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.

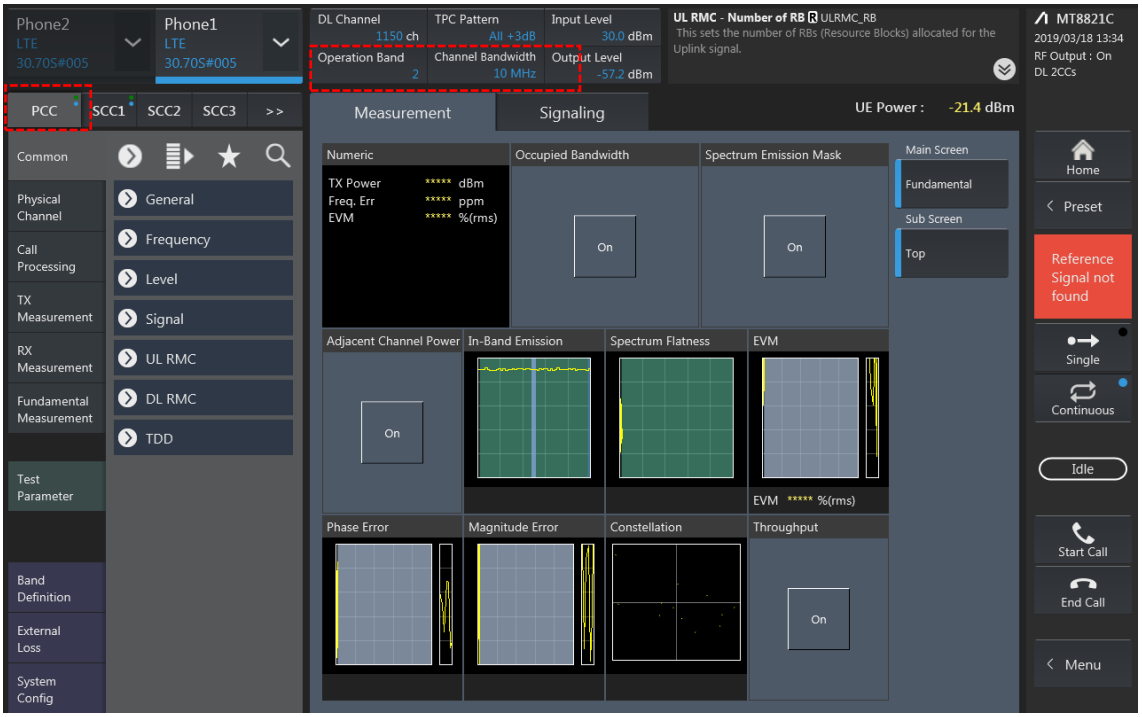
Downlink Carrier aggregation:

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.

