



Power measurement connection diagram:

The power measurement for 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 3G/LTE/5G FR1/UL and DL CA.

<WCDMA>

The screenshot displays the following data:

Measurement Category	Parameter	Value	Unit
UL Channel / Frequency	UL Channel	9400 CH	
	UL Frequency	1 880.000 000 MHz	
	DL Channel	9800 CH	
	DL Frequency	1 960.000 000 MHz	
Power Measurement	TX Power	23.28	dBm
	Frequency Error	-0.0002	kHz
Occupied Bandwidth	Carrier Frequency Error	0.00	ppm
	OBW	4.163	MHz
Spectrum Emission Mask	SEM	Pass	
	Adjacent Channel Power	-40.24	dB
Modulation Analysis	ACLR(-5MHz)	-42.79	dB
	EVM	5.15	%(rms)
Peak Code Domain Error	PCDE	-39.86	dB



<LTE>

The screenshot displays the LTE test equipment interface. At the top, it shows two phone configurations: Phone2 (LTE, 40.20S#021) and Phone1 (LTE, 40.20S#021). Key parameters include UL Channel (21100 ch), TPC Pattern (All +3dB), Input Level (30.0 dBm), Operation Band (7), Channel Bandwidth (20 MHz), and Output Level (-67.0 dBm). An 'External Loss - Main DL' section provides a detailed explanation of the DLEXTLOSS parameter. The 'Measurement' tab is active, showing 'TX Power' at 23.01 dBm. Other measurement options like Occupied Bandwidth, Spectrum Emission Mask, Adjacent Channel Power, In-Band Emission, Spectrum Flatness, EVM, Phase Error, Magnitude Error, Constellation, and Throughput are also visible, many with 'On' buttons. The 'Test Parameter' section shows 'Uplink Downlink Configuration 1: (5ms)DSUUDDSUUD' and 'Special Subframe Configuration 4'. The interface also includes a 'Common' menu, a 'Physical Channel' section, and a 'Fundamental Measurement' section. On the right side, there are controls for 'Main Screen' (Fundamental, Sub Screen, Top), 'Measuring...' (Single, Continuous), and 'Connected' status. The bottom right corner features 'Start Call' and 'End Call' buttons.

<LTE TDD Power class 3>

Phone2 LTE 40.20S#021 | Phone1 LTE 40.20S#021

UL Channel 40620 ch | TPC Pattern All +3dB | Input Level 30.0 dBm

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

TDD - Special Subframe Configuration TDDSSFCNF

UE Power : 23.5 dBm

Measurement

Numeric TX Power 23.19 dBm

Occupied Bandwidth [On]

Spectrum Emission Mask [On]

Adjacent Channel Power [On]

In-Band Emission [On]

Spectrum Flatness [On]

EVM [On]

Phase Error [On]

Magnitude Error [On]

Constellation [On]

Throughput [On]

Test Parameter

Uplink Downlink Configuration 0: (5ms) D S U U D S U U U

Special Subframe Configuration 5

<LTE TDD Power class 2>

Phone2 LTE 40.20S#021 | Phone1 LTE 40.20S#021

UL Channel 40620 ch | TPC Pattern All +3dB | Input Level 30.0 dBm

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

TDD - Special Subframe Configuration TDDSSFCNF

UE Power : 26.6 dBm

Measurement

Numeric TX Power 26.16 dBm

Occupied Bandwidth [On]

Spectrum Emission Mask [On]

Adjacent Channel Power [On]

In-Band Emission [On]

Spectrum Flatness [On]

EVM [On]

Phase Error [On]

Magnitude Error [On]

Constellation [On]

Throughput [On]

Test Parameter

Uplink Downlink Configuration 1: (5ms) D S U U D D S U U D

Special Subframe Configuration 5

Phone2 LTE 40.20S#032 | Phone1 LTE 40.20S#032

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.

