

Appendix I. – Down-link CA Power Measurement / 5G NR Call Box Setup

1. LTE Down-link Carrier Aggregation Conducted Powers

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number component carriers (CCs) supported by test 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.

Downlink Carrier aggregation:

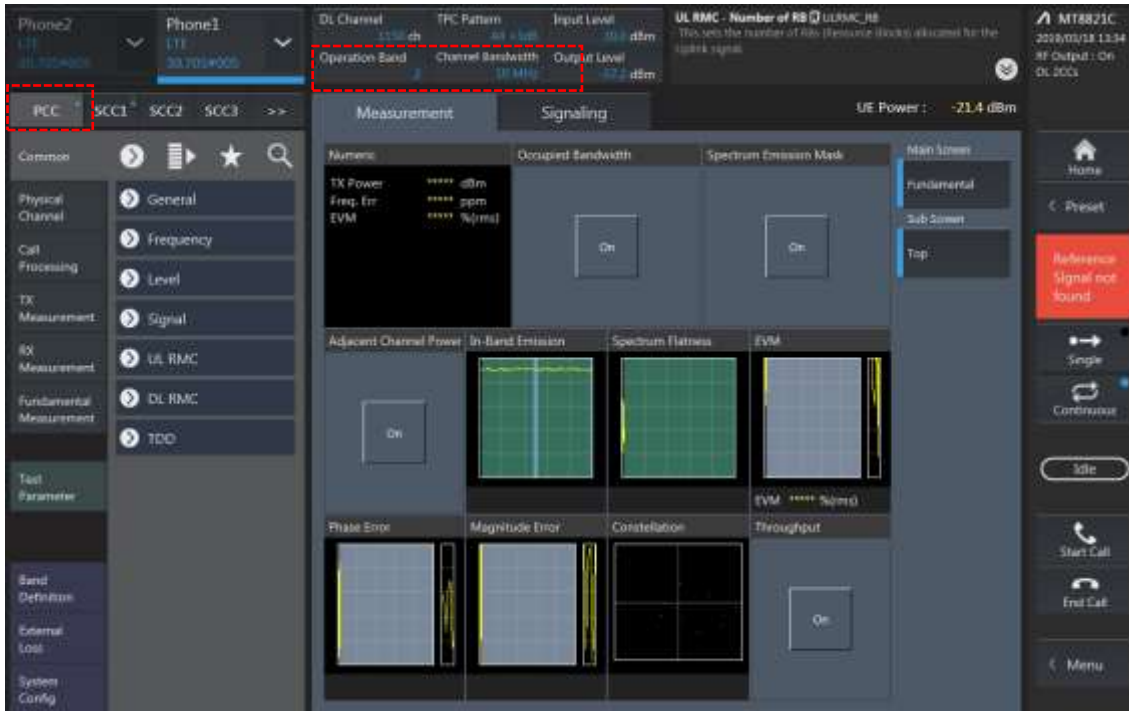
1. This device only supports downlink carrier aggregation. For every supported combination of downlink carrier aggregation, power measurements were performed with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.
2. All control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
3. Per FCC KDB publication 941225 D05A v01r02, Section C)3)b)ii), PCC uplink channel was selected at downlink carrier aggregation combinations. The downlink PCC channel was paired with the selected PCC uplink channel according to normal configurations without carrier aggregation.
4. For continuous intra-band carrier aggregation, the downlink channel spacing between the component carriers was set to multiple of 300kHz less than the nominal channel spacing defined in section 5.4.1A of 3GPP TS 36.521.
5. For non-continuous intra-band carrier aggregation, 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.
6. All selected downlink channels remained fully within the downlink transmission band of the respective component carrier.