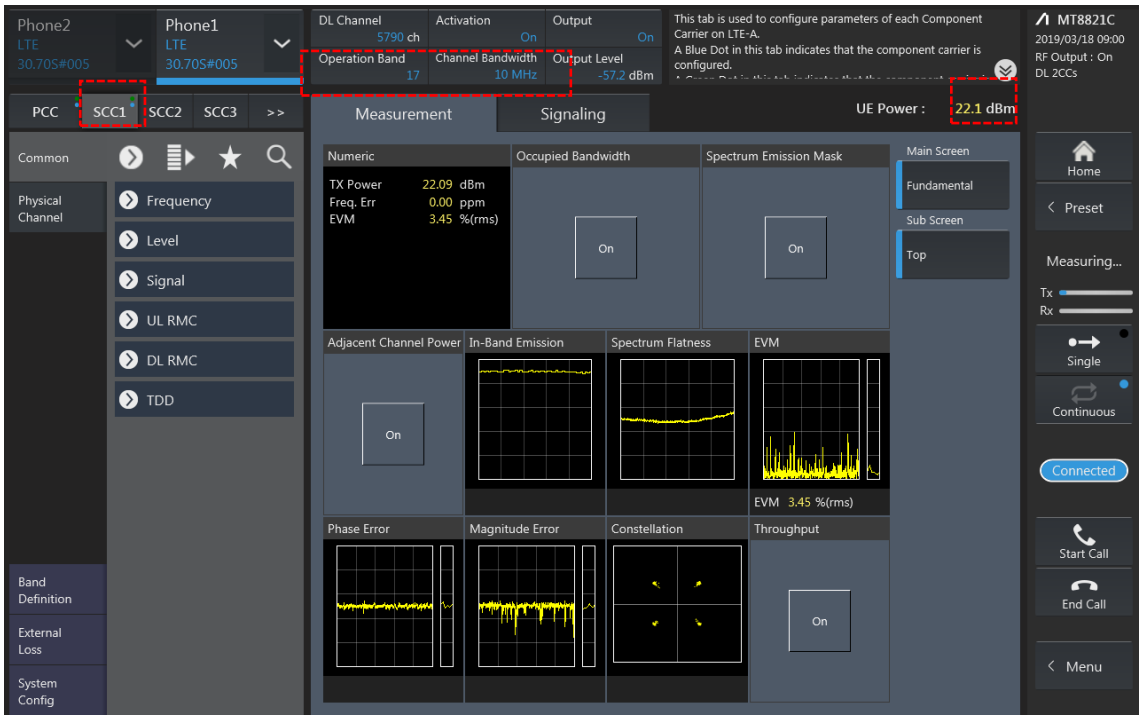
Power Measurement setup

LTE Down Link 2CA Call Setup

PCC Setting: Channel/ RB/ BW/ Modulation



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

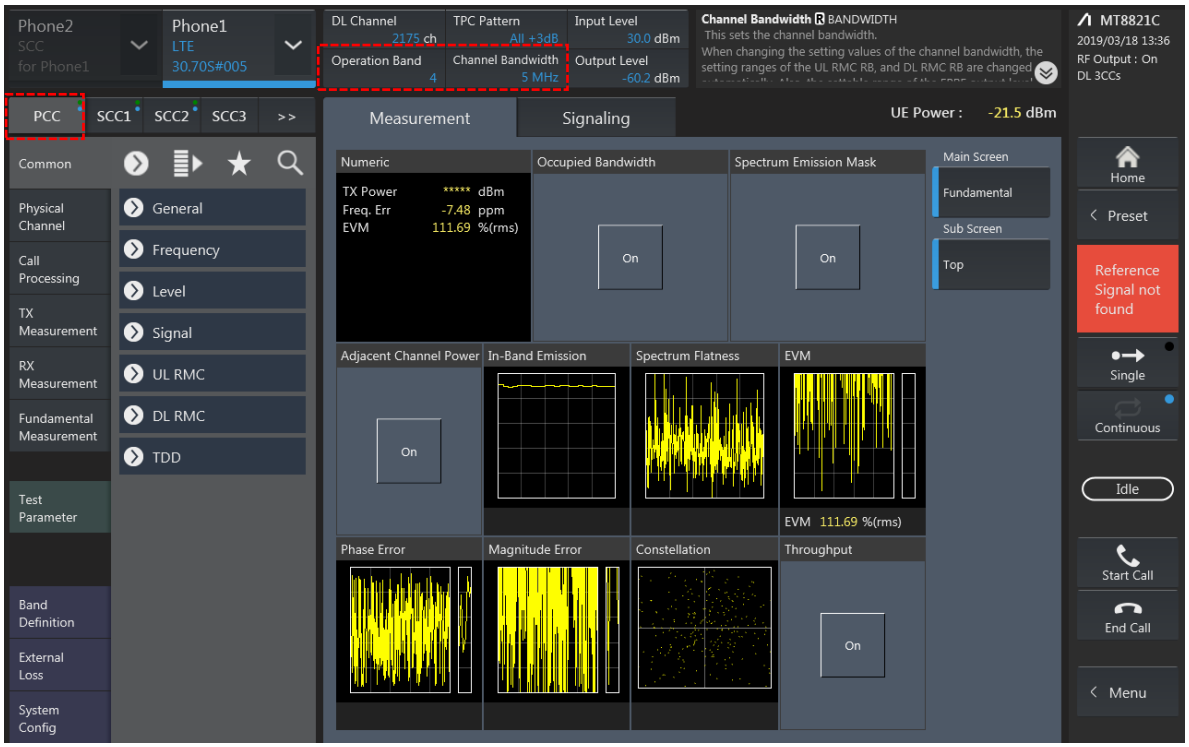


2CA Downlink Carrier aggregation Maximum conducted Powers

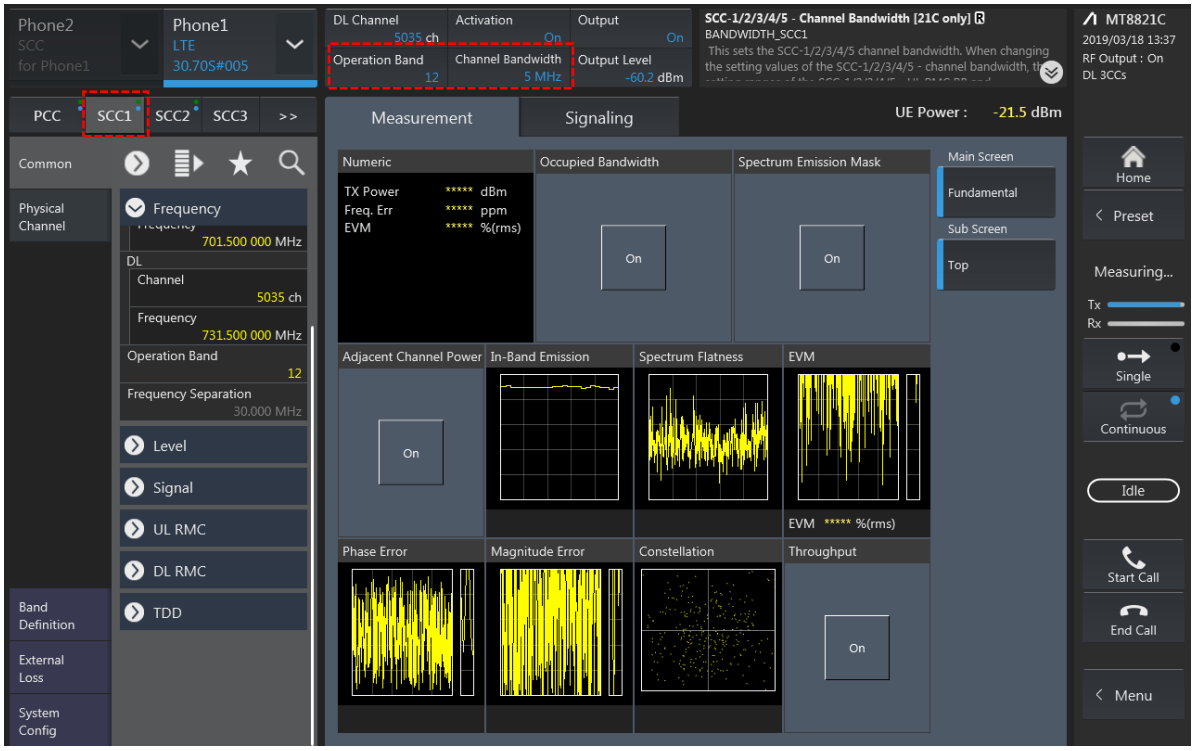
Combination	PCC									SCC				Tx Power		
	Band	BW	PCC UL Channel	PCC UL Frequency	PCC DL Channel	PCC DL Frequency	Modulation	RB	offset	Band	BW	SCC DL Channel	SCC DL Frequency	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled(dBm) (2)	Deviaion(dB) (2)-(1)
2A-2A	2	5	18625	1852.5	625	1932.5	QPSK	1	24	2	20	1100	1980	24.26	24.26	0.00
2C	2	5	18625	1852.5	625	1932.5	QPSK	1	24	2	20	742	1944.2	24.26	24.25	-0.01
2A-12A(0,1,2)	2	5	18625	1852.5	625	1932.5	QPSK	1	24	12	10	5095	737.5	24.26	24.16	-0.10
2A-12A(0)	12	5	23035	701.5	5035	731.5	QPSK	1	12	2	20	900	1960	23.74	23.68	-0.06
2A-12A(1)	12	3	23025	700.5	5025	730.5	QPSK	1	7	2	20	900	1960	23.75	23.73	-0.02
2A-12A(2)	12	5	23035	701.5	5035	731.5	QPSK	1	12	2	10	900	1960	23.74	23.69	-0.05
2A-17A	2	5	18625	1852.5	625	1932.5	QPSK	1	24	17	10	5790	740	24.26	24.21	-0.05
2A-17A	17	5	23755	706.5	5755	736.5	QPSK	1	12	2	10	900	1960	24.03	23.99	-0.04
4A-4A(0)	4	5	19975	1712.5	1975	2112.5	QPSK	1	24	4	10	2350	2150	24.34	24.30	-0.04
4A-4A(1)	4	5	19975	1712.5	1975	2112.5	QPSK	1	24	4	20	2300	2145	24.34	24.25	-0.09
4A-5A(0,1)	4	5	19975	1712.5	1975	2112.5	QPSK	1	24	5	10	2525	881.5	24.34	24.30	-0.04
4A-5A(0)	5	5	20525	836.5	2525	881.5	QPSK	1	12	4	10	2350	2150	24.91	24.89	-0.02
4A-5A(1)	5	5	20525	836.5	2525	881.5	QPSK	1	12	4	20	2300	2145	24.91	24.85	-0.06
4A-17A	4	5	19975	1712.5	1975	2112.5	QPSK	1	24	17	10	5790	740	24.34	24.29	-0.05
5A-41A	5	5	20525	836.5	2525	881.5	QPSK	1	12	41	20	40620	2593	24.91	24.86	-0.05
41A-41A(0,1)	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	24.3	24.24	-0.06
66B	66	15	132047	1717.5	66511	2137.5	QPSK	1	0	66	5	66604	2146.8	24.31	24.21	-0.10
66C	66	15	132047	1717.5	66511	2137.5	QPSK	1	0	66	20	66682	2154.6	24.31	24.25	-0.06

