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SAR EVALUATION REPORT

Applicant Name:
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Gyeonggi-do, 16677, Korea

Date of Testing:
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Test Site/Location:
PCTEST Lab, Columbia, MD, USA
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FCC ID: **A3LSMS908JPN**

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

DUT Type: Portable Handset
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model(s): SC-52C, SCG14

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1g Head (W/kg)	1g Body-Worn (W/kg)	1g Hotspot (W/kg)	10g Phablet (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.14	0.18	0.30	N/A
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	< 0.1	0.43	0.93	1.22
PCE	UMTS 850	826.40 - 846.60 MHz	0.17	0.19	0.40	N/A
PCE	LTE Band 12	699.7 - 715.3 MHz	0.12	0.17	0.29	N/A
PCE	LTE Band 13	779.5 - 784.5 MHz	0.22	0.24	0.42	N/A
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.18	0.24	0.52	N/A
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.12	0.67	1.04	1.19
PCE	LTE Band 41	2498.5 - 2687.5 MHz	< 0.1	0.32	0.34	1.36
DTS	2.4 GHz WLAN	2412 - 2472 MHz	0.33	0.19	0.52	N/A
NII	U-NII-1	5180 - 5240 MHz	N/A	N/A	N/A	N/A
NII	U-NII-2A	5260 - 5320 MHz	0.12*	0.27*	N/A	1.71*
NII	U-NII-2C	5500 - 5720 MHz	0.21*	0.32*	N/A	1.11*
NII	U-NII-3	5745 - 5825 MHz	0.33*	0.22*	0.34*	N/A
NII	U-NII-4	5845 - 5885 MHz	0.29*	0.16*	N/A	0.98*
DSS/DTS	Bluetooth	2402 - 2480 MHz	0.19	< 0.1	0.18	N/A
Simultaneous SAR per KDB 690783 D01v01r03:			1.01	1.11	1.23	2.93

* Note: * SAR values represent RF exposure during MIMO operations.

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.

Randy Ortanez
President

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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
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 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 - 6525 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

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. For this device, all US Operations are limited to peak exposure mode only.

Note that WLAN operations are not enabled with Smart Transmit.

In Peak Exposure mode, the output power of the device is limited to the lower of the Pmax and the Plimit for each characterized technology and band (see RT Exposure Part 0 Test Report, report SN could be found in Section 1.11 – Bibliography).

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 Max	Phablet Reduced	Head	Hotspot	Earjack	Maximum Tune-Up Output Power*
Averaging Volume		1g	10g	10g	1g	1g	10g	
Spacing		15 mm	12, 8, 6, 0 mm	0 mm	0 mm	10 mm	0 mm	
DSI		0	0	1	2	3	4	
Technology/Band	Antenna							Pmax
GSM 850	A	31.4		28.9	32.3	28.9	28.9	25.3
GSM 1900	A	24.5		17.8	33.8	17.8	17.8	22.1
UMTS 850	A	30.2		27.3	31.7	27.3	27.3	23.0
LTE Band 12	A	31.3		26.8	32.7	26.8	26.8	23.0
LTE Band 13	A	30.1		26.5	30.6	26.5	26.5	23.0
LTE Band 5 (Cell)	A	29.0		26.6	31.5	26.3	26.6	23.0
LTE Band 4 (AWS)	A	25.7		19.0	33.2	19.0	19.0	23.0
LTE Band 41 (PC3)	B	25.9		18.0	39.1	18.0	18.0	22.0

*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 2G/3G/4G 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 D01v06.

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 used an independent fixed level power reduction mechanism for WLAN/BT during all voice or VoIP held to ear scenarios. 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 D01v06.

1.4.1 2G/3G/4G 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	33.0	33.0	32.5	30.5	28.5	27.5	26.0	24.0	23.0
	Nominal	32.0	32.0	31.5	29.5	27.5	26.5	25.0	23.0	22.0
DSI = 0 (Body-Worn or Phablet Max)	Max Allowed	33.0	33.0	32.5	30.5	28.5	27.5	26.0	24.0	23.0
	Nominal	32.0	32.0	31.5	29.5	27.5	26.5	25.0	23.0	22.0
DSI = 1 (Phablet Reduced)	Max Allowed	33.0	33.0	32.5	30.5	28.5	27.5	26.0	24.0	23.0
	Nominal	32.0	32.0	31.5	29.5	27.5	26.5	25.0	23.0	22.0
DSI = 2 (Head)	Max Allowed	33.0	33.0	32.5	30.5	28.5	27.5	26.0	24.0	23.0
	Nominal	32.0	32.0	31.5	29.5	27.5	26.5	25.0	23.0	22.0
DSI = 3 (Hotspot)	Max Allowed	N/A	33.0	32.5	30.5	28.5	27.5	26.0	24.0	23.0
	Nominal	N/A	32.0	31.5	29.5	27.5	26.5	25.0	23.0	22.0
DSI = 4 (Earjack)	Max Allowed	33.0	33.0	32.5	30.5	28.5	27.5	26.0	24.0	23.0
	Nominal	32.0	32.0	31.5	29.5	27.5	26.5	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	30.0	30.0	29.0	27.5	25.5	26.5	25.0	23.0	22.0
	Nominal	29.0	29.0	28.0	26.5	24.5	25.5	24.0	22.0	21.0
DSI = 0 (Body-Worn or Phablet Max)	Max Allowed	30.0	30.0	29.0	27.5	25.5	26.5	25.0	23.0	22.0
	Nominal	29.0	29.0	28.0	26.5	24.5	25.5	24.0	22.0	21.0
DSI = 1 (Phablet Reduced)	Max Allowed	28.0	28.0	25.0	23.2	22.0	26.5	25.0	23.0	22.0
	Nominal	27.0	27.0	24.0	22.2	21.0	25.5	24.0	22.0	21.0
DSI = 2 (Head)	Max Allowed	30.0	30.0	29.0	27.5	25.5	26.5	25.0	23.0	22.0
	Nominal	29.0	29.0	28.0	26.5	24.5	25.5	24.0	22.0	21.0
DSI = 3 (Hotspot)	Max Allowed	N/A	28.0	25.0	23.2	22.0	26.5	25.0	23.0	22.0
	Nominal	N/A	27.0	24.0	22.2	21.0	25.5	24.0	22.0	21.0
DSI = 4 (Earjack)	Max Allowed	28.0	28.0	25.0	23.2	22.0	26.5	25.0	23.0	22.0
	Nominal	27.0	27.0	24.0	22.2	21.0	25.5	24.0	22.0	21.0

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
Pmax	Max Allowed Power	24.0	23.0	23.0
	Nominal	23.0	22.0	22.0
DSI = 0 (Body-Worn or Phablet Max)	Max Allowed Power	24.0	23.0	23.0
	Nominal	23.0	22.0	22.0
DSI = 1 (Phablet Reduced)	Max Allowed Power	24.0	23.0	23.0
	Nominal	23.0	22.0	22.0
DSI = 2 (Head)	Max Allowed Power	24.0	23.0	23.0
	Nominal	23.0	22.0	22.0
DSI = 3 (Hotspot)	Max Allowed Power	24.0	23.0	23.0
	Nominal	23.0	22.0	22.0
DSI = 4 (Earjack)	Max Allowed Power	24.0	23.0	23.0
	Nominal	23.0	22.0	22.0

Mode / Band	Antenna		Modulated Average Output Power (in dBm)					
			Pmax	DSI =0 (Body-Worn or Phablet Max)	DSI =1 (Phablet Reduced)	DSI =2 (Head)	DSI =3 (Hotspot)	DSI =4 (Earjack)
LTE Band 12	A	Max Allowed Power	24.0	24.0	24.0	24.0	24.0	24.0
		Nominal	23.0	23.0	23.0	23.0	23.0	23.0
LTE Band 13	A	Max Allowed Power	24.0	24.0	24.0	24.0	24.0	24.0
		Nominal	23.0	23.0	23.0	23.0	23.0	23.0
LTE Band 5 (Cell)	A	Max Allowed Power	24.0	24.0	24.0	24.0	24.0	24.0
		Nominal	23.0	23.0	23.0	23.0	23.0	23.0
LTE Band 4 (AWS)	A	Max Allowed Power	24.0	24.0	20.0	24.0	20.0	20.0
		Nominal	23.0	23.0	19.0	23.0	19.0	19.0
LTE Band 41 (PC3)	B	Max Allowed Power	25.0	25.0	21.0	25.0	21.0	21.0
		Nominal	24.0	24.0	20.0	24.0	20.0	20.0

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

1.4.2 2.4 GHz Maximum SISO/MIMO WLAN Output Power

Note: Targets for 802.11ax RU operations can be found in Appendix J

Mode	Band	IEEE 802.11 (in dBm)							
		SISO		MIMO					
		Antenna 1 & Antenna 2							
		b		g (CDD + STBC)		n (CDD + STBC, SDM)		ax (SU) (CDD + STBC, SDM)	
		Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
2.4 GHz WIFI	2.45 GHz	19.5 Ch. 12: 5.0 Ch. 13: -1.0	20.5 Ch. 12: 6.0 Ch. 13: 0.0	20.5 Ch. 1: 18.5 Ch. 11: 18.5 Ch. 12: 8.0 Ch. 13: 2.0	21.5 Ch. 1: 19.5 Ch. 11: 19.5 Ch. 12: 9.0 Ch. 13: 3.0	20.5 Ch. 1: 18.5 Ch. 11: 18.5 Ch. 12: 8.0 Ch. 13: 2.0	21.5 Ch. 1: 19.5 Ch. 11: 19.5 Ch. 12: 9.0 Ch. 13: 3.0	20.5 Ch. 1: 17.5 Ch. 2: 19.5 Ch. 11: 17.5 Ch. 12: 8.0 Ch. 13: 2.0	21.5 Ch. 1: 18.5 Ch. 2: 20.5 Ch. 11: 18.5 Ch. 12: 9.0 Ch. 13: 3.0

1.4.3 2.4 GHz Reduced WLAN Output Powers

Note: Targets for 802.11ax RU operations can be found in Appendix J

The below table is applicable in the following conditions:

- RCV Active
- Simultaneous conditions with 5/6 GHz WLAN (RCV not Active)

Mode	Band	IEEE 802.11 (in dBm)							
		SISO		MIMO					
		Antenna 1 & Antenna 2							
		b		g (CDD + STBC)		n (CDD + STBC, SDM)		ax (SU) (CDD + STBC, SDM)	
		Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
2.4 GHz WIFI	2.45 GHz	16.0 Ch. 12: 5.0 Ch. 13: -1.0	17.0 Ch. 12: 6.0 Ch. 13: 0.0	19.0 Ch. 1: 18.5 Ch. 11: 18.5 Ch. 12: 8.0 Ch. 13: 2.0	20.0 Ch. 1: 19.5 Ch. 11: 19.5 Ch. 12: 9.0 Ch. 13: 3.0	19.0 Ch. 1: 18.5 Ch. 11: 18.5 Ch .12: 8.0 Ch. 13: 2.0	20.0 Ch. 1: 19.5 Ch. 11: 19.5 Ch .12: 9.0 Ch. 13: 3.0	19.0 Ch. 1: 17.5 Ch. 11: 17.5 Ch. 12: 8.0 Ch. 13: 2.0	20.0 Ch. 1: 18.5 Ch. 11: 18.5 Ch. 12: 9.0 Ch. 13: 3.0

The below table is applicable in the following conditions:

- RCV Active during simultaneous conditions with 5/6 GHz WLAN

Mode	Band	IEEE 802.11 (in dBm)							
		SISO		MIMO					
		Antenna 1 & Antenna 2							
		b		g (CDD + STBC)		n (CDD + STBC, SDM)		ax (SU) (CDD + STBC, SDM)	
		Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
2.4 GHz WIFI	2.45 GHz	13.0 Ch. 12: 5.0 Ch. 13: -1.0	14.0 Ch. 12: 6.0 Ch. 13: 0.0	16.0 Ch. 12: 8.0 Ch. 13: 2.0	17.0 Ch. 12: 9.0 Ch. 13: 3.0	16.0 Ch. 12: 8.0 Ch. 13: 2.0	17.0 Ch. 12: 9.0 Ch. 13: 3.0	16.0 Ch. 12: 8.0 Ch. 13: 2.0	17.0 Ch. 12: 9.0 Ch. 13: 3.0

1.4.4 5 GHz Maximum MIMO WLAN Output Power

Note: Targets for 802.11ax RU operations can be found in Appendix J

Mode	Band	IEEE 802.11 (in dBm)							
		MIMO							
		a (CDD + STBC)		n (CDD + STBC, SDM)		ac (CDD + STBC, SDM)		ax (SU) (CDD + STBC, SDM)	
		Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
5 GHz WIFI (20MHz BW)	UNII-1	17.5	18.5	17.5	18.5	17.5	18.5	17.5	18.5
	UNII-2A	17.5	18.5	17.5	18.5	17.5	18.5	17.5	18.5
	UNII-2C	17.5	18.5	17.5	18.5	17.5	18.5	17.5	18.5
	UNII-3	17.5	18.5	17.5	18.5	17.5	18.5	17.5	18.5
	UNII-4	17.5	18.5	17.5	18.5	17.5	18.5	17.5	18.5
5 GHz WIFI (40MHz BW)	UNII-1			17.5	18.5	17.5	18.5	17.5	18.5
	UNII-2A			17.5	18.5	17.5	18.5	17.5	18.5
	UNII-2C			17.5	18.5	17.5	18.5	17.5	18.5
	UNII-3			17.5	18.5	17.5	18.5	17.5	18.5
	UNII-4			17.5	18.5	17.5	18.5	17.5	18.5
5 GHz WIFI (80MHz BW)	UNII-1					16.5	17.5	17.5	18.5
	UNII-2A					17.5	18.5	17.5	18.5
	UNII-2C					17.5	18.5	17.5	18.5
	UNII-3					17.5	18.5	17.5	18.5
	UNII-4					17.5	18.5	17.5	18.5
5 GHz WIFI (160MHz BW)	UNII-1/2A					16.0	17.0	16.5	17.5
	UNII-2C					17.5	18.5	17.5	18.5
	UNII-3/4					17.5	18.5	17.5	18.5

1.4.5 5 GHz Reduced WLAN Output Powers

Note: Targets for 802.11ax RU operations can be found in Appendix J

The below table is applicable in the following conditions:

- RCV Active
- Simultaneous conditions with 2.4 GHz WLAN
- RCV Active during simultaneous conditions with 2.4 GHz WLAN

Mode	Band	IEEE 802.11 (in dBm)							
		MIMO							
		a (CDD + STBC)		n (CDD + STBC, SDM)		ac (CDD + STBC, SDM)		ax (SU) (CDD + STBC, SDM)	
		Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
5 GHz WIFI (20MHz BW)	UNII-1	16.0	17.0	16.0	17.0	16.0	17.0	16.0	17.0
	UNII-2A	16.0	17.0	16.0	17.0	16.0	17.0	16.0	17.0
	UNII-2C	16.0	17.0	16.0	17.0	16.0	17.0	16.0	17.0
	UNII-3	16.0	17.0	16.0	17.0	16.0	17.0	16.0	17.0
	UNII-4	16.0	17.0	16.0	17.0	16.0	17.0	16.0	17.0
5 GHz WIFI (40MHz BW)	UNII-1			16.0	17.0	16.0	17.0	16.0	17.0
	UNII-2A			16.0	17.0	16.0	17.0	16.0	17.0
	UNII-2C			16.0	17.0	16.0	17.0	16.0	17.0
	UNII-3			16.0	17.0	16.0	17.0	16.0	17.0
	UNII-4			16.0	17.0	16.0	17.0	16.0	17.0
5 GHz WIFI (80MHz BW)	UNII-1					16.0	17.0	16.0	17.0
	UNII-2A					16.0	17.0	16.0	17.0
	UNII-2C					16.0	17.0	16.0	17.0
	UNII-3					16.0	17.0	16.0	17.0
	UNII-4					16.0	17.0	16.0	17.0
5 GHz WIFI (160MHz BW)	UNII-1/2A					16.0	17.0	16.0	17.0
	UNII-2C					16.0	17.0	16.0	17.0
	UNII-3/4					16.0	17.0	16.0	17.0

1.4.6 2.4 GHz Maximum Bluetooth Output Power

Mode	Single Antenna				Single Antenna in Dual Mode				Dual	
	Antenna 1		Antenna 2		Antenna 1		Antenna 2			
	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
Bluetooth (in dBm)	17.0	18.0	16.5	17.5	12.0	13.0	10.0	11.0	14.0	15.0
Bluetooth EDR (in dBm)	17.0	18.0	16.5	17.5	9.5	10.5	8.5	9.5	12.0	13.0
Bluetooth LE 1/2Mbps (in dBm)	17.0	18.0	15.0	16.0	11.0	12.0	9.0	10.0	13.0	14.0
Bluetooth LE 125/500 kbps (in dBm)					11.0	12.0	9.0	10.0		

1.4.7 2.4 GHz Reduced Bluetooth Output Power

The below table is applicable in the following conditions:

- RCV active

Mode	Single Antenna				Single Antenna in Dual Mode				Dual	
	Antenna 1		Antenna 2		Antenna 1		Antenna 2			
	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
Bluetooth (in dBm)	14.0	15.0	14.0	15.0	12.0	13.0	10.0	11.0	14.0	15.0
Bluetooth EDR (in dBm)	14.0	15.0	14.0	15.0	9.5	10.5	8.5	9.5	12.0	13.0
Bluetooth LE 1/2Mbps (in dBm)	14.0	15.0	14.0	15.0	11.0	12.0	9.0	10.0	13.0	14.0
Bluetooth LE 125/500 kbps (in dBm)					11.0	12.0	9.0	10.0		

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 Appendix E. Since the diagonal dimension of this device is > 160 mm and <200 mm, it is considered a "phablet."

Table 1-1
Device Edges/Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	Yes
LTE Band 13	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 41	Yes	Yes	No	Yes	Yes	No
2.4 GHz WLAN Ant 1	Yes	Yes	Yes	No	No	Yes
2.4 GHz WLAN Ant 2	Yes	Yes	No	No	No	Yes
2.4 GHz WLAN MIMO	Yes	Yes	Yes	No	No	Yes
5 GHz WLAN MIMO	Yes	Yes	Yes	No	No	Yes
Bluetooth Ant 1	Yes	Yes	Yes	No	No	Yes
Bluetooth Ant 2	Yes	Yes	No	No	No	Yes
Bluetooth MIMO	Yes	Yes	Yes	No	No	Yes

Note: Particular DUT edges were not required to be evaluated for wireless router SAR or phablet SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v02r01 Section III and FCC KDB Publication 648474 D04v01r03. The distances between the transmit antennas and the edges of the device are included in the filing. When wireless router mode is enabled, U-NII-1, U-NII-2A, U-NII-2C, UNII-4, and WIFI6E operations are disabled.

