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SAR EVALUATION REPORT

Applicant Name:
Samsung Electronics Co., Ltd.
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Gyeonggi-do, 16677, Korea

Date of Testing:
12/08/22 - 12/14/22
Test Site/Location:
Element, Columbia, MD, USA
Document Serial No.:
1M2212020130-01.A3L

FCC ID: **A3LSMS916U**

APPLICANT: **SAMSUNG ELECTRONICS CO., LTD.**

DUT Type:	Portable Handset
Application Type:	Class II Permissive Change
FCC Rule Part(s):	CFR §2.1093
Model(s):	SM-S916U, SM-S916U1
Permissive Change(s):	See FCC Change Document
Date of Original Certification:	12/08/2022

Equipment Class	Band & Mode	Tx Frequency	SAR
			1g Body-Worn (W/kg)
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.13
PCE	UMTS 1750	1712.4 - 1752.6 MHz	0.42
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.41
PCE	LTE Band 66 (AWS)	1710.7 - 1779.3 MHz	0.39
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	N/A
PCE	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.36
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	N/A
PCE	LTE Band 30	2307.5 - 2312.5 MHz	0.15
PCE	LTE Band 7	2502.5 - 2567.5 MHz	0.16
PCE	LTE Band 41	2498.5 - 2687.5 MHz	< 0.1
PCE	LTE Band 38	2572.5 - 2617.5 MHz	N/A
PCE	NR Band n66 (AWS)	1712.5 - 1777.5 MHz	0.44
PCE	NR Band n25 (PCS)	1852.5 - 1912.5 MHz	0.35
PCE	NR Band n2 (PCS)	1852.5 - 1907.5 MHz	N/A
PCE	NR Band n30	2307.5 - 2312.5 MHz	0.20
PCE	NR Band n7	2502.5 - 2567.5 MHz	0.19

Only operations relevant to this permissive change were evaluated for compliance. Please see the original compliance evaluation in RF Exposure Technical Report S/N: 1M2209010097-24.A3L for complete evaluation of all other operating modes. The operation description includes a description of all changed items.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.9 of this report; for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

RJ Ortanez
Executive Vice President

The SAR Tick is an initiative of the Mobile & Wireless Forum (MWF). While a product may be considered eligible, use of the SAR Tick logo requires an agreement with the MWF. Further details can be obtained by emailing: sartick@mwfai.info.

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 -3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26 (Cell)	Voice/Data	816.5 - 846.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

1.2 Time-Averaging Algorithm for RF Exposure Compliance

This Device is enabled with the Qualcomm® Smart Transmit Gen2 feature. This feature performs time averaging algorithm in real time to control and manage transmitting power and ensure the time-averaged RF exposure is in compliance with FCC requirements all the time. Refer to Compliance Summary document for detailed description of Qualcomm® Smart Transmit feature (report SN could be found in Section 1.11 – Bibliography).

Note that WLAN operations are not enabled with Smart Transmit.

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of *SAR_design_target*, below the predefined time-averaged power limit (i.e., P_{limit} for sub-6 radio), for each characterized technology and band (see RF Exposure Part 0 Test Report, report SN could be found in Section 1.11 - Bibliography).

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of *SAR_design_target* or *PD_design_target*, below the predefined time-averaged power limit (i.e., P_{limit} for sub-6 radio, and *input.power.limit* for 5G mmW NR), for each characterized technology and band (see RF Exposure Part 0 Test Report, report SN can be found in Section 1.11 - Bibliography).

Smart Transmit allows the device to transmit at higher power instantaneously, as high as P_{max}, when needed, but enforces power limiting to maintain time-averaged transmit power to P_{limit}. Below table shows P_{limit} EFS settings and maximum tune up output power P_{max} configured for this EUT for various transmit conditions (Device State Index DSI). Note that the device uncertainty for sub-6GHz WWAN is 1.0dB for this EUT.

Exposure Senario			Body-Worn	Phablet	Head	Hotspot	Maximum Tune-Up Output Power*
Averaging Volume			1g	10g	1g	1g	
Spacing			15 mm	0 mm	0 mm	10 mm	
DSI			0	0	2	3	
Technology/Band	Antenna	Antenna Group					Pmax
GSM 850	A	AG0	27.3		31.1	26.7	25.3
GSM 1900	A	AG0	17.8		32.4	16.8	22.1
UMTS 850	A	AG0	26.7		31.0	26.6	24.0
UMTS 1750	A	AG0	19.5		30.5	18.5	23.0
UMTS 1900	A	AG0	20.5		31.3	18.5	23.0
LTE Band 71	A	AG0	27.1		33.8	27.1	24.5
LTE Band 12	A	AG0	27.5		32.6	27.5	24.5
LTE Band 13	A	AG0	27.6		31.8	27.6	24.5
LTE Band 14	A	AG0	27.2		31.7	27.2	24.5
LTE Band 26 (Cell)	A	AG0	25.7		31.2	25.7	24.5
LTE Band 5 (Cell)	A	AG0	26.9		31.4	26.9	24.5
LTE Band 66/4 (AWS)	A	AG0	19.0		30.2	18.0	23.5
LTE Band 66/4 (AWS)	F	AG1	18.5		15.5	18.5	23.5
LTE Band 25/2 (PCS)	A	AG0	20.0		30.4	18.5	23.5
LTE Band 25/2 (PCS)	F	AG1	20.0		16.5	20.0	23.5
LTE Band 30	A	AG0	19.0		34.0	19.0	22.5
LTE Band 30	F	AG1	18.0		16.5	18.0	21.0
LTE Band 7	B	AG0	19.0		30.5	19.0	23.0
LTE Band 7	F	AG1	17.5		14.5	17.5	23.0
LTE Band 48	F	AG1	18.5		14.0	18.5	20.0
LTE Band 41/38 (PC3)	B	AG0	18.0		29.8	17.0	22.0
LTE Band 41 (PC2)	B	AG0	18.0		29.8	17.0	22.0
LTE Band 41/38 (PC3)	F	AG1	16.5		15.5	16.5	22.0
LTE Band 41 (PC2)	F	AG1	16.5		15.5	16.5	22.0
NR Band n71	A	AG0	27.0		33.3	27.0	24.5
NR Band n12	A	AG0	27.4		32.8	27.4	24.5
NR Band n26/n5	A	AG0	25.7		31.2	25.7	24.5
NR Band n66	A	AG0	19.0		23.0	18.5	23.5
NR Band n66	F	AG1	18.5		15.5	18.5	23.5
NR Band n25/n2 (PCS)	A	AG0	20.0		31.2	18.5	23.5
NR Band n25/n2 (PCS)	F	AG1	20.0		16.5	20.0	23.5
NR Band n30	A	AG0	19.0		35.8	19.0	22.5
NR Band n30	F	AG1	18.0		16.5	18.0	22.0
NR Band n7	B	AG0	19.0		30.9	19.0	23.0
NR Band n7	F	AG1	17.5		14.5	17.5	23.0
NR Band n41 Path 1 (PC2)	F	AG1	18.5		15.5	18.5	26.0
NR Band n41 Path 1 (PC2)	B	AG0	18.0		18.0	18.0	21.0
NR Band n41 Path 1 (PC2)	E	AG1	18.0		16.0	18.0	22.0
NR Band n41 Path 1 (PC2)	D	AG0	15.5		15.5	15.5	18.0
NR Band n41 Path 2 (PC2)	B	AG0	19.5		19.5	19.5	26.0
NR Band n41 Path 2 (PC2)	F	AG1	17.0		13.5	17.0	19.0
NR Band n41 Path 2 (PC2)	D	AG0	16.5		16.5	16.5	22.0
NR Band n41 Path 2 (PC2)	E	AG1	16.0		13.5	16.0	19.5
NR Band n38	F	AG1	18.5		15.5	18.5	24.0
NR Band n38	B	AG0	19.5		19.5	19.5	24.0
NR Band n48	F	AG1	18.0		15.5	18.0	21.5
NR Band n48	C	AG0	15.0		15.0	15.0	19.0
NR Band n48	I	AG1	17.0		15.5	17.0	20.0
NR Band n48	D	AG0	15.0		15.0	15.0	18.0
NR Band n77 DoD (PC2)	F	AG1	18.0		14.5	18.0	26.0
NR Band n77 DoD (PC2)	C	AG0	15.0		15.0	15.0	22.0
NR Band n77 DoD (PC2)	I	AG1	17.0		15.5	17.0	23.0
NR Band n77 DoD (PC2)	D	AG0	15.0		15.0	15.0	19.0
NR Band n77 (PC2)	F	AG1	18.0		14.5	18.0	26.0
NR Band n77 (PC2)	C	AG0	15.0		15.0	15.0	22.0
NR Band n77 (PC2)	I	AG1	17.0		15.5	17.0	23.0
NR Band n77 (PC2)	D	AG0	15.0		15.0	15.0	19.0

*Note all P_{limit} EFS and maximum tune up output power P_{max} levels entered in above Table correspond to average power levels after accounting for duty cycle in the case of TDD modulation schemes (e.g. GSM and LTE TDD).

*Maximum tune up output power P_{max} is used to configure EUT during RF tune up procedure. The maximum allowed output power is equal to maximum Tune up output power + 1dB device design uncertainty.

The maximum time-averaged output power (dBm) for any Sub6 WWAN technology, band, and DSI = minimum of "P_{limit} EFS" and "Maximum tune up output power P_{max}" + 1dB device uncertainty. SAR values in this report were scaled to this maximum time-averaged output power to determine compliance per KDB Publication 447498 D04v01.

The purpose of this report (Part 1 test) is to demonstrate that the EUT meets FCC SAR limits when transmitting in static transmission scenario at maximum allowable time-averaged power levels.

Measurement Condition: All conducted power and SAR measurements in this report (Part 1 test) were performed by setting *Reserve_power_margin* (Smart Transmit EFS entry) to 0dB.

1.3 Power Reduction for SAR

This device uses an independent fixed level power reduction mechanism for WLAN/BT operations during voice or VoIP held to ear scenarios and when 5G NR is active. Per FCC Guidance, the held-to-ear exposure conditions were evaluated at reduced power according to the head SAR positions described in IEEE 1528-2013. Detailed descriptions of the power reduction mechanism are included in the operational description.

1.4 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D04v01.

Note: Targets for 802.11ax RU operations can be found in 802.11ax RU SAR Exclusion Appendix in the original filing.

1.4.1 WWAN Output Power

GSM/GPRS/EDGE 850										
Power Level		Voice (in dBm)	Data - Burst Average GMSK (in dBm)				Data - Burst Average 8-PSK (in dBm)			
		1 TX Slot	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
Pmax	Max Allowed Power	33.0	33.0	32.5	30.5	28.5	28.0	26.0	24.0	23.0
	Nominal	32.0	32.0	31.5	29.5	27.5	27.0	25.0	23.0	22.0
DSI = 0 (Body-Worn or Phablet)	Max Allowed Power	33.0	33.0	32.5	30.5	28.5	28.0	26.0	24.0	23.0
	Nominal	32.0	32.0	31.5	29.5	27.5	27.0	25.0	23.0	22.0
DSI = 2 (Head)	Max Allowed Power	33.0	33.0	32.5	30.5	28.5	28.0	26.0	24.0	23.0
	Nominal	32.0	32.0	31.5	29.5	27.5	27.0	25.0	23.0	22.0
DSI = 3 (Hotspot)	Max Allowed Power	N/A	32.5	30.5	28.5		28.0	26.0	24.0	23.0
	Nominal	N/A	32.0	31.5	29.5	27.5	27.0	25.0	23.0	22.0
GSM/GPRS/EDGE 1900										
Power Level		Voice (in dBm)	Data - Burst Average GMSK (in dBm)				Data - Burst Average 8-PSK (in dBm)			
		1 TX Slot	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
Pmax	Max Allowed Power	30.0	30.0	29.0	27.5	25.5	27.0	25.0	23.0	22.0
	Nominal	29.0	29.0	28.0	26.5	24.5	26.0	24.0	22.0	21.0
DSI = 0 (Body-Worn or Phablet)	Max Allowed Power	28.0	28.0	25.0	23.2	22.0	27.0	25.0	23.0	22.0
	Nominal	27.0	27.0	24.0	22.2	21.0	26.0	24.0	22.0	21.0
DSI = 2 (Head)	Max Allowed Power	30.0	30.0	29.0	27.5	25.5	27.0	25.0	23.0	22.0
	Nominal	29.0	29.0	28.0	26.5	24.5	26.0	24.0	22.0	21.0
DSI = 3 (Hotspot)	Max Allowed Power	N/A	27.0	24.0	22.2	21.0	27.0	24.0	22.2	21.0
	Nominal	N/A	26.0	23.0	21.2	20.0	26.0	23.0	21.2	20.0

For GSM, the above powers listed are GSM burst average values.

