

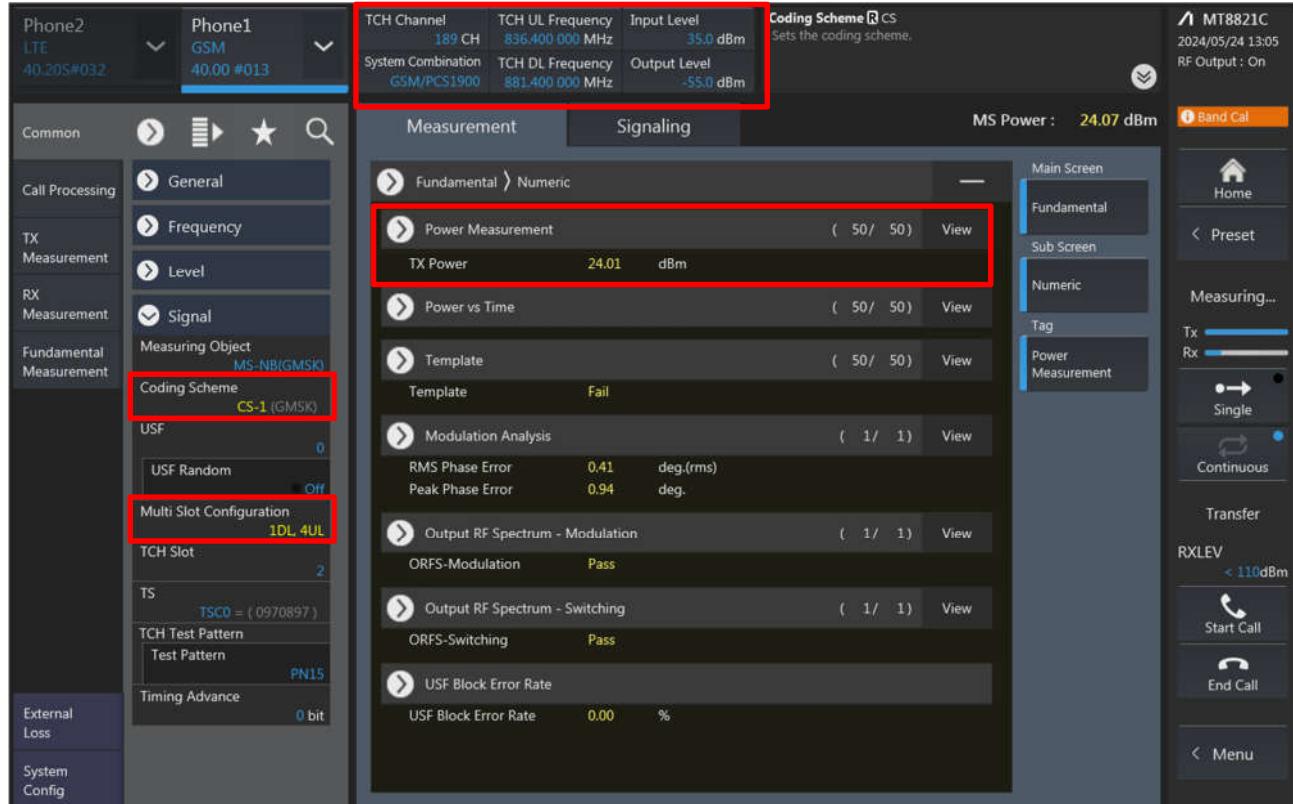


Power measurement connection diagram:

The power measurement for 2G/3G/LTE/5G FR1/UL and DL CA is to establish a connection between device and call box, and via call box to configure Bands, channel, BWs, RB size, carrier aggregation of CA, frequency channels, SCS and maximum output power.

Hereunder is screenshot call box connection information for 2G/3G/LTE/5G FR1/UL and DL CA.

<GSM>





<WCDMA>

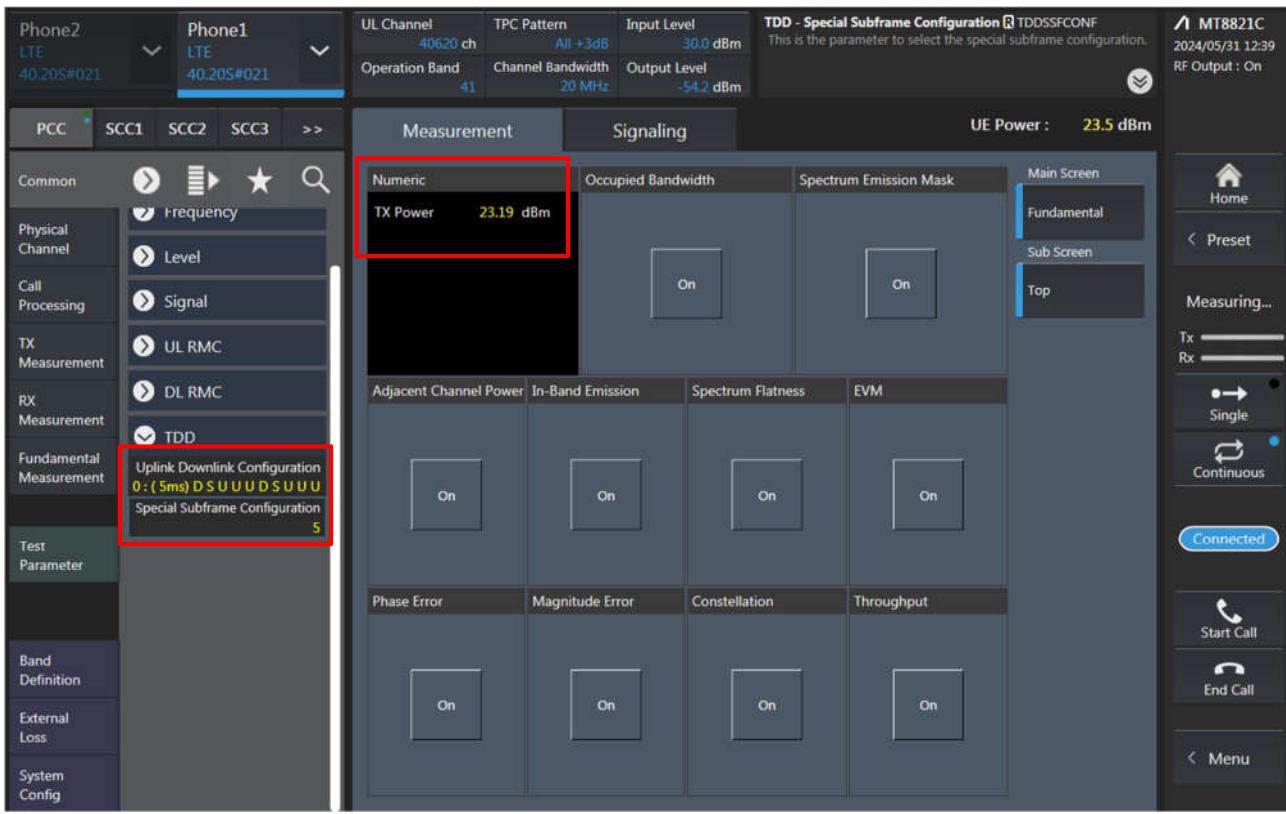
The screenshot shows the MT8821C measurement interface for WCDMA. The left sidebar lists various measurement categories. The main area displays the 'Measurement' tab with several sub-sections. A red box highlights the 'Power Measurement' section, which shows TX Power at 23.28 dBm. Another red box highlights the 'UL Channel' parameters: UL Frequency (9400 CH), Input Level (35.0 dBm), DL Frequency (9800 CH), and Output Level (-65.7 dBm). The top right corner shows the UE Power as 22.6 dBm.