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 Appendix E.

1.7 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, 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 D01v06 4.3.2 procedures.

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
3	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 2.4 GHz Bluetooth	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz WLAN + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
11	GSM voice + 2.4 GHz Bluetooth + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	UMTS + 2.4 GHz WLAN	Yes	Yes	Yes	Yes	
16	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
17	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
18	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
19	UMTS + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
29	LTE + 2.4 GHz WLAN	Yes	Yes	Yes	Yes	
30	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
31	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	LTE + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
38	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
39	LTE + 2.4 GHz Bluetooth + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
40	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz Bluetooth + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
43	GPRS/EDGE + 2.4 GHz WLAN	N/A	N/A	Yes	Yes	
44	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
45	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
46	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
47	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
48	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
49	GPRS/EDGE + 2.4 GHz WLAN + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
50	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
51	GPRS/EDGE + 2.4 GHz WLAN + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
52	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
53	GPRS/EDGE + 2.4 GHz Bluetooth + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
54	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
55	GPRS/EDGE + 2.4 GHz Bluetooth + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
56	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

1. 2.4 GHz WLAN and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
2. 5 GHz WLAN and 6 GHz WLAN share the same antenna path and cannot transmit simultaneously.
3. 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.
4. 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.
5. 5 GHz Wireless Router is only supported for the U-NII-3 by S/W, therefore U-NII-1, U-NII2A, U-NII2C, and UNII-4 were not evaluated for wireless router conditions.
6. 6 GHz Wireless Router is not supported, therefore it was not evaluated for wireless router conditions.
7. 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. WLAN can transmit only when operating with MIMO.
8. This device supports VoWIFI.
9. This device supports Bluetooth Tethering in SISO Mode.
10. This device supports VoLTE.

1.8 Miscellaneous SAR Test Considerations

(A) WIFI/BT

Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02.

This device supports channel 1-13 for 2.4 GHZ WLAN. However, because channel 12/13 targets are not higher than that of channels 1-11, default channels for SAR testing are determined per FCC KDB 248227 D01v02r02.

Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A & U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01.

This device supports IEEE 802.11ax with the following features:

a) Up to 160 MHz Bandwidth only for 5/6 GHz
b) Up to 20 MHz Bandwidth only for 2.4 GHz
c) No aggregate channel configurations
d) 2 Tx antenna output
e) Up to 1024 QAM is supported
f) TDWR and Band gap channels are supported for 5/6 GHz
g) MU-MIMO UL Operations are not supported

Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg. Because wireless router operations are not supported for U-NII-1, U-NII-2A, U-NII-2C, & U-NII-4 WLAN, phablet SAR tests were performed. Phablet SAR was not evaluated for 2.4 GHz and U-NII-3 WLAN operations since wireless router 1g SAR was < 1.2 W/kg.

Per April 2019 TCB Workshop Notes, SAR testing was not required for 802.11ax when applying the initial test configuration procedures of KDB 248227, with 802.11ax considered a higher order 802.11 mode.

This device supports 6 GHz WIFI Operations. RF Exposure assessment for these bands can be found in the WIFI6E RF Exposure Report (report SN can be found in Section 1.11 – Bibliography). Simultaneous transmission analysis is addressed in Appendix D of this report.

(B) Licensed Transmitter(s)

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 Appendix I.

Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

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 capabilities with overlapping transmission frequency ranges. When the supported frequency range of an LTE Band falls completely within an LTE band with a larger transmission frequency range, both LTE bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both LTE 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 LTE Carrier Aggregation (CA) for LTE Band 41 with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per 2017 Fall TCB Workshop Notes.

1.9 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01, D05v02r04, D05Av01r02, D06v02r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D04v01r03 (Phablet Procedures)
- FCC KDB Publication 616217 D04v01r02 (Proximity Sensor)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)
- May 2017 TCB Workshop Notes (LTE 4x4 Downlink MIMO)
- April 2018 TCB Workshop Notes (LTE Carrier Aggregation)
- April 2019 TCB Workshop Notes (IEEE 802.11ax, Dynamic Antenna Tuning)

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	1M2112100159-20.A3L
WIFI 6GHz RF exposure	1M2112100159-17.A3L

2 LTE INFORMATION

LTE Information					
Form Factor	Portable Handset				
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)				
	LTE Band 13 (779.5 - 784.5 MHz)				
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 41 (2498.5 - 2687.5 MHz)				
Channel Bandwidths	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 13: 5 MHz, 10 MHz				
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	Mid-High	High
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 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 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 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
UE Category	DL UE Cat 20, UL UE Cat 13				
Modulations Supported in UL	QPSK, 16QAM, 64QAM				
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 15. It supports carrier aggregation and downlink MIMO features as shown in Section 9 and Appendix I. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. The following LTE Release 15 Features are not supported: Relay, HetNet, Enhanced MIMO, eICIC, WIFI Offloading, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA.				

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:

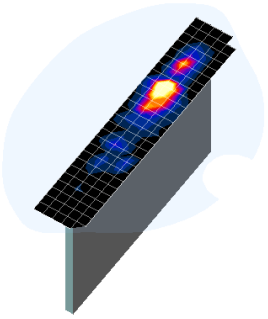


Figure 4-1
Sample SAR Area Scan

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].

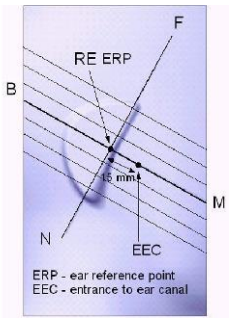


Figure 5-1
Close-Up Side view of ERP

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

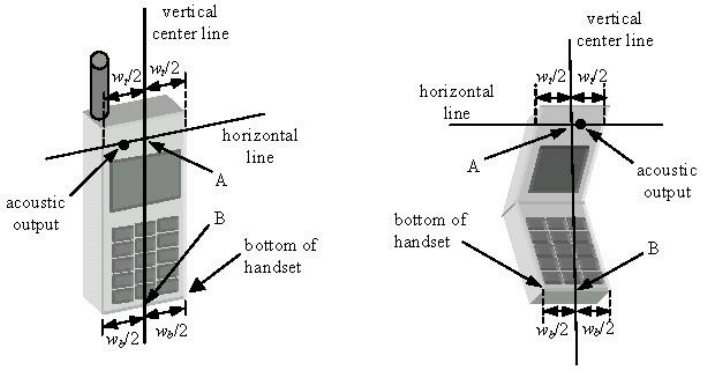


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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 Positioning for Cheek

1. The test device was positioned with the device close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6-1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

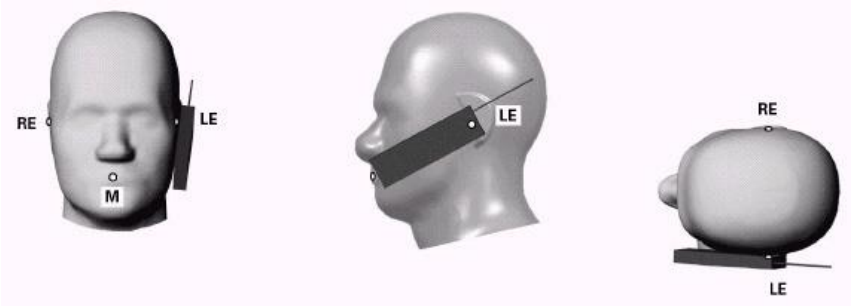


Figure 6-1 Front, Side and Top View of Cheek Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the pinna.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the reference plane.
4. The phone was then rotated around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.
5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the device contact with the ear, the device was rotated about the NF line until any point on the handset made contact with a phantom point below the ear (cheek) (See Figure 6-2).

6.3 Positioning for Ear / 15º Tilt

With the test device aligned in the “Cheek Position”:

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15degrees.
2. The phone was then rotated around the horizontal line by 15 degrees.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the handset touched the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. In this situation, the tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 6-2).

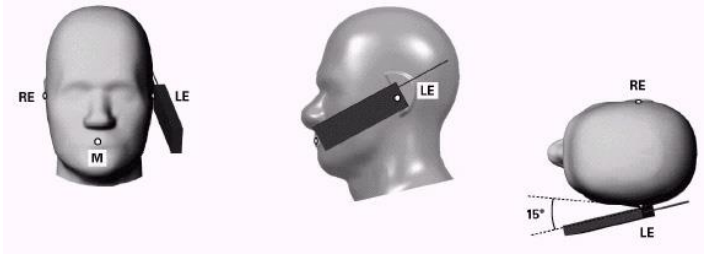


Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

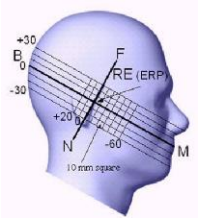


Figure 6-3
Side view w/ relevant markings

6.4 SAR Evaluations near the Mouth/Jaw Regions of the SAM Phantom

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones. Per IEEE 1528-2013, a rotated SAM phantom is necessary to allow probe access to such regions. Both SAM heads of the TwinSAM-Chin20 are rotated 20 degrees around the NF line. Each head can be removed from the table for emptying and cleaning.

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D04v01r03. The SAR required in these regions of SAM should be measured using a flat phantom. The phone should be positioned with a separation distance of 4 mm between the ear reference point (ERP) and the outer surface of the flat phantom shell. While maintaining this distance at the ERP location, the low (bottom) edge of the phone should be lowered from the phantom to establish the same separation distance between the peak SAR location identified by the truncated partial SAR distribution measured with the SAM phantom. The distance from the peak SAR location to the phone is determined by the straight line passing perpendicularly through the phantom surface. When it is not feasible to maintain 4 mm separation at the ERP while also establishing the required separation at the peak SAR location, the top edge of the phone will be allowed to touch the phantom with a separation < 4 mm at the ERP. The phone should not be tilted to the left or right while placed in this inclined position to the flat phantom.

6.5 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 D01v06 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.

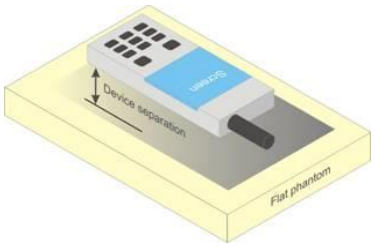


Figure 6-4
Sample Body-Worn Diagram

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.

6.6 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 D01v06 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v06, 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.

6.7 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

6.8 Phablet Configurations

For smart phones with a display diagonal dimension > 150 mm or an overall diagonal dimension > 160 mm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D04v01r03 should be applied to evaluate SAR compliance. A device marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance. In addition to the normally required head and body-worn accessory SAR test procedures required for handsets, the UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna <=25 mm from that surface or edge, in direct contact with the phantom, for 10g SAR. The UMPC mini-tablet 1g SAR at 5 mm is not required. When hotspot mode applies, 10g SAR is required only for the surfaces and edges with hotspot mode 1g SAR > 1.2 W/kg.

6.9 Proximity Sensor Considerations

This device uses a power reduction mechanism to reduce output powers in certain use conditions when the device is used close the user's body.

When the device's antenna is within a certain distance of the user, the sensor activates and reduces the maximum allowed output power. However, the sensor is not active when the device is moved beyond the sensor triggering distance and the maximum output power is no longer limited. Therefore, additional evaluation is needed in the vicinity of the triggering distance to ensure SAR is compliant when the device is allowed to operate at a non-reduced output power level. FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device at these additional test positions. Sensor triggering distance summary data is included in Appendix G.

The sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the sensor entirely covers the antennas.

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 D01v06, 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.

8.5 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.

8.6 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r02 for more details.

8.6.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters.

A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

8.6.2 U-NII-1 and U-NII-2A

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, SAR measurement using OFDM SAR test procedures is not required for U-NII-1 unless the highest reported SAR for U-NII-2A is > 1.2 W/kg. When different maximum output powers are specified for the bands, SAR measurement for the U-NII band with the lower maximum output power is not required unless the highest reported SAR for the U-NII band with the higher maximum output power, adjusted by the ratio of lower to higher specified maximum output power for the two bands, is > 1.2 W/kg. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.6.3 U-NII-2C and U-NII-3

The frequency range covered by U-NII-2C and U-NII-3 is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, SAR must be considered for these channels. Each band is tested independently according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

8.6.4 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.6.5 2.4 GHz SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 GHz 802.11 g/n/ax OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.6.6 OFDM Transmission Mode and SAR Test Channel Selection

When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel bandwidth, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. Per April 2019 TCB Workshop guidance, 802.11ax was considered the highest order 802.11 mode. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band

or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

8.6.7 Initial Test Configuration Procedure

For OFDM, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order IEEE 802.11 mode. The channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 8.6.6). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.6.8 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the subsequent test configurations are required. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.6.9 MIMO SAR considerations

Per KDB Publication 248227 D01v02r02, the simultaneous SAR provisions in KDB Publication 447498 D01v06 should be applied to determine simultaneous transmission SAR test exclusion for WIFI MIMO. If the sum of 1g single transmission chain SAR measurements is <1.6 W/kg, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

9 RF CONDUCTED POWERS

All conducted power measurements for 2G/3G/4G 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_{max}

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 850	128	31.98	31.98	32.50	**29.84**	27.97	26.26	24.74	22.68	21.76
	190	32.10	32.09	32.48	**30.44**	27.72	26.36	24.99	23.03	22.10
	251	31.79	31.80	32.36	**30.07**	28.36	26.00	24.36	22.67	21.55
GSM 1900	512	29.05	29.05	28.68	**26.10**	24.25	25.14	24.00	22.07	21.19
	661	28.71	28.77	28.58	**25.91**	23.51	25.27	23.86	21.91	21.00
	810	29.12	29.19	28.92	**26.35**	23.75	25.23	23.85	21.99	20.89

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 850	128	22.78	22.78	26.31	**25.41**	24.79	17.06	18.55	18.25	18.58
	190	22.90	22.89	26.29	**26.01**	24.54	17.16	18.80	18.60	18.92
	251	22.59	22.60	26.17	**25.64**	25.18	16.80	18.17	18.24	18.37
GSM 1900	512	19.85	19.85	22.49	**21.67**	21.07	15.94	17.81	17.64	18.01
	661	19.51	19.57	22.39	**21.48**	20.33	16.07	17.67	17.48	17.82
	810	19.92	19.99	22.73	**21.92**	20.57	16.03	17.66	17.56	17.71

GSM 850	**Frame Avg.Targets:**	22.80	22.80	25.31	**25.07**	24.32	17.30	18.81	18.57	18.82
GSM 1900		19.80	19.80	21.81	**22.07**	21.32	16.30	17.81	17.57	17.82

Table 9-2
Measured P_{limit} for DSI = 1 (Phablet with grip sensor active), DSI = 3 (Hotspot mode), and/or DSI = 4 (Earjack active)

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	26.67	26.75	23.65	21.61	**20.02**	25.14	24.00	22.07	21.19
	661	26.25	26.30	23.86	21.73	**20.27**	25.27	23.86	21.91	21.00
	810	26.43	26.50	24.15	22.02	**20.51**	25.23	23.85	21.99	20.89

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	17.47	17.55	17.46	17.18	**16.84**	15.94	17.81	17.64	18.01
	661	17.05	17.10	17.67	17.30	**17.09**	16.07	17.67	17.48	17.82
	810	17.23	17.30	17.96	17.59	**17.33**	16.03	17.66	17.56	17.71
GSM 1900	**Frame Avg.Targets:**	17.80	17.80	17.81	17.77	**17.82**	16.30	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 9-3
Measured P_{max}

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	
99	WCDMA	12.2 kbps RMC	23.31	23.21	23.05	-
99		12.2 kbps AMR	23.28	23.17	23.03	-
6	HSDPA	Subtest 1	22.39	22.31	22.21	0
6		Subtest 2	22.41	22.34	22.22	0
6		Subtest 3	21.88	21.82	21.69	0.5
6		Subtest 4	21.88	21.80	21.68	0.5
6	HSUPA	Subtest 1	22.43	22.33	22.22	0
6		Subtest 2	20.51	20.37	20.25	2
6		Subtest 3	21.41	21.34	21.24	1
6		Subtest 4	20.41	20.33	20.22	2
6		Subtest 5	22.47	22.38	22.27	0

This device does not support DC-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.

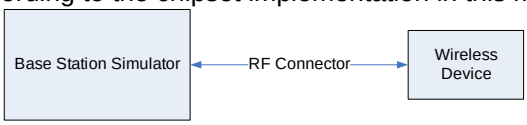


Figure 9-2
Power Measurement Setup

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 Appendix F.