UMTS Band 5 (850 MHz)					
Power Level		Modulated Average Output Power			
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6	3GPP DC-HSDPA Rel 8
Pmax	Max Allowed Power	25.0	24.0	24.0	24.0
	Nominal	24.0	23.0	23.0	23.0
DSI = 0 (Body-Worn or Phablet)	Max Allowed Power	25.0	24.0	24.0	24.0
	Nominal	24.0	23.0	23.0	23.0
DSI = 2 (Head)	Max Allowed Power	25.0	24.0	24.0	24.0
	Nominal	24.0	23.0	23.0	23.0
DSI = 3 (Hotspot)	Max Allowed Power	25.0	24.0	24.0	24.0
	Nominal	24.0	23.0	23.0	23.0
UMTS Band 4 (1750 MHz)					
Power Level		Modulated Average Output Power			
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6	3GPP DC-HSDPA Rel 8
Pmax	Max Allowed Power	24.0	23.0	23.0	23.0
	Nominal	23.0	22.0	22.0	22.0
DSI = 0 (Body-Worn or Phablet)	Max Allowed Power	20.5	19.5	19.5	19.5
	Nominal	19.5	18.5	18.5	18.5
DSI = 2 (Head)	Max Allowed Power	24.0	23.0	23.0	23.0
	Nominal	23.0	22.0	22.0	22.0
DSI = 3 (Hotspot)	Max Allowed Power	19.5	18.5	18.5	18.5
	Nominal	18.5	17.5	17.5	17.5
UMTS Band 2 (1900 MHz)					
Power Level		Modulated Average Output Power			
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6	3GPP DC-HSDPA Rel 8
Pmax	Max Allowed Power	24.0	23.0	23.0	23.0
	Nominal	23.0	22.0	22.0	22.0
DSI = 0 (Body-Worn or Phablet)	Max Allowed Power	21.5	20.5	20.5	20.5
	Nominal	20.5	19.5	19.5	19.5
DSI = 2 (Head)	Max Allowed Power	24.0	23.0	23.0	23.0
	Nominal	23.0	22.0	22.0	22.0
DSI = 3 (Hotspot)	Max Allowed Power	19.5	18.5	18.5	18.5
	Nominal	18.5	17.5	17.5	17.5

Mode / Band	Antenna		Modulated Average Output Power (in dBm)			
			Pmax	DSI = 0 (Body-Worn or Phablet)	DSI = 2 (Head)	DSI = 3 (Hotspot)
LTE Band 71	A	Max Allowed Power	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5
LTE Band 12	A	Max Allowed Power	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5
LTE Band 13	A	Max Allowed Power	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5
LTE Band 14	A	Max Allowed Power	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5
LTE Band 26 (Cell)	A	Max Allowed Power	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5
LTE Band 5 (Cell)	A	Max Allowed Power	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5
LTE Band 66 (AWS)	A	Max Allowed Power	24.5	20.0	24.5	19.0
		Nominal	23.5	19.0	23.5	18.0
LTE Band 66 (AWS)	F	Max Allowed Power	24.5	19.5	16.5	19.5
		Nominal	23.5	18.5	15.5	18.5
LTE Band 4 (AWS)	A	Max Allowed Power	24.5	20.0	24.5	19.0
		Nominal	23.5	19.0	23.5	18.0
LTE Band 4 (AWS)	F	Max Allowed Power	24.5	19.5	16.5	19.5
		Nominal	23.5	18.5	15.5	18.5
LTE Band 25 (PCS)	A	Max Allowed Power	24.5	21.0	24.5	19.5
		Nominal	23.5	20.0	23.5	18.5
LTE Band 25 (PCS)	F	Max Allowed Power	24.5	21.0	17.5	21.0
		Nominal	23.5	20.0	16.5	20.0
LTE Band 2 (PCS)	A	Max Allowed Power	24.5	21.0	24.5	19.5
		Nominal	23.5	20.0	23.5	18.5
LTE Band 2 (PCS)	F	Max Allowed Power	24.5	21.0	17.5	21.0
		Nominal	23.5	20.0	16.5	20.0
LTE Band 30	A	Max Allowed Power	23.5	20.0	23.5	20.0
		Nominal	22.5	19.0	22.5	19.0
LTE Band 30	F	Max Allowed Power	22.0	19.0	17.5	19.0
		Nominal	21.0	18.0	16.5	18.0
LTE Band 7	B	Max Allowed Power	24.0	20.0	24.0	20.0
		Nominal	23.0	19.0	23.0	19.0
LTE Band 7	F	Max Allowed Power	24.0	18.5	15.5	18.5
		Nominal	23.0	17.5	14.5	17.5
LTE Band 48	F	Max Allowed Power	23.0	21.5	17.0	21.5
		Nominal	22.0	20.5	16.0	20.5
LTE Band 41 (PC3)	B	Max Allowed Power	25.0	21.0	25.0	20.0
		Nominal	24.0	20.0	24.0	19.0
LTE Band 41 (PC2)	B	Max Allowed Power	26.6	22.6	26.6	21.6
		Nominal	25.6	21.6	25.6	20.6
LTE Band 41 (PC3)	F	Max Allowed Power	25.0	19.5	18.5	19.5
		Nominal	24.0	18.5	17.5	18.5
LTE Band 41 (PC2)	F	Max Allowed Power	26.6	21.1	20.1	21.1
		Nominal	25.6	20.1	19.1	20.1
LTE Band 38	B	Max Allowed Power	25.0	21.0	25.0	20.0
		Nominal	24.0	20.0	24.0	19.0
LTE Band 38	F	Max Allowed Power	25.0	19.5	18.5	19.5
		Nominal	24.0	18.5	17.5	18.5

Mode / Band	Antenna		Modulated Average Output Power (in dBm)			
			Pmax	DSI = 0 (Body-Worn or Phablet)	DSI = 2 (Head)	DSI = 3 (Hotspot)
NR Band n71	A	Max Allowed Power	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5
NR Band n12	A	Max Allowed Power	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5
NR Band n26/n5	A	Max Allowed Power	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5
NR Band n66	A	Max Allowed Power	24.5	20.0	24.0	19.5
		Nominal	23.5	19.0	23.0	18.5
NR Band n66	F	Max Allowed Power	24.5	19.5	16.5	19.5
		Nominal	23.5	18.5	15.5	18.5
NR Band n25	A	Max Allowed Power	24.5	21.0	24.5	19.5
		Nominal	23.5	20.0	23.5	18.5
NR Band n25	F	Max Allowed Power	24.5	21.0	17.5	21.0
		Nominal	23.5	20.0	16.5	20.0
NR Band n2 (PCS)	A	Max Allowed Power	24.5	21.0	24.5	19.5
		Nominal	23.5	20.0	23.5	18.5
NR Band n2 (PCS)	F	Max Allowed Power	24.5	21.0	17.5	21.0
		Nominal	23.5	20.0	16.5	20.0
NR Band n30	A	Max Allowed Power	23.5	20.0	23.5	20.0
		Nominal	22.5	19.0	22.5	19.0
NR Band n30	F	Max Allowed Power	23.0	19.0	17.5	19.0
		Nominal	22.0	18.0	16.5	18.0
NR Band n7	B	Max Allowed Power	24.0	20.0	24.0	20.0
		Nominal	23.0	19.0	23.0	19.0
NR Band n7	F	Max Allowed Power	24.0	18.5	15.5	18.5
		Nominal	23.0	17.5	14.5	17.5
NR Band n41 Path 1 (PC2)	F	Max Allowed Power	27.0	19.5	16.5	19.5
		Nominal	26.0	18.5	15.5	18.5
NR Band n41 Path 1 (PC2)	B	Max Allowed Power	22.0	19.0	19.0	19.0
		Nominal	21.0	18.0	18.0	18.0
NR Band n41 Path 1 (PC2)	E	Max Allowed Power	23.0	19.0	17.0	19.0
		Nominal	22.0	18.0	16.0	18.0
NR Band n41 Path 1 (PC2)	D	Max Allowed Power	19.0	16.5	16.5	16.5
		Nominal	18.0	15.5	15.5	15.5
NR Band n41 Path 2 (PC2)	B	Max Allowed Power	27.0	20.5	20.5	20.5
		Nominal	26.0	19.5	19.5	19.5
NR Band n41 Path 2 (PC2)	F	Max Allowed Power	20.0	18.0	14.5	18.0
		Nominal	19.0	17.0	13.5	17.0
NR Band n41 Path 2 (PC2)	D	Max Allowed Power	23.0	17.5	17.5	17.5
		Nominal	22.0	16.5	16.5	16.5
NR Band n41 Path 2 (PC2)	E	Max Allowed Power	20.5	17.0	14.5	17.0
		Nominal	19.5	16.0	13.5	16.0
NR Band n38	F	Max Allowed Power	25.0	19.5	16.5	19.5
		Nominal	24.0	18.5	15.5	18.5
NR Band n38	B	Max Allowed Power	25.0	20.5	20.5	20.5
		Nominal	24.0	19.5	19.5	19.5
NR Band n48	F	Max Allowed Power	22.5	19.0	16.5	19.0
		Nominal	21.5	18.0	15.5	18.0
NR Band n48	C	Max Allowed Power	20.0	16.0	16.0	16.0
		Nominal	19.0	15.0	15.0	15.0
NR Band n48	I	Max Allowed Power	21.0	18.0	16.5	18.0
		Nominal	20.0	17.0	15.5	17.0
NR Band n48	D	Max Allowed Power	19.0	16.0	16.0	16.0
		Nominal	18.0	15.0	15.0	15.0
NR Band n77 DoD (PC2)	F	Max Allowed Power	27.0	19.0	15.5	19.0
		Nominal	26.0	18.0	14.5	18.0
NR Band n77 DoD (PC2)	C	Max Allowed Power	23.0	16.0	16.0	16.0
		Nominal	22.0	15.0	15.0	15.0
NR Band n77 DoD (PC2)	I	Max Allowed Power	24.0	18.0	16.5	18.0
		Nominal	23.0	17.0	15.5	17.0
NR Band n77 DoD (PC2)	D	Max Allowed Power	20.0	16.0	16.0	16.0
		Nominal	19.0	15.0	15.0	15.0
NR Band n77 (PC2)	F	Max Allowed Power	27.0	19.0	15.5	19.0
		Nominal	26.0	18.0	14.5	18.0
NR Band n77 (PC2)	C	Max Allowed Power	23.0	16.0	16.0	16.0
		Nominal	22.0	15.0	15.0	15.0
NR Band n77 (PC2)	I	Max Allowed Power	24.0	18.0	16.5	18.0
		Nominal	23.0	17.0	15.5	17.0
NR Band n77 (PC2)	D	Max Allowed Power	20.0	16.0	16.0	16.0
		Nominal	19.0	15.0	15.0	15.0

For LTE TDD and NR TDD, the above powers listed are TDD burst average values.

1.4.1 WLAN and Bluetooth Output Power

Only operations relevant to this permissive change were evaluated for compliance. No other target changes have been made. Targets for all other bands/exposure conditions can be found in the original filing.

1.5 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. A diagram showing the location of the device antennas can be found in DUT Antenna Diagram & SAR Test Setup Photographs Appendix. Since the display diagonal dimension of this device is > 150 mm and <200 mm, it is considered a “phablet.” Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filing.

1.6 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the device for this model. Therefore, all SAR tests were performed with the device which already incorporates the NFC antenna. A diagram showing the location of the NFC antenna can be found in DUT Antenna Diagram & SAR Test Setup Photographs Appendix in the original filling.

1.7 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

Table 1-1
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
16	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
17	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
18	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
19	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
22	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
23	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
24	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
31	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
33	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
36	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
37	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
40	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
41	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	N/A	Yes	
44	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
46	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
48	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
51	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
56	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
59	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
60	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
62	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
65	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
68	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
69	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
70	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
73	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
74	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
75	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
76	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
79	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
82	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
83	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
84	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

1. No other simultaneous scenarios besides described above is supported for this model.
2. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
3. Per the manufacturer, WIFI Direct is not expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.

4. 5 GHz Wireless Router is only supported for the U-NII-3 by S/W, therefore U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 were not evaluated for wireless router conditions.
5. 6 GHz Wireless Router is not supported, therefore it was not evaluated for wireless router conditions.
6. This device supports 2x2 MIMO Tx for WLAN 802.11a/b/g/n/ac/ax. 802.11a/b/g/n/ac/ax supports CDD and STBC and 802.11n/ac/ax additionally supports SDM.
7. This device supports VoWIFI.
8. This device supports Bluetooth Tethering on Antenna 1 only.
9. This device supports VoLTE.
10. This device supports VoNR.
11. LTE + 5G NR FR1 Scenarios are limited to EN-DC combinations with anchor bands as shown in the NR FR1 checklist.
12. 5G NR FR2 n258, n260, and n261 cannot transmit simultaneously.
13. LTE + 5G NR FR2 Scenarios are limited to EN-DC combinations with anchor bands as shown in the NR FR2 checklist.
14. UWB and NFC were evaluated for phablet based on expected usage conditions.

1.8 Miscellaneous SAR Test Considerations

(A) WIFI/BT

There were no changes made to the WIFI and BT operations within this device. Please see the original filing for complete evaluation of these operating modes.

(B) Licensed Transmitter(s)

Only operations relevant to this permissive change were evaluated for compliance. Please see original filing for complete evaluation of all other operating modes. The operational description includes a description of all changed items.

GSM/GPRS/EDGE DTM is not supported for US bands. Therefore, the GSM Voice modes in this report do not transmit simultaneously with GPRS/EDGE Data.

This device is only capable of QPSK HSUPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01v03r01.

LTE SAR for the higher modulations and lower bandwidths were not tested since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05v02r04.

This device supports LTE Carrier Aggregation (CA) in the downlink. All uplink communications are identical to Release 8 specifications. Per FCC KDB Publication 941225 D05A v01r02, SAR for LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive. The downlink carrier aggregation exclusion analysis can be found in Downlink LTE CA RF Conducted Powers Appendix of the original filing.

This device supports downlink 4x4 MIMO operations for some LTE Bands. Per May 2017 TCB Workshop Notes, SAR for 4x4 DL MIMO was not needed since the maximum average output power in 4x4 DL MIMO mode was not more than 0.25 dB higher than the maximum output power with 4x4 DL MIMO inactive. Additionally, SAR for 4x4 MIMO Downlink Carrier Aggregation was not needed since the maximum average output power in 4x4 MIMO Downlink Carrier Aggregation mode was not more than 0.25 dB higher than the maximum output power with 4x4 MIMO Downlink and downlink carrier aggregation inactive.

This device supports LTE/NR capabilities with overlapping transmission frequency ranges. When the supported frequency range of an LTE/NR Band falls completely within an LTE/NR band with a larger

transmission frequency range, both LTE/NR bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both LTE/NR bands share the same transmission path and signal characteristics, SAR was only assessed for the band with the larger transmission frequency range.

