TEST REPORT

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1. Report No : DRRFCC1904-0044(1)

2. Customer

   • Name : LG Electronics USA, Inc.

   • Address : 1000 Sylvan Ave. Englewood Cliffs, New Jersey, United States 07632

3. Use of Report : FCC Original Grant

4. Product Name / Model Name : Mobile Phone / LM-X525EAW

   FCC ID : ZNFX525EAW

5. Test Method Used : IEEE 1528-2013, FCC SAR KDB Publications (Details in test report)

   Test Specification : CFR §2.1093

6. Date of Test : 2019.03.25 ~ 2019.04.04

7. Testing Environment : Refer to appended test report.

8. Test Result : Refer to attached test report.

Affirmation	Tested by Name : HoSik Sim (signature)	Reviewed by Name : HakMin Kim (signature)

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2019 . 04 . 25 .

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Test Report Version

Test Report No.	Date	Description
DRRFCC1904-0044	Apr. 12, 2019	Initial issue
DRRFCC1904-0044(1)	Apr. 25, 2019	Revise of Table 8.3.1

Table of Contents

1. DESCRIPTION OF DEVICE

1.1 General Information

EUT type	Mobile Phone				
FCC ID	ZNFX525EAW				
Equipment model name	LM-X525EAW				
Equipment add model name	LMX525EAW, X525EAW, LM-X520EMW, LMX520EMW, X520EMW				
Equipment serial no.	Identical prototype				
Mode(s) of Operation	GSM 850, GSM 1900, WCDMA 850, WCDMA 1900, 2.4 G W-LAN (802.11b/g/n-HT20), 5 G W-LAN (802.11a/n-HT20/n-HT40/ac-VHT20/ac-VHT40/ac-VHT80), Bluetooth				
	Band	**Mode**	**Operating Modes**	**Bandwidth**	**Frequency**
TX Frequency Range	GSM 850	GSM/GPRS/EDGE	Voice/Data	-	824.2 ~ 848.8 MHz
	GSM 1900	GSM/GPRS/EDGE	Voice/Data	-	1850.2 ~ 1909.8 MHz
	WCDMA 850	WCDMA	Voice/Data	-	826.4 ~ 846.6 MHz
	WCDMA 1900	WCDMA	Voice/Data	-	1852.4 ~ 1907.6 MHz
	2.4 GHz W-LAN	802.11b/g/n	Voice/Data	HT20	2412 ~ 2472 MHz
	5.2 GHz W-LAN	802.11a/n/ac	Voice/Data	HT20/VHT20	5180 ~ 5240 MHz
		802.11n/ac	Voice/Data	HT40/VHT40	5190 ~ 5230 MHz
		802.11ac	Voice/Data	VHT80	5210 MHz
	5.3 GHz W-LAN	802.11a/n/ac	Voice/Data	HT20/VHT20	5260 ~ 5320 MHz
		802.11n/ac	Voice/Data	HT40/VHT40	5270 ~ 5310 MHz
		802.11ac	Voice/Data	VHT80	5290 MHz
	5.6 GHz W-LAN	802.11a/n/ac	Voice/Data	HT20/VHT20	5500 ~ 5720 MHz
		802.11n/ac	Voice/Data	HT40/VHT40	5510 ~ 5710 MHz
		802.11ac	Voice/Data	VHT80	5530 ~ 5690 MHz
	5.8 GHz W-LAN	802.11a/n/ac	Voice/Data	HT20/VHT20	5745 ~ 5825 MHz
		802.11n/ac	Voice/Data	HT40/VHT40	5755 ~ 5795 MHz
		802.11ac	Voice/Data	VHT80	5775 MHz
	Bluetooth	-	Data	-	2402 ~ 2480 MHz
RX Frequency Range	GSM 850	GSM/GPRS/EDGE	Voice/Data	-	869.2 ~ 893.8 MHz
	GSM 1900	GSM/GPRS/EDGE	Voice/Data	-	1930.2 ~ 1989.8 MHz
	WCDMA 850	WCDMA	Voice/Data	-	871.4 ~ 891.6 MHz
	WCDMA 1900	WCDMA	Voice/Data	-	1932.4 ~ 1987.6 MHz
	2.4 GHz W-LAN	802.11b/g/n	Voice/Data	HT20	2412 ~ 2472 MHz
	5.2 GHz W-LAN	802.11a/n/ac	Voice/Data	HT20/VHT20	5180 ~ 5240 MHz
		802.11n/ac	Voice/Data	HT40/VHT40	5190 ~ 5230 MHz
		802.11ac	Voice/Data	VHT80	5210 MHz
	5.3 GHz W-LAN	802.11a/n/ac	Voice/Data	HT20/VHT200	5260 ~ 5320 MHz
		802.11n/ac	Voice/Data	HT40/VHT40	5270 ~ 5310 MHz
		802.11ac	Voice/Data	VHT80	5290 MHz
	5.6 GHz W-LAN	802.11a/n/ac	Voice/Data	HT20/VHT20	5500 ~ 5720 MHz
		802.11n/ac	Voice/Data	HT40/VHT40	5510 ~ 5710 MHz
		802.11ac	Voice/Data	VHT80	5530 ~ 5690 MHz
	5.8 GHz W-LAN	802.11a/n/ac	Voice/Data	HT20/VHT20	5745 ~ 5825 MHz
		802.11n/ac	Voice/Data	HT40/VHT40	5755 ~ 5795 MHz
		802.11ac	Voice/Data	VHT80	5775 MHz
	Bluetooth	-	Data	-	2402 ~ 2480 MHz

SAR Summary Table

Equipment Class	Band	Reported SAR			
		1g SAR (W/kg)			10g SAR (W/kg)
		Head	Body-Worn	Hotspot	Phablet
PCE	GSM 850	0.30	0.49	-	-
PCE	GPRS 850	0.35	0.55	0.55	-
PCE	GSM 1900	0.17	0.39	-	-
PCE	GPRS 1900	0.26	0.56	0.56	-
PCE	WCDMA 850	0.38	0.64	0.66	-
PCE	WCDMA 1900	0.37	0.82	0.82	-
DTS	2.4 GHz W-LAN	0.56	0.16	0.16	-
U-NII-1	5.2 GHz W-LAN	-	-	0.42	-
U-NII-2A	5.3 GHz W-LAN	0.54	0.39	-	1.03
U-NII-2C	5.6 GHz W-LAN	0.54	0.39	-	0.94
U-NII-3	5.8 GHz W-LAN	0.44	0.47	0.47	1.03
DSS	Bluetooth	0.13	0.03	0.03	-
Simultaneous SAR per KDB 690783 D01v01r03		0.94	1.31	1.31	-

FCC Equipment Class	Licensed Portable Transmitter Held to Ear (PCE) Part 15 Spread Spectrum Transmitter(DSS) Digital Transmission System(DTS) Unlicensed National Information Infrastructure (UNII)
Date(s) of Tests	2019.03.25 ~ 2019.04.04
Antenna Type	Internal Antenna
Functions	● GSM/GPRS/EDGE (GPRS/EDGE Class: 12) supported. * DTM not supported. ● No simultaneous transmission between BT & 2.4GHz WLAN ● Simultaneous transmission between [GSM, WCDMA voice & WLAN], [GPRS, WCDMA & WLAN]. ● VoIP is supported. ● W-LAN 2.4GHz is supported Hotspot. ● W-LAN 5 GHz is supported Hotspot in UNII B1, B3.

1.2 Power Reduction for SAR

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

1.3 Nominal and Maximum Output Power Specifications

The Nominal and Maximum Output Power Specifications are in section 9 of this test report.

