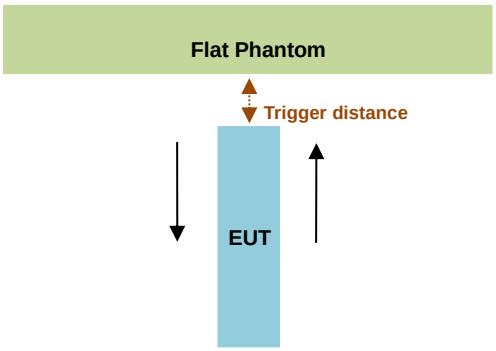
Appendix E. Proximity Sensor Verification

<Proximity Sensor Triggering Distance (KDB 616217 D04 section 6.2)>:

For the device is fully integrated, touch sensing capacitive sensor. It uses a charge transfer capacitive acquisition method that is capable of near range proximity detection. In this device offers a state of the art capacitive sensing engine with an embedded sampling capacitor and voltage regulator allowing the overall solution cost to be reduced and improving system immunity in noisy environments.
Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed. The details are illustrated as following, and the shortest triggering distances were reported and used for SAR assessment.
In the preliminary triggering distance testing, the tissue-equivalent medium for different frequency bands were used for verification; no other frequency bands tissue-equivalent medium was found to result in shortest triggering distance than that for 1900MHz, and the tissue-equivalent medium for 1900MHz was used for formal proximity sensor triggering testing.



Ant 1 Proximity Trigger Distance								
Position	Front		Back		Right Side		Top Side	
Minimum (mm)	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away
	20	21	20	21	26	26	16	16

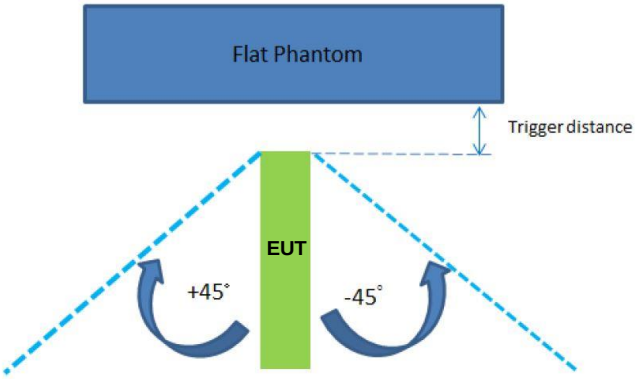
Ant 4 Proximity Trigger Distance						
Position	Front		Back		Top Side	
Minimum (mm)	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away
	16	16	16	17	23	22

<Proximity Sensor Triggering Coverage (KDB 616217 D04 section 6.3)>:

Since the antenna and sensor are collocated and all of the peak SAR location is overlapping with the sensor pad for this device, therefore, According to KDB 616217 section6.3, these procedures do not apply and are not required for this device. due to the antenna and sensor are collocated and the peak SAR location is overlapping with the sensor on this device.

<Tablet Tilt angle influences to proximity sensor triggering (KDB 616217 D04 section 6.4)>:

The influence of table tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at above separation distance.
Rotating the tablet around the edge next to the phantom in ≤ 10° increments until the tablet is ± 45° from the vertical position at 0°, and the maximum output power remains in the reduced mode.



Ant 1 Proximity Trigger Distance				
Position	Right Side		Top Side	
Minimum (mm)	+45	-45	+45	-45
	26	26	16	16

Ant 4 Proximity Trigger Distance		
Position	Top Side	
Minimum (mm)	+45	-45
	22	22

Proximity sensor power reduction in open mode

Transmit Ant 1		Transmit Ant 4	
Exposure Position / wireless Band	Front, Back, Right Side, Top Side(1)	Exposure Position / wireless Band	Front, Back, Top Side(1)
GSM1900	5.17 dB	WLAN 2.4GHz	0.50 dB
WCDMA Band II	7.78 dB	WLAN 5.2GHz	0.10 dB
WCDMA Band IV	5.45 dB	WLAN 5.3GHz	0.10 dB
LTE Band 2	7.42 dB	WLAN 5.8GHz	3.90 dB
LTE Band 4	2.58 dB	WLAN 5.9GHz	3.90 dB
LTE Band 7	4.32 dB	WLAN 6GHz UNII5	6.00 dB
LTE Band 25	7.36 dB	WLAN 6GHz UNII6	4.30 dB
LTE Band 66	5.60 dB	WLAN 6GHz UNII7	7.52 dB
LTE Band 38	2.19 dB	WLAN 6GHz UNII8	3.90 dB
LTE Band 38 HPUE	2.50 dB		
LTE Band 41	2.09 dB		
LTE Band 41 HPUE	2.50 dB		
LTE Band 48	0.98 dB		
FR1 n2	6.17 dB		
FR1 n7	3.55 dB		
FR1 n25	6.10 dB		
FR1 n30	1.56 dB		
FR1 n66	5.77 dB		
FR1 n70	2.74 dB		
FR1 n38	5.20 dB		
FR1 n41	5.15 dB		
FR1 n41 HPUE	4.09 dB		
FR1 n48	1.47 dB		
FR1 n77 27O	2.54 dB		
FR1 n77 27Q	2.54 dB		
FR1 n78 27O	2.73 dB		
FR1 n78 27Q	2.60 dB		

General Note:

1. (1): Reduced maximum limit applied by activation of proximity sensor.
2. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown below
3. For the power verification was selected worst case power reduction level of band of each transmit antenna to verify.
4. Additional conservative evaluation of the top and right side to ensure that users can use it in hand exposure at a low power state.
5. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance -1 was performed:

Ant 1:

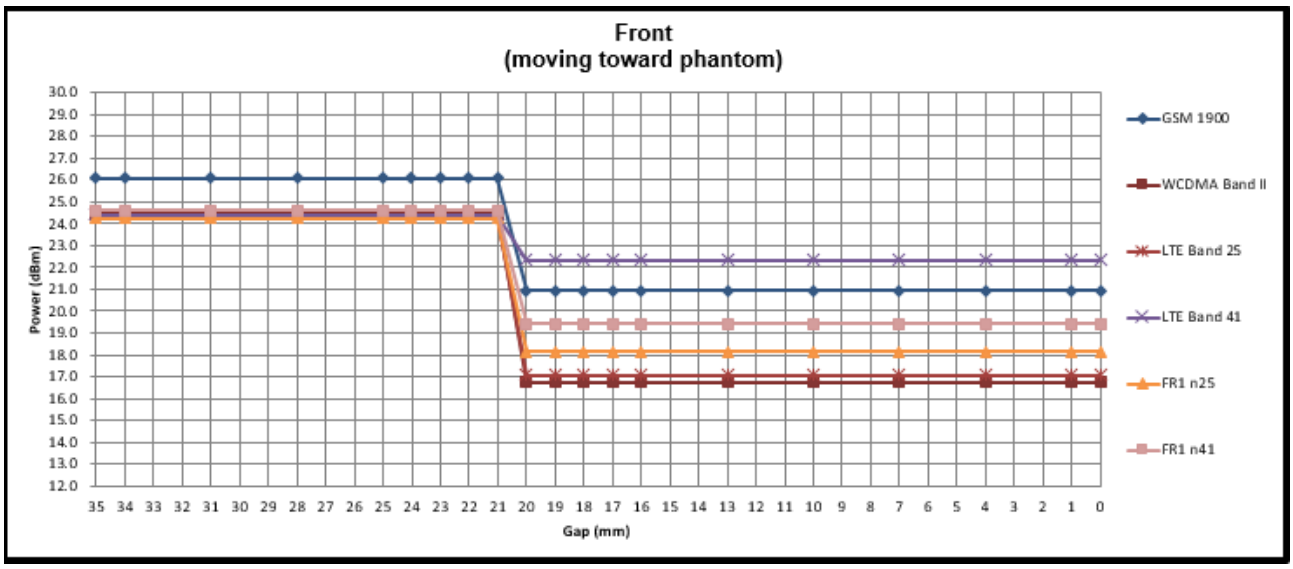
Front: 19 mm
Back: 19 mm
Right Side: 25 mm
Top Side: 15 mm

