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SAR EVALUATION REPORT

Applicant Name:
Panasonic Corporation of North America
One Panasonic Way, 4B-8
Secaucus, NJ 07094
United States

Date of Testing:
12/22/2014 - 01/19/2015
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1412152288-R2.ACJ

FCC ID: **ACJ9TGWL13A**

APPLICANT: **PANASONIC CORPORATION OF NORTH AMERICA**

DUT Type: Wireless Module
Application Type: Class II Permissive Change
FCC Rule Part(s): CFR §2.1093
Model(s): WL13A
Serial Number: Pre-Production [S/N: SAR-5]
Permissive Change(s): The wireless module FCC ID: ACJ9TGWL13A is integrated into the host tablet FZ-R1

Equipment Class	Band & Mode	Tx Frequency	SAR 1 gm Body (W/kg)
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.37
DTS	Bluetooth LE	2402 - 2480 MHz	N/A
NII	5.2 GHz WLAN	5180 - 5240 MHz	0.33
NII	5.3 GHz WLAN	5260 - 5320 MHz	0.49
NII	5.5 GHz WLAN	5500 - 5720 MHz	0.57
NII	5.8 GHz WLAN	5745 - 5825 MHz	0.51
DSS/DTS	Bluetooth	2402 - 2480 MHz	<0.1
Simultaneous SAR per KDB 690783 D01v01r03:			1.58

Note: This revised Test Report (S/N: 0Y1412152288-R2.ACJ) 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 wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.8 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

Randy Ortanez
President

The SAR Tick is an initiative of the Mobile Manufacturers Forum (MMF). While a product may be considered eligible, use of the SAR Tick logo requires an agreement with the MMF. Further details can be obtained by emailing: SARTICK@MMFAI.INFO.

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
2.4 GHz WLAN	Data	2412 - 2462 MHz
5.2 GHz WLAN	Data	5180 - 5240 MHz
5.3 GHz WLAN	Data	5260 - 5320 MHz
5.5 GHz WLAN	Data	5500 - 5720 MHz
5.8 GHz WLAN	Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz

1.2 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 D01v05.

1.2.1 SISO 2.4 GHz WLAN Targets

Mode / Band		Channel	Modulated Average per Data Rate (dBm)							
IEEE 802.11b (2.4 GHz) SISO	Data Rate (Mbps)		1	2	5.5	11				
	Maximum	1	10.5							
	Nominal		9.5							
	Maximum	2	13.5							
	Nominal		12.5							
	Maximum	3-10	14.0							
	Nominal		13.0							
	Maximum	11	12.0							
	Nominal		11.0							
IEEE 802.11g (2.4 GHz) SISO	Data Rate (Mbps)		6	9	12	18	24	36	48	54
	Maximum	1	10.5							
	Nominal		9.5							
	Maximum	2	13.5							11.5
	Nominal		12.5							10.5
	Maximum	3-10	14.0						13.5	11.5
	Nominal		13.0						12.5	10.5
	Maximum	11	12.0							11.5
	Nominal		11.0							10.5
IEEE 802.11n 20 MHz (2.4 GHz) SISO	Data Rate (Mbps)		6.5	13	19.5	26	39	52	58.5	65
	Maximum	1	10.5							10.0
	Nominal		9.5							9.0
	Maximum	2	13.5					11.5	10.5	10.0
	Nominal		12.5					10.5	9.5	9.0
	Maximum	3-10	14.0					13.5	11.5	10.0
	Nominal		13.0					12.5	10.5	9.0
	Maximum	11	12.0						11.5	10.0
	Nominal		11.0						10.5	9.0
IEEE 802.11n 40 MHz (2.4 GHz) SISO	Data Rate (Mbps)		13.5	27	40.5	54	81	108	121.5	135
	Maximum	3	8.5							
	Nominal		7.5							
	Maximum	4	9.5							
	Nominal		8.5							
	Maximum	5-6	11.0							10.0
	Nominal		10.0							9.0
	Maximum	7	12.5						11.5	10.0
	Nominal		11.5						10.5	9.0
	Maximum	8	11.5							10.0
	Nominal		10.5							9.0
	Maximum	9	11.0							10.0
	Nominal		10.0							9.0

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1.2.2 SISO 5 GHz WLAN Targets

Mode / Band		Channel	Modulated Average per Data Rate (dBm)							
IEEE 802.11a (5 GHz) SISO	Data Rate (Mbps)		6	9	12	18	24	36	48	54
	Maximum	36	11.0							
	Nominal		10.0							
	Maximum	40-64	14.0						13.5	11.5
	Nominal		13.0						12.5	10.5
	Maximum	100	12.0							11.5
	Nominal		11.0							10.5
	Maximum	104-136	15.0						13.5	11.5
	Nominal		14.0						12.5	10.5
	Maximum	140-144	11.0							11.5
	Nominal		10.0							10.5
	Maximum	149-165	15.0						13.5	11.5
	Nominal		14.0						12.5	10.5
IEEE 802.11n/ac 20 MHz (5 GHz) SISO	Data Rate (Mbps)		6.5	13	19.5	26	39	52	58.5	65
	Maximum	36	11.0							10.0
	Nominal		10.0							9.0
	Maximum	40-60	14.0						11.5	10.0
	Nominal		13.0						10.5	9.0
	Maximum	64-100	12.0						11.5	10.0
	Nominal		11.0						10.5	9.0
	Maximum	104-136	15.0					13.5	11.5	10.0
	Nominal		14.0					12.5	10.5	9.0
	Maximum	140-144	11.0							10.0
	Nominal		10.0							9.0
	Maximum	149-165	15.0					13.5	11.5	10.0
	Nominal		14.0					12.5	10.5	9.0
IEEE 802.11n/ac 40 MHz (5 GHz) SISO	Data Rate (Mbps)		13.5	27	40.5	54	81	108	121.5	135
	Maximum	38	9.5							
	Nominal		8.5							
	Maximum	46	14.0							
	Nominal		13.0							
	Maximum	54	9.5							
	Nominal		8.5							
	Maximum	62	9.0							
	Nominal		8.0							
	Maximum	102	9.5							
	Nominal		8.5							
	Maximum	110-159	15.0					13.5	11.5	10.0
	Nominal		14.0					12.5	10.5	9.0
IEEE 802.11ac 80 MHz (5 GHz) SISO	Data Rate (Mbps)		29.3	58.5	87.8	117	175.5	234	263.3	292.5
	Maximum	42	8.0							
	Nominal		7.0							
	Maximum	58	10.0							
	Nominal		9.0							
	Maximum	106	7.0							
	Nominal		6.0							
	Maximum	122-155	12.5						11.5	10.0
	Nominal		11.5						10.5	9.0

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1.2.3 MIMO 2.4 GHz WLAN Targets

Mode / Band		Channel	Modulated Average per Data Rate (dBm)
IEEE 802.11n 20 MHz (2.4 GHz) MIMO	Maximum	1	**9.5**
	Nominal		**8.5**
	Maximum	2-10	**12.0**
	Nominal		**11.0**
	Maximum	11	**9.0**
	Nominal		**8.0**
IEEE 802.11n 40 MHz (2.4 GHz) MIMO	Maximum	3	**7.0**
	Nominal		**6.0**
	Maximum	4	**8.0**
	Nominal		**7.0**
	Maximum	5-6	**10.0**
	Nominal		**9.0**
	Maximum	7	**12.0**
	Nominal		**11.0**
	Maximum	8	**11.0**
	Nominal		**10.0**
	Maximum	9	**10.5**
	Nominal		**9.5**

1.2.4 MIMO 5 GHz WLAN Targets

Mode / Band		Channel	Modulated Average per Data Rate (dBm)
IEEE 802.11n 20 MHz (5 GHz) MIMO	Maximum	36	**10.5**
	Nominal		**9.5**
	Maximum	40-44	**11.0**
	Nominal		**10.0**
	Maximum	48-60	**11.5**
	Nominal		**10.5**
	Maximum	64	**11.0**
	Nominal		**10.0**
	Maximum	100	**9.0**
	Nominal		**8.0**
	Maximum	104-136	**12.0**
	Nominal		**11.0**
	Maximum	140-144	**9.0**
	Nominal		**8.0**
	Maximum	149-165	**12.0**
	Nominal		**11.0**
IEEE 802.11n 40 MHz (5 GHz) MIMO	Maximum	38	**6.5**
	Nominal		**5.5**
	Maximum	46	**11.0**
	Nominal		**10.0**
	Maximum	54	**7.5**
	Nominal		**6.5**
	Maximum	62	**9.0**
	Nominal		**8.0**
	Maximum	102	**6.5**
	Nominal		**5.5**
	Maximum	110-159	**12.0**
	Nominal		**11.0**

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Mode / Band		Channel	Modulated Average per Data Rate (dBm)
IEEE 802.11ac 20 MHz (5 GHz) MIMO	Maximum	36	**10.5**
	Nominal		**9.5**
	Maximum	40-44	**11.0**
	Nominal		**10.0**
	Maximum	48-60	**11.5**
	Nominal		**10.5**
	Maximum	64	**11.0**
	Nominal		**10.0**
	Maximum	100	**9.0**
	Nominal		**8.0**
	Maximum	104-136	**12.0**
	Nominal		**11.0**
	Maximum	140-144	**9.0**
	Nominal		**8.0**
	Maximum	149-165	**12.0**
	Nominal		**11.0**
IEEE 802.11ac 40 MHz (5 GHz) MIMO	Maximum	38	**6.5**
	Nominal		**5.5**
	Maximum	46	**11.0**
	Nominal		**10.0**
	Maximum	54	**7.5**
	Nominal		**6.5**
	Maximum	62	**9.0**
	Nominal		**8.0**
	Maximum	102	**6.5**
	Nominal		**5.5**
	Maximum	110-159	**12.0**
	Nominal		**11.0**
IEEE 802.11ac 80 MHz (5 GHz) MIMO	Maximum	42	**8.0**
	Nominal		**7.0**
	Maximum	58	**9.0**
	Nominal		**8.0**
	Maximum	106	**7.0**
	Nominal		**6.0**
	Maximum	122	**8.0**
	Nominal		**7.0**
	Maximum	138-155	**9.0**
	Nominal		**8.0**

1.2.5 Bluetooth Targets

Mode / Band		Modulated Average (dBm)
Bluetooth	Maximum	**8.5**
	Nominal	**7.0**

1.3 Sides for SAR Testing

Table 1-1
Sides for SAR Testing

Mode	Back	Top	Bottom	Right	Left
2.4 GHz WLAN Antenna 1	Yes	Yes	No	No	Yes
2.4 GHz WLAN Antenna 2	Yes	No	No	Yes	No
2.4 GHz WLAN MIMO	Yes	Yes	No	Yes	Yes
5 GHz WLAN Antenna 1	Yes	Yes	No	No	Yes
5 GHz WLAN Antenna 2	Yes	No	No	Yes	No
5 GHz WLAN MIMO	Yes	Yes	No	Yes	Yes
Bluetooth	Yes	No	No	Yes	No

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Note:

1. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the device filing.
2. Overall device diagonal dimension is >20.0 cm.
3. Antenna locations can be found in Appendix F.
4. Per FCC KDB 616217 D04v01r01, Particular DUT edges were not required to be evaluated for SAR based on the SAR exclusion threshold in KDB 447498 D01v05r01.

1.4 Near Field Communication (NFC) Antenna

RFID transmitter ACJ9TGRI14D is integrated into this DUT. Therefore, all SAR tests were performed with the device which already incorporates the NFC antenna. A diagram showing the location of the NFC antenna can be found in Appendix F.

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. The FZ-R1 contains GPRS/ EDGE/UMTS/CDMA/EVDO/LTE transmitter ACJ9TGWW13B and can transmit simultaneously with this transmitter. Possible transmission paths for the DUT are shown in Figure 1-1 and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another. This device supports MIMO Tx for WLAN 802.11n/ac. Each WLAN antenna can transmit independently or together when operating with MIMO.

Figure 1-1
Simultaneous Transmission Paths

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v05 3) procedures.

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Body	Notes
1	GPRS/EDGE + 2.4 GHz WI-FI	Yes	
2	GPRS/EDGE + 2.4 GHz Bluetooth	Yes	
3	GPRS/EDGE + 5 GHz WI-FI	Yes	
4	UMTS + 2.4 GHz WI-FI	Yes	
5	UMTS + 5 GHz WI-FI	Yes	
6	UMTS + 2.4 GHz Bluetooth	Yes	
7	LTE + 2.4 GHz WI-FI	Yes	
8	LTE + 5 GHz WI-FI	Yes	
9	LTE + 2.4 GHz Bluetooth	Yes	
10	CDMA/EVDO data + 2.4 GHz WI-FI	Yes	
11	CDMA/EVDO data + 5 GHz WI-FI	Yes	
12	CDMA/EVDO data + 2.4 GHz Bluetooth	Yes	
13	CDMA/EVDO data + LTE	N/A	Not supported by HW

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1. All licensed modes share the same antenna path and cannot transmit simultaneously.
2. 2.4 GHz WLAN, 5 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
3. This device supports 2x2 MIMO Tx for WLAN 802.11n/ac. Each WLAN antenna can transmit independently or together when operating with MIMO.

1.6 Miscellaneous SAR Test Considerations

(A) WIFI/BT

This module is integrated into a tablet device with an unique form factor with sloped edges. Please see Section 4.2 for additional SAR test considerations, per FCC Guidance.

This device supports IEEE 802.11ac with the following features:

a) Up to 80 MHz Bandwidth only
b) No aggregate channel configurations
c) 2 Tx antenna output
d) 256 QAM is supported
e) Band gap channels are supported

1.7 Power Reduction for SAR

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

1.8 Guidance Applied

- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r03, D02v01r01 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04v01 (Tablet SAR Considerations)
- April 2013 TCB Workshop Notes (IEEE 802.11ac)

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2 INTRODUCTION

The FCC and Industry 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.

2.1 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 2-1).

Equation 2-1
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]

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3 DOSIMETRIC ASSESSMENT

3.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01 and IEEE 1528-2013:

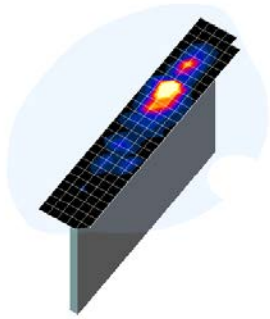

Figure 3-1
Sample SAR Area Scan

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 D01v01 (See Table 3-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01 (See Table 3-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 3-1. 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 3-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01*

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*$\Delta z_{zoom}(n-1)$	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 22

*Also compliant to IEEE 1528-2013 Table 6

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4 SAR TESTING PROCEDURES

4.1 SAR Testing for Tablet per KDB Publication 616217 D04

This device is used in full sized tablet exposure conditions due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D01v05 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

4.2 SAR Test Positioning Based on Form Factor

A non-standard setup was used for SAR testing based on guidance from the FCC. The operational description contains additional information.

This tablet has sloped surfaces at the edges of the device. Per FCC guidance, two device orientations were considered to evaluate each required edge SAR based on the considerations of possible usage position from end-users and worst case exposure scenarios. Per KDB 616217 D04 for SAR testing for Tablets, the device was first positioned with the required edge touching (0mm) and perpendicular to the flat phantom. Additionally, the device was then positioned with the sloped edge touching (0mm) the flat phantom. SAR testing was performed on sloped edges (top-back surface, right-back surface, and left-back surface) when SAR testing was required per the exclusion formula in KDB Publicaiton 447498. The Technical Descriptions in the FCC Filing contain additional information regarding device positioning. The data for both orientations for each required edge is included in Section 9.

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5 RF EXPOSURE LIMITS

5.1 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.

5.2 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 5-1
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.

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6 FCC MEASUREMENT PROCEDURES

6.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v05, 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 D01v01r02.

6.2 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n/ac transmitters. 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 D01v01r02 for more details.

6.2.1 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. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

6.2.2 Frequency Channel Configurations [24]

For 2.4 GHz, the highest average RF output power channel between the low, mid and high channel at the lowest data rate was selected for SAR evaluation in 802.11b mode. 802.11g/n modes and higher data rates for 802.11b were additionally evaluated for SAR if the output power of the respective mode was 0.25 dB or higher than the powers of the SAR configurations tested in the 802.11b mode.

For 5 GHz, the highest average RF output power channel across the default test channels at the lowest data rate was selected for SAR evaluation in 802.11a. When the adjacent channels are higher in power then the default channels, these “required channels” were considered instead of the default channels for SAR testing. 802.11n modes and higher data rates for 802.11a/n were evaluated only if the respective mode was higher than 0.25 dB or more than the 802.11a mode. 802.11ac SAR was evaluated for highest 802.11a configuration in each 5 GHz band and each exposure condition. 802.11ac modes were additionally evaluated for SAR if the output power for the respective mode was more than 0.25 dB higher than powers of 802.11a modes.

If the maximum extrapolated peak SAR of the zoom scan for the highest output channel was less than 1.6 W/kg and if the 1g averaged SAR was less than 0.8 W/kg, SAR testing was not required for the other test channels in the band.

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6.2.3 MIMO SAR considerations

Per KDB 248227, SAR for MIMO was measured with both transmitting simultaneously and was evaluated independently of SISO operation. For 2.4 and 5 GHz MIMO, IEEE 802.11n 20 MHz bandwidth was evaluated. Other IEEE 802.11 modes and bandwidths were not investigated for MIMO operations since the maximum allowed output power (including tolerance) was not higher for these modes.