LTE Down Link 3CA Call Setup

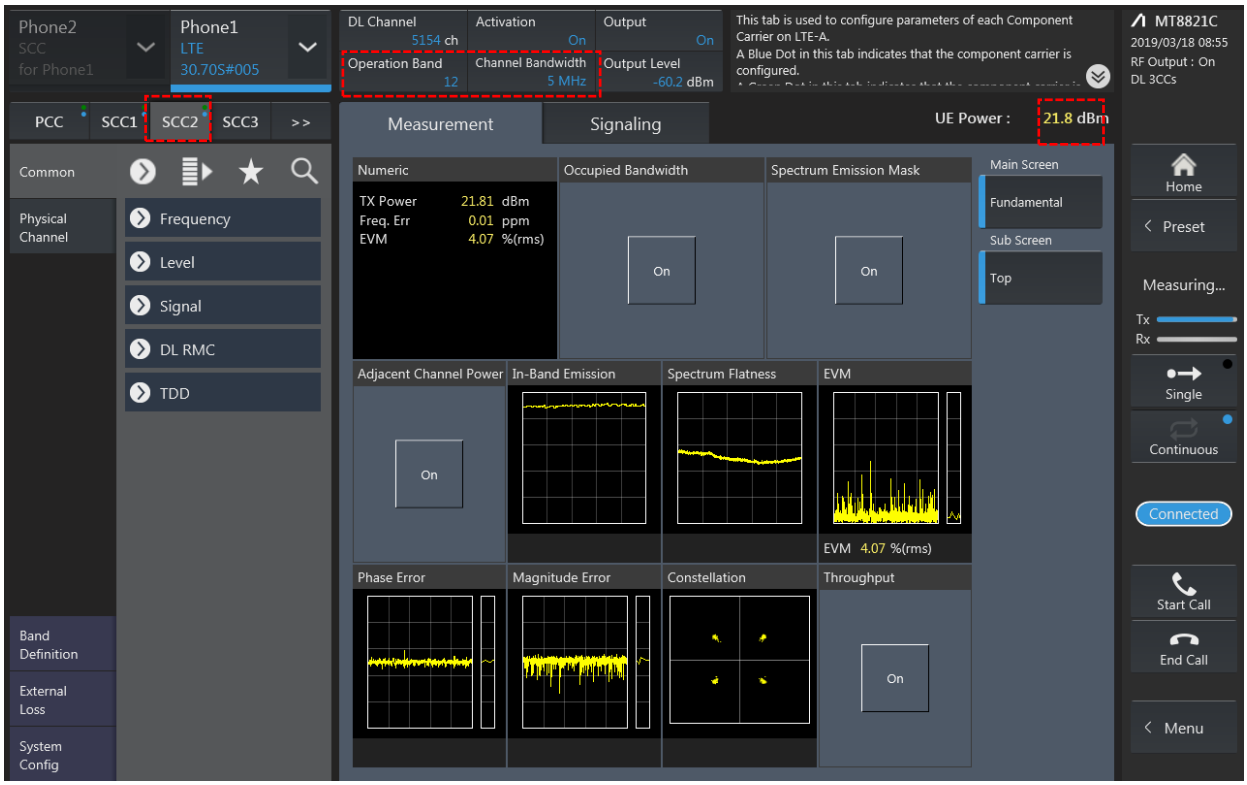
1) PCC Setting: Channel /RB/BW/Modulation



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



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

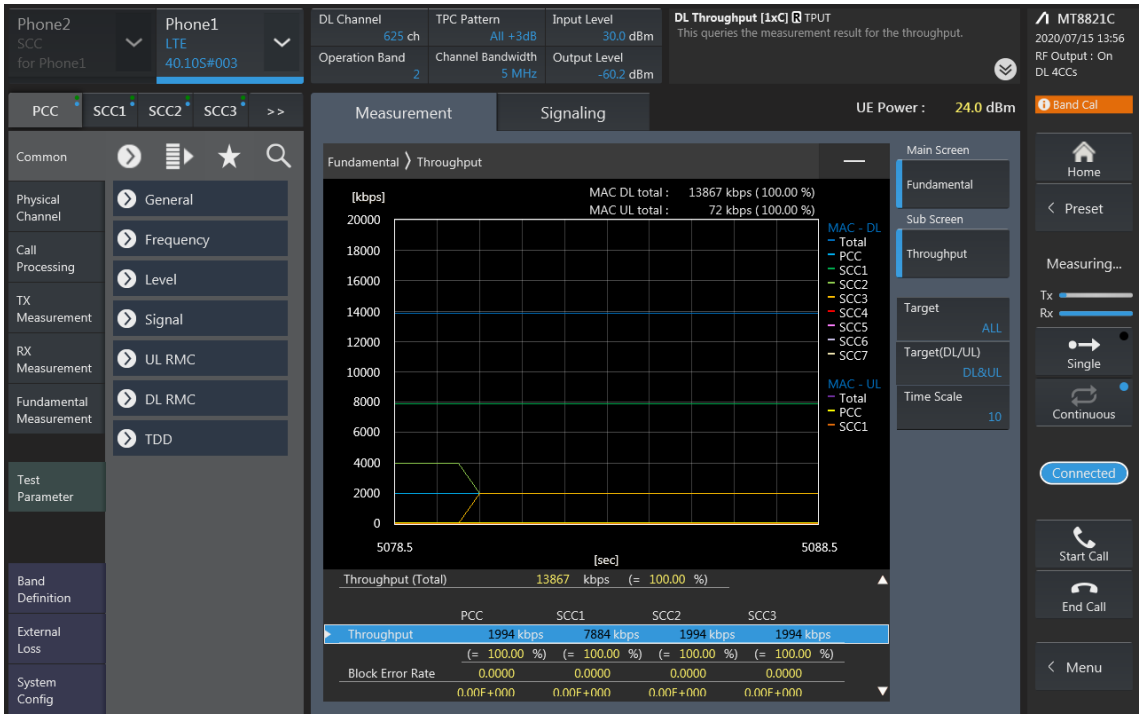


3CA Downlink Carrier aggregation Maximum conducted Powers

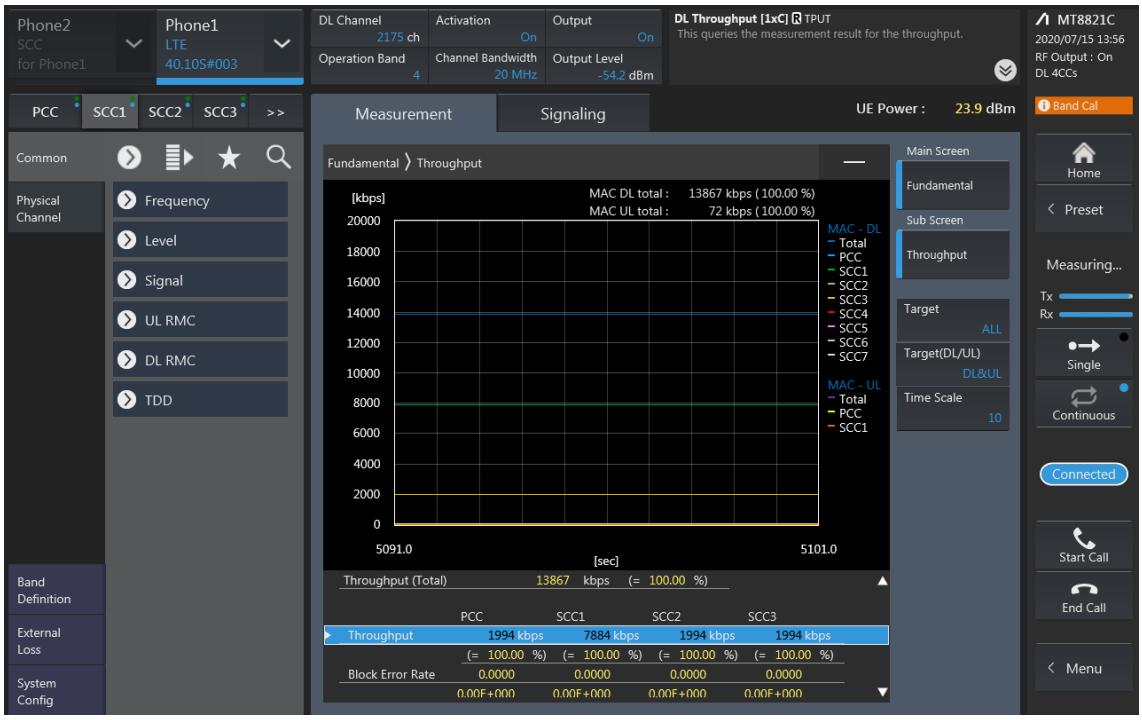
Combination	PCC									SCC				SCC				Tx Power		
	Band	BW	PCC UL Channel	PCC UL Frequency	PCC DL Channel	PCC DL Frequency	Modulation	RB	offset	Band	BW	SCC DL Channel	SCC DL Frequency	Band	BW	SCC DL Channel	SCC DL Frequency	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled(dBm) (2)	Deviaion(dB) (2)-(1)
4A-4A-12A(0)	4	5	19975	1712.5	1975	2112.5	QPSK	1	24	4	20	2300	2145	12	10	5095	737.5	24.34	24.24	-0.10
4A-4A-12A(1)	4	5	19975	1712.5	1975	2112.5	QPSK	1	24	4	10	2350	2150	12	10	5095	737.5	24.34	24.26	-0.08
4A-4A-12A(0)	12	5	23035	701.5	5035	731.5	QPSK	1	12	4	10	2000	2115	4	10	2350	2150	23.74	23.70	-0.04
4A-4A-12A(1)	12	5	23035	701.5	5035	731.5	QPSK	1	12	4	20	2050	2120	4	20	2300	2145	23.74	23.69	-0.05
5A-66A-66A	5	5	20525	836.5	2525	881.5	QPSK	1	12	66	20	66536	2140	66	20	67036	2190	24.91	24.82	-0.09
5A-66A-66A	66	15	132047	1717.5	66511	2137.5	QPSK	1	0	66	20	67036	2190	5	10	2525	881.5	24.31	24.31	0.00
12A-66A-66A	12	5	23035	701.5	5035	731.5	QPSK	1	12	66	20	66536	2140	66	20	67036	2190	23.74	23.66	-0.08
12A-66A-66A	66	15	132047	1717.5	66511	2137.5	QPSK	1	0	66	20	67036	2190	12	10	5095	737.5	24.31	24.30	-0.01
26A-41C(0,1,2,3)	26	10	26750	820	8750	865	QPSK	1	0	41	20	41490	2680	41	20	41292	2660.2	24.02	24.01	-0.01
41A-41C	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	41292	2660.2	24.3	24.22	-0.08
41A-41C	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	39948	2525.8	24.3	24.24	-0.06
41D	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	41094	2640.4	41	20	41292	2660.2	24.3	24.22	-0.08