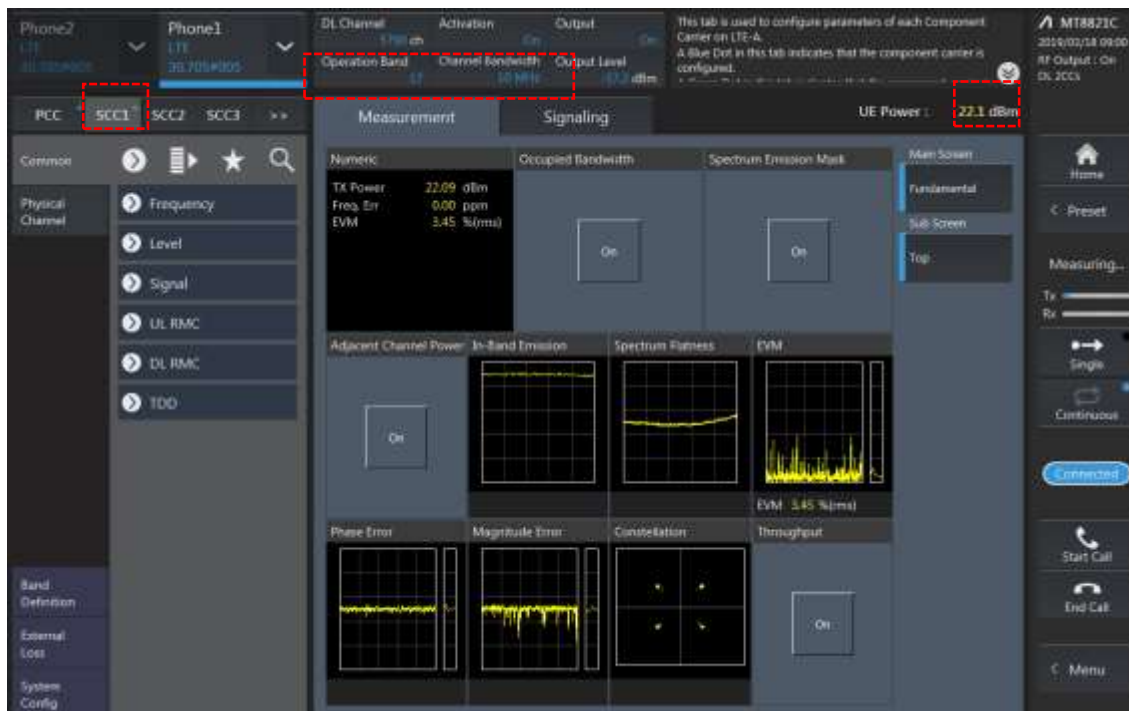
Power Measurement setup

LTE Down Link 2CA Call Setup

PCC Setting: Channel/ RB/ BW/ Modulation



SCC Setting: Channel/ RB/ BW/ Modulation and call Connection

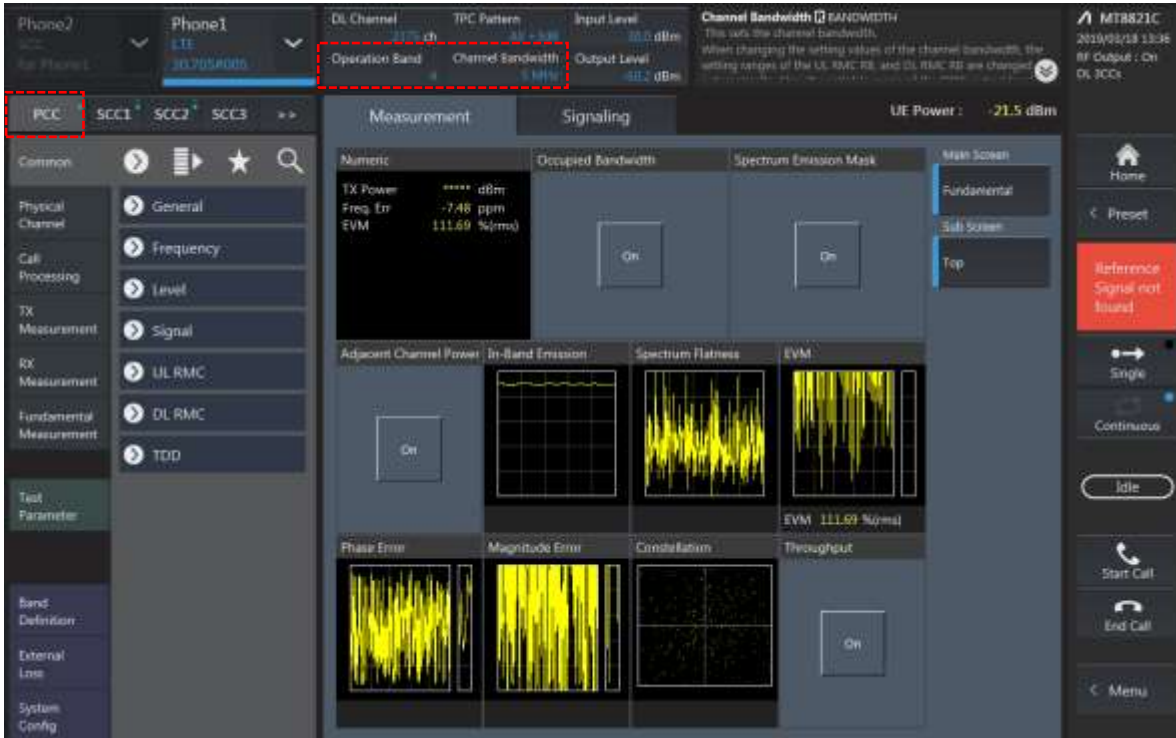


2CA Downlink Carrier aggregation Maximum conducted Powers

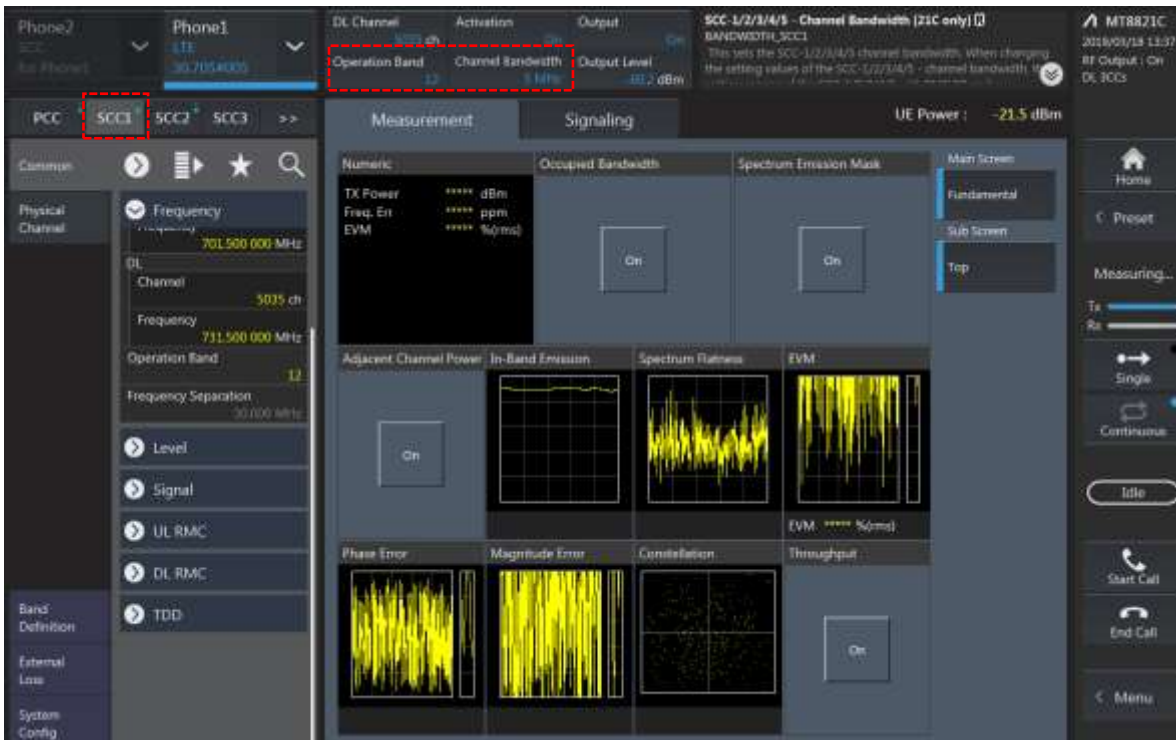
Combination	PCC									SCC				Tx Power		Delta (2)-(1)
	Band	BW	PCC UL Ch.	PCC UL Freq.	PCC DL Ch.	PCC DL Freq.	Modul ation	RB	RB offset	Band	BW	SCC DL Ch.	SCC DL Freq.	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled (dBm) (2)	
2A-2A	2	20	18700	1860	700	1940	QPSK	1	49	2	20	1100	1980	24.64	24.62	0.02
2C	2	20	18700	1860	700	1940	QPSK	1	49	2	20	898	1959.8	24.64	24.64	0.00
2A-12A (0,1)	2	20	18700	1860	700	1940	QPSK	1	49	12	10	5095	737.5	24.64	24.60	0.04
2A-12A (0,1)	12	5	23035	701.5	5035	731.5	QPSK	1	12	2	20	900	1960	25.09	25.07	0.02
2A-12A (2)	2	10	18650	1855	650	1935	QPSK	1	24	12	10	5095	737.5	24.54	24.50	0.04
2A-12A (2)	12	10	23035	701.5	5035	731.5	QPSK	1	12	2	10	900	1960	25.09	25.05	0.04
2A-17A	2	10	18650	1855	650	1935	QPSK	1	24	17	10	5790	740	24.54	24.51	0.03
2A-17A	17	5	23755	706.5	5755	736.5	QPSK	1	12	2	10	900	1960	25.05	25.00	0.05
4A-17A	4	10	20000	1715	2000	2115	QPSK	1	12	17	10	5790	740	23.64	23.62	0.02
4A-17A	17	5	23755	706.5	5755	736.5	QPSK	1	12	4	10	2000	2115	25.05	25.04	0.01
5A-41A	5	5	20425	826.5	2425	871.5	QPSK	1	12	41	20	40620	2593	25.04	25.02	0.02
5A-41A	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	5	10	2525	881.5	24.88	24.87	0.01
66B	66	10	132022	1715	66486	2135	QPSK	1	49	66	10	66585	2124.9	24.59	24.55	0.04
66C	66	10	132022	1715	66486	2135	QPSK	1	49	66	20	66630	2149.4	24.59	24.58	0.01