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7 RF CONDUCTED POWERS

7.1 WLAN Conducted Powers

Table 7-1
SISO IEEE 802.11b Average RF Power – Antenna 1

Mode	Freq	Channel	802.11b (2.4 GHz) Conducted Power [dBm]			
			Data Rate [Mbps]			
	[MHz]		1	2	5.5	11
802.11b	2412	1*	10.30	10.21	10.26	10.25
802.11b	2417	2	13.16	13.06	13.11	13.08
802.11b	2422	3	**13.86**	13.56	13.98	13.89
802.11b	2437	6*	13.84	13.83	13.81	13.77
802.11b	2457	10	13.66	13.66	13.64	13.64
802.11b	2462	11*	11.89	11.64	11.67	11.70

Table 7-2
SISO IEEE 802.11b Average RF Power – Antenna 2

Mode	Freq	Channel	802.11b (2.4 GHz) Conducted Power [dBm]			
			Data Rate [Mbps]			
	[MHz]		1	2	5.5	11
802.11b	2412	1*	10.38	10.01	10.06	10.12
802.11b	2417	2	13.31	13.30	13.27	13.50
802.11b	2422	3	**13.91**	13.82	14.00	13.98
802.11b	2437	6*	13.67	13.64	13.70	13.68
802.11b	2457	10	13.61	13.22	13.17	13.23
802.11b	2462	11*	11.44	11.54	11.50	11.50

Table 7-3
SISO IEEE 802.11g Average RF Power – Antenna 1

Mode	Freq	Channel	802.11g (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11g	2412	1	10.13	10.11	10.16	10.19	10.02	10.10	10.08	9.63
802.11g	2417	2	13.16	13.12	13.45	13.48	13.33	13.42	13.41	11.05
802.11g	2422	3	13.69	13.68	13.72	13.71	13.65	13.14	11.35	9.98
802.11g	2437	6	13.94	13.85	13.95	13.98	13.92	13.38	11.50	9.76
802.11g	2457	10	14.00	13.90	13.91	13.86	13.74	13.28	11.37	9.87
802.11g	2462	11	11.78	11.86	11.87	11.88	11.73	11.86	11.44	9.99

Table 7-4
SISO IEEE 802.11g Average RF Power – Antenna 2

Mode	Freq	Channel	802.11g (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11g	2412	1	10.16	10.05	10.09	10.09	9.97	9.95	9.96	9.95
802.11g	2417	2	13.01	13.02	12.82	12.87	13.10	12.79	12.84	11.43
802.11g	2422	3	13.84	14.00	14.00	14.00	13.95	13.50	13.08	10.00
802.11g	2437	6	14.00	13.89	13.92	14.00	13.79	13.00	13.13	9.87
802.11g	2457	10	13.69	13.73	13.75	13.80	13.72	13.27	13.45	10.00
802.11g	2462	11	12.00	11.76	11.91	11.97	11.79	12.00	11.13	9.92

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Table 7-5
SISO IEEE 802.11n Average RF Power – 20 MHz Bandwidth – Antenna 1

Mode	Freq	Channel	20 MHz 802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	19.5	26	39	52	58.5	65
802.11n	2412	1	10.29	10.40	10.41	10.36	10.42	10.38	10.45	9.94
802.11n	2417	2	13.41	13.36	13.32	13.23	13.23	11.41	10.50	10.00
802.11n	2422	3	**13.82**	13.31	13.30	13.40	13.20	13.42	11.50	9.98
802.11n	2437	6	13.73	13.47	13.37	13.33	13.31	13.30	11.48	10.00
802.11n	2457	10	13.69	13.68	13.68	13.61	13.73	13.32	11.38	9.93
802.11n	2462	11	11.86	11.84	11.86	11.86	11.78	11.94	11.35	10.00

Table 7-6
SISO IEEE 802.11n Average RF Power – 20 MHz Bandwidth – Antenna 2

Mode	Freq	Channel	20 MHz 802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	19.5	26	39	52	58.5	65
802.11n	2412	1	10.50	10.47	10.50	10.42	10.50	10.47	10.49	10.00
802.11n	2417	2	13.12	13.40	13.43	13.40	13.20	11.03	10.41	9.98
802.11n	2422	3	13.69	13.76	13.72	13.98	14.00	13.05	11.34	10.00
802.11n	2437	6	**13.92**	13.91	14.00	13.87	14.00	13.07	11.37	9.98
802.11n	2457	10	13.66	13.74	13.68	13.59	13.71	13.33	11.20	9.92
802.11n	2462	11	11.61	11.55	11.58	11.85	11.88	11.57	11.23	9.88

Table 7-7
MIMO IEEE 802.11n Average RF Power – 20 MHz Bandwidth

802.11n (2.4GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate 13
802.11n	2412	1	9.07
802.11n	2417	2	11.56
802.11n	2437	6	11.44
802.11n	2457	10	**11.61**
802.11n	2462	11	8.67

Table 7-8
SISO IEEE 802.11n Average RF Power – 40 MHz Bandwidth – Antenna 1

Mode	Freq	Channel	40 MHz 802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		13.5	27	40.5	54	81	108	121.5	135
802.11n	2422	3	8.12	8.07	8.07	7.65	7.73	7.77	7.85	7.74
802.11n	2427	4	9.07	9.03	8.15	9.09	9.20	7.30	9.37	9.25
802.11n	2432	5	10.65	10.70	10.74	10.74	10.80	10.89	10.82	9.82
802.11n	2437	6	10.67	10.72	10.62	10.80	10.67	10.96	10.83	9.83
802.11n	2442	7	**12.12**	12.13	12.09	12.16	12.20	12.10	11.31	9.73
802.11n	2447	8	11.28	11.22	11.20	11.29	11.24	11.30	11.32	9.93
802.11n	2452	9	10.70	10.75	10.58	10.66	10.71	10.81	10.75	9.88

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Table 7-9
SISO IEEE 802.11n Average RF Power – 40 MHz Bandwidth – Antenna 2

Mode	Freq	Channel	40 MHz 802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		13.5	27	40.5	54	81	108	122	135
802.11n	2422	3	8.34	8.42	8.45	8.44	8.46	8.50	8.45	8.50
802.11n	2427	4	9.49	9.48	9.47	9.35	9.50	9.31	9.49	9.50
802.11n	2432	5	10.62	11.00	10.97	10.98	10.91	11.00	11.00	9.87
802.11n	2437	6	10.74	10.92	10.95	11.00	11.00	10.93	10.97	9.72
802.11n	2442	7	**11.97**	12.39	12.32	12.37	12.27	12.42	11.10	9.71
802.11n	2447	8	11.29	11.34	11.41	11.42	11.46	11.33	11.50	9.61
802.11n	2452	9	10.52	10.47	10.55	10.53	10.47	10.55	10.51	9.76

Table 7-10
MIMO IEEE 802.11n Average RF Power – 40 MHz Bandwidth

802.11n (2.4GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate 13
802.11n	2422	3	6.57
802.11n	2427	4	7.36
802.11n	2432	5	9.78
802.11n	2437	6	9.60
802.11n	2442	7	11.22
802.11n	2447	8	10.11
802.11n	2452	9	10.48

Table 7-11
SISO IEEE 802.11a Average RF Power – Antenna 1

Mode	Freq	Channel	802.11a (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11a	5180	36*	10.75	10.68	10.61	10.63	10.54	10.55	10.60	10.61
802.11a	5200	40	**13.75**	13.68	13.60	13.63	13.53	13.57	13.16	11.36
802.11a	5220	44	13.73	13.71	13.66	13.59	13.51	13.55	13.24	11.50
802.11a	5240	48*	13.72	13.77	13.78	13.79	13.71	13.77	13.29	11.22
802.11a	5260	52*	13.91	13.86	13.87	13.97	13.77	13.89	13.00	11.24
802.11a	5280	56	**13.98**	14.00	13.99	13.93	13.92	13.86	13.44	11.39
802.11a	5300	60	13.58	13.57	13.58	13.65	13.89	13.93	13.15	11.00
802.11a	5320	64*	13.51	13.62	13.64	13.66	13.52	13.60	13.09	11.49
802.11a	5500	100	11.67	11.67	11.70	11.76	11.70	11.66	11.72	11.50
802.11a	5520	104*	14.70	14.61	14.52	14.58	14.20	14.16	13.44	11.47
802.11a	5540	108	14.77	14.75	15.00	14.80	14.76	14.83	12.88	11.37
802.11a	5560	112	14.75	14.65	15.00	14.82	14.76	14.76	13.03	11.48
802.11a	5580	116*	**15.00**	14.99	14.99	14.91	14.68	14.72	13.06	11.44
802.11a	5600	120	14.78	14.74	14.98	14.98	14.99	14.98	13.03	11.28
802.11a	5620	124	14.92	14.81	14.99	14.95	14.93	14.95	13.21	11.33
802.11a	5640	128	14.81	14.82	14.95	14.92	14.87	14.80	13.15	11.38
802.11a	5660	132	14.51	14.43	14.50	14.80	14.67	14.63	13.15	11.50
802.11a	5680	136*	14.29	14.25	14.64	14.59	14.61	14.68	13.50	11.50
802.11a	5700	140	10.40	10.41	10.68	10.69	10.60	10.64	10.14	11.18
802.11a	5720	144	10.78	10.74	10.96	10.88	10.67	10.64	10.54	9.54
802.11a	5745	149*	14.22	14.13	14.42	14.41	14.34	14.36	13.27	11.41
802.11a	5765	153	14.17	14.96	14.34	14.30	14.18	14.28	13.10	11.35
802.11a	5785	157*	14.94	14.77	15.00	15.00	14.89	14.23	13.45	11.26
802.11a	5805	161	14.82	14.72	14.95	15.00	14.90	14.90	13.30	11.24
802.11a	5825	165*	**15.00**	15.00	14.89	14.87	14.75	14.79	13.21	11.07

(*) – indicates default channels per KDB Publication 248227 D01v01r02. When the adjacent channels are higher in power then the default channels, these "required channels" are considered for SAR testing instead of the default channels.

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Table 7-12
SISO IEEE 802.11a Average RF Power – Antenna 2

Mode	Freq	Channel	802.11a (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11a	5180	36*	10.89	10.77	10.78	10.75	10.67	10.71	10.74	10.71
802.11a	5200	40	**13.79**	13.42	13.33	13.30	13.63	13.57	13.50	11.46
802.11a	5220	44	13.47	13.44	13.49	13.28	13.17	13.30	13.31	11.44
802.11a	5240	48*	13.30	13.13	13.51	13.58	13.42	13.52	13.42	11.31
802.11a	5260	52*	**13.94**	13.89	13.89	13.87	13.78	13.85	13.33	11.11
802.11a	5280	56	13.86	13.71	13.63	13.66	13.65	13.68	13.27	11.11
802.11a	5300	60	13.41	13.42	13.43	13.48	13.32	13.33	13.32	11.22
802.11a	5320	64*	13.50	13.79	13.76	13.76	13.65	13.67	13.25	11.50
802.11a	5500	100	11.72	11.67	11.87	11.83	11.72	11.81	11.88	11.10
802.11a	5520	104*	**14.91**	14.91	14.77	14.81	14.63	14.78	13.43	11.41
802.11a	5540	108	14.83	14.81	14.80	14.79	14.78	14.85	13.33	10.96
802.11a	5560	112	14.90	14.78	14.84	14.83	14.98	15.00	13.06	11.42
802.11a	5580	116*	14.72	14.70	14.74	14.97	14.89	14.97	13.11	11.47
802.11a	5600	120	14.75	14.90	14.71	14.87	14.81	14.80	13.37	11.50
802.11a	5620	124	14.70	14.82	14.76	14.85	14.78	14.71	13.35	11.34
802.11a	5640	128	14.77	14.77	14.61	14.80	14.73	14.74	13.29	11.29
802.11a	5660	132	14.55	14.48	14.79	14.92	14.85	14.90	12.70	11.50
802.11a	5680	136*	14.56	14.61	14.51	14.51	14.47	14.50	13.10	11.50
802.11a	5700	140	10.54	10.47	10.87	10.83	10.70	10.78	10.24	11.19
802.11a	5720	144	10.89	10.72	10.85	10.41	10.22	10.53	10.65	9.26
802.11a	5745	149*	14.52	14.52	14.54	14.58	14.36	14.58	13.30	11.33
802.11a	5765	153	14.95	14.84	14.89	14.85	14.65	14.74	13.31	11.21
802.11a	5785	157*	**14.95**	14.94	14.91	15.00	14.88	14.94	13.36	11.48
802.11a	5805	161	14.56	14.89	14.86	15.00	14.77	14.75	13.15	10.81
802.11a	5825	165*	14.59	14.56	14.52	14.59	14.56	14.54	13.36	11.23

(*) – indicates default channels per KDB Publication 248227 D01v01r02. When the adjacent channels are higher in power then the default channels, these “required channels” are considered for SAR testing instead of the default channels.

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Table 7-13
SISO IEEE 802.11n Average RF Power – 20 MHz Bandwidth – Antenna 1

Mode	Freq	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	10.39	10.45	10.40	10.43	10.50	10.54	10.65	9.71
802.11n	5200	40	13.26	13.16	13.19	13.16	13.13	13.16	11.47	9.67
802.11n	5220	44	13.34	13.66	13.65	13.58	13.69	13.67	11.16	9.19
802.11n	5240	48	13.70	13.77	13.77	13.72	13.77	13.83	11.34	9.15
802.11n	5260	52	13.53	13.54	13.51	13.53	13.51	13.53	11.01	9.49
802.11n	5280	56	**13.68**	13.61	13.73	13.74	13.67	13.71	11.15	9.36
802.11n	5300	60	13.34	13.38	13.43	13.36	13.52	13.41	11.19	9.50
802.11n	5320	64	11.68	11.65	11.73	11.72	11.66	11.69	10.72	9.63
802.11n	5500	100	11.29	11.31	11.20	11.19	11.25	11.22	10.90	9.85
802.11n	5520	104	14.24	14.50	15.00	14.98	15.00	13.30	11.21	10.00
802.11n	5540	108	**14.94**	14.91	14.86	14.89	14.90	13.30	11.29	9.62
802.11n	5560	112	14.91	14.87	14.88	14.80	14.83	13.26	11.25	9.60
802.11n	5580	116	14.75	14.83	14.87	14.77	14.84	13.16	11.23	9.51
802.11n	5600	120	14.72	14.69	14.61	14.97	14.94	13.42	11.17	9.83
802.11n	5620	124	14.59	14.71	14.67	14.86	14.90	13.32	11.20	9.79
802.11n	5640	128	14.52	14.60	14.56	14.81	14.84	13.33	11.01	9.48
802.11n	5660	132	14.84	14.81	14.85	14.79	14.90	13.50	11.34	9.63
802.11n	5680	136	14.52	14.57	14.59	14.53	14.63	13.39	11.21	9.55
802.11n	5700	140	10.51	10.32	10.30	10.11	10.09	10.00	10.01	9.54
802.11n	5720	144	10.71	10.66	10.95	10.84	10.79	10.45	10.70	9.45
802.11n	5745	149	14.61	14.40	14.40	14.26	14.29	12.91	11.33	9.82
802.11n	5765	153	14.62	14.41	14.24	14.09	14.14	13.30	11.20	9.86
802.11n	5785	157	**14.92**	14.96	14.87	14.87	14.95	13.28	11.42	9.68
802.11n	5805	161	14.77	14.60	14.53	14.40	14.45	13.13	11.50	9.95
802.11n	5825	165	14.50	14.32	14.19	14.12	14.17	13.29	11.36	9.72

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Table 7-14
SISO IEEE 802.11n Average RF Power – 20 MHz Bandwidth – Antenna 2

Mode	Freq	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	10.97	11.00	10.90	10.84	11.00	10.89	11.00	9.42
802.11n	5200	40	13.97	13.92	13.92	13.85	13.83	13.88	10.98	9.73
802.11n	5220	44	13.71	13.68	13.67	13.62	13.59	13.66	11.17	10.00
802.11n	5240	48	13.51	13.10	13.38	13.34	13.18	13.29	10.98	9.51
802.11n	5260	52	13.36	13.43	13.42	13.40	13.45	13.41	11.03	9.62
802.11n	5280	56	13.48	13.96	13.96	13.81	13.88	13.81	11.08	9.84
802.11n	5300	60	**13.93**	13.79	14.00	13.98	14.00	13.97	11.50	9.77
802.11n	5320	64	11.83	11.77	11.91	11.76	11.76	11.76	10.75	9.32
802.11n	5500	100	11.55	11.55	11.46	11.42	11.49	11.42	10.63	9.80
802.11n	5520	104	**15.00**	14.92	14.88	14.81	14.78	13.00	11.41	9.78
802.11n	5540	108	14.51	14.97	14.98	15.00	14.87	13.00	11.31	9.85
802.11n	5560	112	14.70	14.75	14.66	14.60	14.68	13.37	11.44	9.42
802.11n	5580	116	14.81	14.75	14.83	14.74	14.76	13.40	11.40	9.71
802.11n	5600	120	14.92	14.60	14.66	14.79	14.82	13.17	11.42	9.92
802.11n	5620	124	14.75	14.58	14.62	14.76	14.79	13.19	11.47	9.98
802.11n	5640	128	14.77	14.52	14.60	14.73	14.74	13.26	11.45	9.96
802.11n	5660	132	14.64	14.69	14.85	14.40	14.46	13.05	11.21	9.58
802.11n	5680	136	14.60	14.57	14.62	14.50	14.55	13.00	11.23	9.96
802.11n	5700	140	10.61	10.61	10.63	10.59	10.72	10.64	10.77	9.37
802.11n	5720	144	10.97	10.13	9.86	10.52	10.68	10.62	9.56	8.00
802.11n	5745	149	14.25	14.33	14.39	14.36	14.38	13.10	10.82	9.92
802.11n	5765	153	14.29	14.38	14.35	14.43	14.47	13.17	11.23	9.94
802.11n	5785	157	14.41	14.54	14.55	14.47	14.48	13.50	11.37	10.00
802.11n	5805	161	14.37	14.35	14.47	14.44	14.57	12.97	11.38	10.00
802.11n	5825	165	**14.50**	14.49	14.48	14.52	14.52	13.30	11.50	9.92

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Table 7-15
MIMO IEEE 802.11n Average RF Power – 20 MHz Bandwidth

20MHz BW 802.11n (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate
			13
802.11n	5180	36	10.12
802.11n	5200	40	10.79
802.11n	5220	44	10.13
802.11n	5240	48	**10.84**
802.11n	5260	52	11.43
802.11n	5280	56	11.12
802.11n	5300	60	**11.43**
802.11n	5320	64	10.52
802.11n	5500	100	8.66
802.11n	5520	104	11.52
802.11n	5540	108	11.60
802.11n	5560	112	11.37
802.11n	5580	116	11.65
802.11n	5600	120	11.98
802.11n	5620	124	**11.99**
802.11n	5640	128	11.94
802.11n	5660	132	11.65
802.11n	5680	136	11.79
802.11n	5700	140	8.50
802.11n	5720	144	8.77
802.11n	5745	149	11.56
802.11n	5765	153	11.52
802.11n	5785	157	11.47
802.11n	5805	161	11.34
802.11n	5825	165	**11.81**

Table 7-16
SISO IEEE 802.11ac Average RF Power – 20 MHz Bandwidth – Antenna 1

20MHz 802.11ac Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			6.5
802.11ac	5180	36	10.61
802.11ac	5200	40	13.35
802.11ac	5220	44	13.78
802.11ac	5240	48	13.75
802.11ac	5260	52	**14.00**
802.11ac	5280	56	13.93
802.11ac	5300	60	13.95
802.11ac	5320	64	12.00
802.11ac	5500	100	11.97
802.11ac	5520	104*	14.86
802.11ac	5540	108	14.75
802.11ac	5560	112	14.64
802.11ac	5580	116	**14.87**
802.11ac	5600	120	14.71
802.11ac	5620	124	14.81
802.11ac	5640	128	14.80
802.11ac	5660	132	14.84
802.11ac	5680	136*	14.73
802.11ac	5700	140	10.98
802.11ac	5720	144	10.76
802.11ac	5745	149	14.91
802.11ac	5765	153	14.76
802.11ac	5785	157	14.77
802.11ac	5805	161*	14.68
802.11ac	5825	165	**14.93**

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Table 7-17
SISO IEEE 802.11ac Average RF Power – 20 MHz Bandwidth – Antenna 2

20MHz 802.11ac Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			6.5
802.11ac	5180	36	10.99
802.11ac	5200	40	13.17
802.11ac	5220	44	13.00
802.11ac	5240	48	13.35
802.11ac	5260	52	13.42
802.11ac	5280	56	**13.44**
802.11ac	5300	60	13.43
802.11ac	5320	64	11.28
802.11ac	5500	100	11.61
802.11ac	5520	104	14.12
802.11ac	5540	108	14.60
802.11ac	5560	112	14.43
802.11ac	5580	116	14.75
802.11ac	5600	120	**14.98**
802.11ac	5620	124	14.95
802.11ac	5640	128	14.91
802.11ac	5660	132	14.41
802.11ac	5680	136	14.36
802.11ac	5700	140	11.00
802.11ac	5720	144	10.42
802.11ac	5745	149	14.81
802.11ac	5765	153	14.97
802.11ac	5785	157	**14.98**
802.11ac	5805	161	14.73
802.11ac	5825	165	14.63

Table 7-18
MIMO IEEE 802.11ac Average RF Power – 20 MHz Bandwidth

20MHz BW 802.11ac (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			13
802.11ac	5180	36	9.83
802.11ac	5200	40	10.27
802.11ac	5220	44	10.42
802.11ac	5240	48	10.56
802.11ac	5260	52	10.73
802.11ac	5280	56	10.70
802.11ac	5300	60	10.71
802.11ac	5320	64	9.71
802.11ac	5500	100	8.30
802.11ac	5520	104	11.02
802.11ac	5560	108	11.19
802.11ac	5580	112	11.05
802.11ac	5580	116	11.74
802.11ac	5600	120	11.81
802.11ac	5620	124	11.94
802.11ac	5640	128	11.97
802.11ac	5660	132	11.89
802.11ac	5680	136	11.81
802.11ac	5700	140	8.45
802.11ac	5720	144	8.78
802.11ac	5745	149	11.87
802.11ac	5765	153	11.88
802.11ac	5785	157	11.89
802.11ac	5805	161	11.72
802.11ac	5825	165	11.79

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Table 7-19
SISO IEEE 802.11n Average RF Power – 40 MHz Bandwidth – Antenna 1