LTE Down Link 4CA Call Setup

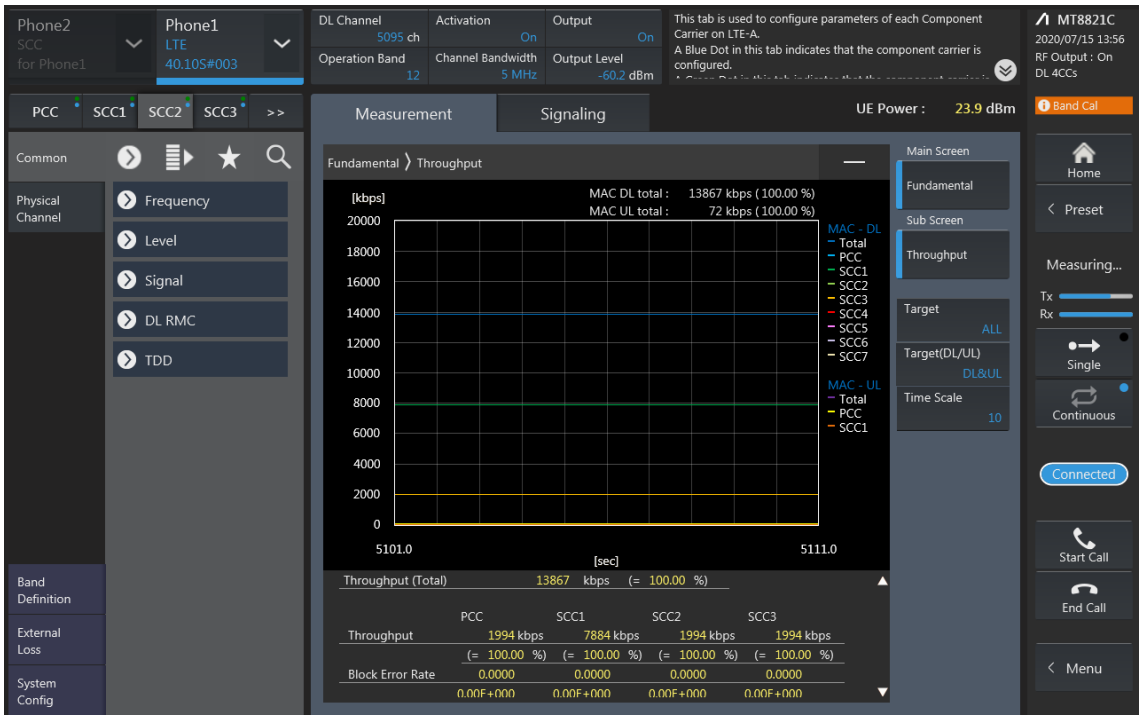
PCC Setting: Channel /RB/BW/Modulation



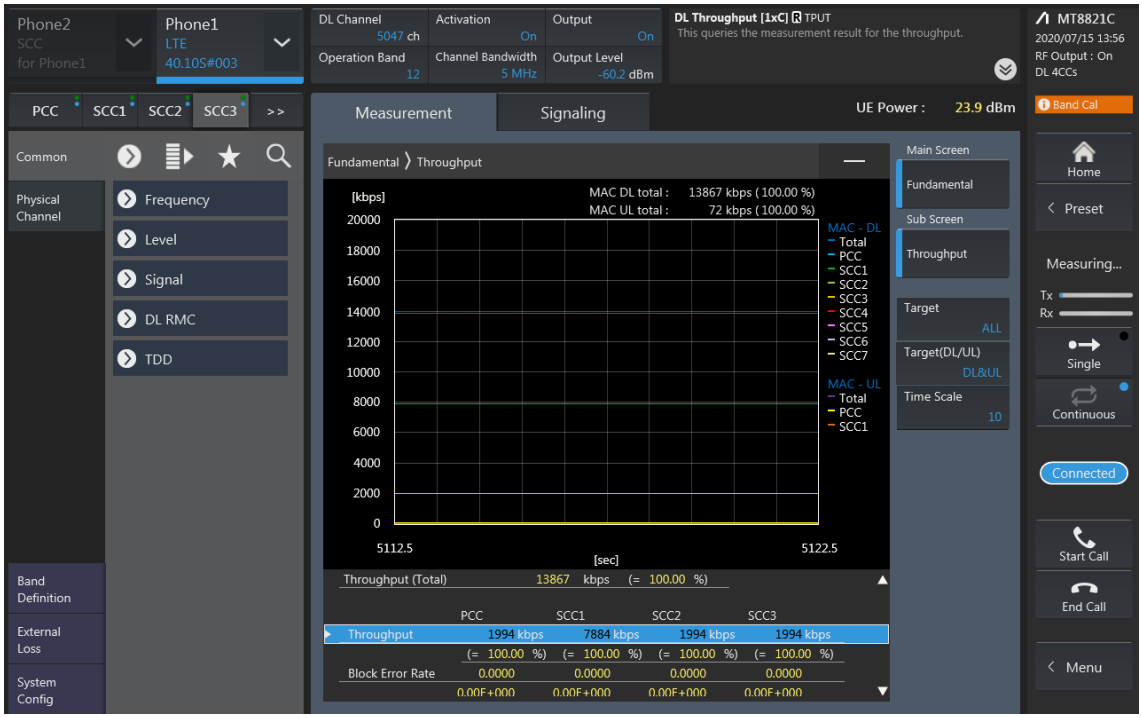
SCC1 Setting (Channel /RB/BW/Modulation)and call Connection



