APPENDIX F: POWER REDUCTION VERIFICATION

Per the May 2017 TCBC Workshop Notes, demonstration of proper functioning of the power reduction mechanisms is required to support the corresponding SAR configurations. The verification process was divided into two parts: (1) evaluation of output power levels for individual or multiple triggering mechanisms and (2) evaluation of the triggering distances for proximity-based sensors.

F.1 Power Verification Procedure

The power verification was performed according to the following procedure:

1. A base station simulator was used to establish a conducted RF connection and the output power was monitored. The power measurements were confirmed to be within expected tolerances for all states before and after a power reduction mechanism was triggered. For licensed modes, the device state index as displayed on the device UI was recorded before and after the mechanism was triggered.

2. Step 1 was repeated for all relevant modes and frequency bands for the mechanism being investigated.

3. Steps 1 and 2 were repeated for all individual power reduction mechanisms and combinations thereof. For the combination cases, one mechanism was switched to a 'triggered' state at a time; powers were confirmed to be within tolerances after each additional mechanism was activated.

F.2 Main Antenna Verification Summary

Table F-1
Power Measurement Verification for Main Antenna

Mechanism(s)		Mode/Band	Device State Index (DSI)		
1st	2nd		Free Space	Mechanism #1	Mechanism #2
Held-to-Ear		GSM1900	0	2	
Held-to-Ear	Hotspot On	LTE Band 66	0	2	2
Hotspot On	Held-to-Ear	LTE Band 66	0	3	2
Held-to-Ear	Hotspot On	LTE Band 4	0	2	2
Hotspot On	Held-to-Ear	LTE Band 4	0	3	2
Held-to-Ear	Hotspot On	LTE Band 2	0	2	2
Hotspot On	Held-to-Ear	LTE Band 2	0	3	2
Held-to-Ear		LTE Band 41	0	2	
Held-to-Ear		NR TDD Band n41	0	2	

*Note: This device uses different Device State Indices (DSI) to configure different time averaged power levels based on certain exposure scenarios. For this device, DSI = 2 represents the case where the device is held to ear, and DSI 3 represents the case when hotspot mode is active. DSI = 0 is configured when the device cannot detect the use condition.

F.3 WIFI Verification Summary

Table F-2
Power Measurement Verification WIFI – Antenna 1

Mode/Band	Conducted Power (dBm)	
	Un-triggered (Max)	Mechanism #1 RCV (Reduced)
802.11b	18.10	10.99
802.11g	17.08	10.93
802.11n (2.4GHz)	17.06	11.00
802.11a	16.70	13.60
802.11n (5GHz, 20MHz BW)	17.10	13.99
802.11ac (20MHz BW)	16.86	13.58
802.11n (5GHz, 40MHz BW)	16.35	13.63
802.11ac (40MHz BW)	15.91	13.60
802.11ac (80MHz BW)	14.85	13.75
802.11ac (160MHz BW)	15.92	13.68

*Note: 802.11ax and MIMO WIFI modes were not evaluated due to equipment limitations. All SISO powers were taken during MIMO conditions.

Table F-3
Power Measurement Verification WIFI – Antenna 2

Mode/Band	Conducted Power (dBm)	
	Un-triggered (Max)	Mechanism #1 RCV (Reduced)
802.11b	17.48	11.99
802.11g	16.26	11.97
802.11n (2.4GHz)	16.21	11.98
802.11a	17.03	13.96
802.11n (5GHz, 20MHz BW)	16.64	13.62
802.11ac (20MHz BW)	16.65	13.42
802.11n (5GHz, 40MHz BW)	16.20	13.73
802.11ac (40MHz BW)	16.03	13.89
802.11ac (80MHz BW)	14.10	12.95
802.11ac (160MHz BW)	15.38	13.37

*Note: 802.11ax and MIMO WIFI modes were not evaluated due to equipment limitations. All SISO powers were taken during MIMO conditions.

Table F-4
Power Measurement Verification WIFI with NR Active – Antenna 1

Mode/Band	Conducted Power (dBm)		
	Un-triggered (Max)	Mechanism #1 NR Active (Reduced)	Mechanism #2 RCV and NR Active (Reduced)
802.11b	18.10	16.19	9.59
802.11g	17.08	16.09	9.35
802.11n (2.4GHz)	17.06	16.06	9.34
802.11a	16.70	13.78	10.65
802.11n (5GHz, 20MHz BW)	17.10	13.72	10.70
802.11ac (20MHz BW)	16.86	13.83	10.57
802.11n (5GHz, 40MHz BW)	16.35	13.97	10.78
802.11ac (40MHz BW)	15.91	13.99	10.67
802.11ac (80MHz BW)	14.85	13.74	10.46
802.11ac (160MHz BW)	15.92	13.68	10.93

*Note: 802.11ax and MIMO WIFI modes were not evaluated due to equipment limitations. All SISO powers were taken during MIMO conditions.

Table F-5
Power Measurement Verification WIFI with NR Active – Antenna 2

Mode/Band	Conducted Power (dBm)		
	Un-triggered (Max)	Mechanism #1 NR Active (Reduced)	Mechanism #2 RCV and NR Active (Reduced)
802.11b	18.67	16.40	9.82
802.11g	17.37	16.32	9.64
802.11n (2.4GHz)	17.45	16.23	9.63
802.11a	17.03	13.05	10.66
802.11n (5GHz, 20MHz BW)	16.64	13.97	10.58
802.11ac (20MHz BW)	16.65	13.98	10.49
802.11n (5GHz, 40MHz BW)	16.20	13.73	10.87
802.11ac (40MHz BW)	16.03	13.72	10.85
802.11ac (80MHz BW)	14.10	13.82	10.78
802.11ac (160MHz BW)	15.38	13.51	10.33

*Note: 802.11ax and MIMO WIFI modes were not evaluated due to equipment limitations. All SISO powers were taken during MIMO conditions.

Table F-6
Power Measurement Verification Bluetooth

Mechanism(s)	Mode/Band	Conducted Power (dBm)	
1st		Un-triggered (Max)	Mechanism #1 RCV Active (Reduced)
Held-to-Ear	Bluetooth Ant 1	14.87	10.71
Held-to-Ear	Bluetooth Ant 2	14.18	10.25