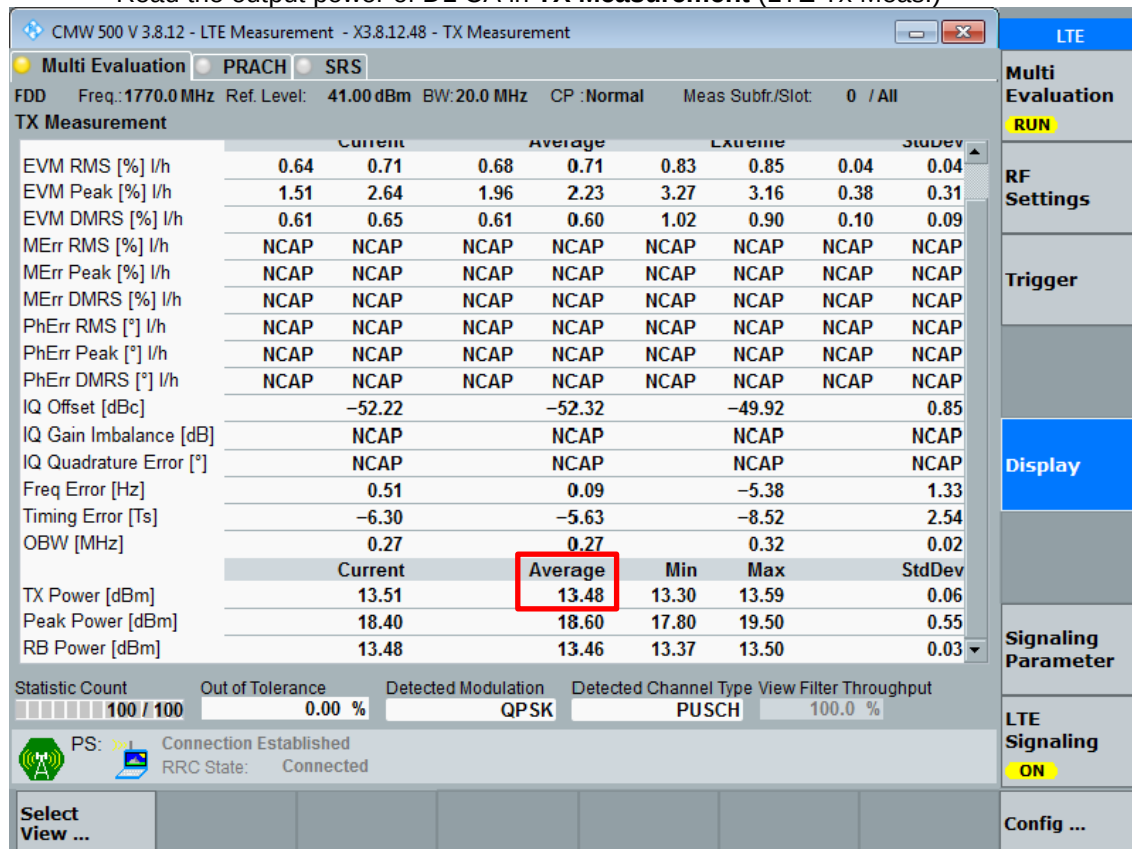


- Back to the LTE Signal screen, set operating band, BW, channel and RB configurations for PCC

- Check the Throughput of DL 4x4 MIMO in **LTE Rx Measurement**.



- Read the output power of DL CA in **TX Measurement** (LTE Tx Meas.)



