

Appendix H. – Power reduction verification

Per the May 2017 TCBC Workshop notes, demonstration of proper functioning of the power reduction mechanism is required to support the corresponding SAR Configurations.

The verification process was divided into two parts:

- 1). Evaluation of output power levels for individual triggering mechanism
- 2) Evaluation of the triggering distances for proximity-based sensors.

1. Power Reduction Verification for Main Ant#1,#2

The Power verification was performed according to the following procedure:

1. A base station simulator was used to establish a conducted RF connection and output power was monitored. The Power measurements were conformed to be within expected tolerances for all states before and after a power reduction mechanism was triggered.
2. Step 1 was repeated for all relevant modes and frequency bands for the mechanism being investigated.
3. Step 1 and 2 were repeated for all individual power reduction mechanism and combinations thereof. For the combination cases, one mechanism was switched to a “triggered” state at a time; powers were conformed to be within tolerance after each additional mechanism was activated.

Main Antenna Verification Summary

Mechanism(s)	Mode/Band	Power reduction Mechanism		
		Un-triggered (Max Power)	Triggered (Reduced Power)	Triggered (Reduced Power)
Grip	WCDMA B2	23.83	18.80	
Grip	WCDMA B4	23.31	19.56	
Grip	LTE Band 2	24.08	19.74	
Grip	LTE Band 4	23.16	18.87	
Grip	LTE Band 5	23.22	20.01	
Grip	LTE Band 7	23.52	17.26	
Grip	LTE Band 12	23.37	19.86	
Grip	LTE Band 25	24.03	19.78	
Grip	LTE Band 26	24.48	20.04	
Grip	LTE Band 30	21.90	15.92	
Grip	LTE Band 41(Class 3)	23.22	20.21	
Grip	LTE Band 41(Class 2)	26.25	23.22	
Grip	LTE Band 66	23.61	17.58	
Grip	Sub 6 Band n2	23.77	20.84	
Grip	Sub 6 Band n25	23.58	20.75	
Grip	Sub 6 Band n66	24.03	20.14	
Hotspot On	WCDMA B2	23.83	18.79	
Hotspot On	WCDMA B4	23.31	19.55	
Hotspot On	LTE Band 2	24.08	19.73	
Hotspot On	LTE Band 4	23.16	18.77	
Hotspot On	LTE Band 5	23.22	20.01	
Hotspot On	LTE Band 7	23.52	19.52	
Hotspot On	LTE Band 25	24.03	19.71	
Hotspot On	LTE Band 26	24.48	20.06	
Hotspot On	LTE Band 30	21.90	19.23	
Hotspot On	LTE Band 41(Class 3)	23.22	20.26	
Hotspot On	LTE Band 41(Class 2)	26.25	23.22	
Hotspot On	LTE Band 66	23.61	19.61	
Hotspot On	Sub 6 Band n2	23.77	20.84	
Hotspot On	Sub 6 Band n25	23.58	20.75	
Hotspot On	Sub 6 Band n66	24.03	20.10	
Hotspot On, Then Grip	WCDMA B2	23.83	18.79	18.80
Hotspot On, Then Grip	WCDMA B4	23.31	19.55	19.56
Hotspot On, Then Grip	LTE Band 2	24.08	19.73	19.74
Hotspot On, Then Grip	LTE Band 4	23.16	18.77	18.87
Hotspot On, Then Grip	LTE Band 5	23.22	20.01	20.01
Hotspot On, Then Grip	LTE Band 7	23.52	19.52	17.26
Hotspot On, Then Grip	LTE Band 12	23.37	23.37	19.86
Hotspot On, Then Grip	LTE Band 25	24.03	19.71	19.78
Hotspot On, Then Grip	LTE Band 26	24.48	20.06	20.04
Hotspot On, Then Grip	LTE Band 30	21.90	19.23	15.92
Hotspot On, Then Grip	LTE Band 41(Class 3)	23.22	20.26	20.21
Hotspot On, Then Grip	LTE Band 41(Class 2)	26.25	23.22	23.22
Hotspot On, Then Grip	LTE Band 66	23.61	19.61	17.58
Hotspot On, Then Grip	Sub 6 Band n2	23.77	20.84	20.84
Hotspot On, Then Grip	Sub 6 Band n25	23.58	20.75	20.75
Hotspot On, Then Grip	Sub 6 Band n66	24.03	20.10	20.14

Grip, then Hotspot On	WCDMA B2	23.83	18.80	18.80
Grip, then Hotspot On	WCDMA B4	23.31	19.56	19.56
Grip, then Hotspot On	LTE Band 2	24.08	19.74	19.74
Grip, then Hotspot On	LTE Band 4	23.16	18.87	18.87
Grip, then Hotspot On	LTE Band 5	23.22	20.01	20.01
Grip, then Hotspot On	LTE Band 7	23.52	17.26	17.26
Grip, then Hotspot On	LTE Band 12	23.37	19.86	19.86
Grip, then Hotspot On	LTE Band 25	24.03	19.78	19.78
Grip, then Hotspot On	LTE Band 26	24.48	20.04	20.04
Grip, then Hotspot On	LTE Band 30	21.90	15.92	15.92
Grip, then Hotspot On	LTE Band 41(Class 3)	23.22	20.21	20.21
Grip, then Hotspot On	LTE Band 41(Class 2)	26.25	23.22	23.22
Grip, then Hotspot On	LTE Band 66	23.61	17.58	17.58
Grip, then Hotspot On	Sub 6 Band n2	23.77	20.84	20.84
Grip, then Hotspot On	Sub 6 Band n25	23.58	20.75	20.75

1.1. Distance Verification Procedure

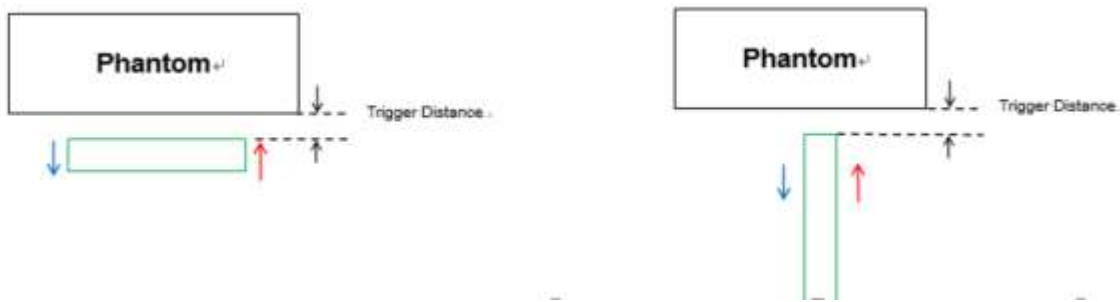
Procedures for determining proximity sensor triggering distances

(KDB 616217D04v01r02§6.2)

The distance verification procedure was performed according to the following procedure:

1. A base station simulator was used to establish an RF connection and to monitor the power levels. The device being tested was placed below the relevant section of the phantom with the relevant side or edge of the device facing toward the phantom.
2. The device was moved toward and away from the phantom to determine the distance at which the mechanism triggers and the output power is reduced per KDB Publication 616217 D04v01r02 .Each applicable test position was evaluated. The distance were conformed to be the same or larger (more conservative) than the minimum distances provided by the manufacturer.
3. Step 1 and 2 were repeated for the relevant modes, as appropriate
4. Steps1 through 3 were repeated for all distance-based power reduction mechanisms.