1.4 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. A diagram showing the location of the device of the device antenna can be found in ZNFX525EAW_Antenna Location. Since the diagonal dimension of this device is > 160 mm and < 200 mm. it is considered a "phablet".

Mode	Device Sides for SAR Testing					
	Top	Bottom	Front	Rear	Right	Left
GSM/GPRS/EDGE 850	X	O	O	O	O	O
GSM/GPRS/EDGE 1900	X	O	O	O	X	O
WCDMA 850	X	O	O	O	O	O
WCDMA 1900	X	O	O	O	X	O
2.4G W-LAN	O	X	O	O	X	O
5G W-LAN	O Note 2	X	O	O	X	O Note 2
Bluetooth	O	X	O	O	X	O

Note 1: Particular DUT edges were not required to be evaluated for Hotspot SAR or Phablet SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 648474 D04v01r03.The antenna document shows the distances between the transmit antennas and the edges of the device.

Note 2: WLAN Hotspot UNII-1, 3 supported.

Note 3: O - Test / X - Not test.

Note 4: This DUT has NFC operations. The NFC antenna is integrated into the back side.
The SAR tests were performed with NFC antenna already incorporated.
A diagram showing the location of the device antenna can be found in ZNFX525EAW_Antenna Location.

1.5 Simultaneous Transmission Capabilities

The Simultaneous Transmission Capabilities are in section 12 of this test report.

1.6 Miscellaneous SAR Test Considerations

(A) WIFI/BT

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

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

Per FCC KDB 447498 D01v06, the 1g SAR exclusion threshold for distances < 50 mm is defined by the following equation:

$$\frac{Max\ Power\ of\ Channel\ (mW)}{Test\ Separation\ Dist\ (mm)} * \sqrt{Frequency(GHz)} \leq 3.0$$

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, body-worn and hotspot **Bluetooth SAR were not required; [(13/10)*√2.480] = 2.0 (< 3.0)**. Per KDB Publication 447498 D01 v06, the maximum power of the channel was rounded to the nearest mW before calculation.

Per FCC KDB 447498 D01v06, the 10g SAR exclusion threshold for distance < 50 mm is defined by the following equation:

$$\frac{Max\ Power\ of\ Channel\ (mW)}{Test\ Separation\ Dist\ (mm)} * \sqrt{Frequency(GHz)} \leq 7.5$$

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, phablet **Bluetooth SAR was not required; [(13/5)*√2.480] = 4.0 (< 7.5)**. Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

Per FCC KDB Publication 648474 D04v01r03, this device is considered a “phablet” since the diagonal dimension is greater than 160 mm and less than 200 mm. Phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg. Because wireless router operations are not supported for U-NII-2A & U-NII-2C & U-NII-3 WLAN(CH 165), phablet SAR tests were performed. Phablet SAR was not evaluated for 2.4 GHz WLAN operations since wireless router 1g SAR was < 1.2 W/kg.

(B) Licensed Transmitter(s)

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

Per FCC KDB Publication 648474 D04 v01r03, this device is considered a “phablet” since the diagonal dimension is greater than 160 mm and less than 200 mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

1.7 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01 (3G SAR Procedures)
- FCC KDB Publication 941225 D06v02r01(Hotspot Mode)
- FCC KDB Publication 248227 D01v02r02 (802.11 Wi-Fi SAR)
- FCC KDB Publication 447498 D01v06 (General RF Exposure Guidance)
- FCC KDB Publication 648474 D04v01r03 (Handset SAR)
- FCC KDB Publication 690783 D01v01r03 (SAR Listings on Grants)
- FCC KDB Publication 865664 D01v01r04 (SAR Measurement 100 MHz to 6 GHz)
- FCC KDB Publication 865664 D02v01r02 (RF Exposure Reporting)
- October 2013 TCB Workshop Notes (GPRS testing criteria)
- April 2015 TCB Workshop Notes (Simultaneous transmission summation clarified)
- October 2016 TCB Workshop Notes (Bluetooth Duty Factor)

1.8 Device Serial Numbers

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

2. INTROCUCTION

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.

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. 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. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring 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 National Council on Radiation Protection and Measurements (NCRP) in Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86 NCRP, 1986, Bethesda, MD 20814. 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.

SAR Definition

Specific Absorption Rate (SAR) 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 Fig. 2.1)

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

Fig. 2.1 SAR Mathematical Equation

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 relations 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.

3. DOSIMETRIC ASSESSMENT

3.1 Measurement Procedure

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

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 3.1) and IEEE1528-2013.

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.

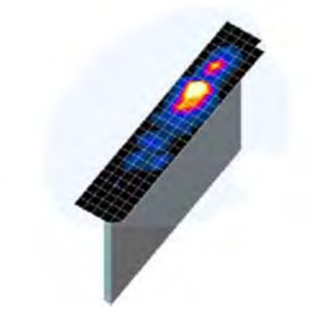

Figure 3.1
Sample SAR Area Scan

3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 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.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 mm ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2)$ mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ $1.5 \cdot \Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Table 3.1 Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*

4. DEFINITION OF REFERENCE POINTS

4.1 Ear Reference Point

Figure 4.1 shows the front, back and side views of the SAM Twin Phantom. The point"M" is the reference point for the center of the mouth, "LE" is the left ear reference point(ERP), and "RE" is the right ERP. The ERPs are 15 mm posterior to the entrance to the Ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 4.1. The plane Passing, through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck- Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 4.1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning.

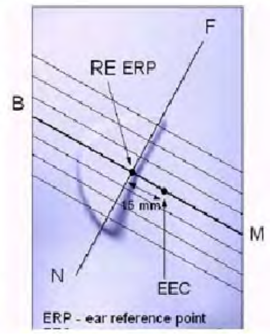

Figure 4.1 Close-up side view of ERP

4.2 Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Fig. 4.3). The "test device reference point" was than located at the same level as the center of the ear reference point. The test device was positioned so that the "vertical centerline" was bisecting the front surface of the handset at it's top and bottom edges, positioning the "ear reference point" on the outer surface of the both the left and right head phantoms on the ear reference point.

Figure 4.2 Front, back and side view SAM Twin Phantom

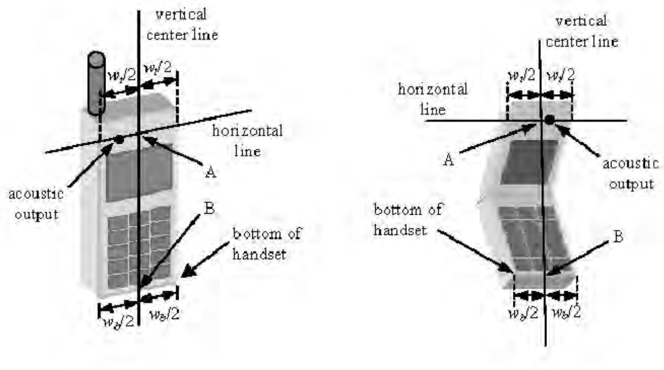

Figure 4.3 Handset Vertical Center & Horizontal Line Reference Points

5. TEST CONFIGURATION POSITIONS FOR HANDSETS

5.1 Device Holder

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

5.2 Positioning for Cheek/Touch

1. The test device was positioned with the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 5.1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

Figure 5.1 Front, Side and Top View of Cheek/Touch Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the plane normal to MB-NF including the line MB (reference plane).
4. The phone was hen rotated around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.
5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, the handset was rotated about the line NF until any point on the handset made contact with a phantom point below the ear (cheek). (See Figure 5.2)

5.3 Positioning for Ear / 15 ° Tilt

With the test device aligned in the "Cheek/Touch Position":

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degree.
2. The phone was then rotated around the horizontal line by 15 degree.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the phone touches the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 5.3).

