

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 Distance Verification Procedure

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

- 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. For licensed modes, the device state index on the device UI was monitored to determine the triggering state.
- 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 and FCC Guidance. Each applicable test position was evaluated. The distances were confirmed to be the same or larger (more conservative) than the minimum distances provided by the manufacturer.
- 3. Steps 1 and 2 were repeated for low, mid, and high bands, as appropriate (see note below Table F-2 for more details).
- 4. Steps 1 through 3 were repeated for all distance-based power reduction mechanisms.

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F.3 Main Antenna Verification Summary

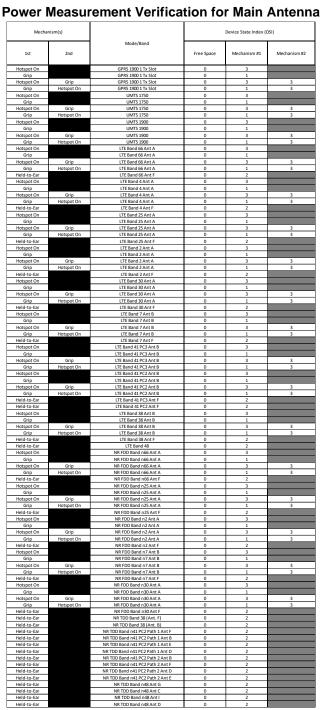


Table F-1

*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 = 1 represents the case when the grip sensor is active, 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 at max power when the device cannot detect the use condition.

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Distance measurement verification for main Antenna					
Test Condition	Band	Distance Measurements (mm)		Minimum Distance per	
Test condition	Dallu	Moving Toward	Moving Away	Manufacturer (mm)	
Phablet - Back Side	Mid	9	24	9	
Phablet - Back Side	High	9	24	9	
Phablet - Front Side	Mid	7	20	7	
Phablet - Front Side	High	7	20	7	
Phablet - Bottom Edge	Mid	13	25	13	
Phablet - Bottom Edge	High	13	25	13	

 Table F-2

 Distance Measurement Verification for Main Antenna

*Note: Mid band refers to in AG0: GSM1900, UMTS B2/4, LTE B2/4/25/66, NR Band n2/25/66; High band refers to in AG0: LTE B7/30/38/41, NR Band n7/30

F.4 WIFI Verification Summary

Power Measurement Verification WIFI – Antenna 1			
Mechanism(s)		Conducted F	ower (dBm)
1st	Mode/Band	Un-triggered (Max)	Mechanism #1 (Reduced)
Held-to-Ear	802.11b	19.33	15.98
Held-to-Ear	802.11g	17.00	15.90
Held-to-Ear	802.11n (2.4GHz)	16.98	15.53
Held-to-Ear	802.11a	16.25	12.22
Held-to-Ear	802.11n (5GHz, 20MHz BW)	16.15	12.01
Held-to-Ear	802.11ac (20MHz BW)	16.27	12.14
Held-to-Ear	802.11n (5GHz <i>,</i> 40MHz BW)	15.53	12.16
Held-to-Ear	802.11ac (40MHz BW)	15.23	12.23
Held-to-Ear	802.11ac (80MHz BW)	14.12	12.21
Held-to-Ear	802.11ac (160MHz BW)	14.60	12.08

 Table F-3

 Power Measurement Verification WIFI – Antenna 1

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

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Mechanism(s)		Conducted F	Power (dBm)
1st	Mode/Band	Un-triggered (Max)	Mechanism #1 (Reduced)
Held-to-Ear	802.11b	18.93	15.97
Held-to-Ear	802.11g	16.80	15.41
Held-to-Ear	802.11n (2.4GHz)	17.15	15.28
Held-to-Ear	802.11a	16.28	12.19
Held-to-Ear	802.11n (5GHz, 20MHz BW)	16.36	12.18
Held-to-Ear	802.11ac (20MHz BW)	16.22	12.38
Held-to-Ear	802.11n (5GHz, 40MHz BW)	15.74	12.64
Held-to-Ear	802.11ac (40MHz BW)	15.53	12.39
Held-to-Ear	802.11ac (80MHz BW)	14.48	12.40
Held-to-Ear	802.11ac (160MHz BW)	15.09	12.98

Table F-4Power Measurement Verification WIFI – Antenna 2

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

Fower measurement vernication wiri with NR Active – Antenna i				
	Conducted Power (dBm)			
Mode/Band	Un-triggered (Max)	Mechanism #1 NR Active (Reduced)	Mechanism #2 RCV and NR Active (Reduced)	
802.11b	19.05	16.08	15.03	
802.11g	16.87	16.14	14.89	
802.11n (2.4GHz)	16.75	15.89	14.88	
802.11a	16.35	13.89	11.87	
802.11n (5GHz, 20MHz BW)	16.40	13.94	11.95	
802.11ac (20MHz BW)	16.44	13.84	11.82	
802.11n (5GHz, 40MHz BW)	15.86	14.01	11.86	
802.11ac (40MHz BW)	15.89	13.94	11.83	
802.11ac (80MHz BW)	14.87	13.86	11.74	
802.11ac (160MHz BW)	14.79	14.11	11.85	

 Table F-5

 Power Measurement Verification WIFI with NR Active – Antenna 1

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

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	Conducted Power (dBm)			
Mode/Band	Un-triggered (Max)	Mechanism #1 NR Active (Reduced)	Mechanism #2 RCV and NR Active (Reduced)	
802.11b	19.10	15.94	14.98	
802.11g	17.08	15.95	14.87	
802.11n (2.4GHz)	17.15	16.12	14.92	
802.11a	16.61	14.05	12.12	
802.11n (5GHz, 20MHz BW)	16.55	14.13	12.14	
802.11ac (20MHz BW)	16.58	14.17	12.02	
802.11n (5GHz, 40MHz BW)	16.11	13.95	12.13	
802.11ac (40MHz BW)	16.05	14.02	12.15	
802.11ac (80MHz BW)	15.10	14.15	12.11	
802.11ac (160MHz BW)	15.18	14.08	12.20	

Table F-6Power Measurement Verification WIFI with NR Active – Antenna 2

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

 Table F-7

 Power Measurement Verification Bluetooth – Antenna 1

Mechanism(s)	Mode/Band -	Conducted F	Power (dBm)
1st		Un-triggered (Max)	Mechanism #1 RCV Active (Reduced)
Held-to-Ear	Bluetooth	17.62	12.27

 Table F-8

 Power Measurement Verification Bluetooth – Antenna 2

Mechanism(s)	Mode/Band	Conducted F	Power (dBm)
1st		Un-triggered (Max)	Mechanism #1 RCV Active (Reduced)
Held-to-Ear	Bluetooth	17.69	12.25

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