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_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 12

Table 9-4
LTE Band 12 Measured P_{Max} for all DSI - 10 MHz Bandwidth

LTE Band 12 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23095 (707.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**22.86**	0	0
	1	25	22.78		0
	1	49	22.62		0
	25	0	21.79	0-1	1
	25	12	**21.86**		1
	25	25	21.67		1
	50	0	21.82		1
16QAM	1	0	22.15	0-1	1
	1	25	22.02		1
	1	49	21.93		1
	25	0	20.87	0-2	2
	25	12	20.91		2
	25	25	20.78		2
	50	0	20.81		2
64QAM	1	0	21.14	0-2	2
	1	25	21.07		2
	1	49	20.92		2
	25	0	19.86	0-3	3
	25	12	19.88		3
	25	25	19.72		3
	50	0	19.81		3

9.3.2 LTE Band 13

Table 9-5
LTE Band 13 Measured P_{Max} for all DSI - 10 MHz Bandwidth

LTE Band 13 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**22.91**	0	0
	1	25	22.90		0
	1	49	22.86		0
	25	0	**21.87**	0-1	1
	25	12	21.85		1
	25	25	21.86		1
	50	0	21.79		1
16QAM	1	0	22.13	0-1	1
	1	25	22.14		1
	1	49	22.09		1
	25	0	20.92	0-2	2
	25	12	20.94		2
	25	25	20.94		2
	50	0	20.79		2
64QAM	1	0	21.09	0-2	2
	1	25	21.11		2
	1	49	21.06		2
	25	0	19.92	0-3	3
	25	12	19.88		3
	25	25	19.90		3
	50	0	19.79		3

9.3.3 LTE Band 5

Table 9-6
LTE Band 5 (Cell) Measured P_{Max} for all DSI - 10 MHz Bandwidth

LTE Band 5 (Cell) 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 20525 (836.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**22.91**	0	0
	1	25	22.86		0
	1	49	22.69		0
	25	0	21.82	0-1	1
	25	12	21.83		1
	25	25	**21.86**		1
	50	0	21.74		1
16QAM	1	0	22.07	0-1	1
	1	25	22.05		1
	1	49	21.94		1
	25	0	20.85	0-2	2
	25	12	20.82		2
	25	25	20.80		2
	50	0	20.71		2
64QAM	1	0	21.04	0-2	2
	1	25	21.03		2
	1	49	20.91		2
	25	0	19.86	0-3	3
	25	12	19.84		3
	25	25	19.87		3
	50	0	19.75		3

9.3.4 LTE Band 4

Table 9-7
LTE Band 4 (AWS) Measured P_{Max} – 20 MHz Bandwidth

LTE Band 4 (AWS) 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 20175 (1732.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	22.14	0	0
	1	50	**22.41**		0
	1	99	22.17		0
	50	0	21.32	0-1	1
	50	25	**21.42**		1
	50	50	21.38		1
	100	0	21.33		1
16QAM	1	0	21.40	0-1	1
	1	50	21.67		1
	1	99	21.39		1
	50	0	20.31	0-2	2
	50	25	20.42		2
	50	50	20.36		2
	100	0	20.36		2
64QAM	1	0	20.27	0-2	2
	1	50	20.70		2
	1	99	20.30		2
	50	0	19.32	0-3	3
	50	25	19.43		3
	50	50	19.36		3
	100	0	19.34		3

Table 9-8
LTE Band 4 (AWS) Measured P_{Limit} for DSI = 1 (Phablet with grip sensor active), or DSI = 3 (Hotspot Mode) and/or DSI = 4 (Earjack Active) - 20 MHz Bandwidth

LTE Band 4 (AWS) 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 20175 (1732.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	18.31	0	0
	1	50	**18.57**		0
	1	99	18.55		0
	50	0	18.40	0-1	0
	50	25	**18.63**		0
	50	50	18.59		0
	100	0	18.52		0
16QAM	1	0	18.65	0-1	0
	1	50	18.97		0
	1	99	18.73		0
	50	0	18.49	0-2	0
	50	25	18.61		0
	50	50	18.55		0
	100	0	18.55		0
64QAM	1	0	18.26	0-2	0
	1	50	18.72		0
	1	99	18.54		0
	50	0	18.42	0-3	0
	50	25	18.65		0
	50	50	18.61		0
	100	0	18.52		0

9.3.5 LTE Band 41

Table 9-9
LTE Band 41 Measured P_{Max} – 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	23.31	23.52	23.40	23.44	23.28	0	0
	1	50	23.36	23.63	23.78	**23.85**	23.70		0
	1	99	23.42	23.52	23.47	23.23	23.62		0
	50	0	22.38	22.49	22.68	22.73	22.63	0-1	1
	50	25	22.47	22.58	22.78	**22.82**	22.76		1
	50	50	22.38	22.61	22.81	22.64	22.77		1
	100	0	22.39	22.51	22.69	22.67	22.71		1
16QAM	1	0	22.40	22.50	22.43	22.41	22.32	0-1	1
	1	50	22.42	22.62	22.78	22.73	22.37		1
	1	99	22.35	22.56	22.42	22.25	22.64		1
	50	0	21.34	21.49	21.67	21.74	21.65	0-2	2
	50	25	21.39	21.59	21.80	21.79	21.76		2
	50	50	21.43	21.61	21.80	21.63	21.83		2
	100	0	21.38	21.52	21.69	21.69	21.70		2
64QAM	1	0	21.42	21.58	21.53	21.53	21.15	0-2	2
	1	50	21.40	21.59	21.91	21.89	21.85		2
	1	99	21.50	21.67	21.64	21.46	21.63		2
	50	0	20.39	20.43	20.67	20.73	20.64	0-3	3
	50	25	20.42	20.56	20.81	20.78	20.81		3
	50	50	20.42	20.60	20.79	20.57	20.75		3
	100	0	19.92	20.50	20.65	20.46	20.71		3

Table 9-10
LTE Band 41 Uplink Carrier Aggregation Measured P_{Max}

	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	41055	2636.5	QPSK	1	0	LTE B41	20	40857	2616.7	QPSK	1	99	23.85	23.44

Table 9-11
LTE Band 41 Measured P_{Limit} for DSI = 1 (Phablet with grip sensor active), or DSI = 3 (Hotspot Mode), and/or DSI = 4 (Earjack Active) - 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	19.48	19.55	19.52	19.58	19.42	0	0
	1	50	19.61	19.62	19.90	**19.95**	19.91		0
	1	99	19.94	19.64	19.56	19.59	19.79		0
	50	0	19.49	19.59	19.76	19.58	19.83	0-1	0
	50	25	19.46	19.68	19.91	**19.95**	19.93		0
	50	50	19.47	19.69	19.89	19.77	19.94		0
	100	0	19.38	19.57	19.70	19.81	19.82		0
16QAM	1	0	19.42	19.85	19.58	19.64	19.40	0-1	0
	1	50	19.64	19.82	20.22	19.87	19.82		0
	1	99	19.42	19.62	19.64	19.15	19.72		0
	50	0	19.40	19.68	19.70	19.90	19.79	0-2	0
	50	25	19.49	19.73	19.90	19.91	19.96		0
	50	50	19.45	19.69	19.90	19.75	19.94		0
	100	0	19.44	19.58	19.73	19.88	19.85		0
64QAM	1	0	19.49	19.73	19.69	19.69	19.37	0-2	0
	1	50	19.60	19.79	20.06	19.90	19.98		0
	1	99	19.66	19.78	19.73	19.45	19.91		0
	50	0	19.40	19.59	19.81	19.84	19.76	0-3	0
	50	25	19.49	19.72	19.93	19.93	19.96		0
	50	50	19.48	19.70	19.89	19.81	19.96		0
	100	0	19.44	19.61	19.82	19.80	19.89		0

Table 9-12
LTE Band 41 Uplink Carrier Aggregation Measured P_{Limit} for DSI = 1 (Phablet with grip sensor active), or DSI = 3 (Hotspot Mode), and/or DSI = 4 (Earjack Active) - 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	41055	2636.5	QPSK	1	99	LTE B41	20	41253	2656.3	QPSK	1	0	19.71	19.59

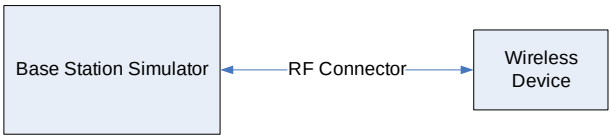


Figure 9-3
Power Measurement Setup

9.4 WLAN Conducted Powers

Table 9-13
2.4 GHz WLAN Maximum Average RF Power – Ant 1

2.4GHz Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode
		802.11b
		Average
2412	1	20.14
2437	6	20.36
2462	11	20.49

Table 9-14
2.4 GHz WLAN Maximum Average RF Power – Ant 2

2.4GHz Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode
		802.11b
		Average
2412	1	19.90
2437	6	19.74
2462	11	20.45

Table 9-15
2.4 GHz WLAN Maximum Average RF Power – MIMO

2.4GHz 802.11n Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
2412	1	16.18	16.11	19.16
2417	2	17.84	18.12	20.99
2437	6	17.96	18.48	21.24
2457	10	17.48	17.82	20.66
2462	11	16.17	16.39	19.29

Table 9-16
2.4 GHz WLAN Reduced Average RF Power with RCV Active – Ant 1

2.4GHz Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode
		802.11b
		Average
2412	1	16.32
2437	6	16.22
2462	11	16.39

Table 9-17
2.4 GHz WLAN Reduced Average RF Power with RCV Active – Ant 2

2.4GHz Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode
		802.11b
		Average
2412	1	16.47
2437	6	16.37
2462	11	16.24

Table 9-18
5 GHz WLAN Maximum Average RF Power – MIMO

5GHz (80MHz) 802.11ac Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
5210	42	13.77	13.89	16.84
5290	58	14.05	14.74	17.42
5530	106	14.77	15.29	18.05
5610	122	14.74	15.49	18.14
5690	138	14.88	15.33	18.12
5775	155	15.01	15.49	18.27
5855	171	14.99	14.92	17.97

Table 9-19
5 GHz WLAN Reduced Average RF Power – MIMO

5GHz (80MHz) 802.11ac Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
5210	42	13.12	13.90	16.54
5290	58	13.02	13.83	16.45
5530	106	13.14	13.93	16.56
5610	122	12.99	13.54	16.28
5690	138	12.74	13.74	16.28
5775	155	12.92	13.31	16.13
5855	171	13.01	13.24	16.14

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.

- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, due to an even number of channels, both channels were measured.

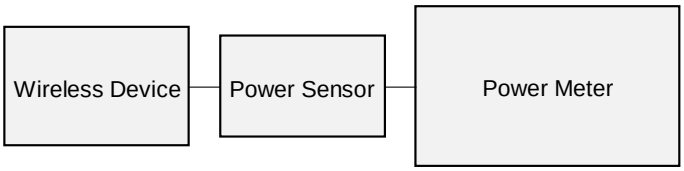


Figure 9-4
Power Measurement Setup

9.5 Bluetooth Conducted Powers

Table 9-20
Bluetooth Maximum Average RF Power– Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	1.0	ePA	0	17.11	51.428
2441	1.0	ePA	39	17.47	55.898
2480	1.0	ePA	78	16.73	47.130
2402	2.0	ePA	0	18.00	63.023
2441	2.0	ePA	39	17.73	59.252
2480	2.0	ePA	78	17.14	51.785
2402	3.0	ePA	0	17.81	60.353
2441	3.0	ePA	39	17.69	58.749
2480	3.0	ePA	78	17.15	51.904

Table 9-21
Bluetooth Maximum Average RF Power– Antenna 2

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	1.0	ePA	0	16.57	45.373
2441	1.0	ePA	39	16.73	47.044
2480	1.0	ePA	78	16.57	45.384
2402	2.0	ePA	0	16.71	46.925
2441	2.0	ePA	39	16.51	44.802
2480	2.0	ePA	78	16.27	42.364
2402	3.0	ePA	0	16.74	47.152
2441	3.0	ePA	39	16.53	45.009
2480	3.0	ePA	78	16.64	46.132

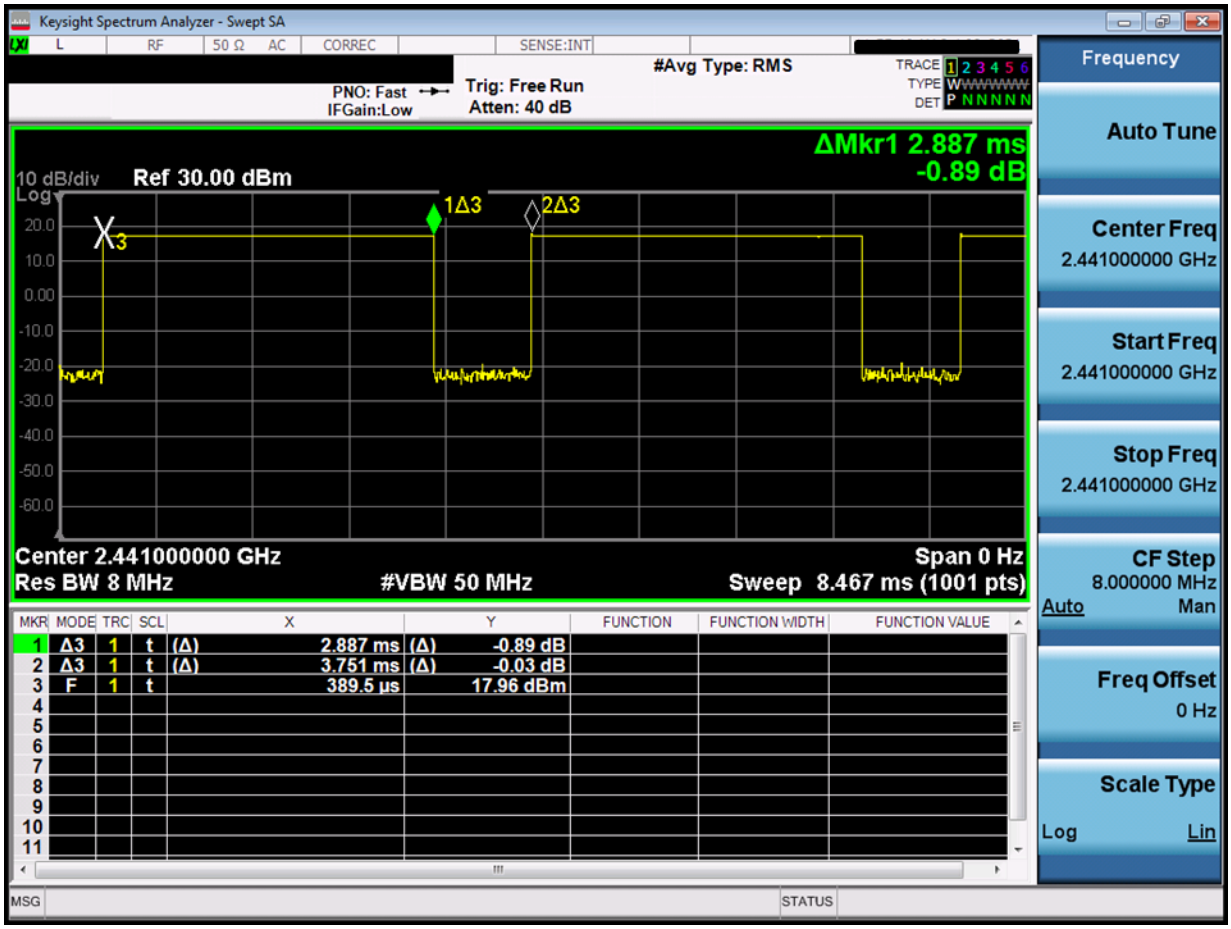
Table 9-22
Bluetooth Reduced Average RF Power (RCV Active) – Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	1.0	ePA	0	13.82	24.099
2441	1.0	ePA	39	14.72	29.648
2480	1.0	ePA	78	13.74	23.659

Table 9-23
Bluetooth Reduced Average RF Power (RCV Active) – Antenna 2

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	1.0	ePA	0	14.29	26.853
2441	1.0	ePA	39	14.01	25.177
2480	1.0	ePA	78	14.19	26.242

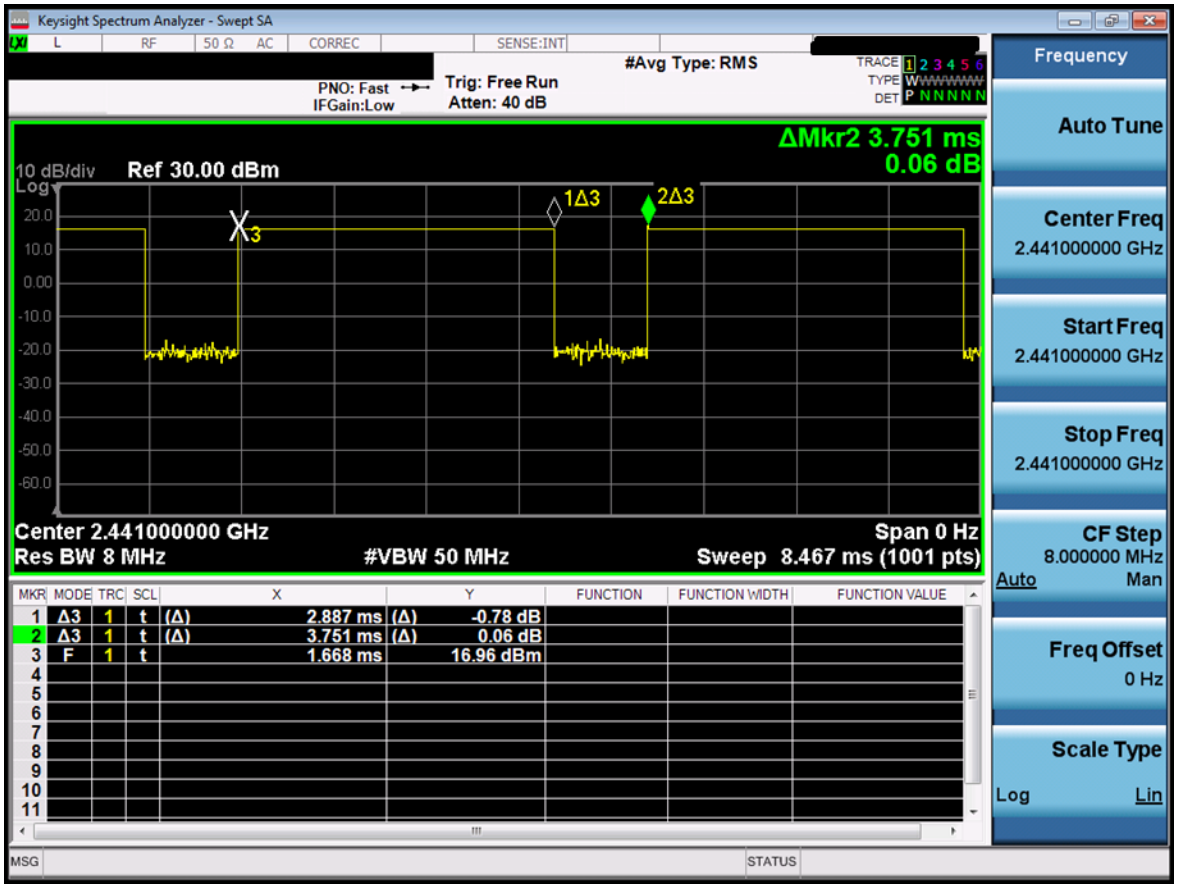
Figure 9-5
Bluetooth Antenna 1 Transmission Plot



Equation 9-1
Bluetooth Antenna 1 Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.887ms}{3.751ms} * 100\% = 77.0\%$$

Figure 9-6
Bluetooth Antenna 2 Transmission Plot



Equation 9-2
Bluetooth Antenna 2 Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.887ms}{3.751ms} * 100\% = 77.0\%$$