<LTE>

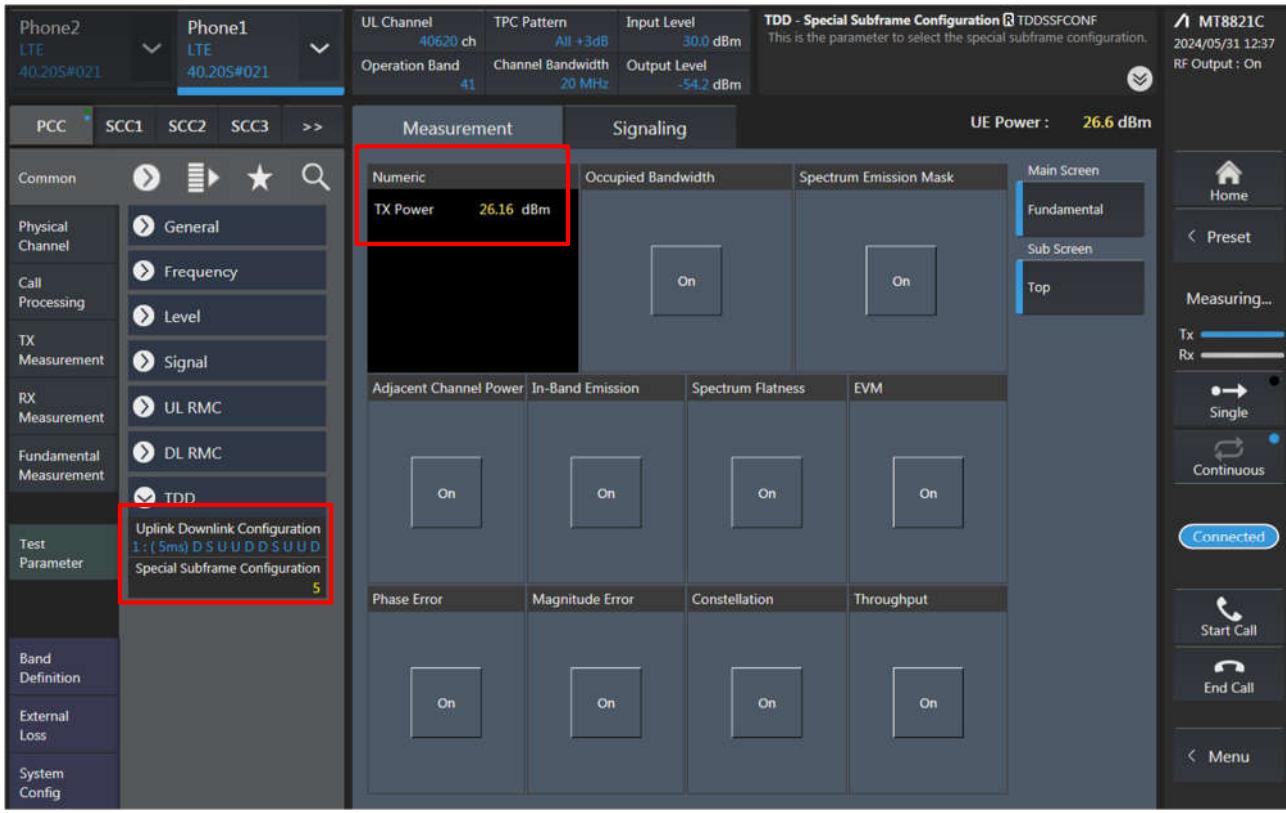
The screenshot shows the MT8821C measurement interface for LTE. The left sidebar lists various measurement categories. The main area displays the 'Measurement' tab with several sub-sections. A red box highlights the 'Numeric' section, which shows TX Power at 23.01 dBm. The top right corner shows the UE Power as 23.4 dBm.



<LTE TDD Power class 3>



<LTE TDD Power class 2>





SPORTON LAB.

Phone2 LTE 40.205#032

Phone1 LTE 40.205#032

PCC SCC1 SCC2 SCC3 >

Common Physical Channel Call Processing TX Measurement RX Measurement Fundamental Measurement Test Parameter Band Definition External Loss System Config

UL Channel 18900 ch TPC Pattern All +3dB Input Level 35.0 dBm Operation Band 2 Channel Bandwidth 20 MHz Output Level -54.2 dBm

Power Measurement - Meas. Count PWR_AVG This sets the measurement count of the power measurement.

