

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:

1. This device uses different Device State Indices (DSI) to configure different time averaged power levels based on certain exposure scenarios.

Exposure conditions	Trigger Conditions	DSI
Head	Receiver on	DSI1
Body Worn (15mm)	Sensor Off / Receiver off	DSI4
Hotspot (10mm)	Hotspot On	DSI5
Extremity (Handheld)	Sensor On	DSI3
	Sensor Off / Receiver off	DSI4

2. This device uses Proximity sensors/receiver detect mechanism to configure different time averaged power levels based on certain exposure scenarios. receiver on represents the case where the device is held to ear, sensor on and receiver off represents the case when hotspot/Body-worn/extremity exposure condition.
3. 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 with simultaneous transmitting power states.
 - Tradition voice call for WCDMA, voice over IP CMRS operations for LTE.
 - LTE Band 7 is set at 'highest BW, 1RB, RB Offset = 0, QPSK' WCDMA V is set RMC 12.2Kbps.
 - b. Establish data connection monitor hotspot power state.
 - GSM850 is set to GPRS 4TX slot, LTE Band 7 is set at 'highest BW, 1RB, RB Offset = 0, QPSK', WCDMA V is set RMC 12.2Kbps, 5G FR1 n7 is set at highest BW, 1RB, RB offset = 1.
 - c. Establish data connection monitor extremity power state.
 - LTE Band 7/42 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 DSI1		WWAN DSI4	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
WCDMA V	Ant1	19.21	20.70	21.77	23.20
LTE Band 7	Ant4	17.01	17.70	25.00	25.70

Hotspot exposure condition

Hotspot exposure condition		Output Power for data connection			
Wifi Hotspot Status		OFF		ON	
Power state		WWAN DSI4		WWAN DSI5	
		WiFi Standalone		WiFi Simultaneous	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM850 (GPRS 4Tx slots)	Ant 1	24.37	25.90	20.88	22.40
WCDMA V	Ant 1	21.77	23.20	19.21	20.70
LTE Band 7	Ant 4	25.00	25.70	17.01	17.70
FR1 n7	Ant 4	25.42	25.70	15.91	16.20

Extremity/Body worn exposure condition

Extremity exposure condition		Output Power (data connection)			
		sensor off		sensor on	
Power state		WWAN DSI4		WWAN DSI3	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
LTE Band 7	Ant 4	24.97	25.70	21.15	21.70
LTE Band 42	Ant 9	24.27	25.50	17.88	19.00