Power reduction mechanism verification

According to the May 2017 TCBC Workshop and November 2019 TCBC Workshop, Demonstration of proper functioning of the detection and triggering mechanisms is required 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

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.

2. Sensor triggering angle and power verification

General Note:

1. The following additional guidance applies only to convertible laptops whose screen rotates around one axis, from 0 degrees to 360 degrees, in a clamshell style, i.e., from closed mode, to open mode, to “tent” mode, and finally to tablet mode. This process must be followed to determine the lid angle where a power reduction occurs, by taking power measurements at each step, as indicated in the step listed here below:
   Step 1: From 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 by 5 degrees increments to verify that the “closed mode” is triggered. If not keep lowering in 5 degree steps
   Step 3: From the position of the previous step, open the screen in 1 degree increments until laptop mode is triggered again
   Step 4: Continue opening the screen in 1 degree increments until at least 5 degrees past where “laptop mode” was obtained, then continue opening the screen in 10 degree steps until the device switches to tablet mode
   Step 5: Then continue opening the screen in 10 degree steps until tablet mode is obtained
   Step 6: Power measurements should be taken at each step
   Step 7: Reverse the previous procedure to go from tablet mode back down to closed mode

2. Test setup
   1) A control PC (IdeaPad 5 2-in-1 14Q8X9) is used to configure the call box as an access point to manage the uplink and downlink data traffic.
   2) Uplink signal power is measured with the Call Box.
   3) Path loss in the power measurement setup from the wireless module antenna port to the Call Box

3. Trigger lid angle detection and power verification as following tables.

Trigger lid angle detection and power verification 2.4GHz

The lid is rotating from 0° to 360°

Mode	Angle (degrees)	Measured Power 2.4GHz-Ch6(dBm)	
		AUX	MAIN
Notebook	0	15.01	15.33
	10	15.01	15.33
	20	15.01	15.33
	30	15.01	15.33
	40	15.01	15.33
	50	15.01	15.33
	60	15.01	15.33
	70	15.01	15.33
	80	15.01	15.33
	90	15.01	15.33
	100	15.01	15.33
	110	15.01	15.33
	120	15.01	15.33
	130	15.01	15.33
	140	15.01	15.33
	150	15.01	15.33
	160	15.01	15.33
	170	15.01	15.33
	180	15.01	15.33
	190	15.01	15.33
	200	15.01	15.33
	210	15.01	15.33
	220	15.01	15.33
	230	15.01	15.33
Notebook	230	15.01	15.33
	240	15.01	15.33
	250	15.01	15.33
	260	15.01	15.33
	270	15.01	15.33
	280	15.01	15.33
	290	15.01	15.33
	300	15.01	15.33
	310	15.01	15.33
	320	15.01	15.33
	330	15.01	15.33
	340	15.01	15.33
Tablet	350	11.28	11.67
Notebook	345	15.01	15.33
	346	15.01	15.33
	347	15.01	15.33
	348	15.01	15.33
	349	15.01	15.33
Tablet	350	11.28	11.67
	351	11.28	11.67
	352	11.28	11.67
	353	11.28	11.67
	354	11.28	11.67
	355	11.28	11.67
	356	11.28	11.67
	357	11.28	11.67
	358	11.28	11.67
	359	11.28	11.67
	360	11.28	11.67

The lid is rotating from 360° to 0°

Mode	Angle (degrees)	Measured Power 2.4GHz-Ch6(dBm)	
		AUX	MAIN
Tablet	360	11.28	11.67
	350	11.28	11.67
Notebook	340	15.01	15.33
	345	15.01	15.33
Tablet	350	11.28	11.67
Notebook	349	15.01	15.33
	348	15.01	15.33
	347	15.01	15.33
	346	15.01	15.33
	345	15.01	15.33
	340	15.01	15.33
	330	15.01	15.33
	320	15.01	15.33
	310	15.01	15.33
	300	15.01	15.33
	290	15.01	15.33
	280	15.01	15.33
	270	15.01	15.33
	260	15.01	15.33
	250	15.01	15.33
	240	15.01	15.33
	230	15.01	15.33
	220	15.01	15.33
	210	15.01	15.33