UE Power : 25.4 dBm

Measurement: Fundamental | Signaling: Numeric

Power Measurement (50 / 50)
 TX Power: 25.12 dBm

Modulation Analysis (1 / 1) View
 Freq. Err: 0.00 ppm
 EVM: 1.35 %(rms)

Test Parameter:
 Number of RB: 1
 Starting RB: 0
 Max UL Throughput: 72 kbps
 MCS Index: 5 QPSK 5 72 8

<5G NR FR1>

5G NR V08.90.21#000 *SA-FDD | Power Measurement - Count PWR_AVG

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

UE Power : 26.0 dBm

Measurement: Numeric

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

Occupied Bandwidth: OBW 18.787 MHz

Waveform: DFT-S-OFDM

Number of RB: 1
 Starting RB: 1

Modulation: Pi/2 BPSK



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

Power Measurement - Count PWR_AVG

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

UE Power : 26.0 dBm

Measurement Signaling

Numeric

Tx Power	25.83 dBm
OBW	18.787 MHz
ACLR(-)	-53.70 dB
ACLR(+)	-55.93 dB

Occupied Bandwidth
 OBW 18.787 MHz

Adjacent Channel Power
 In-Band Emission
 Spectrum Flatness

EVM Phase Error Magnitude Error Constellation

Common

Level / Freq Cell

Level / Freq Routing / ARB N_TAoffset NR only

Physical Channel DL Subcarrier Spacing(data) 15kHz

Call Processing UL Subcarrier Spacing(data) 15kHz

Tx Measurement BW Setting Mode Symmetric

Rx Measurement DL Channel Bandwidth 20MHz

OTA DL Channel Bandwidth 20MHz

Position DL Number of Additional BWP 0

Fundamental Measurement UL Number of Additional BWP 0

BWP1 25 0 25 0

BWP2 25 0 25 0

BWP3 25 0 25 0

BWP4 25 0 25 0

Test Parameter BWP Switch Delay Type Type2

External Loss BWP Configuration Option Option2

System Config Active DL BWP 0

Active UL BWP

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Home Preset Measuring... Tx Rx Single Continuous NR Connected Start Call End Call Menu