This device supports both Power Class 2 (PC2) and Power Class 3 (PC3) for LTE Band 41. Per May 2017 TCB Workshop Notes, SAR tests were performed with Power Class 3 (given the specific UL/DL limitations for Power Class 2). Additionally, SAR testing for the power class 2 condition was evaluated for the highest configuration in Power Class 3 for each test configuration to confirm the results were scalable linearly (See Section 13).

This device supports LTE Carrier Aggregation (CA) for LTE Band 41 and LTE Band 66 with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per 2017 Fall TCB Workshop Notes.

This device can transmit with antenna F for LTE B2/4/7/25/30/38/41/66 and NR Band n2/25/7/30/66, or antenna B for NR Band n38/41. SAR tests for antenna F and antenna B were additionally performed for these LTE and NR bands respectively to ensure compliance.

NR implementation supports SA and NSA mode. In EN-DC mode, NR operates with the LTE Bands shown in the NR FR1 checklist acting as anchor bands. Per FCC guidance, SAR tests for NR Bands and LTE Anchors Bands were performed separately due to limitations in SAR probe calibration factors.

1.9 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01, D05v02r05, D05Av01r02 (2G/3G/4G)
- FCC KDB Publication 447498 D04v01 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- May 2017 TCB Workshop Notes (LTE 4x4 Downlink MIMO, LTE Band 41 Power Class 2/3)

1.10 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units. The serial numbers used for each test are indicated alongside the results in Section 11.

1.11 Bibliography

Report Type	Report Serial Number
RF Exposure Part 0 Test Report	1M2212020130-02.A3L
RF Exposure Part 1 Test Report Original Filing	1M2209010097-24.A3L
RF Exposure Part 2 Test Report Original Filing	1M2209010097-28.A3L

2 LTE AND NR INFORMATION

LTE Information					
Form Factor	Portable Handset				
Frequency Range of each LTE transmission band	LTE Band 71 (665.5 - 695.5 MHz)				
	LTE Band 12 (699.7 - 715.3 MHz)				
	LTE Band 13 (779.5 - 784.5 MHz)				
	LTE Band 14 (790.5 - 795.5 MHz)				
	LTE Band 26 (Cell) (814.7 - 848.3 MHz)				
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)				
	LTE Band 66 (AWS) (1710.7 - 1779.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)				
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)				
	LTE Band 30 (2307.5 - 2312.5 MHz)				
	LTE Band 7 (2502.5 - 2567.5 MHz)				
	LTE Band 41 (2498.5 - 2687.5 MHz)				
	LTE Band 38 (2572.5 - 2617.5 MHz)				
	LTE Band 48 (3552.5 -3697.5 MHz)				
Channel Bandwidths	LTE Band 71: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 13: 5 MHz, 10 MHz				
	LTE Band 14: 5 MHz, 10 MHz				
	LTE Band 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz				
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 66 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 30: 5 MHz, 10 MHz				
	LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 38: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 48: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	Mid-High	High
LTE Band 71: 5 MHz	665.5 (133147)		680.5 (133297)	695.5 (133447)	
LTE Band 71: 10 MHz	668 (133172)		680.5 (133297)	693 (133422)	
LTE Band 71: 15 MHz	670.5 (133197)		680.5 (133297)	690.5 (133397)	
LTE Band 71: 20 MHz	673 (133222)		680.5 (133297)	688 (133372)	
LTE Band 12: 1.4 MHz	699.7 (23017)		707.5 (23095)	715.3 (23173)	
LTE Band 12: 3 MHz	700.5 (23025)		707.5 (23095)	714.5 (23165)	
LTE Band 12: 5 MHz	701.5 (23035)		707.5 (23095)	713.5 (23155)	
LTE Band 12: 10 MHz	704 (23060)		707.5 (23095)	711 (23130)	
LTE Band 13: 5 MHz	779.5 (23205)		782 (23230)	784.5 (23255)	
LTE Band 13: 10 MHz	N/A		782 (23230)	N/A	
LTE Band 14: 5 MHz	790.5 (23305)		793 (23330)	795.5 (23355)	
LTE Band 14: 10 MHz	N/A		793 (23330)	N/A	
LTE Band 26 (Cell): 1.4 MHz	814.7 (26697)		831.5 (26865)	848.3 (27033)	
LTE Band 26 (Cell): 3 MHz	815.5 (26705)		831.5 (26865)	847.5 (27025)	
LTE Band 26 (Cell): 5 MHz	816.5 (26715)		831.5 (26865)	846.5 (27015)	
LTE Band 26 (Cell): 10 MHz	819 (26740)		831.5 (26865)	844 (26990)	
LTE Band 26 (Cell): 15 MHz	821.5 (26765)		831.5 (26865)	841.5 (26965)	
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)		836.5 (20525)	848.3 (20643)	
LTE Band 5 (Cell): 3 MHz	825.5 (20415)		836.5 (20525)	847.5 (20635)	
LTE Band 5 (Cell): 5 MHz	826.5 (20425)		836.5 (20525)	846.5 (20625)	
LTE Band 5 (Cell): 10 MHz	829 (20450)		836.5 (20525)	844 (20600)	
LTE Band 66 (AWS): 1.4 MHz	1710.7 (131979)		1745 (132322)	1779.3 (132665)	
LTE Band 66 (AWS): 3 MHz	1711.5 (131987)		1745 (132322)	1778.5 (132657)	
LTE Band 66 (AWS): 5 MHz	1712.5 (131997)		1745 (132322)	1777.5 (132647)	
LTE Band 66 (AWS): 10 MHz	1715 (132022)		1745 (132322)	1775 (132622)	
LTE Band 66 (AWS): 15 MHz	1717.5 (132047)		1745 (132322)	1772.5 (132597)	
LTE Band 66 (AWS): 20 MHz	1720 (132072)		1745 (132322)	1770 (132572)	
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)		1732.5 (20175)	1754.3 (20393)	
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)		1732.5 (20175)	1753.5 (20385)	
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)		1732.5 (20175)	1752.5 (20375)	
LTE Band 4 (AWS): 10 MHz	1715 (20000)		1732.5 (20175)	1750 (20350)	
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)		1732.5 (20175)	1747.5 (20325)	
LTE Band 4 (AWS): 20 MHz	1720 (20050)		1732.5 (20175)	1745 (20300)	
LTE Band 25 (PCS): 1.4 MHz	1850.7 (26047)		1882.5 (26365)	1914.3 (26683)	
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)		1882.5 (26365)	1913.5 (26675)	
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)		1882.5 (26365)	1912.5 (26665)	
LTE Band 25 (PCS): 10 MHz	1855 (26090)		1882.5 (26365)	1910 (26640)	
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)		1882.5 (26365)	1907.5 (26615)	
LTE Band 25 (PCS): 20 MHz	1860 (26140)		1882.5 (26365)	1905 (26590)	
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)		1880 (18900)	1909.3 (19193)	
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)		1880 (18900)	1908.5 (19185)	
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)		1880 (18900)	1907.5 (19175)	
LTE Band 2 (PCS): 10 MHz	1855 (18650)		1880 (18900)	1905 (19150)	
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)		1880 (18900)	1902.5 (19125)	
LTE Band 2 (PCS): 20 MHz	1860 (18700)		1880 (18900)	1900 (19100)	
LTE Band 30: 5 MHz	2307.5 (27685)		2310 (27710)	2312.5 (27735)	
LTE Band 30: 10 MHz	N/A		2310 (27710)	N/A	
LTE Band 7: 5 MHz	2502.5 (20775)		2535 (21100)	2567.5 (21425)	
LTE Band 7: 10 MHz	2505 (20800)		2535 (21100)	2565 (21400)	
LTE Band 7: 15 MHz	2507.5 (20825)		2405 (21100)	2562.5 (21375)	
LTE Band 7: 20 MHz	2510 (20850)		2535 (21100)	2560 (21350)	
LTE Band 41: 5 MHz	2506 (39750)	2549.5 (40185)	2549.5 (40185)	2593 (40620)	2636.5 (41055)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2549.5 (40185)	2593 (40620)	2636.5 (41055)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2549.5 (40185)	2593 (40620)	2636.5 (41055)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2549.5 (40185)	2593 (40620)	2636.5 (41055)
LTE Band 38: 5 MHz	2572.5 (37775)		2595 (38000)	2617.5 (38225)	
LTE Band 38: 10 MHz	2575 (37800)		2595 (38000)	2615 (38200)	
LTE Band 38: 15 MHz	2577.5 (37825)		2595 (38000)	2612.5 (38175)	
LTE Band 38: 20 MHz	2580 (37850)		2595 (38000)	2610 (38150)	
LTE Band 48: 5 MHz	3552.5 (55265)	3600.8 (55748)	N/A	3649.2 (56232)	3697.5 (56715)
LTE Band 48: 10 MHz	3555 (55290)	3601.7 (55757)	N/A	3648.3 (56223)	3695 (56690)
LTE Band 48: 15 MHz	3557.5 (55315)	3602.5 (55765)	N/A	3647.5 (56215)	3692.5 (56665)
LTE Band 48: 20 MHz	3560 (55340)	3603.3 (55773)	N/A	3646.7 (56207)	3690 (56640)
UE Category	DL UE Cat 20, UL UE Cat 18				
Modulations Supported in UL	QPSK, 16QAM, 64QAM, 256QAM				
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES				
A-MPR (Additional MPR) disabled for SAR Testing?	YES				
LTE Carrier Aggregation Possible Combinations	The technical description includes all the possible carrier aggregation combinations				
LTE Additional Information	This device does not support full CA features on 3GPP Release 16. It supports carrier aggregation, downlink MIMO, LAA features as shown in the RF Conducted Powers section of this report and the Downlink LTE CA RF Conducted Powers Appendix of the Original filing. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. The following LTE Release 16 Features are not supported: Relay, HetNet, Enhanced MIMO, eICIC, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA.				

