ELEMENT MATERIALS TECHNOLOGY
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SAR EVALUATION REPORT

Applicant Name:
Apple, Inc.
One Apple Park Way
Cupertino, CA 95014 USA

Date of Testing:
06/14/2023 – 07/24/2023
Test Report Issue Date:
08/14/2023
Test Site/Location:
Element, Morgan Hill, CA, USA
Document Serial No.:
1C2305020014-01.BCG (Rev 1)

FCC ID:	**BCG-A2986**
APPLICANT:	**APPLE, INC.**

DUT Type: Watch
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model: A2986, A2987

Equipment Class	Band & Mode	Tx Frequency	SAR	
			1g Head (W/kg)	10g Extremity (W/kg)
PCT	UMTS 850	826.40 - 846.60 MHz	< 0.1	0.31
PCT	UMTS 1750	1712.4 - 1752.6 MHz	0.21	< 0.1
PCT	UMTS 1900	1852.4 - 1907.6 MHz	0.61	0.11
PCT	LTE Band 12	699.7 - 715.3 MHz	< 0.1	0.17
PCT	LTE Band 17	706.5 - 713.5 MHz	N/A	N/A
PCT	LTE Band 13	779.5 - 784.5 MHz	< 0.1	0.35
PCT	LTE Band 14	790.5 - 795.5 MHz	< 0.1	0.37
PCT	LTE Band 26 (Cell)	814.7 - 848.3 MHz	< 0.1	0.36
PCT	LTE Band 5 (Cell)	824.7 - 848.3 MHz	< 0.1	0.35
PCT	LTE Band 66 (AWS)	1710.7 - 1779.3 MHz	0.19	< 0.1
PCT	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	N/A	N/A
PCT	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.69	0.13
PCT	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	N/A	N/A
PCT	LTE Band 7	2502.5 - 2567.5 MHz	0.88	0.34
PCT	LTE Band 41	2498.5 - 2687.5 MHz	0.43	0.14
DTS	2.4 GHz WLAN	2412 - 2472 MHz	0.41	< 0.1
NII	U-NII-1	5180 - 5240 MHz	N/A	N/A
NII	U-NII-2A	5260 - 5320 MHz	< 0.1	< 0.1
NII	U-NII-2C	5500 - 5720 MHz	< 0.1	< 0.1
NII	U-NII-3	5745 - 5825 MHz	0.11	< 0.1
DSS/DTS	Bluetooth	2402 - 2480 MHz	0.26	< 0.1
NII	802.15.4 ab-NB	5728.75 - 5846.25 MHz	< 0.1	< 0.1
Simultaneous SAR per KDB 690783 D01v01r03:			1.31	0.45

Note: This revised Test Report supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This watch 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 1.8 of this report; for North American frequency bands only.

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

RJ Ortanez
Executive Vice President

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 17	Voice/Data	706.5 - 713.5 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 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
Bluetooth	Data	2402 - 2480 MHz
802.15.4 ab-NB	Data	5728.75 - 5846.25 MHz
NFC	Data	13.56 MHz
UWB	Data	6489.6 - 7987.2 MHz

1.2 Power Reduction for SAR

There is no power reduction used for any band/mode implemented in this device for SAR purposes.

1.3 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.

1.3.1 Maximum Output Power – UMTS Mode

Mode/Band		Modulated Average Output Power (in dBm)			
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6	DC-HSPA+
UMTS Band 5 (850 MHz)	Max allowed power	**25.00**	**25.00**	**24.00**	**24.00**
	Nominal	**24.00**	**24.00**	**23.00**	**23.00**
UMTS Band 4 (1750 MHz)	Max allowed power	**24.00**	**24.00**	**23.00**	**22.00**
	Nominal	**23.00**	**23.00**	**22.00**	**21.00**
UMTS Band 2 (1900 MHz)	Max allowed power	**24.00**	**24.00**	**23.00**	**22.00**
	Nominal	**23.00**	**23.00**	**22.00**	**21.00**

1.3.2 Maximum Output Power – LTE Mode

Mode / Band		Modulated Average Output Power (in dBm)
LTE FDD Band 12	Max allowed power	**25.50**
	Nominal	**24.50**
LTE FDD Band 17	Max allowed power	**25.50**
	Nominal	**24.50**
LTE FDD Band 13	Max allowed power	**25.50**
	Nominal	**24.50**
LTE FDD Band 14	Max allowed power	**25.50**
	Nominal	**24.50**
LTE FDD Band 26	Max allowed power	**25.50**
	Nominal	**24.50**
LTE FDD Band 5	Max allowed power	**25.50**
	Nominal	**24.50**
LTE FDD Band 4	Max allowed power	**24.50**
	Nominal	**23.50**
LTE FDD Band 66	Max allowed power	**24.50**
	Nominal	**23.50**
LTE FDD Band 2	Max allowed power	**24.50**
	Nominal	**23.50**
LTE FDD Band 25	Max allowed power	**24.50**
	Nominal	**23.50**
LTE FDD Band 7	Max allowed power	**23.50**
	Nominal	**22.50**
LTE TDD Band 41	Max allowed power	**23.50**
	Nominal	**22.50**

1.3.3 Maximum Output Power – WiFi Mode

Mode/ Band			IEEE 802.11b (2.4 GHz)		IEEE 802.11g (2.4 GHz)		IEEE 802.11n (2.4 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm)	20 MHz Bandwidth	1	19.00	18.00	17.00	16.00	17.00	16.00
		2	19.00	18.00	18.00	17.00	18.00	17.00
		3	19.00	18.00	18.50	17.50	18.50	17.50
		4	19.00	18.00	18.50	17.50	18.50	17.50
		5	19.00	18.00	18.50	17.50	18.50	17.50
		6	19.00	18.00	18.50	17.50	18.50	17.50
		7	19.00	18.00	18.50	17.50	18.50	17.50
		8	19.00	18.00	18.50	17.50	18.50	17.50
		9	19.00	18.00	18.00	17.00	18.00	17.00
		10	19.00	18.00	17.00	16.00	17.00	16.00
		11	19.00	18.00	15.00	14.00	15.00	14.00
		12	18.00	17.00	14.00	13.00	14.00	13.00
		13	17.00	16.00	2.00	1.00	2.00	1.00

Mode/ Band			IEEE 802.11a (5 GHz)		IEEE 802.11n (5 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm)	20 MHz Bandwidth	36	17.00	16.00	17.00	16.00
		40	17.00	16.00	17.00	16.00
		44	17.00	16.00	17.00	16.00
		48	17.00	16.00	17.00	16.00
		52	17.00	16.00	17.00	16.00
		56	17.00	16.00	17.00	16.00
		60	17.00	16.00	17.00	16.00
		64	17.00	16.00	17.00	16.00
		100	17.00	16.00	17.00	16.00
		104	17.00	16.00	17.00	16.00
		108	17.00	16.00	17.00	16.00
		112	17.00	16.00	17.00	16.00
		116	17.00	16.00	17.00	16.00
		120	17.00	16.00	17.00	16.00
		124	17.00	16.00	17.00	16.00
		128	17.00	16.00	17.00	16.00
		132	17.00	16.00	17.00	16.00
		136	17.00	16.00	17.00	16.00
		140	14.50	13.50	14.50	13.50
		144	17.00	16.00	17.00	16.00
		149	17.00	16.00	17.00	16.00
		153	17.00	16.00	17.00	16.00
		157	17.00	16.00	17.00	16.00
		161	17.00	16.00	17.00	16.00
		165	17.00	16.00	17.00	16.00

1.3.4 Maximum Output Power – Bluetooth Mode

Mode / Band		Modulated Average - Single Tx Chain (dBm)
Bluetooth BDR/LE	Maximum	**17.50**
	Nominal	**16.50**
Bluetooth EDR	Maximum	**14.00**
	Nominal	**13.00**
Bluetooth HDR	Maximum	**13.50**
	Nominal	**12.50**

1.3.5 Maximum Output Power – 802.15.4 ab-NB

Mode / Band		Modulated Average - Single Tx Chain (dBm)
802.15.4 ab-NB	Maximum	**16.00**
	Nominal	**14.00**

1.4 DUT Antenna Locations

A diagram showing the location of the device antennas can be found in the DUT Antenna Diagram & SAR Test Setup Photographs Appendix**.**

1.5 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 the DUT Antenna Diagram & SAR Test Setup Photographs Appendix**.**

1.6 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 1-1
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Extremity
1	Cellular + 2.4 GHz WI-FI	Yes	Yes
2	Cellular + 5 GHz WI-FI	Yes	Yes
3	Cellular + 2.4 GHz Bluetooth	Yes	Yes
4	Cellular + 802.15.4 ab-NB	Yes	Yes
5	Cellular + 2.4 GHz Bluetooth + 5 GHz WI-FI	Yes	Yes
6	Cellular + 802.15.4 ab-NB + 2.4 GHz WIFI	Yes	Yes
7	Cellular + 2.4 GHz Bluetooth + 802.15.4 ab-NB	Yes	Yes
8	2.4 GHz Bluetooth + 5 GHz WI-FI	Yes	Yes
9	2.4 GHz Bluetooth + 802.15.4 ab-NB	Yes	Yes
10	802.15.4 ab-NB + 2.4 GHz WI-FI	Yes	Yes

1. 2.4 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
2. 2.4 GHz WLAN, and 5 GHz WLAN share the same antenna path and cannot transmit simultaneously.
3. 802.15.4 AB-NB, and 5 GHz WLAN share the same antenna path and cannot transmit simultaneously.
4. Licensed modes cannot transmit simultaneously.
5. 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 scenario.
6. This device supports VOLTE and VOWIFI.

1.7 Miscellaneous SAR Test Considerations

(A) WIFI/BT

This device supports channel 1-13 for 2.4 GHz WLAN. However, due to the reduced output power for channels 12 and 13, channels 1, 6, and 11 were considered for SAR testing per KDB 248227 D01v02r02.

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.

(B) Licensed Transmitter(s)

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 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 is limited to 27 RB on the uplink for 16QAM modulation. Additional measurements were evaluated to support SAR test exclusion for 16 QAM as described in Section 7.5.4.

1.8 Guidance Applied

- FCC KDB Publication 941225 D01v03r01, D05v02r04 (3G/4G)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance, Wrist-worn Device Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- IEEE 1528-2013

1.9 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 10.

1.10 Device Housing Types and Wrist Band Types

This device has one housing type that was evaluated independently for SAR: Titanium. The device can also be used with different wristband accessories. The non-metallic wrist accessories, sport, fabric, and velcro were evaluated for all exposure conditions.

2 LTE INFORMATION

LTE Information					
Form Factor	Watch				
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)				
	LTE Band 17 (706.5 - 713.5 MHz)				
	LTE Band 13 (779.5 - 784.5 MHz)				
	LTE Band 14 (790.5 - 795.5 MHz)				
	LTE Band 26 (Cell) (814.7 - 848.3 MHz)				
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)				
	LTE Band 66 (AWS) (1710.7 - 1779.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)				
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)				
	LTE Band 7 (2502.5 - 2567.5 MHz)				
	LTE Band 41 (2498.5 - 2687.5 MHz)				
	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 17: 5 MHz, 10 MHz				
	LTE Band 13: 5 MHz, 10 MHz				
	LTE Band 14: 5 MHz, 10 MHz				
	LTE Band 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 66 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 7: 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 17: 5 MHz	706.5 (23755)		710 (23790)	713.5 (23825)	
LTE Band 17: 10 MHz	709 (23780)		710 (23790)	711 (23800)	
LTE Band 13: 5 MHz	779.5 (23205)		782 (23230)	784.5 (23255)	
LTE Band 13: 10 MHz	N/A		782 (23230)	N/A	
LTE Band 14: 5 MHz	790.5 (23305)		793 (23330)	795.5 (23355)	
LTE Band 14: 10 MHz	N/A		793 (23330)	N/A	
LTE Band 26 (Cell): 1.4 MHz	814.7 (26697)		831.5 (26865)	848.3 (27033)	
LTE Band 26 (Cell): 3 MHz	815.5 (26705)		831.5 (26865)	847.5 (27025)	
LTE Band 26 (Cell): 5 MHz	816.5 (26715)		831.5 (26865)	846.5 (27015)	
LTE Band 26 (Cell): 10 MHz	819 (26740)		831.5 (26865)	844 (26990)	
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)		836.5 (20525)	848.3 (20643)	
LTE Band 5 (Cell): 3 MHz	825.5 (20415)		836.5 (20525)	847.5 (20635)	
LTE Band 5 (Cell): 5 MHz	826.5 (20425)		836.5 (20525)	846.5 (20625)	
LTE Band 5 (Cell): 10 MHz	829 (20450)		836.5 (20525)	844 (20600)	
LTE Band 66 (AWS): 1.4 MHz	1710.7 (131979)		1745 (132322)	1779.3 (132665)	
LTE Band 66 (AWS): 3 MHz	1711.5 (131987)		1745 (132322)	1778.5 (132657)	
LTE Band 66 (AWS): 5 MHz	1712.5 (131997)		1745 (132322)	1777.5 (132647)	
LTE Band 66 (AWS): 10 MHz	1715 (132022)		1745 (132322)	1775 (132622)	
LTE Band 66 (AWS): 15 MHz	1717.5 (132047)		1745 (132322)	1772.5 (132597)	
LTE Band 66 (AWS): 20 MHz	1720 (132072)		1745 (132322)	1770 (132572)	
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)		1732.5 (20175)	1754.3 (20393)	
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)		1732.5 (20175)	1753.5 (20385)	
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)		1732.5 (20175)	1752.5 (20375)	
LTE Band 4 (AWS): 10 MHz	1715 (20000)		1732.5 (20175)	1750 (20350)	
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)		1732.5 (20175)	1747.5 (20325)	
LTE Band 4 (AWS): 20 MHz	1720 (20050)		1732.5 (20175)	1745 (20300)	
LTE Band 25 (PCS): 1.4 MHz	1850.7 (26047)		1882.5 (26365)	1914.3 (26683)	
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)		1882.5 (26365)	1913.5 (26675)	
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)		1882.5 (26365)	1912.5 (26665)	
LTE Band 25 (PCS): 10 MHz	1855 (26090)		1882.5 (26365)	1910 (26640)	
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)		1882.5 (26365)	1907.5 (26615)	
LTE Band 25 (PCS): 20 MHz	1860 (26140)		1882.5 (26365)	1905 (26590)	
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)		1880 (18900)	1909.3 (19193)	
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)		1880 (18900)	1908.5 (19185)	
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)		1880 (18900)	1907.5 (19175)	
LTE Band 2 (PCS): 10 MHz	1855 (18650)		1880 (18900)	1905 (19150)	
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)		1880 (18900)	1902.5 (19125)	
LTE Band 2 (PCS): 20 MHz	1860 (18700)		1880 (18900)	1900 (19100)	
LTE Band 7: 5 MHz	2502.5 (20775)		2535 (21100)	2567.5 (21425)	
LTE Band 7: 10 MHz	2505 (20800)		2535 (21100)	2565 (21400)	
LTE Band 7: 15 MHz	2507.5 (20825)		2405 (21100)	2562.5 (21375)	
LTE Band 7: 20 MHz	2510 (20850)		2535 (21100)	2560 (21350)	
LTE Band 41: 5 MHz	2506 (39750)	2549.5 (40185)	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	1				
Modulations Supported in UL	QPSK, 16QAM				
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 12. All uplink communications are identical to the Release 8 Specifications. The following LTE Release 12 Features are not supported: Carrier Aggregation, 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:

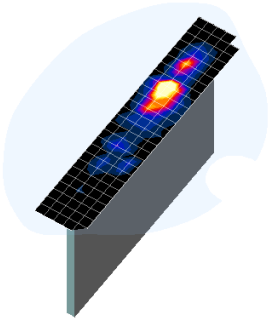

Figure 4-1
Sample SAR Area Scan

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).
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). 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 TEST CONFIGURATION POSITIONS

5.1 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. Additionally, a manufacturer provided low-loss foam was used to position the device for head SAR evaluations.

5.2 Positioning for Head

Devices that are designed to be worn on the wrist may operate in speaker mode for voice communication, with the device worn on the wrist and positioned next to the mouth. When next-to-mouth SAR evaluation is required, the device is positioned at 10 mm from a flat phantom filled with head tissue-equivalent medium. The device is evaluated with wrist bands strapped together to represent normal use conditions.