Measurement Signaling UE Power : 25.4 dBm

Main Screen Fundamental Sub Screen Numeric Tag Power Measurement

Fundamental > Numeric

Power Measurement (50 / 50) TX Power 25.12 dBm

Modulation Analysis (1 / 1) View

Freq. Err 0.00 ppm EVM 1.35 % (rms)

Number of RB 1 Starting RB 0 Max UL Throughput 72 kbps MCS Index 5 QPSK 5.72.8

OFDM Enabled 256QAM Enabled DL RMC

Start Call End Call Menu

Connected

<5GNR FR1>

5G NR V08.90.21#000 *SA-FDD

PCC SCC1 SCC2

Common Level / Freq Cell Level / Freq Routing / ARB Physical Channel Call Processing Tx Measurement Rx Measurement OTA Position Fundamental Measurement Test Parameter External Loss System Config

DL Center Channel 126900 TPC Pattern All +3dB Input Level 26.5 dBm Operation Band 71 DL Channel Bandwidth 20MHz Output Level -40.0 dBm

Power Measurement - Count PWR_AVG

UE Power : 26.0 dBm

Main Screen Fundamental Sub Screen Top

Fundamental > Numeric

Tx Power 25.88 dBm OBW 18.787 MHz ACLR(-) -53.74 dB ACLR(+) -55.90 dB

Occupied Bandwidth OBW 18.787 MHz

Adjacent Channel Power

In-Band Emission

Spectrum Emission Mask On

Spectrum Flatness On

EVM Phase Error Magnitude Error Constellation

DFT-S-OFDM Number of RB 1 Starting RB 1 Resource Allocation Type Type1

RBG Size 1 MCS Index Table Table for 64QAM MCS Index 0 Modulation PI/2 BPSK

Aggregation Level 4 DL RMC Uplink Tx Switching

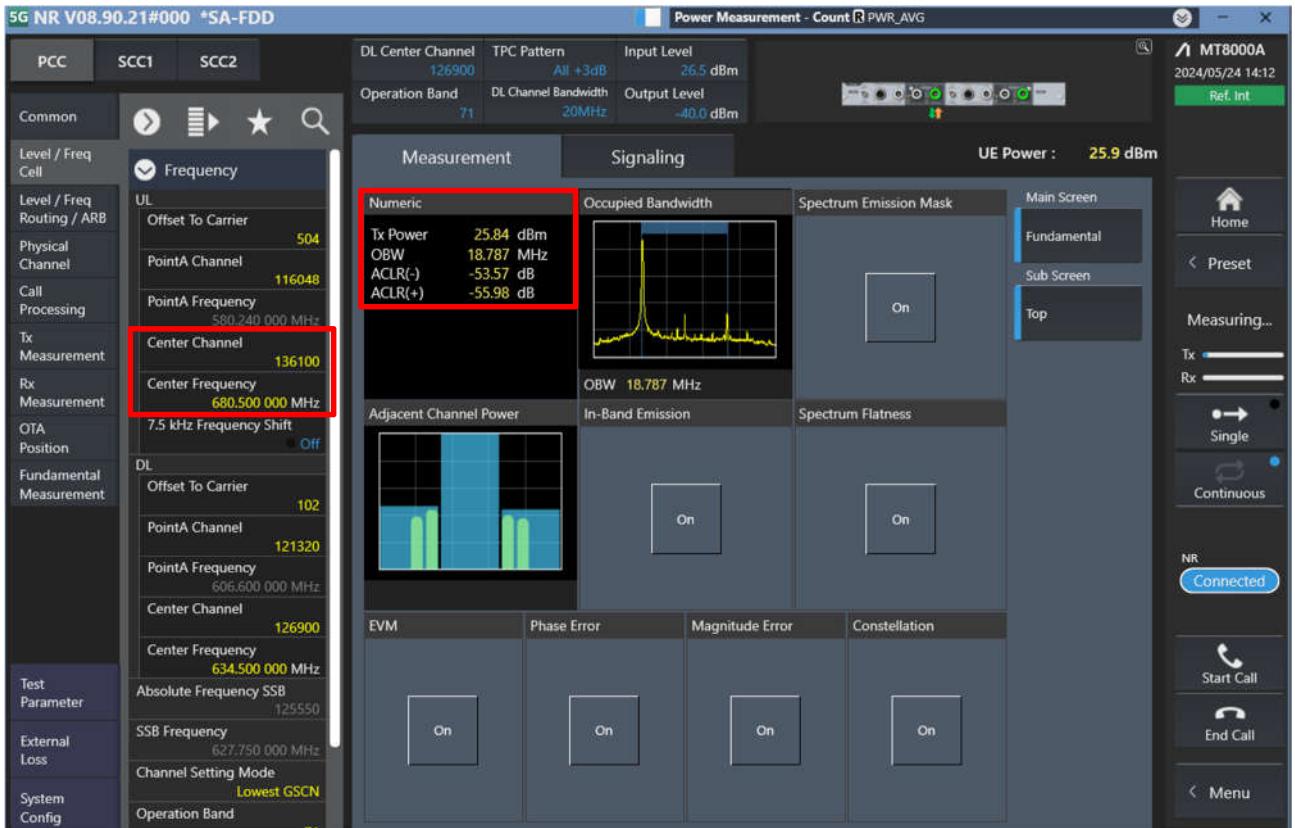
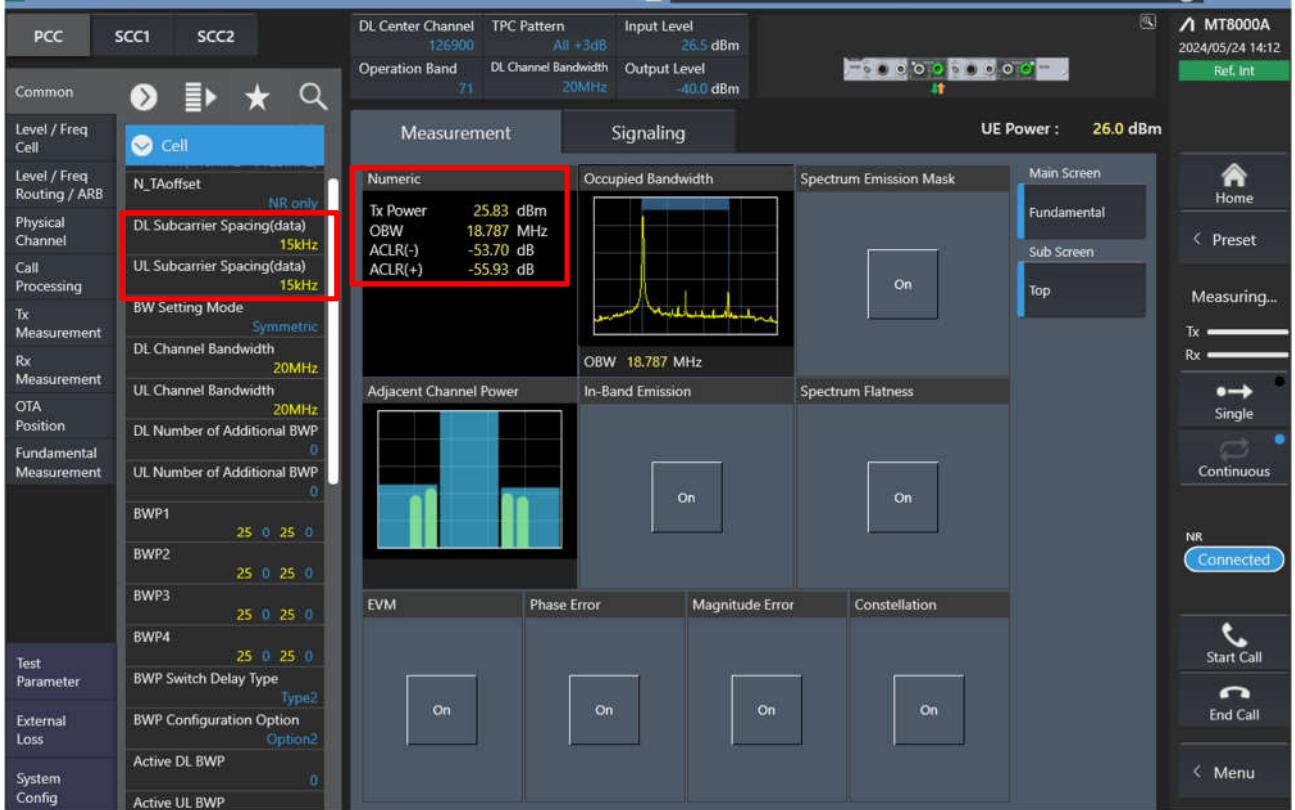
Start Call End Call Menu