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		3CC#1
2CC#2	2C		
2CC#3	2A-4A		3CC#2
2CC#4	2A-5A		3CC#2
2CC#5	2A-12A		3CC#1
2CC#6	2A-13A		3CC#3
2CC#7	2A-17A		
2CC#8	2A-26A		
2CC#9	2A-66A		3CC#4
2CC#10	4A-4A		3CC#6
2CC#11	4A-5A		3CC#6
2CC#12	4A-12A		3CC#7
2CC#13	4A-13A		3CC#3
2CC#14	4A-17A	17A SCC only	
2CC#15	5A-41A	41A SCC only	
2CC#16	5A-66A		3CC#4
2CC#17	12A-25A		
2CC#18	12A-66A		3CC#10
2CC#19	26A-41A	41A SCC only	
2CC#20	41A-41A		
2CC#21	41C		3CC#12
2CC#22	66A-66A		3CC#5
2CC#23	66B		
2CC#24	66C		3CC#9

Index	3CC	Restriction	Completely Covered by Measurement Superset
3CC#1	2A-2A-12A		
3CC#2	2A-4A-5A		
3CC#3	2A-4A-13A		
3CC#4	2A-5A-66A		
3CC#5	2A-66A-66A		
3CC#6	4A-4A-5A		
3CC#7	4A-4A-12A		
3CC#8	5A-66A-66A		
3CC#9	5A-66C		
3CC#10	12A-66A-66A		
3CC#11	26A-41C	41C SCC only	
3CC#12	41A-41C		
3CC#13	41D		4CC#1

Index	4CC	Restriction	Completely Covered by Measurement Superset
4CC#1	41A-41D		
4CC#2	41C-41C		
4CC#3	41E		

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

Note:

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

LTE Uplink Carrier Aggregation Combinations**Maximum Output Power (Tune-up Limit) for LTE UL Carrier Aggregation**

E-UTRA CA configurations	Pwr back-off	Antenna	Bands		UL															
			PCC	SCC	PCC								SCC							
			1st	2nd	Mode	BW	Ch.	Freq. (MHz)	RB	offset	Tune-up Limit (dBm)	Rel.10 Tx. PWR (dBm)	Mode	BW	Ch.	Freq. (MHz)	RB	offset	Tune-up Limit (dBm)	Rel.10 Tx. PWR (dBm)
CA_2A-4A	Pmax	Main.1+Sub.2	2A	4A	QPSK	20	19100	1900	1	49	24	22.51	QPSK	20	20175	1732.5	1	49	24	23.41
		Main.1+Sub.2	4A	2A	QPSK	20	20175	1732.5	1	49	24	23.41	QPSK	20	19100	1900	1	49	24	22.51
CA_4A-5A	Pmax	Main.1	4A	5A	QPSK	20	20175	1732.5	1	49	24	23.41	QPSK	10	20525	836.5	1	0	25	23.44
		Main.1	5A	4A	QPSK	10	20525	836.5	1	0	25	23.44	QPSK	20	20175	1732.5	1	49	24	23.41
CA_4A-12A	Pmax	Main.1	4A	12A	QPSK	20	20175	1732.5	1	49	24	23.41	QPSK	10	23095	707.5	1	0	24	22.81
		Main.1	12A	4A	QPSK	10	23095	707.5	1	0	24	22.81	QPSK	20	20175	1732.5	1	49	24	23.41
CA_5A-66A	Pmax	Main.1	5A	66A	QPSK	10	20525	836.5	1	0	25	23.44	QPSK	20	132322	1745	1	49	24	23.12
		Main.1	66A	5A	QPSK	20	132322	1745	1	49	24	23.12	QPSK	10	20525	836.5	1	0	25	23.44
CA_12A-66A	Pmax	Main.1	12A	66A	QPSK	10	23095	707.5	1	0	24	22.81	QPSK	20	132322	1745	1	49	24	23.12
		Main.1	66A	12A	QPSK	20	132322	1745	1	49	24	23.12	QPSK	10	23095	707.5	1	0	24	22.81

Note:

1. For ULCA inter band, Each PCC and SCC has same target power in standalone mode.
2. All PCC and SCC result are within standalone target power.