Mode	Freq	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	9.05	9.14	9.23	9.21	9.23	9.28	9.43	9.45
802.11n	5230	46	**13.60**	13.99	13.93	13.84	13.95	13.96	13.99	13.99
802.11n	5270	54	8.94	9.33	9.09	9.11	9.18	9.24	9.30	9.35
802.11n	5310	62	8.28	8.31	8.24	8.24	8.24	8.37	8.40	8.38
802.11n	5510	102	9.36	9.41	9.32	9.45	9.44	9.48	9.48	9.50
802.11n	5550	110	**14.64**	14.84	14.78	14.87	14.81	13.16	11.08	9.54
802.11n	5590	118	14.63	14.70	14.70	14.76	14.80	13.31	11.48	9.95
802.11n	5630	126	14.60	14.69	14.69	14.71	14.81	13.35	11.44	9.90
802.11n	5670	134	14.52	14.51	14.60	14.54	14.67	13.50	11.50	9.99
802.11n	5710	142	14.51	14.36	14.32	14.63	14.57	13.46	11.30	9.88
802.11n	5755	151	14.37	14.31	14.28	14.37	14.36	13.31	11.41	9.66
802.11n	5795	159	**14.90**	14.92	14.99	14.90	14.94	13.27	11.50	9.98

Table 7-20
SISO IEEE 802.11n Average RF Power – 40 MHz Bandwidth – Antenna 2

Mode	Freq	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	9.09	9.21	9.16	9.21	9.31	9.34	9.43	9.47
802.11n	5230	46	**13.60**	13.39	13.42	13.61	13.64	13.66	13.81	13.75
802.11n	5270	54	9.17	9.33	9.39	9.31	9.46	9.42	9.41	9.47
802.11n	5310	62	8.57	8.59	8.66	8.66	8.75	8.89	9.00	9.00
802.11n	5510	102	9.34	9.33	9.42	9.47	9.47	9.50	9.48	9.47
802.11n	5550	110	**14.43**	14.71	14.71	14.71	14.73	12.97	11.36	9.66
802.11n	5590	118	14.40	14.67	14.65	14.59	14.66	13.37	11.48	9.99
802.11n	5630	126	14.41	14.65	14.66	14.62	14.67	13.35	11.45	9.98
802.11n	5670	134	14.38	14.57	14.52	14.47	14.75	12.80	10.64	9.32
802.11n	5710	142	14.32	14.02	14.28	13.82	14.29	13.03	10.95	9.43
802.11n	5755	151	**14.83**	14.76	14.78	14.93	14.99	13.04	11.49	9.87
802.11n	5795	159	14.67	14.51	14.55	14.61	14.65	13.01	11.43	10.00

Table 7-21
MIMO IEEE 802.11n Average RF Power – 40 MHz Bandwidth

40MHz BW 802.11n (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			27
802.11n	5190	38	6.22
802.11n	5230	46	10.68
802.11n	5270	54	7.10
802.11n	5310	62	8.43
802.11n	5510	102	5.91
802.11n	5550	110	11.46
802.11n	5590	118	11.97
802.11n	5630	126	11.82
802.11n	5670	134	11.31
802.11n	5710	142	11.42
802.11n	5755	151	11.59
802.11n	5795	159	11.29

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Table 7-22
SISO IEEE 802.11ac Average RF Power – 40 MHz Bandwidth – Antenna 1

40MHz BW 802.11ac Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			13.5
802.11ac	5190	38	9.50
802.11ac	5230	46	**13.60**
802.11ac	5270	54	9.32
802.11ac	5310	62	8.98
802.11ac	5510	102	8.80
802.11ac	5550	110	14.56
802.11ac	5590	118	**14.98**
802.11ac	5630	126	14.97
802.11ac	5670	134	14.32
802.11ac	5710	142	14.53
802.11ac	5755	151	14.24
802.11ac	5795	159	**14.65**

Table 7-23
SISO IEEE 802.11ac Average RF Power – 40 MHz Bandwidth – Antenna 2

40MHz BW 802.11ac Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			13.5
802.11ac	5190	38	8.79
802.11ac	5230	46	**13.42**
802.11ac	5270	54	9.50
802.11ac	5310	62	8.99
802.11ac	5510	102	9.15
802.11ac	5550	110	14.58
802.11ac	5590	118	**14.99**
802.11ac	5630	126	14.95
802.11ac	5670	134	14.15
802.11ac	5710	142	14.50
802.11ac	5755	151	**15.00**
802.11ac	5795	159	14.77

Table 7-24
MIMO IEEE 802.11ac Average RF Power – 40 MHz Bandwidth

40MHz BW 802.11ac (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			27
802.11ac	5190	38	6.45
802.11ac	5230	46	10.77
802.11ac	5270	54	6.94
802.11ac	5310	62	8.97
802.11ac	5510	102	6.49
802.11ac	5550	110	11.58
802.11ac	5590	118	11.92
802.11ac	5630	126	11.97
802.11ac	5670	134	11.25
802.11ac	5710	124	11.07
802.11ac	5755	151	11.67
802.11ac	5795	159	11.72

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Table 7-25
SISO IEEE 802.11ac Average RF Power – 80 MHz Bandwidth – Antenna 1

Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			29.3	58.5	87.8	117	175.5	234	263.3	292.5
802.11ac	5210	42	**7.92**	7.87	7.98	8.00	8.00	7.97	8.00	8.00
802.11ac	5290	58	**9.45**	9.27	9.21	9.34	9.38	9.35	9.50	9.02
802.11ac	5530	106	6.88	6.94	7.00	7.00	7.00	6.94	6.80	6.76
802.11ac	5610	122	**12.43**	12.48	12.45	12.21	12.44	12.39	11.45	10.00
802.11ac	5690	138	12.24	12.19	12.09	12.07	12.15	12.11	11.10	9.36
802.11ac	5775	155	**12.26**	12.00	12.00	12.06	12.17	12.18	11.39	9.88

Table 7-26
SISO IEEE 802.11ac Average RF Power – 80 MHz Bandwidth – Antenna 2

Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			29.3	58.5	87.8	117	175.5	234	263.3	292.5
802.11ac	5210	42	**7.85**	8.00	8.00	7.87	7.72	7.83	7.82	7.86
802.11ac	5290	58	**9.84**	9.64	9.65	9.77	9.84	9.90	9.87	9.78
802.11ac	5530	106	6.65	6.58	6.54	6.61	6.67	6.81	6.86	6.78
802.11ac	5610	122	**12.44**	12.39	12.46	12.33	12.40	12.41	11.31	9.99
802.11ac	5690	138	12.28	12.26	11.80	12.27	12.37	12.36	11.47	9.90
802.11ac	5775	155	**12.32**	12.11	12.50	12.49	12.34	12.34	11.30	9.50

Table 7-27
MIMO IEEE 802.11ac Average RF Power – 80 MHz Bandwidth

80MHz BW 802.11ac (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate 702
802.11ac	5210	42	7.90
802.11ac	5290	58	8.08
802.11ac	5530	106	6.59
802.11ac	5610	122	7.98
802.11ac	5690	138	8.79
802.11ac	5775	155	8.26

Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012/April 2013 FCC/TCB Meeting Notes:

- For 2.4 GHz SISO operations, highest average RF output power channel for the lowest data rate for IEEE 802.11b were selected for SAR evaluation. Other IEEE 802.11 SISO modes (including 802.11g/n) were not required since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode. Some additional IEEE 802.11n SAR tests for the highest measured SAR positions were included in this report per manufacturer request.
- For 5 GHz SISO operations, highest average RF output power channel for the lowest data rate for IEEE 802.11a were selected for SAR evaluation. Other IEEE 802.11 SISO modes (including 802.11n 20 MHz and 40 MHz) were not required since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode. Some additional IEEE 802.11n SAR tests for the highest measured SAR positions were included in this report per manufacturer request.
- Full SAR tests for all SISO IEEE 802.11ac 80 MHz Bandwidth configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac 80 MHz Bandwidth in SISO mode was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
- For MIMO 2.4 GHz and 5 GHz operations, the highest average RF output power channel for the lowest data rate for IEEE 802.11n (20 MHz bandwidth) was selected for SAR evaluation. Other

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IEEE 802.11 modes and bandwidths were not investigated for MIMO operations since the maximum allowed output power (including tolerance) was not higher for these modes.

- The individual spectra for each 2x2 MIMO WIFI Antenna were summed mathematically in linear power units for the MIMO output power measurements.
- When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other channels is not required. Otherwise, the other default (or corresponding required) test channels were additionally tested using the lowest data rate.
- The bolded data rate and channel above were tested for SAR.

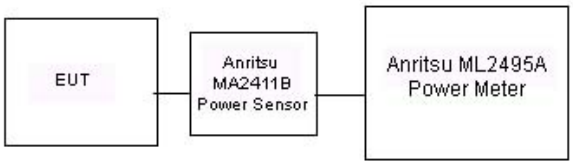

Figure 7-1
Power Measurement Setup for Bandwidths < 50 MHz

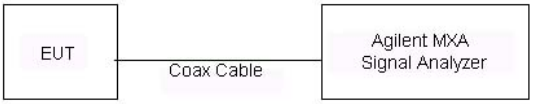

Figure 7-2
Power Measurement Setup for Bandwidths > 50 MHz

7.2 Bluetooth Conducted Powers

Table 7-28
Bluetooth RF Conducted Powers

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
			[dBm]	[mW]
2402	1.0	0	**8.34**	6.823
2441	1.0	39	8.31	6.776
2480	1.0	78	8.21	6.622
2402	2.0	0	6.53	4.498
2441	2.0	39	6.45	4.416
2480	2.0	78	6.30	4.266
2402	3.0	0	2.81	1.910
2441	3.0	39	2.73	1.875
2480	3.0	78	2.67	1.849

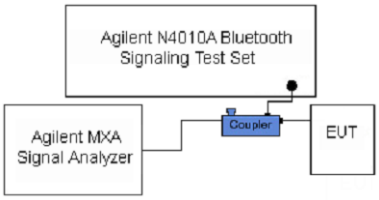

Figure 9-5
Power Measurement Setup

Note:

- The bolded data rate and channel above were tested for SAR.

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8 SYSTEM VERIFICATION

8.1 Tissue Verification

Table 8-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C˚)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
12/22/2014	2450B	21.4	2401	1.938	52.859	1.903	52.765	1.84%	0.18%
			2450	2.019	52.677	1.950	52.700	3.54%	-0.04%
			2499	2.079	52.557	2.019	52.638	2.97%	-0.15%
01/19/2015	2450B	22.8	2401	1.956	51.267	1.903	52.765	2.79%	-2.84%
			2450	2.031	51.040	1.950	52.700	4.15%	-3.15%
			2499	2.092	50.858	2.019	52.638	3.62%	-3.38%
01/05/2015	5200B-5800B	22.5	5200	5.219	48.402	5.299	49.014	-1.51%	-1.25%
			5220	5.251	48.318	5.323	48.987	-1.35%	-1.37%
			5240	5.289	48.297	5.346	48.960	-1.07%	-1.35%
			5260	5.315	48.256	5.369	48.933	-1.01%	-1.38%
			5280	5.350	48.201	5.393	48.906	-0.80%	-1.44%
			5300	5.367	48.170	5.416	48.879	-0.90%	-1.45%
			5500	5.670	47.672	5.650	48.607	0.35%	-1.92%
			5520	5.693	47.664	5.673	48.580	0.35%	-1.89%
			5540	5.713	47.608	5.696	48.553	0.30%	-1.95%
			5560	5.744	47.531	5.720	48.526	0.42%	-2.05%
			5580	5.784	47.472	5.743	48.499	0.71%	-2.12%
			5600	5.819	47.443	5.766	48.471	0.92%	-2.12%
			5660	5.911	47.351	5.837	48.390	1.27%	-2.15%
			5680	5.923	47.275	5.860	48.363	1.08%	-2.25%
			5745	6.038	47.150	5.936	48.275	1.72%	-2.33%
			5765	6.075	47.090	5.959	48.248	1.95%	-2.40%
			5785	6.086	47.058	5.982	48.220	1.74%	-2.41%
			5800	6.115	46.995	6.000	48.200	1.92%	-2.50%
			5825	6.159	46.927	6.029	48.166	2.16%	-2.57%

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 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.

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8.2 Test System Verification

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

Table 8-2
System Verification Results

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
G	2450	BODY	12/22/2014	24.0	22.4	0.100	797	3258	5.220	49.400	52.200	5.67%
I	2450	BODY	01/19/2015	24.0	22.8	0.100	719	3209	5.150	51.800	51.500	-0.58%
I	5200	BODY	01/05/2015	23.0	22.5	0.100	1057	3589	7.220	75.300	72.200	-4.12%
I	5300	BODY	01/05/2015	23.0	22.5	0.100	1057	3589	7.720	77.400	77.200	-0.26%
I	5500	BODY	01/05/2015	23.1	22.5	0.100	1057	3589	7.600	79.100	76.000	-3.92%
I	5600	BODY	01/05/2015	23.1	22.6	0.100	1057	3589	7.540	80.200	75.400	-5.99%
I	5800	BODY	01/05/2015	23.1	22.6	0.100	1057	3589	7.140	74.300	71.400	-3.90%

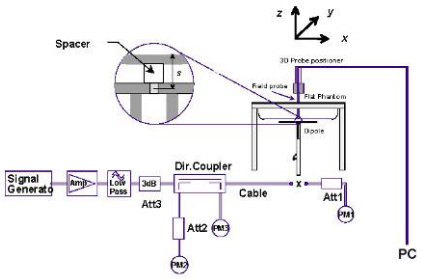

Figure 8-1
System Verification Setup Diagram

Figure 8-2
System Verification Setup Photo

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9 SAR DATA SUMMARY

9.1 Standalone Body SAR Data

Table 9-1
DTS WLAN Antenna 1 SISO Body SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Bandwidth [MHz]	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Orientation	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.														(W/kg)		(W/kg)	
2422	3	IEEE 802.11b	22	DSSS	14.0	13.86	0.13	0 mm	1	SAR-5	1	back	Perpendicular	1:1	0.216	1.033	0.223	
2422	3	IEEE 802.11b	22	DSSS	14.0	13.86	-0.05	0 mm	1	SAR-5	1	top	Perpendicular	1:1	0.125	1.033	0.129	
2422	3	IEEE 802.11b	22	DSSS	14.0	13.86	0.02	0 mm	1	SAR-5	1	top	Tilt (Top-Back Surface)	1:1	0.104	1.033	0.107	
2422	3	IEEE 802.11b	22	DSSS	14.0	13.86	0.15	0 mm	1	SAR-5	1	left	Perpendicular	1:1	0.322	1.033	0.333	
2442	7	IEEE 802.11n	40	OFDM	12.5	12.12	0.12	0 mm	1	SAR-5	13.5	left	Perpendicular	1:1	0.341	1.091	**0.372**	A1
2422	3	IEEE 802.11n	20	OFDM	14.0	13.82	-0.12	0 mm	1	SAR-5	6.5	left	Perpendicular	1:1	0.275	1.042	0.287	
2422	3	IEEE 802.11b	22	DSSS	14.0	13.86	0.07	0 mm	1	SAR-5	1	left	Tilt (Left-Back Surface)	1:1	0.286	1.033	0.295	
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 9-2
DTS WLAN Antenna 2 SISO Body SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Bandwidth [MHz]	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Orientation	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.														(W/kg)		(W/kg)	
2422	3	IEEE 802.11b	22	DSSS	14.0	13.91	0.16	0 mm	2	SAR-5	1	back	Perpendicular	1:1	0.024	1.021	0.025	
2422	3	IEEE 802.11b	22	DSSS	14.0	13.91	-0.06	0 mm	2	SAR-5	1	right	Perpendicular	1:1	0.141	1.021	0.144	
2442	7	IEEE 802.11n	40	OFDM	12.5	11.97	0.14	0 mm	2	SAR-5	13.5	right	Perpendicular	1:1	0.011	1.130	0.012	
2437	6	IEEE 802.11n	20	OFDM	14.0	13.92	-0.02	0 mm	2	SAR-5	6.5	right	Perpendicular	1:1	0.113	1.019	0.115	
2422	3	IEEE 802.11b	22	DSSS	14.0	13.91	0.09	0 mm	2	SAR-5	1	right	Tilt (Right-Back Surface)	1:1	0.051	1.021	0.052	
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 9-3
DTS WLAN MIMO Body SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Bandwidth [MHz]	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Orientation	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.														(W/kg)		(W/kg)	
2457	10	IEEE 802.11n	20	OFDM	12.0	11.61	0.11	0 mm	MIMO	SAR-5	13	back	Perpendicular	1:1	0.142	1.094	0.155	
2457	10	IEEE 802.11n	20	OFDM	12.0	11.61	-0.02	0 mm	MIMO	SAR-5	13	top	Perpendicular	1:1	0.076	1.094	0.083	
2457	10	IEEE 802.11n	20	OFDM	12.0	11.61	0.09	0 mm	MIMO	SAR-5	13	top	Tilt (Top-Back Surface)	1:1	0.044	1.094	0.048	
2457	10	IEEE 802.11n	20	OFDM	12.0	11.61	0.05	0 mm	MIMO	SAR-5	13	right	Perpendicular	1:1	0.062	1.094	0.068	
2457	10	IEEE 802.11n	20	OFDM	12.0	11.61	0.13	0 mm	MIMO	SAR-5	13	right	Tilt (Right-Back Surface)	1:1	0.025	1.094	0.027	
2457	10	IEEE 802.11n	20	OFDM	12.0	11.61	0.16	0 mm	MIMO	SAR-5	13	left	Perpendicular	1:1	0.110	1.094	0.120	
2457	10	IEEE 802.11n	20	OFDM	12.0	11.61	0.08	0 mm	MIMO	SAR-5	13	left	Tilt (Left-Back Surface)	1:1	0.151	1.094	0.165	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram									