Connected



5G NR V08.90.21#000 *SA-FDD

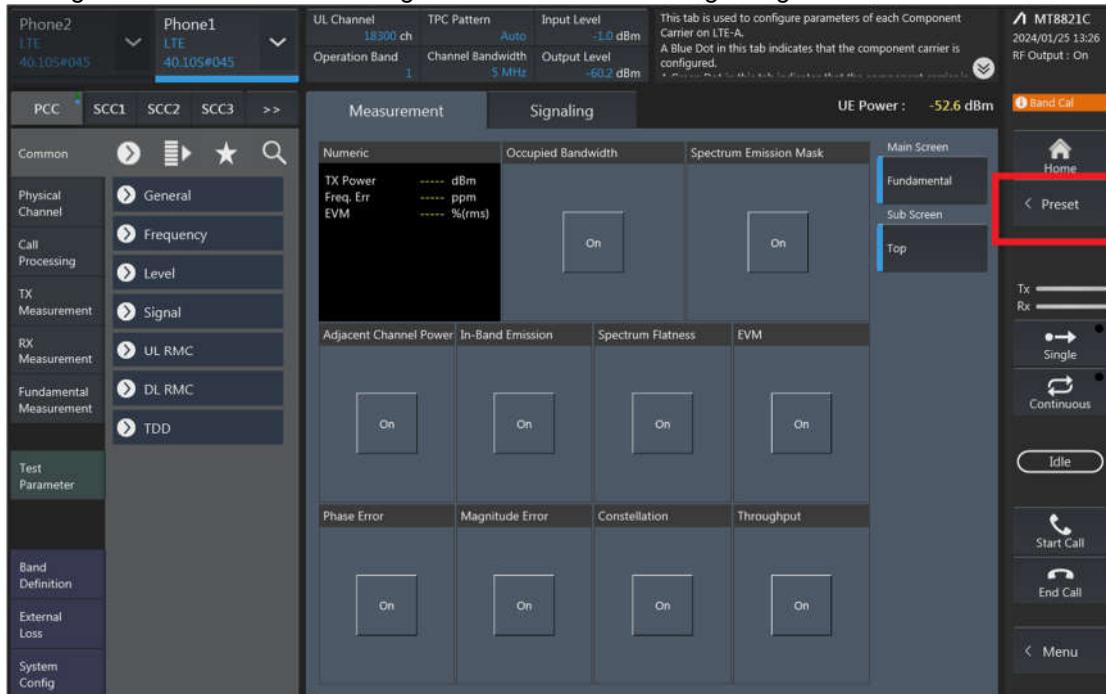
Power Measurement - Count PWR_AVG





LTE Uplink and Downlink Carrier Aggregation configurations:

1. Change the Scenario in the Configuration of Phone1 LTE Signaling and Preset.

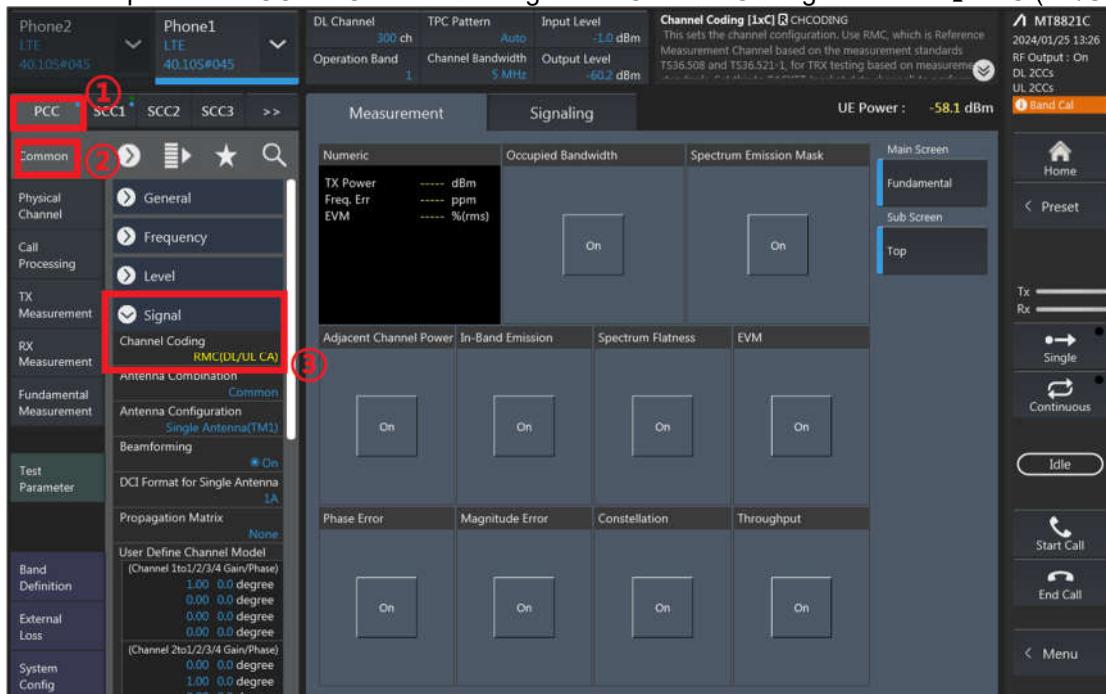


2. If Select "RMC (DL/UL CA)" for Uplink Carrier Aggregation;

If Select "RMC (DL CA)" for Downlink Carrier Aggregation.

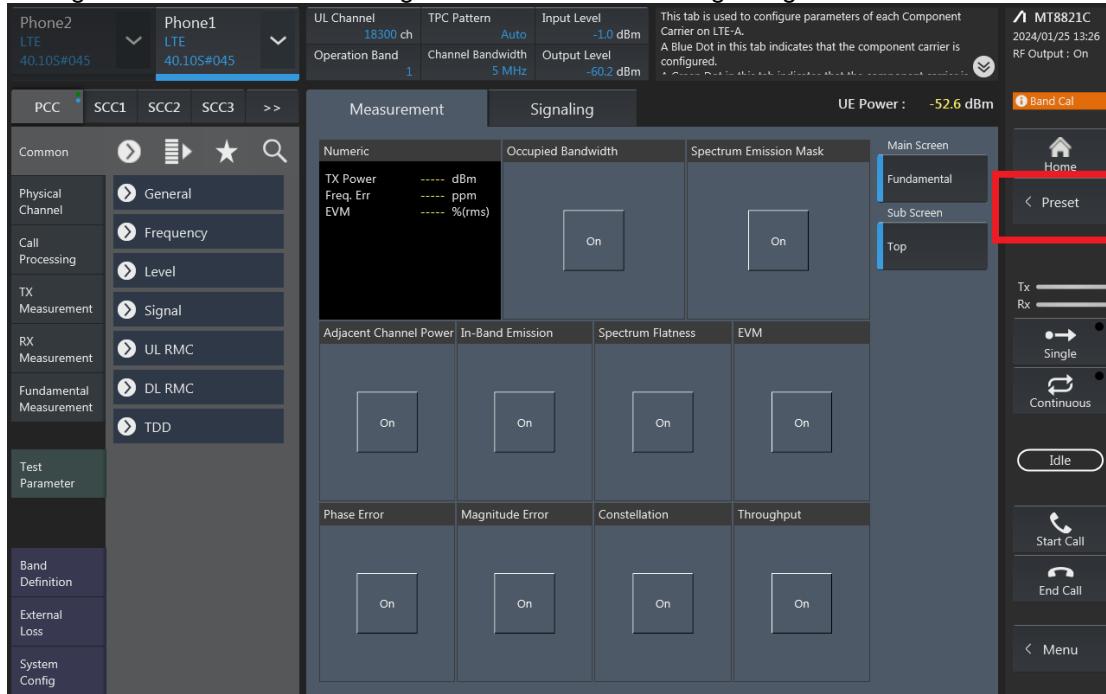
For example, Uplink Carrier Aggregation:

Detailed operation: PCC → Common → Signal → Channel Coding → Select 【RMC (DL/UL CA)】



LTE Uplink and Downlink Carrier Aggregation configurations:

1. Change the Scenario in the Configuration of Phone1 LTE Signaling and Preset.

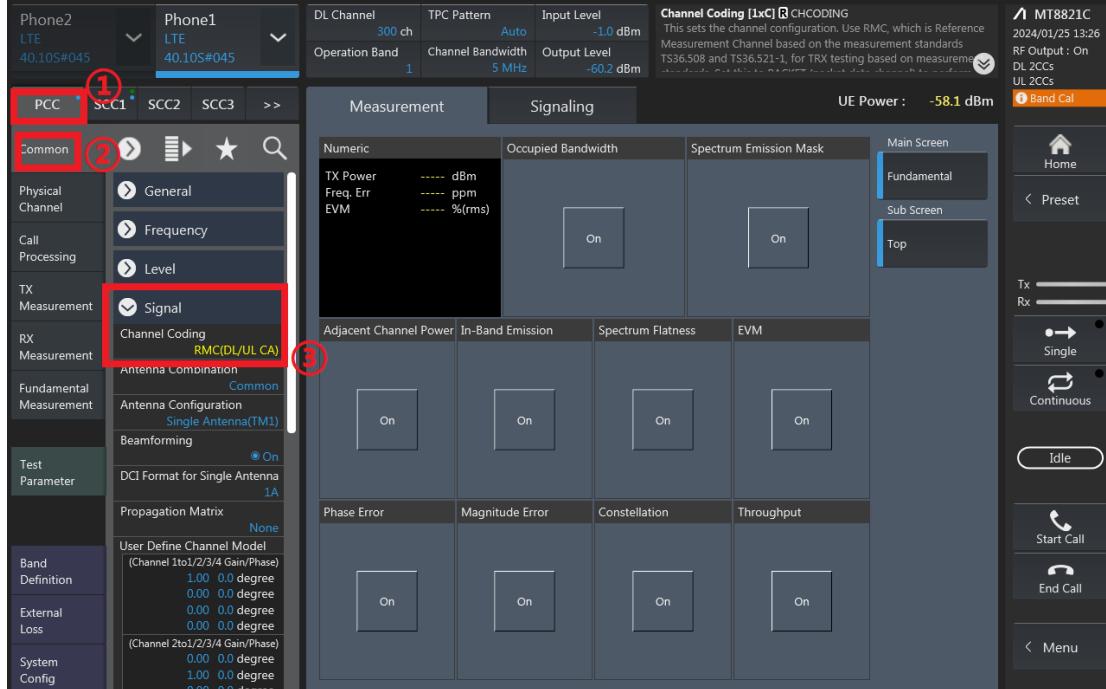


2. If Select “RMC (DL/UL CA)” for Uplink Carrier Aggregation;

If Select “RMC (DL CA)” for Downlink Carrier Aggregation.

For example, Uplink Carrier Aggregation:

Detailed operation: PCC → Common → Signal → Channel Coding → Select 【RMC (DL/UL CA)】





3. PCC parameter Settings: on the screen, and then select the PCC tab and Set operating band, BW, channel and RB configurations for PCC;

Phone2
LTE
40.10S#045

Phone1
LTE
40.10S#045

DL Channel 39750 ch TPC Pattern All +3dB Input Level 30.0 dBm Modulation Analysis R MOD_MEAS This sets whether to perform modulation analysis.

Operation Band 41 Channel Bandwidth 20 MHz Output Level -54.2 dBm

PCC SCC1 SCC2 SCC3 >>

Common (1)

Physical Channel

Call Processing

TX Measurement

RX Measurement

Fundamental Measurement

Test Parameter

Band Definition

External Loss

System Config

Measurement Signaling UE Power : -15.2 dBm

Numeric Occupied Bandwidth Spectrum Emission Mask Main Screen

TX Power dBm ppm %rms ppm %rms

PCC Freq, Err PCC EVM SCC-1 Freq, Err SCC-1 EVM

Adjacent Channel Power In-Band Emission Spectrum Flatness EVM

On On On On

Phase Error Magnitude Error Constellation Throughput

On On On On

Main Screen

Fundamental

Sub Screen

Top

MT8821C 2024/01/25 14:29

RF Output : On

DL 2CCs

UL 2CCs Cont.

Band Cal

Home

< Preset

Stop

Tx Rx

Single

Continuous

Idle

Start Call

End Call

< Menu

RB configurations (Number of RB / Starting RB) for PCC;

Phone2
LTE
40.10S#045

Phone1
LTE
40.10S#045

DL Channel 39750 ch TPC Pattern All +3dB Input Level 30.0 dBm Modulation Analysis R MOD_MEAS This sets whether to perform modulation analysis.

Operation Band 41 Channel Bandwidth 20 MHz Output Level -54.2 dBm

PCC SCC1 SCC2 SCC3 >>

Common (1)

Physical Channel

Call Processing

TX Measurement

RX Measurement

Fundamental Measurement

Test Parameter

Band Definition

External Loss

System Config

Measurement Signaling UE Power : -15.5 dBm

Numeric Occupied Bandwidth Spectrum Emission Mask Main Screen

TX Power dBm ppm %rms ppm %rms

PCC Freq, Err PCC EVM SCC-1 Freq, Err SCC-1 EVM

Adjacent Channel Power In-Band Emission Spectrum Flatness EVM

On On On On

Phase Error Magnitude Error Constellation Throughput

On On On On

Main Screen

Fundamental

Sub Screen

Top

MT8821C 2024/01/25 14:30

RF Output : On

DL 2CCs

UL 2CCs Cont.

Band Cal

Home

< Preset

Stop

Tx Rx

Single

Continuous

Idle

Start Call

End Call

< Menu



4. SCC parameter Settings: Select the SCC1 tab, Set operating band, BW, channel, and RB configurations for SCC1;

The screenshot shows the MT8821C software interface for configuring SCC1 parameters. The main window has tabs for PCC, SCC1, SCC2, and SCC3. The SCC1 tab is selected, indicated by a red circle with number 1. The left sidebar shows various physical channel settings. The main panel displays the following configuration details:

- DL Channel:** 39948 ch
- Activation:** On
- Output:** On
- Operation Band:** 41
- Channel Bandwidth:** 20 MHz
- Channel:** 39948 ch
- Frequency:** 2 525.800 000 MHz
- DL Channel:** 39948 ch
- Frequency:** 2 525.800 000 MHz
- Operation Band:** 41

The right side of the interface includes a status bar showing the date and time (2024/01/25 14:30), RF output status (On), and a 'Band Cal' button. A legend for TX Power, Freq. Err., EVM, and other metrics is also present.

RB configurations (Number of RB / Starting RB) for SCC1;

The screenshot shows the MT8821C software interface for configuring RB configurations for SCC1. The SCC1 tab is selected, indicated by a red circle with number 1. The left sidebar shows various physical channel settings, including UL RMC. The main panel displays the following configuration details:

- DL Channel:** 39948 ch
- Activation:** On
- Output:** On
- Operation Band:** 41
- Channel Bandwidth:** 20 MHz
- Output Level:** -54.2 dBm
- UL RMC:**
 - RB Pos.: Min(#0)
 - Number of RB: 100
 - Starting RB: 0

The right side of the interface includes a status bar showing the date and time (2024/01/25 14:30), RF output status (On), and a 'Band Cal' button. A legend for TX Power, Freq. Err., EVM, and other metrics is also present.