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
4	QPSK	20	20175	1732.5	1/49	23.54	23.49	-0.05
41	QPSK	20	41490	2680	1/99	24.68	24.61	-0.07
66	QPSK	20	132322	1745	1/49	23.23	23.24	0.01

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	PCC						PCC			SCC1			SCC2			SCC3					
	1st	2nd	3rd	4th	Mode	BW (MHz)	Channel	Freq. (MHz)	RB Allocation	RB offset	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)				Channel	Freq. (MHz)
2C	2C	2C			QPSK	20	19100	1900	1	49	20	1100	1980	20	902	1960.2							22.66	22.84	0.18
2A-17A	2A	17A			QPSK	10	19150	1905	1	49	10	1150	1985	10	5790	740							22.73	22.52	-0.21
2A-17A	17A	2A			QPSK	10	23790	710	1	0	10	5790	740	10	900	1960							23.49	23.38	-0.11
2A-26A	2A	26A			QPSK	20	19100	1900	1	49	20	1100	1980	15	8865	876.5							22.66	22.80	0.14
2A-26A	26A	2A			QPSK	15	26865	831.5	1	0	15	8865	876.5	20	900	1960							23.77	23.69	-0.08
4A-17A	4A	17A			QPSK	10	20350	1750	1	25	10	2350	2150	10	5790	740							23.23	23.41	0.18
5A-41A	5A	41A			QPSK	10	20525	836.5	1	0	10	2525	881.5	20	41490	2680							23.54	23.67	0.13
12A-25A	12A	25A			QPSK	10	23095	707.5	1	0	10	5095	737.5	20	8590	1985							22.96	22.76	-0.20
12A-25A	25A	12A			QPSK	20	26590	1905	1	49	20	8590	1985	10	5095	737.5							23.12	23.03	-0.09
26A-41A	26A	41A			QPSK	15	26865	831.5	1	0	15	8865	876.5	20	41490	2680							23.77	23.88	0.11
41A-41A	41A	41A			QPSK	20	40620	2593	1	99	20	41490	2680	20	40620	2593							23.69	23.51	-0.18
66B	66B	66B			QPSK	15	132322	1745	1	49	15	66786	2145	5	66879	2154.3							23.23	23.20	-0.03
2A-2A-12A	2A	2A	12A		QPSK	20	19100	1900	1	49	20	1100	1980	20	902	1960.2	10	5095	737.5				22.66	22.84	0.18
2A-2A-12A	12A	2A	2A		QPSK	10	23095	707.5	1	0	10	5095	737.5	20	1100	1980	20	902	1960.2				22.96	23.05	0.09
2A-4A-5A	2A	4A	5A		QPSK	20	19100	1900	1	49	20	1100	1980	20	2175	2132.5	10	2525	881.5				22.66	22.80	0.14
2A-4A-5A	4A	2A	5A		QPSK	20	20175	1732.5	1	49	20	2175	2132.5	20	1100	1980	10	2525	881.5				23.54	23.72	0.18
2A-4A-5A	5A	2A	4A		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	1100	1980	20	2175	2132.5				23.54	23.52	-0.02
2A-4A-13A	2A	4A	13A		QPSK	20	19100	1900	1	49	20	1100	1980	20	2175	2132.5	10	5230	751				22.66	22.74	0.08
2A-4A-13A	4A	2A	13A		QPSK	20	20175	1732.5	1	49	20	2175	2132.5	20	1100	1980	10	5230	751				23.54	23.52	-0.02
2A-4A-13A	13A	2A	4A		QPSK	10	23230	782	1	0	10	5230	751	20	1100	1980	20	2175	2132.5				23.49	23.42	-0.07
2A-5A-66A	2A	5A	66A		QPSK	20	19100	1900	1	49	20	1100	1980	10	2525	881.5	20	66786	2145				22.66	22.71	0.05