5.3 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions: i.e., hands, wrists, feet, and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. When extremity SAR evaluation is required, the device is evaluated with the back of the device touching the flat phantom, which is filled with head tissue-equivalent medium. The device was evaluated with Sport wristband unstrapped and touching the phantom. For Fabric and Velcro wristbands, the device was evaluated with wristbands strapped and the distance between wristbands and the phantom was minimized to represent the spacing created by actual use conditions.

6 RF EXPOSURE LIMITS

6.1 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.

6.2 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 6-1
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.

7 FCC MEASUREMENT PROCEDURES

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

7.1 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.

7.2 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.

7.3 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.

7.4 SAR Measurement Conditions for UMTS

7.4.1 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.

7.4.2 Head SAR Measurements

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than 0.25 dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

7.4.3 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.

7.4.4 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.

7.4.5 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.

7.5 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).

7.5.1 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.

7.5.2 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.

7.5.3 A-MPR

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

7.5.4 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.
e. This device can only operate with 16QAM on the uplink with less than or equal to 27 RB. For 16QAM configurations with 10 MHz, 15 MHz and 20 MHz bandwidths, LTE powers for RB size of 15 (“50% RB”) and 27 (“100% RB”) with offsets to upper edge, middle, and lower edge of the channel are additionally measured for both QPSK and 16QAM modulations to support comparison and SAR test exclusion per Section 5.2.4 and 5.3.

7.5.5 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.

7.6 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.

7.6.1 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.

7.6.2 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.

7.6.3 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.

7.6.4 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 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.

7.6.5 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, and 802.11n 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 or 802.11g then 802.11n, is used for SAR measurement. 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.

7.6.6 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 7.6.5). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

7.6.7 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 RF CONDUCTED POWERS

8.1 UMTS Conducted Powers

Table 8-1
Maximum Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	1312	1412	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	24.31	24.28	24.19	23.69	23.74	23.66	23.27	23.30	23.16	-
99		12.2 kbps AMR	23.75	23.70	23.80	23.52	23.56	23.45	23.57	23.55	23.52	-
6	HSDPA	Subtest 1	24.11	24.28	24.34	23.46	23.61	23.56	23.21	23.26	23.16	0
6		Subtest 2	23.22	23.44	23.45	22.28	22.53	22.66	22.38	22.27	22.12	0
6		Subtest 3	22.77	22.95	22.91	21.93	22.16	22.18	21.87	21.96	21.77	0.5
6		Subtest 4	22.55	22.71	22.68	21.71	21.94	21.91	21.63	21.74	21.51	0.5
6	HSUPA	Subtest 1	22.76	22.94	22.90	21.60	22.16	22.17	22.21	22.15	22.30	0
6		Subtest 2	20.55	20.70	20.63	19.68	19.90	19.88	20.33	20.30	20.37	2
6		Subtest 3	21.30	21.43	21.38	20.50	20.70	20.66	21.01	21.05	21.13	1
6		Subtest 4	20.74	20.92	20.84	20.20	20.47	20.46	20.10	20.17	20.22	2
6		Subtest 5	22.78	22.93	22.88	22.22	22.47	22.41	22.05	22.04	22.07	0
8	DC-HSDPA	Subtest 1	23.30	23.45	23.38	21.70	21.88	21.87	21.75	21.70	21.81	0
8		Subtest 2	22.35	22.40	22.45	20.75	20.85	20.65	20.70	20.60	20.78	0
8		Subtest 3	21.95	22.15	22.10	20.25	20.35	20.30	20.10	20.15	20.24	0.5
8		Subtest 4	21.71	21.81	21.78	19.95	20.00	20.04	19.90	19.97	20.01	0.5

Figure 8-1
Power Measurement Setup

8.2 LTE Conducted Powers

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 the LTE Lower Bandwidth RF Conducted Powers Appendix.

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

8.2.1 LTE Band 12

Table 8-2
LTE Band 12 Conducted Power – 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]	Design MPR [dB]
QPSK	1	0	**24.81**	0	0
	1	25	24.73		0
	1	49	24.59		0
	25	0	**23.70**	0-1	1
	25	12	23.65		1
	25	25	23.55		1
	50	0	23.67		1
	15	0	23.80	0-1	1
	15	17	23.75		1
	15	35	23.66		1
	27	0	23.81	0-2	1
	27	12	23.79		1
	27	23	23.75		1
16QAM	1	0	23.95	0-2	1
	1	25	23.68		1
	1	49	23.58		1
	25	0	22.38	0-3	2
	25	12	22.26		2
	25	25	22.18		2
	15	0	22.50	0-5	2
	15	17	22.26		2
	15	35	22.15		2
	27	0	22.42		2
	27	12	22.26		2
	27	23	22.25		2

8.2.2 LTE Band 13

Table 8-3
LTE Band 13 Conducted Power – 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]	Design MPR [dB]
QPSK	1	0	24.85	0	0
	1	25	**24.97**		0
	1	49	24.86		0
	25	0	23.91	0-1	1
	25	12	**23.99**		1
	25	25	23.96		1
	50	0	23.91		1
	15	0	23.85	0-1	1
	15	17	23.94		1
	15	35	23.90		1
	27	0	23.89	0-2	1
	27	12	23.81		1
	27	23	23.97		1
16QAM	1	0	23.64	0-2	1
	1	25	23.91		1
	1	49	23.65		1
	25	0	22.50	0-3	2
	25	12	22.60		2
	25	25	22.63		2
	15	0	22.45	0-5	2
	15	17	22.66		2
	15	35	22.57		2
	27	0	22.55		2
	27	12	22.63		2
	27	23	22.64		2

8.2.3 LTE Band 14

Table 8-4
LTE Band 14 Conducted Power – 10 MHz Bandwidth

LTE Band 14 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23330 (793.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	Design MPR [dB]
QPSK	1	0	**24.98**	0	0
	1	25	24.91		0
	1	49	24.81		0
	25	0	**23.84**	0-1	1
	25	12	23.77		1
	25	25	23.73		1
	50	0	23.8		1
	15	0	23.89	0-1	1
	15	17	23.76		1
	15	35	23.70		1
	27	0	23.88	0-2	1
	27	12	23.82		1
	27	23	23.70		1
16QAM	1	0	23.85	0-2	1
	1	25	23.95		1
	1	49	23.76		1
	25	0	22.83	0-3	2
	25	12	22.73		2
	25	25	22.69		2
	15	0	22.90	0-5	2
	15	17	22.74		2
	15	35	22.68		2
	27	0	22.82		2
	27	12	22.77		2
	27	23	22.70		2

8.2.4 LTE Band 26

Table 8-5
LTE Band 26 Conducted Power – 10 MHz Bandwidth

LTE Band 26 (Cell) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26740 (819.0 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 26990 (844.0 MHz)	MPR Allowed per 3GPP [dB]	Design MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.97	24.92	24.87	0	0
	1	25	24.93	24.95	24.92		0
	1	49	24.84	**24.98**	24.93		0
	25	0	23.87	23.92	23.93	0-1	1
	25	12	23.90	23.93	23.98		1
	25	25	23.93	**23.99**	23.97		1
	50	0	23.89	23.90	23.94		1
	15	0	24.24	24.10	23.96	0-1	1
	15	17	24.17	24.17	23.98		1
	15	35	24.00	24.16	24.08		1
	27	0	24.21	24.12	23.98	0-2	1
	27	12	24.09	24.16	24.00		1
	27	23	24.01	24.21	24.06		1
16QAM	1	0	24.09	23.88	23.82	0-2	1
	1	25	24.16	23.95	23.70		1
	1	49	23.94	24.11	23.89		1
	25	0	22.80	22.62	22.53	0-3	2
	25	12	22.76	22.69	22.53		2
	25	25	22.61	22.74	22.59		2
	15	0	22.76	22.63	22.50	0-5	2
	15	17	22.75	22.67	22.56		2
	15	35	22.62	22.70	22.60		2
	27	0	22.76	22.63	22.51		2
	27	12	22.66	22.68	22.51		2
	27	23	22.61	22.74	22.54		2

8.2.5 LTE Band 5

Table 8-6
LTE Band 5 Conducted Power – 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]	Design MPR [dB]
QPSK	1	0	**25.07**	0	0
	1	25	25.06		0
	1	49	24.98		0
	25	0	**24.13**	0-1	1
	25	12	24.10		1
	25	25	23.99		1
	50	0	24.09		1
	15	0	24.11	0-1	1
	15	17	24.04		1
	15	35	23.86		1
	27	0	24.05	0-2	1
	27	12	24.01		1
	27	23	23.91		1
16QAM	1	0	24.05	0-2	1
	1	25	24.03		1
	1	49	23.94		1
	25	0	22.78	0-3	2
	25	12	22.76		2
	25	25	22.67		2
	15	0	22.83	0-5	2
	15	17	22.80		2
	15	35	22.67		2
	27	0	22.76		2
	27	12	22.75		2
	27	23	22.67		2

8.2.6 LTE Band 66

Table 8-7
LTE Band 66 Conducted Power – 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	Design MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.45	23.33	23.56	0	0
	1	50	23.46	**23.82**	23.47		0
	1	99	23.36	23.46	23.54		0
	50	0	22.75	22.64	22.50	0-1	1
	50	25	22.76	**22.96**	22.59		1
	50	50	22.81	22.76	22.72		1
	100	0	22.95	22.90	22.86		1
	15	0	23.43	23.50	23.33	0-1	0
	15	42	23.80	23.69	23.35		0
	15	85	23.55	23.58	23.51		0
	27	0	22.55	22.52	22.44	0-2	1
	27	37	22.85	22.72	22.50		1
	27	73	22.64	22.68	22.66		1
16QAM	1	0	22.71	22.86	22.91	0-2	1
	1	50	22.98	22.89	22.67		1
	1	99	22.88	22.82	22.75		1
	15	0	22.53	22.56	22.47	0-3	1
	15	42	22.81	22.64	22.31		1
	15	85	22.76	22.66	22.52		1
	27	0	21.52	21.42	21.39	0-5	2
	27	37	21.77	21.64	21.27		2
	27	73	21.68	21.63	21.41		2

8.2.7 LTE Band 25

Table 8-8
LTE Band 25 Conducted Power – 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26140 (1860.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26590 (1905.0 MHz)	MPR Allowed per 3GPP [dB]	Design MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.55	23.45	23.36	0	0
	1	50	**23.70**	23.54	23.29		0
	1	99	23.53	23.55	23.09		0
	50	0	**22.85**	22.53	22.40	0-1	1
	50	25	22.83	22.60	22.57		1
	50	50	22.81	22.69	22.60		1
	100	0	22.83	22.84	22.84		1
	15	0	23.71	23.50	23.33	0-1	0
	15	42	23.90	23.60	23.43		0
	15	85	23.72	23.61	23.31		0
	27	0	22.71	22.45	22.29	0-2	1
	27	37	22.85	22.56	22.50		1
	27	73	22.71	22.65	22.45		1
16QAM	1	0	22.75	22.92	22.61	0-2	1
	1	50	22.97	22.97	22.53		1
	1	99	22.88	22.78	22.52		1
	15	0	22.69	22.49	22.33	0-3	1
	15	42	22.84	22.55	22.41		1
	15	85	22.78	22.57	22.44		1
	27	0	21.66	21.44	21.30	0-5	2
	27	37	21.81	21.52	21.33		2
	27	73	21.70	21.48	21.46		2

8.2.8 LTE Band 7

Table 8-9
LTE Band 7 Conducted Power – 20 MHz Bandwidth

LTE Band 7 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20850 (2510.0 MHz)	Mid Channel 21100 (2535.0 MHz)	High Channel 21350 (2560.0 MHz)	MPR Allowed per 3GPP [dB]	Design MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.60	22.36	22.64	0	0
	1	50	**23.00**	22.35	22.33		0
	1	99	22.78	22.38	22.88		0
	50	0	22.07	21.54	21.34	0-1	1
	50	25	**22.25**	21.60	21.32		1
	50	50	22.07	21.70	21.62		1
	100	0	22.24	21.82	21.67		1
	15	0	22.78	22.49	22.43	0-1	0
	15	42	23.15	22.58	22.28		0
	15	85	22.95	22.74	22.77		0
	27	0	21.81	21.50	21.41	0-2	1
	27	37	22.14	21.55	21.27		1
	27	73	22.01	21.64	21.60		1
16QAM	1	0	21.56	22.15	21.88	0-2	1
	1	50	21.90	21.97	21.75		1
	1	99	22.05	22.05	21.79		1
	15	0	21.54	21.69	21.71	0-3	1
	15	42	21.89	21.55	21.54		1
	15	85	21.94	21.68	21.55		1
	27	0	20.56	20.59	20.61	0-5	2
	27	37	20.94	20.58	20.47		2
	27	73	20.93	20.57	20.40		2

8.2.9 LTE Band 41

Table 8-10
LTE Band 41 Conducted Power – 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel 39750 (2506.0 MHz)	Low-Mid Channel 40185 (2549.5 MHz)	Mid Channel 40620 (2593.0 MHz)	Mid-High Channel 41055 (2636.5 MHz)	High Channel 41490 (2680.0 MHz)	MPR Allowed per 3GPP [dB]	Design MPR [dB]
			Conducted Power [dBm]						
QPSK	1	0	22.56	22.53	22.46	22.80	22.43	0	0
	1	50	22.92	22.36	22.51	22.76	22.50		0
	1	99	**22.95**	22.19	22.49	22.64	22.51		0
	50	0	21.66	21.45	21.43	21.59	21.35	0-1	1
	50	25	21.73	21.29	21.47	21.54	21.41		1
	50	50	**21.82**	21.19	21.49	21.52	21.44		1
	100	0	21.79	21.34	21.50	21.58	21.51		1
	15	0	22.55	22.49	22.42	22.58	22.38	0-1	0
	15	42	22.84	22.35	22.46	22.56	22.44		0
	15	85	22.87	22.22	22.45	22.46	22.52		0
	27	0	21.61	21.42	21.40	21.58	21.32	0-2	1
	27	37	21.75	21.29	21.44	21.60	21.39		1
	27	73	21.77	21.15	21.37	21.50	21.43		1
16QAM	1	0	21.31	21.56	21.21	21.39	21.31	0-2	1
	1	50	21.70	21.36	21.11	21.48	21.33		1
	1	99	21.70	21.29	21.08	21.45	21.46		1
	15	0	21.28	21.50	21.22	21.32	21.26	0-3	1
	15	42	21.62	21.29	21.21	21.36	21.26		1
	15	85	21.70	21.19	21.23	21.30	21.34		1
	27	0	20.36	20.44	20.20	20.34	20.18	0-5	2
	27	37	20.53	20.28	20.18	20.34	20.19		2
	27	73	20.63	20.16	20.19	20.31	20.27		2

Figure 8-2
Power Measurement Setup

8.3 WLAN Conducted Powers

Table 8-11
2.4 GHz WLAN Maximum Average RF Power

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	18.04	16.04	15.94
2422	3		17.53	17.57
2432	5		17.40	17.42
2437	6	17.89	17.45	17.46
2447	8		17.50	17.52
2462	11	17.91	14.00	13.99

Table 8-12
5 GHz WLAN Maximum Average RF Power

5GHz (20MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11a	802.11n
		Average	Average
5180	36	16.35	15.96
5200	40	16.22	15.83
5220	44	16.34	15.88
5240	48	16.40	15.79
5260	52	16.19	15.92
5280	56	16.23	15.81
5300	60	16.42	15.95
5320	64	16.21	15.96
5500	100	16.60	15.86
5600	120	16.15	16.10
5620	124	16.22	16.01
5720	144	16.05	15.85
5745	149	16.14	15.95
5785	157	15.93	15.78
5825	165	15.88	15.77

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.

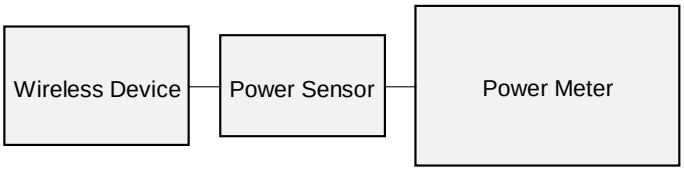

Figure 8-3
Power Measurement Setup

8.4 Bluetooth Conducted Powers

Table 8-13
Bluetooth Average RF Power

Frequency [MHz]	Modulation	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	GFSK	1.0	0	17.33	54.075
2441	GFSK	1.0	39	17.40	54.954
2480	GFSK	1.0	78	17.03	50.466

Note 1: Bluetooth was evaluated with a test mode with 100% transmission duty factor.