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



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

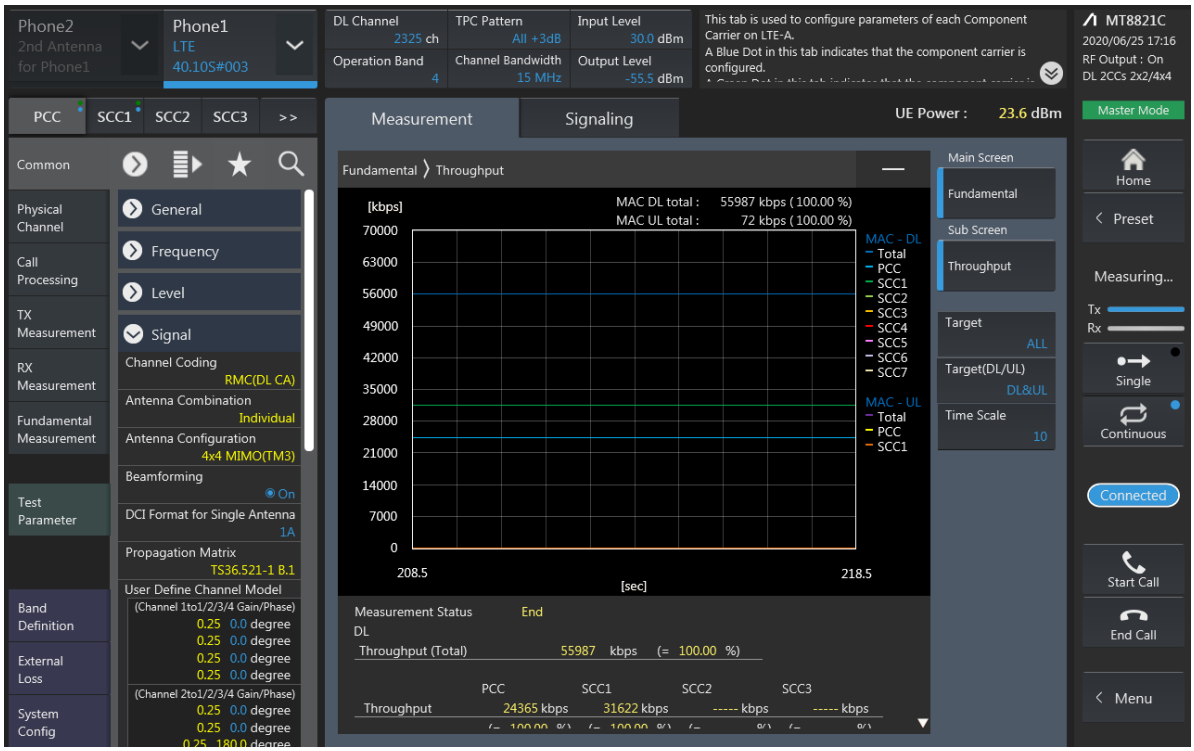


4CA Downlink Carrier aggregation Maximum conducted Powers

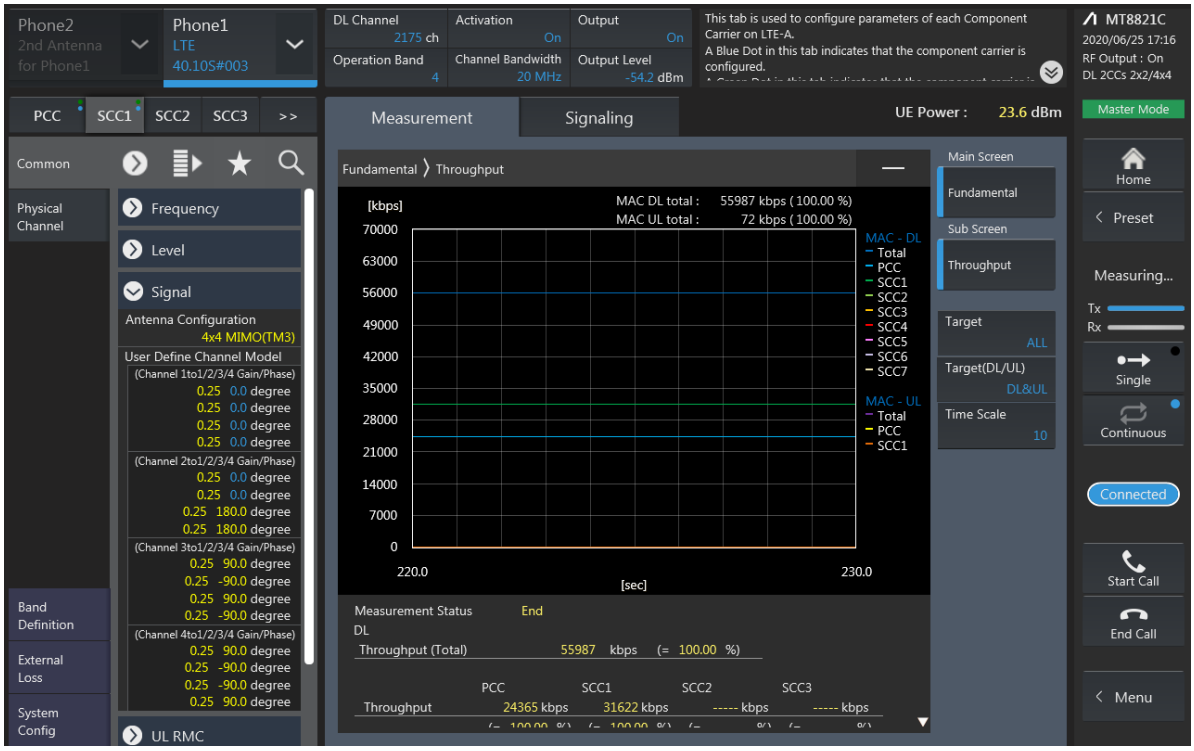
Combination	PCC									SCC				SCC				SCC				Tx Power		
	Band	BW	PCC UL Channel	PCC UL Frequency	PCC DL Channel	PCC DL Frequency	Modulation	RB	offset	Band	BW	SCC DL Channel	SCC DL Frequency	Band	BW	SCC DL Channel	SCC DL Frequency	Band	BW	SCC DL Channel	SCC DL Frequency	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled(dBm) (2)	Deviaion(dB) (2)-(1)
41C-41C	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	39948	2525.8	41	20	41292	2660.2	24.3	24.28	-0.02
[41A]-41D	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	39948	2525.8	41	20	40146	2545.6	24.3	24.25	-0.05
41A-41D	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	41292	2660.2	41	20	41094	2640.4	41	20	39750	2506	24.3	24.21	-0.09
41E	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	41292	2660.2	41	20	41094	2640.4	41	20	40896	2620.6	24.3	24.24	-0.06