NR Information						
Form Factor	Portable Handset					
Frequency Range of each NR transmission band	NR Band n71 (665.5 - 695.5 MHz) NR Band n12 (701.5 - 713.5 MHz) NR Band n26 (816.5 - 846.5 MHz) NR Band n5 (826.5 - 846.5 MHz) NR Band n66 (1712.5 - 1777.5 MHz) NR Band n25 (1852.5 - 1912.5 MHz) NR Band n2 (1852.5 - 1907.5 MHz) NR Band n30 (2307.5 - 2312.5 MHz) NR Band n7 (2502.5 - 2567.5 MHz) NR Band n41 (2501.01 - 2685 MHz) NR Band n38 (2575 - 2615 MHz) NR Band n48 (3555 - 3694.98 MHz) NR Band n77 DoD (3455.01 - 3544.98 MHz) NR Band n77 (3705 - 3975 MHz)						
Channel Bandwidths	NR Band n71: 5 MHz, 10 MHz, 15 MHz, 20 MHz NR Band n12: 5 MHz, 10 MHz, 15 MHz NR Band n26: 5 MHz, 10 MHz, 15 MHz, 20 MHz NR Band n5: 5 MHz, 10 MHz, 15 MHz, 20 MHz NR Band n66: 5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz NR Band n25: 5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz NR Band n2: 5 MHz, 10 MHz, 15 MHz, 20 MHz NR Band n30: 5 MHz, 10 MHz NR Band n7: 5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz NR Band n41: 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz NR Band n38: 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz NR Band n48: 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz NR Band n77 DoD: 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz NR Band n77: 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz						
Channel Numbers and Frequencies (MHz)						
NR Band n71: 5 MHz	665.5 (133100)		680.5 (136100)		695.5 (139100)	
NR Band n71: 10 MHz	668 (133600)		680.5 (136100)		693 (138600)	
NR Band n71: 15 MHz	670.5 (134100)		680.5 (136100)		690.5 (138100)	
NR Band n71: 20 MHz	673 (134600)		680.5 (136100)		688 (137600)	
NR Band n12: 5 MHz	701.5 (140300)		707.5 (141500)		713.5 (142700)	
NR Band n12: 10 MHz	704 (140800)		707.5 (141500)		711 (142200)	
NR Band n12: 15 MHz	706.5 (141300)		707.5 (141500)		708.5 (141700)	
NR Band n26: 5 MHz	816.5 (163300)		831.5 (166300)		846.5 (169300)	
NR Band n26: 10 MHz	819 (163800)		831.5 (166300)		844 (168800)	
NR Band n26: 15 MHz	821.5 (164300)		831.5 (166300)		841.5 (168300)	
NR Band n26: 20 MHz	824 (164800)		831.5 (166300)		839 (167800)	
NR Band n5: 5 MHz	826.5 (165300)		836.5 (167300)		846.5 (169300)	
NR Band n5: 10 MHz	829 (165800)		836.5 (167300)		844 (168800)	
NR Band n5: 15 MHz	831.5 (166300)		836.5 (167300)		841.5 (168300)	
NR Band n5: 20 MHz	834 (166800)		836.5 (167300)		839 (167800)	
NR Band n66: 5 MHz	1712.5 (342500)		1745 (349000)		1777.5 (355500)	
NR Band n66: 10 MHz	1715 (343000)		1745 (349000)		1775 (355000)	
NR Band n66: 15 MHz	1717.5 (343500)		1745 (349000)		1772.5 (354500)	
NR Band n66: 20 MHz	1720 (344000)		1745 (349000)		1770 (354000)	
NR Band n66: 25 MHz	1722.5 (344500)		1745 (349000)		1767.5 (353500)	
NR Band n66: 30 MHz	1725 (345000)		1745 (349000)		1765 (353000)	
NR Band n66: 40 MHz	1730 (346000)		1745 (349000)		1760 (352000)	
NR Band n25: 5 MHz	1852.5 (370500)		1882.5 (376500)		1912.5 (382500)	
NR Band n25: 10 MHz	1855 (371000)		1882.5 (376500)		1910 (382000)	
NR Band n25: 15 MHz	1857.5 (371500)		1882.5 (376500)		1907.5 (381500)	
NR Band n25: 20 MHz	1860 (372000)		1882.5 (376500)		1905 (381000)	
NR Band n25: 25 MHz	1862.5 (372500)		1882.5 (376500)		1902.5 (380500)	
NR Band n25: 30 MHz	1865 (373000)		1882.5 (376500)		1900 (380000)	
NR Band n25: 40 MHz	1870 (374000)		1882.5 (376500)		1895 (379000)	
NR Band n2: 5 MHz	1852.5 (370500)		1880 (376000)		1907.5 (381500)	
NR Band n2: 10 MHz	1855 (371000)		1880 (376000)		1905 (381000)	
NR Band n2: 15 MHz	1857.5 (371500)		1880 (376000)		1902.5 (380500)	
NR Band n2: 20 MHz	1860 (372000)		1880 (376000)		1900 (380000)	
NR Band n30: 5 MHz	2307.5 (461500)		2310 (462000)		2312.5 (462500)	
NR Band n30: 10 MHz	N/A		2310 (462000)		N/A	
NR Band n7: 5 MHz	2502.5 (500500)		2535 (507000)		2567.5 (513500)	
NR Band n7: 10 MHz	2505 (501000)		2535 (507000)		2565 (513000)	
NR Band n7: 15 MHz	2507.5 (501500)		2535 (507000)		2562.5 (512500)	
NR Band n7: 20 MHz	2510 (502000)		2535 (507000)		2560 (512000)	
NR Band n7: 25 MHz	2512.5 (502500)		2535 (507000)		2557.5 (511500)	
NR Band n7: 30 MHz	2515 (503000)		2535 (507000)		2555 (511000)	
NR Band n7: 40 MHz	2520 (504000)		2535 (507000)		2550 (510000)	
NR Band n41: 10 MHz	2501.01 (500202)	2547 (509400)	2592.99 (518598)		2639.01 (527802)	2685 (537000)
NR Band n41: 15 MHz	2503.5 (500700)	2548.26 (509652)	2592.99 (518598)		2637.75 (527550)	2682.51 (536502)
NR Band n41: 20 MHz	2506.02 (501204)	2549.49 (509898)	2592.99 (518598)		2636.49 (527298)	2679.99 (535998)
NR Band n41: 30 MHz	2511 (502200)	2552.01 (510402)	2592.99 (518598)		2634 (526800)	2674.98 (534996)
NR Band n41: 40 MHz	2516.01 (503202)	2567.34 (513468)	N/A		2618.67 (523734)	2670 (534000)
NR Band n41: 50 MHz	2521.02 (504204)		2592.99 (518598)		2664.99 (532998)	
NR Band n41: 60 MHz	2526 (505200)		2592.99 (518598)		2659.98 (531996)	
NR Band n41: 70 MHz	2531.01 (506202)		N/A		2655 (531000)	
NR Band n41: 80 MHz	2536.02 (507204)		N/A		2649.99 (529998)	
NR Band n41: 90 MHz	2541 (508200)		N/A		2644.98 (528996)	
NR Band n41: 100 MHz	2546.01 (509202)		2592.99 (518598)		2640 (528000)	
NR Band n38: 10 MHz	2575 (515000)		2595 (519000)		2615 (523000)	
NR Band n38: 15 MHz	2577.5 (515500)		2595 (519000)		2612.5 (522500)	
NR Band n38: 20 MHz	2580 (516000)		2595 (519000)		2610 (522000)	
NR Band n38: 30 MHz	2585 (517000)		2595 (519000)		2605 (521000)	
NR Band n38: 40 MHz	2590 (518000)		2595 (519000)		2600 (520000)	
NR Band n48: 10 MHz	3555 (637000)	3601.68 (640112)	N/A		3648.33 (643222)	3694.98 (646332)
NR Band n48: 15 MHz	3557.52 (637168)	3602.49 (640166)	N/A		3647.49 (643166)	3692.49 (646166)
NR Band n48: 20 MHz	3560.01 (637334)	3603.33 (640222)	N/A		3646.68 (643112)	3690 (646000)
NR Band n48: 30 MHz	3565.02 (637668)	3605.01 (640334)	N/A		3645 (643000)	3684.99 (645666)
NR Band n48: 40 MHz	3570 (638000)	N/A	3624.99 (641666)		N/A	3679.98 (645332)
NR Band n77 DoD: 10 MHz	3455.01 (630334)		3500.01 (633334)		3544.98 (636332)	
NR Band n77 DoD: 15 MHz	3457.5 (630500)		3500.01 (633334)		3542.49 (636166)	
NR Band n77 DoD: 20 MHz	3460.02 (630668)		3500.01 (633334)		3540 (636000)	
NR Band n77 DoD: 25 MHz	3462.51 (630834)		3500.01 (633334)		3537.48 (635832)	
NR Band n77 DoD: 30 MHz	3465 (631000)		3500.01 (633334)		3534.99 (635666)	
NR Band n77 DoD: 40 MHz	3470.01 (631334)		N/A		3470.01 (631334)	
NR Band n77 DoD: 50 MHz	3475.02 (631668)		N/A		3475.02 (631668)	
NR Band n77 DoD: 60 MHz	N/A		3500.01(633334)		N/A	
NR Band n77 DoD: 70 MHz	N/A		3500.01(633334)		N/A	
NR Band n77 DoD: 80 MHz	N/A		3500.01(633334)		N/A	
NR Band n77 DoD: 90 MHz	N/A		3500.01(633334)		N/A	
NR Band n77 DoD: 100 MHz	N/A		3500.01(633334)		N/A	
NR Band n77: 10 MHz	3705 (647000)	3759 (650600)	3813 (654200)	3867 (657800)	3921 (661400)	3975 (665000)
NR Band n77: 15 MHz	3707.52 (647168)	3760.5 (650700)	3813.51 (654234)	3866.49 (657766)	3919.5 (661300)	3972.48 (664832)
NR Band n77: 20 MHz	3710.01 (647334)	3762 (650800)	3813.99 (654266)	3866.01 (657734)	3918 (661200)	3969.99 (664666)
NR Band n77: 25 MHz	3712.5 (647500)	3763.5 (650900)	3814.5 (654300)	3865.5 (657700)	3916.5 (661100)	3967.5 (664500)
NR Band n77: 30 MHz	3715.02 (647668)	3765 (651000)	3815.01 (654334)	3864.99 (657666)	3915 (661000)	3964.98 (664332)
NR Band n77: 40 MHz	3720 (648000)	3768 (651200)	3816 (654400)	3864 (657600)	3912 (660800)	3960 (664000)
NR Band n77: 50 MHz	3725.01 (648334)	3782.49 (652166)	3840 (656000)		3897.51 (659834)	3954.99 (663666)
NR Band n77: 60 MHz	3730.02 (648668)	3803.34 (653556)	N/A	N/A	3876.66 (659444)	3949.98 (663332)
NR Band n77: 70 MHz	3735 (649000)	3804.99 (653666)	N/A		3875.01 (658334)	3945 (663000)
NR Band n77: 80 MHz	3740.01 (649334)	N/A	3840 (656000)		N/A	3939.99 (662666)
NR Band n77: 90 MHz	3745.02 (649668)	N/A	3840 (656000)		N/A	3934.98 (662332)
NR Band n77: 100 MHz	3750 (650000)	N/A	N/A	N/A	N/A	3930 (662000)
SCS for NR Band n71/n12/n26/n5/n66/n25/n2/n30/n7	15 kHz					
SCS for NR Band n41/n38/n48/n77	30 kHz					
Modulations Supported in UL	DFT-s-OFDM: π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-OFDM: QPSK, 16QAM, 64QAM, 256QAM					
A-MPR (Additional MPR) disabled for SAR Testing?	YES					
EN-DC Carrier Aggregation Possible Combinations	The technical description includes all the possible carrier aggregation combinations					
LTE Anchor Bands for NR Band n71	LTE Band 2/48/66					
LTE Anchor Bands for NR Band n12	LTE Band 2/48/66					
LTE Anchor Bands for NR Band n26	N/A					
LTE Anchor Bands for NR Band n5	LTE Band 2/30/48/66					
LTE Anchor Bands for NR Band n66	LTE Band 2/5/12/13/14/30/48					
LTE Anchor Bands for NR Band n25	LTE Band 12/66					
LTE Anchor Bands for NR Band n2	LTE Band 4/5/12/13/14/30/48/66					
LTE Anchor Bands for NR Band n30	LTE Band 2/5/12/14/66					
LTE Anchor Bands for NR Band n7	N/A					
LTE Anchor Bands for NR Band n41	LTE Band 2/25/66					
LTE Anchor Bands for NR Band n38	N/A					
LTE Anchor Bands for NR Band n48	LTE Band 2/66					
LTE Anchor Bands for NR Band n77	LTE Band 2/5/12/13/14/30/66/71					

3 INTRODUCTION

The FCC and Innovation, Science, and Economic Development Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [22]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

3.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 3-1).

Equation 3-1
SAR Mathematical Equation

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{\rho dv}\right)$$

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \frac{\sigma \cdot E^2}{\rho}$$

where:

σ = conductivity of the tissue-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/m^3)
E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

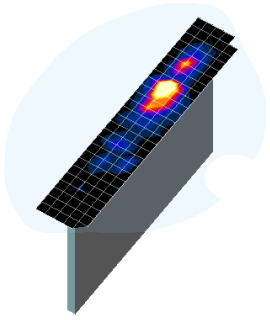

Figure 4-1
Sample SAR Area Scan

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).

   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.

   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

Table 4-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*

Frequency	Maximum Area Scan Resolution (mm) (Δx_{area}, Δy_{area})	Maximum Zoom Scan Resolution (mm) (Δx_{zoom}, Δy_{zoom})	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
			$\Delta z_{zoom}(n)$	$\Delta z_{zoom}(1)$*	$\Delta z_{zoom}(n>1)$*	
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≤ 4	≤ 1.5*Δz_{zoom}(n-1)	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5*Δz_{zoom}(n-1)	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5*Δz_{zoom}(n-1)	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5*Δz_{zoom}(n-1)	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5*Δz_{zoom}(n-1)	≥ 22

*Also compliant to IEEE 1528-2013 Table 6

5 DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

Figure 5-2 shows the front, back and side views of the SAM Twin Phantom. The point "M" is the reference point for the center of the mouth, "LE" is the left ear reference point (ERP), and "RE" is the right ERP. The ERP is 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 5-1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front), also called the Reference Pivoting Line, is not perpendicular to the reference plane (see Figure 5-1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].

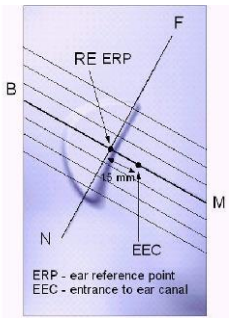

Figure 5-1
Close-Up Side view of ERP

5.2 HANDSET REFERENCE POINTS

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the acoustic output located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Figure 5-3). The acoustic output was than located at the same level as the center of the ear reference point. The test device was positioned so that the "vertical centerline" was bisecting the front surface of the handset at its top and bottom edges, positioning the "ear reference point" on the outer surface of the both the left and right head phantoms on the ear reference point.

Figure 5-2
Front, back and side view of SAM Twin Phantom

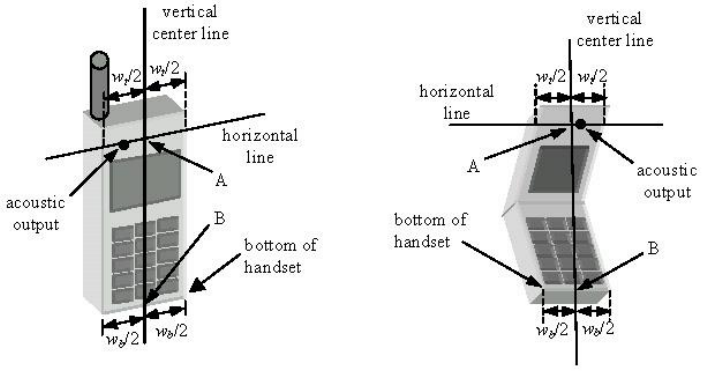

Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

6 TEST CONFIGURATION POSITIONS

6.1 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02.

6.2 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-4). Per FCC KDB Publication 648474 D04v01r03, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D04v01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

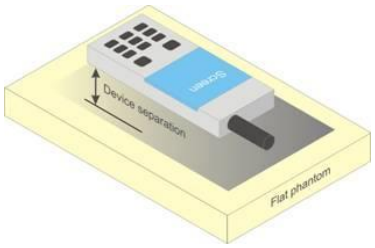

Figure 6-1
Sample Body-Worn Diagram

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.
Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented.
Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

6.3 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1g body and 10g extremity SAR Exclusion Thresholds found in KDB Publication 447498 D04v01 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D04v01, Cell phones (handsets) are not normally designed to be used on extremities or operated in extremity only exposure conditions. The maximum output power levels of handsets generally do not require extremity SAR testing to show compliance. Therefore, extremity SAR was not evaluated for this device.

7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

7.2 Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 7-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (W/kg) or (mW/g)
Peak Spatial Average SAR Head	1.6	8.0
Whole Body SAR	0.08	0.4
Peak Spatial Average SAR Hands, Feet, Ankle, Wrists, etc.	4.0	20

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

8 FCC MEASUREMENT PROCEDURES

Power measurements for licensed transmitters are performed using a base station simulator under digital average power.

8.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D04v01, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

8.2 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03r01, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is ≤ 0.25 dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is ≤ 1.2 W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

8.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03r01 “3G SAR Measurement Procedures.”

