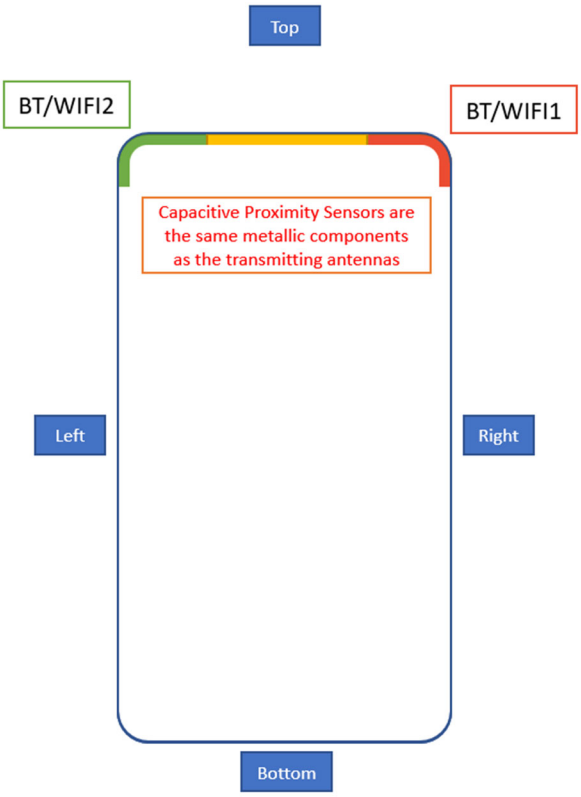
Appendix G: Proximity Sensor Triggering Distance

Proximity Sensor Triggering Distance, Sensor Coverage, and Tilt Angle Assessment

The following verification tests for the proximity sensor triggering, sensor coverage and Tilt Angle Assessment were performed by Samsung and results are presented here to support test distances used for SAR measurements.

Power Reduction by Proximity Sensing

According to FCC KDB 616217 §6.3, if the proximity sensors are not designed to cover the entire rear surface of the DUT, the sensing regions are limited and are spatially offset from the antenna.
However, this device uses a capacitive proximity sensor that is same metallic component as the transmitting antenna to facilitate triggering in any conditions the user may use the device in proximity of the antenna in the device. Therefore, no further sensor coverage assessments were required according to KDB 616217 D04.

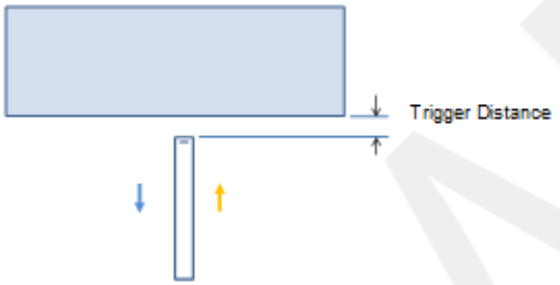


1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Back, Left Edge, Right Edge and Top Edge of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outline in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The DUT featured a visual indicator on its display that showed the status of the proximity sensor (Triggered or not triggered). This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the proximity sensor status indication. This was achieved by observing the proximity sensor status at the same time as monitoring the conducted power. Section 9 contains both the full and reduced conducted power measurements.



Proximity Sensor Trigger Distance Assessment
KDB 616219 §6.2, Top, Right and Left Edges

Proximity Sensor Trigger Distance Assessment
KDB 616219 §6.2, Back

LEGEND

Direction of DUT travel for determination of power reduction triggering point

Direction of DUT travel for determination of full power resumption triggering point

Summary of Trigger Distances

Antenna	Trigger distance - Back		Trigger distance - Edge Top		Trigger distance - Edge Right		Trigger distance - Edge Left	
	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
BT/WIFI 1 ANT	19 mm	19 mm	23 mm	23 mm	12 mm	12 mm	N/A	N/A
BT/WIFI 2 ANT	19 mm	19 mm	26 mm	26 mm	N/A	N/A	11 mm	11 mm

Summary of Test Distances

Per KDB 616217, the SAR Test Distance is the Trigger Distance – 1 mm.