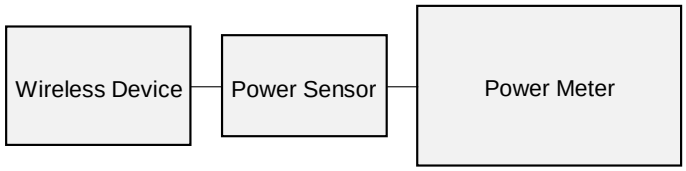

Figure 8-4
Power Measurement Setup

8.5 802.15.4 ab-NB Conducted Powers

Table 8-15
802.15.4 ab-NB Average RF Power

Band	Frequency	Channel	Average
802.15.4 ab-NB	5728.75	Low	15.68
	5786.25	Middle	15.76
	5846.25	High	15.97

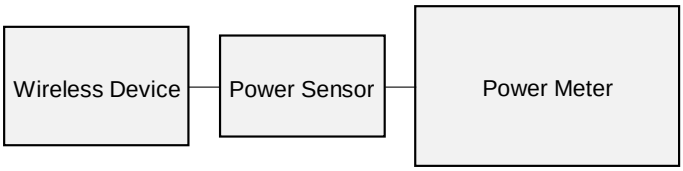

Figure 8-5
Power Measurement Setup

8.6 802.15.4 ab-NB Duty Cycle

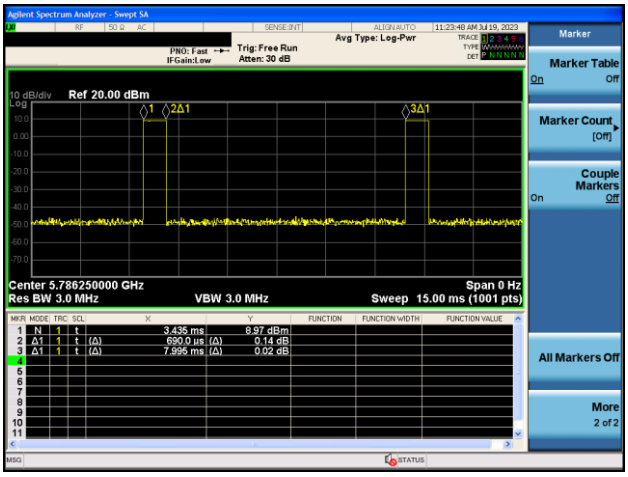

Figure 8-6
802.15.4 ab-NB Transmission Plot

Equation 8-1
802.15.4 ab-NB Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{0.690}{7.995} * 100\% = 8.6\%$$

9 SYSTEM VERIFICATION

9.1 Tissue Verification

Table 9-1
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
07/04/2023	750 Head	22.3	680	0.848	41.599	0.888	42.305	-4.50%	-1.67%
			695	0.852	41.554	0.889	42.227	-4.16%	-1.59%
			700	0.854	41.539	0.889	42.201	-3.94%	-1.57%
			710	0.857	41.509	0.890	42.149	-3.71%	-1.52%
			725	0.862	41.470	0.891	42.071	-3.25%	-1.43%
			750	0.872	41.403	0.894	41.942	-2.46%	-1.29%
			770	0.878	41.334	0.895	41.838	-1.90%	-1.20%
			785	0.883	41.277	0.896	41.760	-1.45%	-1.16%
			800	0.887	41.230	0.897	41.682	-1.11%	-1.08%
07/06/2023	750 Head	22.3	680	0.847	43.822	0.888	42.305	-4.62%	3.59%
			695	0.852	43.788	0.889	42.227	-4.16%	3.70%
			700	0.854	43.776	0.889	42.201	-3.94%	3.73%
			710	0.857	43.746	0.890	42.149	-3.71%	3.79%
			725	0.863	43.698	0.891	42.071	-3.14%	3.87%
			750	0.872	43.632	0.894	41.942	-2.46%	4.03%
			770	0.878	43.586	0.895	41.838	-1.90%	4.18%
			785	0.883	43.540	0.896	41.760	-1.45%	4.26%
			800	0.888	43.491	0.897	41.682	-1.00%	4.34%
07/19/2023	750 Head	20.0	680	0.849	41.863	0.888	42.305	-4.39%	-1.04%
			695	0.853	41.794	0.889	42.227	-4.05%	-1.03%
			700	0.854	41.773	0.889	42.201	-3.94%	-1.01%
			710	0.857	41.730	0.890	42.149	-3.71%	-0.99%
			725	0.863	41.679	0.891	42.071	-3.14%	-0.93%
			750	0.872	41.620	0.894	41.942	-2.46%	-0.77%
			770	0.880	41.556	0.895	41.838	-1.68%	-0.67%
			785	0.885	41.501	0.896	41.760	-1.23%	-0.62%
			800	0.890	41.436	0.897	41.682	-0.78%	-0.59%
			850	0.908	41.277	0.916	41.500	-0.87%	-0.54%
07/24/2023	750 Head	23.3	680	0.848	41.163	0.888	42.305	-4.50%	-2.70%
			695	0.853	41.134	0.889	42.227	-4.05%	-2.59%
			700	0.854	41.124	0.889	42.201	-3.94%	-2.55%
			710	0.857	41.100	0.890	42.149	-3.71%	-2.49%
			725	0.861	41.059	0.891	42.071	-3.37%	-2.41%
			750	0.869	40.986	0.894	41.942	-2.80%	-2.28%
			770	0.875	40.930	0.895	41.838	-2.23%	-2.17%
			785	0.880	40.887	0.896	41.760	-1.79%	-2.09%
			800	0.885	40.849	0.897	41.682	-1.34%	-2.00%
07/04/2023	835 Head	22.3	815	0.893	41.190	0.898	41.594	-0.56%	-0.97%
			820	0.895	41.180	0.899	41.578	-0.44%	-0.96%
			835	0.901	41.149	0.900	41.500	0.11%	-0.85%
			850	0.906	41.114	0.916	41.500	-1.09%	-0.93%
07/06/2023	835 Head	22.3	815	0.893	43.447	0.898	41.594	-0.56%	4.45%
			820	0.895	43.436	0.899	41.578	-0.44%	4.47%
			835	0.900	43.398	0.900	41.500	0.00%	4.57%
			850	0.906	43.362	0.916	41.500	-1.09%	4.49%
07/19/2023	835 Head	20.0	815	0.895	41.383	0.898	41.594	-0.33%	-0.51%
			820	0.897	41.364	0.899	41.578	-0.22%	-0.51%
			835	0.902	41.326	0.900	41.500	0.22%	-0.42%
			850	0.908	41.277	0.916	41.500	-0.87%	-0.54%
07/24/2023	835 Head	23.3	815	0.890	40.822	0.898	41.594	-0.89%	-1.86%
			820	0.891	40.816	0.899	41.578	-0.89%	-1.83%
			835	0.896	40.783	0.900	41.500	-0.44%	-1.73%
			850	0.900	40.740	0.916	41.500	-1.75%	-1.83%
06/14/2023	1750 Head	19.1	1710	1.284	40.849	1.348	40.142	-4.75%	1.76%
			1720	1.290	40.808	1.354	40.126	-4.73%	1.70%
			1745	1.303	40.718	1.368	40.087	-4.75%	1.57%
			1750	1.306	40.701	1.371	40.079	-4.74%	1.55%
			1770	1.318	40.640	1.383	40.047	-4.70%	1.48%
			1790	1.330	40.580	1.394	40.016	-4.59%	1.41%
07/19/2023	1750 Head	21.4	1710	1.338	41.850	1.348	40.142	-0.74%	4.25%
			1720	1.345	41.830	1.354	40.126	-0.66%	4.25%
			1745	1.361	41.787	1.368	40.087	-0.51%	4.24%
			1750	1.363	41.779	1.371	40.079	-0.58%	4.24%
			1770	1.375	41.750	1.383	40.047	-0.58%	4.25%
			1790	1.386	41.719	1.394	40.016	-0.57%	4.26%
06/26/2023	1900 Head	19.2	1850	1.383	38.837	1.400	40.000	-1.21%	-2.91%
			1860	1.393	38.796	1.400	40.000	-0.50%	-3.01%
			1880	1.412	38.726	1.400	40.000	0.86%	-3.19%
			1900	1.429	38.657	1.400	40.000	2.07%	-3.36%
			1905	1.433	38.638	1.400	40.000	2.36%	-3.41%
			1910	1.438	38.619	1.400	40.000	2.71%	-3.45%
			1920	1.447	38.576	1.400	40.000	3.36%	-3.56%
06/21/2023	2450 Head	20.6	2300	1.686	39.181	1.670	39.500	0.96%	-0.81%
			2310	1.694	39.176	1.679	39.480	0.89%	-0.77%
			2320	1.700	39.168	1.687	39.460	0.77%	-0.74%
			2400	1.766	39.041	1.756	39.289	0.57%	-0.63%
			2450	1.803	38.941	1.800	39.200	0.17%	-0.66%
			2480	1.831	38.891	1.833	39.162	-0.11%	-0.69%
			2500	1.846	38.873	1.855	39.136	-0.49%	-0.67%
			2510	1.853	38.857	1.866	39.123	-0.70%	-0.68%
			2535	1.871	38.794	1.893	39.092	-1.16%	-0.76%
			2550	1.885	38.756	1.909	39.073	-1.26%	-0.81%
			2560	1.895	38.737	1.920	39.060	-1.30%	-0.83%
			2600	1.928	38.687	1.964	39.009	-1.83%	-0.83%
			2650	1.969	38.563	2.018	38.945	-2.43%	-0.98%
			2680	1.995	38.522	2.051	38.907	-2.73%	-0.99%
			2700	2.010	38.491	2.073	38.882	-3.04%	-1.01%

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
06/23/2023	2450 Head	19.3	2300	1.652	39.404	1.670	39.500	-1.08%	-0.24%
			2310	1.659	39.394	1.679	39.480	-1.19%	-0.22%
			2320	1.666	39.380	1.687	39.460	-1.24%	-0.20%
			2400	1.729	39.239	1.756	39.289	-1.54%	-0.13%
			2450	1.764	39.142	1.800	39.200	-2.00%	-0.15%
			2480	1.790	39.090	1.833	39.162	-2.35%	-0.18%
			2500	1.805	39.076	1.855	39.136	-2.70%	-0.15%
			2510	1.812	39.062	1.866	39.123	-2.89%	-0.16%
			2535	1.830	39.006	1.893	39.092	-3.33%	-0.22%
			2550	1.843	38.976	1.909	39.073	-3.46%	-0.25%
			2560	1.853	38.961	1.920	39.060	-3.49%	-0.25%
			2600	1.885	38.910	1.964	39.009	-4.02%	-0.25%
			2650	1.927	38.791	2.018	38.945	-4.51%	-0.40%
			2680	1.955	38.749	2.051	38.907	-4.68%	-0.41%
			2700	1.970	38.716	2.073	38.882	-4.97%	-0.43%
06/26/2023	2450 Head	19.2	2300	1.645	40.309	1.670	39.500	-1.50%	2.05%
			2310	1.652	40.299	1.679	39.480	-1.61%	2.07%
			2320	1.660	40.288	1.687	39.460	-1.60%	2.10%
			2400	1.722	40.158	1.756	39.289	-1.94%	2.21%
			2450	1.760	40.080	1.800	39.200	-2.22%	2.24%
			2480	1.786	40.030	1.833	39.162	-2.56%	2.22%
			2500	1.802	40.006	1.855	39.136	-2.86%	2.22%
			2510	1.810	39.992	1.866	39.123	-3.00%	2.22%
			2535	1.830	39.937	1.893	39.092	-3.33%	2.16%
			2550	1.843	39.904	1.909	39.073	-3.46%	2.13%
			2560	1.852	39.888	1.920	39.060	-3.54%	2.12%
			2600	1.884	39.833	1.964	39.009	-4.07%	2.11%
			2650	1.925	39.739	2.018	38.945	-4.61%	2.04%
			2680	1.950	39.695	2.051	38.907	-4.92%	2.03%
06/28/2023	2450 Head	20.2	2300	1.655	40.037	1.670	39.500	-0.90%	1.36%
			2310	1.662	40.030	1.679	39.480	-1.01%	1.39%
			2320	1.669	40.022	1.687	39.460	-1.07%	1.42%
			2400	1.730	39.916	1.756	39.289	-1.48%	1.60%
			2450	1.766	39.835	1.800	39.200	-1.89%	1.62%
			2480	1.792	39.790	1.833	39.162	-2.24%	1.60%
			2500	1.810	39.780	1.855	39.136	-2.43%	1.65%
			2510	1.818	39.769	1.866	39.123	-2.57%	1.65%
			2535	1.836	39.717	1.893	39.092	-3.01%	1.60%
			2550	1.848	39.683	1.909	39.073	-3.20%	1.56%
			2560	1.857	39.664	1.920	39.060	-3.28%	1.55%
			2600	1.891	39.611	1.964	39.009	-3.72%	1.54%
			2650	1.930	39.520	2.018	38.945	-4.36%	1.48%
			2680	1.955	39.464	2.051	38.907	-4.68%	1.43%
			2700	1.972	39.438	2.073	38.882	-4.87%	1.43%
07/19/2023	2450 Head	19.0	2300	1.654	40.814	1.670	39.500	-0.96%	3.33%
			2310	1.661	40.801	1.679	39.480	-1.07%	3.35%
			2320	1.669	40.789	1.687	39.460	-1.07%	3.37%
			2400	1.733	40.657	1.756	39.289	-1.31%	3.48%
			2450	1.771	40.566	1.800	39.200	-1.61%	3.48%
			2480	1.797	40.515	1.833	39.162	-1.96%	3.45%
			2500	1.812	40.492	1.855	39.136	-2.32%	3.46%
			2510	1.819	40.478	1.866	39.123	-2.52%	3.46%
			2535	1.839	40.429	1.893	39.092	-2.85%	3.42%
			2550	1.851	40.400	1.909	39.073	-3.04%	3.40%
			2560	1.861	40.385	1.920	39.060	-3.07%	3.39%
			2600	1.892	40.336	1.964	39.009	-3.67%	3.40%
			2650	1.934	40.240	2.018	38.945	-4.16%	3.33%
			2680	1.961	40.196	2.051	38.907	-4.39%	3.31%
			2700	1.977	40.165	2.073	38.882	-4.63%	3.30%
07/21/2023	2450 Head	19.3	2300	1.655	40.381	1.670	39.500	-0.90%	2.23%
			2310	1.663	40.377	1.679	39.480	-0.95%	2.27%
			2320	1.670	40.368	1.687	39.460	-1.01%	2.30%
			2400	1.734	40.245	1.756	39.289	-1.25%	2.43%
			2450	1.771	40.157	1.800	39.200	-1.61%	2.44%
			2480	1.798	40.108	1.833	39.162	-1.91%	2.42%
			2500	1.813	40.092	1.855	39.136	-2.26%	2.44%
			2510	1.821	40.079	1.866	39.123	-2.41%	2.44%
			2535	1.839	40.021	1.893	39.092	-2.85%	2.38%
			2550	1.852	39.987	1.909	39.073	-2.99%	2.34%
			2560	1.862	39.969	1.920	39.060	-3.02%	2.33%
			2600	1.894	39.914	1.964	39.009	-3.56%	2.32%
			2650	1.935	39.808	2.018	38.945	-4.11%	2.22%
			2680	1.960	39.763	2.051	38.907	-4.44%	2.20%
			2700	1.974	39.730	2.073	38.882	-4.78%	2.18%