LTE Down Link 2CA 4x4 MIMO Call Setup

PCC Setting: Channel/ RB/ BW/ Modulation



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

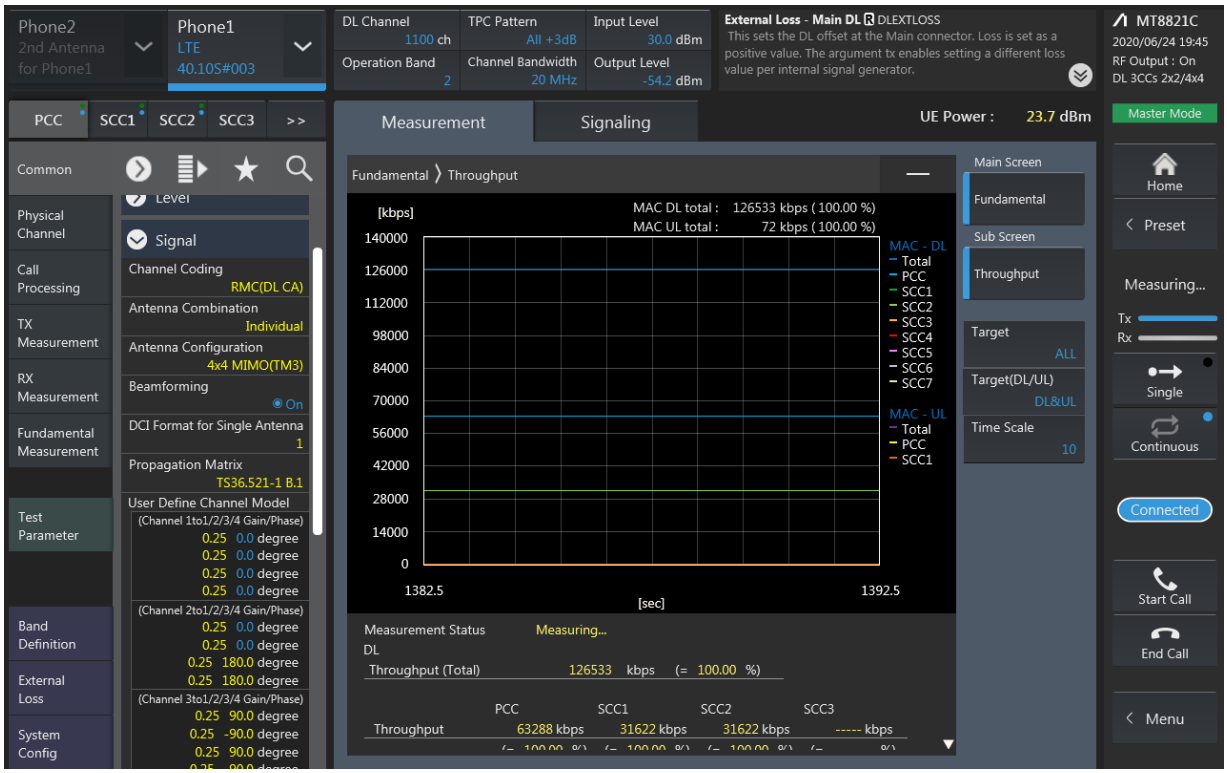


LTE Downlink 2CA 4X4 MIMO Maximum Conducted Power

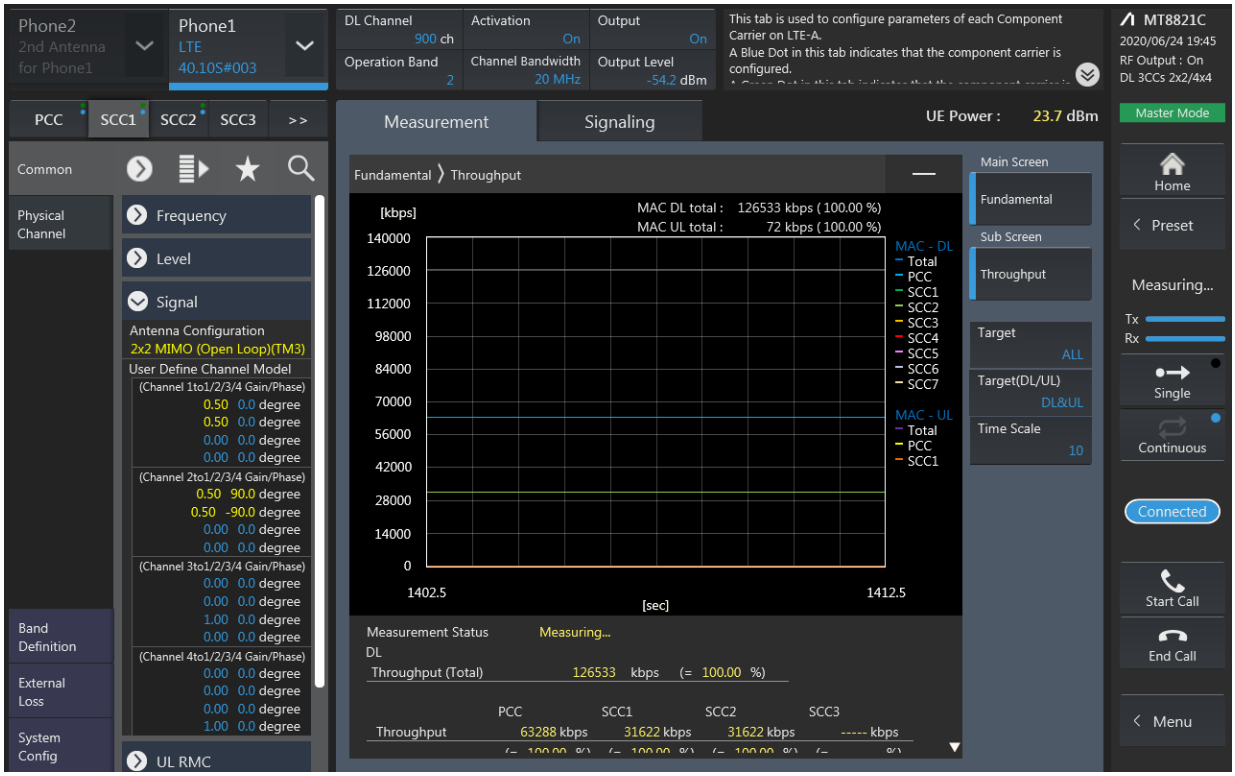
Combination	PCC									SCC				Tx Power		
	Band	BW	PCC UL Channel	PCC UL Frequency	PCC DL Channel	PCC DL Frequency	Modulation	RB	offset	Band	BW	SCC DL Channel	SCC DL Frequency	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled(dBm) (2)	Deviaion(dB) (2)-(1)
5A-[41A]	5	5	20525	836.5	2525	881.5	QPSK	1	12	41	20	40620	2593	24.91	24.87	-0.04
[41A]-41A(0,1)	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	24.3	24.21	-0.09
41A-[41A](0,1)	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	24.3	24.28	-0.02
[41A]-[41A](0,1)	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	24.3	24.29	-0.01