For detailed measurement conducted power results, please refer to the Section .11



Proximity Sensor Trigger Distance Assessment KDB 616217 D04§6.2

LEGEND

- Direction of DUT travel for determination of power reduction triggering point
- Direction of DUT travel for determination of full power resumption triggering point

Main Ant#1

Tissue simulating liquid	Triggering Distance					
	Rear		Right		Bottom	
	Moving toward phantom [mm]	Moving away from phantom [mm]	Moving toward phantom [mm]	Moving away from phantom [mm]	Moving toward phantom [mm]	Moving away from phantom [mm]
750MHz Tissue	7	8	4	5	6	7
850MHz Tissue	7	8	4	5	6	7

Distance Measurement verification for Proximity sensor

Rear side (Main Ant#1) – EUT Moving toward (trigger) to the Phantom

Mode	Distance to DUT Output power (dBm)									
	12[mm]	11[mm]	10[mm]	9[mm]	8[mm]	7[mm]	6[mm]	5[mm]	4[mm]	3[mm]
LTE Band 5	23.24	23.26	23.29	23.23	23.30	20.09	19.93	19.92	20.09	19.92
LTE Band 12	23.28	23.36	23.27	23.43	23.37	19.83	19.83	19.89	19.78	19.79
LTE Band 26	23.49	23.54	23.45	23.44	23.46	19.75	19.88	19.71	19.86	19.84

Rear side (Main Ant#1) – EUT Moving away (Release) from the Phantom

Mode	Distance to DUT Output power (dBm)									
	4[mm]	5[mm]	6[mm]	7[mm]	8[mm]	9[mm]	10[mm]	11[mm]	10[mm]	11[mm]
LTE Band 5	20.03	19.99	19.95	20.08	19.95	23.25	23.28	23.2	23.28	23.22
LTE Band 12	19.78	19.87	19.86	19.76	19.88	23.46	23.38	23.44	23.38	23.41
LTE Band 26	19.77	19.70	19.77	19.73	19.88	23.54	23.47	23.53	23.47	23.48

Based on the most conservative measured triggering distance of 7mm, additional Phablet SAR measurements were required at 6mm from rear side for the above modes.

Bottom side (Main Ant#1) – EUT Moving toward (trigger) to the Phantom

Mode	Distance to DUT Output power (dBm)									
	11[mm]	10[mm]	9[mm]	8[mm]	7[mm]	6[mm]	5[mm]	4[mm]	3[mm]	2[mm]
LTE Band 5	23.27	23.15	23.16	23.13	23.17	19.95	19.98	19.93	20.07	20.08
LTE Band 12	23.4	23.42	23.42	23.46	23.42	19.81	19.93	19.75	19.89	19.94
LTE Band 26	23.44	23.49	23.58	23.4	23.41	19.75	19.73	19.82	19.81	19.86

Bottom side (Main Ant#1) – EUT Moving away (Release) from the Phantom

Mode	Distance to DUT Output power (dBm)									
	3[mm]	4[mm]	5[mm]	6[mm]	7[mm]	8[mm]	9[mm]	10[mm]	11[mm]	12[mm]
LTE Band 5	20.07	20.1	20.06	20.09	20.15	23.33	23.3	23.14	23.14	23.15
LTE Band 12	19.75	19.91	19.93	19.76	19.62	23.32	23.38	23.4	23.42	23.42
LTE Band 26	19.77	19.71	19.74	19.8	19.74	23.50	23.54	23.44	23.53	23.44

Based on the most conservative measured triggering distance of 6mm, additional Phablet SAR measurements were required at 5mm from bottom side for the above modes

Right side (Main Ant#1) – EUT Moving toward (trigger) to the Phantom

Mode	Distance to DUT Output power (dBm)									
	9[mm]	8[mm]	7[mm]	6[mm]	5[mm]	4[mm]	3[mm]	2[mm]	1[mm]	0[mm]
LTE Band 5	23.15	23.24	23.22	23.22	23.27	19.97	19.91	19.99	20.08	19.96
LTE Band 12	23.27	23.44	23.3	23.29	23.31	19.82	19.74	19.86	19.88	19.94
LTE Band 26	23.57	23.43	23.54	23.4	23.4	19.78	19.77	19.74	19.72	19.7

Right side (Main Ant#1) – EUT Moving away (Release) from the Phantom

Mode	Distance to DUT Output power (dBm)									
	1[mm]	2[mm]	3[mm]	4[mm]	5[mm]	6[mm]	7[mm]	8[mm]	9[mm]	10[mm]
LTE Band 5	19.98	20.07	20.05	20.07	20.04	23.19	23.25	23.24	23.24	23.17
LTE Band 12	19.89	19.82	19.86	19.85	19.84	23.27	23.36	23.37	23.4	23.44
LTE Band 26	19.77	19.73	19.82	19.86	19.75	23.57	23.45	23.53	23.53	23.55

Based on the most conservative measured triggering distance of 4mm, additional Phablet SAR measurements were required at 3mm from right side for the above modes

Main Ant#2

Tissue simulating liquid	Triggering Distance					
	Rear		Left		Bottom	
	Moving toward phantom [mm]	Moving away from phantom [mm]	Moving toward phantom [mm]	Moving away from phantom [mm]	Moving toward phantom [mm]	Moving away from phantom [mm]
1800MHz Tissue	7	8	3	4	6	7
1900MHz Tissue	7	8	3	4	6	7
2300MHz Tissue	7	8	3	4	6	7
2600 MHz Tissue	7	8	3	4	6	7

Rear side (Main Ant#2) – EUT Moving toward (trigger) to the Phantom

Mode	Distance to DUT Output power (dBm)									
	12[mm]	11[mm]	10[mm]	9[mm]	8[mm]	7[mm]	6[mm]	5[mm]	4[mm]	3[mm]
WCDMA B2	23.82	23.84	23.93	23.88	23.78	18.78	18.8	18.79	18.87	18.83
WCDMA B4	23.40	23.27	23.38	23.37	23.27	19.57	19.54	19.55	19.66	19.61
LTE Band 2/25	23.99	24.04	24.11	24.00	24.12	19.79	19.73	19.64	19.66	19.73
LTE Band 4/66	23.15	23.24	23.11	23.18	23.13	18.79	18.77	18.94	18.96	18.9
LTE Band 7	23.55	23.57	23.57	23.56	23.56	17.19	17.26	17.25	17.17	17.32
LTE Band 30	22.26	22.22	22.12	22.26	22.22	15.89	15.93	15.86	15.91	15.98
LTE Band 41(Class 3)	23.19	23.14	23.25	23.20	23.27	20.19	20.26	20.14	20.13	20.2
LTE Band 41(Class 2)	26.32	26.21	26.23	26.29	26.17	23.31	23.14	23.31	23.17	23.22
Sub 6 Band n2	23.76	23.72	23.77	23.73	23.75	20.84	20.8	20.91	20.81	20.92
Sub 6 Band n25	23.65	23.59	23.64	23.61	23.49	20.82	20.67	20.67	20.7	20.79
Sub 6 Band n66	23.99	24.02	24.13	24.04	23.99	20.16	20.21	20.2	20.18	20.2

