

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 as the following table:

DSI	Trigger Conditions	Antenna No.	Exposure conditions
DSI2	Receiver on	All Ant	Head Standalone
DSI3	Receiver on+WLAN	All Ant	Head Simultaneous
DSI4	Receiver off/Sensor off	Ant 11/12/13	Sensor Trigger Distance -1mm
	Receiver off/Sensor off	Ant 21/23/31	Body/Extremity Standalone
DSI5	Receiver off/Sensor A +B on	Ant 13	Body/Extremity Standalone
	Receiver off/Sensor A+B on	Ant 11/12	Body/Extremity Standalone
	Receiver off/Sensor off	Ant 21/23/31	Body/Extremity Standalone
DSI8	Receiver off/Sensor A +B on+WLAN	Ant 13	Body/Extremity Simultaneous
	Receiver off/Sensor A +B on+WLAN	Ant 11/12	Body/Extremity Simultaneous
	Receiver off/Sensor off+WLAN	Ant 21/23/31	Body/Extremity Simultaneous
DSI9	Receiver off/Sensor A on+B off +WLAN	Ant 13	Body/Extremity Simultaneous
DSI10	Receiver off/Sensor A off +WLAN	Ant 21/23/31	Body/Extremity Simultaneous
	Hotspot	All ant	Hotspot

2. 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 power states.
 - Tradition voice call for GSM/WCDMA, voice over IP CMRS operations for LTE
 - GSM1900 is set to GPRS 4TX slot, LTE Band 7 is set at 'highest BW, 1RB, RB Offset = 0, QPSK', WCDMA IV is set AMR 12.2Kbps, 5G FR1 n41 is set at highest BW MHz, 1RB, RB offset = 1.
 - b. Establish data connection monitor hotspot power state.
 - GSM1900 is set to GPRS 4TX slot, LTE Band 7 is set at 'highest BW, 1RB, RB Offset = 0, QPSK', WCDMA IV is set RMC 12.2Kbps, 5G FR1 n41 is set at highest BW MHz, 1RB, RB offset = 1.
 - Body Detect mechanism was performed for the in-hand and on a stationary object (placed on a table).
 - c. Establish data connection monitor body-worn / extremity power state.
 - LTE Band 7 is set at 'highest BW, 1RB, RB Offset = 0, QPSK' WCDMA IV is set RMC 12.2Kbps, 5G FR1 n41 is set at highest BW MHz, 1RB, RB offset = 1.
 - Body Detect mechanism was performed for the in-hand and on a stationary object (placed on a table).
3. In this power validation purpose is to demonstrate of proper functioning of the detection and triggering mechanisms to support the corresponding RF exposure conditions.
4. 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

Ear acoustic output Status:		OFF		ON	
Power state		WWAN DSI4		WWAN DSI2	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (GPRS 4 Tx slots)	Ant 13	24.42	25.50	19.41	20.50
WCDMA IV	Ant 13	23.51	24.50	15.04	16.00
LTE Band 7	Ant 13	19.39	20.50	12.48	13.50
n41	Ant 13	20.06	21.50	13.08	14.50

Hotspot exposure condition

Hotspot output Status:		OFF		ON	
Power state		WWAN DSI4		WWAN DSI10	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (GPRS 4 Tx slots)	Ant 13	24.42	25.50	23.03	24.00
WCDMA II	Ant 13	22.94	24.00	17.88	19.00
LTE Band 7	Ant 1	19.39	20.50	14.81	16.00
n41	Ant 13	20.06	21.50	15.22	16.50

Body worn/ Extremity exposure condition

Sensor output Status:		OFF		ON	
Power state		WWAN DSI4		WWAN DSI5	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
WCDMA II	Ant 13	22.94	24.00	19.33	20.50
LTE Band 7	Ant 13	19.39	20.50	18.98	20.00
n41	Ant 11	23.74	24.50	17.67	18.50