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Table 9-4
NII WLAN Antenna 1 SISO Body SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Bandwidth [MHz]	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Orientation	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.														(W/kg)		(W/kg)	
5200	40	IEEE 802.11a	20	OFDM	14.0	13.75	0.15	0 mm	1	SAR-5	6	back	Perpendicular	1:1	0.263	1.059	0.279	
5200	40	IEEE 802.11a	20	OFDM	14.0	13.75	0.15	0 mm	1	SAR-5	6	top	Perpendicular	1:1	0.129	1.059	0.137	
5200	40	IEEE 802.11a	20	OFDM	14.0	13.75	0.14	0 mm	1	SAR-5	6	top	Tilt (Top-Back Surface)	1:1	0.311	1.059	0.329	
5210	42	IEEE 802.11ac	80	OFDM	8.0	7.92	0.12	0 mm	1	SAR-5	29.3	top	Tilt (Top-Back Surface)	1:1	0.147	1.019	0.150	
5230	46	IEEE 802.11ac	40	OFDM	14.0	13.60	-0.17	0 mm	1	SAR-5	13.5	top	Tilt (Top-Back Surface)	1:1	0.233	1.096	0.255	
5230	46	IEEE 802.11n	40	OFDM	14.0	13.60	0.01	0 mm	1	SAR-5	13.5	top	Tilt (Top-Back Surface)	1:1	0.212	1.096	0.232	
5200	40	IEEE 802.11a	20	OFDM	14.0	13.75	0.06	0 mm	1	SAR-5	6	left	Perpendicular	1:1	0.151	1.059	0.160	
5200	40	IEEE 802.11a	20	OFDM	14.0	13.75	-0.07	0 mm	1	SAR-5	6	left	Tilt (Left-Back Surface)	1:1	0.266	1.059	0.282	
5280	56	IEEE 802.11a	20	OFDM	14.0	13.98	0.04	0 mm	1	SAR-5	6	back	Perpendicular	1:1	0.490	1.005	0.492	
5300	60	IEEE 802.11a	20	OFDM	14.0	13.58	-0.15	0 mm	1	SAR-5	6	back	Perpendicular	1:1	0.271	1.102	0.299	
5290	58	IEEE 802.11ac	80	OFDM	10.0	9.45	-0.03	0 mm	1	SAR-5	29.3	back	Perpendicular	1:1	0.094	1.135	0.107	
5260	52	IEEE 802.11ac	20	OFDM	14.0	14.00	-0.17	0 mm	1	SAR-5	6.5	back	Perpendicular	1:1	0.293	1.000	0.293	
5280	56	IEEE 802.11n	20	OFDM	14.0	13.68	0.09	0 mm	1	SAR-5	6.5	back	Perpendicular	1:1	0.262	1.076	0.282	
5280	56	IEEE 802.11a	20	OFDM	14.0	13.98	0.11	0 mm	1	SAR-5	6	top	Perpendicular	1:1	0.137	1.005	0.138	
5280	56	IEEE 802.11a	20	OFDM	14.0	13.98	0.03	0 mm	1	SAR-5	6	top	Tilt (Top-Back Surface)	1:1	0.313	1.005	0.315	
5280	56	IEEE 802.11a	20	OFDM	14.0	13.98	0.19	0 mm	1	SAR-5	6	left	Perpendicular	1:1	0.204	1.005	0.205	
5280	56	IEEE 802.11a	20	OFDM	14.0	13.98	0.03	0 mm	1	SAR-5	6	left	Tilt (Left-Back Surface)	1:1	0.328	1.005	0.330	
5300	60	IEEE 802.11a	20	OFDM	14.0	13.58	0.00	0 mm	1	SAR-5	6	left	Tilt (Left-Back Surface)	1:1	0.378	1.102	0.417	
5580	116	IEEE 802.11a	20	OFDM	15.0	15.00	-0.13	0 mm	1	SAR-5	6	back	Perpendicular	1:1	0.300	1.000	0.300	
5510	102	IEEE 802.11n	40	OFDM	9.5	9.36	0.13	0 mm	1	SAR-5	13.5	back	Perpendicular	1:1	0.169	1.033	0.175	
5550	110	IEEE 802.11n	40	OFDM	15.0	14.64	0.20	0 mm	1	SAR-5	13.5	back	Perpendicular	1:1	0.523	1.086	**0.568**	A2
5670	134	IEEE 802.11n	40	OFDM	15.0	14.52	0.05	0 mm	1	SAR-5	13.5	back	Perpendicular	1:1	0.256	1.117	0.286	
5540	108	IEEE 802.11n	20	OFDM	15.0	14.94	0.15	0 mm	1	SAR-5	6.5	back	Perpendicular	1:1	0.489	1.014	0.496	
5580	116	IEEE 802.11a	20	OFDM	15.0	15.00	0.12	0 mm	1	SAR-5	6	top	Perpendicular	1:1	0.184	1.000	0.184	
5580	116	IEEE 802.11a	20	OFDM	15.0	15.00	-0.08	0 mm	1	SAR-5	6	top	Tilt (Top-Back Surface)	1:1	0.295	1.000	0.295	
5580	116	IEEE 802.11a	20	OFDM	15.0	15.00	-0.13	0 mm	1	SAR-5	6	left	Perpendicular	1:1	0.202	1.000	0.202	
5540	108	IEEE 802.11a	20	OFDM	15.0	14.77	-0.04	0 mm	1	SAR-5	6	left	Tilt (Left-Back Surface)	1:1	0.355	1.054	0.374	
5580	116	IEEE 802.11a	20	OFDM	15.0	15.00	0.06	0 mm	1	SAR-5	6	left	Tilt (Left-Back Surface)	1:1	0.305	1.000	0.305	
5660	132	IEEE 802.11a	20	OFDM	15.0	14.51	0.11	0 mm	1	SAR-5	6	left	Tilt (Left-Back Surface)	1:1	0.239	1.119	0.267	
5610	122	IEEE 802.11ac	80	OFDM	12.5	12.43	0.60	0 mm	1	SAR-5	29.3	left	Tilt (Left-Back Surface)	1:1	0.147	1.016	0.149	
5590	118	IEEE 802.11ac	40	OFDM	15.0	14.98	-0.15	0 mm	1	SAR-5	13.5	left	Tilt (Left-Back Surface)	1:1	0.282	1.005	0.283	
5580	116	IEEE 802.11ac	20	OFDM	15.0	14.87	0.01	0 mm	1	SAR-5	6.5	left	Tilt (Left-Back Surface)	1:1	0.387	1.030	0.399	
5550	110	IEEE 802.11n	40	OFDM	15.0	14.64	0.12	0 mm	1	SAR-5	13.5	left	Tilt (Left-Back Surface)	1:1	0.449	1.086	0.488	
5540	108	IEEE 802.11n	20	OFDM	15.0	14.94	0.13	0 mm	1	SAR-5	6.5	left	Tilt (Left-Back Surface)	1:1	0.476	1.014	0.483	
5745	149	IEEE 802.11a	20	OFDM	15.0	14.22	0.07	0 mm	1	SAR-5	6	back	Perpendicular	1:1	0.262	1.197	0.314	
5785	157	IEEE 802.11a	20	OFDM	15.0	14.94	0.13	0 mm	1	SAR-5	6	back	Perpendicular	1:1	0.285	1.014	0.289	
5825	165	IEEE 802.11a	20	OFDM	15.0	15.00	0.04	0 mm	1	SAR-5	6	back	Perpendicular	1:1	0.416	1.000	0.416	
5775	155	IEEE 802.11ac	80	OFDM	12.5	12.26	0.11	0 mm	1	SAR-5	29.3	back	Perpendicular	1:1	0.161	1.057	0.170	
5795	159	IEEE 802.11ac	40	OFDM	15.0	14.65	0.06	0 mm	1	SAR-5	13.5	back	Perpendicular	1:1	0.317	1.084	0.344	
5825	165	IEEE 802.11ac	20	OFDM	15.0	14.93	-0.14	0 mm	1	SAR-5	6.5	back	Perpendicular	1:1	0.290	1.016	0.295	
5795	159	IEEE 802.11n	40	OFDM	15.0	14.90	0.12	0 mm	1	SAR-5	13.5	back	Perpendicular	1:1	0.307	1.023	0.314	
5785	157	IEEE 802.11n	20	OFDM	15.0	14.92	0.02	0 mm	1	SAR-5	6.5	back	Perpendicular	1:1	0.498	1.019	0.507	
5825	165	IEEE 802.11a	20	OFDM	15.0	15.00	0.13	0 mm	1	SAR-5	6	top	Perpendicular	1:1	0.128	1.000	0.128	
5825	165	IEEE 802.11a	20	OFDM	15.0	15.00	0.12	0 mm	1	SAR-5	6	top	Tilt (Top-Back Surface)	1:1	0.264	1.000	0.264	
5785	157	IEEE 802.11n	20	OFDM	15.0	14.92	-0.02	0 mm	1	SAR-5	6.5	top	Tilt (Top-Back Surface)	1:1	0.341	1.019	0.347	
5825	165	IEEE 802.11a	20	OFDM	15.0	15.00	0.08	0 mm	1	SAR-5	6	left	Perpendicular	1:1	0.116	1.000	0.116	
5825	165	IEEE 802.11a	20	OFDM	15.0	15.00	0.14	0 mm	1	SAR-5	6	left	Tilt (Left-Back Surface)	1:1	0.166	1.000	0.166	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram												

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Table 9-5
NII WLAN Antenna 2 SISO Body SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Orientation	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.														(W/kg)		(W/kg)	
5200	40	IEEE 802.11a	20	OFDM	14.0	13.79	0.12	0 mm	2	SAR-5	6	back	Perpendicular	1:1	0.022	1.050	0.023	
5200	40	IEEE 802.11a	20	OFDM	14.0	13.79	0.13	0 mm	2	SAR-5	6	right	Perpendicular	1:1	0.154	1.050	0.162	
5210	42	IEEE 802.11ac	80	OFDM	8.0	7.85	0.14	0 mm	2	SAR-5	29.3	right	Perpendicular	1:1	0.017	1.035	0.018	
5230	46	IEEE 802.11ac	40	OFDM	14.0	13.42	0.13	0 mm	2	SAR-5	13.5	right	Perpendicular	1:1	0.130	1.143	0.149	
5230	46	IEEE 802.11n	40	OFDM	14.0	13.60	0.15	0 mm	2	SAR-5	13.5	right	Perpendicular	1:1	0.175	1.096	0.192	
5200	40	IEEE 802.11a	20	OFDM	14.0	13.79	0.02	0 mm	2	SAR-5	6	right	Tilt (Right-Back Surface)	1:1	0.078	1.050	0.082	
5260	52	IEEE 802.11a	20	OFDM	14.0	13.94	0.19	0 mm	2	SAR-5	6	back	Perpendicular	1:1	0.029	1.014	0.029	
5260	52	IEEE 802.11a	20	OFDM	14.0	13.94	0.19	0 mm	2	SAR-5	6	right	Perpendicular	1:1	0.152	1.014	0.154	
5290	58	IEEE 802.11ac	80	OFDM	10.0	9.84	0.17	0 mm	2	SAR-5	29.3	right	Perpendicular	1:1	0.043	1.038	0.045	
5280	56	IEEE 802.11ac	20	OFDM	14.0	13.44	-0.09	0 mm	2	SAR-5	6.5	right	Perpendicular	1:1	0.151	1.138	0.172	
5300	60	IEEE 802.11n	20	OFDM	14.0	13.93	0.14	0 mm	2	SAR-5	6.5	right	Perpendicular	1:1	0.114	1.016	0.116	
5260	52	IEEE 802.11a	20	OFDM	14.0	13.94	0.14	0 mm	2	SAR-5	6	right	Tilt (Right-Back Surface)	1:1	0.117	1.014	0.119	
5520	104	IEEE 802.11a	20	OFDM	15.0	14.91	-0.14	0 mm	2	SAR-5	6	back	Perpendicular	1:1	0.036	1.021	0.037	
5520	104	IEEE 802.11a	20	OFDM	15.0	14.91	0.13	0 mm	2	SAR-5	6	right	Perpendicular	1:1	0.192	1.021	0.196	
5520	104	IEEE 802.11a	20	OFDM	15.0	14.91	0.12	0 mm	2	SAR-5	6	right	Tilt (Right-Back Surface)	1:1	0.276	1.021	0.282	
5560	112	IEEE 802.11a	20	OFDM	15.0	14.90	0.03	0 mm	2	SAR-5	6	right	Tilt (Right-Back Surface)	1:1	0.305	1.023	0.312	
5680	136	IEEE 802.11a	20	OFDM	15.0	14.56	0.14	0 mm	2	SAR-5	6	right	Tilt (Right-Back Surface)	1:1	0.299	1.107	0.331	
5610	122	IEEE 802.11ac	80	OFDM	12.5	12.44	0.13	0 mm	2	SAR-5	29.3	right	Tilt (Right-Back Surface)	1:1	0.143	1.014	0.145	
5590	118	IEEE 802.11ac	40	OFDM	15.0	14.99	0.13	0 mm	2	SAR-5	13.5	right	Tilt (Right-Back Surface)	1:1	0.233	1.002	0.233	
5600	120	IEEE 802.11ac	20	OFDM	15.0	14.98	0.03	0 mm	2	SAR-5	6.5	right	Tilt (Right-Back Surface)	1:1	0.377	1.005	0.379	
5550	110	IEEE 802.11n	40	OFDM	15.0	14.43	0.14	0 mm	2	SAR-5	13.5	right	Tilt (Right-Back Surface)	1:1	0.132	1.140	0.150	
5520	104	IEEE 802.11n	20	OFDM	15.0	15.00	0.12	0 mm	2	SAR-5	6.5	right	Tilt (Right-Back Surface)	1:1	0.272	1.000	0.272	
5785	157	IEEE 802.11a	20	OFDM	15.0	14.95	0.12	0 mm	2	SAR-5	6	back	Perpendicular	1:1	0.015	1.012	0.015	
5785	157	IEEE 802.11a	20	OFDM	15.0	14.95	-0.18	0 mm	2	SAR-5	6	right	Perpendicular	1:1	0.136	1.012	0.138	
5785	157	IEEE 802.11a	20	OFDM	15.0	14.95	0.06	0 mm	2	SAR-5	6	right	Tilt (Right-Back Surface)	1:1	0.260	1.012	0.263	
5775	155	IEEE 802.11ac	80	OFDM	12.5	12.32	0.16	0 mm	2	SAR-5	29.3	right	Tilt (Right-Back Surface)	1:1	0.142	1.042	0.148	
5755	151	IEEE 802.11ac	40	OFDM	15.0	15.00	0.08	0 mm	2	SAR-5	13.5	right	Tilt (Right-Back Surface)	1:1	0.180	1.000	0.180	
5785	157	IEEE 802.11ac	20	OFDM	15.0	14.98	-0.17	0 mm	2	SAR-5	6.5	right	Tilt (Right-Back Surface)	1:1	0.035	1.005	0.035	
5755	151	IEEE 802.11n	40	OFDM	15.0	14.83	-0.14	0 mm	2	SAR-5	13.5	right	Tilt (Right-Back Surface)	1:1	0.159	1.040	0.165	
5825	165	IEEE 802.11n	20	OFDM	15.0	14.50	-0.13	0 mm	2	SAR-5	6.5	right	Tilt (Right-Back Surface)	1:1	0.151	1.122	0.169	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram										

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Table 9-6
NII WLAN MIMO Body SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Bandwidth [MHz]	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Orientation	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.														(W/kg)		(W/kg)	
5240	48	IEEE 802.11n	20	OFDM	11.5	10.84	-0.06	0 mm	MIMO	SAR-5	13	back	Perpendicular	1:1	0.135	1.164	0.157	
5240	48	IEEE 802.11n	20	OFDM	11.5	10.84	0.13	0 mm	MIMO	SAR-5	13	top	Perpendicular	1:1	0.053	1.164	0.062	
5240	48	IEEE 802.11n	20	OFDM	11.5	10.84	0.13	0 mm	MIMO	SAR-5	13	top	Tilt (Top-Back Surface)	1:1	0.146	1.164	0.170	
5240	48	IEEE 802.11n	20	OFDM	11.5	10.84	0.20	0 mm	MIMO	SAR-5	13	right	Perpendicular	1:1	0.014	1.164	0.016	
5240	48	IEEE 802.11n	20	OFDM	11.5	10.84	0.16	0 mm	MIMO	SAR-5	13	right	Tilt (Right-Back Surface)	1:1	0.049	1.164	0.057	
5240	48	IEEE 802.11n	20	OFDM	11.5	10.84	0.14	0 mm	MIMO	SAR-5	13	left	Perpendicular	1:1	0.037	1.164	0.043	
5240	48	IEEE 802.11n	20	OFDM	11.5	10.84	0.19	0 mm	MIMO	SAR-5	13	left	Tilt (Left-Back Surface)	1:1	0.103	1.164	0.120	
5300	60	IEEE 802.11n	20	OFDM	11.5	11.43	0.01	0 mm	MIMO	SAR-5	13	back	Perpendicular	1:1	0.151	1.016	0.153	
5300	60	IEEE 802.11n	20	OFDM	11.5	11.43	0.16	0 mm	MIMO	SAR-5	13	top	Perpendicular	1:1	0.077	1.016	0.078	
5300	60	IEEE 802.11n	20	OFDM	11.5	11.43	0.02	0 mm	MIMO	SAR-5	13	top	Tilt (Top-Back Surface)	1:1	0.178	1.016	**0.181**	
5300	60	IEEE 802.11n	20	OFDM	11.5	11.43	0.13	0 mm	MIMO	SAR-5	13	right	Perpendicular	1:1	0.051	1.016	0.052	
5300	60	IEEE 802.11n	20	OFDM	11.5	11.43	-0.16	0 mm	MIMO	SAR-5	13	right	Tilt (Right-Back Surface)	1:1	0.057	1.016	0.058	
5300	60	IEEE 802.11n	20	OFDM	11.5	11.43	0.12	0 mm	MIMO	SAR-5	13	left	Perpendicular	1:1	0.056	1.016	0.057	
5300	60	IEEE 802.11n	20	OFDM	11.5	11.43	0.19	0 mm	MIMO	SAR-5	13	left	Tilt (Left-Back Surface)	1:1	0.095	1.016	0.097	
5620	124	IEEE 802.11n	20	OFDM	12.0	11.99	0.12	0 mm	MIMO	SAR-5	13	back	Perpendicular	1:1	0.142	1.002	0.142	
5620	124	IEEE 802.11n	20	OFDM	12.0	11.99	-0.17	0 mm	MIMO	SAR-5	13	top	Perpendicular	1:1	0.043	1.002	0.043	
5620	124	IEEE 802.11n	20	OFDM	12.0	11.99	0.14	0 mm	MIMO	SAR-5	13	top	Tilt (Top-Back Surface)	1:1	0.154	1.002	0.154	
5620	124	IEEE 802.11n	20	OFDM	12.0	11.99	0.16	0 mm	MIMO	SAR-5	13	right	Perpendicular	1:1	0.047	1.002	0.047	
5620	124	IEEE 802.11n	20	OFDM	12.0	11.99	0.13	0 mm	MIMO	SAR-5	13	right	Tilt (Right-Back Surface)	1:1	0.061	1.002	0.062	
5620	124	IEEE 802.11n	20	OFDM	12.0	11.99	0.17	0 mm	MIMO	SAR-5	13	left	Perpendicular	1:1	0.023	1.002	0.023	
5620	124	IEEE 802.11n	20	OFDM	12.0	11.99	0.16	0 mm	MIMO	SAR-5	13	left	Tilt (Left-Back Surface)	1:1	0.084	1.002	0.084	
5825	165	IEEE 802.11n	20	OFDM	12.0	11.81	0.06	0 mm	MIMO	SAR-5	13	back	Perpendicular	1:1	0.085	1.045	0.089	
5825	165	IEEE 802.11n	20	OFDM	12.0	11.81	0.17	0 mm	MIMO	SAR-5	13	top	Perpendicular	1:1	0.048	1.045	0.050	
5825	165	IEEE 802.11n	20	OFDM	12.0	11.81	-0.08	0 mm	MIMO	SAR-5	13	top	Tilt (Top-Back Surface)	1:1	0.086	1.045	0.090	
5825	165	IEEE 802.11n	20	OFDM	12.0	11.81	0.21	0 mm	MIMO	SAR-5	13	right	Perpendicular	1:1	0.042	1.045	0.044	
5825	165	IEEE 802.11n	20	OFDM	12.0	11.81	0.14	0 mm	MIMO	SAR-5	13	right	Tilt (Right-Back Surface)	1:1	0.057	1.045	0.060	
5825	165	IEEE 802.11n	20	OFDM	12.0	11.81	0.13	0 mm	MIMO	SAR-5	13	left	Perpendicular	1:1	0.013	1.045	0.014	
5825	165	IEEE 802.11n	20	OFDM	12.0	11.81	0.17	0 mm	MIMO	SAR-5	13	left	Tilt (Left-Back Surface)	1:1	0.027	1.045	0.028	
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 9-7
Bluetooth Body SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Orientation	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
2402	0	Bluetooth	FHSS	8.5	8.34	0.17	0 mm	SAR-5	1	back	Perpendicular	1:1	0.000	1.038	0.000	
2402	0	Bluetooth	FHSS	8.5	8.34	0.13	0 mm	SAR-5	1	right	Perpendicular	1:1	0.015	1.038	**0.016**	A3
2402	0	Bluetooth	FHSS	8.5	8.34	0.16	0 mm	SAR-5	1	right	Tilt (Right-Back Surface)	1:1	0.005	1.038	0.005	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram								

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9.2 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2003, and FCC KDB Publication 447498 D01v05.
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 D01v05.
6. Per FCC KDB 865664 D01 v01, variability SAR tests were not performed since the measured SAR results for a frequency band were less than 0.8 W/kg. Please see Section 10 for more variability information.
7. Per FCC KDB 616217 D04 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D01v05 was applied to determine SAR test exclusion for adjacent edge configurations. Top and left edge SAR tests were required for antenna 1 and right edge SAR tests were required for antenna 2.
8. Due to the unique form factor of the device, we have tested each required edge with two different orientations per FCC Guidance. Appendix F contains test setup photographs showing Top Tilt (Top-Back Surface), Right Tilt (Right-Back Surface), and Left Tilt (Left-Back Surface) Positions.