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

Power Measurement - Count PWR_AVG

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

UE Power : 25.9 dBm

Measurement Signaling

Numeric

Tx Power	25.84 dBm
OBW	18.787 MHz
ACLR(-)	-53.57 dB
ACLR(+)	-55.98 dB

Occupied Bandwidth
 OBW 18.787 MHz

Adjacent Channel Power
 In-Band Emission
 Spectrum Flatness

EVM Phase Error Magnitude Error Constellation

Common

Level / Freq Cell

Level / Freq Routing / ARB Frequency

Physical Channel UL Offset To Carrier 504

Call Processing PointA Channel 116048

PointA Frequency 580.240 000 MHz

Tx Measurement Center Channel 136100

Rx Measurement Center Frequency 680.500 000 MHz

OTA 7.5 kHz Frequency Shift Off

Position DL Offset To Carrier 102

Fundamental Measurement PointA Channel 121320

PointA Frequency 606.600 000 MHz

Center Channel 126900

Center Frequency 634.500 000 MHz

Test Parameter Absolute Frequency SSB 125550

External Loss SSB Frequency 627.750 000 MHz

System Config Channel Setting Mode Lowest GSCN

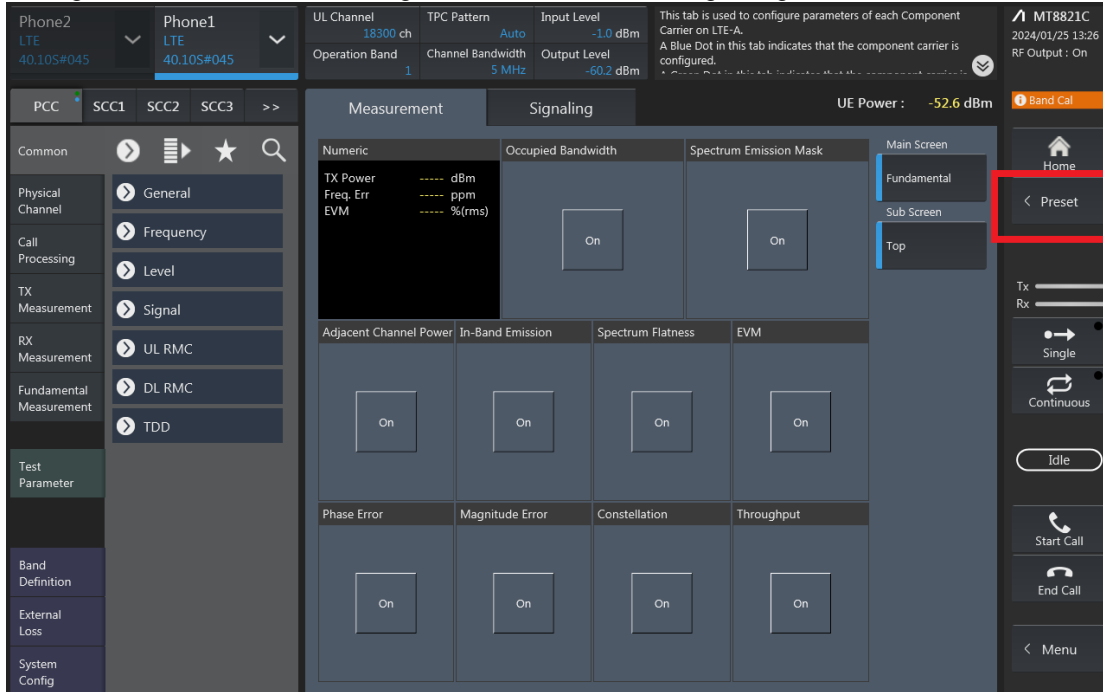
Operation Band 71

MT8000A 2024/05/24 14:12 Ref. Int

Home Preset Measuring... Tx Rx Single Continuous NR Connected Start Call End Call Menu

LTE Uplink and Downlink Carrier Aggregation configurations:

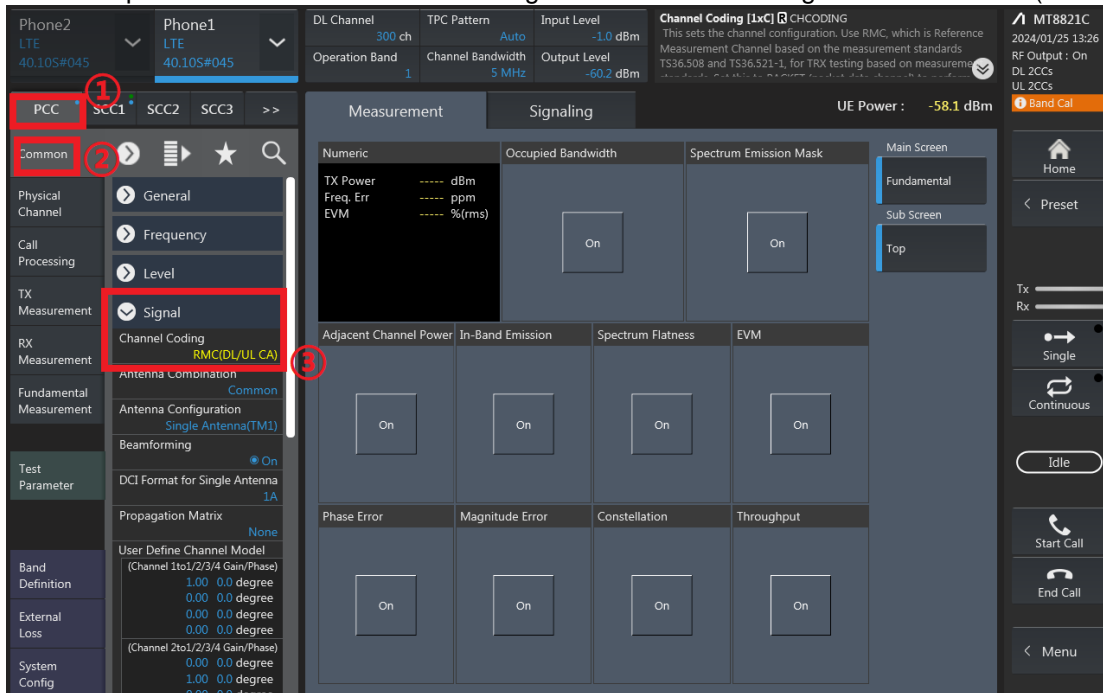
1. Change the Scenario in the Configuration of Phone1 LTE Signaling and Preset.