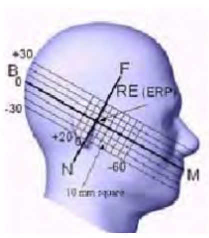

Figure 5.2 Side view w/relevant markings

Figure 5.3 Front, Side and Top View of Ear/15° Position

5.4 Body-Worn Accessory Configurations

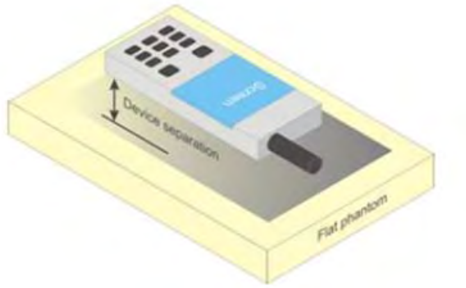

Figure 5.4 Sample Body-Worn Diagram

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 5.4). Per FCC KDB Publication 648474 D04v01r03, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented.
Transmitters that are designed to operate in front of a person’s face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

5.5 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user’s body, SAR compliance for the body is also required. The 1-g body and 10-g extremity SAR Exclusion Thresholds found in KDB Publication 447498 D01v06 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v06, Cell phones (handsets) are not normally designed to be used on extremities or operated in extremity only exposure conditions. The maximum output power levels of handsets generally do not require extremity SAR testing to show compliance. Therefore, extremity SAR was not evaluated for this device.

5.6 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front the front, rear and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. When the same wireless transmission configuration is used for testing body-worn accessory and hotspot mode SAR, respectively, in voice and data mode, SAR results for the most conservative test separation distance configuration may be used to support both SAR conditions.

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

5.7 Phablet Configurations

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

6. RF EXPOSURE LIMITS

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.

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 employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 6.1.SAR Human Exposure Specified in ANSI/IEEE C95.1-1992

	HUMAN EXPOSURE LIMITS	
	General Public Exposure (W/kg) or (mW/g)	Occupational Exposure (W/kg) or (mW/g)
SPATIAL PEAK SAR * (Brain)	1.60	8.00
SPATIAL AVERAGE SAR ** (Whole Body)	0.08	0.40
SPATIAL PEAK SAR *** (Hands / Feet / Ankle / Wrist)	4.00	20.0

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.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

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).

7. FCC MEASUREMENT PROCEDURES

Power measurements were performed using a base station simulator under digital average power.

7.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported SAR. The highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

7.2 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03r01.

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

7.3 SAR Measurement Conditions for WCDMA (UMTS)

7.3.1 Output Power Verification

Maximum output power is measured on the High, Middle and Low channels for each applicable transmission band according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1s”.

Maximum output power is verified on the High, Middle and Low channels according to the general, descriptions in section 5.2 of 3GPP TS 34.121 (release 5), using the appropriate RMC with TPC,(transmit power control) set to all “1s” or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

7.3.2 Head SAR Measurements for Handsets

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than 0.25 dB higher than that measured in12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

7.3.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all“1s”.

7.3.4 Release 5 HSDPA Data Devices

The following procedures are applicable to HSDPA data devices operating under 3GPP Release 5. SAR is required for devices in body-worn accessory and other body exposure conditions, including handsets and data modems operating in various electronic devices. HSDPA operates in conjunction with WCDMA and requires an active DPCCH. The default test configuration is to measure SAR in WCDMA with HSDPA remain inactive, to establish a radio link between the test device and a communication test set using a 12.2 kbps RMC configured in Test Loop Mode 1. SAR for HSDPA is selectively measured using the highest reported SAR configuration in WCDMA, with an FRC in H-set 1 and a 12.2 kbps RMC. SAR is selectively confirmed for other physical channel configurations (DPCCH & DPDCHn) according to exposure conditions, device operating capabilities and maximum output power specified for production units, including tune-up tolerance by applying the 3G SAR test reduction procedures. Maximum output power is verified according to the applicable versions of 3GPP TS 34.121. SAR must be measured based on these maximum output conditions and requirements in KDB Publication 447498, with respect to the UE Categories, and explained in the SAR report. When Maximum Power Reduction (MPR) applies, the implementations must be clearly identified in the SAR report to support test results according to Cubic Metric (CM) and, as appropriate, Enhanced MPR (E-MPR) requirements.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM (dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 (3)	15/15 (3)	64	12/15 (3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$.
Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

Figure 7.1 Table 1

7.3.5 Release 6 HSUPA Data Devices

The following procedures are applicable to HSPA (HSUPA/HSDPA) data devices operating under 3GPP Release 6. SAR is required for devices in body-worn accessory and other body exposure conditions, including handsets and data modems operating in various electronic devices. HSUPA operates in conjunction with WCDMA and HSDPA. SAR is initially measured in WCDMA test configurations with HSPA remain inactive. The default test configuration is to establish a radio link between the test device and a communication test set to configure a 12.2 kbps RMC in Test Loop Mode 1. SAR for HSPA is selectively measured with HS-DPCCH, E-DPCCH and E-DPDCH, all enabled, along with a 12.2 kbps RMC using the highest reported SAR configuration in WCDMA with 12.2 kbps RMC only.
An FRC is configured according to HS-DPCCH Sub-test 1 using H-set 1 and QPSK. HSPA is configured according to E-DCH Sub-test 5 requirements. SAR for other HSPA sub-test configurations is confirmed selectively according to exposure conditions, E-DCH UE Category and maximum output power of production units, including tune-up tolerance by applying the 3G SAR test reduction procedure. Maximum output power is verified according to procedures in applicable versions of 3GPP TS 34.121. SAR must be measured based on these maximum output conditions and requirements in KDB Publication 447498, with respect to the UE Categories for HS-DPCCH and HSPA, and explained in the SAR report. When Maximum Power Reduction (MPR) applies, the implementations must be clearly identified in the SAR report to support test results according to Cubic Metric (CM) and, as appropriate, Enhanced MPR (E-MPR) requirements.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM(2) (dB)	MPR (dB)	AG(4) Index	E-TFCI
1	11/15(3)	15/15(3)	64	11/15(3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}: 47/15 β_{ed2}: 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15(4)	15/15(4)	64	15/15(4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ $A_{hs} = \beta_{hs}/\beta_c = 30/15$ ⇔ $\beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} cannot be set directly; it is set by Absolute Grant Value.

Figure 7.2 Table 2

Note:
1. The manufacturer declares that the HSDPA, HSUPA and DC-HSDPA transmitter's power will not exceed the R99 maximum transmit power in devices based on MTK's HSPA chipset solutions.(WCDMA B5/B2: Please refer to the tune-up procedure about MPR setting 2.)
2. MPR is not applied as shown in Table 2 but it will not exceed R99 maximum transmit power due to MTK's HSPA chipset solution as declared by the manufacturer.

7.3.6 SAR Measurement Conditions for DC-HSDPA

In the following DB 941225 D01v03r01 procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as "otherwise" in the applicable procedures; SAR measurement is required for the secondary mode.

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

7.4 SAR Testing with 802.11 Transmitters

The normal network operating configurations are not suitable for measuring the SAR of 802.11 b/g/n 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 248227D01v02r02 for more details.

7.4.1 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.

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

7.4.2 U-NII and U-NII-2A

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following, with respect to the highest reported SAR and maximum output power specified for production units. The procedures are applied independently to each exposure configuration; for example, head, body, hotspot mode etc.