Antenna	Test distance - Back	Test distance - Edge Top	Test distance - Edge Right	Test distance - Edge Left
BT/WIFI 1 ANT	18 mm	22 mm	11 mm	N/A
BT/WIFI 2 ANT	18 mm	25 mm	N/A	10 mm

Proximity Sensor Triggering Distance Measurement Results

WIFI1 - Back									
Measured Power [dBm]									
Distance[mm]	29	26	23	20	19	18	17	16	15
2.4GHz WLAN 11b	18.28	18.19	18.12	18.23	11.08	11.25	11.18	11.14	11.03
5GHz WLAN(20MHz BW) 11a	16.01	16.04	16.15	16.24	8.22	8.12	8.28	8.18	8.31
5GHz WLAN(160MHz BW) 11ac	14.30	14.06	14.10	14.27	8.01	8.25	8.07	8.27	8.19
6GHz WLAN(160MHz BW) 11ax	14.06	14.32	14.02	14.32	7.26	7.14	7.05	7.07	7.23
Bluetooth BDR	17.26	17.12	17.09	17.30	10.13	10.20	10.13	10.27	10.23

WIFI1 – Edge Top										
Measured Power [dBm]										
Distance[mm]	34	31	28	25	24	23	22	21	20	19
2.4GHz WLAN 11b	18.12	18.20	18.11	18.05	18.22	11.01	11.20	11.08	11.32	11.12
5GHz WLAN(20MHz BW) 11a	16.08	16.08	16.22	16.26	16.18	8.10	8.19	8.01	8.05	8.08
5GHz WLAN(160MHz BW) 11ac	14.03	14.08	14.31	14.17	14.23	8.05	8.05	8.22	8.31	8.03
6GHz WLAN(160MHz BW) 11ax	14.06	14.01	14.17	14.28	14.16	7.01	7.24	7.04	7.01	7.06
Bluetooth BDR	17.01	17.32	17.29	17.23	17.25	10.20	10.26	10.22	10.27	10.01

WIFI1 – Edge Right									
Measured Power [dBm]									
Distance[mm]	22	19	16	13	12	11	10	9	8
2.4GHz WLAN 11b	18.07	18.22	18.25	18.08	11.21	11.03	11.14	11.24	11.16
5GHz WLAN(20MHz BW) 11a	16.14	16.04	16.21	16.24	8.19	8.19	8.12	8.28	8.10
5GHz WLAN(160MHz BW) 11ac	14.28	14.06	14.03	14.02	8.22	8.23	8.25	8.03	8.15
6GHz WLAN(160MHz BW) 11ax	14.05	14.32	14.26	14.29	7.19	7.26	7.05	7.09	7.09
Bluetooth BDR	17.13	17.30	17.20	17.06	10.05	10.29	10.23	10.16	10.05

WIFI2 – Back

Measured Power [dBm]

Distance[mm]	29	26	23	20	19	18	17	16	15
2.4GHz WLAN 11b	18.31	18.33	18.09	18.15	11.27	11.10	11.21	11.25	11.28
5GHz WLAN(20MHz BW) 11a	16.17	16.04	16.05	16.23	8.30	8.13	8.22	8.06	8.29
5GHz WLAN(160MHz BW) 11ac	14.21	14.14	14.33	14.31	8.17	8.18	8.24	8.29	8.30
6GHz WLAN(160MHz BW) 11ax	14.16	14.08	14.31	14.28	7.27	7.24	7.26	7.17	7.22
Bluetooth BDR	16.22	16.22	16.20	16.17	8.06	8.24	8.32	8.06	8.09

WIFI2 – Edge Top

Measured Power [dBm]

Distance[mm]	37	34	31	28	27	26	25	24	23	22
2.4GHz WLAN 11b	18.33	18.12	18.10	18.26	18.29	11.08	11.09	11.32	11.11	11.33
5GHz WLAN(20MHz BW) 11a	16.22	16.18	16.06	16.08	16.16	8.20	8.16	8.17	8.31	8.22
5GHz WLAN(160MHz BW) 11ac	14.09	14.29	14.11	14.05	14.25	8.09	8.18	8.22	8.30	8.09
6GHz WLAN(160MHz BW) 11ax	14.08	14.22	14.33	14.09	14.24	7.28	7.04	7.08	7.33	7.08
Bluetooth BDR	16.18	16.23	16.31	16.04	16.09	8.31	8.30	8.28	8.32	8.18

WIFI2 – Edge Left

Measured Power [dBm]