LTE Down Link 3CA Call Setup

1) PCC Setting: Channel /RB/BW/Modulation



2) SCC1 Setting: Channel /RB/BW/Modulation



3) SCC2 Setting (Channel /RB/BW/Modulation) and call Connection

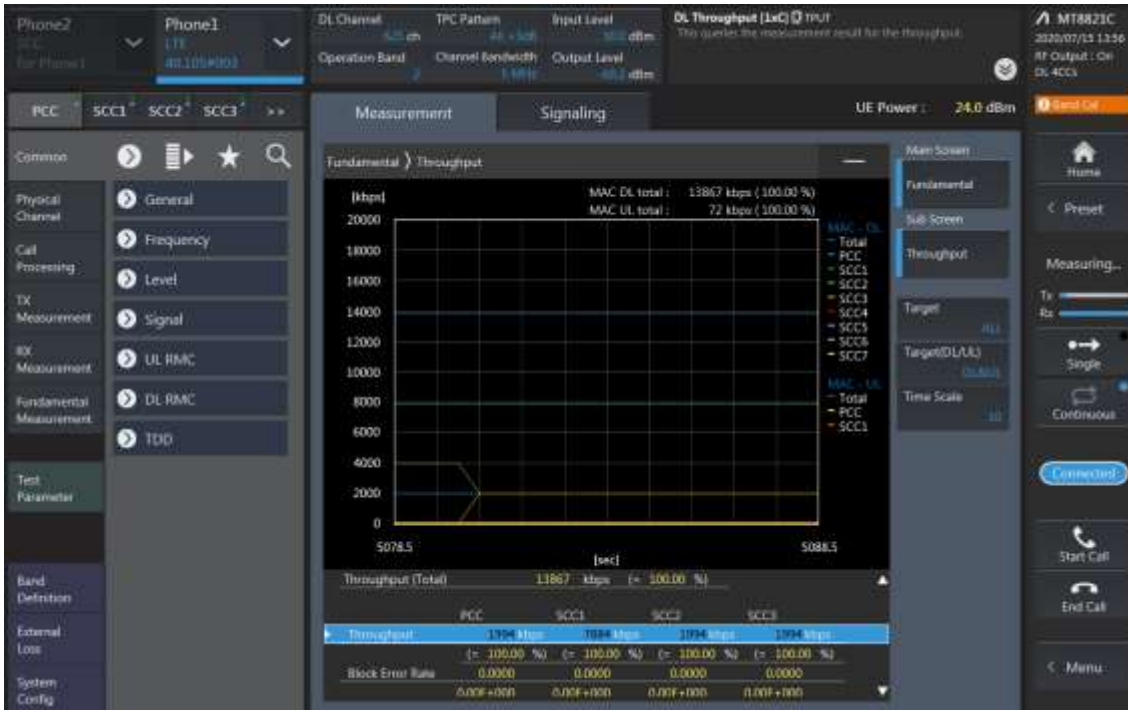


3CA Downlink Carrier aggregation Maximum conducted Powers

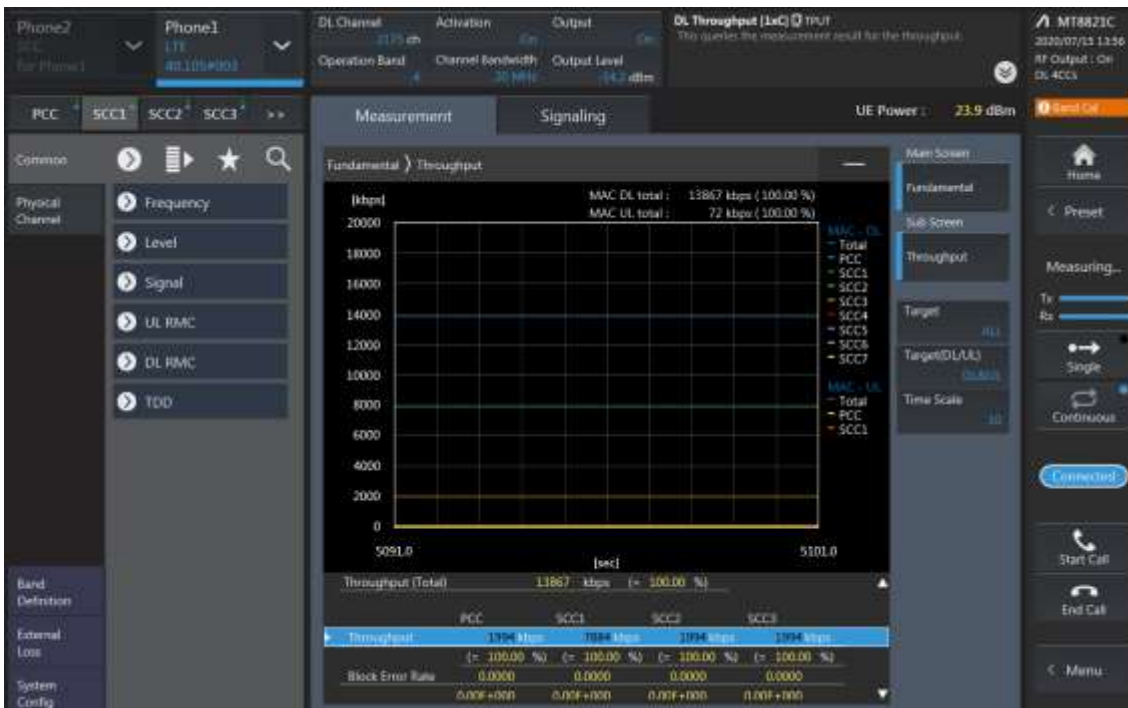
Combination	PCC									SCC				SCC				Tx Power		Delta (2)-(1)
	Band	BW	PCC UL Ch.	PCC UL Freq.	PCC DL Ch.	PCC DL Freq.	Modulation	RB	RB offset	Band	BW	SCC DL Ch.	SCC DL Freq.	Band	BW	SCC DL Ch.	SCC DL Freq.	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled (dBm) (2)	
2A-4A-5A	2	20	18700	1860	700	1940	QPSK	1	49	4	20	2175	2132.5	5	10	2525	881.5	24.64	24.60	0.04
2A-4A-5A	4	10	20000	1715	2000	2115	QPSK	1	49	2	20	900	1960	5	10	2525	881.5	23.64	23.63	0.01
2A-4A-5A	5	5	20425	826.5	2425	826.5	QPSK	1	12	2	20	900	1960	4	20	2175	2132.5	25.04	25.02	0.02
2A-5A-66A	2	20	18700	1860	700	1940	QPSK	1	49	5	10	2525	881.5	66	20	66786	2145	24.64	24.64	0.00
2A-5A-66A	5	5	20425	826.5	2425	826.5	QPSK	1	12	2	20	900	1960	66	20	66786	2145	25.04	25.02	0.02
2A-5A-66A	66	10	132022	1715	66486	2135	QPSK	1	49	2	20	900	1960	5	10	2525	881.5	24.59	24.58	0.01
4A-4A-12A (0,1)	4	10	20000	1715	2000	2115	QPSK	1	12	4	10	2350	2150	12	10	5095	737.5	23.64	23.59	0.05
4A-4A-12A (0,1)	12	10	23035	701.5	5035	731.5	QPSK	1	12	4	10	2175	2132.5	4	10	2274	2142.4	25.09	25.05	0.04
5A-66A-66A	5	5	20425	826.5	2425	826.5	QPSK	1	12	66	20	66536	2120	66	20	67236	2190	25.04	25.01	0.03
5A-66A-66A	66	10	132022	1715	66486	2135	QPSK	1	49	66	20	67036	2190	5	10	2525	881.5	24.59	24.57	0.02
12A-66A-66A	12	10	23035	701.5	5035	731.5	QPSK	1	12	66	20	66536	2120	66	20	67236	2190	25.09	25.07	0.02
12A-66A-66A	66	10	132022	1715	66486	2135	QPSK	1	49	66	20	67036	2190	12	10	5095	737.5	24.59	24.54	0.05
26A-41C	26	5	26715	816.5	8715	861.5	QPSK	1	0	41	20	40620	2593	41	20	40818	2612.8	24.95	24.92	0.03
26A-41C	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	41253	2656.3	26	15	8865	876.5	24.88	24.84	0.04
41A-41C	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	39750	2506	41	20	39948	2525.8	24.88	24.88	0.00
41A-41C	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	41253	2656.3	41	20	39750	2506	24.88	24.86	0.02