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, each band is tested independently for SAR.
2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, each band is tested independently for SAR.

7.4.3 U-NII-2C and U-NII-3

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

7.4.4 Initial Test Position Procedure

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

7.4.5 2.4 GHz SAR Test Requirements

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

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
2) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

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

7.4.6 OFDM Transmission Mode and SAR Test Channel Selection

For the 2.4 GHz and 5 GHz bands, when the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a and 802.11n or 802.11g and 802.11n with the same channel bandwidth, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 80211n or 802.11g then 802.11n is used for SAR measurement. When the maximum output power ware the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

7.4.7 Initial Test Configuration Procedure

For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, and lowest data rate. The channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required.
Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured.

7.4.8 Subsequent Test Configuration Procedures

For OFDM configurations, in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure, when applicable. When the highest reported SAR for the initial test configuration, adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power is ≤ 1.2 W/kg, no additional SAR testing for the subsequent test configurations is required.

8. RF CONDUCTED POWERS

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06

8.1 GSM Nominal and Maximum Output Power Spec and Conducted Powers

Band & Mode		Voice[dBm]	Burst Average GMSK [dBm]				Burst Average GMSK [dBm]			
		1 TX Slot	1 TX Slot	2 TX Slot	3 TX Slot	4 TX Slot	1 TX Slot	2 TX Slot	3 TX Slot	4 TX Slot
GSM/GPRS/EDGE 850	Maximum	33.7	33.7	31.2	29.2	28.2	27.2	25.7	23.7	22.7
	Nominal	33.2	33.2	30.7	28.7	27.7	26.7	25.2	23.2	22.2
GSM/GPRSEDGE 1900	Maximum	30.2	30.2	28.2	26.2	25.2	27.2	24.7	22.7	21.7
	Nominal	29.7	29.7	27.7	25.7	24.7	26.7	24.2	22.2	21.2

Table 9.1.1 GSM Nominal and Maximum Output Power Spec

Band	Channel	Maximum Burst-Averaged Output Power(dBm)								
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
		GSM CS 1 Slot	GPRS 1 TX Slot	GPRS 2 TX Slot	GPRS 3 TX Slot	GPRS 4 TX Slot	EDGE 1 TX Slot	EDGE 2 TX Slot	EDGE 3 TX Slot	EDGE 4 TX Slot
GSM850	128	33.5	33.5	30.8	29.2	28.2	26.9	25.4	23.4	22.2
	190	33.5	33.5	30.8	29.2	28.2	26.9	25.3	23.3	22.2
	251	33.6	33.6	30.7	29.1	28.1	26.8	25.3	23.3	22.1
PCS 1900	512	30.2	30.2	27.7	26.1	25.1	27.0	24.7	22.6	21.5
	661	30.2	30.2	27.7	26.1	25.1	26.8	24.6	22.5	21.5
	810	30.2	30.2	27.6	26.0	25.0	26.8	24.6	22.4	21.4
Band	Channel	Calculated Maximum Frame-Averaged Output Power(dBm)								
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
		GSM CS 1 Slot	GPRS 1 TX Slot	GPRS 2 TX Slot	GPRS 3 TX Slot	GPRS 4 TX Slot	EDGE 1 TX Slot	EDGE 2 TX Slot	EDGE 3 TX Slot	EDGE 4 TX Slot
GSM850	128	24.47	24.47	24.78	24.94	25.19	17.87	19.38	19.14	19.19
	190	24.47	24.47	24.78	24.94	25.19	17.87	19.28	19.04	19.19
	251	24.57	24.57	24.68	24.84	25.09	17.77	19.28	19.04	19.09
PCS 1900	512	21.17	21.17	21.68	21.84	22.09	17.97	18.68	18.34	18.49
	661	21.17	21.17	21.68	21.84	22.09	17.77	18.58	18.24	18.49
	810	21.17	21.17	21.58	21.74	21.99	17.77	18.58	18.14	18.39
GSM850	Frame Avg. Targets:	24.17	24.17	24.68	24.44	24.69	17.67	19.18	18.94	19.19
PCS 1900		20.67	20.67	21.68	21.44	21.69	17.67	18.18	17.94	18.19

Table 9.1.2 GSM Conducted Power

Note:

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

GPRS Multislot class: 12 (max 4 TX Uplink slots)
EDGE Multislot class: 12 (max 4 TX Uplink slots)
DTM Multislot Class: N/A

Figure 8.1 Power Measurement Setup

8.2 WCDMA Nominal and Maximum Output Power Spec and Conducted Powers

3GPP Release Version	Mode			Cellular Band (dBm)	PCS Band (dBm)	3GPP MPR (dB)
99	WCDMA	Voice	Maximum	25.2	23.7	-
			Nominal	24.7	23.2	
5	HSDPA	Subtest 1	Maximum	24.2	22.7	1
			Nominal	23.7	22.2	
5		Subtest 2	Maximum	24.2	22.7	1
			Nominal	23.7	22.2	
5		Subtest 3	Maximum	23.7	22.2	1.5
			Nominal	23.2	21.7	
5		Subtest 4	Maximum	23.7	22.2	1.5
			Nominal	23.2	21.7	
6	HSUPA	Subtest 1	Maximum	22.2	20.7	3
			Nominal	21.7	20.2	
6		Subtest 2	Maximum	22.2	20.7	3
			Nominal	21.7	20.2	
6		Subtest 3	Maximum	23.2	21.7	2
			Nominal	22.7	21.2	
6		Subtest 4	Maximum	21.7	20.2	3.5
			Nominal	21.2	19.7	
6		Subtest 5	Maximum	23.2	21.7	2
			Nominal	22.7	21.2	
8	DC-HSDPA	Subtest 1	Maximum	24.2	22.7	1
			Nominal	23.7	22.2	
8		Subtest 2	Maximum	24.2	22.7	1
			Nominal	23.7	22.2	
8		Subtest 3	Maximum	23.7	22.2	1.5
			Nominal	23.2	21.7	
8		Subtest 4	Maximum	23.7	22.2	1.5
			Nominal	23.2	21.7	

Table 9.2.1 WCDMA Nominal and Maximum Output Power Spec

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band (dBm)			PCS Band (dBm)			3GPP MPR (dB)
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	25.02	25.00	24.98	23.65	23.56	23.49	-
99		12.2 kbps AMR	24.99	24.98	24.97	23.61	23.52	23.45	-
5	HSDPA	Subtest 1	24.03	24.02	23.99	22.65	22.55	22.48	1
5		Subtest 2	24.00	23.99	23.96	22.62	22.51	22.44	1
5		Subtest 3	23.53	23.50	23.48	22.14	22.01	21.96	1.5
5		Subtest 4	23.51	23.49	23.46	22.12	22.00	21.93	1.5
6	HSUPA	Subtest 1	22.03	22.00	21.96	20.64	20.53	20.46	3
6		Subtest 2	22.01	21.98	21.96	20.64	20.53	20.46	3
6		Subtest 3	23.03	22.99	22.97	21.65	21.54	21.46	2
6		Subtest 4	21.54	21.51	21.49	20.16	20.07	19.99	3.5
6		Subtest 5	23.00	22.97	22.94	21.63	21.52	21.44	2
8	DC-HSDPA	Subtest 1	24.02	24.01	23.95	22.64	22.52	22.44	1
8		Subtest 2	23.98	23.95	23.92	22.61	22.50	22.41	1
8		Subtest 3	23.52	23.44	23.46	22.13	21.98	21.95	1.5
8		Subtest 4	23.50	23.41	23.45	22.10	21.98	21.91	1.5

Table 9.2.2 WCDMA Conducted Power

WCDMA SAR was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03r01. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.