LTE Down Link 3CA 4x4 MIMO Call Setup

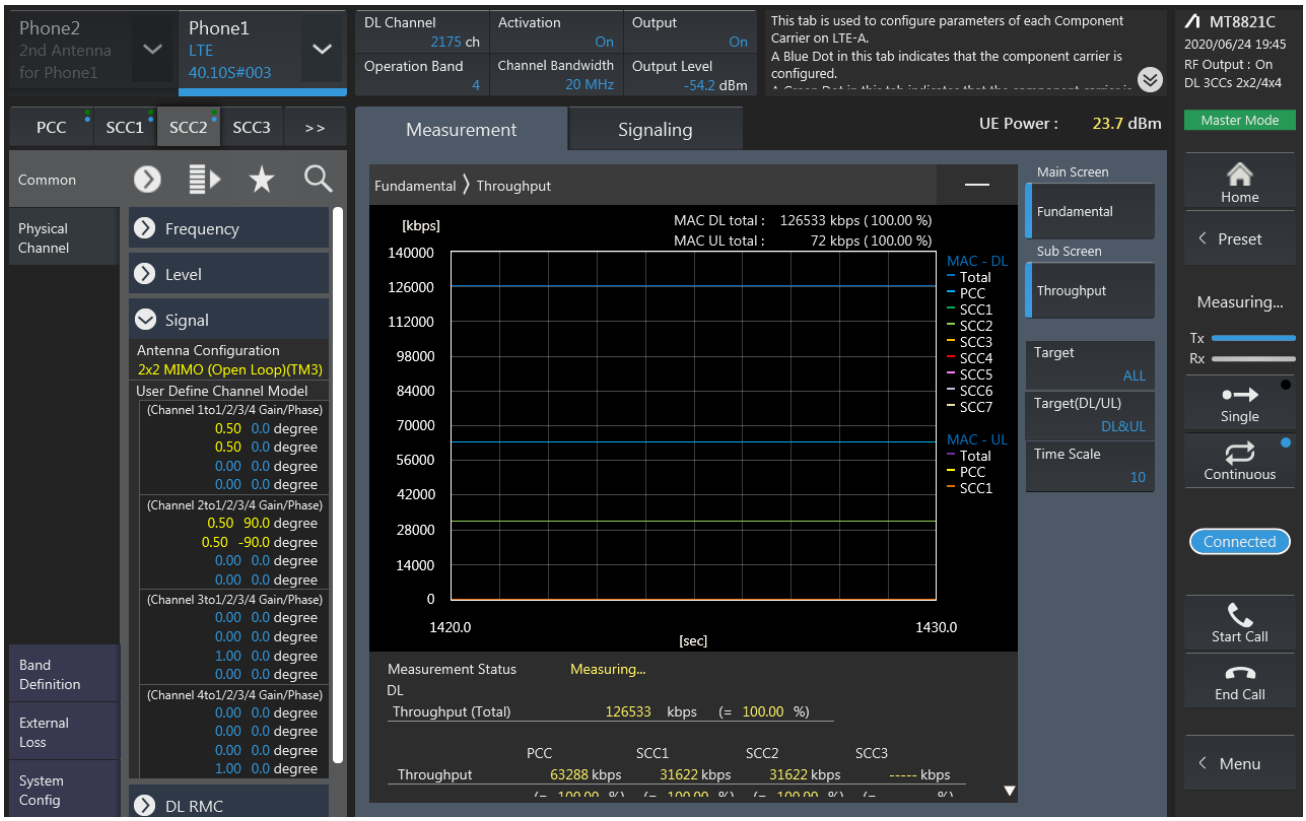
PCC Setting: Channel /RB/BW/Modulation



SCC1 Setting: Channel /RB/BW/Modulation



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

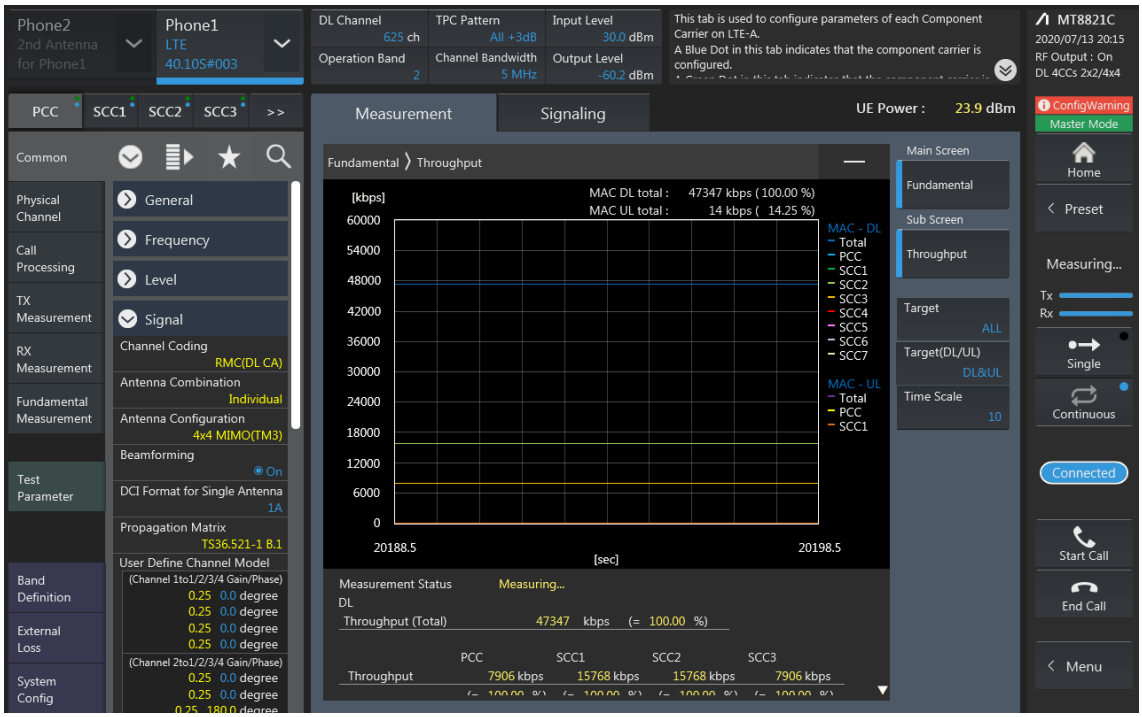


LTE Downlink 3CA 4X4 MIMO Maximum Conducted Power

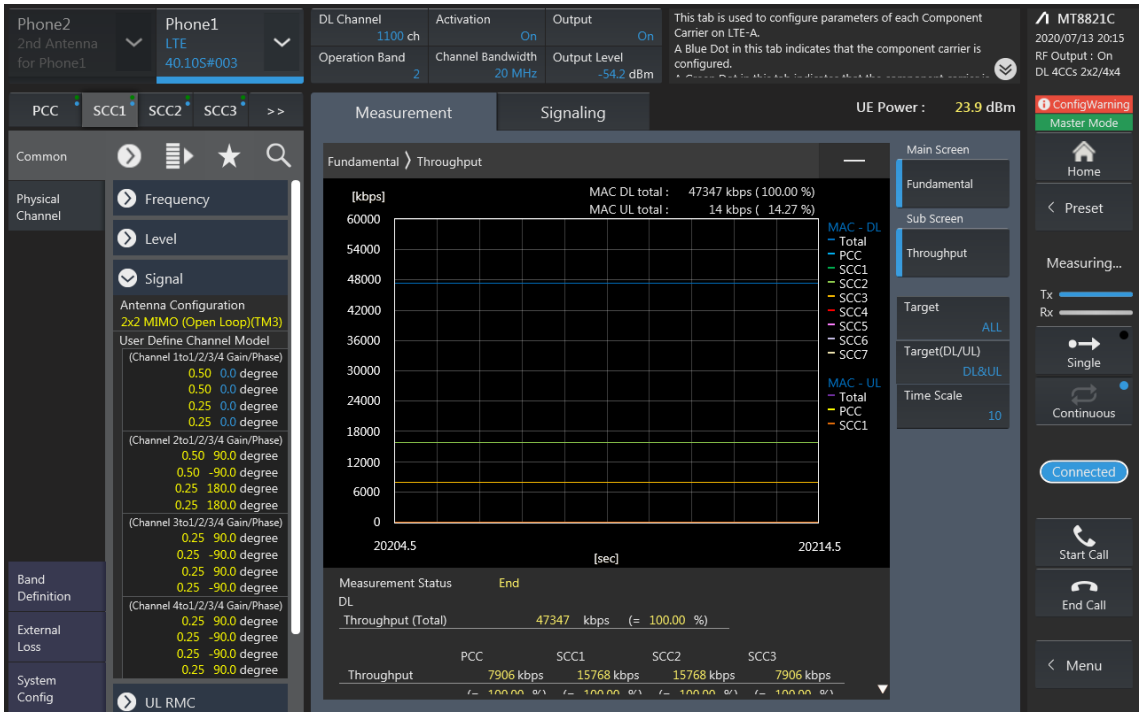
Combination	PCC									SCC				SCC				Tx Power		
	Band	BW	PCC UL Channel	PCC UL Frequency	PCC DL Channel	PCC DL Frequency	Modulation	RB	offset	Band	BW	SCC DL Channel	SCC DL Frequency	Band	BW	SCC DL Channel	SCC DL Frequency	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled(dBm) (2)	Deviaion(dB) (2)-(1)
26A-[41C](0,1,2,3)	26	10	26750	820	8750	865	QPSK	1	0	41	20	41490	2680	41	20	41292	2660.2	24.02	23.95	-0.07
[41A]-41C	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	41292	2660.2	24.3	24.21	-0.09
41A-[41C]	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	41292	2660.2	24.3	24.23	-0.07
[41A]-[41C]	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	41292	2660.2	24.3	24.20	-0.10
[41A]-41C	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	39948	2525.8	24.3	24.26	-0.04
41A-[41C]	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	39948	2525.8	24.3	24.27	-0.03
[41A]-[41C]	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	39948	2525.8	24.3	24.26	-0.04
[41D]	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	41094	2640.4	41	20	41292	2660.2	24.3	24.26	-0.04