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;

The screenshot shows the PCC parameter settings interface. The left sidebar is expanded to show the 'Common' tab. The main area displays the 'Measurement' and 'Signaling' tabs. The following settings are highlighted with red boxes and circled numbers:

- 1. Common tab
- 2. Operation Band: 41
- 3. Channel Bandwidth: 20 MHz
- 4. Channel: 39750 ch

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

The screenshot shows the RB configurations interface. The left sidebar is expanded to show the 'UL RMC' and 'Test Parameter' sections. The main area displays the 'Measurement' and 'Signaling' tabs. The following settings are highlighted with red boxes and circled numbers:

- 1. UL RMC
- 2. UL Allocation Mode: Normal
- 3. Number of RB: 100
- 4. Starting RB: 0

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

The screenshot shows the SCC1 configuration screen. The 'DL Channel' is set to 39948 ch, 'Operation Band' is 41, 'Channel Bandwidth' is 20 MHz, and 'Channel' is 39948 ch. The 'Activation' and 'Output' status are both 'On'. The 'UE Power' is -15.5 dBm. The interface includes sections for 'Measurement' and 'Signaling' with various 'On' buttons for metrics like Adjacent Channel Power, In-Band Emission, Spectrum Flatness, EVM, Phase Error, Magnitude Error, Constellation, and Throughput.

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

This screenshot shows the 'UL RMC' configuration section expanded. The 'Number of RB' is set to 100 and the 'Starting RB' is set to 0. The 'RB Pos.' is marked as 'Min(#0)'. Other parameters like 'Max UL Throughput' (3504 kbps) and 'MCS Index' (5 QPSK 5 8760 8) are also visible. The 'DL RMC' and 'TDD' sections are also present in the left sidebar.

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

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

	Avg.	Max.	Min.
Total 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

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



2CA DL

CA List	PCC										SCC					Power	
	LTE Band	BW	BW	UL	UL	Mod	UL#	UL	DL Antenna Configuration	DL Antenna Configuration	LTE Band	BW	DL	DL	DL Antenna Configuration	With CA	Without CA
	Ant	(MHz)	Freq	Channel	RB		Offset	(MHz)			Freq	Channel	Tx Power (dBm)	Tx Power (dBm)			
CA_2A-7A	Band 2	Ant 0	20M	1880	1890	QPSK	1	0	4x4MIMO	Band 7	20M	2655	3100	4x4MIMO	22.90	23.15	
	Band 2	Ant 1	20M	1880	1890	QPSK	1	0	4x4MIMO	Band 7	20M	2655	3100	4x4MIMO	22.74	22.89	
	Band 7	Ant 0	20M	2535	2110	QPSK	1	0	4x4MIMO	Band 2	20M	1960	900	4x4MIMO	22.31	22.45	
CA_2A-17A	Band 7	Ant 1	20M	2535	2110	QPSK	1	0	4x4MIMO	Band 2	20M	1960	900	4x4MIMO	21.52	21.63	
	Band 2	Ant 0	20M	1880	1890	QPSK	1	0	4x4MIMO	Band 17	10M	740	5790		23.02	23.15	
	Band 2	Ant 1	20M	1880	1890	QPSK	1	0	4x4MIMO	Band 17	10M	740	5790		22.70	22.99	
CA_4A-17A	Band 17	Ant 1	10M	710	23780	QPSK	1	0		Band 2	20M	1960	900	4x4MIMO	23.90	24.02	
	Band 4	Ant 0	10M	1732.5	20175	QPSK	1	0	4x4MIMO	Band 17	10M	740	5790		23.08	23.19	
	Band 4	Ant 1	10M	1732.5	20175	QPSK	1	0	4x4MIMO	Band 17	10M	740	5790		22.84	22.93	
CA_4A-48A	Band 17	Ant 1	10M	710	23780	QPSK	1	0		Band 4	10M	2132.5	2175	4x4MIMO	23.86	24.02	
	Band 4	Ant 0	20M	1732.5	20175	QPSK	1	0	4x4MIMO	Band 48	20M	3609	5830	4x4MIMO	23.06	23.19	
	Band 4	Ant 1	20M	1732.5	20175	QPSK	1	0	4x4MIMO	Band 48	20M	3609	5830	4x4MIMO	22.87	22.93	
CA_5A-5A	Band 48	Ant 2	20M	3609	5830	QPSK	1	0	4x4MIMO	Band 4	20M	2132.5	2175	4x4MIMO	23.85	23.96	
	Band 5	Ant 1	10M	836.5	20525	QPSK	1	0		Band 5	5M	881.5	2525		24.01	24.15	
	Band 5	Ant 1	10M	836.5	20525	QPSK	1	0		Band 7	20M	2655	3100	4x4MIMO	24.12	24.15	
CA_5A-7A	Band 7	Ant 0	20M	2535	2110	QPSK	1	0	4x4MIMO	Band 5	10M	881.5	2525		22.24	22.45	
	Band 7	Ant 1	20M	2535	2110	QPSK	1	0	4x4MIMO	Band 5	10M	881.5	2525		21.44	21.63	
	Band 7	Ant 0	20M	2535	2110	QPSK	1	0	4x4MIMO	Band 7	5M	2687.5	3425	4x4MIMO	22.28	22.45	
CA_7A-7A	Band 7	Ant 1	20M	2535	2110	QPSK	1	0	4x4MIMO	Band 7	5M	2687.5	3425	4x4MIMO	21.61	21.63	
	Band 7	Ant 0	20M	2535	2110	QPSK	1	0	4x4MIMO	Band 7	20M	2544.8	3298	4x4MIMO	22.33	22.45	
	Band 7	Ant 1	20M	2535	2110	QPSK	1	0	4x4MIMO	Band 7	20M	2544.8	3298	4x4MIMO	21.43	21.63	
CA_25A-25A	Band 25	Ant 0	20M	1880	26340	QPSK	1	0	4x4MIMO	Band 25	5M	1891.7	8457	4x4MIMO	22.99	23.17	
	Band 25	Ant 1	20M	1880	26340	QPSK	1	0	4x4MIMO	Band 25	5M	1891.7	8457	4x4MIMO	22.76	22.93	
CA_38C	Band 38	Ant 0	20M	2980	37850	QPSK	1	0	4x4MIMO	Band 38	20M	2599.8	38048	4x4MIMO	21.95	22.13	
	Band 38	Ant 1	20M	2980	37850	QPSK	1	0	4x4MIMO	Band 38	20M	2599.8	38048	4x4MIMO	21.79	21.92	