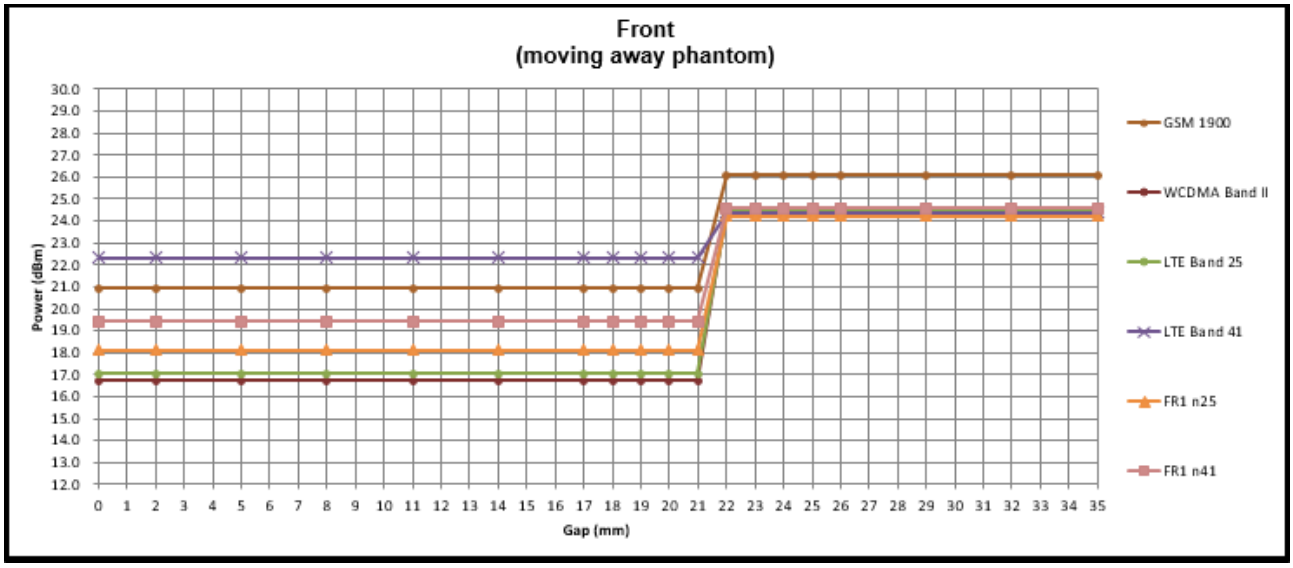
Ant 4:

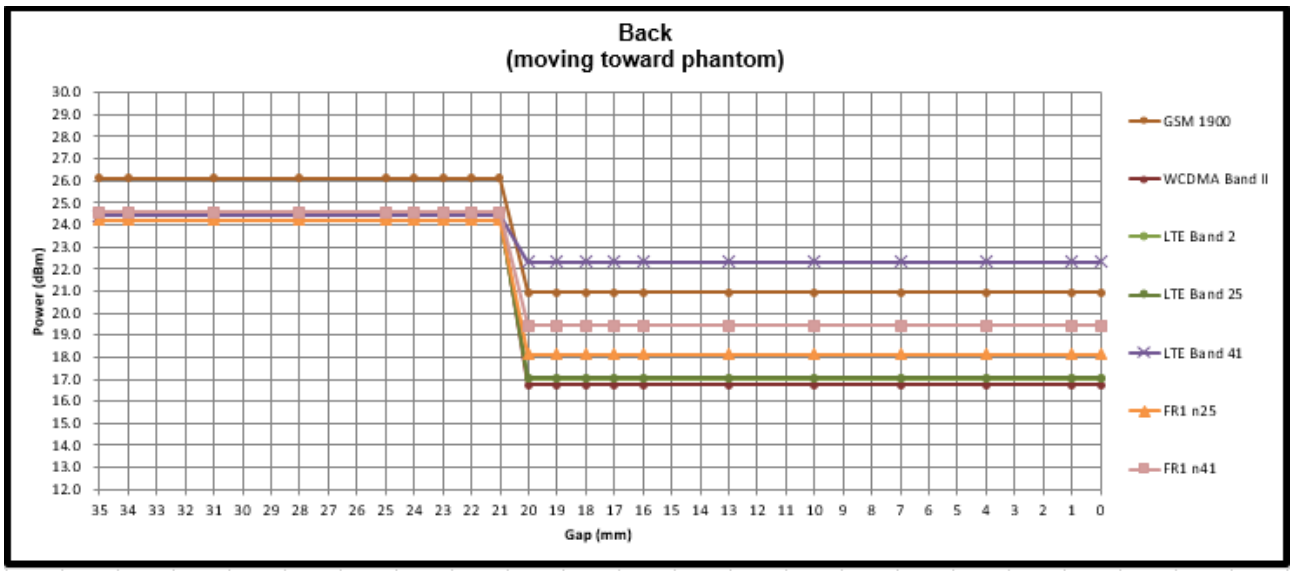
Front: 15 mm
Back: 15 mm
Top Side: 21 mm

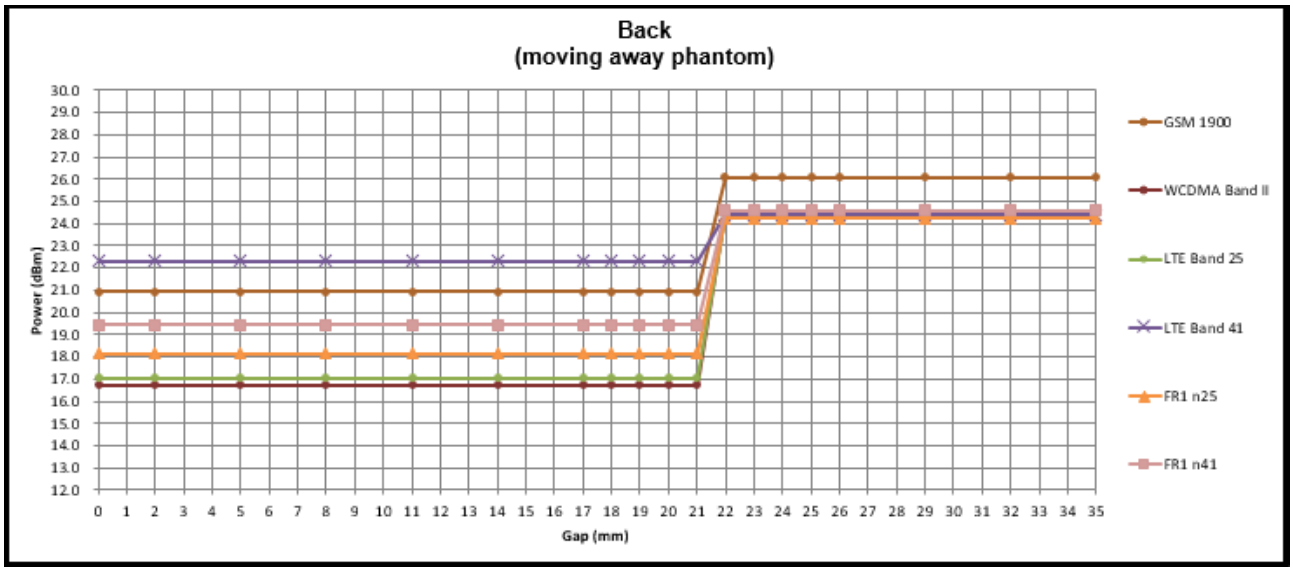
Power Measurement during Sensor Trigger distance testing

