

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 includes evaluation of output power levels for individual or multiple triggering mechanisms.

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

Mid band refers to: GSM1900, UMTS B2/4, LTE B2/4/25/66, NR n66/25/2; High band refers to: LTE B7/30/38/41, NR n30/41; Ultra High band refers to: LTE B48, NR n48/77

- This device uses different Device State Indices (DSI) to configure different time averaged power levels based on certain exposure scenarios. For this device DSI = 1 represents the case where the device is held to ear, and DSI = 2 represents the case when hotspot mode is active. DSI = 0 is configured when the device cannot detect the use conditions.

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	Hotspot On	Mid Band Ant A	0	1	1
Hotspot On	Held-to-Ear	Mid Band Ant A	0	2	1
Held-to-Ear	Hotspot On	High Band Ant A	0	1	1
Hotspot On	Held-to-Ear	High Band Ant A	0	2	1
Held-to-Ear	Hotspot On	High Band Ant B	0	1	1
Hotspot On	Held-to-Ear	High Band Ant B	0	2	1
Held-to-Ear	Hotspot On	Mid Band Ant F	0	1	1
Hotspot On	Held-to-Ear	Mid Band Ant F	0	2	1
Held-to-Ear	Hotspot On	High Band Ant F	0	1	1
Hotspot On	Held-to-Ear	High Band Ant F	0	2	1
Held-to-Ear	Hotspot On	High Ultra Band Ant F	0	1	1
Hotspot On	Held-to-Ear	High Ultra Band Ant F	0	2	1

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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	18.45	15.33	11.87	11.44
802.11g	17.86	15.76	12.13	11.75
802.11n (2.4GHz)	17.64	15.86	12.10	11.85
802.11ax (2.4 GHz)	16.67	15.45	12.17	11.71
802.11a	15.65	12.91	9.45	9.42
802.11n (5GHz, 20MHz BW)	15.61	12.67	9.41	9.73
802.11n (5GHz, 40MHz BW)	15.49	13.10	8.94	9.72
802.11ac (20MHz BW)	16.60	13.10	9.35	9.83
802.11ac (40MHz BW)	15.25	12.72	9.12	9.71
802.11ac (80MHz BW)	13.31	11.60	9.84	9.31
802.11ac (160MHz BW)	13.11	12.36	9.22	9.18
802.11ax (20 MHz BW)	16.42	13.21	9.13	9.76
802.11ax (40 MHz BW)	15.37	12.88	8.94	9.54
802.11ax (80 MHz BW)	13.71	11.79	9.40	9.42
802.11ax (160MHz BW)	13.54	12.11	9.15	9.28

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

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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 #2 RCV Active +NR Active (Reduced)
802.11b	18.73	16.23	12.47	11.98
802.11g	17.61	16.05	12.51	11.88
802.11n (2.4GHz)	17.62	16.26	12.40	11.93
802.11ax (2.4 GHz)	16.63	16.16	12.43	11.97
802.11a	16.73	12.52	9.72	8.96
802.11n (5GHz, 20MHz BW)	15.95	12.56	9.62	8.87
802.11n (5GHz, 40MHz BW)	14.84	12.16	9.51	8.96
802.11ac (20MHz BW)	15.99	12.02	9.66	8.89
802.11ac (40MHz BW)	14.67	12.01	9.64	8.82
802.11ac (80MHz BW)	13.83	12.11	9.18	9.00
802.11ac (160MHz BW)	13.67	12.03	8.96	8.95
802.11ax (20 MHz BW)	15.21	12.01	9.52	8.88
802.11ax (40 MHz BW)	14.30	12.37	9.57	8.56
802.11ax (80 MHz BW)	13.82	12.15	9.21	8.93
802.11ax (160MHz BW)	13.56	12.27	9.05	8.88

*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	15.21	9.29
Held-to-Ear	Bluetooth Antenna 2	13.48	6.20

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