2A-5A-66A	5A	2A	66A		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	1100	1980	20	66786	2145				23.54	23.69	0.15
2A-5A-66A	66A	2A	5A		QPSK	20	132322	1745	1	49	20	66786	2145	20	1100	1980	10	2525	881.5				23.23	23.09	-0.14
2A-66A-66A	2A	66A	66A		QPSK	20	19100	1900	1	49	20	1100	1980	20	66536	2120	20	67036	2170				22.66	22.75	0.09
2A-66A-66A	66A	66A	2A		QPSK	20	132072	1720	1	49	20	66536	2120	20	67036	2170	20	1100	1980				23.13	23.24	0.11
4A-4A-5A	4A	4A	5A		QPSK	20	20050	1720	1	49	20	2050	2120	20	2300	2145	10	2525	881.5				23.23	23.17	-0.06
4A-4A-5A	5A	4A	4A		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	2050	2120	20	2300	2145				23.54	23.67	0.13
4A-4A-12A	4A	4A	12A		QPSK	20	20050	1720	1	49	20	2050	2120	20	2300	2145	10	5095	737.5				23.23	23.14	-0.09
4A-4A-12A	12A	4A	4A		QPSK	10	23095	707.5	1	0	10	5095	737.5	20	2050	2120	20	2300	2145				22.96	22.85	-0.11
5A-66A-66A	5A	66A	66A		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	66536	2120	20	67036	2170				23.54	23.36	-0.18
5A-66A-66A	66A	66A	5A		QPSK	20	132072	1720	1	49	20	66536	2120	20	67036	2170	10	2525	881.5				23.13	23.05	-0.08
5A-66C	5A	66C	66C		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	66786	2145	20	66588	2125.2				23.54	23.36	-0.18
5A-66C	66C	66C	5A		QPSK	20	132322	1745	1	49	20	66786	2145	20	66588	2125.2	10	2525	881.5				23.23	23.41	0.18
12A-66A-66A	12A	66A	66A		QPSK	10	23095	707.5	1	0	10	5095	737.5	20	66536	2120	20	67036	2170				22.96	22.89	-0.07
12A-66A-66A	66A	66A	12A		QPSK	20	132072	1720	1	49	20	66536	2120	20	67036	2170	10	5095	737.5				23.13	22.94	-0.19
26A-41C	26A	41C	41C		QPSK	15	26865	831.5	1	0	15	8865	876.5	20	41490	2680	20	41292	2660.2				23.77	23.62	-0.15
41A-41C	41A	41C	41C		QPSK	20	41490	2680	1	99	20	41490	2680	20	40620	2593	20	40422	2573.2				24.68	24.78	0.10
41A-41C	41C	41C	41A		QPSK	20	41490	2680	1	99	20	41490	2680	20	41292	2660.2	20	40185	2549.5				24.68	24.79	0.11
41A-41D	41A	41D	41D		QPSK	20	41490	2680	1	99	20	41490	2680	20	39750	2506	20	39948	2525.8	20	40146	2545.6	24.68	24.59	-0.09
41A-41D	41D	41D	41D	41A	QPSK	20	41490	2680	1	99	20	41490	2680	20	41292	2660.2	20	41094	2640.4	20	40620	2593	24.68	24.48	-0.20
41C-41C	41C	41C	41C	41C	QPSK	20	41490	2680	1	99	20	41490	2680	20	41292	2660.2	20	40185	2549.5	20	40383	2569.3	24.68	24.70	0.02
41E	41E	41E	41E	41E	QPSK	20	41490	2680	1	99	20	41490	2680	20	41292	2660.2	20	41094	2640.4	20	40896	2620.6	24.68	24.57	-0.11