The manufacturer declares that the HSPA transmitter's power will not exceed the R99 maximum transmit power in devices based on MTK's HSPA chipset solutions.(WCDMA B5/B2: Please refer to the tune-up procedure about MPR setting 2.)

DC-HSDPA considerations

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

Figure 8.2 Power Measurement Setup

8.3 WLAN Nominal and Maximum Output Power Spec and Conducted Powers

Band (GHz)	Mode	Ch	Modulated Average[dBm]	
			Maximum	Nominal
2.4	802.11b	1~11	16.5	15.5
		12~13	4.0	3.0
	802.11g (6~12Mbps)	1	14.0	13.0
		2~10	15.5	14.5
		11	14.5	13.5
		12~13	4.0	3.0
	802.11g (18~54Mbps)	1	14.0	13.0
		2~10	15.0	14.0
		11	14.5	13.5
		12~13	4.0	3.0
	802.11n (MCS0~MCS2)	1	12.5	11.5
		2~10	14.0	13.0
		11	13.0	12.0
		12~13	4.0	3.0
	802.11n (MCS3~MCS7)	1	12.5	11.5
		2~10	14.0	13.0
		11	13.0	12.0
		12~13	4.0	3.0

Table 8.3.1 Nominal and Maximum Output Power Spec

Mode	Freq. (MHz)	Channel	IEEE 802.11 (2.4 GHz) Conducted Power [dBm]
802.11b	2412	1	15.26
	2437	**6**	15.55
	2462	11	15.48
	2467	12	3.23
	2472	13	3.48
802.11g	2412	1	13.46
	2437	6	14.65
	2462	11	13.00
	2467	12	3.12
	2472	13	2.96
802.11n (HT-20)	2412	1	11.45
	2437	6	12.59
	2462	11	11.43
	2467	12	2.61
	2472	13	2.48

Table 8.3.2 IEEE 802.11 Average RF Power

Band (GHz)	Mode	Ch	Modulated Average[dBm]	
			Maximum	Nominal
5 (UNII)	802.11a 6~12Mbps	36-44	14.0	13.0
		48-64	15.0	14.0
		100-144	16.0	15.0
		149-165	16.5	15.5
	802.11a 18~54Mbps	36-44	13.0	12.0
		48-64	14.0	13.0
		100-144	15.0	14.0
		149-165	15.5	14.5
	802.11n (20MHz) MCS0~2	36-44	13.0	12.0
		48-64	14.5	13.5
		100-144	15.0	14.0
		149-165	15.5	14.5
	802.11n (20MHz) MCS3~7	36-44	12.0	11.0
		48-64	13.5	12.5
		100-144	14.0	13.0
		149-165	14.5	13.5
	802.11ac (20MHz) MCS0~8	36-44	11.0	10.0
		48-64	12.0	11.0
		100-144	13.0	12.0
		149-165	13.5	12.5
	802.11n (40MHz) MCS0~7	38, 46	11.0	10.0
		54, 62	12.5	11.5
		102-159	13.0	12.0
	802.11ac (40MHz) MCS0~9	38, 46	10.0	9.0
		54, 62	11.5	10.5
		102-159	12.5	11.5
	802.11ac (80MHz) MCS0~9	42	10.5	9.5
		58	11.0	10.0
		106-155	12.5	11.5

Table 8.3.3 Nominal and Maximum Output Power Spec

Mode	Freq. (MHz)	Channel	IEEE 802.11a (5 GHz) Conducted Power [dBm]
802.11a	5180	36	12.56
	5200	40	12.91
	5220	44	13.19
	5240	**48**	**13.58**
	5260	52	13.96
	5280	56	14.52
	5300	60	14.64
	5320	**64**	**14.79**
	5500	100	15.10
	5600	120	15.77
	5660	**132**	**15.79**
	5720	144	15.70
	5745	**149**	**15.89**
	5785	157	15.83
	5825	**165**	**15.87**

Table 8.3.4 IEEE 802.11a Average RF Power

Mode	Freq. (MHz)	Channel	IEEE 802.11n HT20 (5 GHz) Conducted Power [dBm]
802.11n (HT-20)	5180	36	11.84
	5200	40	12.06
	5220	44	12.78
	5240	48	13.10
	5260	52	13.46
	5280	56	13.98
	5300	60	13.97
	5320	64	14.25
	5500	100	14.37
	5600	120	14.90
	5660	132	14.86
	5720	144	14.97
	5745	149	15.23
	5785	157	15.31
	5825	165	15.45

Table 8.3.5 IEEE 802.11n HT20 Average RF Power

Mode	Freq. (MHz)	Channel	IEEE 802.11ac VHT20 (5 GHz) Conducted Power [dBm]
802.11ac (VHT-20)	5180	36	10.03
	5200	40	10.41
	5220	44	10.98
	5240	48	11.41
	5260	52	11.80
	5280	56	11.73
	5300	60	11.98
	5320	64	11.97
	5500	100	12.72
	5600	120	12.99
	5660	132	12.94
	5720	144	12.95
	5745	149	13.06
	5785	157	13.31
	5825	165	13.32

Table 8.3.6 IEEE 802.11ac VHT20 Average RF Power

Mode	Freq. (MHz)	Channel	IEEE 802.11n HT40 (5 GHz) Conducted Power [dBm]
802.11n (HT-40)	5190	38	10.05
	5230	46	10.82
	5270	54	11.41
	5310	62	11.96
	5510	102	12.69
	5590	118	12.81
	5670	134	12.88
	5710	142	12.84
	5755	151	12.86
	5795	159	12.94

Table 8.3.7 IEEE 802.11n HT40 Average RF Power

Mode	Freq. (MHz)	Channel	IEEE 802.11ac VHT40 (5 GHz) Conducted Power [dBm]
802.11ac (VHT-40)	5190	38	8.94
	5230	46	9.78
	5270	54	10.61
	5310	62	10.98
	5510	102	11.88
	5590	118	11.95
	5670	134	11.91
	5710	142	11.74
	5755	151	12.14
	5795	159	12.12

Table 8.3.8 IEEE 802.11ac VHT40 Average RF Power

Mode	Freq. (MHz)	Channel	IEEE 802.11ac VHT80 (5 GHz) Conducted Power [dBm]
802.11ac (VHT-80)	5210	42	9.32
	5290	58	10.67
	5530	106	11.75
	5610	122	11.83
	5690	138	11.83
	5775	155	12.10

Table 8.3.9 IEEE 802.11ac VHT80 Average RF Power

Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, duo to an even number of channels, both channels were measured.
- Output Power and SAR is not required for 802.11 g/n HT20/ac VHT20 channels when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjust SAR is ≤ 1.2 W/kg.
- The underlined data rate and channel above were tested for SAR.

The average output powers of this device were tested by below configuration.