LTE Down Link 4CA 4x4 MIMO Call Setup

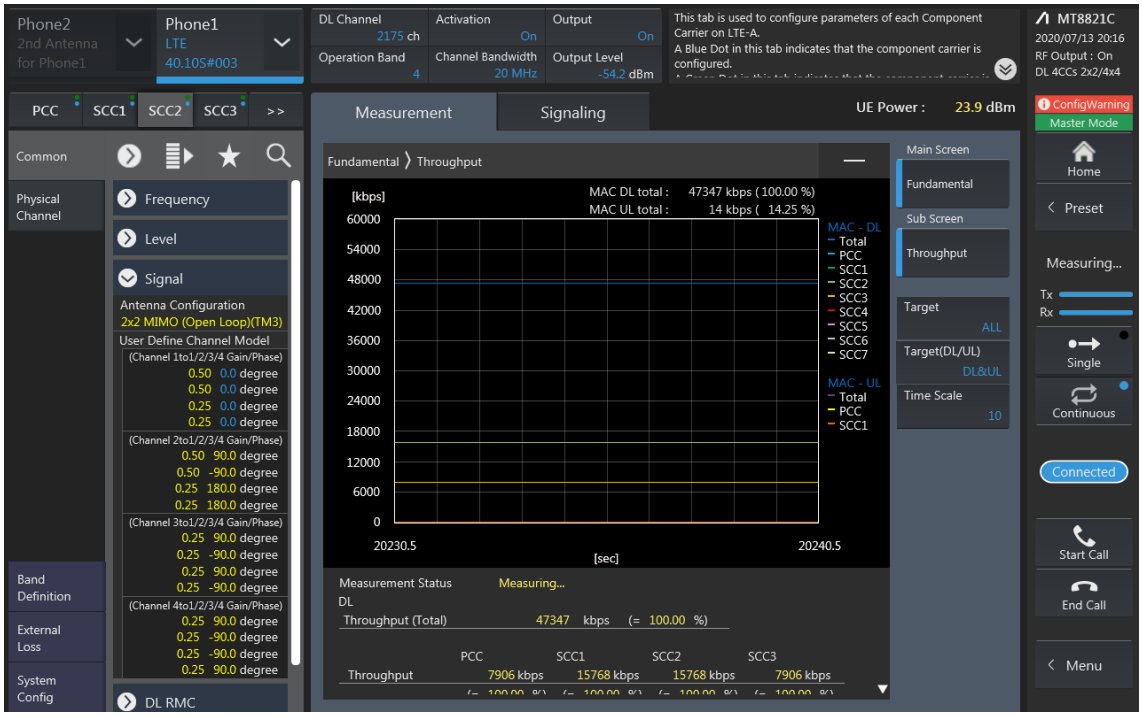
PCC Setting: Channel /RB/BW/Modulation



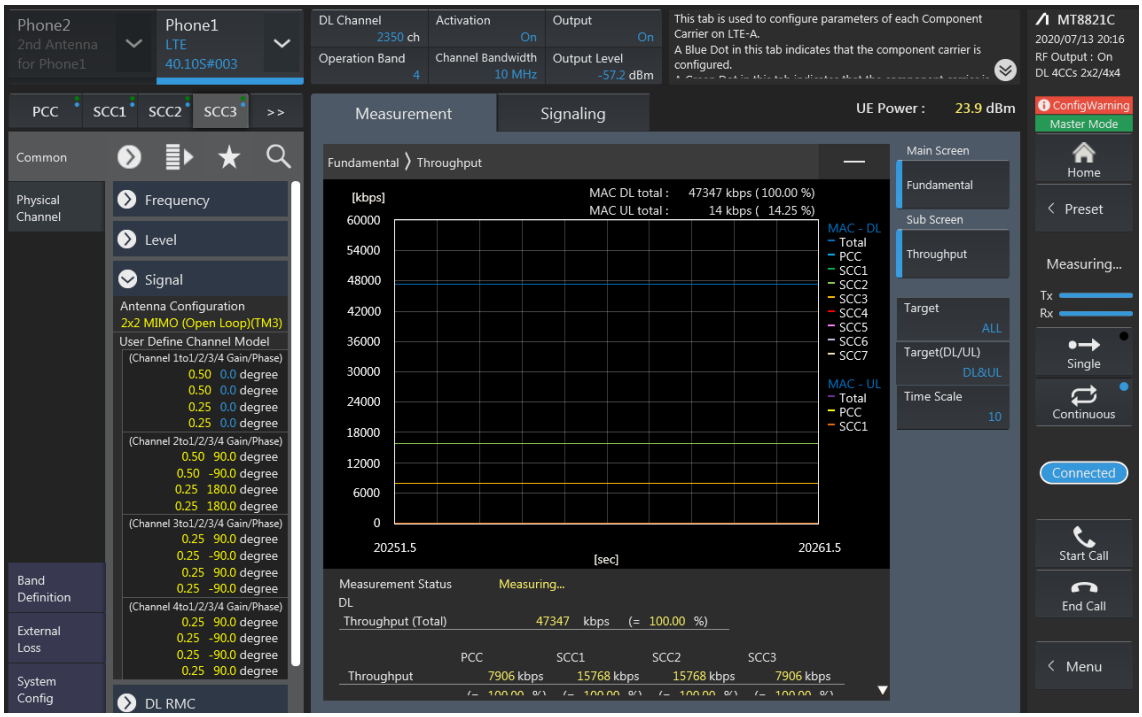
SCC1 Setting : Channel /RB/BW/Modulation



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



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



LTE Downlink 4CA 4X4 MIMO Maximum Conducted Power

Combination	PCC									SCC				SCC				SCC				Tx Power		
	Band	BW	PCC UL Channel	PCC UL Frequency	PCC DL Channel	PCC DL Frequency	Modulation	RB	offset	Band	BW	SCC DL Channel	SCC DL Frequency	Band	BW	SCC DL Channel	SCC DL Frequency	Band	BW	SCC DL Channel	SCC DL Frequency	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled(dBm) (2)	Deviaion(dB) (2)-(1)
[41C]-41C	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	39948	2525.8	41	20	41292	2660.2	24.3	24.23	-0.07
41C-[41C]	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	39948	2525.8	41	20	41292	2660.2	24.3	24.27	-0.03
[41A]-41D	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	39750	2506	41	20	39948	2525.8	41	20	40146	2545.6	24.3	24.28	-0.02
[41A]-41D	41	20	41490	2680	41490	2680	QPSK	1	49	41	20	41292	2660.2	41	20	41094	2640.4	41	20	39750	2506	24.3	24.23	-0.07