

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 Angle Verification Procedure

The angle 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. For licensed modes, the device state index on the device UI was monitored to determine the triggering state.
2. The device was opened and closed to determine the angle at which the mechanism triggers and the output power is reduced, per the FCC TCB Workshop Slides from November 2019. The triggering conditions of the angles was sufficient such that all possible user scenarios with the device in open condition are in the reduced power state.

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F.3 Main Antenna Verification Summary

Note: The device supports manufacturer’s proprietary mechanism which can detect the motion of the device and then configure the DSI during portable use scenarios. Details of this mechanism can be found in the Operational Description. When the device is being used near the user, the device will detect motion and reduce the time-averaged output power. The motion detection operation was verified for on-body condition to represent conservative use cases for a tablet device. The verification results are below.

This device uses different Device State Indices (DSI) to configure different time averaged power levels based on certain exposure scenarios. For this device DSI = 3 represents the case where the device is in laptop configuration or detects no motion. DSI = 6 is configured when the device detects motion and is in tablet mode.

**Table F-1
Power Measurement Verification for Main Antenna**

Mechanism(s)	Mode/Band	Device State Index (DSI)	
		No Motion (Max)	Motion + Tablet (Reduced)
Motion	Low Band Ant 4	3	6
Motion	Mid Band Ant 1	3	6
Motion	Mid Band Ant 4	3	6
Motion	High Band Ant 1	3	6
Motion	High Band Ant 4	3	6
Motion	Ultra High Band Ant 2	3	6
Motion	Ultra High Band Ant 3	3	6

Note:

1. Low band refers to: UMTS B5, LTE B5/12/13/14/26/71, NR n71/12/14/26/5; Mid band refers to: UMTS B2/4, LTE B2/4/25/66, NR n66/25/2; High band refers to: LTE B30/41, NR n30/41; Ultra High band refers to: LTE B48, NR n48/77
2. Antenna 5 and 8 could not be measured due to equipment limitations.

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F.4 WIFI Verification Summary

Note: The device supports manufacturer’s proprietary mechanism which can detect the motion of the device and then configure the power during portable use scenarios. Details of this mechanism can be found in the Operational Description. When the device is being used near the user, the device will detect motion and reduce the time-averaged output power. The motion detection operation was verified for on-body condition to represent conservative use cases for a tablet device. The verification results are in the tables below.

This device uses different Device State Indices (DSI) to configure different time averaged power levels based on certain exposure scenarios. For this device DSI = 0 represents the case where the device is in laptop configuration or detects no motion. DSI = 1 is configured when the device detects motion and is in tablet mode.

**Table F-2
Power Measurement Verification WIFI – 2.4/5 GHz WLAN MIMO**

Mechanism(s)	Mode/Band	Device State Index (DSI)	
		No Motion (Max)	Motion + Tablet (Reduced)
Motion	802.11b	0	1
Motion	802.11g	0	1
Motion	802.11n (2.4GHz) 20MHz	0	1
Motion	802.11n (2.4GHz) 40MHz	0	1
Motion	802.11ac (2.4 GHz) 20MHz	0	1
Motion	802.11ac (2.4 GHz) 40MHz	0	1
Motion	802.11ax (2.4 GHz) 20MHz	0	1
Motion	802.11ax (2.4 GHz) 40MHz	0	1
Motion	802.11a	0	1
Motion	802.11n (5GHz, 20MHz BW)	0	1
Motion	802.11n (5GHz, 40MHz BW)	0	1
Motion	802.11ac (20MHz BW)	0	1
Motion	802.11ac (40MHz BW)	0	1
Motion	802.11ac (80MHz BW)	0	1
Motion	802.11ac (160MHz BW)	0	1
Motion	802.11ax (20 MHz BW)	0	1
Motion	802.11ax (40 MHz BW)	0	1
Motion	802.11ax (80 MHz BW)	0	1
Motion	802.11ax (160MHz BW)	0	1

*Note:

1. SISO WIFI modes were not evaluated due to equipment limitations.
2. IEEE 801.11be WIFI mode was not evaluated due to equipment limitations.

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**Table F-3
Power Measurement Verification WIFI – 6 GHz WLAN SISO**

Mechanism(s)	Mode/Band	Antenna	Device State Index (DSI)	
			No Motion (Max)	Motion + Tablet (Reduced)
Motion	802.11ax (6GHz, 20 MHz BW)	6	0	1
Motion	802.11ax (6GHz, 40 MHz BW)	6	0	1
Motion	802.11ax (6GHz, 80 MHz BW)	6	0	1
Motion	802.11ax (6GHz, 160 MHz BW)	6	0	1
Motion	802.11ax (6GHz, 20 MHz BW)	7	0	1
Motion	802.11ax (6GHz, 40 MHz BW)	7	0	1
Motion	802.11ax (6GHz, 80 MHz BW)	7	0	1
Motion	802.11ax (6GHz, 160 MHz BW)	7	0	1

"Notes:

1. IEEE 801.11be WIFI mode was not evaluated due to equipment limitations.
2. MIMO measurements were not evaluated due to equipment limitations.
3. IEEE 802.11a WIFI mode for 6GHz WIFI was not evaluated due to equipment limitations
4. 320 MHz BW mode was not evaluated due to equipment limitations

**Table F-4
Power Measurement Verification Bluetooth**

Mechanism(s)	Mode/Band	Conducted Power (dBm)		
		No Motion (Max)	Motion + Tablet (Reduced)	Motion + Tablet with WLAN Active (Reduced)
Motion	Bluetooth Ant 6	20.36	12.66	8.67
Motion	Bluetooth Ant 7	20.44	12.93	8.80

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F.5 Angle Verification Summary

**Table F-5
Angle Detection with Keyboard Accessory**

Mechanism(s)	Angle Measurements (°)				Angle (°) Range per Manufacturer
	Opening (0 to 270)	Opening Posture Readout	Closing (270 to 0)	Closing Posture Readout	
Keyboard Angle	0	Max	270	Reduced	210
	10	Max	260	Reduced	
	20	Max	250	Reduced	
	30	Max	240	Reduced	
	40	Max	230	Reduced	
	50	Max	220	Reduced	
	60	Max	219	Reduced	
	70	Max	218	Reduced	
	80	Max	217	Reduced	
	90	Max	216	Reduced	
	100	Max	215	Reduced	
	110	Max	214	Reduced	
	120	Max	213	Reduced	
	130	Max	212	Reduced	
	140	Max	211	Reduced	
	150	Max	210	Reduced	
	160	Max	209	Reduced	
	170	Max	208	Reduced	
	180	Max	207	Reduced	
	190	Max	206	Reduced	
	200	Max	205	Reduced	
	201	Max	204	Max	
	202	Max	203	Max	
	203	Max	202	Max	
	204	Max	201	Max	
	205	Reduced	200	Max	
	206	Reduced	190	Max	
	207	Reduced	180	Max	
208	Reduced	170	Max		
209	Reduced	160	Max		
210	Reduced	150	Max		
211	Reduced	140	Max		
212	Reduced	130	Max		
213	Reduced	120	Max		
214	Reduced	110	Max		
215	Reduced	100	Max		
216	Reduced	90	Max		
217	Reduced	80	Max		
218	Reduced	70	Max		
219	Reduced	60	Max		
220	Reduced	50	Max		
230	Reduced	40	Max		
240	Reduced	30	Max		
250	Reduced	20	Max		
260	Reduced	10	Max		
270	Reduced	0	Max		

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