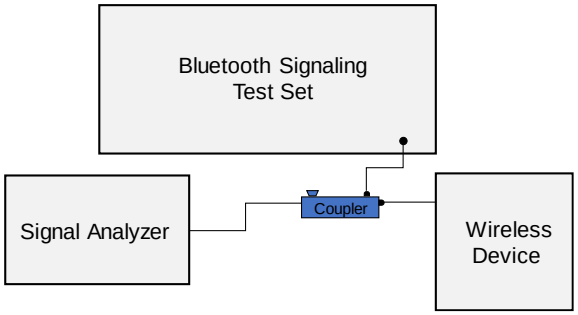


Figure 9-7
Power Measurement Setup

10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Head 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
01/04/2022	750 Head	19.9	680	0.886	41.677	0.888	42.305	-0.23%	-1.48%
			695	0.891	41.634	0.889	42.227	0.22%	-1.40%
			700	0.892	41.620	0.889	42.201	0.34%	-1.38%
			710	0.896	41.597	0.890	42.149	0.67%	-1.31%
			725	0.901	41.563	0.891	42.071	1.12%	-1.21%
			750	0.909	41.507	0.894	41.942	1.68%	-1.04%
			770	0.916	41.456	0.895	41.838	2.35%	-0.91%
			785	0.921	41.414	0.896	41.760	2.79%	-0.83%
			800	0.926	41.377	0.897	41.682	3.23%	-0.73%
12/22/2021	835 Head	21.5	815	0.926	41.722	0.898	41.594	3.12%	0.31%
			820	0.928	41.705	0.899	41.578	3.23%	0.31%
			835	0.934	41.658	0.900	41.500	3.78%	0.38%
			850	0.940	41.617	0.916	41.500	2.62%	0.28%
12/30/2021	835 Head	20.0	815	0.926	42.525	0.898	41.594	3.12%	2.24%
			820	0.928	42.504	0.899	41.578	3.23%	2.23%
			835	0.933	42.429	0.900	41.500	3.67%	2.24%
			850	0.940	42.356	0.916	41.500	2.62%	2.06%
12/21/2021	1750 Head	20.9	1710	1.386	39.538	1.348	40.142	2.82%	-1.50%
			1720	1.391	39.521	1.354	40.126	2.73%	-1.51%
			1745	1.406	39.478	1.368	40.087	2.78%	-1.52%
			1750	1.409	39.468	1.371	40.079	2.77%	-1.52%
			1770	1.419	39.430	1.383	40.047	2.60%	-1.54%
			1790	1.431	39.394	1.394	40.016	2.65%	-1.55%
12/26/2021	1900 Head	23.2	1850	1.367	38.977	1.400	40.000	-2.36%	-2.56%
			1860	1.377	38.935	1.400	40.000	-1.64%	-2.66%
			1880	1.397	38.844	1.400	40.000	-0.21%	-2.89%
			1900	1.419	38.752	1.400	40.000	1.36%	-3.12%
			1905	1.424	38.729	1.400	40.000	1.71%	-3.18%
			1910	1.429	38.705	1.400	40.000	2.07%	-3.24%
01/03/2022	2450 Head	20.2	2300	1.742	39.958	1.670	39.500	4.31%	1.16%
			2310	1.750	39.941	1.679	39.480	4.23%	1.17%
			2320	1.758	39.928	1.687	39.460	4.21%	1.19%
			2400	1.820	39.802	1.756	39.289	3.64%	1.31%
			2450	1.860	39.716	1.800	39.200	3.33%	1.32%
			2480	1.885	39.660	1.833	39.162	2.84%	1.27%
			2500	1.901	39.631	1.855	39.136	2.48%	1.26%
			2510	1.909	39.619	1.866	39.123	2.30%	1.27%
			2535	1.929	39.571	1.893	39.092	1.90%	1.23%
			2550	1.942	39.536	1.909	39.073	1.73%	1.18%
			2560	1.951	39.517	1.920	39.060	1.61%	1.17%
			2600	1.983	39.463	1.964	39.009	0.97%	1.16%
			2650	2.024	39.354	2.018	38.945	0.30%	1.05%
			2680	2.049	39.316	2.051	38.907	-0.10%	1.05%
			2700	2.062	39.283	2.073	38.882	-0.53%	1.03%
01/05/2022	2450 Head	22.0	2300	1.730	39.134	1.670	39.500	3.59%	-0.93%
			2310	1.738	39.120	1.679	39.480	3.51%	-0.91%
			2320	1.746	39.107	1.687	39.460	3.50%	-0.89%
			2400	1.808	38.994	1.756	39.289	2.96%	-0.75%
			2450	1.847	38.921	1.800	39.200	2.61%	-0.71%
			2480	1.870	38.876	1.833	39.162	2.02%	-0.73%
			2500	1.885	38.839	1.855	39.136	1.62%	-0.76%
			2510	1.893	38.821	1.866	39.123	1.45%	-0.77%
			2535	1.914	38.780	1.893	39.092	1.11%	-0.80%
			2550	1.927	38.761	1.909	39.073	0.94%	-0.80%
			2560	1.935	38.747	1.920	39.060	0.78%	-0.80%
			2600	1.966	38.685	1.964	39.009	0.10%	-0.83%
			2650	2.006	38.599	2.018	38.945	-0.59%	-0.89%
			2680	2.030	38.561	2.051	38.907	-1.02%	-0.89%
			2700	2.045	38.537	2.073	38.882	-1.35%	-0.89%

Table 10-2
Measured Head Tissue Properties (Cont.)

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
01/03/2022	5200-5800 Head	21.2	5180	4.658	36.239	4.635	36.009	0.50%	0.64%
			5190	4.666	36.219	4.645	35.998	0.45%	0.61%
			5200	4.673	36.204	4.655	35.986	0.39%	0.61%
			5210	4.686	36.194	4.666	35.975	0.43%	0.61%
			5220	4.699	36.164	4.676	35.963	0.49%	0.56%
			5240	4.722	36.108	4.696	35.940	0.55%	0.47%
			5250	4.732	36.090	4.706	35.929	0.55%	0.45%
			5260	4.746	36.087	4.717	35.917	0.61%	0.47%
			5270	4.760	36.056	4.727	35.906	0.70%	0.42%
			5280	4.772	36.028	4.737	35.894	0.74%	0.37%
			5290	4.782	36.012	4.748	35.883	0.72%	0.36%
			5300	4.794	36.004	4.758	35.871	0.76%	0.37%
			5310	4.808	35.998	4.768	35.860	0.84%	0.38%
			5320	4.822	35.970	4.778	35.849	0.92%	0.34%
			5500	5.029	35.629	4.963	35.643	1.33%	-0.04%
			5510	5.042	35.611	4.973	35.632	1.39%	-0.06%
			5520	5.056	35.590	4.983	35.620	1.46%	-0.08%
			5530	5.070	35.574	4.994	35.609	1.52%	-0.10%
			5540	5.085	35.560	5.004	35.597	1.62%	-0.10%
			5550	5.100	35.550	5.014	35.586	1.72%	-0.10%
			5560	5.114	35.536	5.024	35.574	1.79%	-0.11%
			5580	5.133	35.499	5.045	35.551	1.74%	-0.15%
			5600	5.153	35.455	5.065	35.529	1.74%	-0.21%
			5610	5.167	35.429	5.076	35.518	1.79%	-0.25%
			5620	5.181	35.406	5.086	35.506	1.87%	-0.28%
			5640	5.207	35.366	5.106	35.483	1.98%	-0.33%
			5660	5.235	35.345	5.127	35.460	2.11%	-0.32%
			5670	5.245	35.343	5.137	35.449	2.10%	-0.30%
			5680	5.255	35.334	5.147	35.437	2.10%	-0.29%
			5690	5.266	35.316	5.158	35.426	2.09%	-0.31%
			5700	5.278	35.294	5.168	35.414	2.13%	-0.34%
			5710	5.289	35.268	5.178	35.403	2.14%	-0.38%
			5720	5.301	35.247	5.188	35.391	2.18%	-0.41%
			5745	5.334	35.187	5.214	35.363	2.30%	-0.50%
			5750	5.340	35.178	5.219	35.357	2.32%	-0.51%
			5755	5.346	35.172	5.224	35.351	2.34%	-0.51%
			5765	5.358	35.166	5.234	35.340	2.37%	-0.49%
			5775	5.368	35.162	5.245	35.329	2.35%	-0.47%
			5785	5.380	35.150	5.255	35.317	2.38%	-0.47%
			5795	5.392	35.129	5.265	35.305	2.41%	-0.50%
			5800	5.399	35.118	5.270	35.300	2.45%	-0.52%
			5800	5.399	35.118	5.270	35.300	2.45%	-0.52%
			5805	5.403	35.104	5.275	35.294	2.43%	-0.54%
			5825	5.416	35.068	5.296	35.271	2.27%	-0.58%
			5835	5.428	35.038	5.305	35.230	2.32%	-0.54%
			5845	5.443	35.010	5.315	35.210	2.41%	-0.57%
			5855	5.458	34.990	5.325	35.197	2.50%	-0.59%
			5865	5.470	34.978	5.336	35.190	2.51%	-0.60%
			5865	5.470	34.978	5.336	35.190	2.51%	-0.60%
			5865	5.470	34.978	5.336	35.190	2.51%	-0.60%
			5865	5.470	34.978	5.336	35.190	2.51%	-0.60%
			5875	5.485	34.966	5.347	35.183	2.58%	-0.62%
			5885	5.498	34.944	5.357	35.177	2.63%	-0.66%
			5905	5.520	34.916	5.379	35.163	2.62%	-0.70%
01/11/2022	5200-5800 Head	20.1	5180	4.714	34.895	4.635	36.009	1.70%	-3.09%
			5190	4.727	34.871	4.645	35.998	1.77%	-3.13%
			5200	4.738	34.851	4.655	35.986	1.78%	-3.15%
			5210	4.750	34.834	4.666	35.975	1.80%	-3.17%
			5220	4.762	34.822	4.676	35.963	1.84%	-3.17%
			5240	4.781	34.797	4.696	35.940	1.81%	-3.18%
			5250	4.793	34.772	4.706	35.929	1.85%	-3.22%
			5260	4.804	34.750	4.717	35.917	1.84%	-3.25%
			5270	4.815	34.728	4.727	35.906	1.86%	-3.28%
			5280	4.827	34.704	4.737	35.894	1.90%	-3.32%
			5290	4.839	34.681	4.748	35.883	1.92%	-3.35%
			5300	4.850	34.663	4.758	35.871	1.93%	-3.37%
			5310	4.862	34.651	4.768	35.860	1.97%	-3.37%
			5320	4.874	34.631	4.778	35.849	2.01%	-3.40%
			5500	5.071	34.250	4.963	35.643	2.18%	-3.91%
			5510	5.084	34.224	4.973	35.632	2.23%	-3.95%
			5520	5.097	34.201	4.983	35.620	2.29%	-3.98%
			5530	5.111	34.179	4.994	35.609	2.34%	-4.02%
			5540	5.124	34.157	5.004	35.597	2.40%	-4.05%
			5550	5.137	34.135	5.014	35.586	2.45%	-4.08%
			5560	5.151	34.112	5.024	35.574	2.53%	-4.11%
			5580	5.175	34.083	5.045	35.551	2.58%	-4.13%
			5600	5.197	34.043	5.065	35.529	2.61%	-4.18%
			5610	5.209	34.019	5.076	35.518	2.62%	-4.22%
			5620	5.221	33.996	5.086	35.506	2.65%	-4.25%
			5640	5.241	33.956	5.106	35.483	2.64%	-4.30%
			5660	5.267	33.913	5.127	35.460	2.73%	-4.36%
			5670	5.281	33.900	5.137	35.449	2.80%	-4.37%
			5680	5.294	33.890	5.147	35.437	2.86%	-4.37%
			5690	5.306	33.875	5.158	35.426	2.87%	-4.38%
			5700	5.317	33.851	5.168	35.414	2.88%	-4.41%
			5710	5.330	33.830	5.178	35.403	2.94%	-4.44%
			5720	5.341	33.813	5.188	35.391	2.95%	-4.46%
			5745	5.371	33.767	5.214	35.363	3.01%	-4.51%
			5750	5.377	33.757	5.219	35.357	3.03%	-4.53%
			5755	5.382	33.747	5.224	35.351	3.02%	-4.54%
			5765	5.391	33.728	5.234	35.340	3.00%	-4.56%
			5775	5.401	33.710	5.245	35.329	2.97%	-4.58%
			5785	5.413	33.694	5.255	35.317	3.01%	-4.60%
			5795	5.426	33.672	5.265	35.305	3.06%	-4.63%
			5800	5.432	33.663	5.270	35.300	3.07%	-4.64%
			5800	5.432	33.663	5.270	35.300	3.07%	-4.64%
			5805	5.438	33.653	5.275	35.294	3.09%	-4.65%
			5825	5.463	33.617	5.296	35.271	3.15%	-4.69%
			5835	5.477	33.604	5.305	35.230	3.24%	-4.62%
			5845	5.490	33.589	5.315	35.210	3.29%	-4.60%
			5855	5.503	33.574	5.325	35.197	3.34%	-4.61%
			5865	5.513	33.561	5.336	35.190	3.32%	-4.63%
			5865	5.513	33.561	5.336	35.190	3.32%	-4.63%
			5865	5.513	33.561	5.336	35.190	3.32%	-4.63%
			5865	5.513	33.561	5.336	35.190	3.32%	-4.63%
			5875	5.523	33.543	5.347	35.183	3.29%	-4.66%
			5885	5.531	33.522	5.357	35.177	3.25%	-4.70%
			5905	5.555	33.470	5.379	35.163	3.27%	-4.81%

Table 10-3
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
01/04/2022	750 Body	21.2	680	0.971	53.852	0.958	55.804	1.36%	-3.50%
			695	0.975	53.825	0.959	55.745	1.67%	-3.44%
			700	0.977	53.814	0.959	55.726	1.88%	-3.43%
			710	0.980	53.794	0.960	55.687	2.08%	-3.40%
			725	0.985	53.760	0.961	55.629	2.50%	-3.36%
			750	0.994	53.709	0.964	55.531	3.11%	-3.28%
			770	1.002	53.677	0.965	55.453	3.83%	-3.20%
			785	1.008	53.647	0.966	55.395	4.35%	-3.16%
			800	1.013	53.621	0.967	55.336	4.76%	-3.10%
12/21/2021	835 Body	21.2	815	0.986	55.303	0.968	55.271	1.86%	0.06%
			820	0.988	55.294	0.969	55.258	1.96%	0.07%
			835	0.994	55.263	0.970	55.200	2.47%	0.11%
			850	1.001	55.232	0.988	55.154	1.32%	0.14%
12/30/2021	835 Body	22.9	815	0.999	55.883	0.968	55.271	3.20%	1.11%
			820	1.000	55.869	0.969	55.258	3.20%	1.11%
			835	1.006	55.816	0.970	55.200	3.71%	1.12%
			850	1.014	55.766	0.988	55.154	2.63%	1.11%
01/17/2022	1750 Body	21.8	1710	1.475	51.322	1.463	53.537	0.82%	-4.14%
			1720	1.486	51.284	1.469	53.511	1.16%	-4.16%
			1745	1.513	51.184	1.485	53.445	1.89%	-4.23%
			1750	1.519	51.165	1.488	53.432	2.08%	-4.24%
			1770	1.540	51.088	1.501	53.379	2.60%	-4.29%
			1790	1.561	51.017	1.514	53.326	3.10%	-4.33%
12/27/2021	1750 Body	21.0	1710	1.437	53.719	1.463	53.537	-1.78%	0.34%
			1720	1.443	53.713	1.469	53.511	-1.77%	0.38%
			1745	1.461	53.691	1.485	53.445	-1.62%	0.46%
			1750	1.465	53.685	1.488	53.432	-1.55%	0.47%
			1770	1.479	53.655	1.501	53.379	-1.47%	0.52%
			1790	1.494	53.623	1.514	53.326	-1.32%	0.56%
12/27/2021	1900 Body	23.7	1850	1.520	52.532	1.520	53.300	0.00%	-1.44%
			1860	1.531	52.492	1.520	53.300	0.72%	-1.52%
			1880	1.556	52.424	1.520	53.300	2.37%	-1.64%
			1900	1.579	52.382	1.520	53.300	3.88%	-1.72%
			1905	1.584	52.372	1.520	53.300	4.21%	-1.74%
			1910	1.589	52.361	1.520	53.300	4.54%	-1.76%
01/02/2022	2450 Body	24.0	2300	1.836	51.550	1.809	52.900	1.49%	-2.55%
			2310	1.847	51.529	1.816	52.887	1.71%	-2.57%
			2320	1.858	51.505	1.826	52.873	1.75%	-2.59%
			2400	1.945	51.308	1.902	52.767	2.26%	-2.76%
			2450	2.002	51.180	1.950	52.700	2.67%	-2.88%
			2480	2.036	51.102	1.993	52.662	2.16%	-2.96%
			2500	2.058	51.048	2.021	52.636	1.83%	-3.02%
			2510	2.070	51.021	2.035	52.623	1.72%	-3.04%
			2535	2.099	50.953	2.071	52.592	1.35%	-3.12%
			2550	2.116	50.914	2.092	52.573	1.15%	-3.16%
			2560	2.128	50.889	2.106	52.560	1.04%	-3.18%
			2600	2.174	50.773	2.163	52.509	0.51%	-3.31%
			2650	2.230	50.627	2.234	52.445	-0.18%	-3.47%
			2680	2.263	50.538	2.277	52.407	-0.61%	-3.57%
			2700	2.286	50.474	2.305	52.382	-0.82%	-3.64%
01/04/2022	2450 Body	22.1	2300	1.747	53.580	1.809	52.900	-3.43%	1.29%
			2310	1.758	53.552	1.816	52.887	-3.19%	1.26%
			2320	1.769	53.527	1.826	52.873	-3.12%	1.24%
			2400	1.858	53.340	1.902	52.767	-2.31%	1.09%
			2450	1.914	53.207	1.950	52.700	-1.85%	0.96%
			2480	1.947	53.128	1.993	52.662	-2.31%	0.88%
			2500	1.970	53.072	2.021	52.636	-2.52%	0.83%
			2510	1.981	53.044	2.035	52.623	-2.65%	0.80%
			2535	2.010	52.978	2.071	52.592	-2.95%	0.73%
			2550	2.027	52.942	2.092	52.573	-3.11%	0.70%
			2560	2.039	52.917	2.106	52.560	-3.18%	0.68%
			2600	2.084	52.811	2.163	52.509	-3.65%	0.58%
			2650	2.141	52.680	2.234	52.445	-4.16%	0.45%
			2680	2.176	52.609	2.277	52.407	-4.44%	0.39%
			2700	2.199	52.554	2.305	52.382	-4.60%	0.33%

Table 10-4
Measured Body Tissue Properties (Cont.)