WLAN/BT Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 2.4 GHz WIFI SISO operations: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other SISO IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode. Some additional IEEE 802.11n SAR tests for the highest measured SAR positions were included in this report per manufacturer request.
2. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for SISO 5 GHz WIFI operations: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE SISO 802.11 modes (including 802.11n 20 MHz and 40 MHz bandwidths) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode. Some additional IEEE 802.11n and IEEE 802.11ac SAR tests for the highest measured SAR positions were included in this report per manufacturer request.
3. Per April 2013 TCB Workshop notes, full SISO SAR tests for all IEEE 802.11ac 80 MHz Bandwidth configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac 80 MHz Bandwidth SISO was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
4. Per KDB 248227, SAR for MIMO was measured with both transmitting simultaneously and was evaluated in dependently of SISO operation. For 2.4 GHz MIMO, IEEE 802.11n 20 MHz Bandwidth was evaluated. For 5 GHz MIMO, IEEE 802.11n 20 MHz bandwidth was evaluated.
5. WIFI transmission was verified using an uncalibrated spectrum analyzer.
6. When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is >1.6 W/kg or the reported 1g averaged SAR is >0.8 W/kg, SAR testing on other default channels was required.
7. The channel and data rate with the highest average output power were evaluated for Bluetooth.

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10 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

10.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05 are applicable to handsets with built-in unlicensed transmitters such as 802.11a/b/g/n/ac and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

The FZ-R1 additionally contains GPRS/EDGE/UMTS/CDMA/LTE transmitter ACJ9TGWW13B. Please reference the corresponding SAR report (0Y1412152300.ACJ) for GPRS/EDGE/UMTS/CDMA/EVDO test data.

10.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05 IV.C.1.iii and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05 4.3.2 2), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated SAR} = \frac{\sqrt{f(GHz)}}{7.5} * \frac{(\text{Max Power of channel, mW})}{\text{Min. Separation Distance, mm}}$$

Table 10-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
2.4 GHz WLAN Top Edge Antenna 2	2457	14.00	44.75	**0.117**
5 GHz WLAN Top Edge Antenna 2	5825	15.00	44.75	**0.230**
Bluetooth Top Edge	2480	8.50	44.75	**0.033**

Note: The worst case reported SAR for position was used for SAR summation, regardless of orientation (perpendicular or tilt). Therefore, the summations below represent the absolute worst cases for simultaneous transmission.

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10.3 Body Simultaneous Transmission Analysis

Table 10-2
Simultaneous Transmission Scenario with 2.4 GHz WLAN Antenna 1 (Body at 0 mm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.455	0.223	0.678
	Top	0.319	0.129	0.448
	Bottom	0.400	0.400	**0.800**
	Right	0.152	0.400	0.552
	Left	0.326	0.372	0.698

Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.470	0.223	0.693
	Top	0.250	0.129	0.379
	Bottom	0.400	0.400	**0.800**
	Right	0.077	0.400	0.477
	Left	0.035	0.372	0.407

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.486	0.223	0.709
	Top	0.346	0.129	0.475
	Bottom	0.400	0.400	**0.800**
	Right	0.177	0.400	0.577
	Left	0.171	0.372	0.543

Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.497	0.223	0.720
	Top	0.302	0.129	0.431
	Bottom	0.400	0.400	**0.800**
	Right	0.075	0.400	0.475
	Left	0.126	0.372	0.498

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.606	0.223	**0.829**
	Top	0.380	0.129	0.509
	Bottom	0.400	0.400	0.800
	Right	0.033	0.400	0.433
	Left	0.043	0.372	0.415

Simult Tx	Configuration	EVDO BC10 (§90S) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.632	0.223	**0.855**
	Top	0.343	0.129	0.472
	Bottom	0.400	0.400	0.800
	Right	0.207	0.400	0.607
	Left	0.201	0.372	0.573

Simult Tx	Configuration	EVDO BC0 (§22H) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.700	0.223	**0.923**
	Top	0.424	0.129	0.553
	Bottom	0.400	0.400	0.800
	Right	0.188	0.400	0.588
	Left	0.195	0.372	0.567

Simult Tx	Configuration	PCS EVDO SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.555	0.223	0.778
	Top	0.299	0.129	0.428
	Bottom	0.400	0.400	**0.800**
	Right	0.032	0.400	0.432
	Left	0.052	0.372	0.424

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.403	0.223	0.626
	Top	0.177	0.129	0.306
	Bottom	0.400	0.400	**0.800**
	Right	0.115	0.400	0.515
	Left	0.127	0.372	0.499

Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.494	0.223	0.717
	Top	0.241	0.129	0.370
	Bottom	0.400	0.400	**0.800**
	Right	0.173	0.400	0.573
	Left	0.100	0.372	0.472

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.512	0.223	0.735
	Top	0.381	0.129	0.510
	Bottom	0.400	0.400	**0.800**
	Right	0.264	0.400	0.664
	Left	0.179	0.372	0.551

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.617	0.223	**0.840**
	Top	0.312	0.129	0.441
	Bottom	0.400	0.400	0.800
	Right	0.083	0.400	0.483
	Left	0.043	0.372	0.415

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.566	0.223	0.789
	Top	0.313	0.129	0.442
	Bottom	0.400	0.400	**0.800**
	Right	0.042	0.400	0.442
	Left	0.035	0.372	0.407

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Table 10-3
Simultaneous Transmission Scenario with 2.4 GHz WLAN Antenna 2 (Body at 0 mm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.455	0.025	0.480	Body SAR	Back	0.470	0.025	0.495
	Top	0.319	0.117	0.436		Top	0.250	0.117	0.367
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.152	0.144	0.296		Right	0.077	0.144	0.221
	Left	0.326	0.400	0.726		Left	0.035	0.400	0.435

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.486	0.025	0.511	Body SAR	Back	0.497	0.025	0.522
	Top	0.346	0.117	0.463		Top	0.302	0.117	0.419
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.177	0.144	0.321		Right	0.075	0.144	0.219
	Left	0.171	0.400	0.571		Left	0.126	0.400	0.526

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	EVDO BC10 (§90S) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.606	0.025	0.631	Body SAR	Back	0.632	0.025	0.657
	Top	0.380	0.117	0.497		Top	0.343	0.117	0.460
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.033	0.144	0.177		Right	0.207	0.144	0.351
	Left	0.043	0.400	0.443		Left	0.201	0.400	0.601

Simult Tx	Configuration	EVDO BC0 (§22H) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.700	0.025	0.725	Body SAR	Back	0.555	0.025	0.580
	Top	0.424	0.117	0.541		Top	0.299	0.117	0.416
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.188	0.144	0.332		Right	0.032	0.144	0.176
	Left	0.195	0.400	0.595		Left	0.052	0.400	0.452

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.403	0.025	0.428	Body SAR	Back	0.494	0.025	0.519
	Top	0.177	0.117	0.294		Top	0.241	0.117	0.358
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.115	0.144	0.259		Right	0.173	0.144	0.317
	Left	0.127	0.400	0.527		Left	0.100	0.400	0.500

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.512	0.025	0.537	Body SAR	Back	0.617	0.025	0.642
	Top	0.381	0.117	0.498		Top	0.312	0.117	0.429
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.264	0.144	0.408		Right	0.083	0.144	0.227
	Left	0.179	0.400	0.579		Left	0.043	0.400	0.443

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.566	0.025	0.591
	Top	0.313	0.117	0.430
	Bottom	0.400	0.400	**0.800**
	Right	0.042	0.144	0.186
	Left	0.035	0.400	0.435

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Table 10-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO (Body at 0 mm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.455	0.155	0.610	Body SAR	Back	0.470	0.155	0.625
	Top	0.319	0.083	0.402		Top	0.250	0.083	0.333
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.152	0.068	0.220		Right	0.077	0.068	0.145
	Left	0.326	0.165	0.491		Left	0.035	0.165	0.200

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.486	0.155	0.641	Body SAR	Back	0.497	0.155	0.652
	Top	0.346	0.083	0.429		Top	0.302	0.083	0.385
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.177	0.068	0.245		Right	0.075	0.068	0.143
	Left	0.171	0.165	0.336		Left	0.126	0.165	0.291

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	EVDO BC10 (§90S) SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.606	0.155	0.761	Body SAR	Back	0.632	0.155	0.787
	Top	0.380	0.083	0.463		Top	0.343	0.083	0.426
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.033	0.068	0.101		Right	0.207	0.068	0.275
	Left	0.043	0.165	0.208		Left	0.201	0.165	0.366

Simult Tx	Configuration	EVDO BC0 (§22H) SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.700	0.155	**0.855**	Body SAR	Back	0.555	0.155	0.710
	Top	0.424	0.083	0.507		Top	0.299	0.083	0.382
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	**0.800**
	Right	0.188	0.068	0.256		Right	0.032	0.068	0.100
	Left	0.195	0.165	0.360		Left	0.052	0.165	0.217

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.403	0.155	0.558	Body SAR	Back	0.494	0.155	0.649
	Top	0.177	0.083	0.260		Top	0.241	0.083	0.324
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.115	0.068	0.183		Right	0.173	0.068	0.241
	Left	0.127	0.165	0.292		Left	0.100	0.165	0.265

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.512	0.155	0.667	Body SAR	Back	0.617	0.155	0.772
	Top	0.381	0.083	0.464		Top	0.312	0.083	0.395
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.264	0.068	0.332		Right	0.083	0.068	0.151
	Left	0.179	0.165	0.344		Left	0.043	0.165	0.208

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.566	0.155	0.721
	Top	0.313	0.083	0.396
	Bottom	0.400	0.400	**0.800**
	Right	0.042	0.068	0.110
	Left	0.035	0.165	0.200

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Table 10-5
Simultaneous Transmission Scenario with 5 GHz WLAN Antenna 1 (Body at 0 mm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.455	0.568	**1.023**	Body SAR	Back	0.470	0.568	**1.038**
	Top	0.319	0.347	0.666		Top	0.250	0.347	0.597
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.152	0.400	0.552		Right	0.077	0.400	0.477
	Left	0.326	0.488	0.814		Left	0.035	0.488	0.523

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.486	0.568	**1.054**	Body SAR	Back	0.497	0.568	**1.065**
	Top	0.346	0.347	0.693		Top	0.302	0.347	0.649
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.177	0.400	0.577		Right	0.075	0.400	0.475
	Left	0.171	0.488	0.659		Left	0.126	0.488	0.614

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	EVDO BC10 (§90S) SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.606	0.568	**1.174**	Body SAR	Back	0.632	0.568	**1.200**
	Top	0.380	0.347	0.727		Top	0.343	0.347	0.690
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.033	0.400	0.433		Right	0.207	0.400	0.607
	Left	0.043	0.488	0.531		Left	0.201	0.488	0.689

Simult Tx	Configuration	EVDO BC0 (§22H) SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.700	0.568	**1.268**	Body SAR	Back	0.555	0.568	**1.123**
	Top	0.424	0.347	0.771		Top	0.299	0.347	0.646
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.188	0.400	0.588		Right	0.032	0.400	0.432
	Left	0.195	0.488	0.683		Left	0.052	0.488	0.540

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.403	0.568	**0.971**	Body SAR	Back	0.494	0.568	**1.062**
	Top	0.177	0.347	0.524		Top	0.241	0.347	0.588
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.115	0.400	0.515		Right	0.173	0.400	0.573
	Left	0.127	0.488	0.615		Left	0.100	0.488	0.588

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.512	0.568	**1.080**	Body SAR	Back	0.617	0.568	**1.185**
	Top	0.381	0.347	0.728		Top	0.312	0.347	0.659
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.264	0.400	0.664		Right	0.083	0.400	0.483
	Left	0.179	0.488	0.667		Left	0.043	0.488	0.531

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.566	0.568	**1.134**
	Top	0.313	0.347	0.660
	Bottom	0.400	0.400	0.800
	Right	0.042	0.400	0.442
	Left	0.035	0.488	0.523

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Table 10-6
Simultaneous Transmission Scenario with 5 GHz WLAN Antenna 2 (Body at 0 mm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.455	0.037	0.492	Body SAR	Back	0.470	0.037	0.507
	Top	0.319	0.230	0.549		Top	0.250	0.230	0.480
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.152	0.379	0.531		Right	0.077	0.379	0.456
	Left	0.326	0.400	0.726		Left	0.035	0.400	0.435

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.486	0.037	0.523	Body SAR	Back	0.497	0.037	0.534
	Top	0.346	0.230	0.576		Top	0.302	0.230	0.532
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.177	0.379	0.556		Right	0.075	0.379	0.454
	Left	0.171	0.400	0.571		Left	0.126	0.400	0.526

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	EVDO BC10 (§90S) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.606	0.037	0.643	Body SAR	Back	0.632	0.037	0.669
	Top	0.380	0.230	0.610		Top	0.343	0.230	0.573
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.033	0.379	0.412		Right	0.207	0.379	0.586
	Left	0.043	0.400	0.443		Left	0.201	0.400	0.601

Simult Tx	Configuration	EVDO BC0 (§22H) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.700	0.037	0.737	Body SAR	Back	0.555	0.037	0.592
	Top	0.424	0.230	0.654		Top	0.299	0.230	0.529
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.188	0.379	0.567		Right	0.032	0.379	0.411
	Left	0.195	0.400	0.595		Left	0.052	0.400	0.452

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.403	0.037	0.440	Body SAR	Back	0.494	0.037	0.531
	Top	0.177	0.230	0.407		Top	0.241	0.230	0.471
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.115	0.379	0.494		Right	0.173	0.379	0.552
	Left	0.127	0.400	0.527		Left	0.100	0.400	0.500

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.512	0.037	0.549	Body SAR	Back	0.617	0.037	0.654
	Top	0.381	0.230	0.611		Top	0.312	0.230	0.542
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.264	0.379	0.643		Right	0.083	0.379	0.462
	Left	0.179	0.400	0.579		Left	0.043	0.400	0.443

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.566	0.037	0.603
	Top	0.313	0.230	0.543
	Bottom	0.400	0.400	**0.800**
	Right	0.042	0.379	0.421
	Left	0.035	0.400	0.435

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Table 10-7
Simultaneous Transmission Scenario with 5 GHz WLAN MIMO (Body at 0 mm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.455	0.157	0.612	Body SAR	Back	0.470	0.157	0.627
	Top	0.319	0.181	0.500		Top	0.250	0.181	0.431
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.152	0.062	0.214		Right	0.077	0.062	0.139
	Left	0.326	0.120	0.446		Left	0.035	0.120	0.155

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.486	0.157	0.643	Body SAR	Back	0.497	0.157	0.654
	Top	0.346	0.181	0.527		Top	0.302	0.181	0.483
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.177	0.062	0.239		Right	0.075	0.062	0.137
	Left	0.171	0.120	0.291		Left	0.126	0.120	0.246

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	EVDO BC10 (§90S) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.606	0.157	0.763	Body SAR	Back	0.632	0.157	0.789
	Top	0.380	0.181	0.561		Top	0.343	0.181	0.524
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.033	0.062	0.095		Right	0.207	0.062	0.269
	Left	0.043	0.120	0.163		Left	0.201	0.120	0.321

Simult Tx	Configuration	EVDO BC0 (§22H) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.700	0.157	**0.857**	Body SAR	Back	0.555	0.157	0.712
	Top	0.424	0.181	0.605		Top	0.299	0.181	0.480
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	**0.800**
	Right	0.188	0.062	0.250		Right	0.032	0.062	0.094
	Left	0.195	0.120	0.315		Left	0.052	0.120	0.172

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.403	0.157	0.560	Body SAR	Back	0.494	0.157	0.651
	Top	0.177	0.181	0.358		Top	0.241	0.181	0.422
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.115	0.062	0.177		Right	0.173	0.062	0.235
	Left	0.127	0.120	0.247		Left	0.100	0.120	0.220

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.512	0.157	0.669	Body SAR	Back	0.617	0.157	0.774
	Top	0.381	0.181	0.562		Top	0.312	0.181	0.493
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.264	0.062	0.326		Right	0.083	0.062	0.145
	Left	0.179	0.120	0.299		Left	0.043	0.120	0.163

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.566	0.157	0.723
	Top	0.313	0.181	0.494
	Bottom	0.400	0.400	**0.800**
	Right	0.042	0.062	0.104
	Left	0.035	0.120	0.155

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Table 10-8
Simultaneous Transmission Scenario with Bluetooth (Body at 0 mm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.455	0.000	0.455	Body SAR	Back	0.470	0.000	0.470
	Top	0.319	0.033	0.352		Top	0.250	0.033	0.283
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.152	0.016	0.168		Right	0.077	0.016	0.093
	Left	0.326	0.400	0.726		Left	0.035	0.400	0.435

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.486	0.000	0.486	Body SAR	Back	0.497	0.000	0.497
	Top	0.346	0.033	0.379		Top	0.302	0.033	0.335
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.177	0.016	0.193		Right	0.075	0.016	0.091
	Left	0.171	0.400	0.571		Left	0.126	0.400	0.526

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	EVDO BC10 (§90S) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.606	0.000	0.606	Body SAR	Back	0.632	0.000	0.632
	Top	0.380	0.033	0.413		Top	0.343	0.033	0.376
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.033	0.016	0.049		Right	0.207	0.016	0.223
	Left	0.043	0.400	0.443		Left	0.201	0.400	0.601

Simult Tx	Configuration	EVDO BC0 (§22H) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.700	0.000	0.700	Body SAR	Back	0.555	0.000	0.555
	Top	0.424	0.033	0.457		Top	0.299	0.033	0.332
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.188	0.016	0.204		Right	0.032	0.016	0.048
	Left	0.195	0.400	0.595		Left	0.052	0.400	0.452

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.403	0.000	0.403	Body SAR	Back	0.494	0.000	0.494
	Top	0.177	0.033	0.210		Top	0.241	0.033	0.274
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.115	0.016	0.131		Right	0.173	0.016	0.189
	Left	0.127	0.400	0.527		Left	0.100	0.400	0.500

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.512	0.000	0.512	Body SAR	Back	0.617	0.000	0.617
	Top	0.381	0.033	0.414		Top	0.312	0.033	0.345
	Bottom	0.400	0.400	**0.800**		Bottom	0.400	0.400	**0.800**
	Right	0.264	0.016	0.280		Right	0.083	0.016	0.099
	Left	0.179	0.400	0.579		Left	0.043	0.400	0.443

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.566	0.000	0.566
	Top	0.313	0.033	0.346
	Bottom	0.400	0.400	**0.800**
	Right	0.042	0.016	0.058
	Left	0.035	0.400	0.435

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Table 10-9
Simultaneous Transmission Scenario with 2.4 GHz WLAN Antenna 1 (Back at 18 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.547	<0.223	<0.770
Back Side	GPRS 1900	0.489	<0.223	<0.712
Back Side	UMTS 850	0.279	<0.223	<0.502
Back Side	UMTS 1750	0.625	<0.223	<0.848
Back Side	UMTS 1900	0.599	<0.223	<0.822
Back Side	EVDO BC10 (§90S)	0.367	<0.223	<0.590
Back Side	EVDO BC0 (§22H)	0.407	<0.223	<0.630
Back Side	PCS EVDO	0.849	<0.223	<1.072
Back Side	LTE Band 17	0.268	<0.223	<0.491
Back Side	LTE Band 13	0.293	<0.223	<0.516
Back Side	LTE Band 5 (Cell)	0.350	<0.223	<0.573
Back Side	LTE Band 4 (AWS)	0.737	<0.223	<0.960
Back Side	LTE Band 25 (PCS)	1.007	<0.223	**<1.230**