The device is placed into a simulated call using a base station simulator in a RF shielded chamber. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. Devices under test are evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device is tested throughout the SAR test at maximum output power, the SAR measurement system measures a “point SAR” at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. If the power drift deviates by more than 5%, the SAR test and drift measurements are repeated.

8.4 SAR Measurement Conditions for UMTS

8.4.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC with TPC (transmit power control) set to all “1s” or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

8.4.2 Head SAR Measurements

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure.

8.4.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all "1s". The 3G SAR test reduction procedure is applied to other spreading codes and multiple $DPDCH_n$ configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or $DPDCH_n$, for the highest reported SAR configuration in 12.2 kbps RMC.

8.4.4 SAR Measurements with Rel 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest reported SAR configuration in 12.2 kbps RMC without HSDPA. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

8.4.5 SAR Measurements with Rel 6 HSUPA

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA.

When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing.

8.4.6 SAR Measurement Conditions for DC-HSDPA

SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

8.5 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r04 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

8.5.1 Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

8.5.2 MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

8.5.3 A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
    i. The required channel and offset combination with the highest maximum output power is required for SAR.
    ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
    iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to ½ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is <1.45 W/kg.

8.5.5 TDD

LTE TDD testing is performed using the SAR test guidance provided in FCC KDB 941225 D05v02r04. TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05v02r04. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211 Section 4.

8.5.6 Downlink Only Carrier Aggregation

Conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink

carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band. Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for downlink only carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

9 RF CONDUCTED POWERS

All conducted power measurements for Sub6 WWAN technologies and bands in this section were performed by setting *Reserve_power_margin* (Qualcomm® Smart Transmit EFS entry) to 0dB, so that the EUT transmits continuously at minimum (P_{limit}, maximum tune up output power P_{max}).

9.1 GSM Conducted Powers

Table 9-1
Measured P_{limit} for DSI = 0 (Body-worn or Phablet)

Maximum Burst-Averaged Output Power										
		Voice	*GPRS/EDGE Data (GMSK)*				*EDGE Data (8-PSK)*			
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**	**EDGE [dBm] 3 Tx Slot**	**EDGE [dBm] 4 Tx Slot**
GSM 1900	512	26.56	26.83	23.27	21.46	**20.32**	24.60	23.39	21.17	20.22
	661	26.09	26.55	23.43	21.81	**20.26**	24.67	23.17	21.11	20.06
	810	26.47	26.76	23.66	21.79	**20.64**	24.91	23.21	21.32	20.14

Calculated Maximum Frame-Averaged Output Power										
		Voice	*GPRS/EDGE Data (GMSK)*				*EDGE Data (8-PSK)*			
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**	**EDGE [dBm] 3 Tx Slot**	**EDGE [dBm] 4 Tx Slot**
GSM 1900	512	17.36	17.63	17.08	17.03	**17.14**	15.40	17.20	16.74	17.04
	661	16.89	17.35	17.24	17.38	**17.08**	15.47	16.98	16.68	16.88
	810	17.27	17.56	17.47	17.36	**17.46**	15.71	17.02	16.89	16.96
GSM 1900	**Frame Avg.Targets:**	17.80	17.80	17.81	17.77	**17.82**	16.80	17.81	17.57	17.82

Note:

1. Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
2. GPRS/EDGE (GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.
3. EDGE (8-PSK) output powers were measured with MCS7 on the base station simulator. MCS7 coding scheme was used to measure the output powers for EDGE since investigation has shown that choosing MCS7 coding scheme will ensure 8-PSK modulation. It has been shown that MCS levels that produce 8-PSK modulation do not have an impact on output power.

GSM Class: B
GPRS Multislot class: 33 (Max 4 Tx uplink slots)
EDGE Multislot class: 33 (Max 4 Tx uplink slots)
DTM Multislot Class: N/A

Figure 9-1
Power Measurement Setup

9.2 UMTS Conducted Powers

Table 9-2
Measured P_{limit} for DSI = 0 (Body-worn or Phablet)

3GPP Release Version	Mode	3GPP 34.121 Subtest	AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			1312	1412	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	19.80	19.74	19.82	20.17	20.10	20.18	-
99		12.2 kbps AMR	19.79	19.72	19.80	20.14	20.08	20.07	-
6	HSDPA	Subtest 1	18.73	18.77	18.96	19.87	19.75	19.86	0
6		Subtest 2	18.75	18.76	18.97	19.72	19.70	19.82	0
6		Subtest 3	18.23	18.27	18.44	19.33	19.17	19.29	0.5
6		Subtest 4	18.21	18.25	18.45	19.33	19.16	19.30	0.5
6	HSUPA	Subtest 1	18.75	18.77	18.92	19.84	19.72	19.82	0
6		Subtest 2	16.77	16.76	16.97	17.80	17.71	17.80	2
6		Subtest 3	17.77	17.79	17.96	18.82	18.67	18.79	1
6		Subtest 4	16.76	16.80	17.00	17.84	17.71	17.82	2
6		Subtest 5	18.81	18.81	19.02	19.84	19.70	19.82	0
8	DC-HSDPA	Subtest 1	18.80	18.78	19.01	19.88	19.72	19.80	0
8		Subtest 2	18.76	18.79	19.00	19.84	19.68	19.79	0
8		Subtest 3	18.25	18.26	18.49	19.32	19.18	19.28	0.5
8		Subtest 4	18.26	18.24	18.50	19.34	19.21	19.34	0.5

DC-HSDPA considerations

- 3GPP Specification 34.121-1 Release 8 Ver 8.10.0 was used for DC-HSDPA guidance
- H-Set 12 (QPSK) was confirmed to be used during DC-HSDPA measurements
- The DUT supports UE category 24 for HSDPA

It is expected by the manufacturer that MPR for some HSPA subtests may be up to 2 dB more than specified by 3GPP, but also as low as 0 dB according to the chipset implementation in this model.

Figure 9-2
Power Measurement Setup

9.3 LTE Conducted Powers

Note: Per FCC KDB Publication 941225 D05v02r05, LTE SAR for the lower bandwidths was not required for testing since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg. Lower bandwidth conducted powers for all LTE bands can be found in LTE and NR Lower Bandwidth RF Conducted Powers Appendix of the original filing.

Note: Some bands do not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

LTE Carrier Aggregation Notes:

1. This device supports uplink carrier aggregation for LTE CA_66B, LTE CA_66C, and LTE CA_41C with a maximum of two component carriers. For intraband contiguous carrier aggregation scenarios, 3GPP 36.101 Table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when non-contiguous RB allocation is implemented. The conducted powers and MPR settings in this device are permanently implemented per the above 3GPP requirements.
2. Per FCC Guidance, the output power with uplink CA active was measured for the configuration with the highest reported SAR with single carrier for each exposure condition. The power was measured with wideband signal integration over both component carriers.

9.3.1 LTE Band 66 Antenna A

Table 9-3
LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 0 (Body-worn or Phablet) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	18.30	**18.81**	18.64	0	0
	1	50	18.37	18.75	18.58		0
	1	99	18.61	18.78	18.58		0
	50	0	18.55	18.75	18.64	0-1	0
	50	25	18.64	18.74	18.67		0
	50	50	18.72	**18.76**	18.46		0
	100	0	18.67	18.75	18.64		0
16QAM	1	0	18.78	19.07	18.98	0-1	0
	1	50	18.90	18.93	18.85		0
	1	99	18.98	18.94	18.93		0
	50	0	18.48	18.80	18.67	0-2	0
	50	25	18.63	18.79	18.64		0
	50	50	18.69	18.75	18.49		0
	100	0	18.62	18.79	18.60		0
64QAM	1	0	18.77	19.05	19.16	0-2	0
	1	50	18.82	18.93	18.82		0
	1	99	19.08	18.98	18.74		0
	50	0	18.53	18.78	18.68	0-3	0
	50	25	18.67	18.80	18.64		0
	50	50	18.61	18.80	18.47		0
	100	0	18.62	18.77	18.59		0
256QAM	1	0	18.25	18.56	18.57	0-5	0.5
	1	50	18.69	18.53	18.37		0.5
	1	99	18.78	18.62	18.22		0.5
	50	0	18.01	18.27	18.18		0.5
	50	25	18.13	18.26	18.16		0.5
	50	50	18.18	18.25	18.01		0.5
	100	0	18.13	18.25	18.10		0.5

Table 9-4
LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 0 (Body-worn or Phablet) - 10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132022 (1715.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132622 (1775.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	18.78	18.86	18.65	0	0
	1	25	18.73	18.90	18.66		0
	1	49	18.76	18.84	18.60		0
	25	0	18.60	18.88	18.69	0-1	0
	25	12	18.73	18.90	18.71		0
	25	25	18.72	18.88	18.57		0
	50	0	18.69	18.86	18.70		0
16QAM	1	0	18.94	19.04	19.08	0-1	0
	1	25	18.93	19.16	19.11		0
	1	49	18.95	19.05	19.12		0
	25	0	18.67	18.94	18.75	0-2	0
	25	12	18.75	18.98	18.74		0
	25	25	18.72	18.91	18.66		0
	50	0	18.70	18.91	18.73		0
64QAM	1	0	18.81	19.03	19.20	0-2	0
	1	25	18.96	19.27	19.18		0
	1	49	19.15	19.22	19.06		0
	25	0	18.54	18.95	18.69	0-3	0
	25	12	18.71	18.98	18.70		0
	25	25	18.73	18.91	18.60		0
	50	0	18.67	18.89	18.69		0
256QAM	1	0	18.49	18.75	18.63	0-5	0.5
	1	25	18.49	18.64	18.63		0.5
	1	49	18.45	18.64	18.56		0.5
	25	0	18.13	18.44	18.22		0.5
	25	12	18.21	18.41	18.24		0.5
	25	25	18.20	18.43	18.12		0.5
	50	0	18.18	18.41	18.19		0.5

Table 9-5
LTE Band 66 (AWS) Antenna A Uplink Carrier Aggregation Measured P_{Limit} for DSI = 0 (Body-worn or Phablet)

	PCC									SCC									Power	
Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	PCC DL Channel	PCC DL Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	SCC (DL) Channel	SCC (DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	LTE Tx.Power with UL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_66C	LTE B66	20	132322	1745.0	66786	2145.0	QPSK	50	50	LTE B66	20	132520	1764.8	66984	2164.8	QPSK	50	0	18.82	18.76
CA_66B	LTE B66	10	132322	1745.0	66786	2145.0	QPSK	25	25	LTE B66	10	132421	1754.9	66885	2154.9	QPSK	25	0	18.91	18.88

9.3.2 LTE Band 25 Antenna A

Table 9-6
LTE Band 25 (PCS) Antenna A Measured P_{Limit} for DSI = 0 (Body-worn or Phablet) - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26140 (1860.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26590 (1905.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.40	19.23	19.26	0	0
	1	50	**19.47**	19.02	19.44		0
	1	99	19.32	19.01	19.20		0
	50	0	19.48	19.27	19.24	0-1	0
	50	25	**19.50**	19.37	19.30		0
	50	50	19.46	19.33	19.27		0
	100	0	19.46	19.33	19.30		0
16QAM	1	0	19.47	19.48	19.31	0-1	0
	1	50	19.62	19.57	19.22		0
	1	99	19.52	19.23	19.32		0
	50	0	19.50	19.26	19.28	0-2	0
	50	25	19.47	19.33	19.36		0
	50	50	19.45	19.31	19.28		0
	100	0	19.47	19.33	19.33		0
64QAM	1	0	19.57	19.36	19.36	0-2	0
	1	50	19.47	19.24	19.45		0
	1	99	19.50	19.34	19.14		0
	50	0	19.47	19.26	19.27	0-3	0
	50	25	19.49	19.34	19.30		0
	50	50	19.47	19.28	19.29		0
	100	0	19.48	19.33	19.32		0
256QAM	1	0	18.29	18.33	18.22	0-5	1.5
	1	50	18.25	18.23	18.24		1.5
	1	99	18.41	18.40	18.37		1.5
	50	0	18.33	18.18	18.14		1.5
	50	25	18.37	18.23	18.23		1.5
	50	50	18.39	18.22	18.21		1.5
	100	0	18.33	18.19	18.24		1.5

9.3.3 LTE Band 30 Antenna A

Table 9-7
LTE Band 30 Antenna A Measured P_{Limit} for DSI = 0 (Body-worn or Phablet), or DSI = 3 (Hotspot mode) - 10 MHz Bandwidth

LTE Band 30 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 27710 (2310.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**18.89**	0	0
	1	25	18.82		0
	1	49	18.88		0
	25	0	18.80	0-1	0
	25	12	18.82		0
	25	25	**18.91**		0
	50	0	18.87		0
16QAM	1	0	19.00	0-1	0
	1	25	19.07		0
	1	49	19.09		0
	25	0	18.78	0-2	0
	25	12	18.81		0
	25	25	18.91		0
	50	0	18.93		0
64QAM	1	0	18.96	0-2	0
	1	25	19.14		0
	1	49	19.09		0
	25	0	18.79	0-3	0
	25	12	18.86		0
	25	25	18.90		0
	50	0	18.89		0
256QAM	1	0	17.42	0-5	1.5
	1	25	17.62		1.5
	1	49	17.68		1.5
	25	0	17.37		1.5
	25	12	17.44		1.5
	25	25	17.54		1.5
	50	0	17.53		1.5

9.3.4 LTE Band 7 Antenna B

Table 9-8
LTE Band 7 Antenna B Measured P_{Limit} for DSI = 0 (Body-worn or Phablet), or DSI = 3 (Hotspot mode) - 20 MHz Bandwidth

