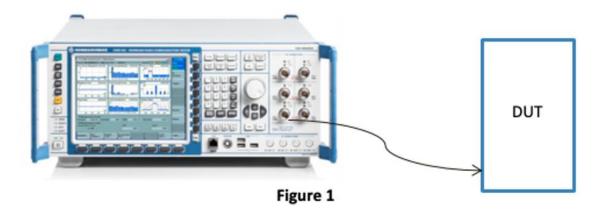# Appendix E.   Power reduction mechanism verification

According to the May 2017 TCBC Workshop, Demonstration of proper functioning of the detection and triggering mechanisms 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

- 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/WIFI/5G FR1
  - ➤ GSM is set to 1TX slot, LTE is set at 'highest BW, 1RB, RB Offset = 0, QPSK' WCDMA is set AMR 12.2Kbps, 5G FR1 is set at highest BW MHz, 1RF, RB offset = 1

- Establish data connection monitor hotspot power state.
  - ➤ GSM is set to GPRS 4TX slot, LTE is set at 'highest BW, 1RB, RB Offset = 0, QPSK' WCDMA is set RMC 12.2Kbps, 5G FR1 is set at highest BW MHz, 1RF, RB offset = 1

- Establish data connection monitor body worn power state.
  - ➤ GSM is set to GPRS 2TX slot, LTE is set at 'highest BW, 1RB, RB Offset = 0, QPSK' WCDMA is set RMC 12.2Kbps, 5G FR1 is set at highest BW MHz, 1RF, RB offset = 1
  - ➤ Body Detect mechanism was performed for the in-hand and on a stationary object (placed on a table)

- This device incorporates the Samsung S.LSI TAS algorithm feature and through under varying Tx power transmission scenarios in real-time to maintain the time-averaged Tx power compliant with FCC RF exposure requirement.
- In this power validation purpose is to demonstrate of proper functioning of the detection and triggering mechanisms to support the corresponding RF exposure conditions. In order to avoid real-time TX power varying may affect monitor output power related to the power reduction mechanisms, therefore power reduction verification would be disabled WWAN TAS feature.
- Verification performed for each technology to demonstrate that the power reduction applies for both technology and call origination.

2. Test setup for measuring power

Figure 1

3. Verification output Power Results

Head exposure conditions

Head Exposure condition		Output Power for Voice Call			
Ear acoustic output Status:		ON		ON	
WiFi Status:		OFF		ON	
Power state		WWAN Index 2		WWAN Index 3	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM850 (1TX)	Ant 0	32.24	33.50	31.97	33.50
	Ant 1	29.15	30.90	28.33	30.20
UMTS Band 2	Ant 2	24.43	25.10	23.89	24.40
	Ant 0	24.08	25.30	23.98	25.30
LTE Band 14 (FDD)	Ant 0	24.63	25.50	24.48	25.50
	Ant 1	22.18	23.30	21.48	22.60
LTE Band 25 (TDD)	Ant 2	23.31	24.50	22.66	23.80
	Ant 0	23.99	25.30	23.9	25.30
NR SA n7	Ant 2	21.93	22.80	21.22	22.10
	Ant 0	23.58	25.00	23.51	25.00

Head Exposure condition		Output Power for Voice Call			
Ear acoustic output Status:		ON		ON	
WWAN Status:		OFF		ON	
Power state		WIFI Index 1		WIFI Index 3	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
WiFi 802.11g CH11	(Ant4+3)Ant 4	14.06	15	11.41	12
	(Ant4+3)Ant 3	14.23	15	12	12
WiFi 802.11a 6Mbps CH157	(Ant4+3)Ant 4	15.84	16	10.19	12.5
	(Ant4+3)Ant 3	15.61	16	10.45	12.5

Hotspot exposure condition

Hotspot exposure condition		Output Power for data connection			
Wifi Hotspot Status		ON		OFF	
BT Hotspot Status		OFF		ON	
Power state		WWAN Index 4 WIFI Index 7		WWAN Index 4 WIFI Index 7	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (4TX)	Ant 2	22.23	24.10	22.20	24.10
	Ant 0	19.56	20.50	19.57	20.50
UMTS Band 2	Ant 2	20.04	21.30	20.13	21.30
	Ant 0	17.35	18.40	17.37	18.40
LTE Band 14 (FDD)	Ant 0	23.26	24.30	23.23	24.30
	Ant 1	24.30	25.10	24.31	25.10
LTE Band 25 (FDD)	Ant 2	19.18	20.00	19.17	20.00
	Ant 0	17.26	18.50	17.25	18.50
NR SA n7	Ant 2	18.96	19.90	18.96	19.90
	Ant 0	17.12	18.60	17.12	18.60
WiFi 802.11g CH11	(Ant4+3)Ant 3	16.04	18		
	(Ant4+3)Ant 4	17.75	18		
WiFi 802.11a UNII ,CH157	(Ant4+3)Ant 3	16.09	18.5		
	(Ant4+3)Ant 4	16.08	18.5		

Body worn exposure condition

Body Worn exposure condition		Output Power (data connection)					
		Stationary		Body Worn (In hand)			
WIFI/BT Status		OFF		OFF		ON	
Power state		WWAN Index 1		WWAN Index 5		WWAN Index 6	
Wireless Technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
GSM1900 (4TX)	Ant 2	26.02	28.00	23.71	24.80	22.99	24.10
	Ant 0	25.01	27.20	21.13	22.60	20.32	21.90
UMTS Band 2	Ant 2	24.35	25.50	21.44	22.00	20.36	21.30
	Ant 0	24.22	25.30	18.23	20.10	17.53	19.40
LTE Band 14 (FDD)	Ant 0	24.54	25.50	24.51	25.00	23.27	24.30
	Ant 1	24.31	25.10	24.30	25.10	24.32	25.10
LTE Band 66 (FDD)	Ant 2	24.40	25.50	20.93	22.00	20.23	21.30
	Ant 0	24.09	25.30	20.19	21.50	19.53	20.80
NR SA n7	Ant 2	24.55	25.40	19.65	20.60	19.05	19.90
	Ant 0	23.55	25.00	19.33	20.80	18.63	20.10

Body Worn exposure condition		Output Power (data connection)					
		Stationary		In hand			
WWAN Status:		OFF		OFF		ON	
Power state		WIFI Index 0		WIFI Index 5		WIFI Index 6	
Wireless technology	Antenna	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)	Measured (dBm)	Max. Tune-up (dBm)
WiFi 802.11g CH11	(Ant4+3)Ant 4	19.35	19.5	19.35	19.5	17.19	18
	(Ant4+3)Ant 3	19.4	19.5	19.0	19.5	17.82	18
WiFi 802.11a UNII ,CH157	(Ant4+3)Ant 4	17.78	21	17.78	20	16.27	18.5
	(Ant4+3)Ant 3	18.15	21	18.15	20	16.3	18.5