Table 10-10
Simultaneous Transmission Scenario with 2.4 GHz WLAN Antenna 2 (Back at 18 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.547	<0.025	<0.572
Back Side	GPRS 1900	0.489	<0.025	<0.514
Back Side	UMTS 850	0.279	<0.025	<0.304
Back Side	UMTS 1750	0.625	<0.025	<0.650
Back Side	UMTS 1900	0.599	<0.025	<0.624
Back Side	EVDO BC10 (§90S)	0.367	<0.025	<0.392
Back Side	EVDO BC0 (§22H)	0.407	<0.025	<0.432
Back Side	PCS EVDO	0.849	<0.025	<0.874
Back Side	LTE Band 17	0.268	<0.025	<0.293
Back Side	LTE Band 13	0.293	<0.025	<0.318
Back Side	LTE Band 5 (Cell)	0.350	<0.025	<0.375
Back Side	LTE Band 4 (AWS)	0.737	<0.025	<0.762
Back Side	LTE Band 25 (PCS)	1.007	<0.025	**<1.032**

Table 10-11
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO (Back at 18 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.547	<0.155	<0.702
Back Side	GPRS 1900	0.489	<0.155	<0.644
Back Side	UMTS 850	0.279	<0.155	<0.434
Back Side	UMTS 1750	0.625	<0.155	<0.780
Back Side	UMTS 1900	0.599	<0.155	<0.754
Back Side	EVDO BC10 (§90S)	0.367	<0.155	<0.522
Back Side	EVDO BC0 (§22H)	0.407	<0.155	<0.562
Back Side	PCS EVDO	0.849	<0.155	<1.004
Back Side	LTE Band 17	0.268	<0.155	<0.423
Back Side	LTE Band 13	0.293	<0.155	<0.448
Back Side	LTE Band 5 (Cell)	0.350	<0.155	<0.505
Back Side	LTE Band 4 (AWS)	0.737	<0.155	<0.892
Back Side	LTE Band 25 (PCS)	1.007	<0.155	**<1.162**

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Table 10-12
Simultaneous Transmission Scenario with 5 GHz WLAN Antenna 1 (Back at 18 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.547	<0.568	<1.115
Back Side	GPRS 1900	0.489	<0.568	<1.057
Back Side	UMTS 850	0.279	<0.568	<0.847
Back Side	UMTS 1750	0.625	<0.568	<1.193
Back Side	UMTS 1900	0.599	<0.568	<1.167
Back Side	EVDO BC10 (§90S)	0.367	<0.568	<0.935
Back Side	EVDO BC0 (§22H)	0.407	<0.568	<0.975
Back Side	PCS EVDO	0.849	<0.568	<1.417
Back Side	LTE Band 17	0.268	<0.568	<0.836
Back Side	LTE Band 13	0.293	<0.568	<0.861
Back Side	LTE Band 5 (Cell)	0.350	<0.568	<0.918
Back Side	LTE Band 4 (AWS)	0.737	<0.568	<1.305
Back Side	LTE Band 25 (PCS)	1.007	<0.568	**<1.575**

Table 10-13
Simultaneous Transmission Scenario with 5 GHz WLAN Antenna 2 (Back at 18 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.547	<0.037	<0.584
Back Side	GPRS 1900	0.489	<0.037	<0.526
Back Side	UMTS 850	0.279	<0.037	<0.316
Back Side	UMTS 1750	0.625	<0.037	<0.662
Back Side	UMTS 1900	0.599	<0.037	<0.636
Back Side	EVDO BC10 (§90S)	0.367	<0.037	<0.404
Back Side	EVDO BC0 (§22H)	0.407	<0.037	<0.444
Back Side	PCS EVDO	0.849	<0.037	<0.886
Back Side	LTE Band 17	0.268	<0.037	<0.305
Back Side	LTE Band 13	0.293	<0.037	<0.330
Back Side	LTE Band 5 (Cell)	0.350	<0.037	<0.387
Back Side	LTE Band 4 (AWS)	0.737	<0.037	<0.774
Back Side	LTE Band 25 (PCS)	1.007	<0.037	**<1.044**

Table 10-14
Simultaneous Transmission Scenario with 5 GHz WLAN MIMO (Back at 18 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.547	<0.157	<0.704
Back Side	GPRS 1900	0.489	<0.157	<0.646
Back Side	UMTS 850	0.279	<0.157	<0.436
Back Side	UMTS 1750	0.625	<0.157	<0.782
Back Side	UMTS 1900	0.599	<0.157	<0.756
Back Side	EVDO BC10 (§90S)	0.367	<0.157	<0.524
Back Side	EVDO BC0 (§22H)	0.407	<0.157	<0.564
Back Side	PCS EVDO	0.849	<0.157	<1.006
Back Side	LTE Band 17	0.268	<0.157	<0.425
Back Side	LTE Band 13	0.293	<0.157	<0.450
Back Side	LTE Band 5 (Cell)	0.350	<0.157	<0.507
Back Side	LTE Band 4 (AWS)	0.737	<0.157	<0.894
Back Side	LTE Band 25 (PCS)	1.007	<0.157	**<1.164**

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Table 10-15
Simultaneous Transmission Scenario with Bluetooth (Back at 18 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.547	0.000	0.547
Back Side	GPRS 1900	0.489	0.000	0.489
Back Side	UMTS 850	0.279	0.000	0.279
Back Side	UMTS 1750	0.625	0.000	0.625
Back Side	UMTS 1900	0.599	0.000	0.599
Back Side	EVDO BC10 (§90S)	0.367	0.000	0.367
Back Side	EVDO BC0 (§22H)	0.407	0.000	0.407
Back Side	PCS EVDO	0.849	0.000	0.849
Back Side	LTE Band 17	0.268	0.000	0.268
Back Side	LTE Band 13	0.293	0.000	0.293
Back Side	LTE Band 5 (Cell)	0.350	0.000	0.350
Back Side	LTE Band 4 (AWS)	0.737	0.000	0.737
Back Side	LTE Band 25 (PCS)	1.007	0.000	**1.007**

Table 10-16
Simultaneous Transmission Scenario with 2.4 GHz WLAN Antenna 1 (Top at 16 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Top Edge	GPRS 850	0.448	<0.129	<0.577
Top Edge	GPRS 1900	0.793	<0.129	<0.922
Top Edge	UMTS 850	0.293	<0.129	<0.422
Top Edge	UMTS 1750	0.774	<0.129	<0.903
Top Edge	UMTS 1900	1.128	<0.129	**<1.257**
Top Edge	EVDO BC10 (§90S)	0.317	<0.129	<0.446
Top Edge	EVDO BC0 (§22H)	0.399	<0.129	<0.528
Top Edge	PCS EVDO	1.028	<0.129	<1.157
Top Edge	LTE Band 17	0.214	<0.129	<0.343
Top Edge	LTE Band 13	0.289	<0.129	<0.418
Top Edge	LTE Band 5 (Cell)	0.311	<0.129	<0.440
Top Edge	LTE Band 4 (AWS)	0.986	<0.129	<1.115
Top Edge	LTE Band 25 (PCS)	1.001	<0.129	<1.130

Table 10-17
Simultaneous Transmission Scenario with 2.4 GHz WLAN Antenna 2 (Top at 16 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Top Edge	GPRS 850	0.448	<0.117	<0.565
Top Edge	GPRS 1900	0.793	<0.117	<0.910
Top Edge	UMTS 850	0.293	<0.117	<0.410
Top Edge	UMTS 1750	0.774	<0.117	<0.891
Top Edge	UMTS 1900	1.128	<0.117	**<1.245**
Top Edge	EVDO BC10 (§90S)	0.317	<0.117	<0.434
Top Edge	EVDO BC0 (§22H)	0.399	<0.117	<0.516
Top Edge	PCS EVDO	1.028	<0.117	<1.145
Top Edge	LTE Band 17	0.214	<0.117	<0.331
Top Edge	LTE Band 13	0.289	<0.117	<0.406
Top Edge	LTE Band 5 (Cell)	0.311	<0.117	<0.428
Top Edge	LTE Band 4 (AWS)	0.986	<0.117	<1.103
Top Edge	LTE Band 25 (PCS)	1.001	<0.117	<1.118

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Table 10-18
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO (Top at 16 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Top Edge	GPRS 850	0.448	<0.083	<0.531
Top Edge	GPRS 1900	0.793	<0.083	<0.876
Top Edge	UMTS 850	0.293	<0.083	<0.376
Top Edge	UMTS 1750	0.774	<0.083	<0.857
Top Edge	UMTS 1900	1.128	<0.083	**<1.211**
Top Edge	EVDO BC10 (§90S)	0.317	<0.083	<0.400
Top Edge	EVDO BC0 (§22H)	0.399	<0.083	<0.482
Top Edge	PCS EVDO	1.028	<0.083	<1.111
Top Edge	LTE Band 17	0.214	<0.083	<0.297
Top Edge	LTE Band 13	0.289	<0.083	<0.372
Top Edge	LTE Band 5 (Cell)	0.311	<0.083	<0.394
Top Edge	LTE Band 4 (AWS)	0.986	<0.083	<1.069
Top Edge	LTE Band 25 (PCS)	1.001	<0.083	<1.084

Table 10-19
Simultaneous Transmission Scenario with 5 GHz WLAN Antenna 1 (Top at 16 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Top Edge	GPRS 850	0.448	<0.347	<0.795
Top Edge	GPRS 1900	0.793	<0.347	<1.140
Top Edge	UMTS 850	0.293	<0.347	<0.640
Top Edge	UMTS 1750	0.774	<0.347	<1.121
Top Edge	UMTS 1900	1.128	<0.347	**<1.475**
Top Edge	EVDO BC10 (§90S)	0.317	<0.347	<0.664
Top Edge	EVDO BC0 (§22H)	0.399	<0.347	<0.746
Top Edge	PCS EVDO	1.028	<0.347	<1.375
Top Edge	LTE Band 17	0.214	<0.347	<0.561
Top Edge	LTE Band 13	0.289	<0.347	<0.636
Top Edge	LTE Band 5 (Cell)	0.311	<0.347	<0.658
Top Edge	LTE Band 4 (AWS)	0.986	<0.347	<1.333
Top Edge	LTE Band 25 (PCS)	1.001	<0.347	<1.348

Table 10-20
Simultaneous Transmission Scenario with 5 GHz WLAN Antenna 2 (Top at 16 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Top Edge	GPRS 850	0.448	<0.230	<0.678
Top Edge	GPRS 1900	0.793	<0.230	<1.023
Top Edge	UMTS 850	0.293	<0.230	<0.523
Top Edge	UMTS 1750	0.774	<0.230	<1.004
Top Edge	UMTS 1900	1.128	<0.230	**<1.358**
Top Edge	EVDO BC10 (§90S)	0.317	<0.230	<0.547
Top Edge	EVDO BC0 (§22H)	0.399	<0.230	<0.629
Top Edge	PCS EVDO	1.028	<0.230	<1.258
Top Edge	LTE Band 17	0.214	<0.230	<0.444
Top Edge	LTE Band 13	0.289	<0.230	<0.519
Top Edge	LTE Band 5 (Cell)	0.311	<0.230	<0.541
Top Edge	LTE Band 4 (AWS)	0.986	<0.230	<1.216
Top Edge	LTE Band 25 (PCS)	1.001	<0.230	<1.231

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Table 10-21
Simultaneous Transmission Scenario with 5 GHz WLAN MIMO (Top at 16 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Top Edge	GPRS 850	0.448	<0.181	<0.629
Top Edge	GPRS 1900	0.793	<0.181	<0.974
Top Edge	UMTS 850	0.293	<0.181	<0.474
Top Edge	UMTS 1750	0.774	<0.181	<0.955
Top Edge	UMTS 1900	1.128	<0.181	**<1.309**
Top Edge	EVDO BC10 (§90S)	0.317	<0.181	<0.498
Top Edge	EVDO BC0 (§22H)	0.399	<0.181	<0.580
Top Edge	PCS EVDO	1.028	<0.181	<1.209
Top Edge	LTE Band 17	0.214	<0.181	<0.395
Top Edge	LTE Band 13	0.289	<0.181	<0.470
Top Edge	LTE Band 5 (Cell)	0.311	<0.181	<0.492
Top Edge	LTE Band 4 (AWS)	0.986	<0.181	<1.167
Top Edge	LTE Band 25 (PCS)	1.001	<0.181	<1.182

Table 10-22
Simultaneous Transmission Scenario with Bluetooth (Top at 16 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Top Edge	GPRS 850	0.448	<0.033	<0.481
Top Edge	GPRS 1900	0.793	<0.033	<0.826
Top Edge	UMTS 850	0.293	<0.033	<0.326
Top Edge	UMTS 1750	0.774	<0.033	<0.807
Top Edge	UMTS 1900	1.128	<0.033	**<1.161**
Top Edge	EVDO BC10 (§90S)	0.317	<0.033	<0.350
Top Edge	EVDO BC0 (§22H)	0.399	<0.033	<0.432
Top Edge	PCS EVDO	1.028	<0.033	<1.061
Top Edge	LTE Band 17	0.214	<0.033	<0.247
Top Edge	LTE Band 13	0.289	<0.033	<0.322
Top Edge	LTE Band 5 (Cell)	0.311	<0.033	<0.344
Top Edge	LTE Band 4 (AWS)	0.986	<0.033	<1.019
Top Edge	LTE Band 25 (PCS)	1.001	<0.033	<1.034

Table 10-23
Simultaneous Transmission Scenario with 2.4 GHz WLAN Antenna 1 (Right at 3 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Right Edge	GPRS 850	0.967	0.400	**1.367**
Right Edge	GPRS 1900	0.395	0.400	0.795
Right Edge	UMTS 850	0.430	0.400	0.830
Right Edge	UMTS 1750	0.486	0.400	0.886
Right Edge	UMTS 1900	0.286	0.400	0.686
Right Edge	EVDO BC10 (§90S)	0.118	0.400	0.518
Right Edge	EVDO BC0 (§22H)	0.110	0.400	0.510
Right Edge	PCS EVDO	0.412	0.400	0.812
Right Edge	LTE Band 17	0.326	0.400	0.726
Right Edge	LTE Band 13	0.307	0.400	0.707
Right Edge	LTE Band 5 (Cell)	0.475	0.400	0.875
Right Edge	LTE Band 4 (AWS)	0.834	0.400	1.234
Right Edge	LTE Band 25 (PCS)	0.365	0.400	0.765

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Table 10-24
Simultaneous Transmission Scenario with 2.4 GHz WLAN Antenna 2 (Right at 3 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Right Edge	GPRS 850	0.967	<0.144	**<1.111**
Right Edge	GPRS 1900	0.395	<0.144	<0.539
Right Edge	UMTS 850	0.430	<0.144	<0.574
Right Edge	UMTS 1750	0.486	<0.144	<0.630
Right Edge	UMTS 1900	0.286	<0.144	<0.430
Right Edge	EVDO BC10 (§90S)	0.118	<0.144	<0.262
Right Edge	EVDO BC0 (§22H)	0.110	<0.144	<0.254
Right Edge	PCS EVDO	0.412	<0.144	<0.556
Right Edge	LTE Band 17	0.326	<0.144	<0.470
Right Edge	LTE Band 13	0.307	<0.144	<0.451
Right Edge	LTE Band 5 (Cell)	0.475	<0.144	<0.619
Right Edge	LTE Band 4 (AWS)	0.834	<0.144	<0.978
Right Edge	LTE Band 25 (PCS)	0.365	<0.144	<0.509

Table 10-25
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO (Right at 3 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Right Edge	GPRS 850	0.967	<0.068	**<1.035**
Right Edge	GPRS 1900	0.395	<0.068	<0.463
Right Edge	UMTS 850	0.430	<0.068	<0.498
Right Edge	UMTS 1750	0.486	<0.068	<0.554
Right Edge	UMTS 1900	0.286	<0.068	<0.354
Right Edge	EVDO BC10 (§90S)	0.118	<0.068	<0.186
Right Edge	EVDO BC0 (§22H)	0.110	<0.068	<0.178
Right Edge	PCS EVDO	0.412	<0.068	<0.480
Right Edge	LTE Band 17	0.326	<0.068	<0.394
Right Edge	LTE Band 13	0.307	<0.068	<0.375
Right Edge	LTE Band 5 (Cell)	0.475	<0.068	<0.543
Right Edge	LTE Band 4 (AWS)	0.834	<0.068	<0.902
Right Edge	LTE Band 25 (PCS)	0.365	<0.068	<0.433

Table 10-26
Simultaneous Transmission Scenario with 5 GHz WLAN Antenna 1 (Right at 3 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Right Edge	GPRS 850	0.967	0.400	**1.367**
Right Edge	GPRS 1900	0.395	0.400	0.795
Right Edge	UMTS 850	0.430	0.400	0.830
Right Edge	UMTS 1750	0.486	0.400	0.886
Right Edge	UMTS 1900	0.286	0.400	0.686
Right Edge	EVDO BC10 (§90S)	0.118	0.400	0.518
Right Edge	EVDO BC0 (§22H)	0.110	0.400	0.510
Right Edge	PCS EVDO	0.412	0.400	0.812
Right Edge	LTE Band 17	0.326	0.400	0.726
Right Edge	LTE Band 13	0.307	0.400	0.707
Right Edge	LTE Band 5 (Cell)	0.475	0.400	0.875
Right Edge	LTE Band 4 (AWS)	0.834	0.400	1.234
Right Edge	LTE Band 25 (PCS)	0.365	0.400	0.765

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Table 10-27
Simultaneous Transmission Scenario with 5 GHz WLAN Antenna 2 (Right at 3 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Right Edge	GPRS 850	0.967	<0.379	**<1.346**
Right Edge	GPRS 1900	0.395	<0.379	<0.774
Right Edge	UMTS 850	0.430	<0.379	<0.809
Right Edge	UMTS 1750	0.486	<0.379	<0.865
Right Edge	UMTS 1900	0.286	<0.379	<0.665
Right Edge	EVDO BC10 (§90S)	0.118	<0.379	<0.497
Right Edge	EVDO BC0 (§22H)	0.110	<0.379	<0.489
Right Edge	PCS EVDO	0.412	<0.379	<0.791
Right Edge	LTE Band 17	0.326	<0.379	<0.705
Right Edge	LTE Band 13	0.307	<0.379	<0.686
Right Edge	LTE Band 5 (Cell)	0.475	<0.379	<0.854
Right Edge	LTE Band 4 (AWS)	0.834	<0.379	<1.213
Right Edge	LTE Band 25 (PCS)	0.365	<0.379	<0.744

Table 10-28
Simultaneous Transmission Scenario with 5 GHz WLAN MIMO (Right at 3 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Right Edge	GPRS 850	0.967	<0.062	**<1.029**
Right Edge	GPRS 1900	0.395	<0.062	<0.457
Right Edge	UMTS 850	0.430	<0.062	<0.492
Right Edge	UMTS 1750	0.486	<0.062	<0.548
Right Edge	UMTS 1900	0.286	<0.062	<0.348
Right Edge	EVDO BC10 (§90S)	0.118	<0.062	<0.180
Right Edge	EVDO BC0 (§22H)	0.110	<0.062	<0.172
Right Edge	PCS EVDO	0.412	<0.062	<0.474
Right Edge	LTE Band 17	0.326	<0.062	<0.388
Right Edge	LTE Band 13	0.307	<0.062	<0.369
Right Edge	LTE Band 5 (Cell)	0.475	<0.062	<0.537
Right Edge	LTE Band 4 (AWS)	0.834	<0.062	<0.896
Right Edge	LTE Band 25 (PCS)	0.365	<0.062	<0.427

Table 10-29
Simultaneous Transmission Scenario with Bluetooth (Right at 3 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Right Edge	GPRS 850	0.967	<0.016	**<0.983**
Right Edge	GPRS 1900	0.395	<0.016	<0.411
Right Edge	UMTS 850	0.430	<0.016	<0.446
Right Edge	UMTS 1750	0.486	<0.016	<0.502
Right Edge	UMTS 1900	0.286	<0.016	<0.302
Right Edge	EVDO BC10 (§90S)	0.118	<0.016	<0.134
Right Edge	EVDO BC0 (§22H)	0.110	<0.016	<0.126
Right Edge	PCS EVDO	0.412	<0.016	<0.428
Right Edge	LTE Band 17	0.326	<0.016	<0.342
Right Edge	LTE Band 13	0.307	<0.016	<0.323
Right Edge	LTE Band 5 (Cell)	0.475	<0.016	<0.491
Right Edge	LTE Band 4 (AWS)	0.834	<0.016	<0.850
Right Edge	LTE Band 25 (PCS)	0.365	<0.016	<0.381

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1. For configurations excluded per 447498 D01v05, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion when the test separation distance was >50 mm.
2. For SAR summations for body back at 18 mm, WLAN and Bluetooth SAR values for 0.0 cm were used since the 0.0 cm test distance for WLAN and Bluetooth was more conservative. "<" denotes that the 0.0 cm WLAN or Bluetooth SAR values were used for summation purposes.
3. For SAR summations for body top at 16 mm, WLAN and Bluetooth SAR values for 0.0 cm were used since the 0.0 cm test distance for WLAN and Bluetooth was more conservative. "<" denotes that the 0.0 cm WLAN or Bluetooth SAR values were used for summation purposes.
4. For SAR summations for body right at 3 mm, WLAN and Bluetooth SAR values for 0.0 cm were used since the 0.0 cm test distance for WLAN and Bluetooth was more conservative. "<" denotes that the 0.0 cm WLAN or Bluetooth SAR values were used for summation purposes.
5. Only WLAN antenna 2 is capable of transmitting Bluetooth.