LTE Band 7 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20850 (2510.0 MHz)	Mid Channel 21100 (2535.0 MHz)	High Channel 21350 (2560.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	18.59	18.55	18.52	0	0
	1	50	**18.75**	18.74	18.57		0
	1	99	18.38	18.70	18.47		0
	50	0	18.47	18.56	18.42	0-1	0
	50	25	**18.58**	18.52	18.53		0
	50	50	18.54	18.55	18.53		0
	100	0	18.57	18.54	18.53		0
16QAM	1	0	18.70	18.93	18.95	0-1	0
	1	50	19.24	18.76	18.89		0
	1	99	18.95	19.11	18.82		0
	50	0	18.47	18.57	18.39	0-2	0
	50	25	18.59	18.53	18.53		0
	50	50	18.57	18.59	18.53		0
	100	0	18.60	18.51	18.45		0
64QAM	1	0	18.45	18.53	18.68	0-2	0
	1	50	18.72	18.51	19.04		0
	1	99	18.75	18.54	18.47		0
	50	0	18.46	18.57	18.42	0-3	0
	50	25	18.56	18.54	18.52		0
	50	50	18.58	18.58	18.49		0
	100	0	18.57	18.50	18.52		0
256QAM	1	0	18.06	18.13	18.37	0-5	1
	1	50	18.18	18.26	18.28		1
	1	99	18.29	18.43	18.26		1
	50	0	17.97	18.10	17.94		1
	50	25	18.09	18.01	18.06		1
	50	50	18.11	18.03	18.06		1
	100	0	18.08	18.07	18.03		1

9.3.5 LTE Band 41 Antenna B

Table 9-9
LTE Band 41 PC3 Antenna B Measured P_{Limit} for DSI = 0 (Body-worn or Phablet) - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel 39750 (2506.0 MHz)	Low-Mid Channel 40185 (2549.5 MHz)	Mid Channel 40620 (2593.0 MHz)	Mid-High Channel 41055 (2636.5 MHz)	High Channel 41490 (2680.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]						
QPSK	1	0	20.01	19.98	19.99	19.96	19.92	0	0
	1	50	20.09	20.05	20.01	19.94	19.98		0
	1	99	19.96	20.00	**20.16**	20.00	19.93		0
	50	0	20.12	19.97	20.04	20.04	19.98	0-1	0
	50	25	20.14	20.07	20.16	20.14	20.07		0
	50	50	20.17	20.04	**20.19**	20.11	20.06		0
	100	0	20.15	20.07	20.15	20.10	20.06		0
16QAM	1	0	20.06	19.90	20.04	20.06	19.91	0-1	0
	1	50	20.10	20.06	20.19	19.96	19.96		0
	1	99	20.00	19.92	20.25	20.06	19.95		0
	50	0	20.13	19.98	20.04	20.03	20.00	0-2	0
	50	25	20.20	20.08	20.17	20.15	20.11		0
	50	50	20.19	20.06	20.18	20.12	20.09		0
	100	0	20.18	20.06	20.17	20.10	20.08		0
64QAM	1	0	20.21	19.98	20.13	20.05	19.97	0-2	0
	1	50	20.17	19.99	20.13	20.17	20.02		0
	1	99	20.13	19.92	20.27	20.21	20.09		0
	50	0	20.11	20.00	20.06	20.08	19.99	0-3	0
	50	25	20.22	20.10	20.16	20.16	20.11		0
	50	50	20.18	20.06	20.15	20.16	20.08		0
	100	0	20.22	20.11	20.16	20.17	20.08		0
256QAM	1	0	18.89	18.78	18.79	18.92	18.80	0-5	1
	1	50	18.92	18.75	18.92	18.90	18.75		1
	1	99	18.91	18.82	19.04	18.96	18.75		1
	50	0	18.93	18.77	18.89	18.88	18.77		1
	50	25	19.02	18.91	18.94	18.98	18.88		1
	50	50	19.01	18.88	18.97	18.95	18.86		1
	100	0	19.00	18.89	18.93	18.96	18.86		1

Table 9-10
LTE Band 41 PC2 Antenna B Measured P_{Limit} for DSI = 0 (Body-worn or Phablet) - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	21.83	21.71	21.84	21.72	21.81	0	0
	1	50	21.81	21.68	21.87	21.70	21.71		0
	1	99	21.79	21.72	21.96	21.79	21.83		0
	50	0	21.88	21.73	21.76	21.74	21.71	0-1	0
	50	25	21.97	21.80	21.87	21.84	21.84		0
	50	50	21.93	21.81	21.87	21.83	21.83		0
	100	0	21.95	21.80	21.86	21.83	21.82		0

Table 9-11
LTE Band 41 PC2 Antenna B Uplink Carrier Aggregation Measured P_{Limit} for DSI = 0 (Body-worn or Phablet) - 20 MHz Bandwidth

	PCC							SCC							Power	
Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL/DL) Channel	PCC (UL/DL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL/DL) Channel	SCC (UL/DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	LTE Tx.Power with UL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41C	LTE B41	20	40620	2593.0	QPSK	1	99	LTE B41	20	40818	2612.8	QPSK	1	0	20.08	20.16

Table 9-12
LTE Band 41 PC2 Antenna B Uplink Carrier Aggregation Measured P_{Limit} for DSI = 0 (Body-worn or Phablet) - 20 MHz Bandwidth

	PCC							SCC							Power	
Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL/DL) Channel	PCC (UL/DL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL/DL) Channel	SCC (UL/DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	LTE Tx.Power with UL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41C	LTE B41 PC2	20	40620	2593.0	QPSK	1	99	LTE B41 PC2	20	40818	2612.8	QPSK	1	0	21.70	21.96

Figure 9-3
Power Measurement Setup

9.4 NR Conducted Powers

Per October 2020 TCB Workshop Guidance, NR FR1 SAR evaluations are being generally based on adapting the existing LTE SAR procedures (FCC KDB Publication 941225 D05v02r05). Therefore, NR SAR for the lower bandwidths was not required for testing based on the measured output power and the reported NR SAR for the highest bandwidth. Lower bandwidth conducted powers for all NR bands can be found in LTE and NR Lower Bandwidth RF Conducted Powers Appendix of the original filing.

Note: Some bands do not support non-overlapping channels. Per FCC Guidance, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

9.4.1 NR Band n66 Antenna A

Table 9-13
NR Band n66 Antenna A Measured P_{Limit} for DSI = 0 (Body-worn or Phablet) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	349000 (1745 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	19.00	0	0.0
	1	108	18.99		0.0
	1	214	18.75		0.0
	108	0	18.99	0-0.5	0.0
	108	54	18.97	0	0.0
	108	108	18.98	0-0.5	0.0
	216	0	18.96		0.0
DFT-s-OFDM QPSK	1	1	18.85	0	0.0
	1	108	**19.02**		0.0
	1	214	18.68		0.0
	108	0	18.96	0-1	0.0
	108	54	**19.01**	0	0.0
	108	108	19.00	0-1	0.0
	216	0	19.00		0.0
DFT-s-OFDM 16QAM	1	1	19.29	0-1	0.0
CP-OFDM QPSK	1	1	18.97	0-1.5	0.0

9.4.2 NR Band n25 Antenna A

Table 9-14
NR Band n25 Antenna A Measured P_{Limit} for DSI = 0 (Body-worn or Phablet) - 40 MHz Bandwidth

NR Band n25 40 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	376500 (1882.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	19.41	0	0.0
	1	108	19.39		0.0
	1	214	19.28		0.0
	108	0	19.44	0-0.5	0.0
	108	54	19.50	0	0.0
	108	108	19.46	0-0.5	0.0
	216	0	19.50		0.0
DFT-s-OFDM QPSK	1	1	19.25	0	0.0
	1	108	**19.41**		0.0
	1	214	19.17		0.0
	108	0	19.43	0-1	0.0
	108	54	**19.54**	0	0.0
	108	108	19.47	0-1	0.0
	216	0	19.40		0.0
DFT-s-OFDM 16QAM	1	1	19.65	0-1	0.0
CP-OFDM QPSK	1	1	19.36	0-1.5	0.0

9.4.3 NR Band n30 Antenna A

Table 9-15
NR Band n30 Antenna A Measured P_{Limit} for DSI = 0 (Body-worn or Phablet), or DSI = 3 (Hotspot mode) - 10 MHz Bandwidth

NR Band n30 10 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	462000 (2310 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	18.51	0	0.0
	1	26	18.54		0.0
	1	50	18.58		0.0
	25	0	18.60	0-0.5	0.0
	25	14	18.59	0	0.0
	25	27	18.57	0-0.5	0.0
	50	0	18.57		0.0
DFT-s-OFDM QPSK	1	1	18.36	0	0.0
	1	26	18.42		0.0
	1	50	**18.53**		0.0
	25	0	18.56	0-1	0.0
	25	14	**18.59**	0	0.0
	25	27	18.54	0-1	0.0
	50	0	18.46		0.0
DFT-s-OFDM 16QAM	1	1	18.79	0-1	0.0
CP-OFDM QPSK	1	1	18.41	0-1.5	0.0

9.4.4 NR Band n7 Antenna B

Table 9-16
NR Band n7 Antenna B Measured P_{Limit} for DSI = 0 (Body-worn or Phablet), or DSI = 3 (Hotspot mode) - 40 MHz Bandwidth

NR Band n7 40 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	507000 (2535 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	18.57	0	0.0
	1	108	18.51		0.0
	1	214	18.35		0.0
	108	0	18.59	0-0.5	0.0
	108	54	18.46	0	0.0
	108	108	18.48	0-0.5	0.0
	216	0	18.49		0.0
DFT-s-OFDM QPSK	1	1	18.43	0	0.0
	1	108	**18.47**		0.0
	1	214	18.24		0.0
	108	0	**18.58**	0-1	0.0
	108	54	18.43	0	0.0
	108	108	18.46	0-1	0.0
	216	0	18.45		0.0
DFT-s-OFDM 16QAM	1	1	18.85	0-1	0.0
CP-OFDM QPSK	1	1	18.51	0-1.5	0.0

Figure 9-4
Power Measurement Setup – NR FDD

10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Body Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
12/08/2022	1750 Body	20.4	1710	1.495	51.158	1.463	53.537	2.19%	-4.44%
			1720	1.506	51.112	1.469	53.511	2.52%	-4.48%
			1745	1.537	51.014	1.485	53.445	3.50%	-4.55%
			1750	1.543	50.995	1.488	53.432	3.70%	-4.56%
			1770	1.566	50.921	1.501	53.379	4.33%	-4.60%
			1790	1.589	50.838	1.514	53.326	4.95%	-4.67%
12/11/2022	1750 Body	20.3	1710	1.436	53.369	1.463	53.537	-1.85%	-0.31%
			1720	1.443	53.348	1.469	53.511	-1.77%	-0.30%
			1745	1.461	53.303	1.485	53.445	-1.62%	-0.27%
			1750	1.465	53.292	1.488	53.432	-1.55%	-0.26%
			1770	1.480	53.264	1.501	53.379	-1.40%	-0.22%
			1790	1.494	53.240	1.514	53.326	-1.32%	-0.16%
12/12/2022	1900 Body	20.8	1850	1.446	53.930	1.520	53.300	-4.87%	1.18%
			1860	1.456	53.904	1.520	53.300	-4.21%	1.13%
			1880	1.477	53.844	1.520	53.300	-2.83%	1.02%
			1900	1.498	53.777	1.520	53.300	-1.45%	0.89%
			1905	1.504	53.760	1.520	53.300	-1.05%	0.86%
			1910	1.511	53.744	1.520	53.300	-0.59%	0.83%
12/13/2022	1900 Body	23.8	1850	1.488	52.080	1.520	53.300	-2.11%	-2.29%
			1860	1.498	52.053	1.520	53.300	-1.45%	-2.34%
			1880	1.518	51.990	1.520	53.300	-0.13%	-2.46%
			1900	1.540	51.925	1.520	53.300	1.32%	-2.58%
			1905	1.546	51.910	1.520	53.300	1.71%	-2.61%
			1910	1.552	51.891	1.520	53.300	2.11%	-2.64%
12/13/2022	2450 Body	21.1	2300	1.801	51.896	1.809	52.900	-0.44%	-1.90%
			2310	1.814	51.874	1.816	52.887	-0.11%	-1.92%
			2320	1.826	51.846	1.826	52.873	0.00%	-1.94%
			2400	1.929	51.537	1.902	52.767	1.42%	-2.33%
			2450	1.996	51.391	1.950	52.700	2.36%	-2.48%
			2480	2.034	51.257	1.993	52.662	2.06%	-2.67%
			2500	2.063	51.184	2.021	52.636	2.08%	-2.76%
			2510	2.078	51.154	2.035	52.623	2.11%	-2.79%
			2535	2.116	51.081	2.071	52.592	2.17%	-2.87%
			2550	2.137	51.034	2.092	52.573	2.15%	-2.93%
			2560	2.149	50.994	2.106	52.560	2.04%	-2.98%
			2600	2.201	50.815	2.163	52.509	1.76%	-3.23%
			2650	2.278	50.641	2.234	52.445	1.97%	-3.44%
			2680	2.318	50.523	2.277	52.407	1.80%	-3.59%
			2700	2.342	50.434	2.305	52.382	1.61%	-3.72%
12/13/2022	2450 Body	20.1	2300	1.881	51.234	1.809	52.900	3.98%	-3.15%
			2310	1.890	51.220	1.816	52.887	4.07%	-3.15%
			2320	1.898	51.208	1.826	52.873	3.94%	-3.15%
			2400	1.966	51.093	1.902	52.767	3.36%	-3.17%
			2450	2.009	51.034	1.950	52.700	3.03%	-3.16%
			2480	2.035	50.997	1.993	52.662	2.11%	-3.16%
			2500	2.052	50.974	2.021	52.636	1.53%	-3.16%
			2510	2.062	50.960	2.035	52.623	1.33%	-3.16%
			2535	2.087	50.920	2.071	52.592	0.77%	-3.18%
			2550	2.102	50.900	2.092	52.573	0.48%	-3.18%
			2560	2.112	50.887	2.106	52.560	0.28%	-3.18%
			2600	2.149	50.831	2.163	52.509	-0.65%	-3.20%
			2650	2.197	50.733	2.234	52.445	-1.66%	-3.26%
			2680	2.227	50.688	2.277	52.407	-2.20%	-3.28%
			2700	2.246	50.658	2.305	52.382	-2.56%	-3.29%
12/14/2022	2450 Body	22.8	2300	1.765	55.351	1.809	52.900	-2.43%	4.63%
			2310	1.779	55.325	1.816	52.887	-2.04%	4.61%
			2320	1.792	55.295	1.826	52.873	-1.86%	4.58%
			2400	1.898	55.024	1.902	52.767	-0.21%	4.28%
			2450	1.966	54.867	1.950	52.700	0.82%	4.11%
			2480	2.006	54.747	1.993	52.662	0.65%	3.96%
			2500	2.033	54.678	2.021	52.636	0.59%	3.88%
			2510	2.048	54.649	2.035	52.623	0.64%	3.85%
			2535	2.083	54.575	2.071	52.592	0.58%	3.77%
			2550	2.104	54.524	2.092	52.573	0.57%	3.71%
			2560	2.119	54.488	2.106	52.560	0.62%	3.67%
			2600	2.174	54.336	2.163	52.509	0.51%	3.48%
			2650	2.245	54.165	2.234	52.445	0.49%	3.28%
			2680	2.288	54.066	2.277	52.407	0.48%	3.17%
			2700	2.314	53.997	2.305	52.382	0.39%	3.08%

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2. The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

10.2 Test System Verification

Prior to SAR assessment, the system is verified to ±10% of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. Full system validation status and result summary can be found in SAR System Validation Appendix.

