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.

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	Conducted Power (dBm)		
1st	2nd		Free Space	Mechanism #1	Mechanism #2
Held-to-Ear	Hotspot On	LTE Band 66 Ant A	18.88	23.87	23.88
Hotspot On	Held-to-Ear	LTE Band 66 Ant A	18.89	18.89	23.88
Held-to-Ear	Hotspot On	LTE Band 4 Ant A	18.94	23.90	23.91
Hotspot On	Held-to-Ear	LTE Band 4 Ant A	18.94	18.94	23.81
Held-to-Ear	Hotspot On	LTE Band 2 Ant A	18.83	23.94	23.94
Hotspot On	Held-to-Ear	LTE Band 2 Ant A	18.89	18.89	23.91
Held-to-Ear	Hotspot On	LTE Band 41 PC3 Ant B	22.40	24.10	22.50
Hotspot On	Held-to-Ear	LTE Band 41 PC3 Ant B	22.36	22.36	24.11
Held-to-Ear	Hotspot On	LTE Band 41 PC2 Ant B	23.70	24.63	24.63
Hotspot On	Held-to-Ear	LTE Band 41 PC2 Ant B	23.70	23.70	24.59
Held-to-Ear	Hotspot On	NR Band n66 Ant A	18.76	23.61	23.61
Hotspot On	Held-to-Ear	NR Band n66 Ant A	18.58	18.58	23.72

F.3 WIFI Verification Summary

Table F-2
Power Measurement Verification WIFI – Antenna 1

Mode/Band	Conducted Power (dBm)			
	Un-triggered (Max)	Mechanism #1 NR Active (Reduced)	Mechanism #2 RCV Active (Reduced)	Mechanism #3 RCV Active +NR Active (Reduced)
802.11b	16.49	13.45	13.90	13.70
802.11g	15.03	13.01	13.24	13.42
802.11n (2.4GHz)	15.22	13.27	13.17	13.22
802.11ax (2.4 GHz)	15.18	13.41	13.31	13.54
802.11a (5 GHz, 20 MHz BW)	15.72	12.48	12.45	12.58
802.11n (5GHz, 20MHz BW)	15.73	12.64	12.63	12.58
802.11n (5GHz, 40MHz BW)	15.59	12.55	12.52	12.52
802.11ac (20MHz BW)	15.78	11.25	11.14	11.26
802.11ac (40MHz BW)	14.56	11.25	11.10	11.24
802.11ac (80MHz BW)	13.93	11.71	11.50	11.31
802.11ac (160MHz BW)	12.36	11.51	11.42	11.55
802.11ax (20 MHz BW)	15.50	12.77	12.79	12.81
802.11ax (40 MHz BW)	15.59	11.78	11.61	11.87
802.11ax (80 MHz BW)	14.37	12.20	12.27	12.51
802.11ax (160MHz BW)	13.09	12.44	12.14	12.33

*Note: 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 NR Active (Reduced)	Mechanism #2 RCV Active (Reduced)	Mechanism #3 RCV Active +NR Active (Reduced)
802.11b	15.71	13.26	13.38	13.51
802.11g	15.10	12.27	12.27	12.41
802.11n (2.4GHz)	15.47	12.34	12.11	12.28
802.11ax (2.4 GHz)	15.20	12.60	12.37	12.44
802.11a (5 GHz, 20 MHz BW)	14.40	12.08	11.92	12.01
802.11n (5GHz, 20MHz BW)	14.53	11.27	11.27	11.38
802.11n (5GHz, 40MHz BW)	14.70	11.61	11.52	11.55
802.11ac (20MHz BW)	14.36	11.47	11.27	11.28
802.11ac (40MHz BW)	14.75	11.34	11.30	11.75
802.11ac (80MHz BW)	14.22	11.42	11.34	11.46
802.11ac (160MHz BW)	13.24	11.57	11.31	11.43
802.11ax (20 MHz BW)	15.73	11.37	11.35	11.37
802.11ax (40 MHz BW)	14.27	11.24	11.37	11.58
802.11ax (80 MHz BW)	13.20	11.72	11.41	11.67
802.11ax (160MHz BW)	12.34	11.47	11.34	11.27

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

Table F-4
Power Measurement Verification Bluetooth

Mechanism(s)	Mode/Band	Conducted Power (dBm)	
1st		Un-triggered (Max)	Mechanism #1 RCV Active (Reduced)
Held-to-Ear	Bluetooth Antenna 1	14.70	9.70
Held-to-Ear	Bluetooth Antenna 2	13.50	7.70