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
			5180	4.597	36.301	4.635	36.009	-0.82%	0.81%
			5190	4.607	36.286	4.645	35.998	-0.82%	0.80%
			5200	4.617	36.273	4.655	35.986	-0.82%	0.80%
			5210	4.627	36.243	4.666	35.975	-0.84%	0.74%
			5220	4.635	36.209	4.676	35.963	-0.88%	0.68%
			5240	4.658	36.164	4.696	35.940	-0.81%	0.62%
			5250	4.673	36.144	4.706	35.929	-0.70%	0.60%
			5260	4.687	36.122	4.717	35.917	-0.64%	0.57%
			5270	4.700	36.107	4.727	35.906	-0.57%	0.56%
			5280	4.709	36.111	4.737	35.894	-0.59%	0.60%
			5290	4.717	36.102	4.748	35.883	-0.65%	0.61%
			5300	4.724	36.082	4.758	35.871	-0.71%	0.59%
			5310	4.732	36.046	4.768	35.860	-0.76%	0.52%
			5320	4.744	36.015	4.778	35.849	-0.71%	0.46%
			5500	4.951	35.700	4.963	35.643	-0.24%	0.16%
			5510	4.963	35.668	4.973	35.632	-0.20%	0.10%
			5520	4.977	35.643	4.983	35.620	-0.12%	0.06%
			5530	4.990	35.622	4.994	35.609	-0.08%	0.04%
			5540	5.003	35.607	5.004	35.597	-0.02%	0.03%
			5550	5.017	35.598	5.014	35.586	0.06%	0.03%
			5560	5.031	35.592	5.024	35.574	0.14%	0.05%
			5580	5.053	35.570	5.045	35.551	0.16%	0.05%
			5600	5.073	35.534	5.065	35.529	0.16%	0.01%
			5610	5.084	35.514	5.076	35.518	0.16%	-0.01%
			5620	5.097	35.487	5.086	35.506	0.22%	-0.05%
			5640	5.128	35.448	5.106	35.483	0.43%	-0.10%
06/26/2023	5200-5800 Head	20.7	5660	5.152	35.437	5.127	35.460	0.49%	-0.06%
			5670	5.160	35.430	5.137	35.449	0.45%	-0.05%
			5680	5.169	35.417	5.147	35.437	0.43%	-0.06%
			5690	5.180	35.389	5.158	35.426	0.43%	-0.10%
			5700	5.193	35.359	5.168	35.414	0.48%	-0.16%
			5710	5.204	35.334	5.178	35.403	0.50%	-0.19%
			5720	5.215	35.315	5.188	35.391	0.52%	-0.21%
			5745	5.248	35.278	5.214	35.363	0.65%	-0.24%
			5750	5.254	35.271	5.219	35.357	0.67%	-0.24%
			5755	5.259	35.267	5.224	35.351	0.67%	-0.24%
			5765	5.269	35.253	5.234	35.340	0.67%	-0.25%
			5775	5.281	35.234	5.245	35.329	0.69%	-0.27%
			5785	5.290	35.210	5.255	35.317	0.67%	-0.30%
			5795	5.301	35.188	5.265	35.305	0.68%	-0.33%
			5800	5.306	35.180	5.270	35.300	0.68%	-0.34%
			5800	5.306	35.180	5.270	35.300	0.68%	-0.34%
			5805	5.313	35.174	5.275	35.294	0.72%	-0.34%
			5825	5.343	35.126	5.296	35.271	0.89%	-0.41%
			5835	5.354	35.109	5.305	35.230	0.92%	-0.34%
			5845	5.363	35.099	5.315	35.210	0.90%	-0.32%
			5855	5.374	35.097	5.325	35.197	0.92%	-0.28%
			5865	5.387	35.082	5.336	35.190	0.96%	-0.31%
			5865	5.387	35.082	5.336	35.190	0.96%	-0.31%
			5865	5.387	35.082	5.336	35.190	0.96%	-0.31%
			5865	5.387	35.082	5.336	35.190	0.96%	-0.31%
			5875	5.397	35.056	5.347	35.183	0.94%	-0.36%
			5885	5.407	35.032	5.357	35.177	0.93%	-0.41%
			5905	5.434	34.991	5.379	35.163	1.02%	-0.49%

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
			5180	4.543	35.144	4.635	36.009	-1.98%	-2.40%
			5190	4.552	35.128	4.645	35.998	-2.00%	-2.42%
			5200	4.561	35.108	4.655	35.986	-2.02%	-2.44%
			5210	4.570	35.088	4.666	35.975	-2.06%	-2.47%
			5220	4.578	35.068	4.676	35.963	-2.10%	-2.49%
			5240	4.597	35.035	4.696	35.940	-2.11%	-2.52%
			5250	4.607	35.013	4.706	35.929	-2.10%	-2.55%
			5260	4.621	34.996	4.717	35.917	-2.04%	-2.56%
			5270	4.635	34.988	4.727	35.906	-1.95%	-2.56%
			5280	4.643	34.978	4.737	35.894	-1.98%	-2.55%
			5290	4.650	34.967	4.748	35.883	-2.06%	-2.55%
			5300	4.657	34.943	4.758	35.871	-2.12%	-2.59%
			5310	4.666	34.921	4.768	35.860	-2.14%	-2.62%
			5320	4.677	34.894	4.778	35.849	-2.11%	-2.66%
			5500	4.863	34.654	4.963	35.643	-2.01%	-2.77%
			5510	4.873	34.630	4.973	35.632	-2.01%	-2.81%
			5520	4.885	34.616	4.983	35.620	-1.97%	-2.82%
			5530	4.898	34.597	4.994	35.609	-1.92%	-2.84%
			5540	4.912	34.585	5.004	35.597	-1.84%	-2.84%
			5550	4.925	34.576	5.014	35.586	-1.78%	-2.84%
			5560	4.937	34.567	5.024	35.574	-1.73%	-2.83%
			5580	4.955	34.554	5.045	35.551	-1.78%	-2.80%
			5600	4.975	34.518	5.065	35.529	-1.78%	-2.85%
			5610	4.985	34.497	5.076	35.518	-1.79%	-2.87%
07/18/2023	5200-5800 Head	20.0	5620	4.996	34.482	5.086	35.506	-1.77%	-2.88%
			5640	5.021	34.447	5.106	35.483	-1.66%	-2.92%
			5660	5.041	34.439	5.127	35.460	-1.68%	-2.88%
			5670	5.048	34.434	5.137	35.449	-1.73%	-2.86%
			5680	5.053	34.411	5.147	35.437	-1.83%	-2.90%
			5690	5.061	34.386	5.158	35.426	-1.88%	-2.94%
			5700	5.074	34.353	5.168	35.414	-1.82%	-3.00%
			5710	5.088	34.328	5.178	35.403	-1.74%	-3.04%
			5720	5.100	34.317	5.188	35.391	-1.70%	-3.03%
			5745	5.127	34.296	5.214	35.363	-1.67%	-3.02%
			5750	5.133	34.289	5.219	35.357	-1.65%	-3.02%
			5755	5.137	34.279	5.224	35.351	-1.67%	-3.03%
			5765	5.144	34.271	5.234	35.340	-1.72%	-3.02%
			5775	5.150	34.257	5.245	35.329	-1.81%	-3.03%
			5785	5.159	34.234	5.255	35.317	-1.83%	-3.07%
			5795	5.173	34.203	5.265	35.305	-1.75%	-3.12%
			5805	5.186	34.176	5.275	35.294	-1.69%	-3.17%
			5825	5.206	34.156	5.296	35.271	-1.70%	-3.16%
			5835	5.217	34.155	5.305	35.230	-1.66%	-3.05%
			5845	5.230	34.146	5.315	35.210	-1.60%	-3.02%
			5855	5.240	34.136	5.325	35.197	-1.60%	-3.01%
			5875	5.256	34.096	5.347	35.183	-1.70%	-3.09%
			5885	5.268	34.063	5.357	35.177	-1.66%	-3.17%
			5905	5.292	34.021	5.379	35.163	-1.62%	-3.25%

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
07/19/2023	5200-5800 Head	21.0	5180	4.412	35.749	4.635	36.009	-4.81%	-0.72%
			5190	4.425	35.728	4.645	35.998	-4.74%	-0.75%
			5200	4.434	35.714	4.655	35.986	-4.75%	-0.76%
			5210	4.443	35.706	4.666	35.975	-4.78%	-0.75%
			5220	4.455	35.688	4.676	35.963	-4.73%	-0.76%
			5240	4.478	35.642	4.696	35.940	-4.64%	-0.83%
			5250	4.487	35.622	4.706	35.929	-4.65%	-0.85%
			5260	4.499	35.606	4.717	35.917	-4.62%	-0.87%
			5270	4.512	35.585	4.727	35.906	-4.55%	-0.89%
			5280	4.524	35.577	4.737	35.894	-4.50%	-0.88%
			5290	4.534	35.563	4.748	35.883	-4.51%	-0.89%
			5300	4.545	35.543	4.758	35.871	-4.48%	-0.91%
			5310	4.554	35.528	4.768	35.860	-4.49%	-0.93%
			5320	4.567	35.510	4.778	35.849	-4.42%	-0.95%
			5500	4.759	35.201	4.963	35.643	-4.11%	-1.24%
			5510	4.770	35.180	4.973	35.632	-4.08%	-1.27%
			5520	4.783	35.165	4.983	35.620	-4.01%	-1.28%
			5530	4.795	35.151	4.994	35.609	-3.98%	-1.29%
			5540	4.808	35.131	5.004	35.597	-3.92%	-1.31%
			5550	4.821	35.103	5.014	35.586	-3.85%	-1.36%
			5560	4.833	35.082	5.024	35.574	-3.80%	-1.38%
			5580	4.854	35.051	5.045	35.551	-3.79%	-1.41%
			5600	4.874	35.021	5.065	35.529	-3.77%	-1.43%
			5610	4.886	35.001	5.076	35.518	-3.74%	-1.46%
			5620	4.898	34.976	5.086	35.506	-3.70%	-1.49%
			5640	4.923	34.930	5.106	35.483	-3.58%	-1.56%
			5660	4.947	34.919	5.127	35.460	-3.51%	-1.53%
			5670	4.957	34.905	5.137	35.449	-3.50%	-1.53%
			5680	4.967	34.885	5.147	35.437	-3.50%	-1.56%
			5690	4.977	34.868	5.158	35.426	-3.51%	-1.58%
			5700	4.989	34.848	5.168	35.414	-3.46%	-1.60%
			5710	5.003	34.824	5.178	35.403	-3.38%	-1.64%
			5720	5.015	34.805	5.188	35.391	-3.33%	-1.66%
			5745	5.042	34.767	5.214	35.363	-3.30%	-1.69%
			5750	5.048	34.758	5.219	35.357	-3.28%	-1.69%
			5755	5.056	34.750	5.224	35.351	-3.22%	-1.70%
			5765	5.067	34.731	5.234	35.340	-3.19%	-1.72%
			5775	5.076	34.718	5.245	35.329	-3.22%	-1.73%
			5785	5.090	34.706	5.255	35.317	-3.14%	-1.73%
			5795	5.101	34.697	5.265	35.305	-3.11%	-1.72%
			5800	5.107	34.691	5.270	35.300	-3.09%	-1.73%
			5805	5.112	34.683	5.275	35.294	-3.09%	-1.73%
			5825	5.132	34.641	5.296	35.271	-3.10%	-1.79%
			5835	5.144	34.629	5.305	35.230	-3.03%	-1.71%
			5845	5.154	34.610	5.315	35.210	-3.03%	-1.70%
			5855	5.162	34.590	5.325	35.197	-3.06%	-1.72%
			5865	5.172	34.576	5.336	35.190	-3.07%	-1.74%
			5875	5.185	34.566	5.347	35.183	-3.03%	-1.75%
			5885	5.198	34.551	5.357	35.177	-2.97%	-1.78%
			5905	5.222	34.504	5.379	35.163	-2.92%	-1.87%

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.

Per April 2019 TCB Workshop Notes, single head-tissue simulating liquid specified in IEC 62209-1 is permitted to use for all SAR tests.

9.2 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 the SAR System Validation Appendix.

Table 9-2
System Verification Results – 1g

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	DAE	Measured SAR 1g (W/kg)	1W Target SAR 1g (W/kg)	1W Normalized SAR 1g (W/kg)	Deviation 1g (%)
AM8	750	HEAD	07/04/2023	20.3	21.2	0.20	1034	7421	604	1.810	8.640	9.050	4.75%
AM8	750	HEAD	07/06/2023	22.0	21.0	0.20	1057	7421	604	1.760	8.510	8.800	3.41%
AM8	750	HEAD	07/24/2023	20.7	22.4	0.20	1034	7421	604	1.740	8.640	8.700	0.69%
AM8	835	HEAD	07/04/2023	20.3	21.2	0.20	460	7421	604	1.990	9.720	9.950	2.37%
AM8	835	HEAD	07/19/2023	19.9	20.4	0.20	460	7421	604	2.000	9.720	10.000	2.88%
AM8	835	HEAD	07/24/2023	20.7	22.4	0.20	4d040	7421	604	1.980	9.790	9.900	1.12%
AM5	1750	HEAD	06/14/2023	19.3	20.1	0.10	1083	7639	1646	3.450	36.500	34.500	-5.48%
AM4	1750	HEAD	07/19/2023	23.7	21.8	0.10	1104	7490	1644	3.460	35.700	34.600	-3.08%
AM8	1900	HEAD	06/26/2023	21.1	20.0	0.10	5d181	7421	604	4.110	40.100	41.100	2.49%
AM7	2450	HEAD	06/21/2023	21.6	20.2	0.10	921	7532	501	5.080	54.200	50.800	-6.27%
AM7	2450	HEAD	06/23/2023	20.6	20.0	0.10	921	7532	501	5.150	54.200	51.500	-4.98%
AM2	2450	HEAD	06/26/2023	22.5	20.6	0.10	921	7308	467	5.470	54.200	54.700	0.92%
AM2	2450	HEAD	06/28/2023	22.9	20.9	0.10	921	7308	467	5.150	54.200	51.500	-4.98%
AM7	2450	HEAD	07/19/2023	22.3	21.3	0.10	921	7532	501	5.380	54.200	53.800	-0.74%
AM7	2450	HEAD	07/21/2023	21.4	21.0	0.10	921	7532	501	5.030	54.200	50.300	-7.20%
AM7	2600	HEAD	06/21/2023	21.6	20.2	0.10	1069	7532	501	5.250	55.600	52.500	-5.58%
AM2	2600	HEAD	06/28/2023	22.9	20.9	0.10	1069	7308	467	5.550	55.600	55.500	-0.18%
AM7	2600	HEAD	07/19/2023	22.3	21.3	0.10	1069	7532	501	5.760	55.600	57.600	3.60%
AM7	2600	HEAD	07/21/2023	21.4	21.0	0.10	1069	7532	501	5.560	55.600	55.600	0.00%
AM1	5250	HEAD	06/26/2023	22.0	21.1	0.05	1123	7420	1333	4.000	80.500	80.000	-0.62%
AM9	5250	HEAD	07/18/2023	21.2	19.5	0.05	1123	7427	1403	3.990	80.500	79.800	-0.87%
AM1	5250	HEAD	07/19/2023	22.5	20.7	0.05	1123	7420	1333	3.850	80.500	77.000	-4.35%
AM1	5600	HEAD	06/26/2023	22.0	21.1	0.05	1123	7420	1333	4.190	83.700	83.800	0.12%
AM9	5600	HEAD	07/18/2023	21.2	19.5	0.05	1123	7427	1403	4.110	83.700	82.200	-1.79%
AM1	5600	HEAD	07/19/2023	22.5	20.7	0.05	1123	7420	1333	4.260	83.700	85.200	1.79%
AM1	5750	HEAD	06/26/2023	22.0	21.1	0.05	1123	7420	1333	4.060	80.500	81.200	0.87%
AM9	5750	HEAD	07/18/2023	21.2	19.5	0.05	1123	7427	1403	3.850	80.500	77.000	-4.35%
AM1	5750	HEAD	07/19/2023	22.5	20.7	0.05	1123	7420	1333	3.810	80.500	76.200	-5.34%