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
12/27/2021	5200-5800 Body	23.0	5180	5.305	48.283	5.276	49.041	0.55%	-1.55%
			5190	5.320	48.269	5.288	49.028	0.61%	-1.55%
			5200	5.338	48.251	5.299	49.014	0.74%	-1.56%
			5210	5.352	48.223	5.311	49.001	0.77%	-1.59%
			5220	5.366	48.206	5.323	48.987	0.81%	-1.59%
			5240	5.390	48.191	5.346	48.960	0.82%	-1.57%
			5250	5.402	48.174	5.358	48.947	0.82%	-1.58%
			5260	5.412	48.141	5.369	48.933	0.80%	-1.62%
			5270	5.423	48.106	5.381	48.919	0.78%	-1.66%
			5280	5.439	48.068	5.393	48.906	0.85%	-1.71%
			5290	5.458	48.041	5.404	48.892	1.00%	-1.74%
			5300	5.476	48.017	5.416	48.879	1.11%	-1.76%
			5310	5.488	47.996	5.428	48.865	1.11%	-1.78%
			5320	5.501	47.981	5.439	48.851	1.14%	-1.78%
			5500	5.748	47.614	5.650	48.607	1.73%	-2.04%
			5510	5.761	47.586	5.661	48.594	1.77%	-2.07%
			5520	5.779	47.555	5.673	48.580	1.87%	-2.11%
			5530	5.797	47.534	5.685	48.566	1.97%	-2.12%
			5540	5.815	47.515	5.696	48.553	2.09%	-2.14%
			5550	5.831	47.503	5.708	48.539	2.15%	-2.13%
			5560	5.847	47.493	5.720	48.526	2.22%	-2.13%
			5580	5.874	47.462	5.743	48.499	2.28%	-2.14%
			5600	5.899	47.408	5.766	48.471	2.31%	-2.19%
			5610	5.915	47.387	5.778	48.458	2.37%	-2.21%
			5620	5.931	47.364	5.790	48.444	2.44%	-2.23%
			5640	5.964	47.319	5.813	48.417	2.60%	-2.27%
			5660	6.000	47.301	5.837	48.390	2.79%	-2.25%
			5670	6.015	47.294	5.848	48.376	2.86%	-2.24%
			5680	6.026	47.277	5.860	48.363	2.83%	-2.25%
			5690	6.039	47.261	5.872	48.349	2.84%	-2.25%
			5700	6.055	47.240	5.883	48.336	2.92%	-2.27%
			5710	6.071	47.218	5.895	48.322	2.99%	-2.28%
			5720	6.085	47.200	5.907	48.309	3.01%	-2.30%
			5745	6.121	47.148	5.936	48.275	3.12%	-2.33%
			5750	6.128	47.138	5.942	48.268	3.13%	-2.34%
			5755	6.137	47.130	5.947	48.261	3.19%	-2.34%
			5765	6.152	47.118	5.959	48.248	3.24%	-2.34%
			5775	6.166	47.113	5.971	48.234	3.27%	-2.32%
			5785	6.180	47.103	5.982	48.220	3.31%	-2.32%
			5795	6.195	47.085	5.994	48.207	3.35%	-2.33%
			5800	6.203	47.079	6.000	48.200	3.38%	-2.33%
			5805	6.211	47.069	6.006	48.193	3.41%	-2.33%
			5825	6.237	47.048	6.029	48.166	3.45%	-2.32%
			5835	6.250	47.030	6.042	48.130	3.44%	-2.29%
			5845	6.268	47.001	6.054	48.110	3.53%	-2.31%
			5855	6.286	46.971	6.066	48.093	3.63%	-2.33%
			5865	6.302	46.937	6.077	48.080	3.70%	-2.38%
			5875	6.318	46.923	6.088	48.067	3.78%	-2.38%
			5885	6.332	46.918	6.100	48.053	3.80%	-2.36%
			5905	6.364	46.902	6.122	48.027	3.95%	-2.34%
01/13/2022	5200-5800 Body	23.1	5180	5.304	47.760	5.276	49.041	0.53%	-2.61%
			5190	5.313	47.753	5.288	49.028	0.47%	-2.60%
			5200	5.323	47.731	5.299	49.014	0.45%	-2.62%
			5210	5.334	47.704	5.311	49.001	0.43%	-2.65%
			5220	5.352	47.680	5.323	48.987	0.54%	-2.67%
			5240	5.391	47.613	5.346	48.960	0.84%	-2.75%
			5250	5.405	47.585	5.358	48.947	0.88%	-2.78%
			5260	5.419	47.572	5.369	48.933	0.93%	-2.78%
			5270	5.433	47.568	5.381	48.919	0.97%	-2.76%
			5280	5.448	47.557	5.393	48.906	1.02%	-2.76%
			5290	5.461	47.554	5.404	48.892	1.05%	-2.74%
			5300	5.478	47.559	5.416	48.879	1.14%	-2.70%
			5310	5.492	47.551	5.428	48.865	1.16%	-2.69%
			5320	5.508	47.532	5.439	48.851	1.27%	-2.70%
			5500	5.781	47.240	5.650	48.607	2.32%	-2.81%
			5510	5.799	47.229	5.661	48.594	2.44%	-2.81%
			5520	5.817	47.217	5.673	48.580	2.54%	-2.81%
			5530	5.832	47.206	5.685	48.566	2.59%	-2.80%
			5540	5.844	47.190	5.696	48.553	2.60%	-2.81%
			5550	5.857	47.180	5.708	48.539	2.61%	-2.80%
			5560	5.872	47.169	5.720	48.526	2.66%	-2.80%
			5580	5.902	47.130	5.743	48.499	2.77%	-2.82%
			5600	5.929	47.083	5.766	48.471	2.83%	-2.86%
			5610	5.945	47.064	5.778	48.458	2.89%	-2.88%
			5620	5.961	47.053	5.790	48.444	2.95%	-2.87%
			5640	5.988	47.031	5.813	48.417	3.01%	-2.86%
			5660	6.012	46.986	5.837	48.390	3.00%	-2.90%
			5670	6.026	46.975	5.848	48.376	3.04%	-2.90%
			5680	6.038	46.966	5.860	48.363	3.04%	-2.89%
			5690	6.051	46.949	5.872	48.349	3.05%	-2.90%
			5700	6.064	46.921	5.883	48.336	3.08%	-2.93%
			5710	6.078	46.896	5.895	48.322	3.10%	-2.95%
			5720	6.091	46.877	5.907	48.309	3.11%	-2.96%
			5745	6.131	46.834	5.936	48.275	3.29%	-2.98%
			5750	6.138	46.826	5.942	48.268	3.30%	-2.99%
			5755	6.144	46.817	5.947	48.261	3.31%	-2.99%
			5765	6.154	46.800	5.959	48.248	3.27%	-3.00%
			5775	6.163	46.780	5.971	48.234	3.22%	-3.01%
			5785	6.174	46.762	5.982	48.220	3.21%	-3.02%
			5795	6.185	46.742	5.994	48.207	3.19%	-3.04%
			5800	6.190	46.731	6.000	48.200	3.17%	-3.05%
			5805	6.195	46.720	6.006	48.193	3.15%	-3.06%
			5825	6.227	46.658	6.029	48.166	3.28%	-3.13%
			5835	6.242	46.632	6.042	48.130	3.31%	-3.11%
			5845	6.256	46.614	6.054	48.110	3.34%	-3.11%
			5855	6.270	46.590	6.066	48.093	3.36%	-3.13%
			5865	6.285	46.570	6.077	48.080	3.42%	-3.14%
			5875	6.297	46.558	6.088	48.067	3.43%	-3.14%
			5885	6.309	46.547	6.100	48.053	3.43%	-3.13%
			5905	6.331	46.477	6.122	48.027	3.41%	-3.23%

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 Appendix H.

Table 10-5
System Verification Results – 1g Head

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 SAR1g (W/kg)	1W Target SAR1g (W/kg)	1W Normalized SAR 1g (W/kg)	Deviation1g (%)
K4	750	HEAD	01/04/2022	20.5	19.9	0.20	1046	7640	1.690	8.59	8.450	-1.63%
K4	835	HEAD	12/22/2021	20.7	21.5	0.20	4d119	7640	2.040	9.64	10.200	5.81%
K4	835	HEAD	12/30/2021	20.4	20.0	0.20	4d119	7640	2.060	9.64	10.300	6.85%
A	1750	HEAD	12/21/2021	22.3	22.1	0.10	1148	7406	3.500	35.90	35.000	-2.51%
A	1900	HEAD	12/26/2021	22.7	21.5	0.10	5d080	7406	4.210	40.50	42.100	3.95%
B	2450	HEAD	01/03/2022	20.5	20.5	0.10	719	7660	5.100	55.00	51.000	-7.27%
B	2450	HEAD	01/05/2022	22.8	22.0	0.10	719	7660	5.130	55.00	51.300	-6.73%
B	2600	HEAD	01/03/2022	20.5	20.5	0.10	1004	7660	5.710	57.80	57.100	-1.21%
J	5250	HEAD	01/03/2022	20.1	21.0	0.05	1191	7668	3.780	79.60	75.600	-5.03%
J	5600	HEAD	01/03/2022	20.1	21.0	0.05	1191	7668	4.080	82.10	81.600	-0.61%
J	5750	HEAD	01/03/2022	20.1	21.0	0.05	1191	7668	3.720	78.20	74.400	-4.86%
B	5800	HEAD	01/11/2022	22.1	20.1	0.05	1191	7552	3.840	79.20	76.800	-3.03%

Table 10-6
System Verification Results – 1g 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 SAR1g (W/kg)	1W Target SAR1g (W/kg)	1W Normalized SAR 1g (W/kg)	Deviation1g (%)
K1	750	BODY	01/04/2022	22.6	22.3	0.20	1034	7558	1.830	8.91	9.150	2.69%
K3	835	BODY	12/21/2021	21.8	21.6	0.20	4d119	7637	2.090	9.90	10.450	5.56%
K3	835	BODY	12/30/2021	22.0	22.2	0.20	4d119	7637	2.050	9.90	10.250	3.54%
G	1750	BODY	12/27/2021	22.4	21.0	0.10	1148	7357	3.670	36.30	36.700	1.10%
D	1750	BODY	01/17/2022	22.1	20.2	0.10	1008	7571	3.830	37.80	38.300	1.32%
P	1900	BODY	12/27/2021	23.6	23.7	0.10	5d080	7410	3.980	40.70	39.800	-2.21%
K	2450	BODY	01/02/2022	22.0	24.0	0.10	719	3914	5.180	52.00	51.800	-0.38%
K	2450	BODY	01/04/2022	22.4	22.1	0.10	981	3914	4.870	50.30	48.700	-3.18%
K	2600	BODY	01/04/2022	22.4	22.1	0.10	1071	3914	5.330	54.30	53.300	-1.84%
J	5250	BODY	12/27/2021	20.3	21.0	0.05	1191	7668	3.430	74.10	68.600	-7.42%
J	5600	BODY	12/27/2021	20.3	21.0	0.05	1191	7668	3.800	76.90	76.000	-1.17%
J	5750	BODY	12/27/2021	20.3	21.0	0.05	1191	7668	3.480	74.40	69.600	-6.45%
B	5800	BODY	01/13/2022	23.5	21.3	0.05	1191	7552	3.710	73.50	74.200	0.95%

Table 10-7
System Verification Results – 10g

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 SAR10g (W/kg)	1W Target SAR10g (W/kg)	1W Normalized SAR10g (W/kg)	Deviation10g (%)
G	1750	BODY	12/27/2021	22.4	21.0	0.10	1148	7357	1.970	19.30	19.700	2.07%
P	1900	BODY	12/27/2021	23.6	23.7	0.10	5d080	7410	2.040	21.40	20.400	-4.67%
K	2450	BODY	01/04/2022	22.4	22.1	0.10	981	3914	2.220	23.70	22.200	-6.33%
K	2600	BODY	01/04/2022	22.4	22.1	0.10	1071	3914	2.330	24.10	23.300	-3.32%
J	5250	BODY	12/27/2021	20.3	21.0	0.05	1191	7668	0.958	20.80	19.160	-7.88%
J	5600	BODY	12/27/2021	20.3	21.0	0.05	1191	7668	1.050	21.30	21.000	-1.41%
J	5750	BODY	12/27/2021	20.3	21.0	0.05	1191	7668	0.982	20.70	19.640	-5.12%
B	5800	BODY	01/13/2022	23.5	21.3	0.05	1191	7552	1.050	20.20	21.000	3.96%

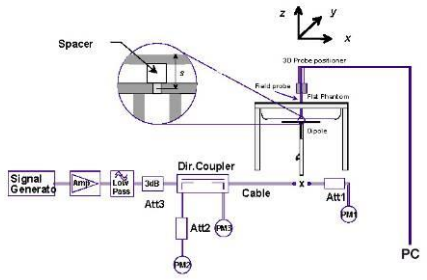


Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GSM 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.0	32.10	0.08	Right	Cheek	A	0110M	1:8.3	0.081	1.230	0.100	
836.60	190	GSM 850	GSM	33.0	32.10	0.17	Right	Tilt	A	0110M	1:8.3	0.056	1.230	0.069	
836.60	190	GSM 850	GSM	33.0	32.10	0.05	Left	Cheek	A	0110M	1:8.3	0.114	1.230	0.140	A1
836.60	190	GSM 850	GSM	33.0	32.10	-0.02	Left	Tilt	A	0110M	1:8.3	0.059	1.230	0.073	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-2
GSM 1900 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1909.80	810	GSM 1900	GSM	30.0	29.12	0.20	Right	Cheek	A	0114M	1:8.3	0.035	1.225	0.043	
1909.80	810	GSM 1900	GSM	30.0	29.12	-0.14	Right	Tilt	A	0114M	1:8.3	0.009	1.225	0.011	
1909.80	810	GSM 1900	GSM	30.0	29.12	-0.07	Left	Cheek	A	0114M	1:8.3	0.041	1.225	0.050	A2
1909.80	810	GSM 1900	GSM	30.0	29.12	0.14	Left	Tilt	A	0114M	1:8.3	0.016	1.225	0.020	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-3
UMTS 850 Head SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
826.40	4132	UMTS 850	RMC	24.0	23.31	2	0.08	Right	Cheek	A	0110M	1:1	0.116	1.172	0.136	
826.40	4132	UMTS 850	RMC	24.0	23.31	2	0.12	Right	Tilt	A	0110M	1:1	0.068	1.172	0.080	
826.40	4132	UMTS 850	RMC	24.0	23.31	2	0.05	Left	Cheek	A	0110M	1:1	0.144	1.172	0.169	A3
826.40	4132	UMTS 850	RMC	24.0	23.31	2	0.01	Left	Tilt	A	0110M	1:1	0.071	1.172	0.083	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-4
LTE Band 12 Head SAR

MEASUREMENT RESULTS																						
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	MPR [dB]	Side	Test Position	Antenna Config.	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																				
707.50	23095	Mid	LTE Band 12	10	24.0	22.86	108	0.03	0	Right	Cheek	A	QPSK	1	0	0132M	1:1	0.075	1.300	0.098	
707.50	23095	Mid	LTE Band 12	10	23.0	21.86	108	0.12	1	Right	Cheek	A	QPSK	25	12	0132M	1:1	0.068	1.300	0.088	
707.50	23095	Mid	LTE Band 12	10	24.0	22.86	108	0.17	0	Right	Tilt	A	QPSK	1	0	0132M	1:1	0.037	1.300	0.048	
707.50	23095	Mid	LTE Band 12	10	23.0	21.86	108	0.15	1	Right	Tilt	A	QPSK	25	12	0132M	1:1	0.034	1.300	0.044	
707.50	23095	Mid	LTE Band 12	10	24.0	22.86	108	0.11	0	Left	Cheek	A	QPSK	1	0	0132M	1:1	0.093	1.300	0.121	A4
707.50	23095	Mid	LTE Band 12	10	23.0	21.86	108	0.10	1	Left	Cheek	A	QPSK	25	12	0132M	1:1	0.082	1.300	0.107	
707.50	23095	Mid	LTE Band 12	10	24.0	22.86	108	0.18	0	Left	Tilt	A	QPSK	1	0	0132M	1:1	0.041	1.300	0.053	
707.50	23095	Mid	LTE Band 12	10	23.0	21.86	108	0.08	1	Left	Tilt	A	QPSK	25	12	0132M	1:1	0.037	1.300	0.048	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-5
LTE Band 13 Head SAR

MEASUREMENT RESULTS																						
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	MPR [dB]	Side	Test Position	Antenna Config.	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																				
782.00	23230	Mid	LTE Band 13	10	24.0	22.91	1	0.02	0	Right	Cheek	A	QPSK	1	0	0132M	1:1	0.137	1.285	0.176	
782.00	23230	Mid	LTE Band 13	10	23.0	21.87	1	0.06	1	Right	Cheek	A	QPSK	25	0	0132M	1:1	0.108	1.297	0.140	
782.00	23230	Mid	LTE Band 13	10	24.0	22.91	1	0.20	0	Right	Tilt	A	QPSK	1	0	0132M	1:1	0.076	1.285	0.098	
782.00	23230	Mid	LTE Band 13	10	23.0	21.87	1	0.09	1	Right	Tilt	A	QPSK	25	0	0132M	1:1	0.059	1.297	0.077	
782.00	23230	Mid	LTE Band 13	10	24.0	22.91	1	0.19	0	Left	Cheek	A	QPSK	1	0	0132M	1:1	0.171	1.285	**0.220**	A5
782.00	23230	Mid	LTE Band 13	10	23.0	21.87	1	0.06	1	Left	Cheek	A	QPSK	25	0	0132M	1:1	0.127	1.297	0.165	
782.00	23230	Mid	LTE Band 13	10	24.0	22.91	1	0.00	0	Left	Tilt	A	QPSK	1	0	0132M	1:1	0.074	1.285	0.095	
782.00	23230	Mid	LTE Band 13	10	23.0	21.87	1	0.07	1	Left	Tilt	A	QPSK	25	0	0132M	1:1	0.056	1.297	0.073	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-6
LTE Band 5 (Cell) Head SAR

MEASUREMENT RESULTS																						
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	MPR [dB]	Side	Test Position	Antenna Config.	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																				
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.91	116	0.07	0	Right	Cheek	A	QPSK	1	0	0110M	1:1	0.099	1.285	0.127	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	21.86	116	0.18	1	Right	Cheek	A	QPSK	25	25	0110M	1:1	0.073	1.300	0.095	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.91	116	0.17	0	Right	Tilt	A	QPSK	1	0	0110M	1:1	0.060	1.285	0.077	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	21.86	116	0.12	1	Right	Tilt	A	QPSK	25	25	0110M	1:1	0.048	1.300	0.062	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.91	116	0.03	0	Left	Cheek	A	QPSK	1	0	0110M	1:1	0.137	1.285	0.176	A6
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	21.86	116	0.11	1	Left	Cheek	A	QPSK	25	25	0110M	1:1	0.108	1.300	0.140	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.91	116	0.12	0	Left	Tilt	A	QPSK	1	0	0110M	1:1	0.067	1.285	0.086	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	21.86	116	0.11	1	Left	Tilt	A	QPSK	25	25	0110M	1:1	0.055	1.300	0.072	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-7
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																						
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	MPR [dB]	Side	Test Position	Antenna Config.	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	22.41	85	-0.03	0	Right	Cheek	A	QPSK	1	50	0124M	1:1	0.084	1.442	0.121	A7
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.42	85	0.00	1	Right	Cheek	A	QPSK	50	25	0124M	1:1	0.067	1.439	0.096	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	22.41	85	-0.14	0	Right	Tilt	A	QPSK	1	50	0124M	1:1	0.067	1.442	0.097	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.42	85	-0.18	1	Right	Tilt	A	QPSK	50	25	0124M	1:1	0.052	1.439	0.075	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	22.41	85	0.12	0	Left	Cheek	A	QPSK	1	50	0124M	1:1	0.053	1.442	0.076	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.42	85	0.03	1	Left	Cheek	A	QPSK	50	25	0124M	1:1	0.040	1.439	0.058	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	22.41	85	-0.19	0	Left	Tilt	A	QPSK	1	50	0124M	1:1	0.060	1.442	0.087	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.42	85	-0.10	1	Left	Tilt	A	QPSK	50	25	0124M	1:1	0.043	1.439	0.062	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**	**Head** **1.6 W/kg (mW/g)** averaged over 1 gram