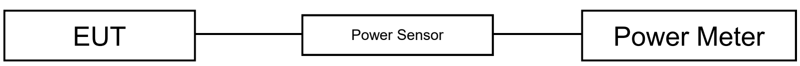

Figure 8.3 Power Measurement Setup

8.4 Bluetooth Conducted Powers

Burst Modulated Average[dBm]		
Bluetooth 1 Mbps	Maximum	11.0
	Nominal	10.0
Bluetooth 2 Mbps	Maximum	7.5
	Nominal	6.5
Bluetooth 3 Mbps	Maximum	7.5
	Nominal	6.5
Bluetooth LE	Maximum	-1.5
	Nominal	-2.5

Table 8.4.1 Nominal and Maximum Output Power Spec (Burst)

Frame Modulated Average[dBm]		
Bluetooth 1 Mbps	Maximum	9.85
	Nominal	8.85
Bluetooth 2 Mbps	Maximum	6.35
	Nominal	5.35
Bluetooth 3 Mbps	Maximum	6.35
	Nominal	5.35
Bluetooth (LE / 1Mbps)	Maximum	-2.22
	Nominal	-3.22
Bluetooth (LE / 2Mbps)	Maximum	-3.94
	Nominal	-4.94

Table 8.4.2 Nominal and Maximum Output Power Spec (Frame)

Channel	Frequency	Burst AVG Output Power (1Mbps)	Frame AVG Output Power (1Mbps)	Burst AVG Output Power (2Mbps)	Frame AVG Output Power (2Mbps)	Burst AVG Output Power (3Mbps)	Frame AVG Output Power (3Mbps)
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
Low	2402	10.45	9.30	7.45	6.30	7.46	6.31
Mid	2441	10.21	9.06	7.44	6.29	7.45	6.30
High	2480	9.04	7.89	6.09	4.94	6.09	4.94

Table 8.4.3 Bluetooth Burst and Frame Average RF Power

Channel	Frequency	Burst AVG Output Power(LE / 1Mbps)	Frame AVG Output Power(LE / 1Mbps)	Burst AVG Output Power(LE / 2Mbps)	Frame AVG Output Power(LE / 2Mbps)
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)
Low	2402	-2.67	-3.39	-2.67	-5.11
Mid	2440	-1.54	-2.26	-1.53	-3.97
High	2480	-3.19	-3.91	-3.17	-5.61

Table 8.4.4 Bluetooth LE Burst and Frame Average RF Power

- **Bluetooth Conducted Powers procedures**

1. Bluetooth (BDR, EDR)
   1) Enter DUT mode in EUT and operate it.
      When it operating, The EUT is transmitting at maximum power level and duty cycle fixed.
   2) Instruments and EUT were connected like Figure 8.4.1(A).
   3) The maximum output powers of BDR(1 Mbps), EDR(2, 3 Mbps) and each frequency were set by a Bluetooth Tester.
   4) Power levels were measured by a Power Meter.

2. Bluetooth (LE)
   1) Enter LE mode in EUT and operate it.
      When it operating, The EUT is transmitting at maximum power level and duty cycle fixed.
   2) Instruments and EUT were connected like Figure 8.4.1(B).
   3) The average conducted output powers of LE and each frequency can measurement according to setting program in EUT.
   4) Power levels were measured by a Power Meter.