Table 9-3
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	DAE	Measured SAR 10g (W/kg)	1W Target SAR 10g (W/kg)	1W Normalized SAR 10g (W/kg)	Deviation 10g (%)
AM8	750	HEAD	07/04/2023	20.3	21.2	0.20	1034	7421	604	1.200	5.610	6.000	6.95%
AM8	750	HEAD	07/06/2023	22.0	21.0	0.20	1057	7421	604	1.160	5.580	5.800	3.94%
AM8	750	HEAD	07/24/2023	20.7	22.4	0.20	1034	7421	604	1.150	5.610	5.750	2.50%
AM8	835	HEAD	07/04/2023	20.3	21.2	0.20	460	7421	604	1.310	6.340	6.550	3.31%
AM8	835	HEAD	07/19/2023	19.9	20.4	0.20	460	7421	604	1.310	6.340	6.550	3.31%
AM8	835	HEAD	07/24/2023	20.7	22.4	0.20	4d040	7421	604	1.300	6.380	6.500	1.88%
AM5	1750	HEAD	06/14/2023	19.3	20.1	0.10	1083	7639	1646	1.850	19.200	18.500	-3.65%
AM4	1750	HEAD	07/19/2023	23.7	21.8	0.10	1104	7490	1644	1.850	18.800	18.500	-1.60%
AM8	1900	HEAD	06/26/2023	21.1	20.0	0.10	5d181	7421	604	2.110	20.800	21.100	1.44%
AM7	2450	HEAD	06/21/2023	21.6	20.2	0.10	921	7532	501	2.390	25.500	23.900	-6.27%
AM7	2450	HEAD	06/23/2023	20.6	20.0	0.10	921	7532	501	2.420	25.500	24.200	-5.10%
AM2	2450	HEAD	06/26/2023	22.5	20.6	0.10	921	7308	467	2.590	25.500	25.900	1.57%
AM2	2450	HEAD	06/28/2023	22.9	20.9	0.10	921	7308	467	2.450	25.500	24.500	-3.92%
AM7	2450	HEAD	07/19/2023	22.3	21.3	0.10	921	7532	501	2.540	25.500	25.400	-0.39%
AM7	2450	HEAD	07/21/2023	21.4	21.0	0.10	921	7532	501	2.370	25.500	23.700	-7.06%
AM7	2600	HEAD	06/21/2023	21.6	20.2	0.10	1069	7532	501	2.440	24.900	24.400	-2.01%
AM2	2600	HEAD	06/28/2023	22.9	20.9	0.10	1069	7308	467	2.540	24.900	25.400	2.01%
AM7	2600	HEAD	07/19/2023	22.3	21.3	0.10	1069	7532	501	2.620	24.900	26.200	5.22%
AM7	2600	HEAD	07/21/2023	21.4	21.0	0.10	1069	7532	501	2.540	24.900	25.400	2.01%
AM1	5250	HEAD	06/26/2023	22.0	21.1	0.05	1123	7420	1333	1.140	22.900	22.800	-0.44%
AM9	5250	HEAD	07/18/2023	21.2	19.5	0.05	1123	7427	1403	1.150	22.900	23.000	0.44%
AM1	5250	HEAD	07/19/2023	22.5	20.7	0.05	1123	7420	1333	1.100	22.900	22.000	-3.93%
AM1	5600	HEAD	06/26/2023	22.0	21.1	0.05	1123	7420	1333	1.180	23.700	23.600	-0.42%
AM9	5600	HEAD	07/18/2023	21.2	19.5	0.05	1123	7427	1403	1.160	23.700	23.200	-2.11%
AM1	5600	HEAD	07/19/2023	22.5	20.7	0.05	1123	7420	1333	1.210	23.700	24.200	2.11%
AM1	5750	HEAD	06/26/2023	22.0	21.1	0.05	1123	7420	1333	1.150	22.700	23.000	1.32%
AM9	5750	HEAD	07/18/2023	21.2	19.5	0.05	1123	7427	1403	1.110	22.700	22.200	-2.20%
AM1	5750	HEAD	07/19/2023	22.5	20.7	0.05	1123	7420	1333	1.080	22.700	21.600	-4.85%

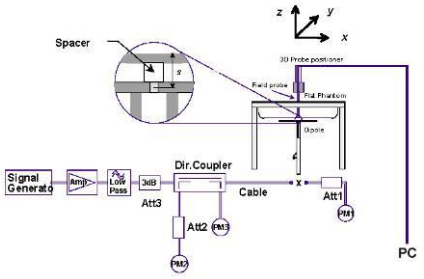

Figure 9-1
System Verification Setup Diagram

Figure 9-2
System Verification Setup Photo

10 SAR DATA SUMMARY

10.1 Standalone Head SAR Data

Table 10-1
UMTS 850 Head SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
826.40	4132	front	10 mm	UMTS 850	RMC	Titanium	Sport	HYX46KF72Q	25.00	24.31	0.02	1:1	0.002	1.172	0.002	A1
836.60	4183	front	10 mm	UMTS 850	RMC	Titanium	Sport	HYX46KF72Q	25.00	24.28	0.00	1:1	0.002	1.180	0.002	
846.60	4233	front	10 mm	UMTS 850	RMC	Titanium	Sport	HYX46KF72Q	25.00	24.19	0.05	1:1	0.001	1.205	0.001	
826.40	4132	front	10 mm	UMTS 850	RMC	Titanium	Fabric	HYX46KF72Q	25.00	24.31	0.00	1:1	0.002	1.172	0.002	
826.40	4132	front	10 mm	UMTS 850	RMC	Titanium	Velcro	HYX46KF72Q	25.00	24.31	0.03	1:1	0.000	1.172	0.000	
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 10-2
UMTS 1750 Head SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
1732.40	1412	front	10 mm	UMTS 1750	RMC	Titanium	Sport	GJV2G7C0FP	24.00	23.74	-0.19	1:1	0.112	1.062	0.119	
1732.40	1412	front	10 mm	UMTS 1750	RMC	Titanium	Fabric	GJV2G7C0FP	24.00	23.74	0.02	1:1	0.118	1.062	0.125	
1712.40	1312	front	10 mm	UMTS 1750	RMC	Titanium	Velcro	GJV2G7C0FP	24.00	23.69	0.03	1:1	0.169	1.074	0.182	
1732.40	1412	front	10 mm	UMTS 1750	RMC	Titanium	Velcro	GJV2G7C0FP	24.00	23.74	-0.07	1:1	0.195	1.062	0.207	A2
1752.60	1513	front	10 mm	UMTS 1750	RMC	Titanium	Velcro	GJV2G7C0FP	24.00	23.66	0.04	1:1	0.194	1.081	0.210	
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 10-3
UMTS 1900 Head SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
1880.00	9400	front	10 mm	UMTS 1900	RMC	Titanium	Sport	GJV2G7C0FP	24.00	23.30	-0.04	1:1	0.324	1.175	0.381	
1852.40	9262	front	10 mm	UMTS 1900	RMC	Titanium	Fabric	GJV2G7C0FP	24.00	23.27	-0.04	1:1	0.293	1.183	0.347	
1880.00	9400	front	10 mm	UMTS 1900	RMC	Titanium	Fabric	GJV2G7C0FP	24.00	23.30	0.02	1:1	0.425	1.175	0.499	
1907.60	9538	front	10 mm	UMTS 1900	RMC	Titanium	Fabric	GJV2G7C0FP	24.00	23.16	-0.06	1:1	0.505	1.213	0.613	A3
1880.00	9400	front	10 mm	UMTS 1900	RMC	Titanium	Velcro	GJV2G7C0FP	24.00	23.30	0.04	1:1	0.300	1.175	0.353	
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 10-4
LTE Band 12 Head SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
707.50	23095	Mid	front	10 mm	LTE Band 12	Titanium	Sport	C2W202JN4G	10	QPSK	1	0	25.50	24.81	0	0.20	1:1	0.000	1.172	0.000	
707.50	23095	Mid	front	10 mm	LTE Band 12	Titanium	Sport	C2W202JN4G	10	QPSK	25	0	24.50	23.70	1	0.20	1:1	0.000	1.202	0.000	
707.50	23095	Mid	front	10 mm	LTE Band 12	Titanium	Fabric	C2W202JN4G	10	QPSK	1	0	25.50	24.81	0	0.02	1:1	0.000	1.172	0.000	A4
707.50	23095	Mid	front	10 mm	LTE Band 12	Titanium	Fabric	C2W202JN4G	10	QPSK	25	0	24.50	23.70	1	0.05	1:1	0.000	1.202	0.000	
707.50	23095	Mid	front	10 mm	LTE Band 12	Titanium	Velcro	C2W202JN4G	10	QPSK	1	0	25.50	24.81	0	0.07	1:1	0.000	1.172	0.000	
707.50	23095	Mid	front	10 mm	LTE Band 12	Titanium	Velcro	C2W202JN4G	10	QPSK	25	0	24.50	23.70	1	0.08	1:1	0.000	1.202	0.000	
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 10-5
LTE Band 13 Head SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
782.00	23230	Mid	front	10 mm	LTE Band 13	Titanium	Sport	JVPX2G4M64	10	QPSK	1	25	25.50	24.97	0	0.09	1:1	0.001	1.130	0.001	
782.00	23230	Mid	front	10 mm	LTE Band 13	Titanium	Sport	JVPX2G4M64	10	QPSK	25	12	24.50	23.99	1	0.07	1:1	0.000	1.125	0.000	
782.00	23230	Mid	front	10 mm	LTE Band 13	Titanium	Fabric	JVPX2G4M64	10	QPSK	1	25	25.50	24.97	0	0.01	1:1	0.003	1.130	0.003	A5
782.00	23230	Mid	front	10 mm	LTE Band 13	Titanium	Fabric	JVPX2G4M64	10	QPSK	25	12	24.50	23.99	1	0.02	1:1	0.002	1.125	0.002	
782.00	23230	Mid	front	10 mm	LTE Band 13	Titanium	Velcro	JVPX2G4M64	10	QPSK	1	25	25.50	24.97	0	0.02	1:1	0.002	1.130	0.002	
782.00	23230	Mid	front	10 mm	LTE Band 13	Titanium	Velcro	JVPX2G4M64	10	QPSK	25	12	24.50	23.99	1	0.04	1:1	0.001	1.125	0.001	
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 10-6
LTE Band 14 Head SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
793.00	23330	Mid	front	10 mm	LTE Band 14	Titanium	Sport	HYX46KF72Q	10	QPSK	1	0	25.50	24.98	0	0.14	1:1	0.003	1.127	0.003	A6
793.00	23330	Mid	front	10 mm	LTE Band 14	Titanium	Sport	HYX46KF72Q	10	QPSK	25	0	24.50	23.84	1	0.04	1:1	0.002	1.164	0.002	
793.00	23330	Mid	front	10 mm	LTE Band 14	Titanium	Fabric	HYX46KF72Q	10	QPSK	1	0	25.50	24.98	0	0.08	1:1	0.002	1.127	0.002	
793.00	23330	Mid	front	10 mm	LTE Band 14	Titanium	Fabric	HYX46KF72Q	10	QPSK	25	0	24.50	23.84	1	0.02	1:1	0.001	1.164	0.001	
793.00	23330	Mid	front	10 mm	LTE Band 14	Titanium	Velcro	HYX46KF72Q	10	QPSK	1	0	25.50	24.98	0	0.01	1:1	0.000	1.127	0.000	
793.00	23330	Mid	front	10 mm	LTE Band 14	Titanium	Velcro	HYX46KF72Q	10	QPSK	25	0	24.50	23.84	1	0.03	1:1	0.000	1.164	0.000	
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 10-7
LTE Band 26 Head SAR Data

MEASUREMENT RESULTS																							
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
831.50	26865	Mid	front	10 mm	LTE Band 26 (Cell)	Titanium	Sport	JVPX2G4M64	10	QPSK	1	49	25.50	24.98	0	0.02	1:1	0.003	1.127	0.003	
831.50	26865	Mid	front	10 mm	LTE Band 26 (Cell)	Titanium	Sport	JVPX2G4M64	10	QPSK	25	25	24.50	23.99	1	0.02	1:1	0.002	1.125	0.002	
819.00	26740	Low	front	10 mm	LTE Band 26 (Cell)	Titanium	Fabric	JVPX2G4M64	10	QPSK	1	0	25.50	24.97	0	0.08	1:1	0.001	1.130	0.001	
831.50	26865	Mid	front	10 mm	LTE Band 26 (Cell)	Titanium	Fabric	JVPX2G4M64	10	QPSK	1	49	25.50	24.98	0	-0.20	1:1	0.003	1.127	0.003	A7
844.00	26990	High	front	10 mm	LTE Band 26 (Cell)	Titanium	Fabric	JVPX2G4M64	10	QPSK	1	49	25.50	24.93	0	0.07	1:1	0.002	1.140	0.002	
831.50	26865	Mid	front	10 mm	LTE Band 26 (Cell)	Titanium	Fabric	JVPX2G4M64	10	QPSK	25	25	24.50	23.99	1	0.01	1:1	0.002	1.125	0.002	
831.50	26865	Mid	front	10 mm	LTE Band 26 (Cell)	Titanium	Velcro	JVPX2G4M64	10	QPSK	1	49	25.50	24.98	0	0.01	1:1	0.002	1.127	0.002	
831.50	26865	Mid	front	10 mm	LTE Band 26 (Cell)	Titanium	Velcro	JVPX2G4M64	10	QPSK	25	25	24.50	23.99	1	0.06	1:1	0.001	1.125	0.001	
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 10-8
LTE Band 5 Head SAR Data

MEASUREMENT RESULTS																							
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
836.50	20525	Mid	front	10 mm	LTE Band 5 (Cell)	Titanium	Sport	C2W202JN4G	10	QPSK	1	0	25.50	25.07	0	0.02	1:1	0.002	1.104	0.002	
836.50	20525	Mid	front	10 mm	LTE Band 5 (Cell)	Titanium	Sport	C2W202JN4G	10	QPSK	25	0	24.50	24.13	1	0.05	1:1	0.001	1.089	0.001	
836.50	20525	Mid	front	10 mm	LTE Band 5 (Cell)	Titanium	Fabric	C2W202JN4G	10	QPSK	1	0	25.50	25.07	0	-0.02	1:1	0.002	1.104	0.002	
836.50	20525	Mid	front	10 mm	LTE Band 5 (Cell)	Titanium	Fabric	C2W202JN4G	10	QPSK	25	0	24.50	24.13	1	0.08	1:1	0.001	1.089	0.001	
836.50	20525	Mid	front	10 mm	LTE Band 5 (Cell)	Titanium	Velcro	C2W202JN4G	10	QPSK	1	0	25.50	25.07	0	0.16	1:1	0.003	1.104	0.003	A8
836.50	20525	Mid	front	10 mm	LTE Band 5 (Cell)	Titanium	Velcro	C2W202JN4G	10	QPSK	25	0	24.50	24.13	1	0.06	1:1	0.002	1.089	0.002	
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 10-9
LTE Band 66 Head SAR Data