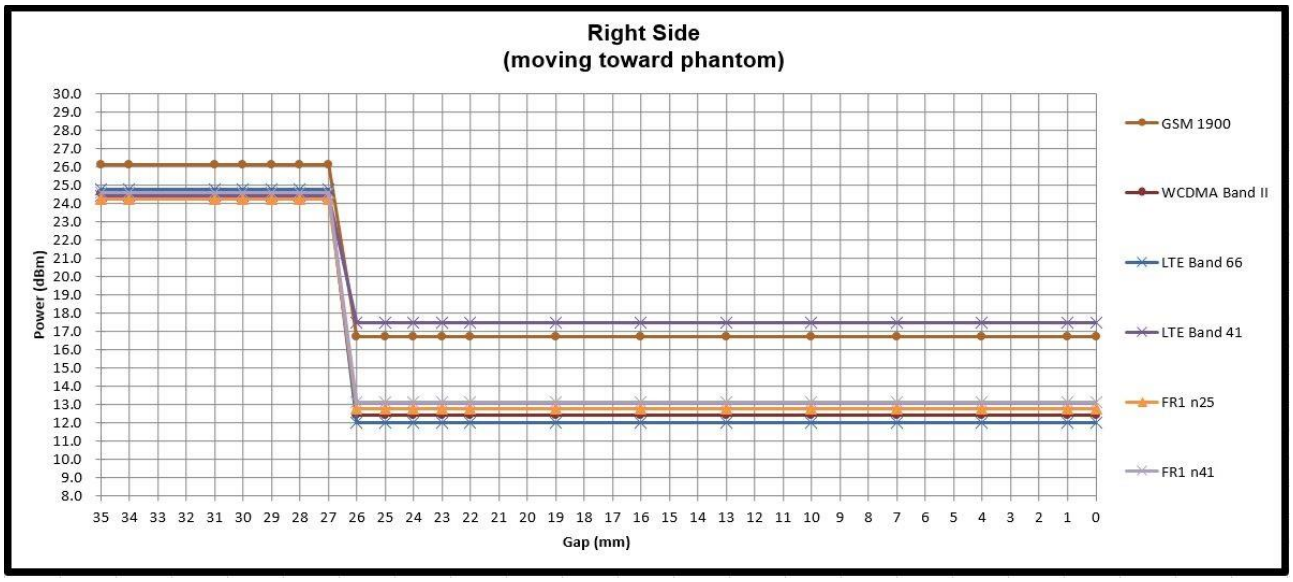
Ant 1

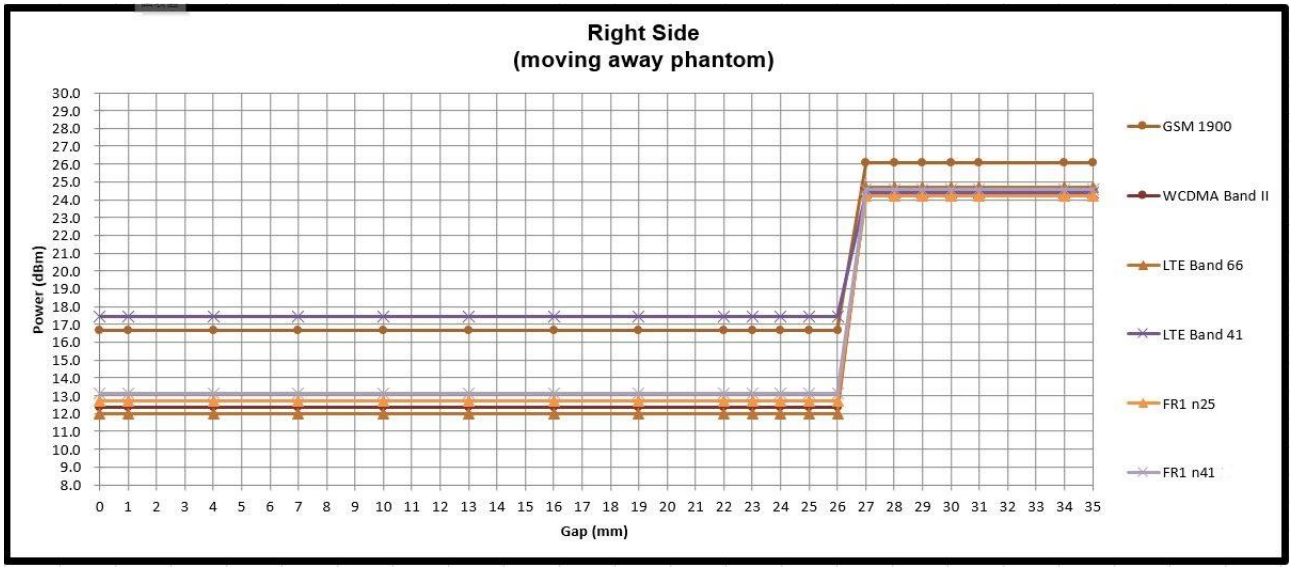


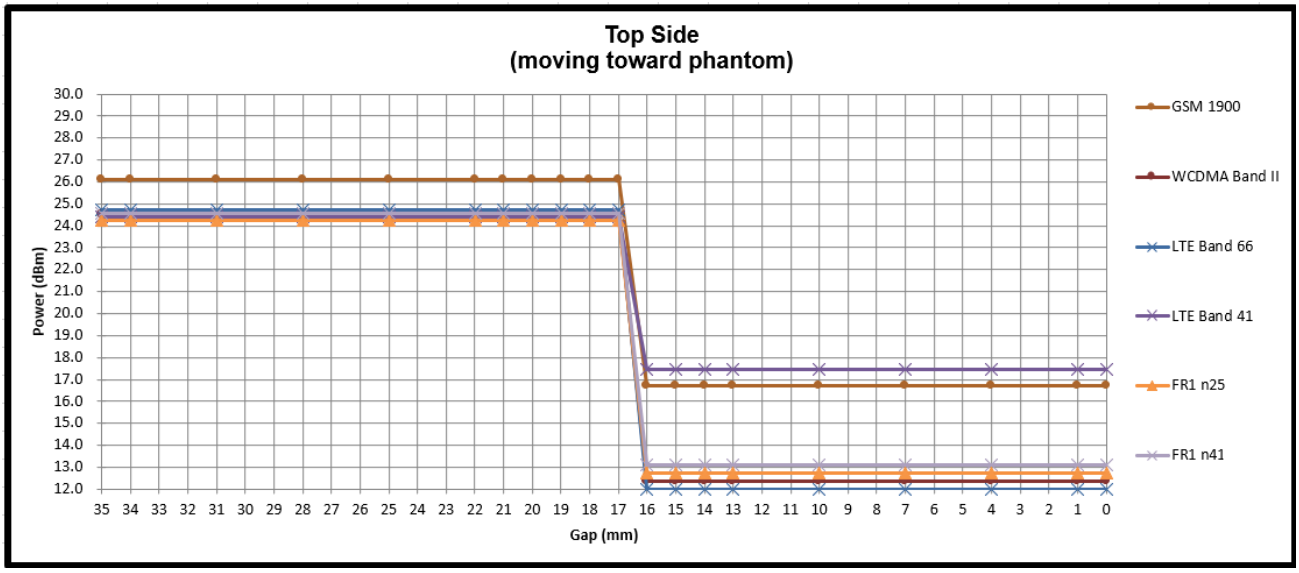


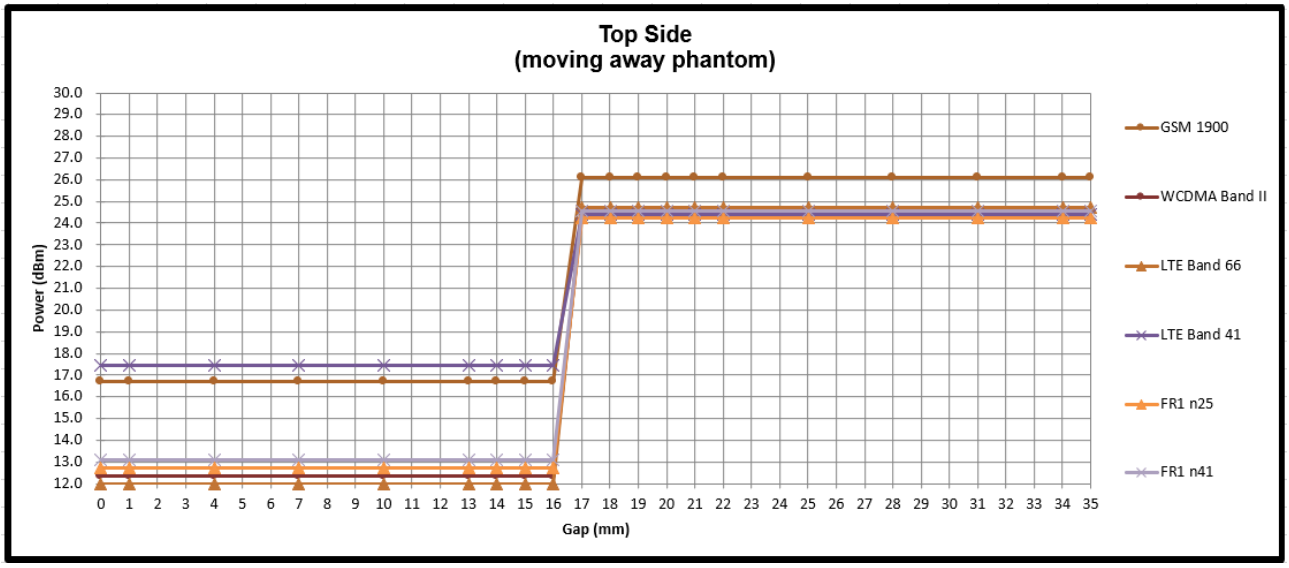

Back
(moving toward phantom)
Power (dBm)
Gap (mm)
GSM 1900
WCDMA Band II
LTE Band 2
LTE Band 25
LTE Band 41
FR1 n25
FR1 n41


Back
(moving away phantom)
Power (dBm)
Gap (mm)
GSM 1900
WCDMA Band II
LTE Band 25
LTE Band 41
FR1 n25
FR1 n41