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 Allocation	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)		
[4A]-17A	[4A]	17A			QPSK	10	20350	1750	1	25	10	2350	2150	10	5790	740											23.23	23.33	0.10	
5A-[41A]	5A	[41A]			QPSK	10	20525	836.5	1	0	10	2525	881.5	20	41490	2680											23.54	23.67	0.13	
26A-[41A]	26A	[41A]			QPSK	15	26865	831.5	1	0	15	8865	876.5	20	41490	2680											23.77	23.90	0.13	
[41A]-41A	[41A]	41A			QPSK	20	40620	2593	1	99	20	41490	2680	20	40620	2593											23.69	23.54	-0.15	
[41A]-41A	41A	[41A]			QPSK	20	40620	2593	1	99	20	41490	2680	20	40620	2593											23.69	23.62	-0.07	
[41A]-[41A]	[41A]	[41A]			QPSK	20	40620	2593	1	99	20	41490	2680	20	40620	2593											23.69	23.73	0.04	
[66B]	[66B]	[66B]			QPSK	15	132322	1745	1	49	15	66786	2145	5	66879	2154.3											23.23	23.24	0.01	
2A-[4A]-5A	2A	[4A]	5A		QPSK	20	19100	1900	1	49	20	1100	1980	20	2175	2132.5	10	2525	881.5	20	1100	1980					22.66	22.71	0.05	
2A-[4A]-5A	[4A]	5A	2A		QPSK	20	20175	1732.5	1	49	20	2175	2132.5	10	2525	881.5	20	1100	1980	20	2175	2132.5					23.54	23.57	0.03	
2A-[4A]-5A	5A	2A	[4A]		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	1100	1980	20	2175	2132.5								23.54	23.37	-0.17	
2A-[4A]-13A	2A	[4A]	13A		QPSK	20	19100	1900	1	49	20	1100	1980	20	2175	2132.5	10	5230	751	20	1100	1980					22.66	22.54	-0.12	
2A-[4A]-13A	[4A]	13A	2A		QPSK	20	20175	1732.5	1	49	20	2175	2132.5	10	5230	751	20	1100	1980								23.54	23.69	0.15	
2A-[4A]-13A	13A	2A	[4A]		QPSK	10	23230	782	1	0	10	5230	751	20	1100	1980	20	2175	2132.5								23.49	23.66	0.17	
2A-5A-[66A]	2A	5A	[66A]		QPSK	20	19100	1900	1	49	20	1100	1980	10	2525	881.5	20	66786	2145								22.66	22.78	0.12	
2A-5A-[66A]	5A	[66A]	2A		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	66786	2145	20	1100	1980								23.54	23.38	-0.16	
2A-5A-[66A]	[66A]	2A	5A		QPSK	20	132322	1745	1	49	20	66786	2145	20	1100	1980	10	2525	881.5								23.23	23.30	0.07	
2A-[66A]-66A	2A	[66A]	66A		QPSK	20	19100	1900	1	49	20	1100	1980	20	66536	2120	20	67036	2170								22.66	22.50	-0.16	
2A-[66A]-66A	[66A]	66A	2A		QPSK	20	132072	1720	1	49	20	66536	2120	20	67036	2170	20	1100	1980								23.13	23.24	0.11	
2A-[66A]-66A	66A	2A	[66A]		QPSK	20	132072	1720	1	49	20	66536	2120	20	1100	1980	20	67036	2170								23.13	23.25	0.12	
2A-[66A]-[66A]	2A	[66A]	[66A]		QPSK	20	19100	1900	1	49	20	1100	1980	20	66536	2120	20	67036	2170								22.66	22.62	-0.04	
2A-[66A]-[66A]	[66A]	[66A]	2A		QPSK	20	132072	1720	1	49	20	66536	2120	20	67036	2170	20	1100	1980								23.13	23.18	0.05	
[4A]-4A-5A	[4A]	4A	5A		QPSK	20	20050	1720	1	49	20	2050	2120	20	2300	2145	10	2525	881.5								23.23	23.08	-0.15	
[4A]-4A-5A	4A	5A	[4A]		QPSK	20	20050	1720	1	49	20	2050	2120	10	2525	881.5	20	2300	2145								23.23	23.10	-0.13	