Table 11-8
LTE Band 41 Head SAR

MEASUREMENT RESULTS																							
1 CC Uplink | 2 CC Uplink	Component Carrier	FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Antenna Config.	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
		MHz	Ch.																(W/kg)		(W/kg)	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	0.05	0	Right	Cheek	B	QPSK	1	50	0095M	1:1.58	0.017	1.303	0.022	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.0	22.82	0.14	1	Right	Cheek	B	QPSK	50	25	0095M	1:1.58	0.011	1.312	0.014	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	-0.12	0	Right	Tilt	B	QPSK	1	50	0095M	1:1.58	0.006	1.303	0.008	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.0	22.82	0.11	1	Right	Tilt	B	QPSK	50	25	0095M	1:1.58	0.006	1.312	0.008	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.44	0.04	0	Left	Cheek	B	QPSK	1	0	0095M	1:1.58	0.020	1.432	0.029	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	0.13	0	Left	Cheek	B	QPSK	1	50	0095M	1:1.58	0.019	1.303	0.025	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.0	22.82	-0.01	1	Left	Cheek	B	QPSK	50	25	0095M	1:1.58	0.012	1.312	0.016	
2 CC Uplink	PCC	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	-0.14	0	Left	Cheek	B	QPSK	1	0	0095M	1:1.58	0.021	1.303	0.027	A8
	SCC	2616.70	40857													99						
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	-0.05	0	Left	Tilt	B	QPSK	1	50	0095M	1:1.58	0.014	1.303	0.018	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.0	22.82	0.18	1	Left	Tilt	B	QPSK	50	25	0095M	1:1.58	0.008	1.312	0.010	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**	**Head** **1.6 W/kg (mW/g)** averaged over 1 gram

Table 11-9
DTS Head SISO SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2462	11	802.11b	DSSS	22	17.0	16.39	-0.08	Right	Cheek	1	0114M	1	99.8	0.139	0.113	1.151	1.002	0.130	
2462	11	802.11b	DSSS	22	17.0	16.39	-0.09	Right	Tilt	1	0114M	1	99.8	0.072	-	1.151	1.002	-	
2462	11	802.11b	DSSS	22	17.0	16.39	0.07	Left	Cheek	1	0114M	1	99.8	0.099	-	1.151	1.002	-	
2462	11	802.11b	DSSS	22	17.0	16.39	-0.01	Left	Tilt	1	0114M	1	99.8	0.063	-	1.151	1.002	-	
2412	1	802.11b	DSSS	22	17.0	16.47	-0.04	Right	Cheek	2	0114M	1	99.8	0.389	0.291	1.130	1.002	**0.329**	A9
2412	1	802.11b	DSSS	22	17.0	16.47	0.03	Right	Tilt	2	0114M	1	99.8	0.074	-	1.130	1.002	-	
2412	1	802.11b	DSSS	22	17.0	16.47	0.04	Left	Cheek	2	0114M	1	99.8	0.326	-	1.130	1.002	-	
2412	1	802.11b	DSSS	22	17.0	16.47	-0.13	Left	Tilt	2	0114M	1	99.8	0.042	-	1.130	1.002	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**														**Head** **1.6 W/kg (mW/g)** averaged over 1 gram					

Table 11-10
NII MIMO Head SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															W/kg	(W/kg)			(W/kg)	
5290	58	802.11ac	OFDM	80	14.0	13.02	14.0	13.83	0.12	Right	Cheek	MIMO	0114M	58.5	92.4	0.134	0.089	1.253	1.082	0.121	
5290	58	802.11ac	OFDM	80	14.0	13.02	14.0	13.83	-0.17	Right	Tilt	MIMO	0114M	58.5	92.4	0.028	-	1.253	1.082	-	
5290	58	802.11ac	OFDM	80	14.0	13.02	14.0	13.83	-0.20	Left	Cheek	MIMO	0114M	58.5	92.4	0.095	-	1.253	1.082	-	
5290	58	802.11ac	OFDM	80	14.0	13.02	14.0	13.83	-0.14	Left	Tilt	MIMO	0114M	58.5	92.4	0.039	-	1.253	1.082	-	
5530	106	802.11ac	OFDM	80	14.0	13.14	14.0	13.93	0.12	Right	Cheek	MIMO	0114M	58.5	92.4	0.277	0.161	1.219	1.082	0.212	
5530	106	802.11ac	OFDM	80	14.0	13.14	14.0	13.93	-0.17	Right	Tilt	MIMO	0114M	58.5	92.4	0.096	-	1.219	1.082	-	
5530	106	802.11ac	OFDM	80	14.0	13.14	14.0	13.93	0.21	Left	Cheek	MIMO	0114M	58.5	92.4	0.117	-	1.219	1.082	-	
5530	106	802.11ac	OFDM	80	14.0	13.14	14.0	13.93	0.14	Left	Tilt	MIMO	0114M	58.5	92.4	0.058	-	1.219	1.082	-	
5775	155	802.11ac	OFDM	80	14.0	12.92	14.0	13.31	0.12	Right	Cheek	MIMO	0114M	58.5	92.4	0.398	0.235	1.282	1.082	**0.326**	A10
5775	155	802.11ac	OFDM	80	14.0	12.92	14.0	13.31	-0.10	Right	Tilt	MIMO	0114M	58.5	92.4	0.149	-	1.282	1.082	-	
5775	155	802.11ac	OFDM	80	14.0	12.92	14.0	13.31	0.11	Left	Cheek	MIMO	0114M	58.5	92.4	0.141	-	1.282	1.082	-	
5775	155	802.11ac	OFDM	80	14.0	12.92	14.0	13.31	0.12	Left	Tilt	MIMO	0114M	58.5	92.4	0.085	-	1.282	1.082	-	
5855	171	802.11ac	OFDM	80	14.0	13.01	14.0	13.24	-0.03	Right	Cheek	MIMO	0114M	58.5	92.4	0.286	0.213	1.256	1.082	0.289	
5855	171	802.11ac	OFDM	80	14.0	13.01	14.0	13.24	-0.16	Right	Tilt	MIMO	0114M	58.5	92.4	0.096	-	1.256	1.082	-	
5855	171	802.11ac	OFDM	80	14.0	13.01	14.0	13.24	-0.17	Left	Cheek	MIMO	0114M	58.5	92.4	0.153	-	1.256	1.082	-	
5855	171	802.11ac	OFDM	80	14.0	13.01	14.0	13.24	-0.15	Left	Tilt	MIMO	0114M	58.5	92.4	0.049	-	1.256	1.082	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**																**Head** **1.6 W/kg (mW/g)** averaged over 1 gram					

Note: To achieve the 17.0 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 14.0 dBm.

Table 11-11
DSS Head SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)			(W/kg)	
2441.00	39	Bluetooth	FHSS	15.0	14.72	0.13	Right	Cheek	1	0114M	1	77.00	0.056	1.067	1.299	0.078	
2441.00	39	Bluetooth	FHSS	15.0	14.72	0.15	Right	Tilt	1	0114M	1	77.00	0.025	1.067	1.299	0.035	
2441.00	39	Bluetooth	FHSS	15.0	14.72	-0.21	Left	Cheek	1	0114M	1	77.00	0.030	1.067	1.299	0.042	
2441.00	39	Bluetooth	FHSS	15.0	14.72	0.12	Left	Tilt	1	0114M	1	77.00	0.018	1.067	1.299	0.025	
2402.00	0	Bluetooth	FHSS	15.0	14.29	0.03	Right	Cheek	2	0114M	1	77.00	0.123	1.178	1.299	**0.188**	A11
2402.00	0	Bluetooth	FHSS	15.0	14.29	-0.19	Right	Tilt	2	0114M	1	77.00	0.026	1.178	1.299	0.040	
2402.00	0	Bluetooth	FHSS	15.0	14.29	-0.06	Left	Cheek	2	0114M	1	77.00	0.087	1.178	1.299	0.133	
2402.00	0	Bluetooth	FHSS	15.0	14.29	0.13	Left	Tilt	2	0114M	1	77.00	0.017	1.178	1.299	0.026	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**	**Head** **1.6 W/kg (mW/g)** averaged over 1 gram

REV 21.4 M
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11.2 Standalone Body-Worn SAR Data

Table 11-12
GSM/UMTS Body-Worn SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.0	32.10	N/A	0.02	15 mm	A	0132M	1:8.3	back	0.142	1.230	0.175	A12
1909.80	810	GSM 1900	GSM	30.0	29.12	N/A	-0.04	15 mm	A	0115M	1:8.3	back	0.352	1.225	0.431	A14
826.40	4132	UMTS 850	RMC	24.0	23.31	116	0.02	15 mm	A	0132M	1:1	back	0.163	1.172	0.191	A16
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 11-13
LTE Body-Worn SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	MPR [dB]	Antenna Config.	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	24.0	22.86	4	-0.01	0	A	0110M	QPSK	1	0	15 mm	back	1:1	0.131	1.300	0.170	A18
707.50	23095	Mid	LTE Band 12	10	23.0	21.86	4	0.03	1	A	0110M	QPSK	25	12	15 mm	back	1:1	0.113	1.300	0.147	
782.00	23230	Mid	LTE Band 13	10	24.0	22.91	1	0.08	0	A	0110M	QPSK	1	0	15 mm	back	1:1	0.187	1.285	0.240	A20
782.00	23230	Mid	LTE Band 13	10	23.0	21.87	1	-0.03	1	A	0110M	QPSK	25	0	15 mm	back	1:1	0.152	1.297	0.197	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.91	116	0.01	0	A	0132M	QPSK	1	0	15 mm	back	1:1	0.187	1.285	0.240	A22
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	21.86	116	-0.01	1	A	0132M	QPSK	25	25	15 mm	back	1:1	0.170	1.300	0.221	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	22.41	59	0.04	0	A	0124M	QPSK	1	50	15 mm	back	1:1	0.466	1.442	**0.672**	A24
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.42	59	0.01	1	A	0124M	QPSK	50	25	15 mm	back	1:1	0.370	1.439	0.532	
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 11-14
LTE Band 41 Body-Worn SAR

MEASUREMENT RESULTS																						
1 CC Uplink | 2 CC Uplink	Component Carrier	FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Antenna Config.	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
		MHz	Ch.																(W/kg)		(W/kg)	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.44	-0.01	0	B	0095M	QPSK	1	0	15 mm	back	1:1.58	0.225	1.432	0.322	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	-0.02	0	B	0095M	QPSK	1	50	15 mm	back	1:1.58	0.245	1.303	0.319	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.0	22.82	-0.01	1	B	0095M	QPSK	50	25	15 mm	back	1:1.58	0.192	1.312	0.252	
2 CC Uplink	PCC	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	0.04	0	B	0095M	QPSK	1	0	15 mm	back	1:1.58	0.246	1.303	0.321	A26
	SCC	2616.70	40857												99							
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 11-15
DTS SISO Body-Worn SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2462	11	802.11b	DSSS	22	20.5	20.49	-0.06	15 mm	1	0114M	1	back	99.8	0.046	0.026	1.002	1.002	0.026	
2462	11	802.11b	DSSS	22	20.5	20.45	-0.01	15 mm	2	0114M	1	back	99.8	0.218	0.185	1.012	1.002	**0.188**	A28
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 11-16
DTS MIMO Body-Worn SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															W/kg	(W/kg)			(W/kg)	
2437	6	802.11n	OFDM	20	18.5	17.96	18.5	18.48	-0.06	15 mm	MIMO	0114M	13	back	98.0	0.120	0.104	1.132	1.020	0.120	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram											

Note: To achieve the 21.5 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 18.5 dBm.

Table 11-17
NII MIMO Body-Worn SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															W/kg	(W/kg)			(W/kg)	
5290	58	802.11ac	OFDM	80	15.5	14.05	15.5	14.74	-0.13	15 mm	MIMO	0114M	58.5	back	92.4	0.236	0.179	1.396	1.082	0.270	
5610	122	802.11ac	OFDM	80	15.5	14.74	15.5	15.49	0.08	15 mm	MIMO	0114M	58.5	back	92.4	0.307	0.250	1.191	1.082	**0.322**	A30
5775	155	802.11ac	OFDM	80	15.5	15.01	15.5	15.49	0.12	15 mm	MIMO	0114M	58.5	back	92.4	0.253	0.183	1.119	1.082	0.222	
5855	171	802.11ac	OFDM	80	15.5	14.99	15.5	14.92	-0.05	15 mm	MIMO	0114M	58.5	back	92.4	0.166	0.130	1.143	1.082	0.161	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram											

Note: To achieve the 18.5 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 15.5 dBm.

Table 11-18
DSS Body-Worn SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)			(W/kg)	
2441	39	Bluetooth	FHSS	18.0	17.47	0.19	15 mm	1	0095M	1	back	77	0.005	1.130	1.299	0.007	
2441	39	Bluetooth	FHSS	17.5	16.73	0.02	15 mm	2	0095M	1	back	77.00	0.041	1.194	1.299	**0.064**	A32
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram									

11.3 Standalone Hotspot SAR Data

Table 11-19
GPRS Hotspot SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
836.60	190	GSM 850	GPRS	30.5	30.44	0.03	10 mm	A	0132M	3	1:2.76	back	0.295	1.014	0.299	A13
836.60	190	GSM 850	GPRS	30.5	30.44	-0.01	10 mm	A	0132M	3	1:2.76	front	0.187	1.014	0.190	
836.60	190	GSM 850	GPRS	30.5	30.44	0.03	10 mm	A	0132M	3	1:2.76	bottom	0.110	1.014	0.112	
836.60	190	GSM 850	GPRS	30.5	30.44	-0.09	10 mm	A	0132M	3	1:2.76	right	0.059	1.014	0.060	
836.60	190	GSM 850	GPRS	30.5	30.44	0.04	10 mm	A	0132M	3	1:2.76	left	0.108	1.014	0.110	
1909.80	810	GSM 1900	GPRS	22.0	20.51	-0.06	10 mm	A	0115M	4	1:2.076	back	0.396	1.409	0.558	
1909.80	810	GSM 1900	GPRS	22.0	20.51	-0.05	10 mm	A	0115M	4	1:2.076	front	0.304	1.409	0.428	
1850.20	512	GSM 1900	GPRS	22.0	20.02	-0.05	10 mm	A	0115M	4	1:2.076	bottom	0.504	1.578	0.795	
1880.00	661	GSM 1900	GPRS	22.0	20.27	0.01	10 mm	A	0115M	4	1:2.076	bottom	0.589	1.489	0.877	
1909.80	810	GSM 1900	GPRS	22.0	20.51	0.00	10 mm	A	0115M	4	1:2.076	bottom	0.662	1.409	0.933	A15
1909.80	810	GSM 1900	GPRS	22.0	20.51	0.14	10 mm	A	0115M	4	1:2.076	right	0.036	1.409	0.051	
1909.80	810	GSM 1900	GPRS	22.0	20.51	-0.04	10 mm	A	0115M	4	1:2.076	left	0.025	1.409	0.035	
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 11-20
UMTS Hotspot SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
826.40	4132	UMTS 850	RMC	24.0	23.31	116	0.02	10 mm	A	0132M	1:1	back	0.337	1.172	0.395	A17
826.40	4132	UMTS 850	RMC	24.0	23.31	116	0.03	10 mm	A	0132M	1:1	front	0.214	1.172	0.251	
826.40	4132	UMTS 850	RMC	24.0	23.31	116	-0.05	10 mm	A	0132M	1:1	bottom	0.122	1.172	0.143	
826.40	4132	UMTS 850	RMC	24.0	23.31	116	-0.03	10 mm	A	0132M	1:1	right	0.107	1.172	0.125	
826.40	4132	UMTS 850	RMC	24.0	23.31	116	0.02	10 mm	A	0132M	1:1	left	0.186	1.172	0.218	
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 11-21
LTE Band 12 Hotspot SAR

MEASUREMENT RESULTS																						
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	MPR [dB]	Antenna Config.	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	24.0	22.86	4	-0.06	0	A	0110M	QPSK	1	0	10 mm	back	1:1	0.222	1.300	0.289	A19
707.50	23095	Mid	LTE Band 12	10	23.0	21.86	4	-0.02	1	A	0110M	QPSK	25	12	10 mm	back	1:1	0.185	1.300	0.241	
707.50	23095	Mid	LTE Band 12	10	24.0	22.86	4	-0.03	0	A	0110M	QPSK	1	0	10 mm	front	1:1	0.164	1.300	0.213	
707.50	23095	Mid	LTE Band 12	10	23.0	21.86	4	-0.01	1	A	0110M	QPSK	25	12	10 mm	front	1:1	0.139	1.300	0.181	
707.50	23095	Mid	LTE Band 12	10	24.0	22.86	4	0.04	0	A	0110M	QPSK	1	0	10 mm	bottom	1:1	0.082	1.300	0.107	
707.50	23095	Mid	LTE Band 12	10	23.0	21.86	4	0.03	1	A	0110M	QPSK	25	12	10 mm	bottom	1:1	0.070	1.300	0.091	
707.50	23095	Mid	LTE Band 12	10	24.0	22.86	4	0.05	0	A	0110M	QPSK	1	0	10 mm	right	1:1	0.130	1.300	0.169	
707.50	23095	Mid	LTE Band 12	10	23.0	21.86	4	0.03	1	A	0110M	QPSK	25	12	10 mm	right	1:1	0.103	1.300	0.134	
707.50	23095	Mid	LTE Band 12	10	24.0	22.86	4	0.03	0	A	0110M	QPSK	1	0	10 mm	left	1:1	0.124	1.300	0.161	
707.50	23095	Mid	LTE Band 12	10	23.0	21.86	4	0.03	1	A	0110M	QPSK	25	12	10 mm	left	1:1	0.108	1.300	0.140	
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 11-22
LTE Band 13 Hotspot SAR