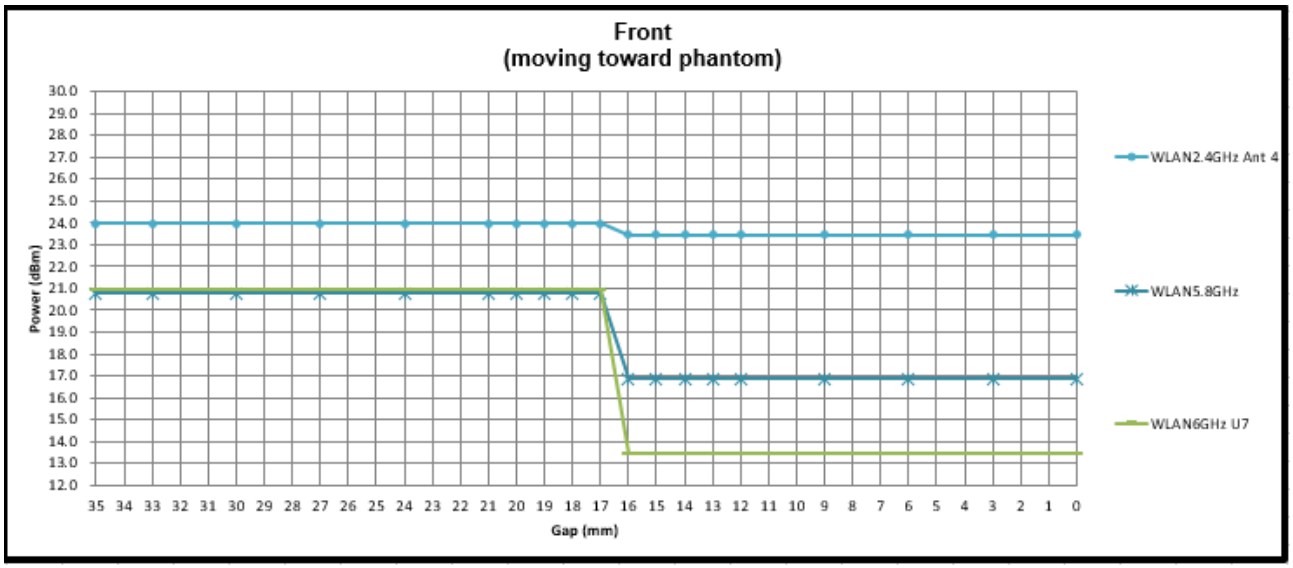

Right Side
(moving toward phantom)
Power (dBm)
Gap (mm)
GSM 1900
WCDMA Band II
LTE Band 66
LTE Band 41
FR1 n25
FR1 n41

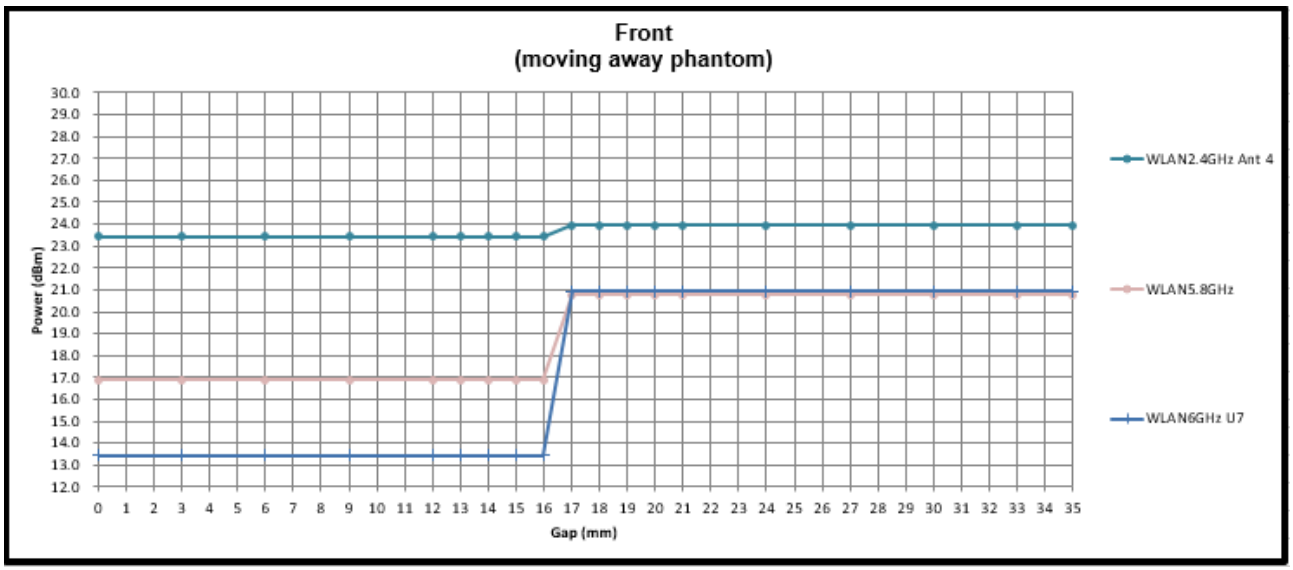

Right Side
(moving away phantom)
Power (dBm)
Gap (mm)
GSM 1900
WCDMA Band II
LTE Band 66
LTE Band 41
FR1 n25
FR1 n41

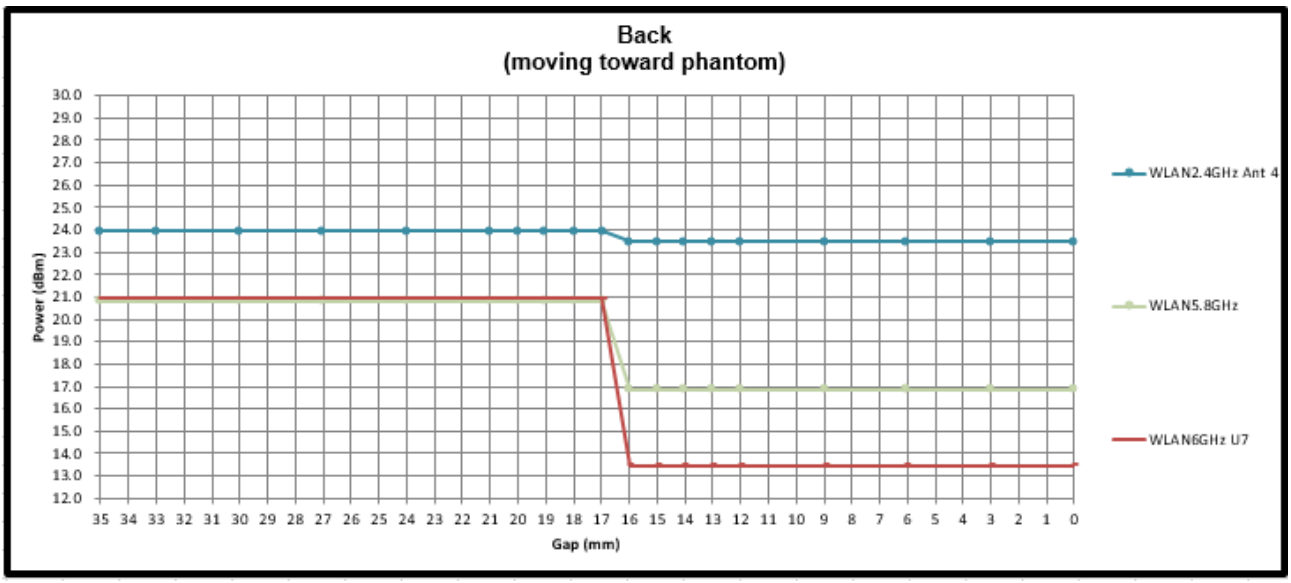

Top Side
(moving toward phantom)
Power (dBm)
Gap (mm)
GSM 1900
WCDMA Band II
LTE Band 66
LTE Band 41
FR1 n25
FR1 n41

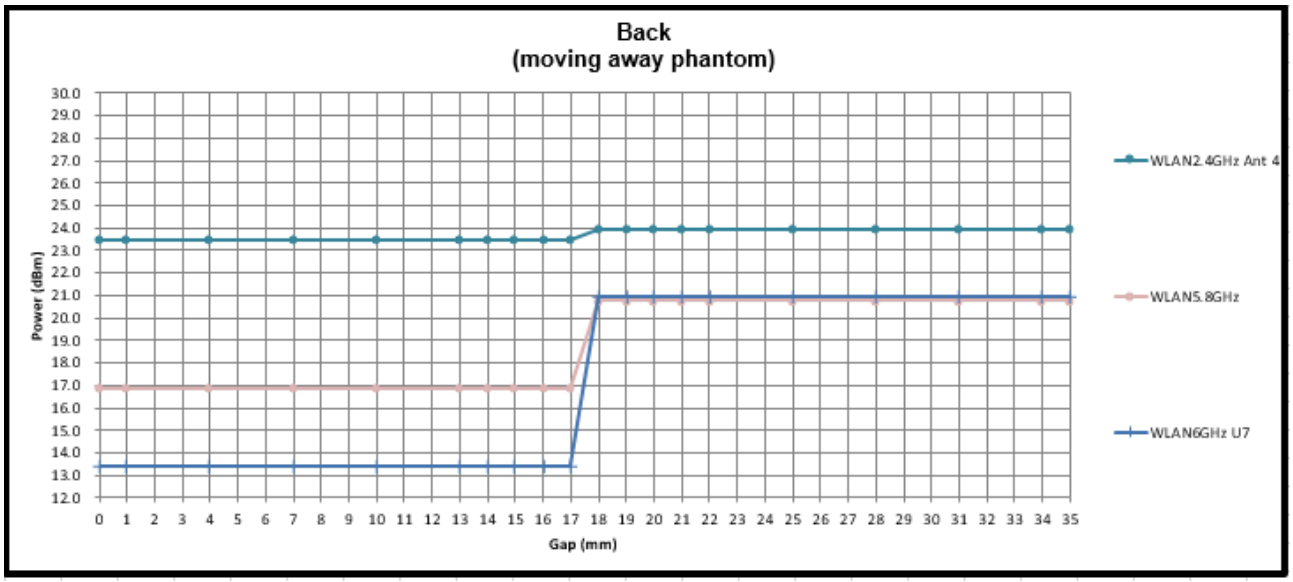

Top Side
(moving away phantom)
Power (dBm)
Gap (mm)
GSM 1900
WCDMA Band II
LTE Band 66
LTE Band 41
FR1 n25
FR1 n41