LTE Down Link 4CA Call Setup

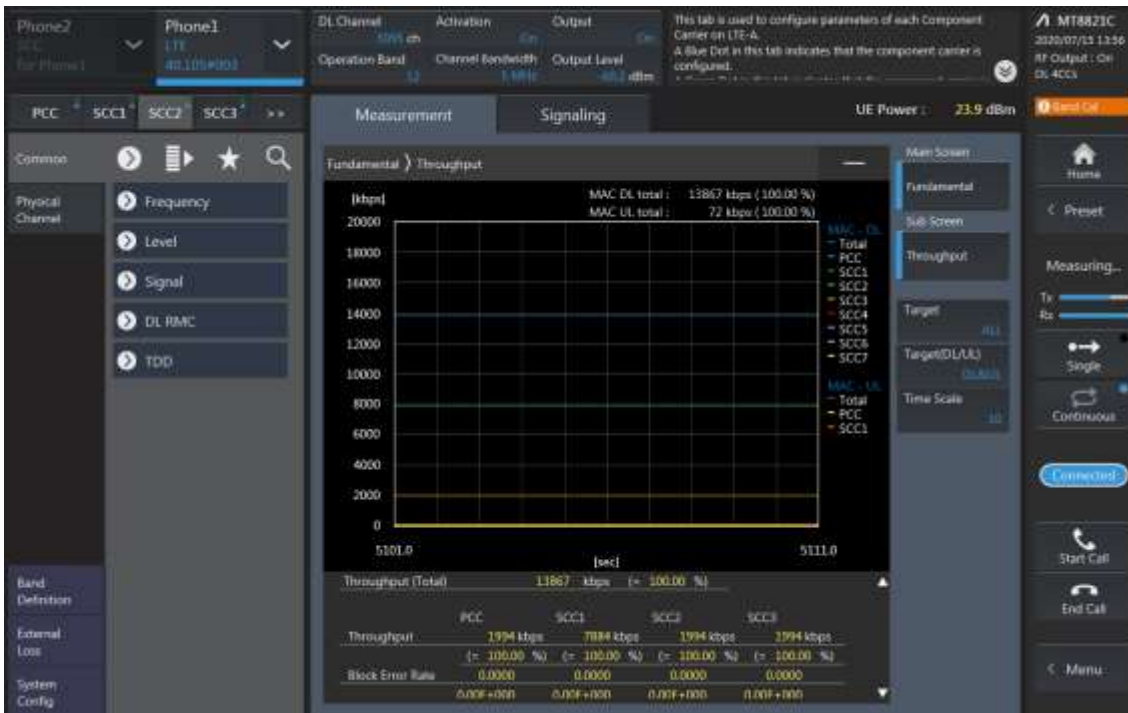
PCC Setting: Channel /RB/BW/Modulation



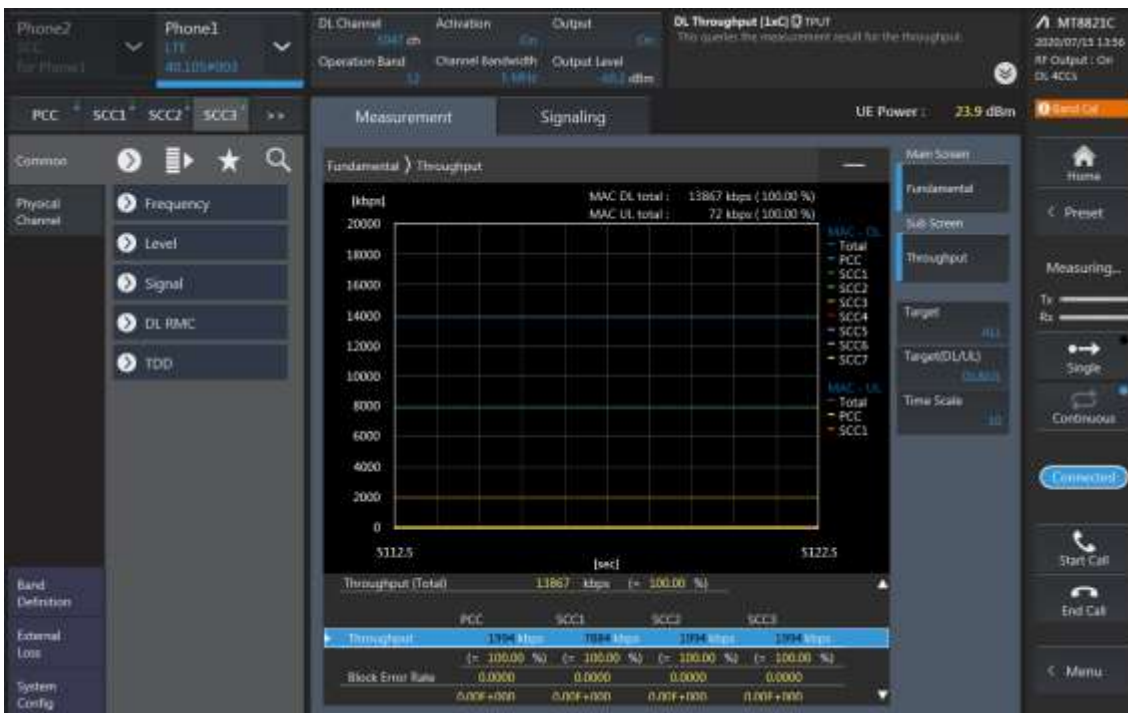
SCC1 Setting (Channel /RB/BW/Modulation)and call Connection