MEASUREMENT RESULTS																							
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
1745.00	132322	Mid	front	10 mm	LTE Band 66 (AWS)	Titanium	Sport	FQ7GKVG649	20	QPSK	1	50	24.50	23.82	0	-0.04	1:1	0.117	1.169	0.137	
1745.00	132322	Mid	front	10 mm	LTE Band 66 (AWS)	Titanium	Sport	FQ7GKVG649	20	QPSK	50	25	23.50	22.96	1	0.01	1:1	0.089	1.132	0.101	
1720.00	132072	Low	front	10 mm	LTE Band 66 (AWS)	Titanium	Fabric	FQ7GKVG649	20	QPSK	1	50	24.50	23.46	0	-0.04	1:1	0.139	1.271	0.177	
1745.00	132322	Mid	front	10 mm	LTE Band 66 (AWS)	Titanium	Fabric	FQ7GKVG649	20	QPSK	1	50	24.50	23.82	0	0.20	1:1	0.158	1.169	0.185	A9
1770.00	132572	High	front	10 mm	LTE Band 66 (AWS)	Titanium	Fabric	FQ7GKVG649	20	QPSK	1	0	24.50	23.56	0	0.18	1:1	0.153	1.242	0.190	
1745.00	132322	Mid	front	10 mm	LTE Band 66 (AWS)	Titanium	Fabric	FQ7GKVG649	20	QPSK	50	25	23.50	22.96	1	0.06	1:1	0.113	1.132	0.128	
1745.00	132322	Mid	front	10 mm	LTE Band 66 (AWS)	Titanium	Velcro	FQ7GKVG649	20	QPSK	1	50	24.50	23.82	0	-0.03	1:1	0.126	1.169	0.147	
1745.00	132322	Mid	front	10 mm	LTE Band 66 (AWS)	Titanium	Velcro	FQ7GKVG649	20	QPSK	50	25	23.50	22.96	1	-0.01	1:1	0.101	1.132	0.114	
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 10-10
LTE Band 25 Head SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
1860.00	26140	Low	front	10 mm	LTE Band 25 (PCS)	Titanium	Sport	GJV2G7C0FP	20	QPSK	1	50	24.50	23.70	0	-0.07	1:1	0.237	1.202	0.285	
1860.00	26140	Low	front	10 mm	LTE Band 25 (PCS)	Titanium	Sport	GJV2G7C0FP	20	QPSK	50	0	23.50	22.85	1	-0.03	1:1	0.190	1.161	0.221	
1860.00	26140	Low	front	10 mm	LTE Band 25 (PCS)	Titanium	Fabric	GJV2G7C0FP	20	QPSK	1	50	24.50	23.70	0	0.03	1:1	0.343	1.202	0.412	
1882.50	26365	Mid	front	10 mm	LTE Band 25 (PCS)	Titanium	Fabric	GJV2G7C0FP	20	QPSK	1	99	24.50	23.55	0	0.13	1:1	0.505	1.245	0.629	
1905.00	26590	High	front	10 mm	LTE Band 25 (PCS)	Titanium	Fabric	GJV2G7C0FP	20	QPSK	1	0	24.50	23.36	0	-0.01	1:1	0.528	1.300	0.686	A10
1860.00	26140	Low	front	10 mm	LTE Band 25 (PCS)	Titanium	Fabric	GJV2G7C0FP	20	QPSK	50	0	23.50	22.85	1	0.02	1:1	0.255	1.161	0.296	
1860.00	26140	Low	front	10 mm	LTE Band 25 (PCS)	Titanium	Velcro	GJV2G7C0FP	20	QPSK	1	50	24.50	23.70	0	-0.03	1:1	0.292	1.202	0.351	
1860.00	26140	Low	front	10 mm	LTE Band 25 (PCS)	Titanium	Velcro	GJV2G7C0FP	20	QPSK	50	0	23.50	22.85	1	0.04	1:1	0.237	1.161	0.275	
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 10-11
LTE Band 7 Head SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
2510.00	20850	Low	front	10 mm	LTE Band 7	Titanium	Sport	G14Y233GVK	20	QPSK	1	50	23.50	23.00	0	0.00	1:1	0.611	1.122	0.686	
2510.00	20850	Low	front	10 mm	LTE Band 7	Titanium	Sport	G14Y233GVK	20	QPSK	50	25	22.50	22.25	1	-0.02	1:1	0.472	1.059	0.500	
2510.00	20850	Low	front	10 mm	LTE Band 7	Titanium	Fabric	G14Y233GVK	20	QPSK	1	50	23.50	23.00	0	0.06	1:1	0.650	1.122	0.729	
2510.00	20850	Low	front	10 mm	LTE Band 7	Titanium	Fabric	G14Y233GVK	20	QPSK	50	25	22.50	22.25	1	0.02	1:1	0.510	1.059	0.540	
2510.00	20850	Low	front	10 mm	LTE Band 7	Titanium	Velcro	G14Y233GVK	20	QPSK	1	50	23.50	23.00	0	-0.05	1:1	0.788	1.122	**0.884**	A11
2535.00	21100	Mid	front	10 mm	LTE Band 7	Titanium	Velcro	G14Y233GVK	20	QPSK	1	99	23.50	22.38	0	-0.03	1:1	0.571	1.294	0.739	
2560.00	21350	High	front	10 mm	LTE Band 7	Titanium	Velcro	G14Y233GVK	20	QPSK	1	99	23.50	22.88	0	-0.04	1:1	0.501	1.153	0.578	
2510.00	20850	Low	front	10 mm	LTE Band 7	Titanium	Velcro	G14Y233GVK	20	QPSK	50	25	22.50	22.25	1	0.00	1:1	0.542	1.059	0.574	
2510.00	20850	Low	front	10 mm	LTE Band 7	Titanium	Velcro	G14Y233GVK	20	QPSK	100	0	22.50	22.24	1	-0.02	1:1	0.648	1.062	0.688	
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 10-12
LTE Band 41 Head SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
2506.00	39750	Low	front	10 mm	LTE Band 41	Titanium	Sport	DR4VYCY6KT	20	QPSK	1	99	23.50	22.95	0	0.01	1:1.58	0.361	1.135	0.410	
2506.00	39750	Low	front	10 mm	LTE Band 41	Titanium	Sport	DR4VYCY6KT	20	QPSK	50	50	22.50	21.82	1	-0.02	1:1.58	0.282	1.169	0.330	
2506.00	39750	Low	front	10 mm	LTE Band 41	Titanium	Fabric	DR4VYCY6KT	20	QPSK	1	99	23.50	22.95	0	0.03	1:1.58	0.381	1.135	0.432	A12
2549.50	40185	Low-Mid	front	10 mm	LTE Band 41	Titanium	Fabric	DR4VYCY6KT	20	QPSK	1	0	23.50	22.53	0	-0.02	1:1.58	0.336	1.250	0.420	
2593.00	40620	Mid	front	10 mm	LTE Band 41	Titanium	Fabric	DR4VYCY6KT	20	QPSK	1	50	23.50	22.51	0	0.04	1:1.58	0.243	1.256	0.305	
2636.50	41055	Mid-High	front	10 mm	LTE Band 41	Titanium	Fabric	DR4VYCY6KT	20	QPSK	1	0	23.50	22.80	0	-0.17	1:1.58	0.188	1.175	0.221	
2680.00	41490	High	front	10 mm	LTE Band 41	Titanium	Fabric	DR4VYCY6KT	20	QPSK	1	99	23.50	22.51	0	-0.10	1:1.58	0.144	1.256	0.181	
2506.00	39750	Low	front	10 mm	LTE Band 41	Titanium	Fabric	DR4VYCY6KT	20	QPSK	50	50	22.50	21.82	1	-0.02	1:1.58	0.297	1.169	0.347	
2506.00	39750	Low	front	10 mm	LTE Band 41	Titanium	Velcro	DR4VYCY6KT	20	QPSK	1	99	23.50	22.95	0	-0.05	1:1.58	0.380	1.135	0.431	
2506.00	39750	Low	front	10 mm	LTE Band 41	Titanium	Velcro	DR4VYCY6KT	20	QPSK	50	50	22.50	21.82	1	-0.03	1:1.58	0.302	1.169	0.353	
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 10-13
2.4 GHz WLAN Head SAR Data

MEASUREMENT RESULTS																			
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Data Rate (Mbps)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.														(W/kg)			(W/kg)	
2412	1	front	10 mm	802.11b	DSSS	Titanium	Sport	G14Y233GVK	22	1	19.00	18.04	-0.01	99.6	0.297	1.247	1.004	0.372	
2412	1	front	10 mm	802.11b	DSSS	Titanium	Fabric	G14Y233GVK	22	1	19.00	18.04	0.01	99.6	0.330	1.247	1.004	**0.413**	A13
2412	1	front	10 mm	802.11b	DSSS	Titanium	Velcro	G14Y233GVK	22	1	19.00	18.04	-0.05	99.6	0.272	1.247	1.004	0.341	
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 10-14
5 GHz WLAN Head SAR Data

MEASUREMENT RESULTS																			
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Data Rate (Mbps)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.														(W/kg)			(W/kg)	
5300	60	front	10 mm	802.11a	OFDM	Titanium	Sport	JQWJ7DC7RR	20	6	17.00	16.42	-0.19	98.6	0.063	1.143	1.014	0.073	
5300	60	front	10 mm	802.11a	OFDM	Titanium	Fabric	JQWJ7DC7RR	20	6	17.00	16.42	-0.05	98.6	0.059	1.143	1.014	0.068	
5300	60	front	10 mm	802.11a	OFDM	Titanium	Velcro	JQWJ7DC7RR	20	6	17.00	16.42	0.05	98.6	0.030	1.143	1.014	0.035	
5500	100	front	10 mm	802.11a	OFDM	Titanium	Sport	JQWJ7DC7RR	20	6	17.00	16.60	0.06	98.6	0.048	1.096	1.014	0.053	
5500	100	front	10 mm	802.11a	OFDM	Titanium	Fabric	JQWJ7DC7RR	20	6	17.00	16.60	0.08	98.6	0.064	1.096	1.014	0.071	
5500	100	front	10 mm	802.11a	OFDM	Titanium	Velcro	JQWJ7DC7RR	20	6	17.00	16.60	0.05	98.6	0.057	1.096	1.014	0.063	
5745	149	front	10 mm	802.11a	OFDM	Titanium	Sport	JQWJ7DC7RR	20	6	17.00	16.14	0.14	98.6	0.081	1.219	1.014	0.100	
5745	149	front	10 mm	802.11a	OFDM	Titanium	Fabric	JQWJ7DC7RR	20	6	17.00	16.14	-0.01	98.6	0.088	1.219	1.014	**0.109**	A14
5745	149	front	10 mm	802.11a	OFDM	Titanium	Velcro	JQWJ7DC7RR	20	6	17.00	16.14	0.05	98.6	0.076	1.219	1.014	0.094	
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 10-15
Bluetooth Head SAR Data

MEASUREMENT RESULTS																		
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Data Rate (Mbps)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													(W/kg)			(W/kg)	
2441	39	front	10 mm	Bluetooth	FHSS	Titanium	Sport	G14Y233GVK	1	17.50	17.40	0.08	100.0	0.186	1.023	1.000	0.190	
2441	39	front	10 mm	Bluetooth	FHSS	Titanium	Fabric	G14Y233GVK	1	17.50	17.40	0.00	100.0	0.256	1.023	1.000	**0.262**	A15
2441	39	front	10 mm	Bluetooth	FHSS	Titanium	Velcro	G14Y233GVK	1	17.50	17.40	0.03	100.0	0.204	1.023	1.000	0.209	
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 10-16
802.15.4 ab-NB Head SAR Data

MEASUREMENT RESULTS																	
FREQUENCY		Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Data Rate (kbps)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)			(W/kg)	
5846.25	High	front	10 mm	802.15.4 ab-NB	Titanium	Fabric	JQWJ7DC7RR	1000	16.00	15.97	0.21	8.6	0.010	1.007	1.159	0.012	A16
5846.25	High	front	10 mm	802.15.4 ab-NB	Titanium	Sport	JQWJ7DC7RR	1000	16.00	15.97	-0.21	8.6	0.009	1.007	1.159	0.011	
5846.25	High	front	10 mm	802.15.4 ab-NB	Titanium	Velcro	JQWJ7DC7RR	1000	16.00	15.97	-0.21	8.6	0.009	1.007	1.159	0.011	
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: The reported SAR was scaled to the 8.9% transmission duty factor

10.2 Standalone Extremity SAR Data

Table 10-17
UMTS 850 Extremity SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.													(W/kg)	(W/kg)	
826.40	4132	back	0 mm	UMTS 850	RMC	Titanium	Sport	HYX46KF72Q	25.00	24.31	0.00	1:1	1.172	0.190	0.223	
826.40	4132	back	0 mm	UMTS 850	RMC	Titanium	Fabric	HYX46KF72Q	25.00	24.31	-0.01	1:1	1.172	0.221	0.259	
826.40	4132	back	0 mm	UMTS 850	RMC	Titanium	Velcro	HYX46KF72Q	25.00	24.31	-0.09	1:1	1.172	0.238	0.279	
836.60	4183	back	0 mm	UMTS 850	RMC	Titanium	Velcro	HYX46KF72Q	25.00	24.28	-0.04	1:1	1.180	0.238	0.281	
846.60	4233	back	0 mm	UMTS 850	RMC	Titanium	Velcro	HYX46KF72Q	25.00	24.19	-0.06	1:1	1.205	0.260	0.313	A17
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Extremity 4.0 W/kg (mW/g) averaged over 10 grams								

Table 10-18
UMTS 1750 Extremity SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.													(W/kg)	(W/kg)	
1712.40	1312	back	0 mm	UMTS 1750	RMC	Titanium	Sport	FQ7GKVG649	24.00	23.69	0.04	1:1	1.074	0.059	0.063	
1732.40	1412	back	0 mm	UMTS 1750	RMC	Titanium	Sport	FQ7GKVG649	24.00	23.74	-0.07	1:1	1.062	0.059	0.063	
1752.60	1513	back	0 mm	UMTS 1750	RMC	Titanium	Sport	FQ7GKVG649	24.00	23.66	0.03	1:1	1.081	0.062	0.067	A18
1732.40	1412	back	0 mm	UMTS 1750	RMC	Titanium	Fabric	FQ7GKVG649	24.00	23.74	0.08	1:1	1.062	0.059	0.063	
1732.40	1412	back	0 mm	UMTS 1750	RMC	Titanium	Velcro	FQ7GKVG649	24.00	23.74	-0.04	1:1	1.062	0.049	0.052	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Extremity 4.0 W/kg (mW/g) averaged over 10 grams								

Table 10-19
UMTS 1900 Extremity SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.													(W/kg)	(W/kg)	
1880.00	9400	back	0 mm	UMTS 1900	RMC	Titanium	Sport	GJV2G7C0FP	24.00	23.30	0.00	1:1	1.175	0.079	0.093	
1852.40	9262	back	0 mm	UMTS 1900	RMC	Titanium	Fabric	GJV2G7C0FP	24.00	23.27	0.05	1:1	1.183	0.083	0.098	
1880.00	9400	back	0 mm	UMTS 1900	RMC	Titanium	Fabric	GJV2G7C0FP	24.00	23.30	0.09	1:1	1.175	0.084	0.099	
1907.60	9538	back	0 mm	UMTS 1900	RMC	Titanium	Fabric	GJV2G7C0FP	24.00	23.16	0.05	1:1	1.213	0.087	0.106	A19
1880.00	9400	back	0 mm	UMTS 1900	RMC	Titanium	Velcro	GJV2G7C0FP	24.00	23.30	0.03	1:1	1.175	0.079	0.093	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Extremity 4.0 W/kg (mW/g) averaged over 10 grams								

Table 10-20
LTE Band 12 Extremity SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																		(W/kg)	(W/kg)	
707.50	23095	Mid	back	0 mm	LTE Band 12	Titanium	Sport	JVPX2G4M64	10	QPSK	1	0	25.50	24.81	0	0.08	1:1	1.172	0.120	0.141	
707.50	23095	Mid	back	0 mm	LTE Band 12	Titanium	Sport	JVPX2G4M64	10	QPSK	25	0	24.50	23.70	1	-0.11	1:1	1.202	0.096	0.115	
707.50	23095	Mid	back	0 mm	LTE Band 12	Titanium	Fabric	JVPX2G4M64	10	QPSK	1	0	25.50	24.81	0	-0.01	1:1	1.172	0.147	0.172	A20
707.50	23095	Mid	back	0 mm	LTE Band 12	Titanium	Fabric	JVPX2G4M64	10	QPSK	25	0	24.50	23.70	1	0.06	1:1	1.202	0.123	0.148	
707.50	23095	Mid	back	0 mm	LTE Band 12	Titanium	Velcro	JVPX2G4M64	10	QPSK	1	0	25.50	24.81	0	0.09	1:1	1.172	0.142	0.166	
707.50	23095	Mid	back	0 mm	LTE Band 12	Titanium	Velcro	JVPX2G4M64	10	QPSK	25	0	24.50	23.70	1	0.02	1:1	1.202	0.121	0.145	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Extremity 4.0 W/kg (mW/g) averaged over 10 gram								

Table 10-21
LTE Band 13 Extremity SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																		(W/kg)	(W/kg)	
782.00	23230	Mid	back	0 mm	LTE Band 13	Titanium	Sport	C2W202JN4G	10	QPSK	1	25	25.50	24.97	0	-0.02	1:1	1.130	0.278	0.314	
782.00	23230	Mid	back	0 mm	LTE Band 13	Titanium	Sport	C2W202JN4G	10	QPSK	25	12	24.50	23.99	1	0.00	1:1	1.125	0.228	0.257	
782.00	23230	Mid	back	0 mm	LTE Band 13	Titanium	Fabric	C2W202JN4G	10	QPSK	1	25	25.50	24.97	0	0.01	1:1	1.130	0.290	0.328	
782.00	23230	Mid	back	0 mm	LTE Band 13	Titanium	Fabric	C2W202JN4G	10	QPSK	25	12	24.50	23.99	1	-0.04	1:1	1.125	0.240	0.270	
782.00	23230	Mid	back	0 mm	LTE Band 13	Titanium	Velcro	C2W202JN4G	10	QPSK	1	25	25.50	24.97	0	-0.02	1:1	1.130	0.308	0.348	A21
782.00	23230	Mid	back	0 mm	LTE Band 13	Titanium	Velcro	C2W202JN4G	10	QPSK	25	12	24.50	23.99	1	-0.07	1:1	1.125	0.247	0.278	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Extremity 4.0 W/kg (mW/g) averaged over 10 gram								

Table 10-22
LTE Band 14 Extremity SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																		(W/kg)	(W/kg)	
793.00	23330	Mid	back	0 mm	LTE Band 14	Titanium	Sport	C2W202JN4G	10	QPSK	1	0	25.50	24.98	0	0.03	1:1	1.127	0.298	0.336	
793.00	23330	Mid	back	0 mm	LTE Band 14	Titanium	Sport	C2W202JN4G	10	QPSK	25	0	24.50	23.84	1	0.01	1:1	1.164	0.239	0.278	
793.00	23330	Mid	back	0 mm	LTE Band 14	Titanium	Fabric	C2W202JN4G	10	QPSK	1	0	25.50	24.98	0	0.05	1:1	1.127	0.319	0.360	
793.00	23330	Mid	back	0 mm	LTE Band 14	Titanium	Fabric	C2W202JN4G	10	QPSK	25	0	24.50	23.84	1	-0.08	1:1	1.164	0.256	0.298	
793.00	23330	Mid	back	0 mm	LTE Band 14	Titanium	Velcro	C2W202JN4G	10	QPSK	1	0	25.50	24.98	0	0.00	1:1	1.127	0.332	**0.374**	A22
793.00	23330	Mid	back	0 mm	LTE Band 14	Titanium	Velcro	C2W202JN4G	10	QPSK	25	0	24.50	23.84	1	0.00	1:1	1.164	0.265	0.308	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Extremity 4.0 W/kg (mW/g) averaged over 10 gram								