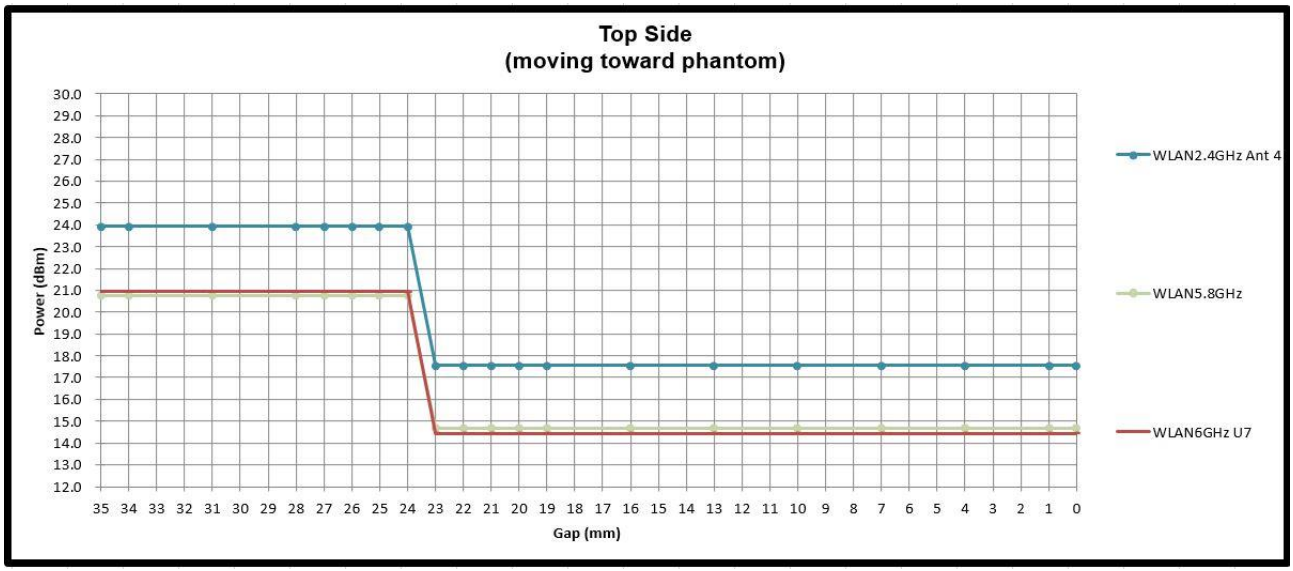
Ant 4

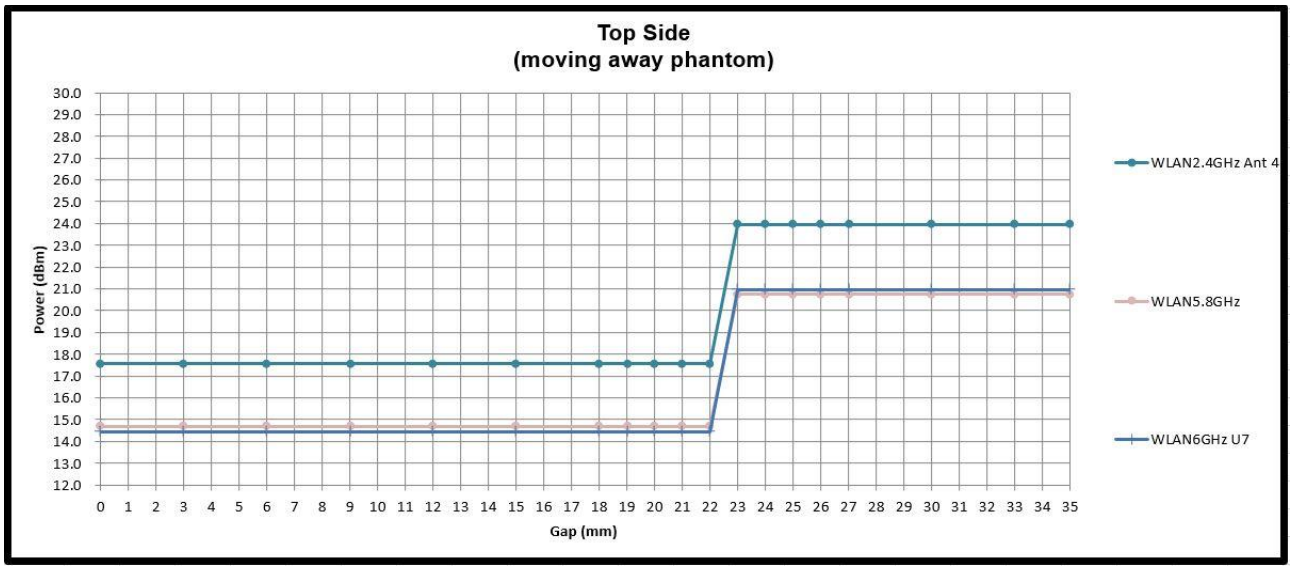

Front
(moving toward phantom)
Power (dBm)
Gap (mm)
WLAN2.4GHz Ant 4
WLAN5.8GHz
WLAN6GHz U7


Front
(moving away phantom)
Power (dBm)
Gap (mm)
WLAN2.4GHz Ant 4
WLAN5.8GHz
WLAN6GHz U7


Back
(moving toward phantom)
Power (dBm)
Gap (mm)
WLAN2.4GHz Ant 4
WLAN5.8GHz
WLAN6GHz U7


Back
(moving away phantom)
Power (dBm)
Gap (mm)
WLAN2.4GHz Ant 4
WLAN5.8GHz
WLAN6GHz U7


Top Side
(moving toward phantom)
Power (dBm)
Gap (mm)
WLAN2.4GHz Ant 4
WLAN5.8GHz
WLAN6GHz U7


Top Side
(moving away phantom)
Power (dBm)
Gap (mm)
WLAN2.4GHz Ant 4
WLAN5.8GHz
WLAN6GHz U7

Appendix E. Lid angle and power verification

General Note:

1. The following guidance should be applied to device that use Hall Effect or gravity sensors to detect lid angle for the purpose of power reduction:
   Step 1: With the lid is in closed mode (0 degrees), open the screen in 10 degree steps until laptop mode is obtained
   Step 2: Lower the screen 5 degrees. Closed mode should be reobtained. If not keep lowering in 5 degree steps
   Step 3: Open the screen in 1 degree steps until device is reobtained
   Step 4: Continue opening the screen in 1 degree steps until at least 5 degrees past where device was obtained
   Step 5: Then continue opening the screen in 10 degree steps until device is obtained
   Step 6: Power measurements should be taken at each step
   Step 7: Reverse this procedure going from device in open mode back down to device into closed mode
2. The worst power reduction bands were selected to power verification and list below.
3. WLAN and BT function are turned off to associate with body-worn standalone mode, and motion sensor, proximity sensor is active, the verification is to observe the WWAN power transition between index 5 (close mode) and index 10 (open mode) versus lid angle change.
4. WWAN function is turned off to associate with body-worn standalone mode, and motion sensor, proximity sensor is active, the verification is to observe the WLAN power transition between index 4-1 (close mode) and index 9-1 (open mode) versus lid angle change.

