

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:

Exposure Condition	Main PA	PA (Reference Designator)	Trigger conditions
Head SAR	ECI2	ECI2-1	Earpiece On
Hotspot SAR	ECI7	ECI7-1	Hotspot On
Body worn SAR	ECI3	ECI3-1	Sensor On
Extremity SAR	ECI6	ECI6-1	Sensor On
Body worn/ Extremity SAR	ECI4	ECI4-1	Sensor Off

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.
 - Voice over IP CMRS operations for LTE/WIFI
 - LTE Band 42 is set at 'highest BW, 1RB, RB Offset = 0, QPSK', WLAN5GHz is set 802.11n-HT40 MCS0.
 - b. Establish data connection monitor hotspot power state.
 - GSM1900 is set to GPRS 4TX slot, LTE Band 25/2 is set at 'highest BW, 1RB, RB Offset = 0, QPSK', WCDMA IV is set RMC 12.2Kbps, 5G FR1 n2 is set at highest BW, 1RB, RB offset = 1, WLAN2.4GHz is set 802.11ac-VHT80 MCS0.
 - c. Establish data connection monitor body worn power state.
 - GSM1900 is set to GPRS 4TX slot, LTE Band 25/2 is set at 'highest BW, 1RB, RB Offset = 0, QPSK' WCDMA IV is set RMC 12.2Kbps, 5G FR1 n2 is set at highest BW, 1RB, RB offset = 1, WLAN5GHz is set 802.11n-HT40 MCS0.
 - 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.
 - GSM1900 is set to GPRS 4TX slot, LTE Band 25/2 is set at 'highest BW, 1RB, RB Offset = 0, QPSK' WCDMA IV is set RMC 12.2Kbps. 5G FR1 n2 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

Head Exposure condition		Output Power for Voice Call			
Ear acoustic output Status:		ON		OFF	
Power state		WWAN Receiver on		WWAN Receiver off	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
LTE Band 42	Ant 5	17.55	18.8	22.21	23.0
WLAN 5.3G 802.11n-HT40 MCS0	Ant 6	15.14	16.5	16.31	18.0

Hotspot exposure condition

Hotspot exposure condition		Output Power (data connection)			
Wifi Hotspot Status		ON		OFF	
Power state		WWAN Hotspot on		WWAN Hotspot off	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900(GPRS 4 Tx slot)	Ant 0	20.83	21.6	25.51	26.5
WCDMA IV	Ant 0	17.11	18.2	23.38	24.0
LTE Band 25(2)	Ant 0	15.56	17.0	22.56	24.0
FR1 n2	Ant 0	16.5	17.1	22.68	24.0
WLAN 2.4GHz 802.11b 1Mbps	Ant 6	13.91	15.0	18.36	20.0

Body worn exposure condition

Body Worn exposure condition		Output Power (data connection)			
Power state		WWAN Sensor on		WWAN Sensor off	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (GPRS 4Tx slots)	Ant 0	21.89	23.0	25.51	26.5
WCDMA IV	Ant 0	17.68	18.7	23.38	24.0
LTE Band 25(2)	Ant 0	16.77	18.0	22.56	24.0
FR1 n2	Ant 0	16.49	17.5	22.68	24.0
WLAN 5.3G 802.11n-HT40 MCS0	Ant 6	15.33	16.5	16.31	18.0

Extremity exposure condition

Body Worn exposure condition		Output Power (data connection)			
Power state		WWAN Sensor on		WWAN Sensor off	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (GPRS 4Tx slots)	Ant 0	24.82	25.6	25.51	26.5
WCDMA IV	Ant 0	21.17	22.1	23.38	24.0
LTE Band 25(2)	Ant 0	20.55	21.7	22.56	24.0
FR1 n2	Ant 0	20.45	21.7	22.68	24.0