Rear side (Main Ant#2) – EUT Moving away (Release) from the Phantom

Mode	Distance to DUT Output power (dBm)									
	4[mm]	5[mm]	6[mm]	7[mm]	8[mm]	9[mm]	10[mm]	11[mm]	12[mm]	13[mm]
WCDMA B2	18.83	18.77	18.89	18.72	18.79	23.83	23.88	23.87	23.89	23.88
WCDMA B4	19.5	19.56	19.52	19.57	19.59	23.38	23.40	23.28	23.32	23.41
LTE Band 2/25	19.71	19.78	19.73	19.72	19.64	24.16	24.08	24.01	24.10	24.09
LTE Band 4/66	18.91	18.97	18.81	18.89	18.83	23.18	23.22	23.21	23.13	23.23
LTE Band 7	17.18	17.19	17.27	17.26	17.18	23.61	23.43	23.52	23.52	23.53
LTE Band 30	15.88	15.82	15.96	15.95	16	22.28	22.19	22.29	22.15	22.13
LTE Band 41(Class 3)	20.3	20.12	20.21	20.17	20.16	23.29	23.19	23.27	23.22	23.31
LTE Band 41(Class 2)	23.3	23.13	23.27	23.18	23.12	26.35	26.26	26.33	26.26	26.18
Sub 6 Band n2	20.89	20.92	20.85	20.9	20.86	23.77	23.67	23.85	23.74	23.83
Sub 6 Band n25	20.85	20.85	20.78	20.78	20.79	23.67	23.48	23.65	23.62	23.53
Sub 6 Band n66	20.16	20.11	20.08	20.13	20.16	23.94	24.03	23.96	24.02	24.03

Based on the most conservative measured triggering distance of 7mm, additional Phablet SAR measurements were required at 6mm from rear side for the above modes

Bottom side (Main Ant#2) – EUT Moving toward (trigger) to the Phantom

Mode	Distance to DUT Output power (dBm)									
	11[mm]	10[mm]	9[mm]	8[mm]	7[mm]	6[mm]	5[mm]	4[mm]	3[mm]	2[mm]
WCDMA B2	23.84	23.83	23.93	23.97	23.78	18.73	18.83	18.76	18.8	18.9
WCDMA B4	23.38	23.37	23.39	23.26	23.24	19.52	19.53	19.55	19.66	19.62
LTE Band 2/25	24.14	24.05	24.12	23.98	24.10	19.7	19.66	19.82	19.67	19.69
LTE Band 4/66	23.06	23.09	23.06	23.22	23.14	18.94	18.91	18.81	18.91	18.85
LTE Band 7	23.53	23.53	23.43	23.59	23.47	17.33	17.3	17.35	17.19	17.29
LTE Band 30	22.14	22.29	22.25	22.13	22.19	15.97	15.85	15.94	15.85	15.97
LTE Band 41(Class 3)	23.13	23.22	23.28	23.26	23.22	20.27	20.14	20.13	20.21	20.26
LTE Band 41(Class 2)	26.20	26.18	26.33	26.23	26.16	23.13	23.23	23.2	23.3	23.2
Sub 6 Band n2	23.74	23.81	23.71	23.72	23.67	20.85	20.89	20.83	20.76	20.81
Sub 6 Band n25	23.54	23.54	23.58	23.56	23.61	20.73	20.72	20.77	20.76	20.82
Sub 6 Band n66	24.04	24.03	24.01	24.01	24.09	20.08	20.17	20.05	20.21	20.04

Bottom side (Main Ant#2) – EUT Moving away (Release) from the Phantom

Mode	Distance to DUT Output power (dBm)									
	3[mm]	4[mm]	5[mm]	6[mm]	7[mm]	8[mm]	9[mm]	10[mm]	11[mm]	12[mm]
WCDMA B2	18.83	18.69	18.84	18.69	18.8	23.94	23.94	23.82	23.95	23.82
WCDMA B4	19.49	19.52	19.66	19.61	19.51	23.33	23.29	23.26	23.23	23.23
LTE Band 2/25	19.74	19.78	19.82	19.84	19.7	24.14	24.16	23.99	24.00	24.13
LTE Band 4/66	18.95	18.81	18.86	18.82	18.95	23.22	23.22	23.11	23.18	23.16
LTE Band 7	17.34	17.21	17.33	17.21	17.32	23.59	23.62	23.42	23.55	23.46
LTE Band 30	15.84	15.88	15.84	15.92	15.93	22.20	22.24	22.15	22.17	22.27
LTE Band 41(Class 3)	20.31	20.17	20.14	20.2	20.16	23.15	23.30	23.27	23.19	23.24
LTE Band 41(Class 2)	23.23	23.3	23.24	23.13	23.31	26.16	26.21	26.26	26.23	26.23
Sub 6 Band n2	20.88	20.87	20.87	20.75	20.85	23.70	23.73	23.73	23.81	23.72
Sub 6 Band n25	20.72	20.7	20.69	20.84	20.79	23.51	23.56	23.51	23.55	23.66
Sub 6 Band n66	20.19	20.14	20.24	20.05	20.16	24.10	24.12	23.97	24.10	24.03

Based on the most conservative measured triggering distance of 6mm, additional Phablet SAR measurements were required at 5mm from bottom side for the above modes

Left side (Main Ant#2) – EUT Moving toward (trigger) to the Phantom

Mode	Distance to DUT Output power (dBm)									
	9[mm]	8[mm]	7[mm]	6[mm]	5[mm]	4[mm]	3[mm]	2[mm]	1[mm]	0[mm]
WCDMA B2	23.84	23.83	23.93	23.97	23.78	23.91	18.83	18.76	18.8	18.9
WCDMA B4	23.38	23.37	23.39	23.26	23.24	23.33	19.53	19.55	19.66	19.62
LTE Band 2/25	24.14	24.05	24.12	23.98	24.10	24.16	19.66	19.82	19.67	19.69
LTE Band 4/66	23.06	23.09	23.06	23.22	23.14	23.24	18.91	18.81	18.91	18.85
LTE Band 7	23.53	23.53	23.43	23.59	23.47	23.55	17.3	17.35	17.19	17.29
LTE Band 30	22.14	22.29	22.25	22.13	22.19	22.16	15.85	15.94	15.85	15.97
LTE Band 41(Class 3)	23.13	23.22	23.28	23.26	23.22	23.26	20.14	20.13	20.21	20.26
LTE Band 41(Class 2)	26.20	26.18	26.33	26.23	26.16	26.15	23.23	23.2	23.3	23.2
Sub 6 Band n2	23.74	23.81	23.71	23.72	23.67	23.70	20.89	20.83	20.76	20.81
Sub 6 Band n25	23.54	23.54	23.58	23.56	23.61	23.48	20.72	20.77	20.76	20.82
Sub 6 Band n66	24.04	24.03	24.01	24.01	24.09	24.09	20.17	20.05	20.21	20.04