Mode	Angle (degrees)	Measured Power 2.4GHz-Ch6(dBm)	
		AUX	MAIN
Notebook	200	15.01	15.33
	190	15.01	15.33
	180	15.01	15.33
	170	15.01	15.33
	160	15.01	15.33
	150	15.01	15.33
	140	15.01	15.33
	130	15.01	15.33
	120	15.01	15.33
	110	15.01	15.33
	100	15.01	15.33
	90	15.01	15.33
	80	15.01	15.33
	70	15.01	15.33
	60	15.01	15.33
	50	15.01	15.33
	40	15.01	15.33
	30	15.01	15.33
	20	15.01	15.33
	10	15.01	15.33
	0	15.01	15.33

Trigger lid angle detection and power verification 5GHz

The lid is rotating from 0° to 360°

Mode	Angle (degrees)	Measured Power 5GHz-Ch40(dBm)	
		AUX	MAIN
Notebook	0	14.33	14.12
	10	14.33	14.12
	20	14.33	14.12
	30	14.33	14.12
	40	14.33	14.12
	50	14.33	14.12
	60	14.33	14.12
	70	14.33	14.12
	80	14.33	14.12
	90	14.33	14.12
	100	14.33	14.12
	110	14.33	14.12
	120	14.33	14.12
	130	14.33	14.12
	140	14.33	14.12
	150	14.33	14.12
	160	14.33	14.12
	170	14.33	14.12
	180	14.33	14.12
	190	14.33	14.12
	200	14.33	14.12
	210	14.33	14.12
	220	14.33	14.12
	230	14.33	14.12

Mode	Angle (degrees)	Measured Power 5GHz-Ch40(dBm)	
		AUX	MAIN
Notebook	230	14.33	14.12
	240	14.33	14.12
	250	14.33	14.12
	260	14.33	14.12
	270	14.33	14.12
	280	14.33	14.12
	290	14.33	14.12
	300	14.33	14.12
	310	14.33	14.12
	320	14.33	14.12
	330	14.33	14.12
	340	14.33	14.12
Tablet	350	10.53	10.83
Notebook	345	14.33	14.12
	346	14.33	14.12
	347	14.33	14.12
	348	14.33	14.12
	349	14.33	14.12
Tablet	350	10.53	10.83
	351	10.53	10.83
	352	10.53	10.83
	353	10.53	10.83
	354	10.53	10.83
	355	10.53	10.83
	356	10.53	10.83
	357	10.53	10.83
	358	10.53	10.83
	359	10.53	10.83
	360	10.53	10.83

The lid is rotating from 360° to 0°

Mode	Angle (degrees)	Measured Power 5GHz-Ch40(dBm)		Mode	Angle (degrees)	Measured Power 5GHz-Ch40(dBm)	
		AUX	MAIN			AUX	MAIN
Tablet	360	10.53	10.83	Notebook	200	14.33	14.12
	350	10.53	10.83		190	14.33	14.12
Notebook	340	14.33	14.12		180	14.33	14.12
	345	14.33	14.12		170	14.33	14.12
Tablet	350	10.53	10.83		160	14.33	14.12
Notebook	349	14.33	14.12		150	14.33	14.12
	348	14.33	14.12		140	14.33	14.12
	347	14.33	14.12		130	14.33	14.12
	346	14.33	14.12		120	14.33	14.12
	345	14.33	14.12		110	14.33	14.12
	340	14.33	14.12		100	14.33	14.12
	330	14.33	14.12		90	14.33	14.12
	320	14.33	14.12		80	14.33	14.12
	310	14.33	14.12		70	14.33	14.12
	300	14.33	14.12		60	14.33	14.12
	290	14.33	14.12		50	14.33	14.12
	280	14.33	14.12		40	14.33	14.12
	270	14.33	14.12		30	14.33	14.12
	260	14.33	14.12		20	14.33	14.12
	250	14.33	14.12		10	14.33	14.12
	240	14.33	14.12		0	14.33	14.12
	230	14.33	14.12				
	220	14.33	14.12				
	210	14.33	14.12				