10.4 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 D01v05 and IEEE 1528-2013 Section 6.3.4.1.2.

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11 SAR MEASUREMENT VARIABILITY

11.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01, SAR measurement variability is assessed when the highest measured SAR is ≥ 0.80 W/kg. Since all measured SAR values are < 0.80 W/kg for this device, SAR measurement variability was not assessed.

11.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01, the extended measurement uncertainty analysis per IEEE 1528-2003 was not required.

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12 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/15/2014	Annual	4/15/2015	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	12/30/2014	Annual	12/30/2015	JP38020182
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/15/2014	Annual	4/15/2015	3629U00687
Agilent	E4438C	ESG Vector Signal Generator	4/25/2014	Annual	4/25/2015	MY42082385
Agilent	N9020A	MXA Signal Analyzer	10/27/2014	Annual	10/27/2015	US46470561
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420651
Agilent	8753ES	S-Parameter Network Analyzer	5/22/2014	Annual	5/22/2015	US39170118
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433978
Anritsu	ML2469A	Power Meter	3/14/2014	Annual	3/14/2015	1306009
Anritsu	MA2411B	Pulse Power Sensor	11/17/2014	Annual	11/17/2015	1126066
Anritsu	MA2411B	Pulse Power Sensor	11/17/2014	Annual	11/17/2015	1207364
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1231535
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1231538
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M1S5A00-009
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Control Company	4052	Long Stem Thermometer	9/27/2013	Biennial	9/27/2015	130567447
Control Company	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	122014488
Fisher Scientific	15-077-960	Digital Thermometer	12/4/2013	Biennial	12/4/2015	130764551
Fisher Scientific	S407993	Long Stem Thermometer	11/4/2013	Biennial	11/4/2015	130671826
Fisher Scientific	S97611	Thermometer	4/12/2013	Biennial	4/12/2015	130219303
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	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
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	22313
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
SPEAG	D2450V2	2450 MHz SAR Dipole	8/11/2014	Annual	8/11/2015	719
SPEAG	D2450V2	2450 MHz SAR Dipole	1/21/2014	Annual	1/21/2015	797
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/27/2014	Annual	1/27/2015	1057
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/26/2014	Annual	2/26/2015	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/17/2014	Annual	3/17/2015	1334
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/6/2014	Annual	5/6/2015	1070
SPEAG	ES3DV3	SAR Probe	3/19/2014	Annual	3/19/2015	3209
SPEAG	ES3DV3	SAR Probe	2/25/2014	Annual	2/25/2015	3258
SPEAG	EX3DV4	SAR Probe	1/29/2014	Annual	1/29/2015	3589
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/16/2014	Annual	4/16/2015	B010177
VWR	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	111859323

Note:

1. 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.
2. All equipment was used within its calibration period.

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13 MEASUREMENT UNCERTAINTIES

Applicable for frequencies less than 3000 MHz.

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	6.0	N	1	1.0	1.0	6.0	6.0	∞
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	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)			RSS				12.1	11.7	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.2	23.5	

The above measurement uncertainties are according to IEEE Std. 1528-2003

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Applicable for frequencies up to 6 GHz.

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	6.55	N	1	1.0	1.0	6.6	6.6	∞
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	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)			RSS				12.4	12.0	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.7	24.0	

The above measurement uncertainties are according to IEEE Std. 1528-2003

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14 CONCLUSION

14.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Industry 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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APPENDIX A: SAR TEST DATA

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PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJ9TGWL13A; Type: Wireless Module; Serial: SAR-5

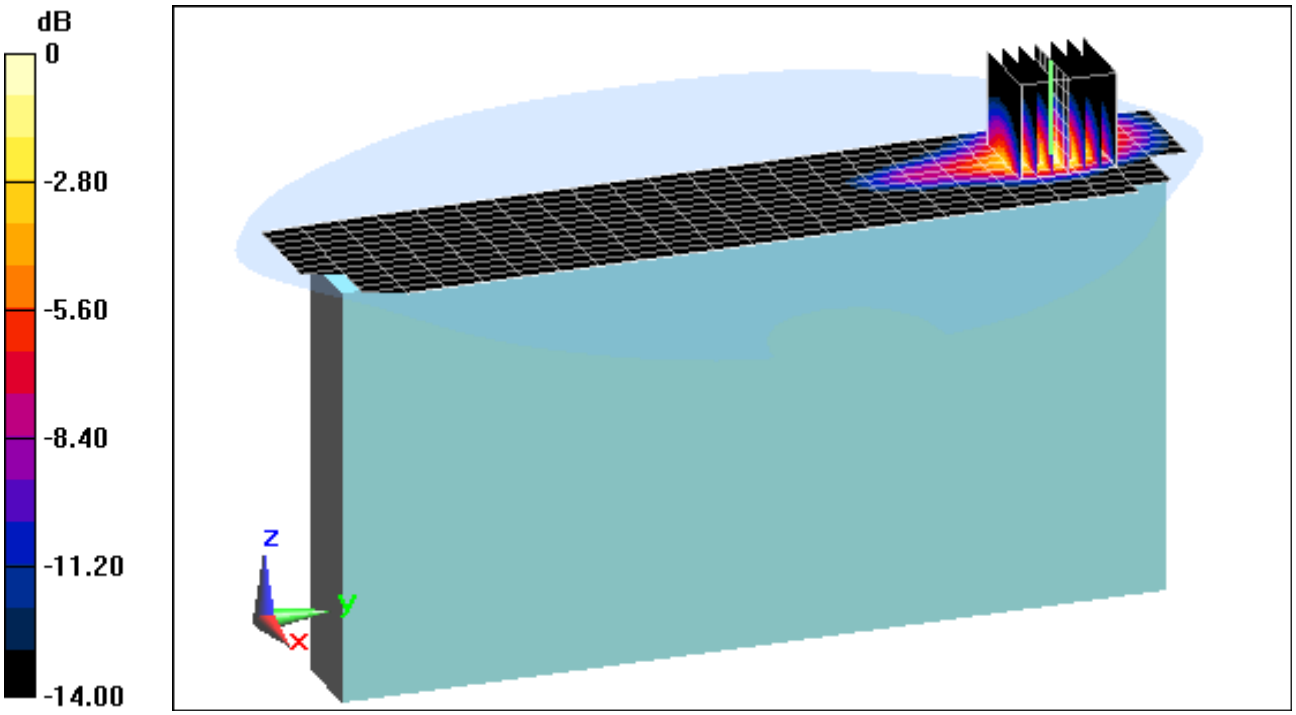
Communication System: UID 0, IEEE 802.11n; Frequency: 2442 MHz; Duty Cycle: 1:1
Medium: 2450 Body, Medium parameters used (interpolated):
f = 2442 MHz; σ = 2.019 S/m; ε_r = 51.077; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-19-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3209; ConvF(4.2, 4.2, 4.2); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11n, 40 MHz Bandwidth, 2.4 GHz, Body SAR, Ch 7, 13.5 Mbps, Antenna 1, Left Edge (Perpendicular)

Area Scan (13x26x1): Measurement grid: dx=5mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.065 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.777 W/kg
SAR(1 g) = 0.341 W/kg



0 dB = 0.462 W/kg = -3.35 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJ9TGWL13A; Type: Wireless Module; Serial: SAR-5

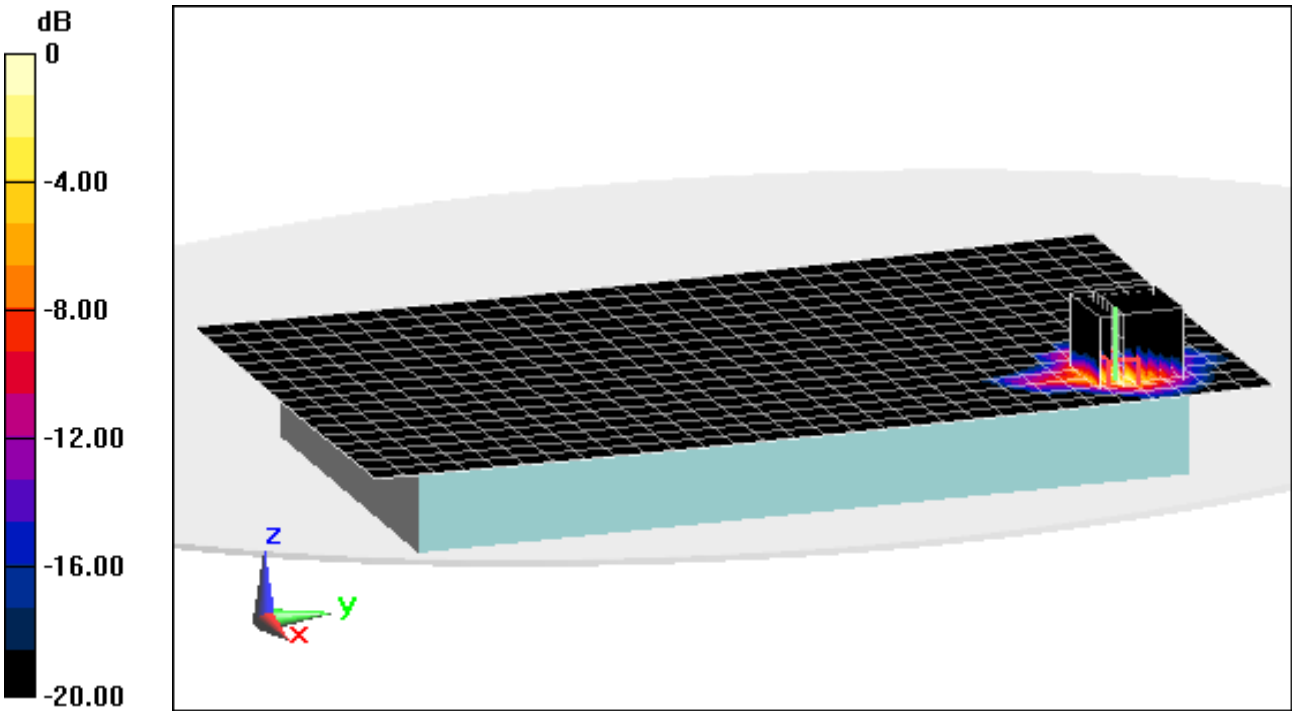
Communication System: UID 0, IEEE 802.11n; Frequency: 5550 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body, Medium parameters used (interpolated):
f = 5550 MHz; σ = 5.728 S/m; ε_r = 47.569; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-05-2015; Ambient Temp: 23.1°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3589; ConvF(3.81, 3.81, 3.81); Calibrated: 1/29/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: ELI Front; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11n, 40 MHz Bandwidth, 5.5-5.7 GHz, Body SAR, Ch 110, 13.5 Mbps, Antenna 1, Back Side (Perpendicular)

Area Scan (18x31x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 7.506 V/m; Power Drift = 0.20 dB
Peak SAR (extrapolated) = 2.91 W/kg
SAR(1 g) = 0.523 W/kg



0 dB = 1.39 W/kg = 1.43 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJ9TGWL13A; Type: Wireless Module; Serial: SAR-5

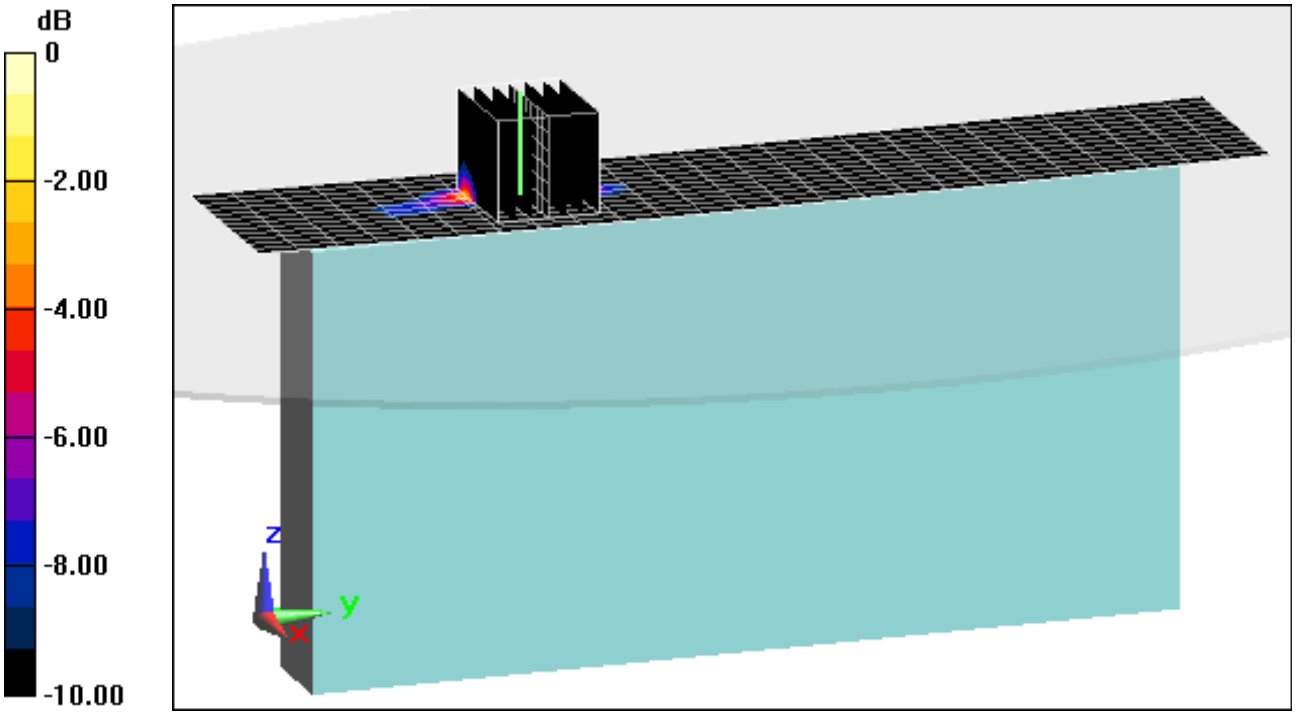
Communication System: UID 0, Bluetooth; Frequency: 2402 MHz; Duty Cycle: 1:1
Medium: 2450 Body, Medium parameters used (interpolated):
f = 2402 MHz; σ = 1.94 S/m; ε_r = 52.855; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-22-2014; Ambient Temp: 24.0°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3258; ConvF(4.14, 4.14, 4.14); Calibrated: 2/25/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/26/2014
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP-1158
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: Bluetooth, Body SAR, Ch 0, 1 Mbps, Right Edge (Perpendicular)

Area Scan (13x26x1): Measurement grid: dx=5mm, dy=12mm
Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.072 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.0410 W/kg
SAR(1 g) = 0.015 W/kg



0 dB = 0.0208 W/kg = -16.82 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

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PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 797

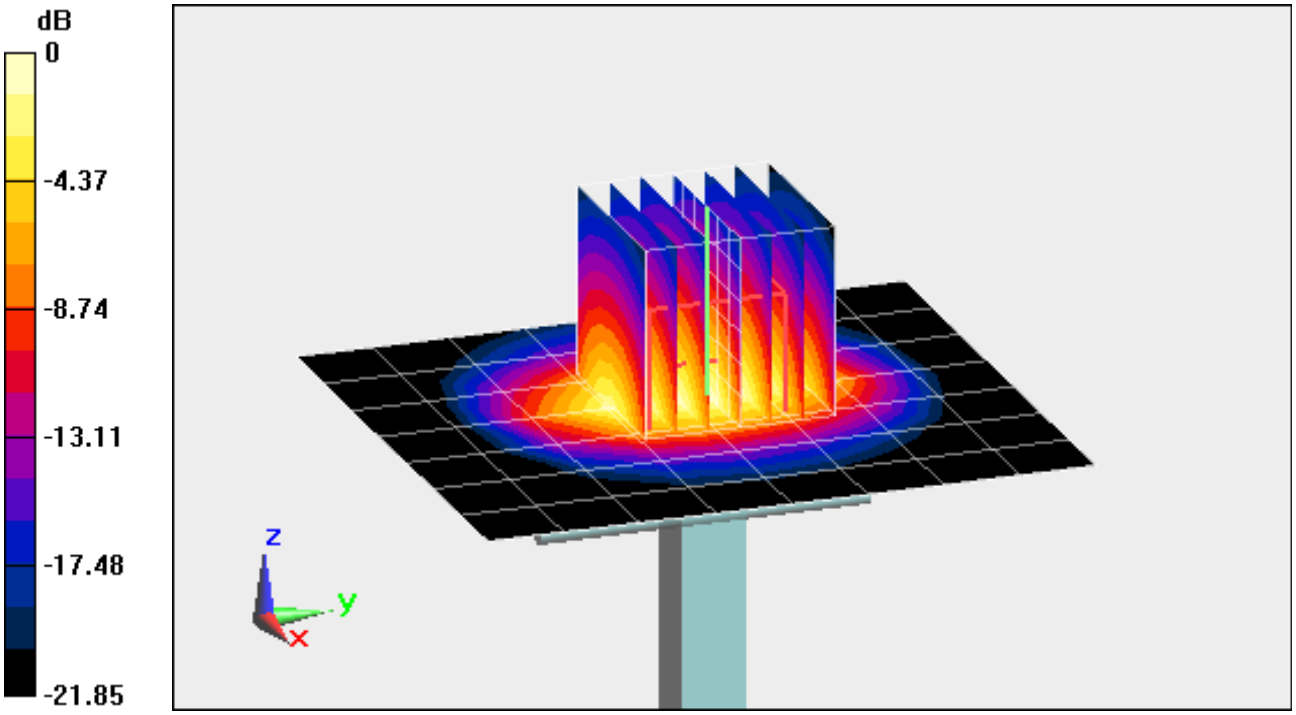
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body, Medium parameters used:
f = 2450 MHz; σ = 2.019 S/m; ε_r = 52.677; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-22-2014; Ambient Temp: 24.0°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3258; ConvF(4.14, 4.14, 4.14); Calibrated: 2/25/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/26/2014
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP-1158
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 10.9 W/kg
SAR(1 g) = 5.22 W/kg
Deviation = 5.67%



0 dB = 6.83 W/kg = 8.34 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 719