Table 10-2
System Verification Results – Body

System Verification TARGET & MEASURED																
SAR System	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp. (C)	Liquid Temp. (C)	Input Power (W)	Source SN	Probe SN	Measured SAR 1g (W/kg)	1W Target SAR 1g (W/kg)	1W Normalized SAR 1g (W/kg)	Deviation 1g (%)	Measured SAR 10g (W/kg)	1W Target SAR 10g (W/kg)	1W Normalized SAR 10g (W/kg)	Deviation 10g (%)
C	1750	BODY	12/08/2022	23.1	20.4	0.10	1150	7406	3.940	37.800	39.400	4.23%	2.080	20.000	20.800	4.00%
L	1750	BODY	12/11/2022	22.9	20.4	0.10	1148	7410	3.940	37.100	39.400	6.20%	2.090	19.600	20.900	6.63%
S	1900	BODY	12/12/2022	20.0	22.5	0.10	5d148	7488	3.900	39.900	39.000	-2.26%	2.000	20.900	20.000	-4.31%
J	1900	BODY	12/13/2022	22.5	21.8	0.10	5d080	7570	3.950	40.700	39.500	-2.95%	2.050	21.300	20.500	-3.76%
P	2300	BODY	12/14/2022	20.7	21.3	0.10	1073	7409	4.800	48.100	48.000	-0.21%	2.270	23.600	22.700	-3.81%
G	2450	BODY	12/13/2022	23.8	20.1	0.10	719	7527	5.070	52.000	50.700	-2.50%	2.280	24.700	22.800	-7.69%
G	2600	BODY	12/13/2022	23.8	20.1	0.10	1064	7527	5.320	54.600	53.200	-2.56%	2.280	24.400	22.800	-6.56%
L	2600	BODY	12/13/2022	20.9	20.1	0.10	1004	7410	5.460	55.400	54.600	-1.44%	2.420	24.800	24.200	-2.42%

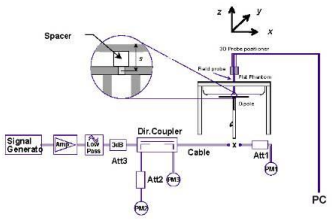

Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

11 SAR DATA SUMMARY

11.1 Standalone Body-Worn SAR Data

Table 11-1
GSM Body-Worn SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Side	Spacing	Mode	Service	Antenna Config.	Device Serial Number	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1850.20	512	back	15 mm	GSM 1900	GSM	A	0942M	28.0	26.56	-0.04	1:8.3	0.095	1.393	0.132	A1
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-2
UMTS Body-Worn SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Side	Spacing	Mode	Service	Antenna Config.	Tune State	Device Serial Number	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
1752.60	1513	back	15 mm	UMTS 1750	RMC	A	141	0942M	20.5	19.82	-0.02	1:1	0.361	1.169	0.422	A2
1907.60	9538	back	15 mm	UMTS 1900	RMC	A	48	0942M	21.5	20.18	0.00	1:1	0.302	1.355	0.409	A3
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-3
LTE Body-Worn SAR

MEASUREMENT RESULTS																								
# CC Uplink, Power Class	Component Carrier	FREQUENCY			Side	Spacing	Mode	Antenna Config.	Tune State	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
		MHz	Ch.																	(W/kg)		(W/kg)	
1 CC Uplink	N/A	1745.00	132322	Mid	back	15 mm	LTE Band 66 (AWS)	A	141	0942M	20	QPSK	1	0	20.0	18.81	0	-0.01	1:1	0.282	1.315	0.371	
1 CC Uplink	N/A	1745.00	132322	Mid	back	15 mm	LTE Band 66 (AWS)	A	141	0942M	20	QPSK	50	50	20.0	18.76	0	-0.01	1:1	0.294	1.330	0.391	
1 CC Uplink	N/A	1745.00	132322	Mid	back	15 mm	LTE Band 66 (AWS)	A	141	0942M	10	QPSK	25	25	20.0	18.88	0	0.00	1:1	0.301	1.294	0.389	A4
2 CC Uplink CA_66C	PCC	1745.00	132322	Mid	back	15 mm	LTE Band 66 (AWS)	A	141	0942M	20	QPSK	50	50	20.0	18.82	0	-0.01	1:1	0.287	1.312	0.377	
	SCC	1764.80	132520											0									
2 CC Uplink CA_66B	PCC	1745.00	132322	Mid	back	15 mm	LTE Band 66 (AWS)	A	141	0942M	10	QPSK	25	25	20.0	18.91	0	-0.01	1:1	0.290	1.285	0.373	
	SCC	1754.90	132421											0									
1 CC Uplink	N/A	1860.00	26140	Low	back	15 mm	LTE Band 25 (PCS)	A	141	0942M	20	QPSK	1	50	21.0	19.47	0	-0.12	1:1	0.254	1.422	0.361	A5
1 CC Uplink	N/A	1860.00	26140	Low	back	15 mm	LTE Band 25 (PCS)	A	141	0942M	20	QPSK	50	25	21.0	19.50	0	-0.01	1:1	0.253	1.413	0.357	
1 CC Uplink	N/A	2310.00	27710	Mid	back	15 mm	LTE Band 30	A	N/A	0973M	10	QPSK	1	0	20.0	18.89	0	-0.03	1:1	0.115	1.291	0.148	A6
1 CC Uplink	N/A	2310.00	27710	Mid	back	15 mm	LTE Band 30	A	N/A	0973M	10	QPSK	25	25	20.0	18.91	0	0.05	1:1	0.113	1.285	0.145	
1 CC Uplink	N/A	2510.00	20850	Low	back	15 mm	LTE Band 7	B	N/A	0957M	20	QPSK	1	50	20.0	18.75	0	-0.02	1:1	0.113	1.334	0.151	A7
1 CC Uplink	N/A	2510.00	20850	Low	back	15 mm	LTE Band 7	B	N/A	0957M	20	QPSK	50	25	20.0	18.58	0	-0.03	1:1	0.112	1.387	0.155	
1 CC Uplink - Power Class 3	N/A	2593.00	40620	Mid	back	15 mm	LTE Band 41	B	N/A	0957M	20	QPSK	1	99	21.0	20.16	0	0.10	1:1.58	0.075	1.213	0.091	A8
1 CC Uplink - Power Class 3	N/A	2593.00	40620	Mid	back	15 mm	LTE Band 41	B	N/A	0957M	20	QPSK	50	50	21.0	20.19	0	0.02	1:1.58	0.072	1.205	0.087	
1 CC Uplink - Power Class 2	N/A	2593.00	40620	Mid	back	15 mm	LTE Band 41	B	N/A	0957M	20	QPSK	1	99	22.6	21.96	0	0.03	1:2.31	0.070	1.159	0.081	
2 CC Uplink - Power Class 3	PCC	2593.00	40620	Mid	back	15 mm	LTE Band 41	B	N/A	0957M	20	QPSK	1	99	21.0	20.08	0	-0.11	1:1.58	0.075	1.236	0.093	
	SCC	2612.80	40818											0									
2 CC Uplink - Power Class 2	PCC	2593.00	40620	Mid	back	15 mm	LTE Band 41	B	N/A	0957M	20	QPSK	1	99	22.6	21.70	0	0.04	1:2.31	0.068	1.230	0.084	
	SCC	2612.80	40818											0									
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population															Body 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-4
NR Body-Worn SAR

MEASUREMENT RESULTS																						
FREQUENCY			Side	Spacing	Mode	Antenna Config	Tune State	Serial Number	Bandwidth [MHz]	Waveform	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																		(W/kg)		(W/kg)	
1745.00	349000	Md	back	15 mm	NR Band n66	A	141	0973M	40	DFT-S-OFDM	QPSK	1	108	20.0	19.02	0	0.02	1:1	0.349	1.253	0.437	
1745.00	349000	Md	back	15 mm	NR Band n66	A	81	0973M	40	DFT-S-OFDM	QPSK	108	54	20.0	19.01	0	0.01	1:1	0.343	1.256	0.431	
1745.00	349000	Md	back	15 mm	NR Band n66	A	81	0973M	40	CP-OFDM	QPSK	1	1	20.0	18.97	0	-0.02	1:1	0.349	1.268	0.443	A9
1882.50	376500	Md	back	15 mm	NR Band n25	A	48	0973M	40	DFT-S-OFDM	QPSK	1	108	21.0	19.41	0	-0.04	1:1	0.217	1.442	0.313	
1882.50	376500	Md	back	15 mm	NR Band n25	A	48	0973M	40	DFT-S-OFDM	QPSK	108	54	21.0	19.54	0	0.03	1:1	0.225	1.400	0.315	
1882.50	376500	Md	back	15 mm	NR Band n25	A	48	0973M	40	CP-OFDM	QPSK	1	1	21.0	19.36	0	0.04	1:1	0.241	1.459	0.352	A10
2310.00	462000	Md	back	15 mm	NR Band n30	A	N/A	0957M	10	DFT-S-OFDM	QPSK	1	50	20.0	18.53	0	0.01	1:1	0.133	1.403	0.187	
2310.00	462000	Md	back	15 mm	NR Band n30	A	N/A	0957M	10	DFT-S-OFDM	QPSK	25	14	20.0	18.59	0	-0.01	1:1	0.140	1.384	0.194	
2310.00	462000	Md	back	15 mm	NR Band n30	A	N/A	0957M	10	CP-OFDM	QPSK	1	1	20.0	18.41	0	0.09	1:1	0.140	1.442	0.202	A11
2535.00	507000	Md	back	15 mm	NR Band n7	B	N/A	0973M	40	DFT-S-OFDM	QPSK	1	108	20.0	18.47	0	0.04	1:1	0.130	1.422	0.185	A12
2535.00	507000	Md	back	15 mm	NR Band n7	B	N/A	0973M	40	DFT-S-OFDM	QPSK	108	0	20.0	18.58	0	0.02	1:1	0.128	1.387	0.178	
2535.00	507000	Md	back	15 mm	NR Band n7	B	N/A	0973M	40	CP-OFDM	QPSK	1	1	20.0	18.51	0	0.02	1:1	0.127	1.409	0.179	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population												Body 1.6 W/kg (mW/g) averaged over 1 gram										

11.2 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D04v01.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04v01.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 15 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
8. Per FCC KDB 865664 D01v01r04, variability SAR tests were not required since measured SAR for all frequency bands were less than 0.8 W/kg.
9. This device supports dynamic antenna tuning for some bands. Per FCC Guidance, SAR was measured according to the normally required SAR measurement configurations with tuner active. The auto-tune state determined by the device was verified before and after each SAR measurement and is listed in tables above. Please see Section 13 of the original filing for supplemental data.
10. Unless otherwise noted, when 10g SAR measurement is considered, a factor of 2.5 is applied to the 1g thresholds for the equivalent test cases.
11. This device uses Qualcomm Smart Transmit for WWAN operations to control and manage transmitting power in real time to ensure RF Exposure compliance. Per FCC Guidance, compliance for was assessed at the minimum of the time averaged power and the maximum output power for each band/mode/exposure condition (DSI).

GSM Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. Justification for reduced test configurations per KDB Publication 941225 D01v03r01 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. Per FCC KDB Publication 447498 D04v01, if the reported (scaled) SAR measured at the highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g evaluations then testing at the other channels is not required for such test configuration(s).

UMTS Notes:

1. UMTS mode was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03r01. AMR and HSPA SAR was not required per the 3G Test Reduction Procedure in KDB Publication 941225 D01v03r01.
2. Per FCC KDB Publication 447498 D04v01, if the reported (scaled) SAR measured at the highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g evaluations then testing at the other channels is not required for such test configuration(s).

