Power reduction mechanism verification

According to the May 2017 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.

General Note:

This device uses different Exposure Condition Index (ECI) to configure different time averaged power levels based on certain exposure scenarios as the following table:

Exposure Condition	ECI	EUT Flip State	Trigger conditions
Head SAR-Standalone	ECI 2	Flip Open	Earpiece On
Hotspot Mode SAR	ECI 9	Flip Open	Hotspot On
Hotspot Mode SAR	ECI 10	Flip Close	Hotspot On
Body worn Mode SAR-Standalone	ECI 3	Flip Open	Sensor On
Body worn Mode SAR-Standalone	ECI 5	Flip Close	Sensor On
Extremity (Handheld) SAR-Standalone	ECI 6	Flip Open	Sensor On
Sensor off SAR	ECI 4	Flip Open/Flip Close	Sensor Off

1. Select the bands with the largest power reduction for power verification:
   a. Establish voice call and audio routed through the earpiece to monitor output power under head transmitting power states.
      - LTE Band 25/2 is set at 'highest BW, 1RB, RB Offset = 0, QPSK'.

   b. Establish data connection monitor hotspot power state.
      <Flip Open >
      - LTE Band 25/2 is set at 'highest BW, 1RB, RB Offset = 0, QPSK'.

      <Flip Close >
      - LTE Band 48 is set at 'highest BW, 1RB, RB Offset = 0, QPSK'.

   c. Establish data connection monitor body worn power state.
      <Flip Open >
      - LTE Band 7 is set at 'highest BW, 1RB, RB Offset = 0, QPSK'.
      - Body Detect mechanism was performed for the in-hand and on a stationary object (placed on a table)

      <Flip Close >
      - LTE Band 7 is set at 'highest BW, 1RB, RB Offset = 0, QPSK'.
      - Body Detect mechanism was performed for the in-hand and on a stationary object (placed on a table)

   d. Establish data connection monitor extremity power state.
      - LTE Band 7 is set at 'highest BW, 1RB, RB Offset = 0, QPSK'.
      - Body Detect mechanism was performed for the in-hand and on a stationary object (placed on a table).

2. In this power validation purpose is to demonstrate of proper functioning of the detection and triggering mechanisms to support the corresponding RF exposure conditions.
3. Verification performed for one technology/Band to demonstrate that the power reduction applies for same technology/band and call origination.

2. Verification output Power Results

Head exposure conditions

Head Exposure condition		Output Power for Voice Call			
Ear acoustic output Status:		ON		OFF	
Power state		WWAN ECI2		WWAN ECI4	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
LTE Band 25(2)	Ant 2	11.43	12.1	23.41	24

Hotspot exposure condition

<Flip Open >

Hotspot exposure condition		Output Power for data connection			
Wifi Hotspot Status		OFF		ON	
Power state		WWAN ECI4		WWAN ECI9	
		WiFi Standalone		WiFi Simultaneous	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
LTE Band 25(2)	Ant 1	22.76	24	18.92	19.5

<Flip Close >

Hotspot exposure condition		Output Power for data connection			
Wifi Hotspot Status		OFF		ON	
Power state		WWAN ECI4		WWAN ECI10	
		WiFi Standalone		WiFi Simultaneous	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
LTE Band 48	Ant 4	23.11	24	11.98	12.8

Body worn exposure condition

<Flip Open >

Body Worn exposure condition		Output Power (data connection)			
		Stationary		Grip	
WIFI/BT Status		OFF		OFF	
Power state		WWAN ECI4		WWAN ECI3	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
LTE Band 7	Ant 3	23.87	25	18.96	19.6

<Flip Close >

Body Worn exposure condition		Output Power (data connection)			
		Stationary		Grip	
WIFI/BT Status		OFF		OFF	
Power state		WWAN ECI4		WWAN ECI5	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
LTE Band 7	Ant 0	23.87	25	20.34	21.2

Extremity exposure condition

<Flip Open >

Extremity exposure condition		Output Power (data connection)			
		Stationary		Grip	
WIFI/BT Status		OFF		OFF	
Power state		WWAN ECI4		WWAN ECI6	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
LTE Band 7	Ant 3	23.79	25	18.79	19.9

3. Angle Verification Results

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

1. 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 Hall sensor mechanism triggers, per the FCC TCB Workshop Slides from November 2019. The triggering conditions of the angles were sufficient such that all possible user scenarios with the device in open/closed condition are in the different power state, the angle Verification data as following tables.

Flip from closed state to open state														
Degree steps	0 Degrees	1 Degrees	2 Degrees	3 Degrees	4 Degrees	5 Degrees	6 Degrees	7 Degrees	8 Degrees	9 Degrees	10 Degrees	20 Degrees	30 Degrees	40 Degrees
State	2	2	2	1	1	1	1	1	1	1	1	1	1	1
Degree steps	50 Degrees	60 Degrees	70 Degrees	80 Degrees	90 Degrees	100 Degrees	110 Degrees	120 Degrees	130 Degrees	140 Degrees	150 Degrees	160 Degrees	170 Degrees	180 Degrees
State	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Flip from open state to closed state														
Degree steps	180 Degrees	170 Degrees	160 Degrees	150 Degrees	140 Degrees	130 Degrees	120 Degrees	110 Degrees	100 Degrees	90 Degrees	80 Degrees	70 Degrees	60 Degrees	50 Degrees
State	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Degree steps	40 Degrees	30 Degrees	20 Degrees	10 Degrees	9 Degrees	8 Degrees	7 Degrees	6 Degrees	5 Degrees	4 Degrees	3 Degrees	2 Degrees	1 Degrees	0 Degrees
State	1	1	1	1	1	1	1	1	1	1	1	2	2	2