SCC2 Setting (Channel /RB/BW/Modulation)and call Connection



SCC3 Setting (Channel /RB/BW/Modulation)and call Connection

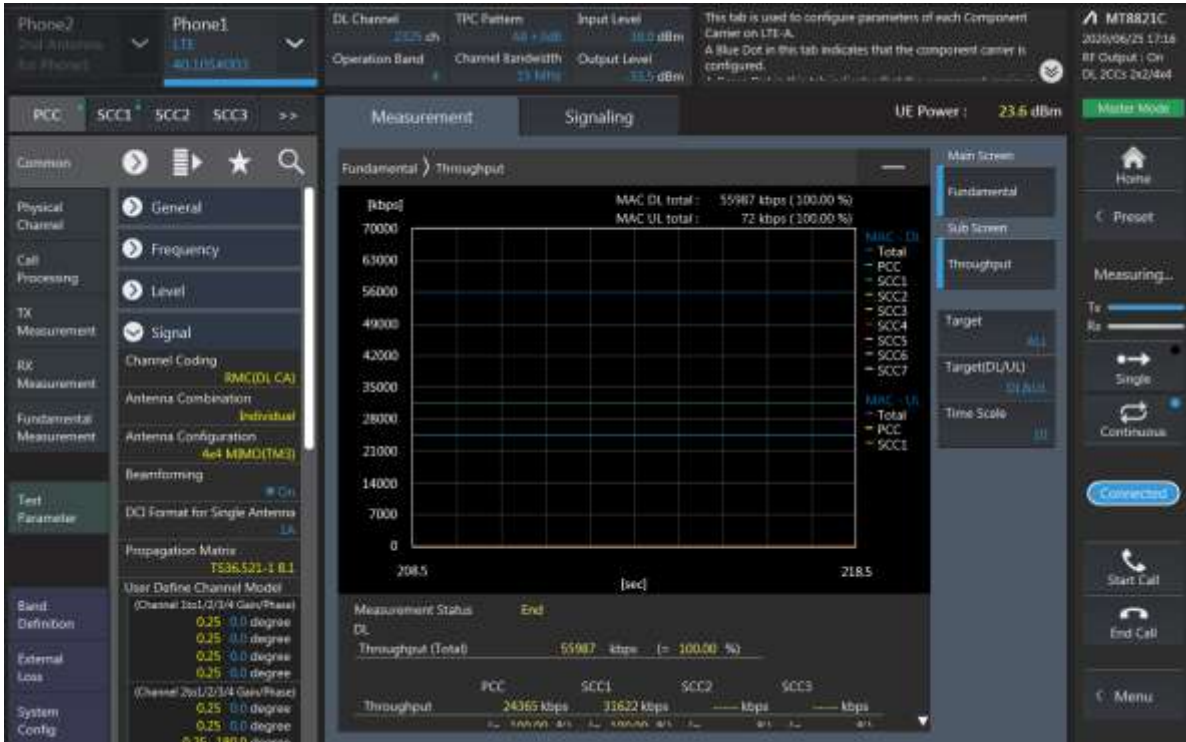


4CA Downlink Carrier aggregation Maximum conducted Powers

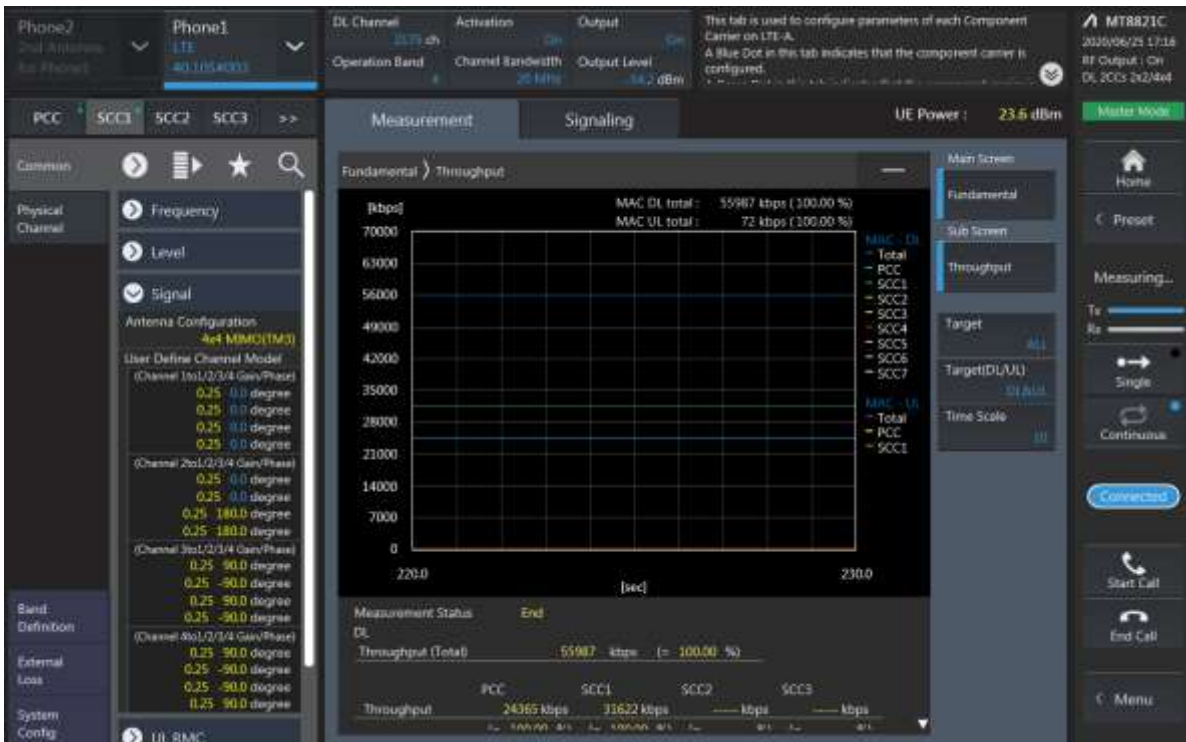
Combination	PCC									SCC				SCC				SCC				Tx Power		Delta (2)-(1)
	Band	BW	PCC UL Ch.	PCC UL Freq.	PCC DL Ch.	PCC DL Freq.	Modulation	RB	RB offset	Band	BW	SCC DL Ch.	SCC DL Freq.	Band	BW	SCC DL Ch.	SCC DL Freq.	Band	BW	SCC DL Ch.	SCC DL Freq.	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled (dBm) (2)	
41C-41C	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	41253	2656.3	41	20	39750	2506	41	20	39948	2525.8	24.88	24.84	0.04
41A-41D	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	39750	2506	41	20	39948	2525.8	41	20	40146	2545.6	24.88	24.83	0.05
41A-41D	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	40857	2616.7	41	20	40659	2596.9	41	20	39750	2506	24.88	24.83	0.05
41E	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	40857	2616.7	41	20	40659	2596.9	41	20	40461	2577.1	24.88	24.85	0.03