LTE Notes:

1. LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 8.5.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 and MCC=001 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC KDB Publication 447498 D04v01, when the reported 1g SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg for LTE B41, testing at the other channels was required for such test configurations.
5. TDD LTE was tested per the guidance provided in FCC KDB Publication 941225 D05v02r04. Testing was performed using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using extended cyclic prefix only and special subframe configuration 6. SAR tests were performed at maximum output power and worst-case transmission duty factor in extended cyclic prefix. Per 3GPP 36.211 Section 4, the duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633.
6. Per KDB Publication 941225 D05Av01r02, SAR for downlink only LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive.
7. This device supports Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operations is 43.3 % using UL-DL configuration 1. Per FCC Guidance, all SAR tests were performed using Power Class 3. SAR with power class 2 at the available duty factor was additionally performed for the power class 3 configuration with the highest SAR configuration for each exposure conditions. Please see Section 13 for linearity results.
8. For LTE Band 66 and LTE Band 41, per FCC guidance, SAR was first measured with only a single carrier active in the uplink (carrier aggregation not active). For each exposure condition, the uplink CA scenario with two component carriers was additionally tested for the configuration with the highest SAR when carrier aggregation was not active. The SCC was configured with the closest available contiguous channel. The two component carriers were configured so the resource blocks are physically allocated side by side to achieve the maximum output power.

9. This device supports LTE Band 41 ULCA active with Power Class 2. Highest SAR test configuration for each exposure condition in Power Class 3 with ULCA active was repeated with Power Class 2 with ULCA active.

NR Notes:

1. NR implementation supports SA and NSA mode. In EN-DC mode, NR operates with the LTE Bands shown in the NR FR1 checklist acting as anchor bands. Per FCC guidance, SAR tests for NR Bands and LTE Anchors Bands were performed separately due to limitations in SAR probe calibration factors.
2. Simultaneous transmission analysis for EN-DC operations is addressed in the Part 2 Test Report in the original filing (Serial Number can be found in the bibliography).
3. This device additionally supports some EN-DC conditions where additional LTE carriers are added on the downlink only.
4. Per FCC Guidance, NR modulations and RB Sizes/Offsets were selected for testing such that configurations with the highest output power were evaluated for SAR tests.

12 SAR MEASUREMENT VARIABILITY

12.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, variability SAR tests were not required since measured SAR results for all frequency bands were less than 0.8 W/kg.

12.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for 1g and <3.75 W/kg for 10g for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

13 ADDITIONAL TESTING PER FCC GUIDANCE

13.1 LTE Band 41 Power Class 2 and Power Class 3 Linearity

This device supports Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operations is 43.3 % using UL-DL configuration 1. Per May 2017 TCB Workshop Notes based on the device behavior, all SAR tests were performed using Power Class 3. SAR with Power Class 2 at the highest power and available duty factor was additionally performed for the Power Class 3 configuration with the highest SAR for each exposure condition.
The linearity between the Power Class 2 and Power Class 3 SAR results and the respective frame averaged powers was calculated to determine that the results were linear. When
ULCA is active, the linearity between the Power Class 2 with ULCA active and Power Class 3 with ULCA active SAR results and the respective frame averaged powers was calculated to determine that the results were linear. Per May 2017 TCB Workshop, no additional SAR measurements were required since the linearity between power classes was < 10% and all reported SAR values were < 1.4 W/kg for 1g and < 3.5 W/kg for 10g.

Table 13-1
LTE Band 41 Antenna B Body-Worn Linearity Data

	LTE Band 41 PC3	LTE Band 41 PC2
Maximum Allowed Output Power (dBm)	21.00	22.60
Measured Output Power (dBm)	20.16	21.96
Measured SAR (W/kg)	0.075	0.070
Measured Power (mW)	103.75	157.06
Duty Cycle	63.3%	43.3%
Frame Averaged Output Power (mW)	65.68	68.01
% deviation from expected linearity		-9.87%

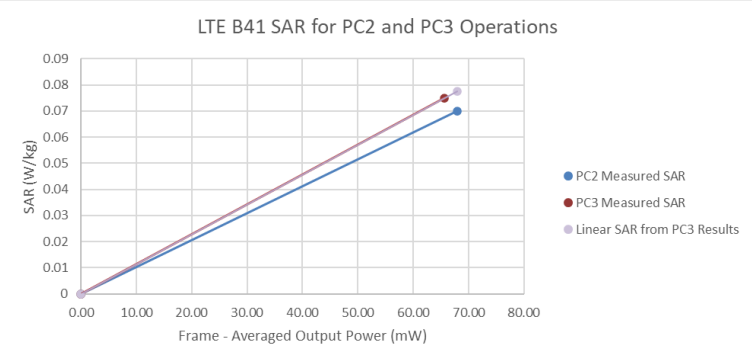

Figure 13-1
LTE Band 41 Antenna B Body-Worn Linearity

Table 13-2
LTE Band 41 Antenna B ULCA Body-Worn Linearity Data

	LTE Band 41 PC3	LTE Band 41 PC2
Maximum Allowed Output Power (dBm)	21.00	22.60
Measured Output Power (dBm)	20.08	21.70
Measured SAR (W/kg)	0.075	0.068
Measured Power (mW)	101.86	147.91
Duty Cycle	63.3%	43.3%
Frame Averaged Output Power (mW)	64.48	64.05
% deviation from expected linearity		-8.72%

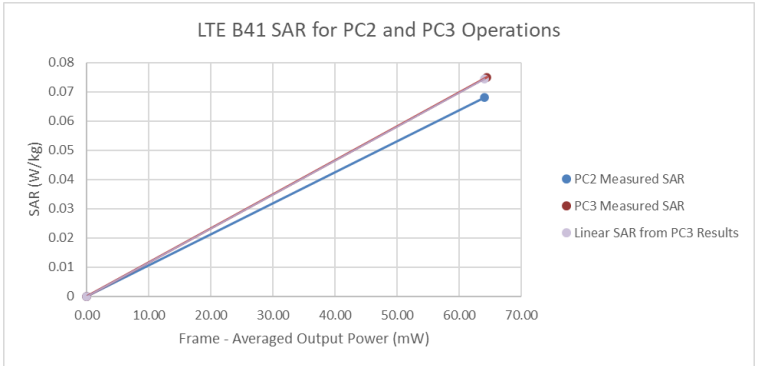

Figure 13-2
LTE Band 41 Antenna B ULCA Body-Worn Linearity

14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4404B	Spectrum Analyzer	N/A	N/A	N/A	MY45113242
Agilent	E4438C	ESG Vector Signal Generator	5/10/2022	Annual	5/10/2023	MY42082659
Agilent	E4438C	ESG Vector Signal Generator	3/24/2022	Annual	3/24/2023	MY45093678
Agilent	N5182A	MXG Vector Signal Generator	7/20/2022	Annual	7/20/2023	MY47420800
Agilent	N5182A	MXG Vector Signal Generator	1/12/2022	Annual	1/12/2023	MY47420837
Agilent	8753ES	S-Parameter Vector Network Analyzer	2/11/2022	Annual	2/11/2023	MY40003841
Agilent	8753ES	S-Parameter Vector Network Analyzer	12/17/2021	Annual	12/17/2022	MY40000670
Agilent	E5515C	Wireless Communications Test Set	5/12/2022	Annual	5/12/2023	GB43304278
Agilent	E5515C	Wireless Communications Test Set	5/4/2021	Biennial	5/4/2023	GB41450275
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433972
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433974
Anritsu	MA2411B	Pulse Power Sensor	10/21/2022	Annual	10/21/2023	1207364
Anritsu	MA2411B	Pulse Power Sensor	3/28/2022	Annual	3/28/2023	1339007
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	6/27/2022	Annual	6/27/2023	6261895213
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	5/11/2022	Annual	5/11/2023	6262044715
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	5/24/2022	Annual	5/24/2023	6201144418
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	3/31/2022	Annual	3/31/2023	6201664756
Anritsu	MT8000A	Radio Communication Test Station	9/29/2022	Annual	9/29/2023	6272337438
Anritsu	MT8000A	Radio Communication Test Station	3/30/2022	Annual	3/30/2023	6261914237
Anritsu	MT8000A	Radio Communication Test Station	8/3/2022	Annual	8/3/2023	6272337405
Anritsu	MA24106A	USB Power Sensor	10/21/2022	Annual	10/21/2023	1231538
Anritsu	MA24106A	USB Power Sensor	4/22/2022	Annual	4/22/2023	1520504
Anritsu	MA24106A	USB Power Sensor	3/28/2022	Annual	3/28/2023	1520503
Control Company	4352	Long Stem Thermometer	9/10/2021	Biennial	9/10/2023	210774678
Control Company	4352	Long Stem Thermometer	9/10/2021	Biennial	9/10/2023	210774685
Control Company	4040	Therm./ Clock/ Humidity Monitor	3/12/20221	Biennial	3/12/2023	210202100
Control Company	4040	Therm./ Clock/ Humidity Monitor	1/21/2022	Annual	1/21/2023	160574418
Mitutoyo	500-196-30	CD-6"ASX 6Inch Digital Caliper	2/16/2022	Triennial	2/16/2025	A20238413
Keysight Technologies	N6705B	DC Power Analyzer	5/5/2021	Triennial	5/5/2024	MY53004059
Keysight Technologies	N9020A	MXA Signal Analyzer	3/4/2022	Annual	3/4/2023	US46470561
Keysight Technologies	N9020A	MXA Signal Analyzer	4/14/2022	Annual	4/14/2023	MY48010233
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	VLF-6000+	Low Pass Filter DC to 6000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	ZUDC10-83-S+	Directional Coupler	CBT	N/A	CBT	2050
Huber + Suhner	74Z-0-0-21	Torque Wrench	4/6/2022	Biennial	4/6/2024	83881
Pasternack	PE5011-1	Torque Wrench	12/21/2021	Biennial	12/21/2023	82475
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	8/25/2022	Annual	8/25/2023	140148
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	4/14/2022	Annual	4/14/2023	167284
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	8/26/2022	Annual	8/26/2023	166818
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	8/25/2022	Annual	8/25/2023	140144
SPEAG	DAK-3.5	Dielectric Assessment Kit	1/6/2022	Annual	1/6/2023	1278
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	7/5/2022	Annual	7/5/2023	1039
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1379
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1237
SPEAG	D1750V2	1750 MHz SAR Dipole	1/18/2022	Annual	1/18/2023	1148
SPEAG	D1750V2	1750 MHz SAR Dipole	10/22/2021	Biennial	10/22/2023	1150
SPEAG	D1900V2	1900 MHz SAR Dipole	2/21/2022	Annual	2/21/2023	5d148
SPEAG	D1900V2	1900 MHz SAR Dipole	8/8/2022	Annual	8/8/2023	5d080
SPEAG	D2300V2	2300 MHz SAR Dipole	8/25/2022	Annual	8/25/2023	1073
SPEAG	D2450V2	2450 MHz SAR Dipole	8/18/2021	Biennial	8/18/2023	719
SPEAG	D2600V2	2600 MHz SAR Dipole	4/14/2021	Biennial	4/14/2023	1004
SPEAG	D2600V2	2600 MHz SAR Dipole	6/13/2022	Annual	6/13/2023	1064
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/16/2022	Annual	3/16/2023	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/14/2022	Annual	6/14/2023	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/23/2022	Annual	2/23/2023	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/18/2022	Annual	7/18/2023	1583
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/18/2022	Annual	7/18/2023	1677
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/14/2022	Annual	1/14/2023	1558
SPEAG	EX3DV4	SAR Probe	3/21/2022	Annual	3/21/2023	7527
SPEAG	EX3DV4	SAR Probe	6/16/2022	Annual	6/16/2023	7409
SPEAG	EX3DV4	SAR Probe	2/21/2022	Annual	2/21/2023	7488
SPEAG	EX3DV4	SAR Probe	7/19/2022	Annual	7/19/2023	7410
SPEAG	EX3DV4	SAR Probe	7/18/2022	Annual	7/18/2023	7406
SPEAG	EX3DV4	SAR Probe	1/19/2022	Annual	1/19/2023	7570

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.
Note: All equipment was used solely within its respective calibration period.

15 MEASUREMENT UNCERTAINTIES

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c_i 1gm	c_i 10 gms	1gm u_i (± %)	10gms u_i (± %)	v_i
Measurement System									
Probe Calibration	E.2.1	7	N	1	1	1	7.0	7.0	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	0.7	0.7	0.9	0.9	∞
Boundary Effect	E.2.3	2	R	1.732	1	1	1.2	1.2	∞
Linearity	E.2.4	0.3	N	1	1	1	0.3	0.3	∞
System Detection Limits	E.2.4	0.25	R	1.732	1	1	0.1	0.1	∞
Modulation Response	E.2.5	4.8	R	1.732	1	1	2.8	2.8	∞
Readout Electronics	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	R	1.732	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.732	1	1	0.5	0.5	∞
Probe Positioning w/ respect to Phantom	E.6.3	6.7	R	1.732	1	1	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	4	R	1.732	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning	E.4.2	3.12	N	1	1	1	3.1	3.1	35
Device Holder Uncertainty	E.4.1	1.67	N	1	1	1	1.7	1.7	5
Output Power Variation - SAR drift measurement	E.2.9	5	R	1.732	1	1	2.9	2.9	∞
SAR Scaling	E.6.5	0	R	1.732	1	1	0.0	0.0	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	7.6	R	1.73	1.0	1.0	4.4	4.4	∞
Liquid Conductivity - measurement uncertainty	E.3.3	4.3	N	1	0.78	0.71	3.3	3.0	76
Liquid Permittivity - measurement uncertainty	E.3.3	4.2	N	1	0.23	0.26	1.0	1.1	75
Liquid Conductivity - Temperature Uncertainty	E.3.4	3.4	R	1.732	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Unceritainty	E.3.4	0.6	R	1.732	0.23	0.26	0.1	0.1	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Combined Standard Uncertainty (k=1)			RSS				12.2	12.0	191
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.4	24.0	

The above measurement uncertainties are according to IEEE Std. 1528-2013

16 CONCLUSION

16.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Innovation, Science, and Economic Development Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

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