5. Select the PCC tab, then set “SIM Model Number” and select max power;

Phone2 LTE 40.10S#045 Phone1 LTE 40.10S#045

DL Channel 39750 ch TPC Pattern All +3dB Input Level 30.0 dBm
Operation Band 41 Channel Bandwidth 20 MHz Output Level -54.2 dBm

Modulation Analysis R MOD_MEAS
This sets whether to perform modulation analysis.

PCC SCC1 SCC2 SCC3 >>

Measurement Signaling UE Power : -15.5 dBm

Numeric Occupied Bandwidth Spectrum Emission Mask Main Screen

TX Power PCC Freq, Err PPM PCC EVM %rms SCC1 Freq, Err PPM SCC1 EVM %rms

Adjacent Channel Power In-Band Emission Spectrum Flatness EVM

Phase Error Magnitude Error Constellation Throughput

① TX Measurement ② SIM Model Number P0250 ③ Integrity Protection Snow 3G ④ Power Control All +3dB

⑤ Main Screen Fundamental Sub Screen Top

⑥ Home Preset Stop Tx Rx Single Continuous Idle Start Call End Call Menu

6. Click the “Connect” button at the Right of the screen, if necessary, turn the Airplane mode on/off in the DUT

Phone2 LTE 40.10S#045 Phone1 LTE 40.10S#045

DL Channel 39750 ch TPC Pattern All +3dB Input Level 30.0 dBm
Operation Band 41 Channel Bandwidth 20 MHz Output Level -54.2 dBm

This tab is used to configure parameters of each Component Carrier on LTE-A.
A Blue Dot in this tab indicates that the component carrier is configured.

Measurement Signaling UE Power : 21.3 dBm

Fundamental Numeric Power Measurement

Total Avg. Max. Min.

	Avg.	Max.	Min.
TX Power	22.38	22.38	22.38 dBm
PCC			
TX Power	21.85	21.85	21.85 dBm
Channel Power	21.84	21.84	21.84 dBm
SCC-1			
TX Power	13.02	13.02	13.02 dBm
Channel Power	13.02	13.02	13.02 dBm

① Connected ② Start Call ③ Fundamental ④ Power Measurement ⑤ Power Measurement Data ⑥ End Call

Main Screen Fundamental Sub Screen Numeric Tag Power Measurement

Home Preset Stop Tx Rx Single Continuous Idle Start Call End Call Menu

7. The inter-band DLCA test method is similar to intra-band ULCA, and DLCA test method is similar to intra-band ULCA too.



Downlink CA Power

2CA DL

CA List	PCC								SCC								Power	
	LTE		BW	BW	UL	UL	UL#	UL	LTE		BW	DL	DL	DL Antenna Configuration		With CA	Without CA	
	Band	Ant	(MHz)	Freq (MHz)	Channel	Mod	RB	DL Antenna Configuration	Band	(MHz)	Band	Channel	Mod	Tx Power	Tx Power	dBm	(dBm)	
CA_5A-7A	Band 5	Ant 0	10M	836.5	20825	QPSK	1	0	Band 7	20M	2655	3100	4x4MIMO	22.78	22.87			
	Band 7	Ant 1	20M	2535	21100	QPSK	1	0	4x4MIMO	Band 5	10M	881.5	2525		23.16	23.26		
CA_7A-26A	Band 7	Ant 1	20M	2535	21100	QPSK	1	0	4x4MIMO	Band 26	15M	876.5	8965		23.12	23.26		
	Band 26	Ant 0	15M	831.5	28863	QPSK	1	0	4x4MIMO	Band 7	20M	2655	3100	4x4MIMO	22.88	22.98		
CA_7A-7A	Band 7	Ant 1	20M	2535	21100	QPSK	1	0	4x4MIMO	Band 7	5M	2687.5	3425	4x4MIMO	23.19	23.26		
CA_7B	Band 7	Ant 1	15M	2535	21100	QPSK	1	0	4x4MIMO	Band 7	5M	2687.5	3425	4x4MIMO	23.16	23.26		
CA_7C	Band 7	Ant 1	20M	2535	21100	QPSK	1	0	4x4MIMO	Band 7	20M	2554.8	3298	4x4MIMO	23.21	23.26		
CA_38C	Band 38	Ant 4	20M	2583	37853	QPSK	1	0	4x4MIMO	Band 38	20M	2599.8	38048	4x4MIMO	23.30	23.45		
CA_41A-42A	Band 41	Ant 4	20M	2593	40625	QPSK	1	0	4x4MIMO	Band 42	20M	3600	4250	4x4MIMO	23.48	23.49		
CA_41A-41A	Band 42	Ant 5	20M	3600	42595	QPSK	1	0	4x4MIMO	Band 41	20M	2593	40620	4x4MIMO	23.66	23.76		
CA_41A-42C	Band 41	Ant 4	20M	2593	40625	QPSK	1	0	4x4MIMO	Band 41	5M	2687.5	41564	4x4MIMO	23.33	23.49		
CA_42C	Band 42	Ant 5	20M	3600	42595	QPSK	1	0	4x4MIMO	Band 42	20M	3519.8	42788	4x4MIMO	23.58	23.76		



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3CA DL

3CA List	PCC										SCC1				SCC2				Power	
	LTE	BW	BW	UL	UL	Mod.	UL#	UL	DL	DL	Dl. Antenna Configuration	LTE	BW	DL	DL	Dl. Antenna Configuration	With CA	Without CA		
	Band	Ant	(MHz)	Freq (MHz)	Channel	RB	RB	Offset	Band	(MHz)	Freq (MHz)	Channel	Band	(MHz)	Freq (MHz)	Channel	Dl. Antenna Configuration	Tx Power (dBm)	Tx Power (dBm)	
CA_41A-41C	Band 41	Ant 4	20M	2675.8	39750	QPSK	1	0	Band 41	20M	2600.2	41292	Band 41	20M	2680	41490		23.28	23.49	
CA_41D	Band 41	Ant 4	20M	2593	40620	QPSK	1	0	Band 41	20M	2612.8	40818	Band 41	20M	2632.6	41016		23.31	23.49	