Uplink CA Power

CA_7C Ant0 Default								
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	22.08	23.00
21100	21298	QPSK	1	99	1	0	22.25	23.00
21350	21152	QPSK	1	0	1	99	22.21	23.00

CA_66C Ant0 Default								
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		
132072	132270	QPSK	1	99	1	0	23.06	24.00
132322	132520	QPSK	1	99	1	0	23.19	24.00
132572	132374	QPSK	1	0	1	99	22.92	24.00

CA_66B Ant0 Default								
Combination 15MHz+15MHz (75RB+75RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
132047	132146	QPSK	1	74	1	0	22.82	24.00
132322	132421	QPSK	1	74	1	0	23.08	24.00
132597	132498	QPSK	1	0	1	74	22.83	24.00

CA_38C Ant0 Default								
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	22.07	23.00
38000	38198	QPSK	1	99	1	0	22.09	23.00
38150	37952	QPSK	1	0	1	99	21.96	23.00

CA_41C Ant0 Default								
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	22.17	23.00
40185	40383	QPSK	1	99	1	0	22.23	23.00
40620	40818	QPSK	1	99	1	0	22.22	23.00
41055	41253	QPSK	1	99	1	0	22.31	23.00
41490	41292	QPSK	1	0	1	99	22.21	23.00

CA_48C Ant2 Default								
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		
55340	55538	QPSK	1	99	1	0	23.59	25.00
55830	56028	QPSK	1	99	1	0	23.72	25.00
56150	56348	QPSK	1	99	1	0	23.79	25.00
56640	56442	QPSK	1	0	1	99	23.7	25.00

Uplink CA Power

CA_66C Ant0 Sensor on&Hotspot								
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		
132072	132270	QPSK	1	99	1	0	22.21	23.00
132322	132520	QPSK	1	99	1	0	22.41	23.00
132572	132374	QPSK	1	0	1	99	22.38	23.00

CA_66B Ant0 Sensor on&Hotspot								
Combination 15MHz+15MHz (75RB+75RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset		
132047	132146	QPSK	1	74	1	0	22.23	23.00
132322	132421	QPSK	1	74	1	0	22.27	23.00
132597	132498	QPSK	1	0	1	74	22.16	23.00

CA_48C Ant2 Receiver on								
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		
55340	55538	QPSK	1	99	1	0	22.8	24.00
55830	56028	QPSK	1	99	1	0	22.75	24.00
56150	56348	QPSK	1	99	1	0	22.73	24.00
56640	56442	QPSK	1	0	1	99	22.71	24.00

CA_48C Ant2 Sensor on&Hotspot								
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		
55340	55538	QPSK	1	99	1	0	18.74	20.00
55830	56028	QPSK	1	99	1	0	18.87	20.00
56150	56348	QPSK	1	99	1	0	18.83	20.00
56640	56442	QPSK	1	0	1	99	18.81	20.00