Table 10-23
LTE Band 26 Extremity SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																		(W/kg)	(W/kg)	
831.50	26865	Mid	back	0 mm	LTE Band 26 (Cell)	Titanium	Sport	HYX46KF72Q	10	QPSK	1	49	25.50	24.98	0	0.02	1:1	1.127	0.280	0.316	
831.50	26865	Mid	back	0 mm	LTE Band 26 (Cell)	Titanium	Sport	HYX46KF72Q	10	QPSK	25	25	24.50	23.99	1	-0.06	1:1	1.125	0.219	0.246	
831.50	26865	Mid	back	0 mm	LTE Band 26 (Cell)	Titanium	Fabric	HYX46KF72Q	10	QPSK	1	49	25.50	24.98	0	0.02	1:1	1.127	0.272	0.307	
831.50	26865	Mid	back	0 mm	LTE Band 26 (Cell)	Titanium	Fabric	HYX46KF72Q	10	QPSK	25	25	24.50	23.99	1	-0.03	1:1	1.125	0.215	0.242	
819.00	26740	Low	back	0 mm	LTE Band 26 (Cell)	Titanium	Velcro	HYX46KF72Q	10	QPSK	1	0	25.50	24.97	0	-0.01	1:1	1.130	0.249	0.281	
831.50	26865	Mid	back	0 mm	LTE Band 26 (Cell)	Titanium	Velcro	HYX46KF72Q	10	QPSK	1	49	25.50	24.98	0	-0.10	1:1	1.127	0.295	0.332	
844.00	26990	High	back	0 mm	LTE Band 26 (Cell)	Titanium	Velcro	HYX46KF72Q	10	QPSK	1	49	25.50	24.93	0	0.01	1:1	1.140	0.318	0.363	A23
831.50	26865	Mid	back	0 mm	LTE Band 26 (Cell)	Titanium	Velcro	HYX46KF72Q	10	QPSK	25	25	24.50	23.99	1	-0.05	1:1	1.125	0.233	0.262	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Extremity 4.0 W/kg (mW/g) averaged over 10 gram							

Table 10-24
LTE Band 5 Extremity SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																		(W/kg)	(W/kg)	
836.50	20525	Mid	back	0 mm	LTE Band 5 (Cell)	Titanium	Sport	HYX46KF72Q	10	QPSK	1	0	25.50	25.07	0	0.00	1:1	1.104	0.271	0.299	
836.50	20525	Mid	back	0 mm	LTE Band 5 (Cell)	Titanium	Sport	HYX46KF72Q	10	QPSK	25	0	24.50	24.13	1	0.01	1:1	1.089	0.210	0.229	
836.50	20525	Mid	back	0 mm	LTE Band 5 (Cell)	Titanium	Fabric	HYX46KF72Q	10	QPSK	1	0	25.50	25.07	0	-0.04	1:1	1.104	0.311	0.343	
836.50	20525	Mid	back	0 mm	LTE Band 5 (Cell)	Titanium	Fabric	HYX46KF72Q	10	QPSK	25	0	24.50	24.13	1	-0.03	1:1	1.089	0.244	0.266	
836.50	20525	Mid	back	0 mm	LTE Band 5 (Cell)	Titanium	Velcro	HYX46KF72Q	10	QPSK	1	0	25.50	25.07	0	-0.06	1:1	1.104	0.313	0.346	A24
836.50	20525	Mid	back	0 mm	LTE Band 5 (Cell)	Titanium	Velcro	HYX46KF72Q	10	QPSK	25	0	24.50	24.13	1	-0.02	1:1	1.089	0.244	0.266	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Extremity 4.0 W/kg (mW/g) averaged over 10 gram							

Table 10-25
LTE Band 66 Extremity SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																		(W/kg)	(W/kg)	
1745.00	132322	Mid	back	0 mm	LTE Band 66 (AWS)	Titanium	Sport	FQ7GKVG649	20	QPSK	1	50	24.50	23.82	0	-0.07	1:1	1.169	0.066	0.077	
1745.00	132322	Mid	back	0 mm	LTE Band 66 (AWS)	Titanium	Sport	FQ7GKVG649	20	QPSK	50	25	23.50	22.96	1	-0.10	1:1	1.132	0.041	0.046	
1745.00	132322	Mid	back	0 mm	LTE Band 66 (AWS)	Titanium	Fabric	FQ7GKVG649	20	QPSK	1	50	24.50	23.82	0	-0.06	1:1	1.169	0.060	0.070	
1745.00	132322	Mid	back	0 mm	LTE Band 66 (AWS)	Titanium	Fabric	FQ7GKVG649	20	QPSK	50	25	23.50	22.96	1	-0.05	1:1	1.132	0.042	0.048	
1720.00	132072	Low	back	0 mm	LTE Band 66 (AWS)	Titanium	Velcro	FQ7GKVG649	20	QPSK	1	50	24.50	23.46	0	0.04	1:1	1.271	0.042	0.053	
1745.00	132322	Mid	back	0 mm	LTE Band 66 (AWS)	Titanium	Velcro	FQ7GKVG649	20	QPSK	1	50	24.50	23.82	0	0.03	1:1	1.169	0.075	0.088	A25
1770.00	132572	High	back	0 mm	LTE Band 66 (AWS)	Titanium	Velcro	FQ7GKVG649	20	QPSK	1	0	24.50	23.56	0	-0.04	1:1	1.242	0.052	0.065	
1745.00	132322	Mid	back	0 mm	LTE Band 66 (AWS)	Titanium	Velcro	FQ7GKVG649	20	QPSK	50	25	23.50	22.96	1	-0.08	1:1	1.132	0.051	0.058	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Extremity 4.0 W/kg (mW/g) averaged over 10 gram							

Table 10-26
LTE Band 25 Extremity SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																		(W/kg)	(W/kg)	
1860.00	26140	Low	back	0 mm	LTE Band 25 (PCS)	Titanium	Sport	GJV2G7C0FP	20	QPSK	1	50	24.50	23.70	0	0.07	1:1	1.202	0.098	0.118	
1882.50	26365	Mid	back	0 mm	LTE Band 25 (PCS)	Titanium	Sport	GJV2G7C0FP	20	QPSK	1	99	24.50	23.55	0	-0.10	1:1	1.245	0.102	0.127	A26
1905.00	26590	High	back	0 mm	LTE Band 25 (PCS)	Titanium	Sport	GJV2G7C0FP	20	QPSK	1	0	24.50	23.36	0	0.07	1:1	1.300	0.098	0.127	
1860.00	26140	Low	back	0 mm	LTE Band 25 (PCS)	Titanium	Sport	GJV2G7C0FP	20	QPSK	50	0	23.50	22.85	1	0.20	1:1	1.161	0.080	0.093	
1860.00	26140	Low	back	0 mm	LTE Band 25 (PCS)	Titanium	Fabric	GJV2G7C0FP	20	QPSK	1	50	24.50	23.70	0	0.03	1:1	1.202	0.088	0.106	
1860.00	26140	Low	back	0 mm	LTE Band 25 (PCS)	Titanium	Fabric	GJV2G7C0FP	20	QPSK	50	0	23.50	22.85	1	0.07	1:1	1.161	0.069	0.080	
1860.00	26140	Low	back	0 mm	LTE Band 25 (PCS)	Titanium	Velcro	GJV2G7C0FP	20	QPSK	1	50	24.50	23.70	0	-0.09	1:1	1.202	0.069	0.083	
1860.00	26140	Low	back	0 mm	LTE Band 25 (PCS)	Titanium	Velcro	GJV2G7C0FP	20	QPSK	50	0	23.50	22.85	1	0.00	1:1	1.161	0.057	0.066	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Extremity 4.0 W/kg (mW/g) averaged over 10 gram								

Table 10-27
LTE Band 7 Extremity SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																		(W/kg)	(W/kg)	
2510.00	20850	Low	back	0 mm	LTE Band 7	Titanium	Sport	JHY9Q2V77W	20	QPSK	1	50	23.50	23.00	0	-0.10	1:1	1.122	0.234	0.263	
2535.00	21100	Mid	back	0 mm	LTE Band 7	Titanium	Sport	JHY9Q2V77W	20	QPSK	1	99	23.50	22.38	0	-0.02	1:1	1.294	0.262	0.339	A27
2560.00	21350	High	back	0 mm	LTE Band 7	Titanium	Sport	JHY9Q2V77W	20	QPSK	1	99	23.50	22.88	0	-0.01	1:1	1.153	0.261	0.301	
2510.00	20850	Low	back	0 mm	LTE Band 7	Titanium	Sport	JHY9Q2V77W	20	QPSK	50	25	22.50	22.25	1	-0.12	1:1	1.059	0.138	0.146	
2510.00	20850	Low	back	0 mm	LTE Band 7	Titanium	Fabric	JHY9Q2V77W	20	QPSK	1	50	23.50	23.00	0	0.00	1:1	1.122	0.165	0.185	
2510.00	20850	Low	back	0 mm	LTE Band 7	Titanium	Fabric	JHY9Q2V77W	20	QPSK	50	25	22.50	22.25	1	-0.13	1:1	1.059	0.110	0.116	
2510.00	20850	Low	back	0 mm	LTE Band 7	Titanium	Velcro	JHY9Q2V77W	20	QPSK	1	50	23.50	23.00	0	-0.19	1:1	1.122	0.175	0.196	
2510.00	20850	Low	back	0 mm	LTE Band 7	Titanium	Velcro	JHY9Q2V77W	20	QPSK	50	25	22.50	22.25	1	-0.05	1:1	1.059	0.142	0.150	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Extremity 4.0 W/kg (mW/g) averaged over 10 gram								

Table 10-28
LTE Band 41 Extremity SAR Data

MEASUREMENT RESULTS																					
FREQUENCY			Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Maximum Allowed Power [dBm]	Conducted Power [dBm]	MPR [dB]	Power Drift [dB]	Duty Cycle	Scaling Factor	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																		(W/kg)	(W/kg)	
2506.00	39750	Low	back	0 mm	LTE Band 41	Titanium	Sport	DR4VYCY6KT	20	QPSK	1	99	23.50	22.95	0	-0.19	1:1.58	1.135	0.052	0.059	
2506.00	39750	Low	back	0 mm	LTE Band 41	Titanium	Sport	DR4VYCY6KT	20	QPSK	50	50	22.50	21.82	1	-0.02	1:1.58	1.169	0.038	0.044	
2506.00	39750	Low	back	0 mm	LTE Band 41	Titanium	Fabric	DR4VYCY6KT	20	QPSK	1	99	23.50	22.95	0	-0.14	1:1.58	1.135	0.045	0.051	
2506.00	39750	Low	back	0 mm	LTE Band 41	Titanium	Fabric	DR4VYCY6KT	20	QPSK	50	50	22.50	21.82	1	-0.15	1:1.58	1.169	0.032	0.037	
2506.00	39750	Low	back	0 mm	LTE Band 41	Titanium	Velcro	DR4VYCY6KT	20	QPSK	1	99	23.50	22.95	0	0.00	1:1.58	1.135	0.114	0.129	
2549.50	40185	Low-Mid	back	0 mm	LTE Band 41	Titanium	Velcro	DR4VYCY6KT	20	QPSK	1	0	23.50	22.53	0	0.01	1:1.58	1.250	0.115	0.144	A28
2593.00	40620	Mid	back	0 mm	LTE Band 41	Titanium	Velcro	DR4VYCY6KT	20	QPSK	1	50	23.50	22.51	0	-0.01	1:1.58	1.256	0.091	0.114	
2636.50	41055	Mid-High	back	0 mm	LTE Band 41	Titanium	Velcro	DR4VYCY6KT	20	QPSK	1	0	23.50	22.80	0	-0.03	1:1.58	1.175	0.080	0.094	
2680.00	41490	High	back	0 mm	LTE Band 41	Titanium	Velcro	DR4VYCY6KT	20	QPSK	1	99	23.50	22.51	0	0.03	1:1.58	1.256	0.071	0.089	
2506.00	39750	Low	back	0 mm	LTE Band 41	Titanium	Velcro	DR4VYCY6KT	20	QPSK	50	50	22.50	21.82	1	-0.03	1:1.58	1.169	0.084	0.098	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Extremity 4.0 W/kg (mW/g) averaged over 10 gram								

Table 10-29
2.4 GHz WLAN Extremity SAR Data

MEASUREMENT RESULTS																		
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Data Rate (Mbps)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle (%)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																(W/kg)	(W/kg)	
2412	1	back	0 mm	802.11b	DSSS	Titanium	Sport	G14Y233GVK	22	1	19.00	18.04	0.00	99.6	1.247	1.004	0.042	**0.053**	A29
2412	1	back	0 mm	802.11b	DSSS	Titanium	Fabric	G14Y233GVK	22	1	19.00	18.04	0.06	99.6	1.247	1.004	0.036	0.045	
2412	1	back	0 mm	802.11b	DSSS	Titanium	Velcro	G14Y233GVK	22	1	19.00	18.04	0.04	99.6	1.247	1.004	0.037	0.046	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**													**Extremity** **4.0 W/kg (mW/g)** averaged over 10 gram						

Table 10-30
5 GHz WLAN Extremity SAR Data

MEASUREMENT RESULTS																		
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Bandwidth [MHz]	Data Rate (Mbps)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle (%)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.																(W/kg)	(W/kg)	
5300	60	back	0 mm	802.11a	OFDM	Titanium	Sport	JQWJ7DC7RR	20	6	17.00	16.42	0.08	98.6	1.143	1.014	0.001	0.001	
5300	60	back	0 mm	802.11a	OFDM	Titanium	Fabric	JQWJ7DC7RR	20	6	17.00	16.42	0.09	98.6	1.143	1.014	0.006	0.007	
5300	60	back	0 mm	802.11a	OFDM	Titanium	Velcro	JQWJ7DC7RR	20	6	17.00	16.42	-0.01	98.6	1.143	1.014	0.000	0.000	
5500	100	back	0 mm	802.11a	OFDM	Titanium	Sport	JQWJ7DC7RR	20	6	17.00	16.60	0.04	98.6	1.096	1.014	0.010	0.011	
5500	100	back	0 mm	802.11a	OFDM	Titanium	Fabric	JQWJ7DC7RR	20	6	17.00	16.60	0.02	98.6	1.096	1.014	0.011	0.012	
5500	100	back	0 mm	802.11a	OFDM	Titanium	Velcro	JQWJ7DC7RR	20	6	17.00	16.60	0.20	98.6	1.096	1.014	0.009	0.010	
5745	149	back	0 mm	802.11a	OFDM	Titanium	Sport	JQWJ7DC7RR	20	6	17.00	16.14	0.01	98.6	1.219	1.014	0.015	0.019	
5745	149	back	0 mm	802.11a	OFDM	Titanium	Fabric	JQWJ7DC7RR	20	6	17.00	16.14	0.07	98.6	1.219	1.014	0.016	**0.020**	A30
5745	149	back	0 mm	802.11a	OFDM	Titanium	Velcro	JQWJ7DC7RR	20	6	17.00	16.14	0.09	98.6	1.219	1.014	0.012	0.015	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**													**Extremity** **4.0 W/kg (mW/g)** averaged over 10 gram						

Table 10-31
Bluetooth Extremity SAR Data

MEASUREMENT RESULTS																		
FREQUENCY		Side	Spacing	Mode	Service	Housing Type	Wristband Type	Device Serial Number	Data Rate (Mbps)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle (%)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.															(W/kg)	(W/kg)	
2441	39	back	0 mm	Bluetooth	FHSS	Titanium	Sport	G14Y233GVK	1	17.50	17.40	-0.03	100.0	1.023	1.000	0.054	**0.055**	A31
2441	39	back	0 mm	Bluetooth	FHSS	Titanium	Fabric	G14Y233GVK	1	17.50	17.40	-0.18	100.0	1.023	1.000	0.046	0.047	
2441	39	back	0 mm	Bluetooth	FHSS	Titanium	Velcro	G14Y233GVK	1	17.50	17.40	-0.08	100.0	1.023	1.000	0.028	0.029	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**													**Extremity** **1.6 W/kg (mW/g)** averaged over 1 gram						

Table 10-32
802.15.4 ab-NB Extremity SAR Data

MEASUREMENT RESULTS																	
FREQUENCY		Side	Spacing	Mode	Housing Type	Wristband Type	Device Serial Number	Data Rate (kbps)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Duty Cycle (%)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.														(W/kg)	(W/kg)	
5846.25	High	back	0 mm	802.15.4 ab-NB	Titanium	Fabric	JVPX2G4M64	1000	16.00	15.97	0.21	8.6	1.007	1.031	0.000	0.000	
5846.25	High	back	0 mm	802.15.4 ab-NB	Titanium	Sport	JVPX2G4M64	1000	16.00	15.97	-0.21	8.6	1.007	1.031	0.000	**0.000**	A32
5846.25	High	back	0 mm	802.15.4 ab-NB	Titanium	Velcro	JVPX2G4M64	1000	16.00	15.97	0.21	8.6	1.007	1.031	0.000	0.000	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**													**Extremity** **4.0 W/kg (mW/g)** averaged over 10 gram				

Note: The reported SAR was scaled to the 8.9% transmission duty factor

10.3 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in 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. 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 and 2.0 W/kg for 10g SAR.
7. This device has one housing type: Titanium. The non-metallic wrist accessories, sport, fabric and velcro were evaluated for all exposure conditions.
8. This device is a portable wrist-worn device and does not support any other use conditions. Therefore, the procedures in FCC KDB Publication 447498 D01v06 Section 6.2 have been applied for extremity and next to mouth (head) conditions.
9. Unless otherwise noted, when 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds below.