Lid angle verification between close mode an open mode																			
Screen angle (degree) v.s. power	Wireless		GSM			WCDMA			LTE							FR1					
	Antenna		Ant 0	Ant 1	Ant 2	Ant 0	Ant 2	Ant 1	Ant 5	Ant 0	Ant 0	Ant 2	Ant 6	Ant 1	Ant 5	Ant 0	Ant 0	Ant 2	Ant 1	Ant 6
	Band		GSM 850	GSM 1900	GSM 1900	B5	B2	B4	B2	B2	B13	B30	B48	B66	N2	N2	N14	N7	N25	N48
	Close mode to open mode	0	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		6	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		7	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		8	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		9	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		10	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		11	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		12	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		13	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		14	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		15	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		20	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		30	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		40	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		50	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		60	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		70	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		80	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		90	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		100	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		110	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		120	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		130	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		140	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		150	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		160	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		170	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
		180	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	19.5
	Open mode to close mode	180	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		170	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		160	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		150	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		140	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0

		130	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		120	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		110	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		100	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		90	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		80	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		70	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		60	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		50	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		40	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		30	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		20	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		10	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		9	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		8	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		7	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		6	27.7	21.1	18.2	23.8	17.3	18.7	21.8	19.5	24.1	17.9	22.1	19.5	22.2	19.6	24.1	20.0	18.0	18.0
		5	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		4	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		3	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		2	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		1	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2
		0	27.7	23.9	21.9	23.8	17.5	19.7	23.2	20.9	24.1	17.2	23.9	19.0	23.6	22.3	24.1	17.3	20.9	24.2

Lid angle verification between close mode an open mode						
Screen angle (degree) v.s. power	Wireless		WLAN Ant 3		WLAN Ant 4	
	Band		2.4GHz WLAN	5.2GHz WLAN	2.4GHz WLAN	5.2GHz WLAN
	Close mode to open mode	0	19.11	13.92	19.48	14.20
		6	19.11	13.92	19.48	14.20
		7	19.11	13.92	19.48	14.20
		8	19.11	13.92	19.48	14.20
		9	19.11	13.92	19.48	14.20
		10	19.11	13.92	19.48	14.20
		11	20.91	14.41	21.00	15.34
		12	20.91	14.41	21.00	15.34
		13	20.91	14.41	21.00	15.34
		14	20.91	14.41	21.00	15.34
		15	20.91	14.41	21.00	15.34
		20	20.91	14.41	21.00	15.34
		30	20.91	14.41	21.00	15.34
		40	20.91	14.41	21.00	15.34
		50	20.91	14.41	21.00	15.34
		60	20.91	14.41	21.00	15.34
		70	20.91	14.41	21.00	15.34
		80	20.91	14.41	21.00	15.34
		90	20.91	14.41	21.00	15.34
		100	20.91	14.41	21.00	15.34
		110	20.91	14.41	21.00	15.34
		120	20.91	14.41	21.00	15.34
		130	20.91	14.41	21.00	15.34
		140	20.91	14.41	21.00	15.34
		150	20.91	14.41	21.00	15.34
		160	20.91	14.41	21.00	15.34
		170	20.91	14.41	21.00	15.34
		180	20.91	14.41	21.00	15.34
	Open mode to close mode	180	20.91	14.41	21.00	15.34
		170	20.91	14.41	21.00	15.34
		160	20.91	14.41	21.00	15.34
		150	20.91	14.41	21.00	15.34
		140	20.91	14.41	21.00	15.34
		130	20.91	14.41	21.00	15.34
		120	20.91	14.41	21.00	15.34
		110	20.91	14.41	21.00	15.34
		100	20.91	14.41	21.00	15.34
		90	20.91	14.41	21.00	15.34
		80	20.91	14.41	21.00	15.34
		70	20.91	14.41	21.00	15.34
		60	20.91	14.41	21.00	15.34
		50	20.91	14.41	21.00	15.34
		40	20.91	14.41	21.00	15.34
		30	20.91	14.41	21.00	15.34
		20	20.91	14.41	21.00	15.34
		10	20.91	14.41	21.00	15.34
		9	20.91	14.41	21.00	15.34
		8	20.91	14.41	21.00	15.34
		7	20.91	14.41	21.00	15.34
		6	20.91	14.41	21.00	15.34
		5	19.11	13.92	19.48	14.20
		4	19.11	13.92	19.48	14.20
		3	19.11	13.92	19.48	14.20
		2	19.11	13.92	19.48	14.20
		1	19.11	13.92	19.48	14.20
		0	19.11	13.92	19.48	14.20

Appendix E. Power reduction mechanism verification

According to the May 2017 TCBC Workshop, Demonstration of proper functioning of the detection and triggering mechanisms to support the corresponding RF exposure conditions. The verification is through a base station simulator is used to establish a conducted RF connection and monitor output power under different operating conditions related to the power reduction mechanisms. Detail of power reduction mechanisms referring to Operational Description

1. Power verification procedure

- Establish voice call and audio routed through the earpiece to monitor output power under head with simultaneous transmitting power states.
  - Tradition voice call for GSM/WCDMA, voice over IP CMRS operations for LTE/WIFI/5G FR1
  - GSM is set to 1TX slot, LTE is set at 'highest BW, 1RB, RB Offset = 0, QPSK,WCDMA is set AMR 12.2Kbps, 5G FR1 is set at highest BW MHz, 1RF, RB offset = 1

- Establish data connection monitor hotspot power state.
  - GSM is set to GPRS 4TX slot, LTE is set at 'highest BW, 1RB, RB Offset = 0, QPSK, WCDMA is set RMC 12.2Kbps, 5G FR1 is set at highest BW MHz, 1RF, RB offset = 1

- Establish data connection monitor body worn power state.
  - GSM is set to GPRS 4TX slot, LTE is set at 'highest BW, 1RB, RB Offset = 0, QPSK, WCDMA is set RMC 12.2Kbps, 5G FR1 is set at highest BW MHz, 1RF, RB offset = 1
  - Body Detect mechanism was performed for the in-hand and on a stationary object (placed on a table)
  - Proximity sensor detect mechanism only for Ant 1 and Ant 4
  - Proximity sensor Detect mechanism was performed for the in-hand to trigger body detection and hand close to the Ant 1 and Ant 4 within proximity sensor detect range, to trigger power reduction is when body detect and proximity sensor detect are triggered simultaneously.

- This device incorporates the Samsung S.LSI TAS algorithm feature and through under varying Tx power transmission scenarios in real-time to maintain the time-averaged Tx power compliant with FCC RF exposure requirement.
- In this power validation purpose is to demonstrate of proper functioning of the detection and triggering mechanisms to support the corresponding RF exposure conditions. In order to avoid real-time TX power varying may affect monitor output power related to the power reduction mechanisms, therefore power reduction verification would be disabled WWAN TAS feature.
- Verification performed for each technology to demonstrate that the power reduction applies for both technology and call origination.

2. Test setup for measuring power

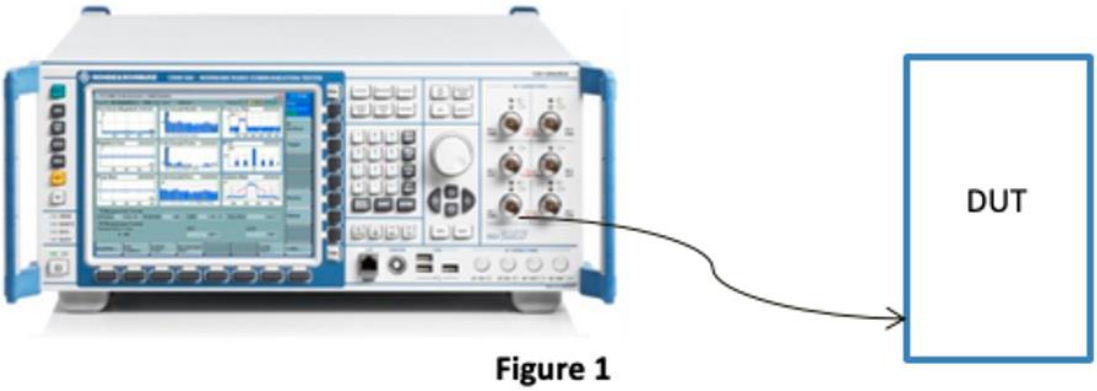


Figure 1

3. Verification output Power Results

Head exposure conditions

Close Mode		Output Power for Voice Call			
Ear acoustic output Status:		ON		ON	
WiFi Status:		OFF		ON	
Power state		WWAN Index 2		WWAN Index 3	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (1TX)	Ant 2	29.77	30.50	29.72	30.50
	Ant 1	23.75	24.70	22.74	23.90
UMTS Band 4	Ant 2	24.33	25.60	24.28	25.60
	Ant 1	13.57	15.00	12.81	14.20
LTE Band 66 (FDD)	Ant 2	23.61	25.60	23.60	25.60
	Ant 1	13.29	14.70	12.44	13.90
LTE Band 26 (FDD)	Ant 0	23.71	25.70	23.70	25.70
	Ant 1	23.45	24.00	21.74	23.20
LTE Band 38 (TDD)	Ant 2	25.00	25.00	24.99	25.00
	Ant 1	24.98	25.00	24.99	25.00
NR SA n2	Ant 2	23.31	25.30	23.3	25.30
	Ant 1	14.87	16.20	14.42	15.40