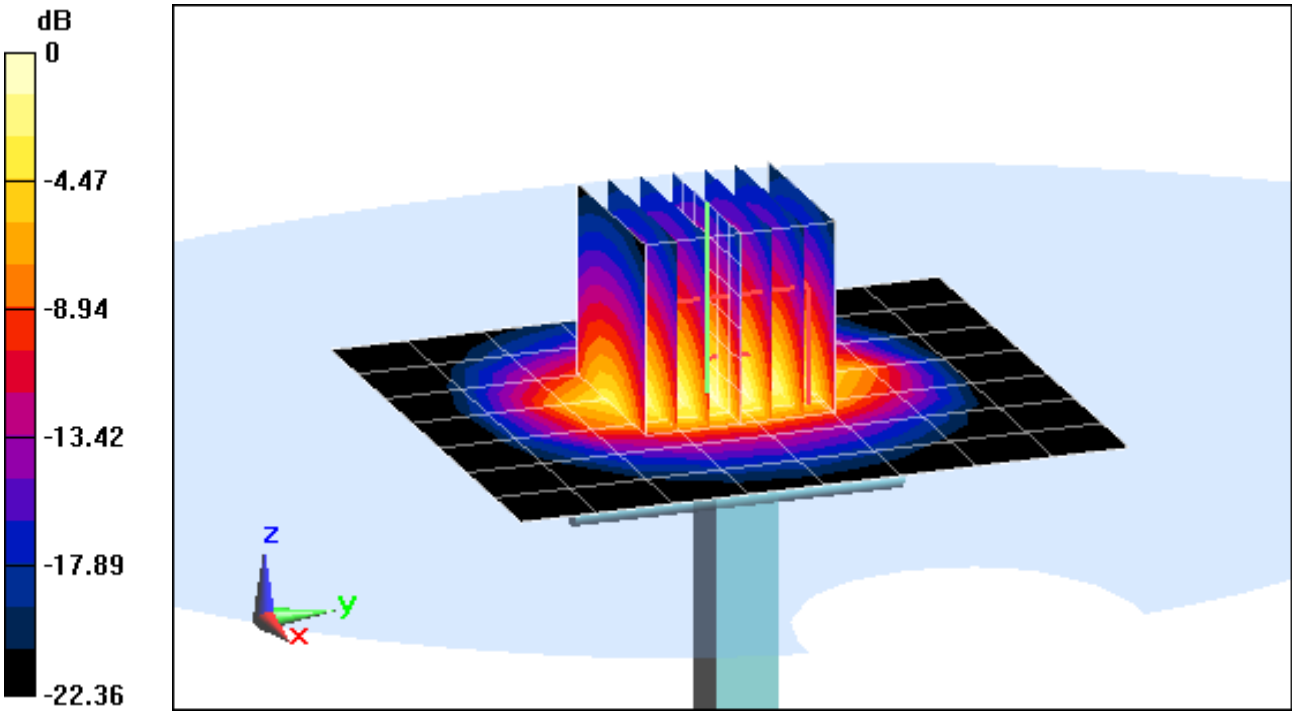
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body, Medium parameters used:
f = 2450 MHz; σ = 2.031 S/m; ε_r = 51.04; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-19-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3209; ConvF(4.2, 4.2, 4.2); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 11.2 W/kg
SAR(1 g) = 5.15 W/kg
Deviation = -0.58%



0 dB = 6.76 W/kg = 8.30 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1057

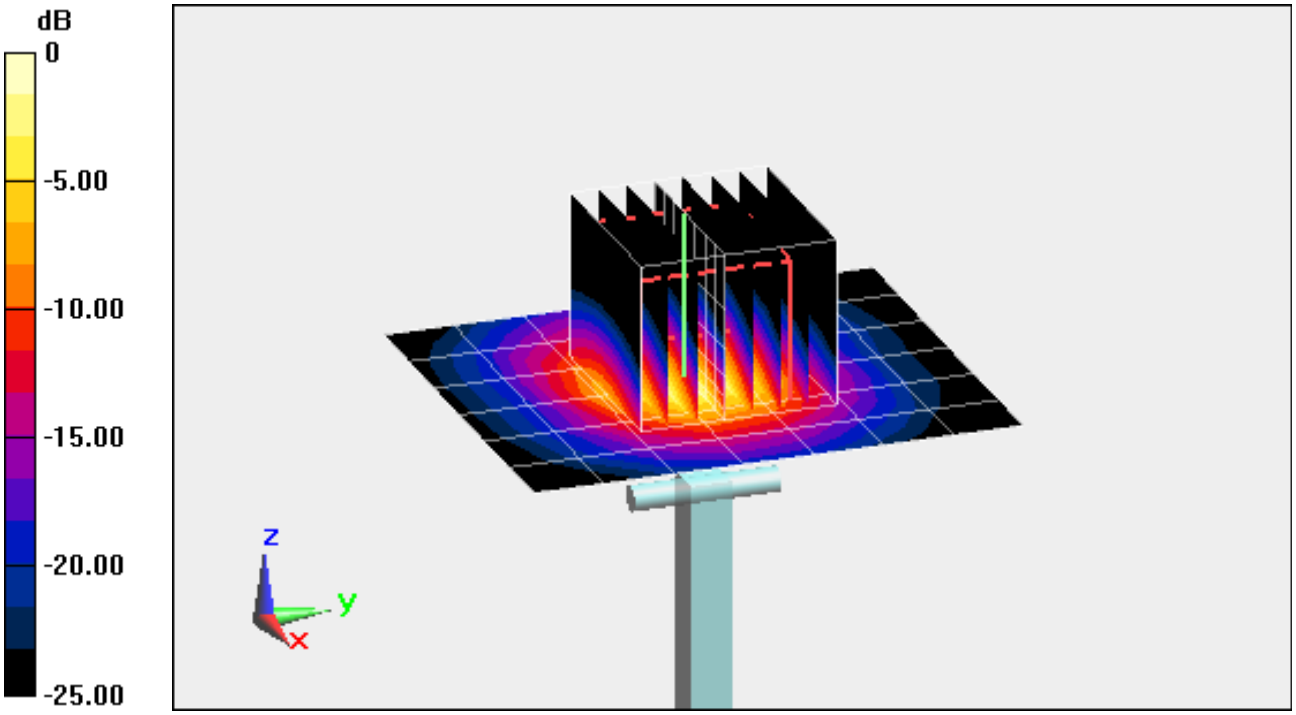
Communication System: UID 0, CW; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body, Medium parameters used:
f = 5200 MHz; σ = 5.219 S/m; ε_r = 48.402; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-05-2015; Ambient Temp: 23.0°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3589; ConvF(4.19, 4.19, 4.19); Calibrated: 1/29/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: ELI Front; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5200 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 32.3 W/kg
SAR(1 g) = 7.22 W/kg
Deviation = -4.12%



0 dB = 18.4 W/kg = 12.65 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1057

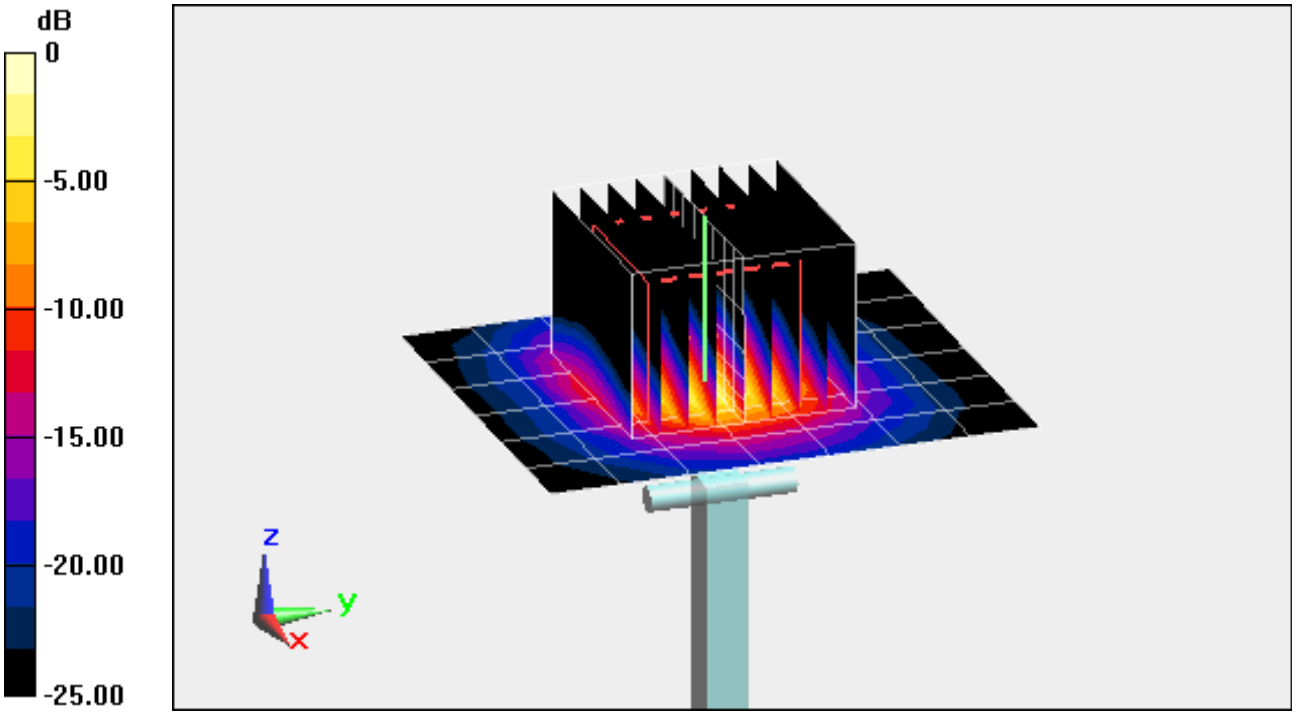
Communication System: UID 0, CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body, Medium parameters used:
f = 5300 MHz; σ = 5.367 S/m; ε_r = 48.17; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-05-2015; Ambient Temp: 23.0°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3589; ConvF(3.98, 3.98, 3.98); Calibrated: 1/29/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: ELI Front; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 35.7 W/kg
SAR(1 g) = 7.72 W/kg
Deviation = -0.26%



0 dB = 20.1 W/kg = 13.03 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057

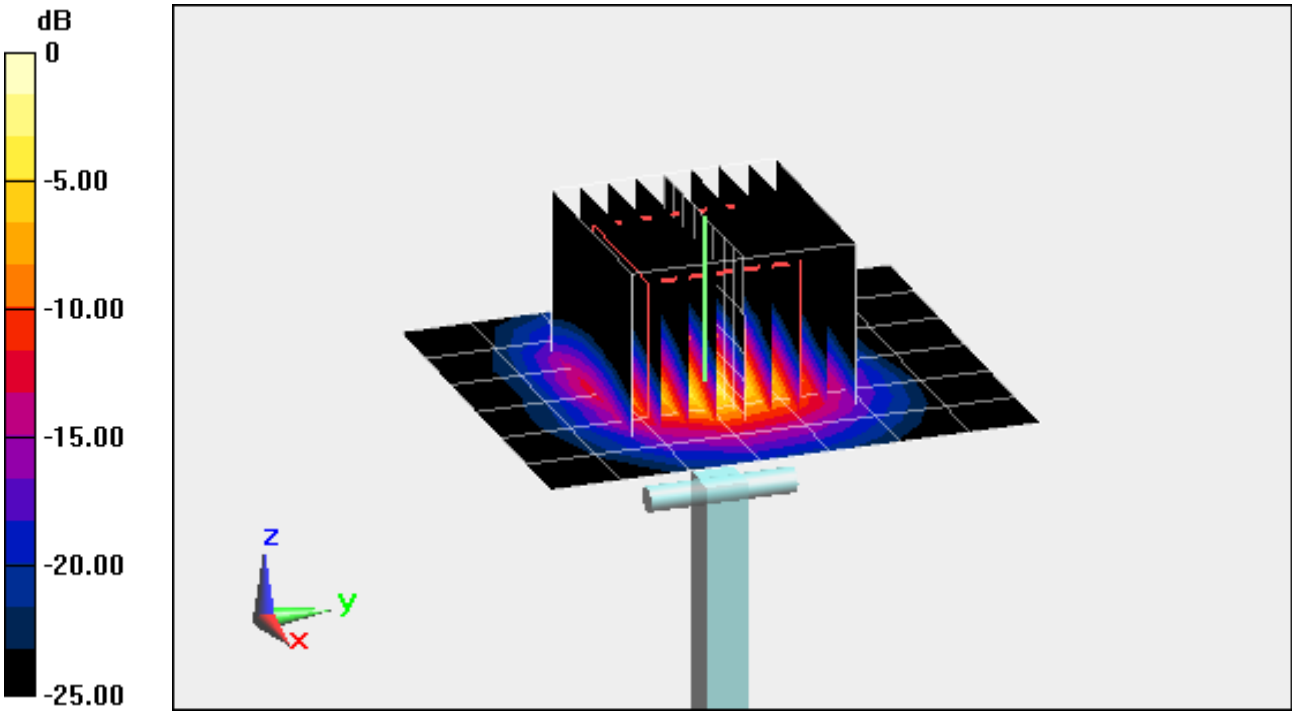
Communication System: UID 0, CW; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body, Medium parameters used:
f = 5500 MHz; σ = 5.67 S/m; ε_r = 47.672; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-05-2015; Ambient Temp: 23.1°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3589; ConvF(3.76, 3.76, 3.76); Calibrated: 1/29/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: ELI Front; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5500 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 36.8 W/kg
SAR(1 g) = 7.60 W/kg
Deviation = -3.92%



0 dB = 20.4 W/kg = 13.10 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1057

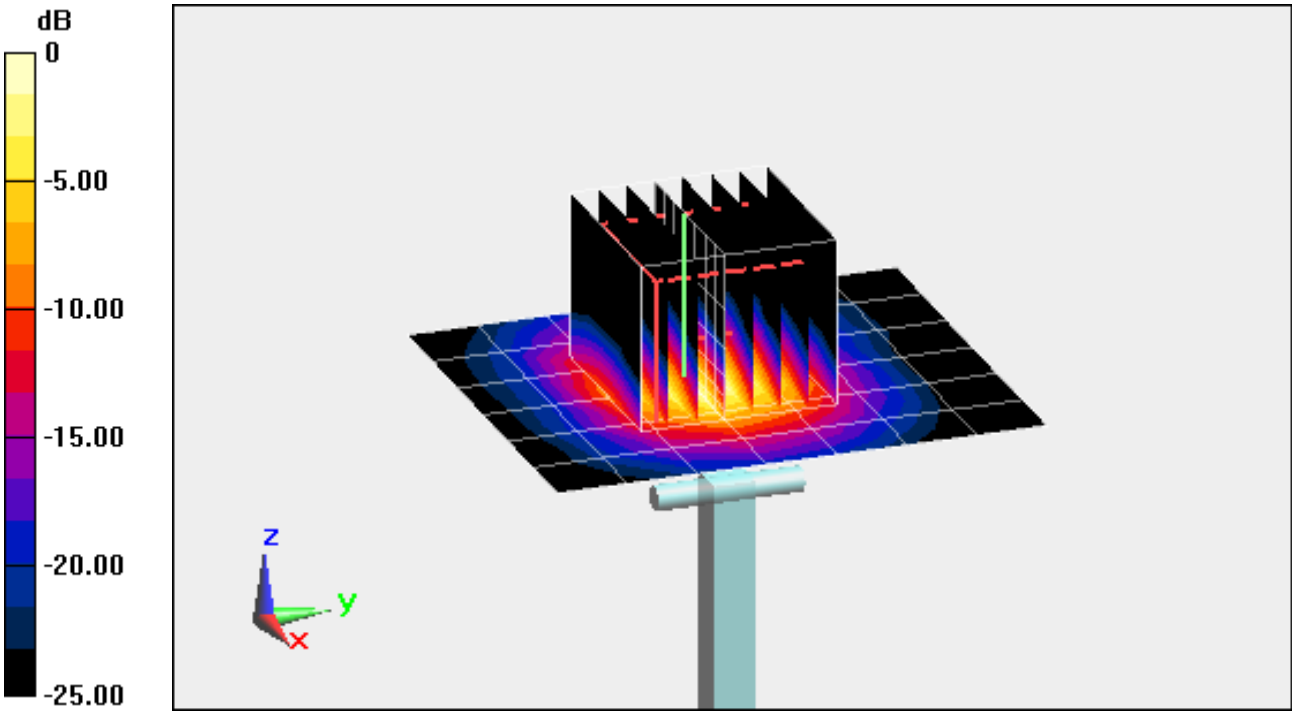
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body, Medium parameters used:
f = 5600 MHz; σ = 5.819 S/m; ε_r = 47.443; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-05-2015; Ambient Temp: 23.1°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3589; ConvF(3.81, 3.81, 3.81); Calibrated: 1/29/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: ELI Front; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5600 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 40.1 W/kg
SAR(1 g) = 7.54 W/kg
Deviation = -5.99%



0 dB = 18.8 W/kg = 12.74 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1057

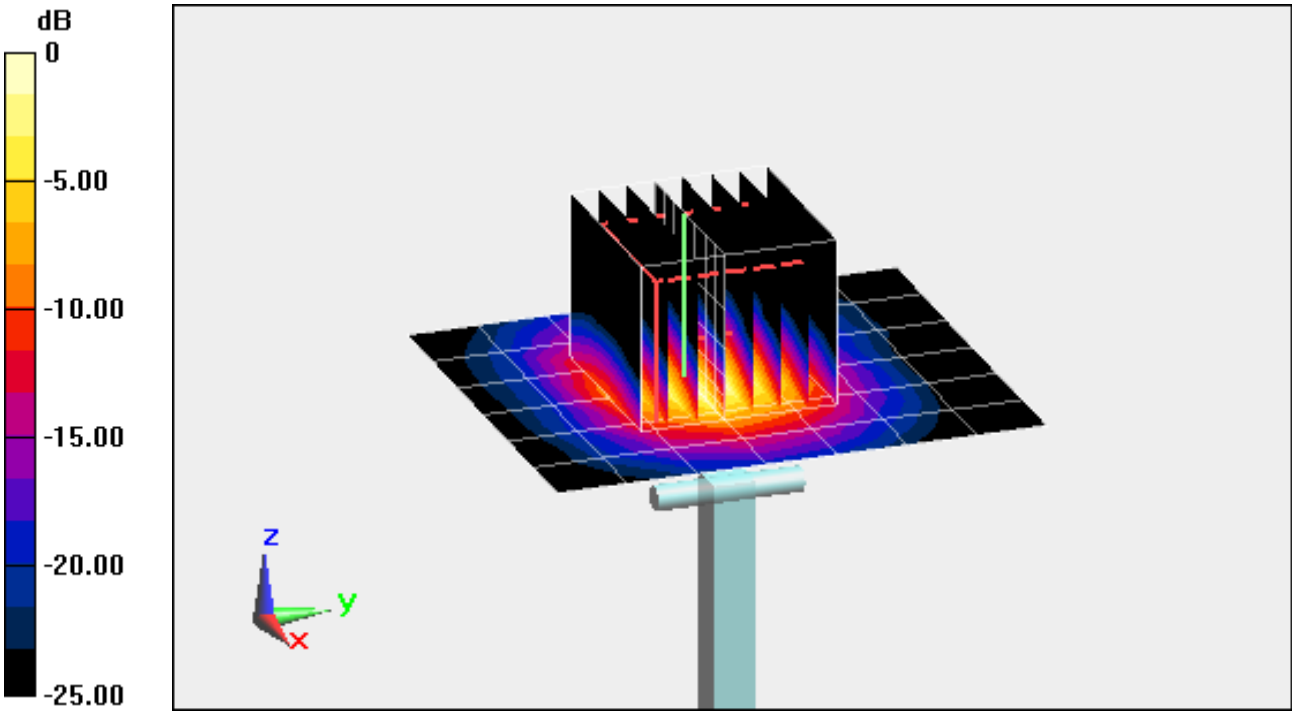
Communication System: UID 0, CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body, Medium parameters used:
f = 5800 MHz; σ = 6.115 S/m; ε_r = 46.995; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-05-2015; Ambient Temp: 23.1°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3589; ConvF(3.97, 3.97, 3.97); Calibrated: 1/29/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: ELI Front; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5800 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 34.8 W/kg
SAR(1 g) = 7.14 W/kg
Deviation = -3.90%



0 dB = 17.6 W/kg = 12.46 dBW/kg