
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 hotspot/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, Hotspot on represents the case when hotspot exposure condition, receiver off represents the case when Body-worn/extremity exposure condition.
 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/WIFI/5G FR1
 - GSM1900 is set to GPRS 3TX slot, LTE Band 7 is set at 'highest BW, 1RB, RB Offset = 0, QPSK', WCDMA V is set AMR 12.2Kbps, 5G FR1 n77 is set at highest BW, 1RB, RB offset = 1, WLAN5GHz is set 802.11n-HT40 MCS0.
 - b. Establish data connection monitor hotspot power state.
 - GSM1900 is set to GPRS 3TX slot, LTE Band 7 is set at 'highest BW, 1RB, RB Offset = 0, QPSK', WCDMA 5 is set RMC 12.2Kbps, 5G FR1 n77 is set at highest BW, 1RB, RB offset = 1.
 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.
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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)
GSM1900 (3TX)	Ant 4	21.32	23.00	22.48	24.00
UMTS Band 5	Ant 4	19.62	21.50	21.23	23.00
LTE Band 7 (FDD)	Ant 4	15.57	17.00	17.22	18.50
NR SA n77	Ant 5	15.31	16.50	18.63	20.00

Head Exposure condition		Output Power for Voice Call					
Ear acoustic output Status:		OFF		ON		ON	
WWAN Status:		OFF		OFF		ON	
Power state		WiFi Standalone		WiFi Standalone		WiFi Simultaneous	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
802.11n-HT40 MCS0	(Ant5+7)Ant 5	15.33	17.00	9.47	11.00	5.71	7.50
Ch54	(Ant5+7)Ant 7	15.41	17.00	10.18	11.50	6.48	8.00

Hotspot exposure condition

Hotspot exposure condition		Output Power for data connection			
Wifi Hotspot Status		ON		OFF	
Power state		WWAN Hotspot on		WWAN Receiver off	
		WiFi Simultaneous		WiFi Standalone	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (3TX)	Ant 4	21.63	23.50	22.48	24.00
UMTS Band 5	Ant 4	20.18	22.00	21.23	23.00
LTE Band 7 (FDD)	Ant 4	15.03	16.50	17.22	18.50
NR SA n77	Ant 2	12.18	14.00	17.83	19.50