Left side (Main Ant#2) – EUT Moving away (Release) from the Phantom

Mode	Distance to DUT Output power (dBm)									
	0[mm]	1[mm]	2[mm]	3[mm]	4[mm]	5[mm]	6[mm]	7[mm]	8[mm]	9[mm]
WCDMA B2	18.83	18.69	18.84	18.69	18.86	23.94	23.94	23.82	23.95	23.82
WCDMA B4	19.49	19.52	19.66	19.61	19.62	23.33	23.29	23.26	23.23	23.23
LTE Band 2/25	19.74	19.78	19.82	19.84	19.8	24.14	24.16	23.99	24.00	24.13
LTE Band 4/66	18.95	18.81	18.86	18.82	18.94	23.22	23.22	23.11	23.18	23.16
LTE Band 7	17.34	17.21	17.33	17.21	17.2	23.59	23.62	23.42	23.55	23.46
LTE Band 30	15.84	15.88	15.84	15.92	15.89	22.20	22.24	22.15	22.17	22.27
LTE Band 41(Class 3)	20.31	20.17	20.14	20.2	20.23	23.15	23.30	23.27	23.19	23.24
LTE Band 41(Class 2)	23.23	23.3	23.24	23.13	23.31	26.16	26.21	26.26	26.23	26.23
Sub 6 Band n2	20.88	20.87	20.87	20.75	20.83	23.70	23.73	23.73	23.81	23.72
Sub 6 Band n25	20.72	20.7	20.69	20.84	20.69	23.51	23.56	23.51	23.55	23.66
Sub 6 Band n66	20.19	20.14	20.24	20.05	20.14	24.10	24.12	23.97	24.10	24.03

Based on the most conservative measured triggering distance of 3mm, additional Phablet SAR measurements were required at 2mm from Left side for the above modes

1.2 Proximity Sensor Coverage for SAR measurements

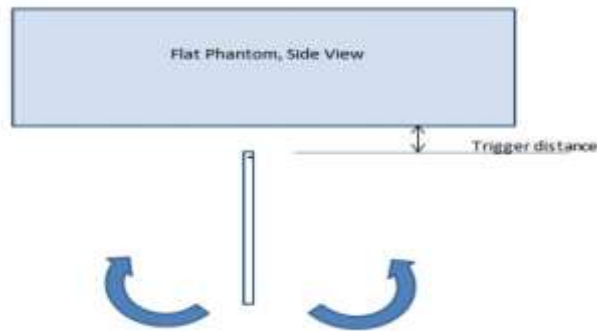
(KDB 616217 D04v01r02§6.3)

As there is no spatial offset between the antenna and the proximity sensor element, proximity sensor coverage did not need to be assessed.

1.3 Proximity Sensor Tilt Angle Assessment

(KDB 616217 D04v01r02 §6.4)

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Bottom side parallel to the base of the flat phantom for each band. The EUT was rotated about Bottom side for angles up to $\pm 45^\circ$. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to $\pm 45^\circ$.



Proximity sensor tilt angle assessment (Bottom For MainAnt#1, Left side for Main Ant#2) KDB 616217 §6.4

Summary of Tablet Tilt Angle influence to Proximity Sensor Triggering (Bottom side for Main Ant#1)

Tissue	Minimum distance At which power reduction was maintained over- 45°	Power reduction status											
		-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°	
700 MHz Tissue	6mm	On	On	On	On	On	On	On	On	On	On	On	On
850 MHz Tissue	6mm	On	On	On	On	On	On	On	On	On	On	On	On

Summary of Tablet Tilt Angle influence to Proximity Sensor Triggering (Bottom side for Main Ant#2)

Tissue	Minimum distance At which power reduction was maintained over- 45°	Power reduction status											
		-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°	
1800MHz Tissue	6mm	On	On	On	On	On	On	On	On	On	On	On	On
1900MHz Tissue	6mm	On	On	On	On	On	On	On	On	On	On	On	On
2300MHz Tissue	6mm	On	On	On	On	On	On	On	On	On	On	On	On
2600 MHz Tissue	6mm	On	On	On	On	On	On	On	On	On	On	On	On

1.4 Resulting test positions for Phablet SAR measurements

Wireless technologies	Position	§6.2 Triggering Distance [mm]	§6.3 Coverage	§6.4 Tilt Angle	Worst case distance for Phablet SAR [mm]
WWAN (/WCDMA B2/B4/ /LTEB2/B4/B5/B7/B12/B25 /B26/B30/B41(Class3) /B41(Class2)/B66 /SUB6 n2/n25/n66)	Rear	7	N/A	N/A	6
	Bottom	6	N/A	N/A	5
	Right	4	N/A	N/A	3
	Left	3	N/A	N/A	2

Note:FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device when being used in phablet use conditions

2. Power reduction Verification for RCV-ON

This device uses a power reduction mechanism for SAR compliance for operations during voice or VoIP held to ear scenarios.

When a user makes or receives a voice call or VOIP call for Main Ant#3 the audio of the call is sent through the Receiver at the top of the device will trigger the Power reduction for Main Ant#2 and Sub Ant#4 (i.e. reducing output power for Head SAR compliance)

Detailed descriptions of the power reduction mechanism are included in the Main operational description document

Main Ant#3

Condition For Power reduction	Wireless Technologies	Conducted Power[dBm]	
		Un-Triggered (Max Power)	Triggered (Reduced Power)
RCV-on	LTE 48	23.26	21.23

3. Power reduction Verification for WLAN Ant

This device uses a power reduction mechanism for SAR compliance for WLAN operations during voice or VoIP held to ear scenarios.

When a user makes or receives a WLAN voice or WLAN VOIP call for WLAN Ant the audio of the call is sent through the Receiver at the top of the device will trigger the Power reduction for WLAN Ant (i.e. reducing output power for Head SAR compliance)

Detailed descriptions of the power reduction mechanism are included in the Main operational description document

Power Measurement Verification for WLAN

Condition For Power reduction	Wireless Technologies	Conducted Power[dBm]	
		Un-Triggered (Max Power)	Triggered (Reduced Power)
RCV-on	2.4GHz 802.11b	18.98	13.08
RCV-on	2.4GHz 802.11g	19.24	13.17
RCV-on	2.4GHz 802.11n	19.14	13.91
RCV-on	5GHz 802.11a	16.82	5.79
RCV-on	5GHz 802.11n 20MHz	16.70	5.70
RCV-on	5GHz 802.11n 40MHz	16.78	5.70
RCV-on	5GHz 802.11ac 20MHz	16.54	5.60
RCV-on	5GHz 802.11ac 40MHz	15.74	5.87
RCV-on	5GHz 802.11ac 80MHz	14.75	5.76

Appendix I. – DL 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:

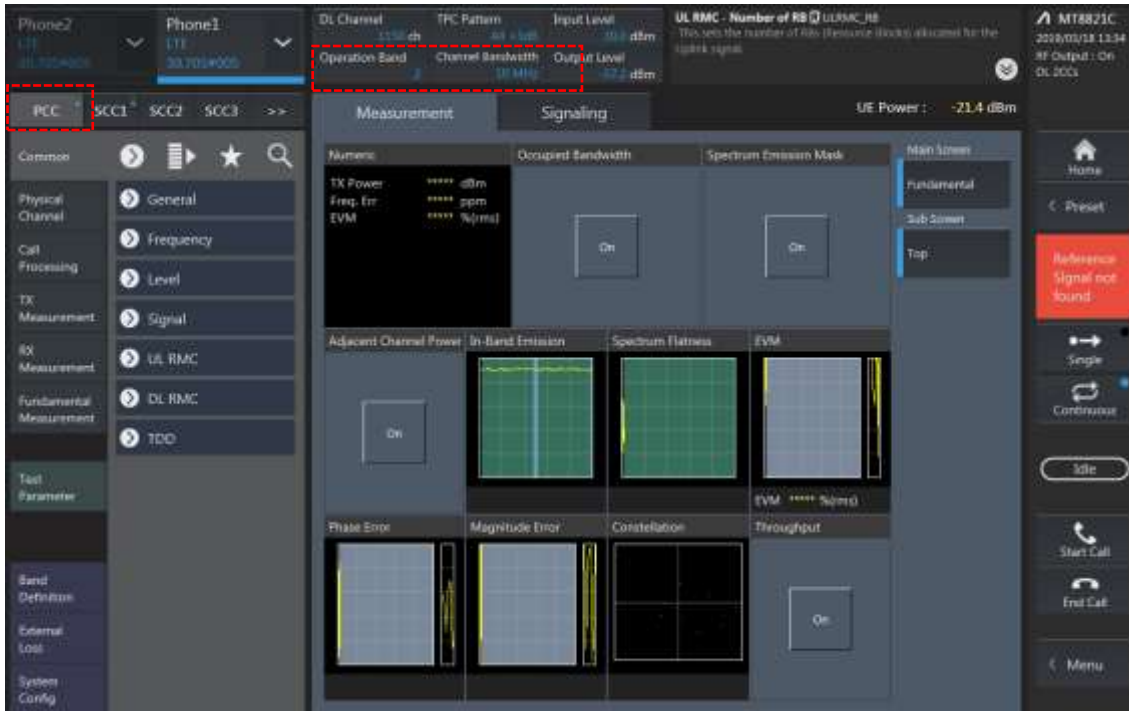
1. This device only supports downlink carrier aggregation. For every supported combination of downlink carrier aggregation, power measurements were performed with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation 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.