Close Mode		Output Power for Voice Call			
Ear acoustic output Status:		ON		ON	
WWAN Status:		OFF		ON	
Power state		WIFI Index 1-1		WIFI Index 2-1	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
WiFi 802.11g CH6	(Ant4+3)Ant 3	16.67	17.00	15.44	15.50
	(Ant4+3)Ant 4	16.71	17.00	14.92	15.50
WiFi 802.11a 6Mbps CH44	(Ant4+3)Ant 3	16.37	19.00	14.74	17.00
	(Ant4+3)Ant 4	17.12	19.00	14.92	17.00

Hotspot exposure condition

Close Mode		Output Power for data connection			
Wifi Hotspot Status		ON		OFF	
BT Hotspot Status		OFF		ON	
Power state		WWAN Index 4 WIFI Index 4-1		WWAN Index 4 WIFI Index 4-1	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (4TX)	Ant 2	20.42	21.80	20.40	21.80
	Ant 1	22.98	24.90	22.94	24.90
UMTS Band 4	Ant 2	16.89	18.20	16.88	18.20
	Ant 1	17.22	19.00	17.22	19.20
LTE Band 66 (FDD)	Ant 2	16.08	17.40	16.05	17.40
	Ant 1	16.35	18.10	16.34	18.10
LTE Band 7 (FDD)	Ant 2	16.42	17.60	16.40	17.60
	Ant 1	20.38	21.80	20.34	21.80
LTE Band 38 (TDD)	Ant 2	18.96	20.20	18.99	20.20
	Ant 1	22.81	24.00	22.80	24.00
NR SA n7	Ant 2	16.70	17.30	16.75	17.30
	Ant 1	21.26	22.60	21.24	22.60
WiFi 802.11g CH6	(Ant4+3)Ant 3	19.11	19.50		
	(Ant4+3)Ant 4	19.48	19.50		
WiFi 802.11a UNII ,CH44	(Ant4+3)Ant 3	13.92	16.00		
	(Ant4+3)Ant 4	14.20	16.00		

Body worn exposure condition

Close Mode		Output Power (data connection)					
		Stationary		Body Worn (In hand)			
WIFI/BT Status		OFF		OFF		ON	
Power state		WWAN Index 1		WWAN Index 5		WWAN Index 6	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (4TX)	Ant 2	25.72	27.50	21.17	22.80	20.54	22.00
	Ant 1	25.52	27.50	23.72	25.70	22.92	24.90
UMTS Band 4	Ant 2	24.33	25.60	17.62	19.00	16.91	18.20
	Ant 1	23.83	25.60	19.02	20.80	18.19	20.00
LTE Band 66 (FDD)	Ant 2	24.17	25.60	16.82	18.20	16.03	17.40
	Ant 1	23.83	25.60	18.03	19.80	17.22	19.00
LTE Band 7 (FDD)	Ant 2	23.52	25.00	17.19	18.40	16.42	17.60
	Ant 1	23.20	25.00	21.16	22.60	20.37	21.80
LTE Band 38(TDD)	Ant 2	24.98	25.00	20.02	21.30	19.34	20.50
	Ant 1	24.99	25.00	24.42	25.00	24.38	24.80
NR SA n7	Ant 2	23.14	25.10	17.54	18.10	16.78	17.30
	Ant 1	23.10	25.10	21.99	23.40	21.25	22.60

Close Mode		Output Power (data connection)					
		Stationary		In hand			
WWAN Status:		OFF		OFF		ON	
Power state		WIFI Index 0		WIFI Index 3-1		WIFI Index 4-1	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
WiFi 802.11g CH6	(Ant4+3)Ant 3	22.00	22.00	20.50	21.00	18.97	19.50
	(Ant4+3)Ant 4	22.00	22.00	20.98	21.00	19.49	19.50
WiFi 802.11a UNII ,CH44	(Ant4+3)Ant 3	16.44	19.00	16.16	19.00	14.35	16.00
	(Ant4+3)Ant 4	16.91	19.00	16.88	19.00	14.34	16.00

Head exposure conditions

Open Mode		Output Power for Voice Call			
Ear acoustic output Status:		ON		ON	
WiFi Status:		OFF		ON	
Power state		WWAN Index 7/8		WWAN Index 7/8	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (1TX)	Ant 2	29.58	30.50	29.56	30.50
	Ant 1	24.65	25.80	24.64	25.80
UMTS Band 4	Ant 2	24.06	25.60	24.05	25.60
	Ant 1	16.47	18.10	16.45	18.10
LTE Band 66 (FDD)	Ant 2	23.60	25.60	23.60	25.60
	Ant 1	16.23	17.70	16.22	17.70
LTE Band 7 (FDD)	Ant 2	23.06	25.00	23.01	25.00
	Ant 1	17.25	18.50	17.20	18.50
LTE Band 38 (TDD)	Ant 2	24.96	25.00	24.98	25.00
	Ant 1	19.04	20.30	19.02	20.30
NR SA n7	Ant 2	23.20	25.10	23.20	25.10
	Ant 1	17.53	18.90	17.52	18.90

Open Mode		Output Power for Voice Call			
Ear acoustic output Status:		ON		ON	
WWAN Status:		OFF		ON	
Power state		WIFI Index 5-1		WIFI Index 5-1	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
WiFi 802.11g CH6	(Ant4+3)Ant 3	10.34	10.50	10.41	10.50
	(Ant4+3)Ant 4	9.97	10.50	9.50	10.50
WiFi 802.11a 6Mbps UNII CH44	(Ant4+3)Ant 3	3.16	6.00	4.18	6.00
	(Ant4+3)Ant 4	4.02	6.00	4.58	6.00

Hotspot exposure condition

Open Mode		Output Power for data connection			
Wifi Hotspot Status		ON		OFF	
BT Hotspot Status		OFF		ON	
Power state		WWAN Index 9 WIFI Index 9-1		WWAN Index 9 WIFI Index 9-1	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (4TX)	Ant 2	17.09	19.00	17.12	19.00
	Ant 1	17.54	19.50	17.53	19.50
UMTS Band 2	Ant 2	16.23	17.60	16.21	17.60
	Ant 1	13.45	15.30	13.42	15.30
LTE Band 66 (FDD)	Ant 2	17.82	19.20	17.81	19.20
	Ant 1	15.17	16.90	15.16	16.90
LTE Band 7 (FDD)	Ant 2	17.89	19.00	17.85	19.00
	Ant 1	17.51	19.00	17.52	19.00
LTE Band 38 (TDD)	Ant 2	18.91	20.20	18.88	20.20
	Ant 1	19.52	20.70	19.50	20.70
NR SA n7	Ant 2	18.42	18.90	18.40	18.90
	Ant 1	18.36	19.70	18.38	19.70
WiFi 802.11g CH6	(Ant4+3)Ant 3	20.91	21.00		
	(Ant4+3)Ant 4	21.00	21.00		
WiFi 802.11a CH44	(Ant4+3)Ant 3	14.41	17.50		
	(Ant4+3)Ant 4	15.34	17.50		

Body worn exposure condition

Open Mode		Output Power (data connection)					
		Stationary		Body Worn (In hand)			
WIFI/BT Status		OFF		OFF		ON	
Power state		WWAN Index 1		WWAN Index 10		WWAN Index 11	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (4TX)	Ant 2	25.78	27.50	18.21	19.80	17.24	19.00
UMTS Band 2	Ant 2	24.27	25.60	16.97	18.40	16.19	17.60
LTE Band 25(FDD)	Ant 2	23.52	25.30	16.52	18.20	15.70	17.40
LTE Band 7 (FDD)	Ant 2	23.57	25.00	19.50	20.60	18.67	19.80
LTE Band 38(TDD)	Ant 2	24.99	25.00	19.75	21.00	18.98	20.20
NR SA n7	Ant 2	23.20	25.10	20.39	20.90	19.62	20.10

Open Mode		Output Power (data connection)					
		Stationary		Body Worn (In hand)			
WIFI/BT Status		OFF		OFF		ON	
Proximity Sensor		OFF		ON		ON	
Power state		WWAN Index 1		WWAN Index 10		WWAN Index 11	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (4TX)	Ant 1	25.57	27.5	19.91	21.90	19.14	21.10
UMTS Band 2	Ant 1	23.82	25.6	16.32	18.10	15.48	17.30
LTE Band 25(FDD)	Ant 1	23.31	25.3	16.13	18.20	15.44	17.40
LTE Band 7 (FDD)	Ant 1	23.2	25.00	19.45	20.90	18.65	20.10
LTE Band 38(TDD)	Ant 1	24.98	25.00	22.51	23.50	21.71	22.70
NR SA n7	Ant 1	23.16	25.10	20.58	21.90	19.76	21.10