LTE Down Link 2CA 4x4 MIMO Call Setup

PCC Setting: Channel/ RB/ BW/ Modulation



SCC Setting: Channel/ RB/ BW/ Modulation and call Connection

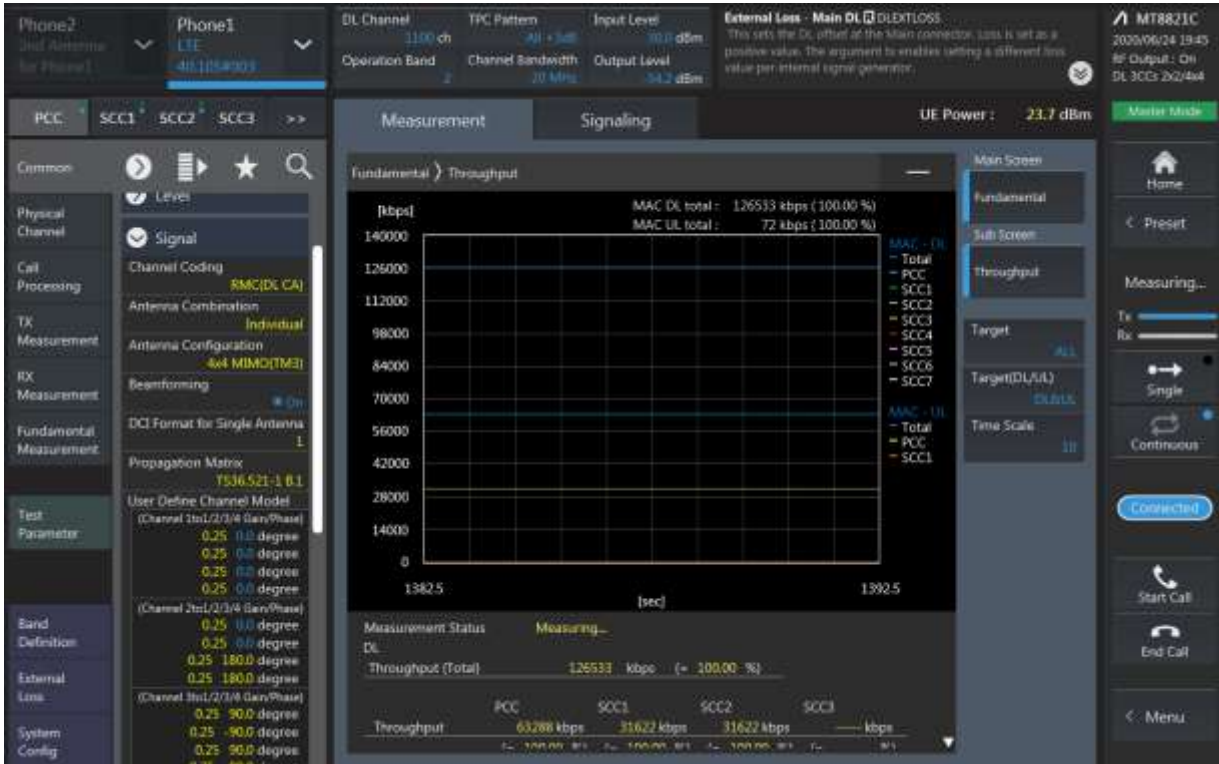


LTE Downlink 2CA 4X4 MIMO Maximum Conducted Power

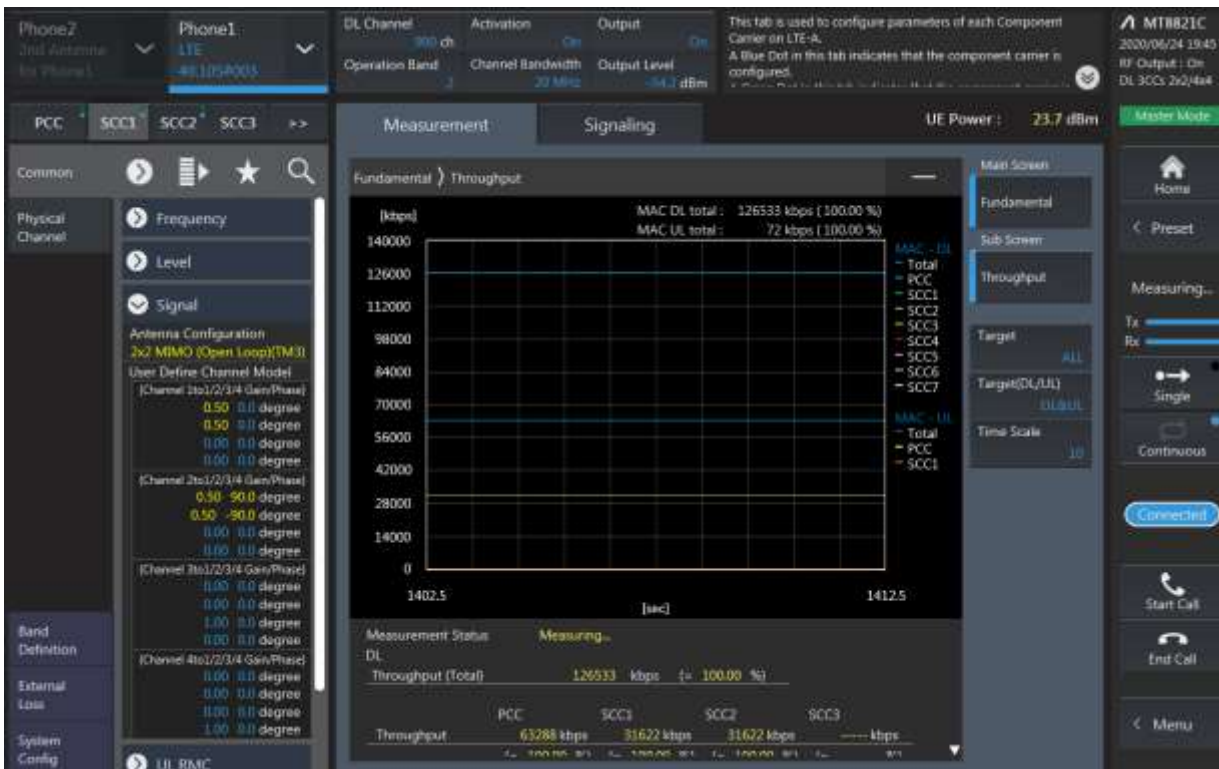
Combination	PCC									SCC				Tx Power		Delta (2)-(1)
	Band	BW	PCC UL Ch.	PCC UL Freq.	PCC DL Ch.	PCC DL Freq.	Modul ation	RB	RB offset	Band	BW	SCC DL Ch.	SCC DL Freq.	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled (dBm) (2)	
[4A]-17A	4	10	20000	1715	2000	2115	QPSK	1	12	17	10	5790	740	23.64	23.60	0.04
[4A]-17A	17	5	23755	706.5	5755	736.5	QPSK	1	12	4	10	2000	2115	25.05	25.03	0.02
5A-[41A]	5	5	20425	826.5	2425	871.5	QPSK	1	12	41	20	40620	2593	25.04	25.04	0.00
5A-[41A]	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	5	10	2525	881.5	24.88	24.84	0.04
[66B]	66	10	132022	1715	66486	2135	QPSK	1	49	66	10	66585	2124.9	24.59	24.55	0.04
[66C]	66	10	132022	1715	66486	2135	QPSK	1	49	66	20	66630	2149.4	24.59	24.57	0.02