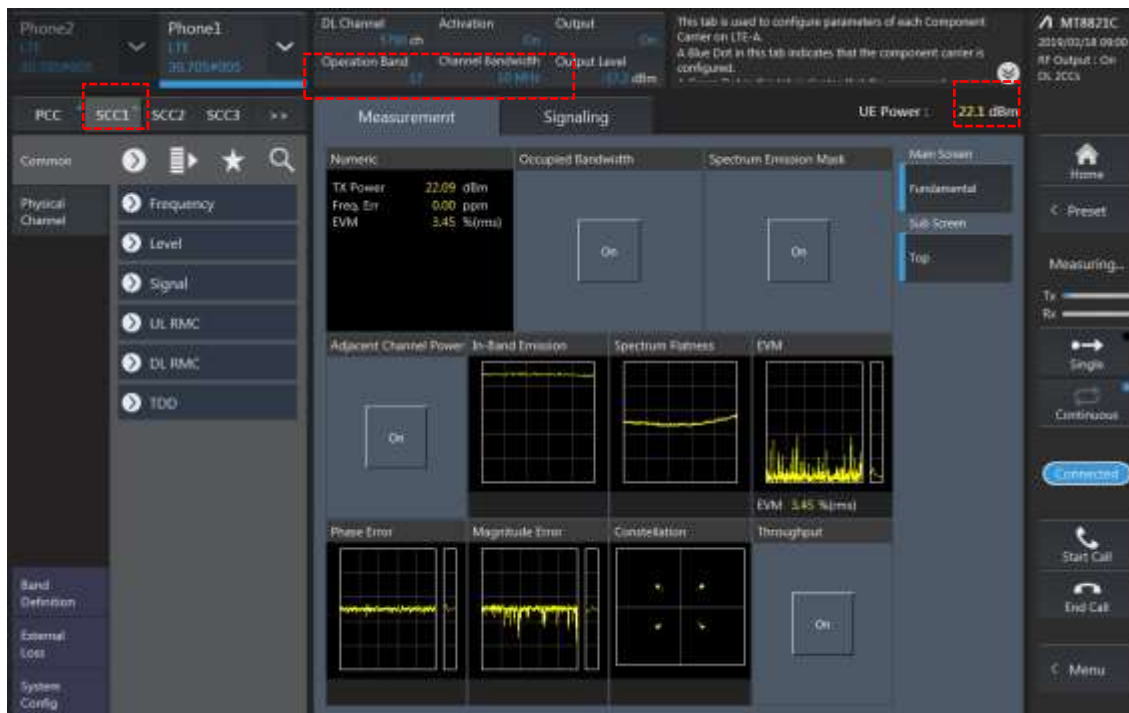
Power Measurement setup

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

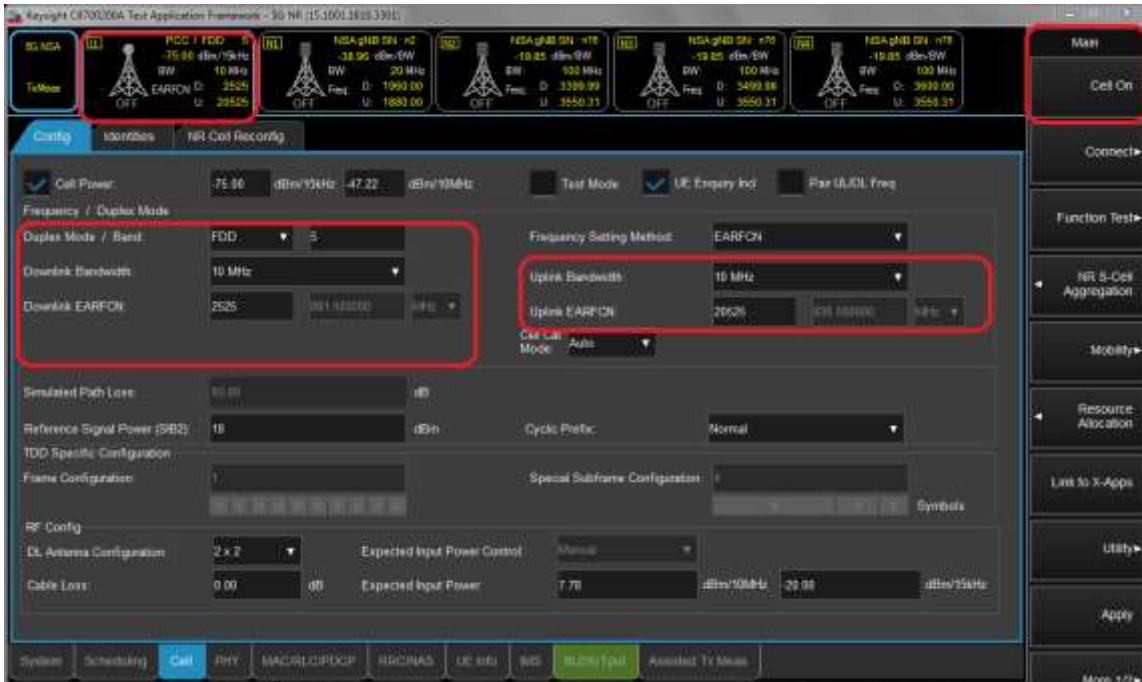
Combination	PCC									SCC				Tx Power		Delta (2)-(1)
	Band	BW	PCC UL Ch.	PCC UL Freq.	PCC DL Ch.	PCC DL Freq.	Modulation	RB	RB offset	Band	BW	SCC DL Ch.	SCC DL Freq.	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled (dBm) (2)	
2A-2A	2	5	18900	1880	900	1960	QPSK	1	12	2	20	1100	1980	24.09	24.00	-0.09
2A-4A(0)	2	5	18900	1880	900	1960	QPSK	1	12	2	20	2175	2132.5	24.09	24.02	-0.07
2A-4A(1)	2	5	18900	1880	900	1960	QPSK	1	12	2	10	2175	2132.5	24.09	24.10	0.01
2A-5A	2	5	18900	1880	900	1960	QPSK	1	12	5	10	2525	881.5	24.09	24.05	-0.04
2A-7A	2	5	18900	1880	900	1960	QPSK	1	12	7	20	3100	2655	24.09	24.08	-0.01
2A-12A	2	5	18900	1880	900	1960	QPSK	1	12	12	10	5095	737.5	24.09	24.08	-0.01
2A-13A	2	5	18900	1880	900	1960	QPSK	1	12	13	10	5230	751	24.09	24.03	-0.06
2A-14A	2	5	18900	1880	900	1960	QPSK	1	12	14	10	5330	763	24.09	24.12	0.03
2A-30A	2	5	18900	1880	900	1960	QPSK	1	12	30	10	9820	2355	24.09	24.20	0.11
2A-48A	2	5	18900	1880	900	1960	QPSK	1	12	48	20	55773	3603.3	24.09	24.11	0.02
2A-66A(1)	2	5	18900	1880	900	1960	QPSK	1	12	66	20	66786	2145	24.09	24.00	-0.09
2A-66A(2)	2	5	18900	1880	900	1960	QPSK	1	12	66	10	66786	2145	24.09	24.01	-0.08
2A-71A(0)	2	5	18900	1880	900	1960	QPSK	1	12	71	20	68761	634.5	24.09	24.05	-0.04
2A-71A(1)	2	5	18900	1880	900	1960	QPSK	1	12	71	10	68761	634.5	24.09	21.12	-2.97
2C	2	5	18900	1880	900	1960	QPSK	1	12	2	20	783	1948.3	24.09	24.12	0.03
4A-4A	4	10	20350	1750	2350	2150	QPSK	1	49	4	20	2175	2132.5	23.46	23.44	-0.02
4A-5A	4	10	20350	1750	2350	2150	QPSK	1	49	5	10	2525	881.5	23.46	23.39	-0.07
4A-7A	4	10	20350	1750	2350	2150	QPSK	1	49	7	20	3100	2655	23.46	23.38	-0.08
4A-12A	4	10	20350	1750	2350	2150	QPSK	1	49	12	10	5095	737.5	23.46	23.47	0.01
4A-13A	4	10	20350	1750	2350	2150	QPSK	1	49	13	10	5230	751	23.46	23.65	0.19
4A-30A	4	10	20350	1750	2350	2150	QPSK	1	49	30	10	9820	2355	23.46	23.48	0.02
4A-48A	4	10	20350	1750	2350	2150	QPSK	1	49	48	20	55773	3603.3	23.46	23.43	-0.03
4A-71A	4	10	20350	1750	2350	2150	QPSK	1	49	71	20	68761	634.5	23.46	23.37	-0.09
5A-5A	5	5	20525	836.5	2525	881.5	QPSK	1	0	5	10	2600	889	23.43	23.40	-0.03
5A-7A	5	5	20525	836.5	2525	881.5	QPSK	1	0	7	20	3100	2655	23.43	23.42	-0.01
5A-25A	5	5	20525	836.5	2525	881.5	QPSK	1	0	25	20	8365	1962.5	23.43	23.49	0.06
5A-30A	5	5	20525	836.5	2525	881.5	QPSK	1	0	30	10	9820	2355	23.43	23.50	0.07
5A-38A	5	5	20525	836.5	2525	881.5	QPSK	1	0	38	20	38000	2595	23.43	23.44	0.01
5A-41A	5	5	20525	836.5	2525	881.5	QPSK	1	0	41	20	40620	2593	23.43	23.48	0.05
5A-48A	5	5	20525	836.5	2525	881.5	QPSK	1	0	48	20	55773	3603.3	23.43	23.50	0.07
5A-66A	5	5	20525	836.5	2525	881.5	QPSK	1	0	66	20	66786	2145	23.43	23.48	0.05
5B	5	5	20525	836.5	2525	881.5	QPSK	1	0	5	10	2454	874.4	23.43	23.44	0.01
7A-7A	7	15	21375	2562.5	3375	2682.5	QPSK	1	36	7	20	3100	2655	23.57	23.64	0.07
7A-12A	7	15	21375	2562.5	3375	2682.5	QPSK	1	36	12	10	5095	737.5	23.57	23.55	-0.02
7A-13A	7	15	21375	2562.5	3375	2682.5	QPSK	1	36	13	10	5230	751	23.57	23.55	-0.02
7A-66A	7	15	21375	2562.5	3375	2682.5	QPSK	1	36	66	20	66786	2145	23.57	23.61	0.04
7C	7	15	21375	2562.5	3375	2682.5	QPSK	1	36	7	15	3225	2667.5	23.57	23.50	-0.07
12A-25A	12	5	23095	707.5	5095	737.5	QPSK	1	0	25	20	8365	1962.5	23.46	23.53	0.07
12A-30A	12	5	23095	707.5	5095	737.5	QPSK	1	0	30	10	9820	2355	23.46	23.38	-0.08
12A-48A	12	5	23095	707.5	5095	737.5	QPSK	1	0	48	20	55773	3603.3	23.46	23.51	0.05
12A-66A(0)	12	5	23095	707.5	5095	737.5	QPSK	1	0	66	10	66786	2145	23.46	23.55	0.09
12A-66A(1)	12	5	23095	707.5	5095	737.5	QPSK	1	0	66	20	66786	2145	23.46	23.43	-0.03
12B	12	5	23095	707.5	5095	737.5	QPSK	1	0	12	10	5120	740	23.46	23.44	-0.02
13A-48A	13	10	23230	782	5230	751	QPSK	1	0	48	20	55773	3603.3	23.46	23.47	0.01
13A-66A	13	10	23230	782	5230	751	QPSK	1	0	66	20	66786	2145	23.46	23.41	-0.05
14A-30A	14	5	23355	795.5	5355	765.5	QPSK	1	24	30	10	9820	2355	23.44	23.44	0.00
14A-66A	14	5	23355	795.5	5355	765.5	QPSK	1	24	66	20	66786	2145	23.44	23.51	0.07
25A-25A	25	15	26365	1882.5	8365	1962.5	QPSK	1	36	25	20	8590	1985	24.09	24.19	0.10
25A-26A(0)	25	15	26365	1882.5	8365	1962.5	QPSK	1	36	26	15	8865	876.5	24.09	24.16	0.07
25A-26A(1)	25	15	26365	1882.5	8365	1962.5	QPSK	1	36	26	10	8865	876.5	24.09	24.00	-0.09
25A-41A	25	15	26365	1882.5	8365	1962.5	QPSK	1	36	41	20	40620	2593	24.09	24.16	0.07
26A-41A	26	5	26715	816.5	8715	861.5	QPSK	1	0	41	20	40620	2593	23.56	23.60	0.04
30A-66A	30	5	27735	2312.5	9845	2357.5	QPSK	1	0	66	20	66786	2145	22.37	22.38	0.01