Uplink CA Power

CA_7C Ant1 Default&DS2 Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
20850	21048	QPSK	1	99	1	0	23.11	24.00
21100	21298	QPSK	1	99	1	0	23.24	24.00
21350	21152	QPSK	1	0	1	99	23.08	24.00

CA_38C Ant 4 Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
37850	38048	QPSK	1	99	1	0	23.35	24.00
37901	38099	QPSK	1	99	1	0	23.24	24.00
38150	37952	QPSK	1	0	1	99	23.04	24.00

CA_41C Ant 4 Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
39750	39948	QPSK	1	99	1	0	23.14	24.00
40185	40383	QPSK	1	99	1	0	23.03	24.00
40620	40818	QPSK	1	99	1	0	23.29	24.00
41055	41253	QPSK	1	99	1	0	23.06	24.00
41490	41292	QPSK	1	0	1	99	23.08	24.00

CA_42C Ant 5 Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
42190	42388	QPSK	1	99	1	0	23.61	24.00
42590	42788	QPSK	1	99	1	0	23.68	24.00
42990	42792	QPSK	1	0	1	99	23.59	24.00



Uplink CA Power

CA_7C Ant1 DS13&DS17 Combination 20MHz+20MHz (100RB+100RB)									
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)	
			RB Size	RB offset	RB Size	RB offset			
20850	21048	QPSK	1	99	1	0	17.61	18.50	
21100	21298	QPSK	1	99	1	0	17.69	18.50	
21350	21152	QPSK	1	0	1	99	17.42	18.50	

CA_38C Ant 4 DS12 Combination 20MHz+20MHz (100RB+100RB)									
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)	
			RB Size	RB offset	RB Size	RB offset			
37850	38048	QPSK	1	99	1	0	15.89	16.50	
37901	38099	QPSK	1	99	1	0	15.88	16.50	
38150	37952	QPSK	1	0	1	99	15.71	16.50	

CA_41C Ant 4 DS12 Combination 20MHz+20MHz (100RB+100RB)									
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)	
			RB Size	RB offset	RB Size	RB offset			
39750	39948	QPSK	1	99	1	0	15.96	16.50	
40185	40383	QPSK	1	99	1	0	15.91	16.50	
40620	40818	QPSK	1	99	1	0	15.84	16.50	
41055	41253	QPSK	1	99	1	0	15.73	16.50	
41490	41292	QPSK	1	0	1	99	15.82	16.50	

CA_42C Ant 5 DS12 Combination 20MHz+20MHz (100RB+100RB)									
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)	
			RB Size	RB offset	RB Size	RB offset			
42190	42388	QPSK	1	99	1	0	19.26	20.00	
42590	42788	QPSK	1	99	1	0	19.73	20.00	
42990	42792	QPSK	1	0	1	99	19.49	20.00	

CA_7C Ant1 DS16 Combination 20MHz+20MHz (100RB+100RB)									
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)	
			RB Size	RB offset	RB Size	RB offset			
20850	21048	QPSK	1	99	1	0	20.09	21.00	
21100	21298	QPSK	1	99	1	0	20.18	21.00	
21350	21152	QPSK	1	0	1	99	19.92	21.00	

CA_38C Ant 4 DS13 Combination 20MHz+20MHz (100RB+100RB)									
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)	
			RB Size	RB offset	RB Size	RB offset			
37850	38048	QPSK	1	99	1	0	16.83	17.50	
37901	38099	QPSK	1	99	1	0	16.80	17.50	
38150	37952	QPSK	1	0	1	99	16.71	17.50	

CA_41C Ant 4 DS13 Combination 20MHz+20MHz (100RB+100RB)									
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)	
			RB Size	RB offset	RB Size	RB offset			
39750	39948	QPSK	1	99	1	0	15.2	16.00	
40185	40383	QPSK	1	99	1	0	15.39	16.00	
40620	40818	QPSK	1	99	1	0	15.55	16.00	
41055	41253	QPSK	1	99	1	0	15.38	16.00	
41490	41292	QPSK	1	0	1	99	15.36	16.00	

CA_42C Ant 5 DS13 Combination 20MHz+20MHz (100RB+100RB)									
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)	
			RB Size	RB offset	RB Size	RB offset			
42190	42388	QPSK	1	99	1	0	17.91	18.50	
42590	42788	QPSK	1	99	1	0	18.25	18.50	
42990	42792	QPSK	1	0	1	99	18.21	18.50	



CA_38C Ant 4 DS17								
Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
37850	38048	QPSK	1	99	1	0	13.37	14.00
37901	38099	QPSK	1	99	1	0	13.44	14.00
38150	37952	QPSK	1	0	1	99	13.34	14.00

CA_41C Ant 4 DS17								
Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
39750	39948	QPSK	1	99	1	0	13.25	14.00
40185	40383	QPSK	1	99	1	0	13.37	14.00
40620	40818	QPSK	1	99	1	0	13.4	14.00
41055	41253	QPSK	1	99	1	0	13.33	14.00
41490	41292	QPSK	1	0	1	99	13.38	14.00

CA_42C Ant 5 DS17								
Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
42190	42388	QPSK	1	99	1	0	15.68	16.50
42590	42788	QPSK	1	99	1	0	16.19	16.50
42990	42792	QPSK	1	0	1	99	16.06	16.50

CA_38C Ant 4 DS16								
Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
37850	38048	QPSK	1	99	1	0	19.68	20.50
37901	38099	QPSK	1	99	1	0	19.83	20.50
38150	37952	QPSK	1	0	1	99	19.83	20.50

CA_41C Ant 4 DS16								
Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
39750	39948	QPSK	1	99	1	0	19.92	20.50
40185	40383	QPSK	1	99	1	0	19.95	20.50
40620	40818	QPSK	1	99	1	0	19.87	20.50
41055	41253	QPSK	1	99	1	0	19.83	20.50
41490	41292	QPSK	1	0	1	99	19.68	20.50

CA_42C Ant 5 DS16								
Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
42190	42388	QPSK	1	99	1	0	22.71	23.00
42590	42788	QPSK	1	99	1	0	22.75	23.00
42990	42792	QPSK	1	0	1	99	22.69	23.00