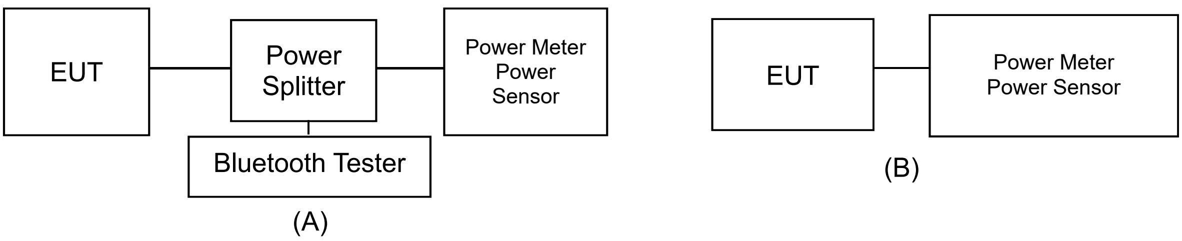

Figure 8.4.1 Average Power Measurement Setup

- **Bluetooth Transmission Plot**

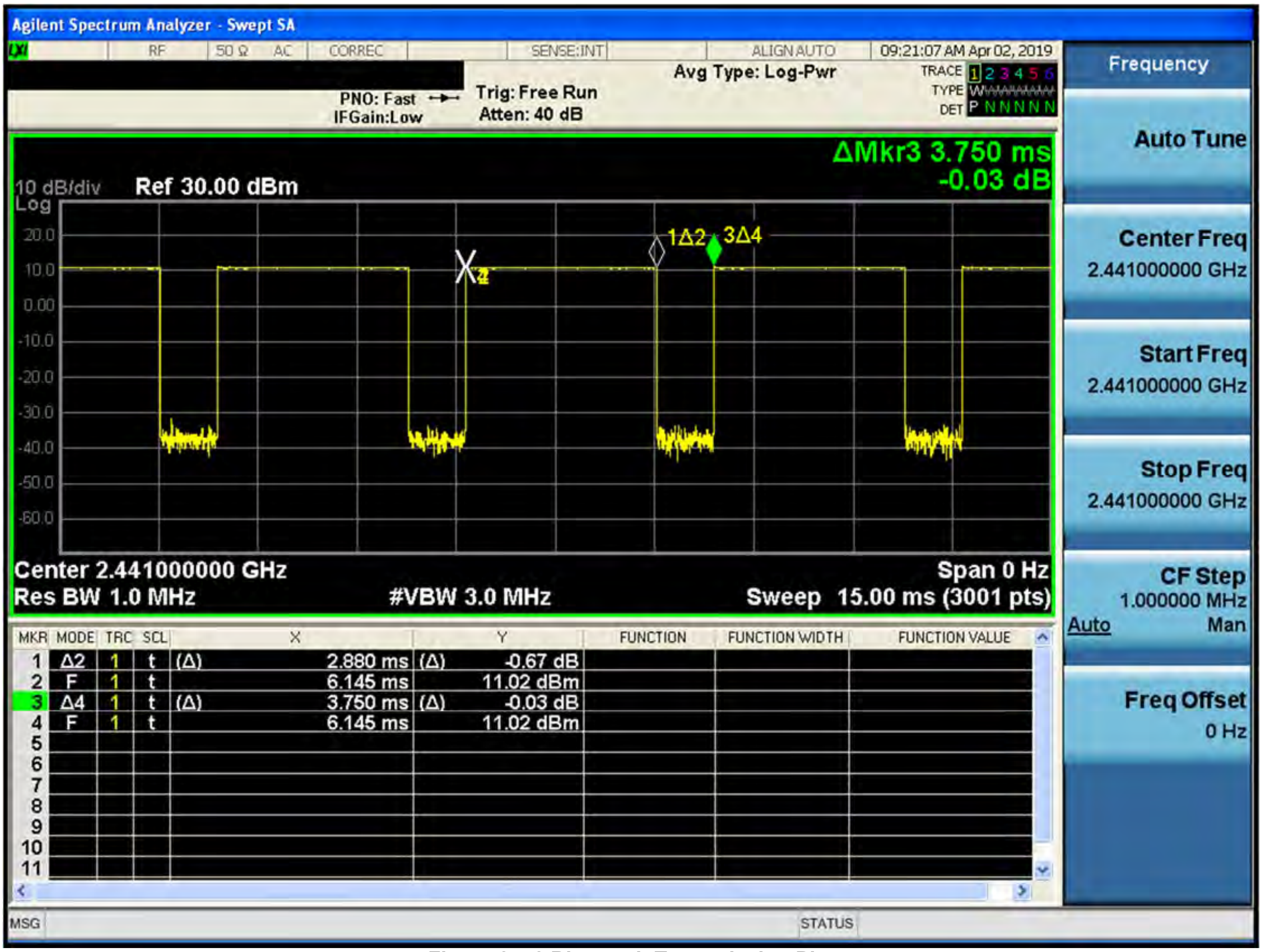

Figure 8.4.2 Bluetooth Transmission Plot

- **Bluetooth Duty Cycle Calculation**

Duty Cycle = Pulse/Period * 100% = (2.880/3.750) * 100 = 76.8%

9. SYSTEM VERIFICATION

9.1 Tissue Verification

MEASURED TISSUE PARAMETERS										
Date(s)	Tissue Type	Ambient Temp.[°C]	Liquid Temp.[°C]	Measured Frequency [MHz]	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	Er Deviation [%]	σ Deviation [%]
Apr. 01. 2019	835 Head	21.4	21.2	824.2	41.552	0.899	41.638	0.883	0.21	-1.78
				835.0	41.500	0.900	41.508	0.893	0.02	-0.78
				836.6	41.500	0.901	41.494	0.895	-0.01	-0.67
				848.8	41.500	0.914	41.320	0.906	-0.43	-0.88
Apr. 01. 2019	835 Body	21.4	21.6	824.2	55.243	0.969	54.751	0.978	-0.89	0.93
				835.0	55.200	0.970	54.668	0.990	-0.96	2.06
				836.6	55.197	0.971	54.653	0.992	-0.99	2.16
				848.8	55.160	0.986	54.562	1.006	-1.08	2.03
Apr. 02. 2019	835 Head	21.2	21.5	826.4	41.542	0.899	41.631	0.884	0.21	-1.67
				835.0	41.500	0.900	41.525	0.892	0.06	-0.89
				836.6	41.500	0.901	41.508	0.894	0.02	-0.78
				846.6	41.500	0.912	41.366	0.903	-0.32	-0.99
Apr. 02. 2019	835 Body	21.2	21.6	826.4	55.235	0.969	54.653	0.979	-1.05	1.03
				835.0	55.200	0.970	54.586	0.989	-1.11	1.96
				836.6	55.197	0.971	54.571	0.991	-1.13	2.06
				846.6	55.166	0.984	54.498	1.002	-1.21	1.83
Apr. 03. 2019	1900 Head	21.6	21.3	1850.2	40.000	1.400	40.174	1.355	0.43	-3.21
				1880.0	40.000	1.400	40.016	1.383	0.04	-1.21
				1900.0	40.000	1.400	39.886	1.400	-0.28	0.00
				1909.8	40.000	1.400	39.829	1.408	-0.43	0.57
Apr. 03. 2019	1900 Body	21.6	21.5	1850.2	53.300	1.520	55.293	1.486	3.74	-2.24
				1880.0	53.300	1.520	55.191	1.514	3.55	-0.39
				1900.0	53.300	1.520	55.093	1.528	3.36	0.53
				1909.8	53.300	1.520	55.049	1.535	3.28	0.99
Apr. 04. 2019	1900 Head	21.3	21.7	1852.4	40.000	1.400	39.746	1.359	-0.63	-2.93
				1880.0	40.000	1.400	39.586	1.385	-1.04	-1.07
				1900.0	40.000	1.400	39.452	1.401	-1.37	0.07
				1907.6	40.000	1.400	39.404	1.407	-1.49	0.50
Apr. 04. 2019	1900 Body	21.3	21.5	1852.4	53.300	1.520	55.354	1.488	3.85	-2.11
				1880.0	53.300	1.520	55.252	1.513	3.66	-0.46
				1900.0	53.300	1.520	55.147	1.527	3.47	0.46
				1907.6	53.300	1.520	55.113	1.532	3.40	0.79

MEASURED TISSUE PARAMETERS										
Date(s)	Tissue Type	Ambient Temp.[°C]	Liquid Temp.[°C]	Measured Frequency [MHz]	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	Er Deviation [%]	σ Deviation [%]
Mar. 25. 2019	2450 Head	20.4	20.8	2402.0	39.282	1.757	39.989	1.755	1.80	-0.11
				2412.0	39.265	1.766	39.970	1.769	1.80	0.17
				2437.0	39.222	1.788	39.952	1.801	1.86	0.73
				2441.0	39.215	1.792	39.946	1.806	1.86	0.78
				2450.0	39.200	1.800	39.933	1.816	1.87	0.89
				2462.0	39.184	1.813	39.908	1.827	1.85	0.77
				2467.0	39.177	1.818	39.890	1.831	1.82	0.72
				2472.0	39.171	1.823	39.865	1.835	1.77	0.66
				2480.0	39.160	1.832	39.819	1.842	1.68	0.55
Mar. 25. 2019	2450 Body	20.4	21.0	2402.0	52.764	1.904	53.611	1.907	1.61	0.16
				2412.0	52.751	1.914	53.591	1.924	1.59	0.52
				2437.0	52.717	1.938	53.573	1.963	1.62	1.29
				2441.0	52.712	1.941	53.569	1.968	1.63	1.39
				2450.0	52.700	1.950	53.559	1.977	1.63	1.38
				2462.0	52.685	1.967	53.539	1.987	1.62	1.02
				2467.0	52.678	1.974	53.523	1.991	1.60	0.86
				2472.0	52.672	1.981	53.504	1.994	1.58	0.66
				2480.0	52.662	1.993	53.471	2.000	1.54	0.35
Mar. 26. 2019	5200 Body	20.6	20.8	5180.0	49.041	5.276	48.544	5.116	-1.01	-3.03
				5190.0	49.028	5.288	48.516	5.128	-1.04	-3.03
				5200.0	49.014	5.299	48.487	5.143	-1.08	-2.94
				5210.0	49.001	5.311	48.468	5.157	-1.09	-2.90
				5220.0	48.987	5.323	48.451	5.170	-1.09	-2.87
				5230.0	48.974	5.334	48.434	5.182	-1.10	-2.85
				5240.0	48.960	5.346	48.410	5.194	-1.12	-2.84
Mar. 27. 2019	5300 Head	20.8	21.1	5260.0	35.940	4.720	35.639	4.663	-0.84	-1.21
				5270.0	35.930	4.730	35.622	4.677	-0.86	-1.12
				5280.0	35.920	4.740	35.618	4.688	-0.84	-1.10
				5290.0	35.910	4.750	35.613	4.696	-0.83	-1.14
				5300.0	35.900	4.760	35.590	4.705	-0.86	-1.16
				5310.0	35.890	4.770	35.567	4.717	-0.90	-1.11
				5320.0	35.880	4.780	35.553	4.728	-0.91	-1.09
Mar. 27. 2019	5300 Body	20.8	21.2	5260.0	48.933	5.369	48.772	5.516	-0.33	2.74
				5270.0	48.919	5.381	48.742	5.530	-0.36	2.77
				5280.0	48.906	5.393	48.722	5.543	-0.38	2.78
				5290.0	48.892	5.404	48.700	5.553	-0.39	2.76
				5300.0	48.879	5.416	48.676	5.566	-0.42	2.77
				5310.0	48.865	5.428	48.647	5.583	-0.45	2.86
				5320.0	48.851	5.439	48.635	5.599	-0.44	2.94