Combination	PCC									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.	LTE Single Carrier Tx Power (dBm) (1)	LTE Tx Power with DL CA Enabled (dBm) (2)	
38C	38	15	37825	2577.5	37825	2577.5	QPSK	1	0	38	15	37970	2592.0	23.95	23.89	-0.06
41A-41A	41	5	40185	2549.5	40185	2549.5	QPSK	1	0	41	20	41490	2680	23.28	23.36	0.08
41A-48A	41	5	40185	2549.5	40185	2549.5	QPSK	1	0	48	20	55773	3603.3	23.28	23.27	-0.01
41C	41	5	40185	2549.5	40185	2549.5	QPSK	1	0	41	20	40068	2537.8	23.28	23.36	0.08
48B	48	5	55265	3552.5	55265	3552.5	QPSK	1	0	48	5	55319	3557	23.88	23.71	-0.17
48C	48	5	55265	3552.5	55265	3552.5	QPSK	1	0	48	20	55382	3564.2	23.88	23.88	0.00
66A-66A	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	66	20	67036	2170	23.63	23.55	-0.08
66A-71A	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	71	20	68761	634.5	23.63	23.62	-0.01
66B	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	66	5	66968	2163.2	23.63	23.70	0.07
66C	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	66	20	66890	2155.4	23.63	23.58	-0.05
4A-2A	4	10	20350	1750	2350	2150	QPSK	1	49	2	20	1100	1980	23.46	23.45	-0.01
5A-2A	5	5	20525	836.5	2525	881.5	QPSK	1	0	2	20	1100	1980	23.43	23.44	0.01
7A-2A	7	15	21375	2562.5	3375	2682.5	QPSK	1	36	2	20	1100	1980	23.57	23.49	-0.08
12A-2A	12	5	23095	707.5	5095	737.5	QPSK	1	0	2	20	1100	1980	23.46	23.50	0.04
13A-2A	13	10	23230	782	5230	751	QPSK	1	0	2	20	1100	1980	23.46	23.48	0.02
14A-2A	14	5	23355	795.5	5355	765.5	QPSK	1	24	2	20	1100	1980	23.44	23.53	0.09
30A-2A	30	5	27735	2312.5	9845	2357.5	QPSK	1	0	2	20	1100	1980	22.37	22.44	0.07
66A-2A	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	2	20	1100	1980	23.63	23.71	0.08
71A-2A	71	10	133172	668	68636	622	QPSK	1	0	2	20	1100	1980	23.45	23.43	-0.02
5A-4A	5	5	20525	836.5	2525	881.5	QPSK	1	0	4	20	2300	2145	23.43	23.45	0.02
7A-4A(0)	7	15	21375	2562.5	3375	2682.5	QPSK	1	36	4	10	2300	2145	23.57	23.54	-0.03
7A-4A(1)	7	15	21375	2562.5	3375	2682.5	QPSK	1	36	4	20	2300	2145	23.57	23.56	-0.01
12A-4A(0)	12	5	23095	707.5	5095	737.5	QPSK	1	0	4	10	2300	2145	23.46	23.48	0.02
12A-4A(1)	12	5	23095	707.5	5095	737.5	QPSK	1	0	4	20	2300	2145	23.46	23.39	-0.07
12A-4A(5)	12	5	23095	707.5	5095	737.5	QPSK	1	0	4	15	2300	2145	23.46	23.47	0.01
13A-4A(0)	13	10	23230	782	5230	751	QPSK	1	0	4	20	2300	2145	23.46	23.47	0.01
13A-4A(1)	13	10	23230	782	5230	751	QPSK	1	0	4	10	2300	2145	23.46	23.52	0.06
30A-4A	30	5	27735	2312.5	9845	2357.5	QPSK	1	0	4	20	2300	2145	22.37	22.37	0.00
71A-4A	71	10	133172	668	68636	622	QPSK	1	0	4	20	2300	2145	23.45	23.47	0.02
7A-5A	7	15	21375	2562.5	3375	2682.5	QPSK	1	36	5	10	2454	874.4	23.57	23.61	0.04
25A-5A	25	15	26365	1882.5	8365	1962.5	QPSK	1	36	5	10	2454	874.4	24.09	24.09	0.00
30A-5A	30	5	27735	2312.5	9845	2357.5	QPSK	1	0	5	10	2454	874.4	22.37	22.40	0.03
48A-5A	48	5	55265	3552.5	55265	3552.5	QPSK	1	0	5	10	2454	874.4	23.88	23.78	-0.10
66A-5A	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	5	10	2454	874.4	23.63	23.65	0.02
12A-7A	12	5	23095	707.5	5095	737.5	QPSK	1	0	7	20	3350	2680	23.46	23.44	-0.02
13A-7A	13	10	23230	782	5230	751	QPSK	1	0	7	20	3350	2680	23.46	23.42	-0.04
66A-7A	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	7	20	3350	2680	23.63	23.61	-0.02
25A-12A	25	15	26365	1882.5	8365	1962.5	QPSK	1	36	12	10	5095	737.5	24.09	24.05	-0.04
30A-12A	30	5	27735	2312.5	9845	2357.5	QPSK	1	0	12	10	5095	737.5	22.37	22.45	0.08
66A-12A(2)	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	12	10	5095	737.5	23.63	23.64	0.01
66A-12A(0)	66	10	132622	1775	67086	2175	QPSK	1	49	12	10	5095	737.5	23.62	23.56	-0.06
66A-12A(5)	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	12	5	5095	737.5	23.63	23.60	-0.03
66A-13A	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	13	10	5230	751	23.63	23.66	0.03
30A-14A	30	5	27735	2312.5	9845	2357.5	QPSK	1	0	14	10	5330	763	22.37	22.36	-0.01
66A-14A	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	14	10	5330	763	23.44	23.37	-0.07
26A-25A(0)	26	5	26715	816.5	8715	861.5	QPSK	1	0	25	20	8365	1962.5	23.56	23.60	0.04
26A-25A(0)	26	5	26715	816.5	8715	861.5	QPSK	1	0	25	10	8365	1962.5	23.56	23.56	0.00
66A-30A	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	30	10	9820	2355	23.63	23.62	-0.01
48A-41A	48	5	55265	3552.5	55265	3552.5	QPSK	1	0	41	20	40620	2593	23.88	23.89	0.01
66A-48A	66	15	132597	1772.5	67061	2172.5	QPSK	1	36	48	20	55773	3603.3	23.63	23.54	-0.09
71A-48A	71	10	133172	668	68636	622	QPSK	1	0	48	20	55773	3603.3	23.45	23.39	-0.06
71A-66A	71	10	133172	668	68636	622	QPSK	1	0	66	20	66786	2145	23.45	23.36	-0.09

