

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

ECI	Trigger Conditions	Antenna No.	Exposure conditions	
ECI2	Receiver on	All ant	Head Standalone	Head all Position
ECI3	Receiver on+WLAN	All ant	Head Simultaneous	Head all Position
ECI4	Receiver off/Sensor off	ant 11/12/13	Sensor Trigger Distance -1mm	See by section 6
	Receiver off/Sensor off		Body-worn/Extremity Standalone	No Sensor Position
	Receiver off/Sensor off	ant 21/22/23/31	Body-worn/Extremity Standalone	Body all Position
ECI5	Receiver off/Sensor A + B on	ant 13	Body-worn/Extremity Standalone	See by section 6
	Receiver off/Sensor A + B on	ant 11/12	Body-worn/Extremity Standalone	See by section 6
ECI8	Receiver off/Sensor A + B on+WLAN	ant 13	Body-worn/Extremity Simultaneous	See by section 6
	Receiver off/Sensor A + B on+WLAN	ant 11/12	Body-worn/Extremity Simultaneous	See by section 6
ECI9	Receiver off/Sensor A on + B off +WLAN	ant 11/12	Body-worn/Extremity Simultaneous	No Sensor Position
ECI10	Receiver off/Sensor A off+WLAN	ant 13	Body-worn/Extremity Simultaneous	No Sensor Position
	Receiver off/Sensor A off+WLAN	ant 21/22/23/31	Body-worn/Extremity Simultaneous	Body all Position
	Hotspot on	All ant	Hotspot Simultaneous	Hotspot all Position

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 with simultaneous transmitting power states.
 - Tradition voice call for GSM/WCDMA, voice over IP CMRS operations for LTE/5G FR1
 - GSM1900 is set to GPRS 2TX 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, 1RB, RB offset = 1.
 - b. Establish data connection monitor hotspot power state.
 - GSM1900 is set to GPRS 2TX 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, 1RB, RB offset = 1.
 - c. Establish data connection monitor extremity power state.
 - GSM1900 is set to GPRS 2TX 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, 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 ECI 4		WWAN ECI 2	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (2 Tx slots)	Ant 13	27.61	28.70	23.62	24.40
WCDMA IV	Ant 13	23.78	24.70	17.01	17.70
LTE Band 7	Ant 13	21.34	22.70	15.87	16.70
n41	Ant 13	21.81	23.40	15.53	16.90

Hotspot exposure condition

Hotspot output Status:		OFF		ON	
Power state		WWAN ECI 4		WWAN ECI 10	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (2 Tx slots)	Ant 13	27.61	28.70	24.91	25.70
WCDMA IV	Ant 13	23.78	24.70	19.08	19.70
LTE Band 7	Ant 13	21.34	22.70	15.86	16.70
n41	Ant 13	21.81	23.40	16.06	17.40

Extremity exposure condition

Sensor output Status:		OFF		ON	
Power state		WWAN ECI 4		WWAN ECI 5	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (2 Tx slots)	Ant 13	27.61	28.70	25.37	26.20
WCDMA IV	Ant 13	23.78	24.70	21.06	21.70
LTE Band 7	Ant 13	21.34	22.70	18.38	19.20
n41	Ant 13	21.81	23.40	17.50	18.90