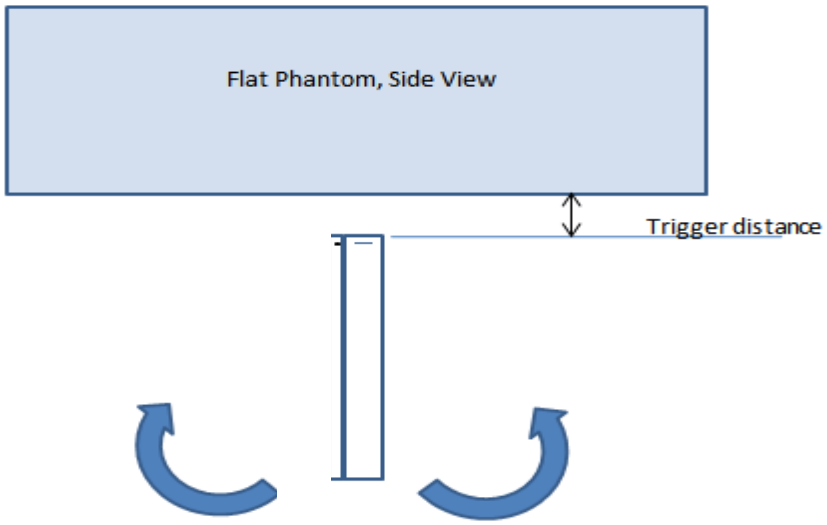
Distance[mm]	21	18	15	12	11	10	9	8	7
2.4GHz WLAN 11b	18.12	18.33	18.07	18.01	11.08	11.06	11.24	11.28	11.33
5GHz WLAN(20MHz BW) 11a	16.09	16.20	16.22	16.25	8.10	8.31	8.22	8.08	8.15
5GHz WLAN(160MHz BW) 11ac	14.02	14.13	14.04	14.14	8.25	8.32	8.14	8.27	8.24
6GHz WLAN(160MHz BW) 11ax	14.32	14.28	14.27	14.09	7.15	7.14	7.24	7.25	7.01
Bluetooth BDR	16.08	16.01	16.02	16.22	8.33	8.26	8.09	8.08	8.12

2. Proximity Sensor Coverage (KDB 616217 §6.3)

As there is no spatial offset between the antenna and the proximity sensor element, proximity sensor coverage did not need to be assessed.

3. Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4)

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Edge Bottom parallel to the base of the flat phantom for each band.
The DUT was rotated about Edge Bottom for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to +/- 45°.



Proximity sensor tilt angle assessment (Edge Bottom) KDB 616217 §6.4

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering (Edge Top)

WIFI1

Measured Power [dBm]

Tilt Angle[o]	-45	-35	-35	-15	-5	5	15	25	35	45
2.4GHz WLAN 11b	11.19	11.05	11.32	11.01	11.16	11.17	11.27	11.05	11.20	11.09
5GHz WLAN(20MHz BW) 11a	8.10	8.10	8.20	8.22	8.29	8.21	8.27	8.28	8.16	8.17
5GHz WLAN(160MHz BW) 11ac	8.15	8.17	8.28	8.19	8.05	8.16	8.12	8.09	8.30	8.10
6GHz WLAN(160MHz BW) 11ax	7.30	7.23	7.18	7.27	7.23	7.24	7.19	7.07	7.27	7.24
Bluetooth BDR	10.06	10.03	10.32	10.06	10.16	10.27	10.05	10.12	10.08	10.18

WIFI2

Measured Power [dBm]

Tilt Angle[o]	-45	-35	-35	-15	-5	5	15	25	35	45
2.4GHz WLAN 11b	11.33	11.28	11.13	11.10	11.21	11.15	11.06	11.08	11.23	11.17
5GHz WLAN(20MHz BW) 11a	8.16	8.31	8.15	8.32	8.19	8.30	8.00	8.17	8.03	8.05
5GHz WLAN(160MHz BW) 11ac	8.10	8.12	8.08	8.03	8.11	8.02	8.29	8.16	8.33	8.22
6GHz WLAN(160MHz BW) 11ax	7.25	7.02	7.03	7.12	7.10	7.19	7.03	7.01	7.29	7.05
Bluetooth BDR	8.03	8.12	8.08	8.21	8.33	8.09	8.29	8.10	8.11	8.29

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