MEASUREMENT RESULTS																						
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	MPR [dB]	Antenna Config.	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
782.00	23230	Mid	LTE Band 13	10	24.0	22.91	1	-0.02	0	A	0110M	QPSK	1	0	10 mm	back	1:1	0.326	1.285	0.419	A21
782.00	23230	Mid	LTE Band 13	10	23.0	21.87	1	-0.01	1	A	0110M	QPSK	25	0	10 mm	back	1:1	0.266	1.297	0.345	
782.00	23230	Mid	LTE Band 13	10	24.0	22.91	1	-0.01	0	A	0110M	QPSK	1	0	10 mm	front	1:1	0.237	1.285	0.305	
782.00	23230	Mid	LTE Band 13	10	23.0	21.87	1	-0.01	1	A	0110M	QPSK	25	0	10 mm	front	1:1	0.190	1.297	0.246	
782.00	23230	Mid	LTE Band 13	10	24.0	22.91	1	-0.03	0	A	0110M	QPSK	1	0	10 mm	bottom	1:1	0.162	1.285	0.208	
782.00	23230	Mid	LTE Band 13	10	23.0	21.87	1	0.02	1	A	0110M	QPSK	25	0	10 mm	bottom	1:1	0.131	1.297	0.170	
782.00	23230	Mid	LTE Band 13	10	24.0	22.91	1	-0.03	0	A	0110M	QPSK	1	0	10 mm	right	1:1	0.087	1.285	0.112	
782.00	23230	Mid	LTE Band 13	10	23.0	21.87	1	0.01	1	A	0110M	QPSK	25	0	10 mm	right	1:1	0.068	1.297	0.088	
782.00	23230	Mid	LTE Band 13	10	24.0	22.91	1	0.01	0	A	0110M	QPSK	1	0	10 mm	left	1:1	0.207	1.285	0.266	
782.00	23230	Mid	LTE Band 13	10	23.0	21.87	1	0.00	1	A	0110M	QPSK	25	0	10 mm	left	1:1	0.159	1.297	0.206	
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 11-23
LTE Band 5 (Cell) Hotspot SAR

MEASUREMENT RESULTS																						
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	MPR [dB]	Antenna Config.	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.91	116	0.01	0	A	0132M	QPSK	1	0	10 mm	back	1:1	0.405	1.285	0.520	A23
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	21.86	116	0.00	1	A	0132M	QPSK	25	25	10 mm	back	1:1	0.359	1.300	0.467	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.91	116	0.04	0	A	0132M	QPSK	1	0	10 mm	front	1:1	0.226	1.285	0.290	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	21.86	116	0.01	1	A	0132M	QPSK	25	25	10 mm	front	1:1	0.204	1.300	0.265	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.91	116	0.01	0	A	0132M	QPSK	1	0	10 mm	bottom	1:1	0.125	1.285	0.161	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	21.86	116	-0.02	1	A	0132M	QPSK	25	25	10 mm	bottom	1:1	0.109	1.300	0.142	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.91	116	0.06	0	A	0132M	QPSK	1	0	10 mm	right	1:1	0.071	1.285	0.091	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	21.86	116	0.09	1	A	0132M	QPSK	25	25	10 mm	right	1:1	0.059	1.300	0.077	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.91	116	0.06	0	A	0132M	QPSK	1	0	10 mm	left	1:1	0.110	1.285	0.141	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	21.86	116	0.07	1	A	0132M	QPSK	25	25	10 mm	left	1:1	0.094	1.300	0.122	
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 11-24
LTE Band 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																						
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	MPR [dB]	Antenna Config.	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.57	59	-0.02	0	A	0124M	QPSK	1	50	10 mm	back	1:1	0.321	1.390	0.446	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.63	59	0.01	0	A	0124M	QPSK	50	25	10 mm	back	1:1	0.327	1.371	0.448	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.57	59	0.00	0	A	0124M	QPSK	1	50	10 mm	front	1:1	0.278	1.390	0.386	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.63	59	0.00	0	A	0124M	QPSK	50	25	10 mm	front	1:1	0.278	1.371	0.381	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.57	59	-0.01	0	A	0124M	QPSK	1	50	10 mm	bottom	1:1	0.745	1.390	**1.036**	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.63	59	0.00	0	A	0124M	QPSK	50	25	10 mm	bottom	1:1	0.751	1.371	1.030	A25
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.52	59	0.00	0	A	0124M	QPSK	100	0	10 mm	bottom	1:1	0.741	1.406	**1.042**	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.57	59	0.15	0	A	0124M	QPSK	1	50	10 mm	right	1:1	0.079	1.390	0.110	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.63	59	-0.05	0	A	0124M	QPSK	50	25	10 mm	right	1:1	0.078	1.371	0.107	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.57	59	-0.02	0	A	0124M	QPSK	1	50	10 mm	left	1:1	0.052	1.390	0.072	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.63	59	0.17	0	A	0124M	QPSK	50	25	10 mm	left	1:1	0.045	1.371	0.062	
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 11-25
LTE Band 41 Hotspot SAR

MEASUREMENT RESULTS																						
1 CC Uplink | 2 CC Uplink	Component Carrier	FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Antenna Config.	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
		MHz	Ch.																(W/kg)		(W/kg)	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	-0.01	0	B	0095M	QPSK	1	50	10 mm	back	1:1.58	0.200	1.274	0.255	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	-0.05	0	B	0095M	QPSK	50	25	10 mm	back	1:1.58	0.202	1.274	0.257	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	0.00	0	B	0095M	QPSK	1	50	10 mm	front	1:1.58	0.161	1.274	0.205	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	0.04	0	B	0095M	QPSK	50	25	10 mm	front	1:1.58	0.165	1.274	0.210	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	-0.13	0	B	0095M	QPSK	1	50	10 mm	bottom	1:1.58	0.263	1.274	0.335	A27
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.59	0.01	0	B	0095M	QPSK	1	99	10 mm	bottom	1:1.58	0.234	1.384	0.324	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	0.18	0	B	0095M	QPSK	50	25	10 mm	bottom	1:1.58	0.262	1.274	0.334	
2 CC Uplink	PCC	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.71	-0.04	0	B	0095M	QPSK	1	99	10 mm	bottom	1:1.58	0.239	1.346	0.322	
	SCC	2656.30	41253												0							
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	0.12	0	B	0095M	QPSK	1	50	10 mm	right	1:1.58	0.112	1.274	0.143	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	0.07	0	B	0095M	QPSK	50	25	10 mm	right	1:1.58	0.117	1.274	0.149	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT	Body
Spatial Peak	1.6 W/kg (mW/g)
Uncontrolled Exposure/General Population	averaged over 1 gram

Table 11-26
DTS SISO WLAN Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2462	11	802.11b	DSSS	22	20.5	20.49	-0.13	10 mm	1	0114M	1	back	99.8	0.094	0.079	1.002	1.002	0.079	
2462	11	802.11b	DSSS	22	20.5	20.49	0.00	10 mm	1	0114M	1	front	99.8	0.061	-	1.002	1.002	-	
2462	11	802.11b	DSSS	22	20.5	20.49	0.12	10 mm	1	0114M	1	top	99.8	0.050	-	1.002	1.002	-	
2462	11	802.11b	DSSS	22	20.5	20.49	0.13	10 mm	1	0114M	1	left	99.8	0.052	-	1.002	1.002	-	
2462	11	802.11b	DSSS	22	20.5	20.45	0.01	10 mm	2	0114M	1	back	99.8	0.402	0.356	1.012	1.002	0.361	
2462	11	802.11b	DSSS	22	20.5	20.45	-0.01	10 mm	2	0114M	1	front	99.8	0.240	-	1.012	1.002	-	
2462	11	802.11b	DSSS	22	20.5	20.45	-0.01	10 mm	2	0114M	1	left	99.8	0.696	0.517	1.012	1.002	**0.524**	A29

ANSI / IEEE C95.1 1992 - SAFETY LIMIT	Body
Spatial Peak	1.6 W/kg (mW/g)
Uncontrolled Exposure/General Population	averaged over 1 gram

Table 11-27
DTS MIMO WLAN Hotspot SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															W/kg	(W/kg)			(W/kg)	
2437	6	802.11n	OFDM	20	18.5	17.96	18.5	18.48	0.05	10 mm	MIMO	0114M	13	back	98.0	0.245	-	1.132	1.020	-	
2437	6	802.11n	OFDM	20	18.5	17.96	18.5	18.48	0.16	10 mm	MIMO	0114M	13	front	98.0	0.136	-	1.132	1.020	-	
2437	6	802.11n	OFDM	20	18.5	17.96	18.5	18.48	0.18	10 mm	MIMO	0114M	13	top	98.0	0.025	-	1.132	1.020	-	
2437	6	802.11n	OFDM	20	18.5	17.96	18.5	18.48	-0.05	10 mm	MIMO	0114M	13	left	98.0	0.375	0.291	1.132	1.020	0.336	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT	Body
Spatial Peak	1.6 W/kg (mW/g)
Uncontrolled Exposure/General Population	averaged over 1 gram

Note: To achieve the 21.5 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 18.5 dBm.

Table 11-28
NII MIMO WLAN Hotspot SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															W/kg	(W/kg)			(W/kg)	
5775	155	802.11ac	OFDM	80	15.5	15.01	15.5	15.49	0.03	10 mm	MIMO	0114M	58.5	back	92.4	0.376	0.279	1.119	1.082	**0.338**	A31
5775	155	802.11ac	OFDM	80	15.5	15.01	15.5	15.49	0.16	10 mm	MIMO	0114M	58.5	front	92.4	0.104	-	1.119	1.082	-	
5775	155	802.11ac	OFDM	80	15.5	15.01	15.5	15.49	0.14	10 mm	MIMO	0114M	58.5	top	92.4	0.116	-	1.119	1.082	-	
5775	155	802.11ac	OFDM	80	15.5	15.01	15.5	15.49	0.11	10 mm	MIMO	0114M	58.5	left	92.4	0.280	-	1.119	1.082	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**														**Body** **1.6 W/kg (mW/g)** averaged over 1 gram							

Note: To achieve the 18.5 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 15.5 dBm.

Table 11-29
DSS Hotspot SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)			(W/kg)	
2441	39	Bluetooth	FHSS	18.0	17.47	0.06	10 mm	1	0095M	1	back	77.00	0.015	1.130	1.299	0.022	
2441	39	Bluetooth	FHSS	18.0	17.47	-0.15	10 mm	1	0095M	1	front	77.00	0.010	1.130	1.299	0.015	
2441	39	Bluetooth	FHSS	18.0	17.47	-0.12	10 mm	1	0095M	1	top	77.00	0.006	1.130	1.299	0.009	
2441	39	Bluetooth	FHSS	18.0	17.47	0.10	10 mm	1	0095M	1	left	77.00	0.006	1.130	1.299	0.009	
2441	39	Bluetooth	FHSS	17.5	16.73	-0.12	10 mm	2	0095M	1	back	77.00	0.093	1.194	1.299	0.144	
2441	39	Bluetooth	FHSS	17.5	16.73	0.06	10 mm	2	0095M	1	front	77.00	0.036	1.194	1.299	0.056	
2441	39	Bluetooth	FHSS	17.5	16.73	-0.02	10 mm	2	0095M	1	left	77.00	0.116	1.194	1.299	**0.180**	A33
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**													**Body** **1.6 W/kg (mW/g)** averaged over 1 gram				

11.4 Standalone Phablet SAR Data

Table 11-30
GPRS Phablet SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
1909.80	810	GSM 1900	GPRS	27.5	26.35	0.02	8 mm	A	0115M	3	1:2.76	back	0.621	1.303	0.809	
1909.80	810	GSM 1900	GPRS	27.5	26.35	-0.02	6 mm	A	0115M	3	1:2.76	front	0.664	1.303	0.865	
1909.80	810	GSM 1900	GPRS	27.5	26.35	-0.04	12 mm	A	0115M	3	1:2.76	bottom	0.909	1.303	1.184	A34
1909.80	810	GSM 1900	GPRS	27.5	26.35	0.01	0 mm	A	0115M	3	1:2.76	right	0.228	1.303	0.297	
1909.80	810	GSM 1900	GPRS	27.5	26.35	0.05	0 mm	A	0115M	3	1:2.76	left	0.179	1.303	0.233	
1909.80	810	GSM 1900	GPRS	22.0	20.51	0.02	0 mm	A	0115M	4	1:2.076	back	0.867	1.409	1.222	
1909.80	810	GSM 1900	GPRS	22.0	20.51	0.08	0 mm	A	0115M	4	1:2.076	front	0.673	1.409	0.948	
1909.80	810	GSM 1900	GPRS	22.0	20.51	-0.03	0 mm	A	0115M	4	1:2.076	bottom	0.681	1.409	0.960	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Phablet 4.0 W/kg (mW/g) averaged over 10 grams			

Table 11-31
LTE Band 4 (AWS) Phablet SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Tune State	Power Drift [dB]	MPR [dB]	Antenna Config.	Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	22.41	59	-0.10	0	A	0124M	QPSK	1	50	8 mm	back	1:1	0.633	1.442	0.913	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.42	59	0.02	1	A	0124M	QPSK	50	25	8 mm	back	1:1	0.488	1.439	0.702	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	22.41	59	0.06	0	A	0124M	QPSK	1	50	6 mm	front	1:1	0.822	1.442	1.185	A35
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.42	59	-0.03	1	A	0124M	QPSK	50	25	6 mm	front	1:1	0.651	1.439	0.937	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	22.41	59	0.03	0	A	0124M	QPSK	1	50	12 mm	bottom	1:1	0.778	1.442	1.122	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.42	59	-0.02	1	A	0124M	QPSK	50	25	12 mm	bottom	1:1	0.634	1.439	0.912	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	22.41	59	0.00	0	A	0124M	QPSK	1	50	0 mm	right	1:1	0.474	1.442	0.684	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.42	59	-0.03	1	A	0124M	QPSK	50	25	0 mm	right	1:1	0.429	1.439	0.617	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	22.41	59	-0.03	0	A	0124M	QPSK	1	50	0 mm	left	1:1	0.248	1.442	0.358	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.42	59	-0.01	1	A	0124M	QPSK	50	25	0 mm	left	1:1	0.194	1.439	0.279	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.57	59	-0.03	0	A	0124M	QPSK	1	50	0 mm	back	1:1	0.774	1.390	1.076	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.63	59	0.01	0	A	0124M	QPSK	50	25	0 mm	back	1:1	0.755	1.371	1.035	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.57	59	-0.09	0	A	0124M	QPSK	1	50	0 mm	front	1:1	0.407	1.390	0.566	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.63	59	-0.02	0	A	0124M	QPSK	50	25	0 mm	front	1:1	0.409	1.371	0.561	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.57	59	-0.01	0	A	0124M	QPSK	1	50	0 mm	bottom	1:1	0.622	1.390	0.865	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	18.63	59	-0.06	0	A	0124M	QPSK	50	25	0 mm	bottom	1:1	0.613	1.371	0.840	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial PeAK Uncontrolled Exposure/General Population																Phablet 4.0 W/kg (mW/g) averaged over 10 grams					

Table 11-32
LTE Band 41 Phablet SAR

MEASUREMENT RESULTS																							
1 CC Uplink | 2 CC Uplink	Component Carrier	FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Antenna Config.	Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #
		MHz	Ch.																(W/kg)		(W/kg)	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	-0.02	0	B	0095M	QPSK	1	50	8 mm	back	1:1.58	0.303	1.303	0.395	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.0	22.82	-0.05	1	B	0095M	QPSK	50	25	8 mm	back	1:1.58	0.234	1.312	0.307	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	0.01	0	B	0095M	QPSK	1	50	6 mm	front	1:1.58	0.331	1.303	0.431	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.0	22.82	-0.01	1	B	0095M	QPSK	50	25	6 mm	front	1:1.58	0.260	1.312	0.341	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	0.02	0	B	0095M	QPSK	1	50	12 mm	bottom	1:1.58	0.307	1.303	0.400	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.0	22.82	0.05	1	B	0095M	QPSK	50	25	12 mm	bottom	1:1.58	0.245	1.312	0.321	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.44	-0.03	0	B	0095M	QPSK	1	0	0 mm	right	1:1.58	0.926	1.432	1.326	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	0.00	0	B	0095M	QPSK	1	50	0 mm	right	1:1.58	0.999	1.303	1.302	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.0	22.82	0.06	1	B	0095M	QPSK	50	25	0 mm	right	1:1.58	0.787	1.312	1.033	
2 CC Uplink	PCC	2636.50	41055	Mid-High	LTE Band 41	20	25.0	23.85	-0.01	0	B	0095M	QPSK	1	0	0 mm	right	1:1.58	1.040	1.303	**1.355**	A36
	SCC	2616.70	40857												99							
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	0.02	0	B	0095M	QPSK	1	50	0 mm	back	1:1.58	0.873	1.274	1.112	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	-0.04	0	B	0095M	QPSK	50	25	0 mm	back	1:1.58	0.873	1.274	1.112	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	0.00	0	B	0095M	QPSK	1	50	0 mm	front	1:1.58	0.715	1.274	0.911	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	0.01	0	B	0095M	QPSK	50	25	0 mm	front	1:1.58	0.711	1.274	0.906	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	0.01	0	B	0095M	QPSK	1	50	0 mm	bottom	1:1.58	0.972	1.274	1.238	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	21.0	19.95	0.00	0	B	0095M	QPSK	50	25	0 mm	bottom	1:1.58	0.977	1.274	1.245	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																			Phablet 4.0 W/kg (mW/g) averaged over 10 grams			

Table 11-33
WLAN MIMO Phablet SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (10g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (10g)	Plot #
MHz	Ch.															W/kg	(W/kg)			(W/kg)	
5290	58	802.11ac	OFDM	80	15.5	14.05	15.5	14.74	-0.01	0 mm	MIMO	0114M	58.5	back	92.4	8.150	1.130	1.396	1.082	**1.707**	A37
5290	58	802.11ac	OFDM	80	15.5	14.05	15.5	14.74	0.02	0 mm	MIMO	0114M	58.5	front	92.4	0.327	-	1.396	1.082	-	
5290	58	802.11ac	OFDM	80	15.5	14.05	15.5	14.74	-0.02	0 mm	MIMO	0114M	58.5	top	92.4	0.409	-	1.396	1.082	-	
5290	58	802.11ac	OFDM	80	15.5	14.05	15.5	14.74	0.01	0 mm	MIMO	0114M	58.5	left	92.4	4.770	0.453	1.396	1.082	0.684	
5610	122	802.11ac	OFDM	80	15.5	14.74	15.5	15.49	-0.07	0 mm	MIMO	0114M	58.5	back	92.4	8.180	0.859	1.191	1.082	1.107	
5610	122	802.11ac	OFDM	80	15.5	14.74	15.5	15.49	-0.12	0 mm	MIMO	0114M	58.5	front	92.4	1.260	-	1.191	1.082	-	
5610	122	802.11ac	OFDM	80	15.5	14.74	15.5	15.49	0.07	0 mm	MIMO	0114M	58.5	top	92.4	0.695	-	1.191	1.082	-	
5610	122	802.11ac	OFDM	80	15.5	14.74	15.5	15.49	-0.05	0 mm	MIMO	0114M	58.5	left	92.4	6.260	0.823	1.191	1.082	1.061	
5855	171	802.11ac	OFDM	80	15.5	14.99	15.5	14.92	0.01	0 mm	MIMO	0114M	58.5	back	92.4	2.310	-	1.143	1.082	-	
5855	171	802.11ac	OFDM	80	15.5	14.99	15.5	14.92	-0.15	0 mm	MIMO	0114M	58.5	front	92.4	1.470	-	1.143	1.082	-	
5855	171	802.11ac	OFDM	80	15.5	14.99	15.5	14.92	0.04	0 mm	MIMO	0114M	58.5	top	92.4	0.527	-	1.143	1.082	-	
5855	171	802.11ac	OFDM	80	15.5	14.99	15.5	14.92	-0.03	0 mm	MIMO	0114M	58.5	left	92.4	6.390	0.795	1.143	1.082	0.983	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																Phablet 4.0 W/kg (mW/g) averaged over 10 grams					

Note: To achieve the 18.5 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 15.5 dBm.