2. 5G NR Call Box Setup

Procedure used to establish output Power measurement for NR Bands
Select operating band, BW and Channel.

- Click Cell on button in the right of Test application screen.
- Turn the LTE Cell On using “ON/OFF” Key.



- Turn the Airplane Mode On and then turn the Airplane mode off.
- Select All down bits for UL Power control Mode in LTE.

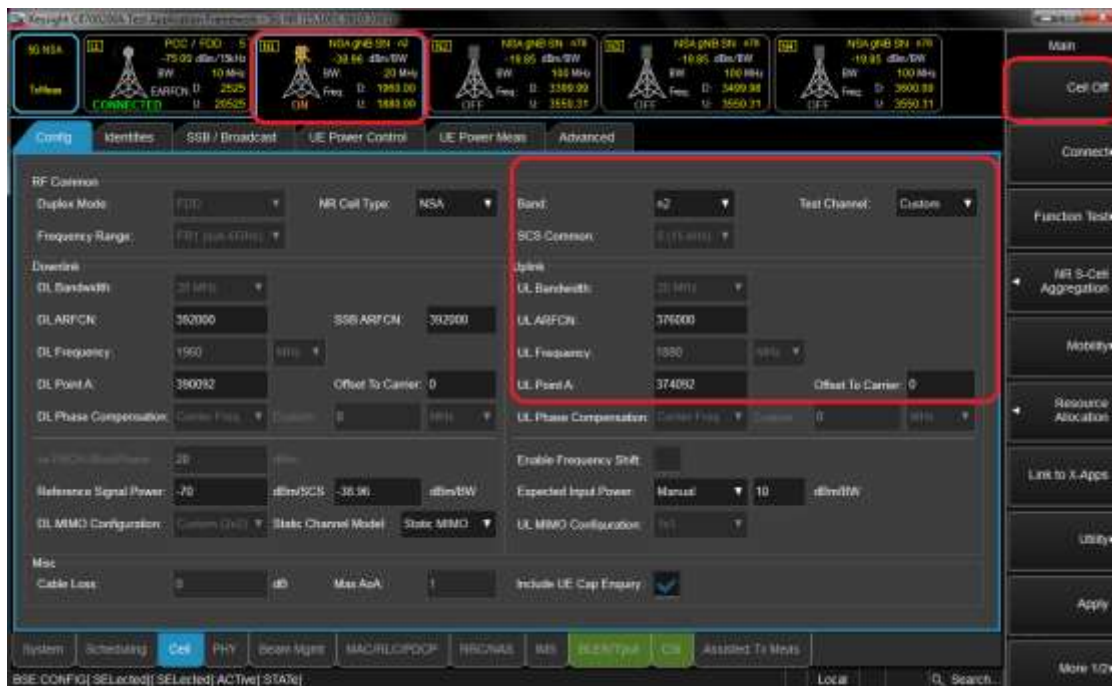


Setup for NR Band

- Select waveform for Setting NR Band (PHY->PUSCH->Enable Transform Precoder)
 - Enable : DFT-s-OFDM, Disable : CP-OFDM

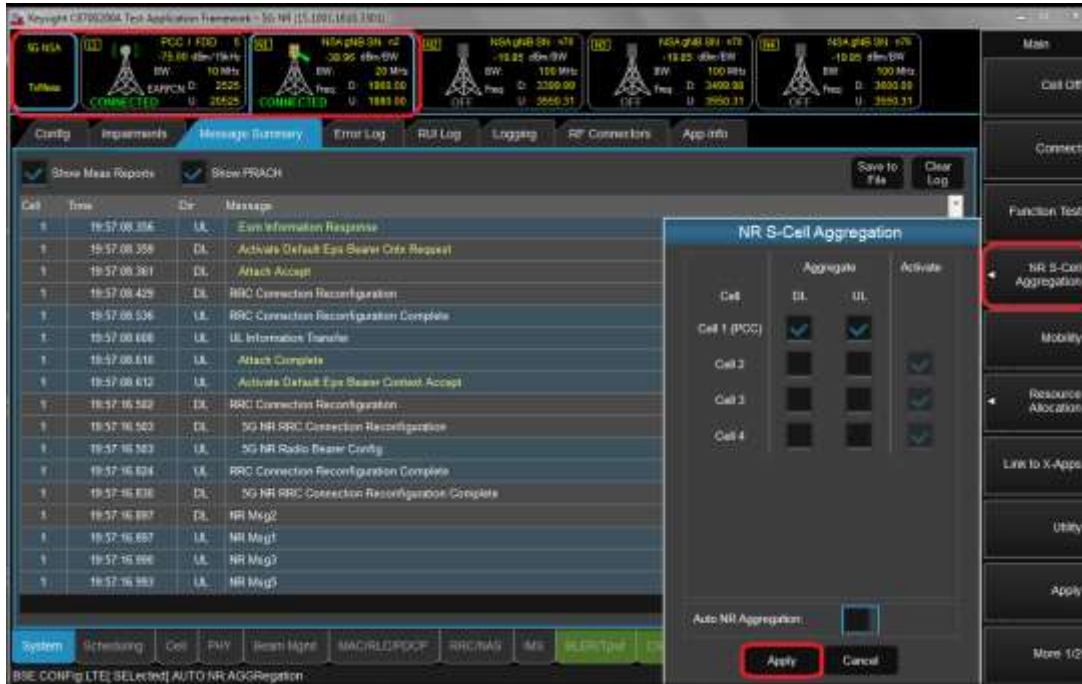


- Select operating band, BW, SCS and Channel.
- Turn the NR Cell On using “ON/OFF” Key.



Connect NR S-Cell Aggregation

- Click NR S-Cell Aggregation
- Check the Cell 1's DL and UL box(PCC) and than Click Apply.
- Check the message summary If message shows NR Msg 5, It is connected.



Max Power setting

- Click "Cell in the bottom of screen.
- Click "UE Power control" than change UE Power control mode to All Up bits.



Selecting Start RB/Count/MCS

- Select the each test configuring (Start RB, Count, MCS).



View Tx Power

- Click “Link to X-Apps.”(Please refer to Figure-7)
- Select “Channel Power”.