LTE Down Link 3CA 4x4 MIMO Call Setup

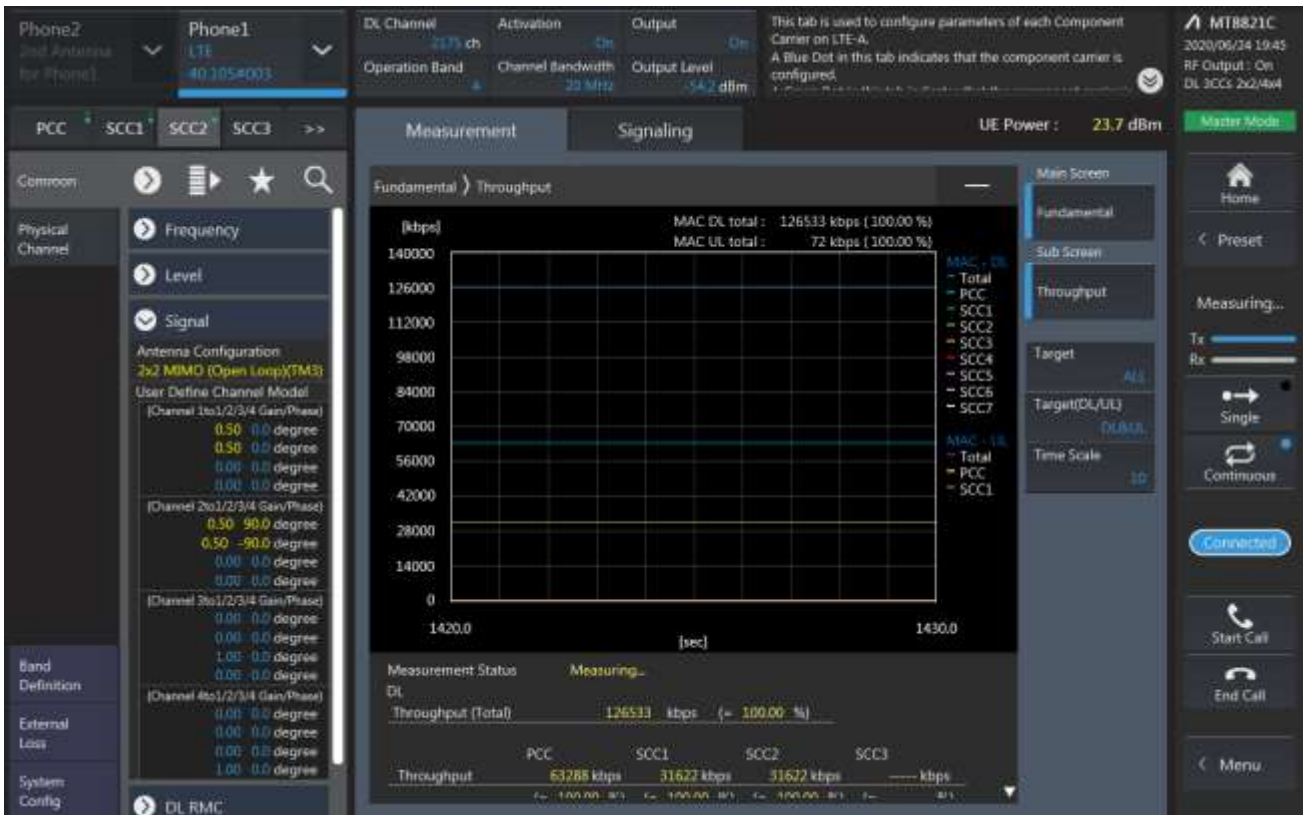
PCC Setting: Channel /RB/BW/Modulation



SCC1 Setting: Channel /RB/BW/Modulation



SCC2 Setting: (Channel /RB/BW/Modulation) and call Connection



LTE Downlink 3CA 4X4 MIMO Maximum Conducted Power

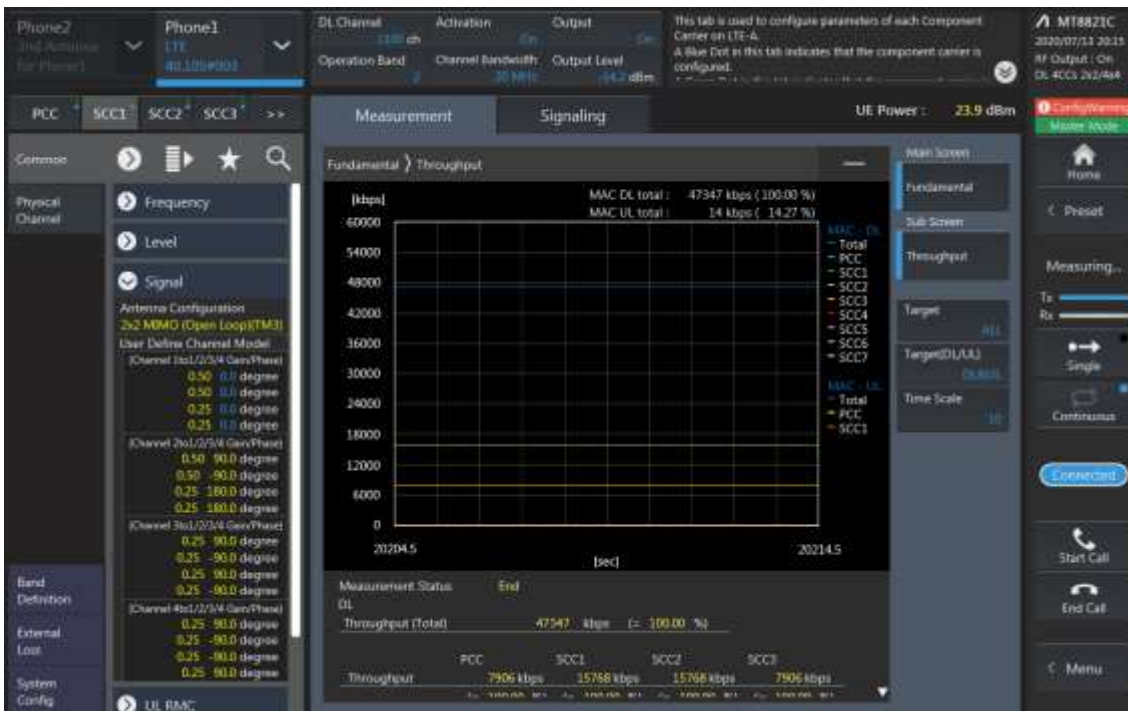
Combination	PCC									SCC				SCC				Tx Power		Delta (2)-(1)
	Band	BW	PCC UL Ch.	PCC UL Freq.	PCC DL Ch.	PCC DL Freq.	Modulation	RB	RB offset	Band	BW	SCC DL Ch.	SCC DL Freq.	Band	BW	SCC DL Ch.	SCC DL Freq.	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled (dBm) (2)	
2A-[4A]-5A	2	20	18700	1860	700	1940	QPSK	1	49	4	20	2175	2132.5	5	10	2525	881.5	24.64	24.62	0.02
2A-[4A]-5A	4	10	20000	1715	2000	2115	QPSK	1	49	2	20	900	1960	5	10	2525	881.5	23.64	23.60	0.04
2A-[4A]-5A	5	5	20425	826.5	2425	826.5	QPSK	1	12	2	20	900	1960	4	20	2175	2132.5	25.04	25.00	0.04
2A-5A-[66A]	2	20	18700	1860	700	1940	QPSK	1	49	5	10	2525	881.5	66	20	66786	2145	24.64	24.63	0.01
2A-5A-[66A]	5	5	20425	826.5	2425	826.5	QPSK	1	12	2	20	900	1960	66	20	66786	2145	25.04	25.02	0.02
2A-5A-[66A]	66	10	132022	1715	66486	2135	QPSK	1	49	2	20	900	1960	5	10	2525	881.5	24.59	24.56	0.03
4A-[4A]-12A (0,1)	4	10	20000	1715	2000	2115	QPSK	1	12	4	10	2350	2150	12	10	5095	737.5	23.64	23.61	0.03
[4A]-4A-12A (0,1)	4	10	20000	1715	2000	2115	QPSK	1	12	4	10	2350	2150	12	10	5095	737.5	23.64	23.62	0.02
[4A]-[4A]-12A (0,1)	4	10	20000	1715	2000	2115	QPSK	1	12	4	10	2350	2150	12	10	5095	737.5	23.64	23.60	0.04
4A-[4A]-12A (0,1)	12	10	23035	701.5	5035	731.5	QPSK	1	12	4	10	2175	2132.5	4	10	2274	2142.4	25.09	25.07	0.02
[4A]-4A-12A (0,1)	12	10	23035	701.5	5035	731.5	QPSK	1	12	4	10	2175	2132.5	4	10	2274	2142.4	25.09	25.05	0.04
[4A]-[4A]-12A (0,1)	12	10	23035	701.5	5035	731.5	QPSK	1	12	4	10	2175	2132.5	4	10	2274	2142.4	25.09	25.08	0.01
5A-[66A]-[66A]	5	5	20425	826.5	2425	826.5	QPSK	1	12	66	20	66536	2120	66	20	67236	2190	25.04	25.02	0.02
5A-[66A]-66A	5	5	20425	826.5	2425	826.5	QPSK	1	12	66	20	66536	2120	66	20	67236	2190	25.04	25.04	0.00
5A-[66A]-[66A]	5	5	20425	826.5	2425	826.5	QPSK	1	12	66	20	66536	2120	66	20	67236	2190	25.04	25.02	0.02
5A-66A-[66A]	66	10	132022	1715	66486	2135	QPSK	1	49	66	20	67036	2190	5	10	2525	881.5	24.59	24.58	0.01
5A-[66A]-66A	66	10	132022	1715	66486	2135	QPSK	1	49	66	20	67036	2190	5	10	2525	881.5	24.59	24.58	0.01
5A-[66A]-[66A]	66	10	132022	1715	66486	2135	QPSK	1	49	66	20	67036	2190	5	10	2525	881.5	24.59	24.54	0.05
12A-66A-[66A]	12	10	23035	701.5	5035	731.5	QPSK	1	12	66	20	66536	2120	66	20	67236	2190	25.09	25.06	0.03
12A-[66A]-66A	12	10	23035	701.5	5035	731.5	QPSK	1	12	66	20	66536	2120	66	20	67236	2190	25.09	25.06	0.03
12A-[66A]-[66A]	12	10	23035	701.5	5035	731.5	QPSK	1	12	66	20	66536	2120	66	20	67236	2190	25.09	25.06	0.03
12A-66A-[66A]	66	10	132022	1715	66486	2135	QPSK	1	49	66	20	67036	2190	12	10	5095	737.5	24.59	24.55	0.04
12A-[66A]-66A	66	10	132022	1715	66486	2135	QPSK	1	49	66	20	67036	2190	12	10	5095	737.5	24.59	24.57	0.02
12A-[66A]-[66A]	66	10	132022	1715	66486	2135	QPSK	1	49	66	20	67036	2190	12	10	5095	737.5	24.59	24.56	0.03
26A-[41C]	26	5	26715	816.5	8715	861.5	QPSK	1	0	41	20	40620	2593	41	20	40818	2612.8	24.95	24.90	0.05
26A-[41C]	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	41253	2656.3	26	15	8865	876.5	24.88	24.88	0.00
41A-[41C]	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	39750	2506	41	20	39948	2525.8	24.88	24.87	0.01
[41A]-41C	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	39750	2506	41	20	39948	2525.8	24.88	24.86	0.02
[41A]-[41C]	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	39750	2506	41	20	39948	2525.8	24.88	24.83	0.05
41A-[41C]	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	41253	2656.3	41	20	39750	2506	24.88	24.86	0.02
[41A]-41C	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	41253	2656.3	41	20	39750	2506	24.88	24.86	0.02
[41A]-[41C]	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	41253	2656.3	41	20	39750	2506	24.88	24.87	0.01