11.5 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 D01v06.
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 D01v06.
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 results for all frequency bands were less than 0.8 W/kg.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).
10. Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.
11. 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 for supplemental data.
12. Additional SAR tests for phablet SAR were evaluated per KDB 616217 Section 6 (See Section 6.9 for more information).
13. 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.
14. This device uses Qualcomm Smart Transmit for 2G/3G/4G 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 D01v06, 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 D01v06, 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 D01v06, 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. For 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.

WLAN Notes:

1. For held-to-ear, and hotspot, and phablet operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g evaluations, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n/ax) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 8.6.5 for more information.
3. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported

SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2 W/kg for 1g evaluations. See Section 8.6.6 for more information.

4. Per KDB Publication 248227 D01v02r02, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498 D01v06 by either evaluating the sum of the 1g SAR values of each antenna transmitting independently or making a SAR measurement with both antennas transmitting simultaneously. Please see Appendix D for complete analysis.
5. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.
6. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.
7. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

Bluetooth Notes

1. Bluetooth SAR was measured with the device connected to a call box with hopping disabled with DH5 operation and Tx Tests test mode type. Per October 2016 TCB Workshop Notes, the reported SAR was scaled to the 100% transmission duty factor to determine compliance. See Section 9 for the time domain plot and calculation for the duty factor of the device.
2. Head and Hotspot Bluetooth SAR were evaluated for BT BDR tethering applications.

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 for 1g SAR and less than 2.0 W/kg for 10g SAR.

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 Tuner Testing

Per April 2019 TCB Workshop Notes, the following test procedures were followed to demonstrate that the SAR results in Section 11 represented the appropriate SAR test conditions. For bands with dynamic tuning implemented, SAR was measured according to the required FCC SAR test procedures with the dynamic tuner active to allow the device to automatically tune to the antenna state for the respective RF exposure test configurations. Additional single point SAR time-sweep measurements were evaluated for other tuner states to determine that the other tuner configurations would result in equivalent or lower SAR values. The additional tuner hardware has no influence on the antenna characteristics, other than impedance matching.

To evaluate all the tuner states, the 120 tuner states were divided among the aggregate band, mode and exposure combinations. Single point time-sweep measurements were performed at the peak SAR location determined by the zoom scan of the configuration with the highest measured SAR for each combination. The tuner state was able to be established remotely so that the device was not moved for the entire series of single point SAR for the tuner states in each combination. The SAR probe remained stationary at the same position throughout the entire series of single point measurements for each combination. When the single point SAR or 1g SAR was > 1.2 W/kg for a particular band/mode/exposure condition, point SAR measurements were made for all 120 states.

The operational description contains more information about the design and implementation of the dynamic antenna tuning.

Table 13-1
UMTS Supplemental Head SAR Data

Supplemental Head SAR Data	
UMTS B5	
RMC	
Test Position	Left Cheek
Frequency (MHz)	826.40
Channel	4132
Measured 1g SAR (W/kg)	0.144
Average Value of Time Sweep (W/kg)	
Auto-tune (State 2)	0.186
Default (State 13)	0.182
State 0	0.178
State 2	0.196
State 3	0.197
State 7	0.162
State 12	0.027
State 17	0.188
State 44	0.128
State 57	0.123
State 60	0.058
State 67	0.138
State 86	0.049
State 110	0.117
State 112	0.182

Table 13-2
LTE Supplemental Head SAR Data

Supplemental Head SAR Data							
LTE B12		LTE B13		LTE B5		LTE B4	
QPSK, 10 MHz Bandwidth, 1 RB, 0 RB Offset		QPSK, 10 MHz Bandwidth, 1 RB, 0 RB Offset		QPSK, 10 MHz Bandwidth, 1 RB, 0 RB Offset		QPSK, 20 MHz Bandwidth, 1 RB, 50 RB Offset	
Test Position	Left Cheek	Test Position	Left Cheek	Test Position	Left Cheek	Test Position	Right Cheek
Frequency (MHz)	707.50	Frequency (MHz)	782.00	Frequency (MHz)	836.50	Frequency (MHz)	1732.50
Channel	23095	Channel	23230	Channel	20525	Channel	20175
Measured 1g SAR (W/kg)	0.093	Measured 1g SAR (W/kg)	0.171	Measured 1g SAR (W/kg)	0.137	Measured 1g SAR (W/kg)	0.084
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-tune (State 108)	0.123	Auto-tune (State 1)	0.224	Auto-tune (State 116)	0.182	Auto-tune (State 85)	0.092
Default (State 0)	0.116	Default (State 0)	0.213	Default (State 13)	0.181	Default (State 0)	0.086
State 28	0.049	State 1	0.221	State 8	0.123	State 10	0.043
State 37	0.004	State 4	0.212	State 15	0.178	State 19	0.049
State 47	0.052	State 14	0.211	State 16	0.177	State 30	0.092
State 58	0.033	State 25	0.016	State 24	0.034	State 32	0.085
State 66	0.062	State 31	0.137	State 39	0.087	State 49	0.041
State 68	0.055	State 34	0.076	State 48	0.056	State 54	0.087
State 80	0.047	State 61	0.032	State 53	0.139	State 72	0.057
State 82	0.069	State 73	0.044	State 79	0.084	State 75	0.034
State 89	0.000	State 74	0.025	State 87	0.020	State 83	0.083
State 91	0.016	State 96	0.154	State 90	0.001	State 85	0.084
State 98	0.022	State 101	0.009	State 100	0.025	State 104	0.092
State 108	0.117	State 106	0.143	State 102	0.006	State 111	0.085
State 109	0.028	State 113	0.102	State 116	0.180	State 118	0.066

Table 13-3
UMTS Supplemental Body SAR Data

Supplemental Body SAR Data	
UMTS B5	
RMC	
Test Position	Back
Spacing	10 mm
Frequency (MHz)	826.40
Channel	4132
Measured 1g SAR (W/kg)	0.337
Average Value of Time Sweep (W/kg)	
Auto-tune (State 116)	0.529
Default (State 13)	0.543
State 6	0.544
State 9	0.302
State 26	0.207
State 50	0.078
State 52	0.340
State 56	0.383
State 65	0.395
State 69	0.375
State 78	0.125
State 88	0.036
State 97	0.391
State 114	0.393
State 116	0.543

Table 13-4
LTE Supplemental Body SAR Data

Supplemental Body SAR Data							
LTE B12		LTE B13		LTE B5		LTE B4	
QPSK, 10 MHz Bandwidth, 1 RB, 0 RB Offset		QPSK, 10 MHz Bandwidth, 1 RB, 0 RB Offset		QPSK, 10 MHz Bandwidth, 1 RB, 0 RB Offset		QPSK, 20 MHz Bandwidth, 50 RB, 25 RB Offset	
Test Position	Back	Test Position	Back	Test Position	Back	Test Position	Bottom
Spacing	10 mm	Spacing	10 mm	Spacing	10 mm	Spacing	10 mm
Frequency (MHz)	707.50	Frequency (MHz)	782.00	Frequency (MHz)	836.50	Frequency (MHz)	1732.50
Channel	23095	Channel	23230	Channel	20525	Channel	20175
Measured 1g SAR (W/kg)	0.222	Measured 1g SAR (W/kg)	0.326	Measured 1g SAR (W/kg)	0.405	Measured 1g SAR (W/kg)	0.751
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-tune (State 4)	0.342	Auto-tune (State 1)	0.551	Auto-tune (State 116)	0.623	Auto-tune (State 59)	0.822
Default (State 0)	0.310	Default (State 0)	0.476	Default (State 13)	0.624	Default (State 0)	0.726
State 4	0.335	State 1	0.507	State 2	0.646	State 13	0.509
State 18	0.304	State 2	0.502	State 11	0.175	State 29	0.728
State 20	0.183	State 5	0.464	State 22	0.259	State 33	0.735
State 24	0.040	State 21	0.209	State 23	0.201	State 40	0.692
State 35	0.045	State 27	0.284	State 41	0.384	State 43	0.694
State 45	0.242	State 36	0.061	State 42	0.393	State 51	0.392
State 46	0.189	State 38	0.016	State 55	0.477	State 59	0.827
State 76	0.010	State 62	0.047	State 59	0.313	State 63	0.600
State 81	0.162	State 64	0.017	State 77	0.032	State 71	0.657
State 84	0.119	State 70	0.241	State 94	0.352	State 92	0.693
State 85	0.052	State 93	0.270	State 103	0.014	State 95	0.723
State 107	0.048	State 99	0.097	State 116	0.622	State 105	0.714
State 108	0.310	State 115	0.133	State 117	0.298	State 119	0.660

14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	85033E	3.5mm Standard Calibration Kit	7/7/2021	Annual	7/7/2022	MY53402352
Agilent	8753ES	S-Parameter Vector Network Analyzer	2/2/2021	Annual	2/2/2022	US39170122
Agilent	8753ES	S-Parameter Vector Network Analyzer	4/14/2021	Annual	4/14/2022	US39170118
Agilent	E4438C	ESG Vector Signal Generator	12/14/2020	Biennial	12/14/2022	MY42082385
Agilent	E4438C	ESG Vector Signal Generator	11/21/2021	Annual	11/21/2022	MY47270002
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Agilent	N5182A	MXG Vector Signal Generator	11/17/2021	Annual	11/17/2022	US46240505
Agilent	N5182A	MXG Vector Signal Generator	6/15/2021	Annual	6/15/2022	MY47420800
Rohde & Schwarz	CMU200	Base Station Simulator	5/10/2021	Annual	5/10/2022	109892
Amplifier Research	150A100C	Amplifier	CBT	N/A	CBT	350132
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	MA24106A	USB Power Sensor	8/10/2021	Annual	8/10/2022	1231538
Anritsu	MA24106A	USB Power Sensor	8/10/2021	Annual	8/10/2022	1231535
Anritsu	MA24106A	USB Power Sensor	3/2/2021	Annual	3/2/2022	1244524
Anritsu	MA24106A	USB Power Sensor	9/21/2021	Annual	9/21/2022	1244515
Anritsu	MA2411B	Pulse Power Sensor	8/10/2021	Annual	8/10/2022	1207364
Anritsu	MA2411B	Pulse Power Sensor	9/21/2021	Annual	9/21/2022	1315051
Anritsu	ML2496A	Power Meter	2/19/2021	Annual	2/19/2022	1138001
Anritsu	MS2028C	Vector Network Analyzer	2/26/2021	Annual	2/26/2022	1204153
Anritsu	MT8820C	Radio Communication Analyzer	10/23/2021	Annual	10/23/2022	6201300731
Anritsu	MT8821C	Radio Communication Analyzer	4/16/2021	Annual	4/16/2022	6200901190
Anritsu	MT8821C	Radio Communication Analyzer	3/23/2021	Annual	3/23/2022	6201144418
Anritsu	MT8862A	Wireless Connectivity Test Set	10/27/2021	Annual	10/27/2022	6261782395
Control Company	4040	Therm./ Clock/ Humidity Monitor	2/23/2021	Annual	2/23/2022	160574418
Insize	1108-150	Digital Caliper	1/17/2020	Biennial	1/17/2022	409193536
Control Company	4352	Ultra Long Stem Thermometer	3/2/2021	Annual	3/2/2022	160508097
Control Company	4352	Ultra Long Stem Thermometer	3/2/2021	Annual	3/2/2022	160508122
Fairview Microwave	FM2CP1122-10	2.92mm Directional Coupler	7/7/2021	Annual	7/7/2022	1946
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	9/27/2021	Annual	9/27/2022	MY53401181
Keysight Technologies	E4438C	VECTOR SIGNAL GENERATOR	10/15/2021	Annual	10/15/2022	MY45092078
Keysight Technologies	N6705B	DC Power Analyzer	5/5/2021	Triennial	5/5/2024	MY53004059
Keysight Technologies	N9020A	MXA Signal Analyzer	2/24/2021	Annual	2/24/2022	MY48010233
MCL	BW-N10W5+	Attenuator	7/6/2021	Annual	7/6/2022	1507
MCL	BW-N3W5+	Attenuator	7/6/2021	Annual	7/6/2022	1608
Mini-Circuits	BW-N10W5+	Attenuator	CBT	N/A	CBT	1350
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	7/6/2021	Annual	7/6/2022	UU19201507
Mini-Circuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	VLF-6000+	Low Pass Filter	7/6/2021	Annual	7/6/2022	31634
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-6	Dual Directional Coupler	7/6/2021	Annual	7/6/2022	N/A
Rohde & Schwarz	CMW500	Radio Communication Tester	12/30/2021	Annual	12/30/2022	106578
Rohde & Schwarz	CMW500	Radio Communication Tester	7/19/2021	Annual	7/19/2022	128635
Rohde & Schwarz	CMW500	Radio Communication Tester	3/22/2021	Annual	3/22/2022	167283
Seekonk	TSF-100	Torque Wrench 5/16", 8" lbs	7/8/2021	Annual	7/8/2022	47639-1256
Seekonk	TSF-100	Torque Wrench	7/8/2021	Annual	7/8/2022	47639-29
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1237
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1243
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2021	Annual	5/12/2022	1070
SPEAG	DAK-3.5	Dielectric Assessment Kit	10/20/2021	Annual	10/20/2022	1091
SPEAG	EX3DV4	SAR Probe	3/3/2021	Annual	3/3/2022	7640
SPEAG	EX3DV4	SAR Probe	7/20/2021	Annual	7/20/2022	7406
SPEAG	EX3DV4	SAR Probe	6/28/2021	Annual	6/28/2022	7660
SPEAG	EX3DV4	SAR Probe	8/4/2021	Annual	8/4/2022	7668
SPEAG	EX3DV4	SAR Probe	10/7/2021	Annual	10/7/2022	7558
SPEAG	EX3DV4	SAR Probe	3/3/2021	Annual	3/3/2022	7637
SPEAG	EX3DV4	SAR Probe	4/19/2021	Annual	4/19/2022	7357
SPEAG	EX3DV4	SAR Probe	1/10/2022	Annual	1/10/2023	7571
SPEAG	EX3DV4	SAR Probe	7/20/2021	Annual	7/20/2022	7410
SPEAG	EX3DV4	SAR Probe	5/18/2021	Annual	5/18/2022	3914
SPEAG	EX3DV4	SAR Probe	9/20/2021	Annual	9/20/2022	7552
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/11/2021	Annual	1/11/2022	1645
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/21/2021	Annual	6/21/2022	1676
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/22/2021	Annual	6/22/2022	1677
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/18/2021	Annual	3/18/2022	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/13/2021	Annual	9/13/2022	1364
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/1/2021	Annual	3/1/2022	1652
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/7/2021	Annual	4/7/2022	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/8/2021	Annual	12/8/2022	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/13/2021	Annual	7/13/2022	1583
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/11/2021	Annual	5/11/2022	728
SPEAG	D750V3	750 MHz SAR Dipole	2/17/2021	Annual	2/17/2022	1046
SPEAG	D835V2	835 MHz SAR Dipole	4/15/2021	Annual	4/15/2022	4d119
SPEAG	D1750V2	1750 MHz SAR Dipole	5/12/2020	Biennial	5/12/2022	1148
SPEAG	D1900V2	1900 MHz SAR Dipole	10/22/2021	Annual	10/22/2022	5d080
SPEAG	D2450V2	2450 MHz SAR Dipole	8/18/2021	Annual	8/18/2022	719
SPEAG	D2600V2	2600 MHz SAR Dipole	4/14/2021	Annual	4/14/2022	1004
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/15/2021	Annual	9/15/2022	1191
SPEAG	D750V3	750 MHz SAR Dipole	5/11/2021	Annual	5/11/2022	1034
SPEAG	D1765V2	1765 MHz SAR Dipole	5/14/2021	Annual	5/14/2022	1008
SPEAG	D2450V2	2450 MHz SAR Dipole	11/25/2021	Annual	11/25/2022	981
SPEAG	D2600V2	2600 MHz SAR Dipole	11/12/2019	Triennial	11/12/2022	1071

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]

17 REFERENCES

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.

[3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.

[4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[5] IEEE Standards Coordinating Committee 39 –Standards Coordinating Committee 34 – IEEE Std. 1528-2013, IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

[6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 1 -124.

[9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[15] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[17] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[18] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.

[19] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hoschschule Zürich, Dosimetric Evaluation of the Cellular Phone.

[20] IEC 62209-1, Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz), July 2016.

[21] Innovation, Science, Economic Development Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 5, March 2015.

[22] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2015

[23] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225, D01-D07

[24] SAR Measurement Guidance for IEEE 802.11 Transmitters, KDB Publication 248227 D01

[25] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474 D03-D04

[26] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDB Publication 616217 D04

[27] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02

[28] FCC General RF Exposure Guidance and SAR Procedures for Dongles, KDB Publication 447498, D01-D02

[29] Anexo à Resolução No. 533, de 10 de Septembro de 2009.

[30] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Mar. 2010.