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 middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g evaluations and ≤ 2.0 W/kg for 10g SAR then testing at the other channels is not required for such test configuration(s).

LTE Notes:

1. LTE Considerations: 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 7.5.4.
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 LTE Band 41 SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg for 1g evaluations and > 1.5 W/kg for 10g SAR, 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. This device can only operate with 16 QAM on the uplink with less than or equal to 27 RB. QPSK and 16QAM LTE powers for RB size of 15 (“50% RB”) and 27 (“100% RB”) were additionally measured to support comparison and SAR test exclusion per KDB 941225 D05v02r04 Section 5.2.4 and 5.3.

WLAN Notes:

1. 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) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.6.4 for more information.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI single transmission chain 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 7.6.5 for more information.
3. 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. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.
4. 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.

Bluetooth Notes

1. To determine compliance, Bluetooth SAR was measured with the maximum power condition. Bluetooth was evaluated with a test mode with 100% transmission duty factor.

802.15.4 ab-NB Notes

1. To determine compliance, 802.15.4 ab-NB SAR was scaled to the 8.9% transmission duty factor to determine compliance since the duty factor of the device is limited to 8.9% per the manufacturer. See Section 8.6 for the time domain plot and calculation for the duty factor of the device.

11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

11.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v06 are applicable to devices with built-in unlicensed transmitters such as 802.11 and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

11.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore, simultaneous transmission analysis is required. Per FCC KDB Publication 447498 D01v06 4.3.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1g or 10g SAR.

Note: In some cases where simultaneous transmission scenarios overlap with the same power level (for example, cellular band + 2.4 GHz WIFI and cellular band + 2.4 GHz WIFI + 802.15.4 ab-NB), the most conservative SAR summation scenario was evaluated.

11.3 Head SAR Simultaneous Transmission Analysis

For SAR summation, the highest reported SAR across all housing and wristband types was used as a conservative evaluation for the simultaneous transmission analysis.

Table 11-1
Simultaneous Transmission Scenario with 2.4 GHz WLAN, and 802.15.4 ab-NB (Head at 1.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	802.15.4 ab-NB SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Head SAR	UMTS 850	0.002	0.413	0.012	0.427
	UMTS 1750	0.210	0.413	0.012	0.635
	UMTS 1900	0.613	0.413	0.012	1.038
	LTE Band 12	0.000	0.413	0.012	0.425
	LTE Band 13	0.003	0.413	0.012	0.428
	LTE Band 14	0.003	0.413	0.012	0.428
	LTE Band 26 (Cell)	0.003	0.413	0.012	0.428
	LTE Band 5 (Cell)	0.003	0.413	0.012	0.428
	LTE Band 66 (AWS)	0.190	0.413	0.012	0.615
	LTE Band 25 (PCS)	0.686	0.413	0.012	1.111
	LTE Band 7	0.884	0.413	0.012	**1.309**
	LTE Band 41	0.432	0.413	0.012	0.857

Table 11-2
Simultaneous Transmission Scenario with Bluetooth, and 5 GHz WLAN (Head at 1.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Head SAR	UMTS 850	0.002	0.262	0.109	0.373
	UMTS 1750	0.210	0.262	0.109	0.581
	UMTS 1900	0.613	0.262	0.109	0.984
	LTE Band 12	0.000	0.262	0.109	0.371
	LTE Band 13	0.003	0.262	0.109	0.374
	LTE Band 14	0.003	0.262	0.109	0.374
	LTE Band 26 (Cell)	0.003	0.262	0.109	0.374
	LTE Band 5 (Cell)	0.003	0.262	0.109	0.374
	LTE Band 66 (AWS)	0.190	0.262	0.109	0.561
	LTE Band 25 (PCS)	0.686	0.262	0.109	1.057
	LTE Band 7	0.884	0.262	0.109	1.255
	LTE Band 41	0.432	0.262	0.109	0.803

Table 11-3
Simultaneous Transmission Scenario with Bluetooth and 802.15.4 ab-NB (Head at 1.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	802.15.4 ab-NB SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Head SAR	UMTS 850	0.002	0.262	0.012	0.276
	UMTS 1750	0.210	0.262	0.012	0.484
	UMTS 1900	0.613	0.262	0.012	0.887
	LTE Band 12	0.000	0.262	0.012	0.274
	LTE Band 13	0.003	0.262	0.012	0.277
	LTE Band 14	0.003	0.262	0.012	0.277
	LTE Band 26 (Cell)	0.003	0.262	0.012	0.277
	LTE Band 5 (Cell)	0.003	0.262	0.012	0.277
	LTE Band 66 (AWS)	0.190	0.262	0.012	0.464
	LTE Band 25 (PCS)	0.686	0.262	0.012	0.960
	LTE Band 7	0.884	0.262	0.012	1.158
	LTE Band 41	0.432	0.262	0.012	0.706

Table 11-4
Simultaneous Transmission Scenario with Bluetooth, 5 GHz WLAN, and 802.15.4 ab-NB (Head at 1.0 cm)

Exposure Condition	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	802.15.4 ab-NB SAR (W/kg)	Σ SAR (W/kg)	Σ SAR (W/kg)
	1	2	3	1+2	1+3
Head SAR	0.262	0.109	0.012	0.371	0.274

Table 11-5
Simultaneous Transmission Scenario with 802.15.4 AB-NB, and 2.4 GHz WLAN (Head at 1.0 cm)

Exposure Condition	802.15.4 ab-NB SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
	1	2	1+2
Head SAR	0.012	0.413	0.425

11.4 Extremity SAR Simultaneous Transmission Analysis

For SAR summation, the highest reported SAR across all housing and wristband types was used as a conservative evaluation for the simultaneous transmission analysis.

Table 11-6
Simultaneous Transmission Scenario with 2.4 GHz WLAN, and 802.15.4 ab-NB (Extremity at 0.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	802.15.4 ab-NB SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2
Extremity SAR	UMTS 850	0.313	0.053	0.000	0.366
	UMTS 1750	0.067	0.053	0.000	0.120
	UMTS 1900	0.106	0.053	0.000	0.159
	LTE Band 12	0.172	0.053	0.000	0.225
	LTE Band 13	0.348	0.053	0.000	0.401
	LTE Band 14	0.374	0.053	0.000	0.427
	LTE Band 26 (Cell)	0.363	0.053	0.000	0.416
	LTE Band 5 (Cell)	0.346	0.053	0.000	0.399
	LTE Band 66 (AWS)	0.088	0.053	0.000	0.141
	LTE Band 25 (PCS)	0.127	0.053	0.000	0.180
	LTE Band 7	0.339	0.053	0.000	0.392
	LTE Band 41	0.144	0.053	0.000	0.197

Table 11-7
Simultaneous Transmission Scenario with Bluetooth, and 5 GHz WLAN (Extremity at 0.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Extremity SAR	UMTS 850	0.313	0.055	0.020	0.388
	UMTS 1750	0.067	0.055	0.020	0.142
	UMTS 1900	0.106	0.055	0.020	0.181
	LTE Band 12	0.172	0.055	0.020	0.247
	LTE Band 13	0.348	0.055	0.020	0.423
	LTE Band 14	0.374	0.055	0.020	**0.449**
	LTE Band 26 (Cell)	0.363	0.055	0.020	0.438
	LTE Band 5 (Cell)	0.346	0.055	0.020	0.421
	LTE Band 66 (AWS)	0.088	0.055	0.020	0.163
	LTE Band 25 (PCS)	0.127	0.055	0.020	0.202
	LTE Band 7	0.339	0.055	0.020	0.414
	LTE Band 41	0.144	0.055	0.020	0.219

Table 11-8
Simultaneous Transmission Scenario with Bluetooth and 802.15.4 ab-NB (Extremity at 0.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	802.15.4 ab-NB SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Extremity SAR	UMTS 850	0.313	0.055	0.000	0.368
	UMTS 1750	0.067	0.055	0.000	0.122
	UMTS 1900	0.106	0.055	0.000	0.161
	LTE Band 12	0.172	0.055	0.000	0.227
	LTE Band 13	0.348	0.055	0.000	0.403
	LTE Band 14	0.374	0.055	0.000	0.429
	LTE Band 26 (Cell)	0.363	0.055	0.000	0.418
	LTE Band 5 (Cell)	0.346	0.055	0.000	0.401
	LTE Band 66 (AWS)	0.088	0.055	0.000	0.143
	LTE Band 25 (PCS)	0.127	0.055	0.000	0.182
	LTE Band 7	0.339	0.055	0.000	0.394
	LTE Band 41	0.144	0.055	0.000	0.199

Table 11-9
Simultaneous Transmission Scenario with Bluetooth, 5 GHz WLAN and 802.15.4 ab-NB (Extremity at 0.0 cm)

Exposure Condition	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	802.15.4 ab-NB SAR (W/kg)	Σ SAR (W/kg)	Σ SAR (W/kg)
	1	2	3	1+2	1+3
Extremity SAR	0.055	0.020	0.000	0.075	0.055

Table 11-10
Simultaneous Transmission Scenario with 802.15.4 ab-NB and 2.4 GHz WLAN (Extremity at 0.0 cm)

Exposure Condition	802.15.4 ab-NB SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
	1	2	1+2
Extremity SAR	0.000	0.053	0.053

11.5 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06.

12 SAR MEASUREMENT VARIABILITY

12.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01, SAR measurement variability was not assessed for each frequency band since all measured SAR values are < 0.8 W/kg for 1g SAR and < 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 was not required.

13 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4404B	Spectrum Analyzer	N/A	N/A	N/A	MY45113242
Agilent	E4438C	ESG Vector Signal Generator	4/25/2023	Annual	4/25/2024	US41460739
Agilent	E4438C	ESG Vector Signal Generator	11/17/2022	Annual	11/17/2023	MY45093852
Agilent	N5182A	MXG Vector Signal Generator	4/1/2023	Annual	4/1/2024	MY47420837
Agilent	N5182A	MXG Vector Signal Generator	11/17/2022	Annual	11/17/2023	US46240505
Agilent	8753ES	S-Parameter Vector Network Analyzer	6/2/2023	Annual	6/2/2024	MY40003841
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343971
Amplifier Research	150A100C	Amplifier	CBT	N/A	CBT	350132
Anritsu	MN8110B	I/O Adaptor	CBT	N/A	CBT	6261747881
Anritsu	ML2496A	Power Meter	6/15/2023	Annual	6/15/2024	1138001
Anritsu	ML2496A	Power Meter	8/16/2022	Annual	8/16/2023	1351001
Anritsu	MA2411B	Pulse Power Sensor	6/15/2023	Annual	6/15/2024	1126066
Anritsu	MA2411B	Pulse Power Sensor	6/15/2023	Annual	6/15/2024	1339007
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	3/31/2023	Annual	3/31/2024	6201381794
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	1/20/2023	Annual	1/20/2024	6201144419
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	1/10/2023	Annual	1/10/2024	6201524637
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	11/28/2022	Annual	11/28/2023	6262150047
Anritsu	MA24106A	USB Power Sensor	6/15/2023	Annual	6/15/2024	1827530
Anritsu	MA24106A	USB Power Sensor	6/15/2023	Annual	6/15/2024	1827532
Mini-Circuits	PWR-4GHS	USB Power Sensor	11/11/2022	Annual	11/11/2023	11710030062
Control Company	4352	Long Stem Thermometer	9/10/2021	Biennial	9/10/2023	210774678
Control Company	4352	Long Stem Thermometer	9/10/2021	Biennial	9/10/2023	210774685
Control Company	4352	Long Stem Thermometer	9/10/2021	Biennial	9/10/2023	210774675
Control Company	4040	Therm./ Clock/ Humidity Monitor	1/17/2023	Annual	1/17/2024	160574418
Mitutoyo	500-196-30	CD-6"ASX 6Inch Digital Caliper	2/16/2022	Triennial	2/16/2025	A20238413
Keysight Technologies	N6705B	DC Power Analyzer	5/5/2021	Triennial	5/5/2024	MY53004059
Keysight Technologies	N9020A	MXA Signal Analyzer	3/15/2023	Annual	3/15/2024	US46470561
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	VLF-6000+	Low Pass Filter DC to 6000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	ZUDC10-83-S+	Directional Coupler	CBT	N/A	CBT	2050
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Seekonk	TSF-100	Torque Wrench	11/28/2022	Annual	11/28/2024	47639-29
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	6/1/2023	Annual	6/1/2024	108843
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	6/1/2023	Annual	6/1/2024	168543
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	4/5/2023	Annual	4/5/2024	167284
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	3/24/2023	Annual	3/24/2024	167285
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/9/2023	Annual	5/9/2024	1070
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	9/19/2022	Annual	9/19/2023	1045
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1559
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1529
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1243
SPEAG	D750V3	750 MHz SAR Dipole	5/11/2021	Biennial	5/11/2024	1034
SPEAG	D750V3	750 MHz SAR Dipole	5/16/2022	Biennial	5/16/2024	1057
SPEAG	D835V2	835 MHz SAR Dipole	5/16/2022	Biennial	5/16/2024	460
SPEAG	D835V2	835 MHz SAR Dipole	5/16/2022	Biennial	5/16/2024	4d040
SPEAG	D1750V2	1750 MHz SAR Dipole	9/9/2020	Triennial	9/9/2023	1104
SPEAG	D1750V2	1750 MHz SAR Dipole	5/10/2022	Annual	5/10/2024	1083
SPEAG	D1900V2	1900 MHz SAR Dipole	9/10/2020	Triennial	9/10/2023	5d181
SPEAG	D2450V2	2450 MHz SAR Dipole	11/9/2021	Biennial	11/9/2023	921
SPEAG	D2600V2	2600 MHz SAR Dipole	9/9/2020	Triennial	9/9/2023	1069
SPEAG	D5GHzV2	5 GHz SAR Dipole	3/22/2022	Biennial	3/22/2024	1123
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/15/2023	Annual	2/15/2024	467
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/15/2023	Annual	3/15/2024	604
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/15/2023	Annual	2/15/2024	1403
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/10/2022	Annual	11/10/2023	1646
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/13/2022	Annual	12/13/2023	1644
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/14/2023	Annual	4/14/2024	501
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/13/2022	Annual	10/13/2023	1333
SPEAG	EX3DV4	SAR Probe	3/16/2023	Annual	3/16/2024	7421
SPEAG	EX3DV4	SAR Probe	11/14/2022	Annual	11/14/2023	7639
SPEAG	EX3DV4	SAR Probe	2/13/2023	Annual	2/13/2024	7427
SPEAG	EX3DV4	SAR Probe	12/9/2022	Annual	12/9/2023	7490
SPEAG	EX3DV4	SAR Probe	4/18/2023	Annual	4/18/2024	7532
SPEAG	EX3DV4	SAR Probe	10/20/2022	Annual	10/20/2023	7420
SPEAG	EX3DV4	SAR Probe	2/13/2023	Annual	2/13/2024	7308

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. Each equipment item was used solely within its respective calibration period.

14 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

15 CONCLUSION

15.1 Measurement Conclusion

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

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

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