LTE Down Link 4CA 4x4 MIMO Call Setup

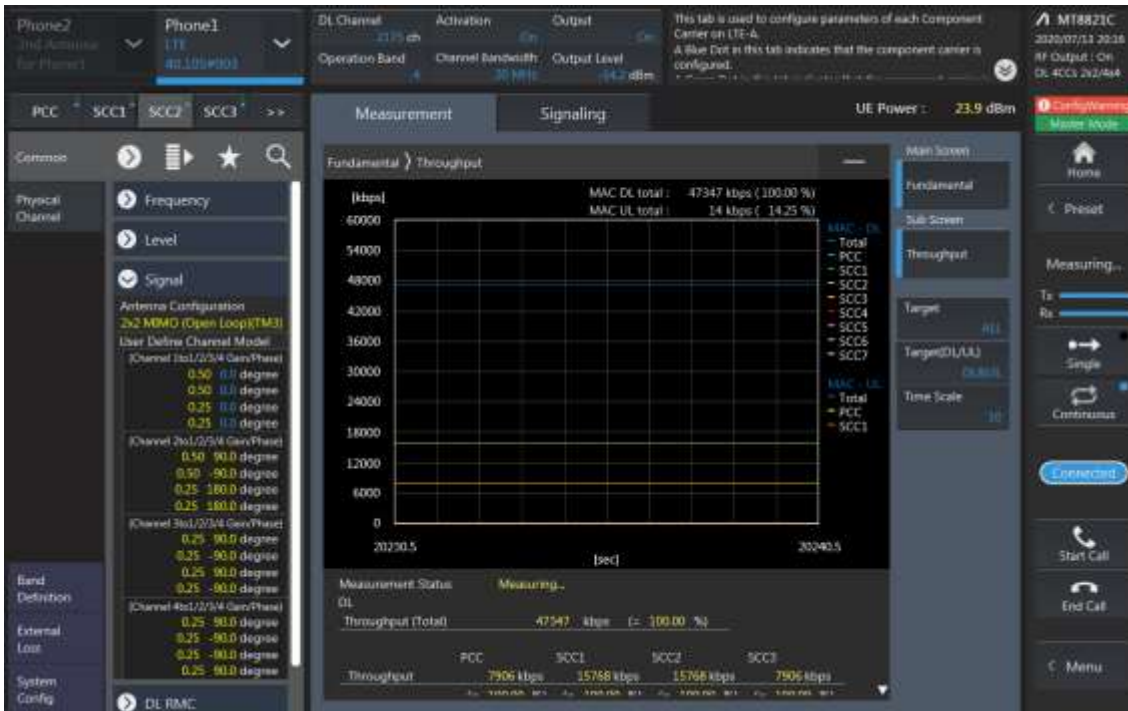
PCC Setting: Channel /RB/BW/Modulation



SCC1 Setting : Channel /RB/BW/Modulation



SCC2 Setting (Channel /RB/BW/Modulation) and call Connection



SCC3 Setting (Channel /RB/BW/Modulation) and call Connection



Combination	PCC									SCC				SCC				SCC				Tx Power		Delta (2)-(1)
	Band	BW	PCC UL Ch.	PCC UL Freq.	PCC DL Ch.	PCC DL Freq.	Modulation	RB	RB offset	Band	BW	SCC DL Ch.	SCC DL Freq.	Band	BW	SCC DL Ch.	SCC DL Freq.	Band	BW	SCC DL Ch.	SCC DL Freq.	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled (dBm) (2)	
[41C]-41C	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	41253	2656.3	41	20	39750	2506	41	20	39948	2525.8	24.88	24.86	0.02
41C-[41C]	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	41253	2656.3	41	20	39750	2506	41	20	39948	2525.8	24.88	24.84	0.04
[41A]-41D	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	39750	2506	41	20	39948	2525.8	41	20	40146	2545.6	24.88	24.86	0.02
[41A]-41D	41	20	41055	2636.5	41055	2636.5	QPSK	1	0	41	20	40857	2616.7	41	20	40659	2596.9	41	20	39750	2506	24.88	24.88	0.00