[4A]-4A-5A	5A	[4A]	4A		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	2050	2120	20	2300	2145								23.54	23.52	-0.02	
[4A]-[4A]-5A	[4A]	[4A]	5A		QPSK	20	20050	1720	1	49	20	2050	2120	20	2300	2145	10	2525	881.5								23.23	23.29	0.06	
[4A]-[4A]-5A	5A	[4A]	[4A]		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	2050	2120	20	2300	2145								23.54	23.65	0.11	
[4A]-4A-12A	[4A]	4A	12A		QPSK	20	20050	1720	1	49	20	2050	2120	20	2300	2145	10	5095	737.5								23.23	23.22	-0.01	
[4A]-4A-12A	4A	12A	[4A]		QPSK	20	20050	1720	1	49	20	2050	2120	10	5095	737.5	20	2300	2145								23.23	23.05	-0.18	
[4A]-4A-12A	12A	[4A]	4A		QPSK	10	23095	707.5	1	0	10	5095	737.5	20	2050	2120	20	2300	2145								22.96	23.12	0.16	
[4A]-[4A]-12A	[4A]	[4A]	12A		QPSK	20	20050	1720	1	49	20	2050	2120	20	2300	2145	10	5095	737.5								23.23	23.18	-0.05	
[4A]-[4A]-12A	12A	[4A]	[4A]		QPSK	10	23095	707.5	1	0	10	5095	737.5	20	2050	2120	20	2300	2145								22.96	23.10	0.14	
5A-[66A]-66A	5A	[66A]	66A		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	66536	2120	20	67036	2170								23.54	23.71	0.17	
5A-[66A]-66A	[66A]	66A	5A		QPSK	20	132072	1720	1	49	20	66536	2120	20	67036	2170	10	2525	881.5								23.13	23.01	-0.12	
5A-[66A]-66A	66A	5A	[66A]		QPSK	20	132072	1720	1	49	20	66536	2120	10	2525	881.5	20	67036	2170								23.13	23.25	0.12	
5A-[66A]-[66A]	5A	[66A]	[66A]		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	66536	2120	20	67036	2170								23.54	23.51	-0.03	
5A-[66A]-[66A]	[66A]	[66A]	5A		QPSK	20	132072	1720	1	49	20	66536	2120	20	67036	2170	10	2525	881.5								23.13	23.05	-0.08	
5A-[66C]	5A	[66C]	[66C]		QPSK	10	20525	836.5	1	0	10	2525	881.5	20	66786	2145	20	66588	2125.2								23.54	23.62	0.08	
5A-[66C]	[66C]	[66C]	5A		QPSK	20	132322	1745	1	49	20	66786	2145	20	66588	2125.2	10	2525	881.5								23.23	23.31	0.08	
12A-[66A]-66A	12A	[66A]	66A		QPSK	10	23095	707.5	1	0	10	5095	737.5	20	66536	2120	20	67036	2170								22.96	23.08	0.12	
12A-[66A]-66A	[66A]	66A	12A		QPSK	20	132072	1720	1	49	20	66536	2120	20	67036	2170	10	5095	737.5								23.13	23.18	0.05	
12A-[66A]-66A	66A	12A	[66A]		QPSK	20	132072	1720	1	49	20	66536	2120	10	5095	737.5	20	67036	2170								23.13	23.24	0.11	
12A-[66A]-[66A]	12A	[66A]	[66A]		QPSK	10	23095	707.5	1	0	10	5095	737.5	20	66536	2120	20	67036	2170								22.96	22.93	-0.03	
12A-[66A]-[66A]	[66A]	[66A]	12A		QPSK	20	132072	1720	1	49	20	66536	2120	20	67036	2170	10	5095	737.5								23.13	23.09	-0.04	
26A-[41C]	26A	[41C]	[41C]		QPSK	15	26865	831.5	1	0	15	8865	876.5	20	41490	2680	20	41292	2660.2								23.77	23.92	0.15	
[41A]-41C	[41A]	41C	41C		QPSK	20	41490	2680	1	99	20	41490	2680	20	40620	2593	20	40422	2573.2								24.68	24.52	-0.16	
[41A]-41C	41C	41C	[41A]		QPSK	20	41490	2680	1	99	20	41490	2680	20	41292	2660.2	20	40185	2549.5								24.68	24.63	-0.05	
41A-[41C]																														