Open Mode		Output Power (data connection)					
		Stationary		Body Worn (In hand)			
WIFI/BT Status		OFF		OFF		ON	
Proximity Sensor		OFF		OFF		OFF	
Power state		WWAN Index 1		WWAN Index 10		WWAN Index 11	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (4TX)	Ant 1	25.57	27.5	25.52	27.50	25.5	27.50
UMTS Band 2	Ant 1	23.82	25.6	23.81	25.60	23.82	25.60
LTE Band 25(FDD)	Ant 1	23.31	25.3	23.28	25.30	23.27	25.30
LTE Band 7 (FDD)	Ant 1	23.2	25.00	23.19	25.00	23.17	25.00
LTE Band 38(TDD)	Ant 1	24.98	25.00	24.96	25.00	24.95	25.00
NR SA n7	Ant 1	23.16	25.10	23.12	25.10	23.11	25.10

Open Mode		Output Power (data connection)					
		Stationary		In hand			
WWAN Status:		OFF		OFF		ON	
Proximity Sensor		OFF		ON		ON	
Power state		WIFI Index 0		WIFI Index 8-1		WIFI Index 9-1	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
WiFi 802.11g CH6	(Ant4+3)Ant 3	21.93	22.00	21.90	22.00	20.53	21.00
	(Ant4+3)Ant 4	22.00	22.00	21.98	22.00	20.63	21.00
WiFi 802.11a UNII ,CH44	(Ant4+3)Ant 3	17.01	19.00	16.99	19.00	15.35	17.50
	(Ant4+3)Ant 4	17.78	19.00	18.13	19.00	16.30	17.50

Open Mode		Output Power (data connection)					
		Stationary		In hand			
WWAN Status:		OFF		OFF		ON	
Proximity Sensor		OFF		OFF		OFF	
Power state		WIFI Index 0		WIFI Index 6-1		WIFI Index 7-1	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
WiFi 802.11g CH6	(Ant4+3)Ant 3	21.93	22.00	21.88	22.00	20.51	21.00
	(Ant4+3)Ant 4	22.00	22.00	21.94	22.00	21.43	22.00
WiFi 802.11a UNII ,CH44	(Ant4+3)Ant 3	17.01	19.00	17.02	19.00	15.33	17.50
	(Ant4+3)Ant 4	17.78	19.00	18.11	19.00	17.54	19.00

a) Body Detect mechanism will be performed for the in-hand and on a stationary object (placed on a table).
b) Verify the functionality of the motion sensor by measuring the output power in the following steps.

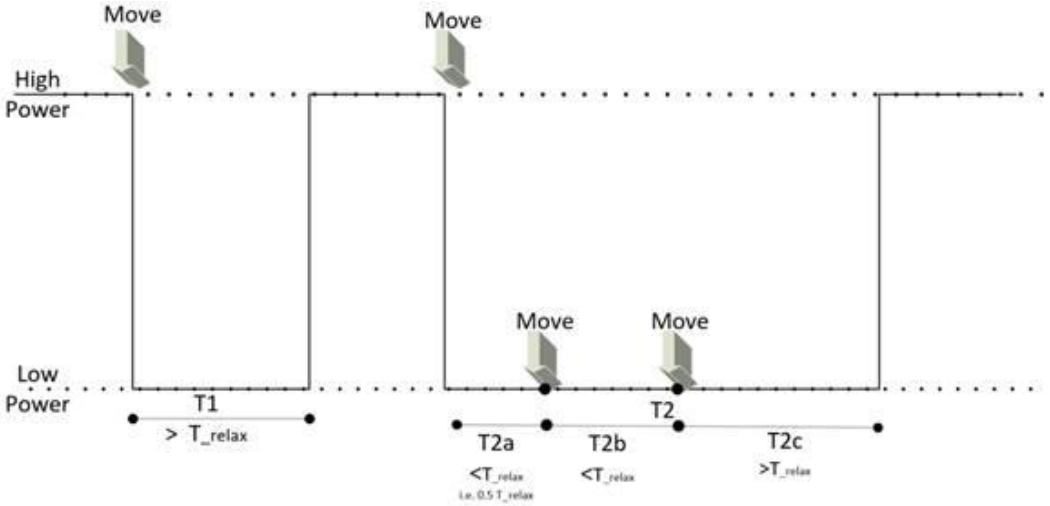


Figure 1 Illustration of the procedure for the validation of the power reduction

The device is embedded with motion sensors only, no proximity sensors are installed.

1. **Placed on a table:** Make the DUT transmit with the maximum output power by using a base station simulator.
   a) Confirm that motion sensor is not triggered by letting the DUT remain stationary with no movements for the period T_{relax} for the motion sensor to reach stationary state.
   b) Record P_{step1} (high power)
2. **In-hand:** Move the DUT to trigger the motion sensor. Apply the motion of the DUT with respect to movements in intended and reasonably foreseeable use conditions of the DUT.
   a) Record P_{step2} (low power)
3. For the validation of T_{relax}, wait a time period $T_1 > T_{relax}$ and confirm DUT restores to high power (P_{step1}).
4. Move the DUT to trigger the motion sensor.
5. Move DUT within T_{relax} to ensure T_{relax} resets when DUT is in motion.
   DUT can be moved once or twice within T_{relax}, (after time periods T_{2a} and T_{2b} in Figure 1.) followed by waiting for a time period greater than T_{relax} (time period T_{2c} in Figure 1.) for DUT to restore high power. The total time duration of this step is T_2, and the power during the whole period T_2 shall be reduced (low power – P_{step2}).
   T_{relax}: *20 sec*
   Monitor period, T_1: 25 *sec*, T_{2a}: 15 sec, T_{2b}:15 sec, T_{2c}: 25 sec

Close Mode		Output Power (data connection) (dBm)											
		Stationary Placed on a table		In hand		Stationary Placed on a table		In hand				Stationary Placed on a table	
WWAN Index 5 WLAN Index 3-1		Full Power P_{step1}		Low Power P_{step2}		Full Power P_{step1} & T_1 > T_{relax}		Low Power P_{step2} & T_{2a} < T_{relax}		Low Power P_{step2} & T_{2b} < T_{relax}		Full Power P_{step1}& T_{2c} > T_{relax}	
Wireless technology	Antenna	Measured	Max. Tune-up	Measured	Max. Tune-up	Measured	Max. Tune-up	Measured	Max. Tune-up	Measured	Max. Tune-up	Measured	Max. Tune-up
GSM_1900	Ant 2	25.82	27.50	21.52	22.8	25.73	27.50	21.52	22.80	21.55	22.80	25.71	27.50
WCDMA IV	Ant 2	24.62	25.60	18.72	19.00	24.66	25.60	18.75	19.00	18.77	19.00	24.56	25.60
LTE Band 66	Ant 2	23.88	25.60	17.77	18.20	23.91	25.60	17.85	18.20	17.92	18.20	23.86	25.30
NR SA n7	Ant 2	24.32	25.10	17.66	18.10	24.35	25.10	17.62	18.10	17.60	18.10	24.31	25.10
WLAN2.4G	Ant 3+4 (3)	20.12	22.00	20.15	21.00	20.12	22.00	20.13	21.00	20.12	21.00	20.11	22.00
	Ant 3+4 (4)	20.95	22.00	20.92	21.00	20.94	22.00	20.95	21.00	20.91	21.00	20.92	22.00

Open Mode		Output Power (data connection) (dBm)											
		Stationary Placed on a table		In hand		Stationary Placed on a table		In hand				Stationary Placed on a table	
WWAN Index 10 WLAN Index 8-1		Full Power P_{step1}		Low Power P_{step2}		Full Power P_{step1} & T_1 > T_{relax}		Low Power P_{step2} & T_{2a} < T_{relax}		Low Power P_{step2} & T_{2b} < T_{relax}		Full Power P_{step1} & T_{2c} > T_{relax}	
Wireless technology	Antenna	Measured	Max. Tune-up	Measured	Max. Tune-up	Measured	Max. Tune-up	Measured	Max. Tune-up	Measured	Max. Tune-up	Measured	Max. Tune-up
GSM_1900	Ant 2	25.22	27.50	19.22	19.80	25.16	27.50	19.23	19.80	19.22	19.80	25.18	27.50
WCDMA II	Ant 2	24.77	25.60	17.54	18.40	24.63	25.60	17.32	18.40	17.42	18.40	24.57	25.60
LTE Band 25	Ant 2	23.51	25.30	17.66	18.20	23.52	25.30	17.57	18.20	17.56	18.20	23.57	25.30
NR SA n7	Ant 2	23.85	25.10	19.30	20.90	23.75	25.10	19.28	20.90	19.29	20.90	23.79	25.10
WLAN2.4G	Ant 3+4 (3)	16.77	19.00	16.75	19.00	16.83	19.00	16.79	19.00	16.82	19.00	16.75	19.00
	Ant 3+4 (4)	18.22	19.00	18.25	19.00	18.24	19.00	18.27	19.00	18.25	19.00	18.21	19.00