MEASURED TISSUE PARAMETERS										
Date(s)	Tissue Type	Ambient Temp.[°C]	Liquid Temp.[°C]	Measured Frequency [MHz]	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	Er Deviation [%]	σ Deviation [%]
Mar. 28. 2019	5600 Head	20.5	20.7	5500.0	35.650	4.965	35.227	4.926	-1.19	-0.79
				5510.0	35.635	4.976	35.214	4.936	-1.18	-0.80
				5530.0	35.605	4.997	35.170	4.962	-1.22	-0.70
				5550.0	35.575	5.018	35.145	4.985	-1.21	-0.66
				5580.0	35.530	5.049	35.075	5.019	-1.28	-0.59
				5600.0	35.500	5.070	35.041	5.047	-1.29	-0.45
				5660.0	35.440	5.130	34.950	5.111	-1.38	-0.37
				5670.0	35.430	5.140	34.931	5.119	-1.41	-0.41
				5690.0	35.410	5.160	34.882	5.142	-1.49	-0.35
				5710.0	35.390	5.180	34.855	5.168	-1.51	-0.23
				5720.0	35.380	5.190	34.848	5.176	-1.50	-0.27
Mar. 28. 2019	5600 Body	20.9	21.0	5500.0	48.607	5.650	48.700	5.494	0.19	-2.76
				5510.0	48.594	5.661	48.688	5.507	0.19	-2.72
				5530.0	48.566	5.685	48.665	5.538	0.20	-2.59
				5550.0	48.539	5.708	48.649	5.564	0.23	-2.52
				5580.0	48.499	5.743	48.588	5.601	0.18	-2.47
				5600.0	48.471	5.766	48.565	5.634	0.19	-2.29
				5660.0	48.390	5.836	48.475	5.716	0.18	-2.06
				5670.0	48.376	5.848	48.458	5.725	0.17	-2.10
				5690.0	48.349	5.872	48.425	5.748	0.16	-2.11
				5710.0	48.322	5.895	48.392	5.775	0.14	-2.04
				5720.0	48.309	5.907	48.376	5.785	0.14	-2.07
				5800.0	48.200	6.000	48.240	5.892	0.08	-1.80
Mar. 29. 2019	5800 Head	20.7	20.9	5745.0	35.355	5.215	34.794	5.212	-1.59	-0.06
				5755.0	35.345	5.225	34.780	5.224	-1.60	-0.02
				5775.0	35.325	5.245	34.756	5.242	-1.61	-0.06
				5785.0	35.315	5.255	34.733	5.250	-1.65	-0.10
				5795.0	35.305	5.265	34.706	5.262	-1.70	-0.06
				5800.0	35.300	5.270	34.694	5.269	-1.72	-0.02
				5825.0	35.275	5.296	34.668	5.297	-1.72	0.02
Mar. 29. 2019	5800 Body	20.6	20.9	5745.0	48.275	5.936	48.150	5.807	-0.26	-2.17
				5755.0	48.261	5.947	48.139	5.823	-0.25	-2.09
				5775.0	48.234	5.971	48.121	5.848	-0.23	-2.06
				5785.0	48.220	5.982	48.107	5.858	-0.23	-2.07
				5795.0	48.207	5.994	48.089	5.869	-0.24	-2.09
				5800.0	48.200	6.000	48.079	5.875	-0.25	-2.08
				5825.0	48.166	6.029	48.047	5.900	-0.25	-2.14

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 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.

Measurement Procedure for Tissue verification:

1) The network analyzer and probe system was configured and calibrated.
2) The probe was immersed in the sample which was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
3) The complex admittance with respect to the probe aperture was measured
4) The complex relative permittivity , for example from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{[\ln(b/a)]^2}\int_a^b\int_a^b\int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r'\varepsilon_0)^{1/2}\right]}{r} d\phi' d\rho' d\rho$$

where Y is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

9.2 Test System Verification

Prior to assessment, the system is verified to the ± 10 % of the specifications at using the SAR Dipole kit(s). (Graphic Plots Attached)

Table 9.2.1 System Verification Results (1g)

SYSTEM DIPOLE VERIFICATION TARGET & MEASURED												
SAR System #	Freq. [MHz]	SAR Dipole kits	Date(s)	Tissue Type	Ambient Temp. [°C]	Liquid Temp. [°C]	Probe S/N	Input Power (mW)	1 W Target SAR_{1g} (W/kg)	Measured SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	Deviation [%]
C	835	D835V2, SN:4d159	Apr. 01. 2019	Head	21.4	21.2	3327	250	9.36	2.38	9.52	1.71
C	835	D835V2, SN:4d159	Apr. 01. 2019	Body	21.4	21.6	3327	250	9.56	2.44	9.76	2.09
C	835	D835V2, SN:4d159	Apr. 02. 2019	Head	21.2	21.5	3327	250	9.36	2.32	9.28	-0.85
C	835	D835V2, SN:4d159	Apr. 02. 2019	Body	21.2	21.6	3327	250	9.56	2.46	9.84	2.93
C	1900	D1900V2, SN:5d176	Apr. 03. 2019	Head	21.6	21.3	3327	100	40.7	3.97	39.70	-2.46
C	1900	D1900V2, SN:5d176	Apr. 03. 2019	Body	21.6	21.5	3327	100	39.7	3.86	38.60	-2.77
C	1900	D1900V2, SN:5d176	Apr. 04. 2019	Head	21.3	21.7	3327	100	40.7	3.95	39.50	-2.95
C	1900	D1900V2, SN:5d176	Apr. 04. 2019	Body	21.3	21.5	3327	100	39.7	3.87	38.70	-2.52
D	2450	D2450V2, SN: 920	Mar. 25. 2019	Head	20.4	20.8	3933	100	51.9	5.10	51.00	-1.73
D	2450	D2450V2, SN: 920	Mar. 25. 2019	Body	20.4	21.0	3933	100	52.1	5.05	50.50	-3.07
A	5200	D5GHzV2, SN:1103	Mar. 26. 2019	Body	20.6	20.8	3930	100	75.5	7.42	74.20	-1.72
F	5300	D5GHzV2, SN:1103	Mar. 27. 2019	Head	20.8	21.1	3916	100	82.4	7.87	78.70	-4.49
A	5300	D5GHzV2, SN:1103	Mar. 27. 2019	Body	20.8	21.2	3930	100	74.4	7.77	77.70	4.44
F	5600	D5GHzV2, SN:1103	Mar. 28. 2019	Head	20.5	20.7	3916	100	84.0	8.39	83.90	-0.12
A	5600	D5GHzV2, SN:1103	Mar. 28. 2019	Body	20.9	21.0	3930	100	79.7	7.59	75.90	-4.77
F	5800	D5GHzV2, SN:1103	Mar. 29. 2019	Head	20.7	20.9	3916	100	81.4	7.71	77.10	-5.28
A	5800	D5GHzV2, SN:1103	Mar. 29. 2019	Body	20.6	20.9	3930	100	74.8	7.45	74.50	-0.40

Table 10.2.2 System Verification Results (10g)

SYSTEM DIPOLE VERIFICATION TARGET & MEASURED												
SAR System #	Freq. [MHz]	SAR Dipole kits	Date(s)	Tissue Type	Ambient Temp. [°C]	Liquid Temp. [°C]	Probe S/N	Input Power (mW)	1 W Target SAR_{10g} (W/kg)	Measured SAR_{10g} (W/kg)	1 W Normalized SAR_{10g} (W/kg)	Deviation [%]
A	5300	D5GHzV2, SN:1103	Mar. 27. 2019	Body	20.8	21.2	3930	100	20.9	2.17	21.70	3.83
A	5600	D5GHzV2, SN:1103	Mar. 28. 2019	Body	20.9	21.0	3930	100	22.3	2.12	21.20	-4.93
A	5800	D5GHzV2, SN:1103	Mar. 29. 2019	Body	20.6	20.9	3930	100	20.9	2.06	20.60	-1.44

Note1 : System Verification was measured with input 250 mW, 100 mW and normalized to 1W.
Note2 : Full system validation status and results can be found in Appendix D.

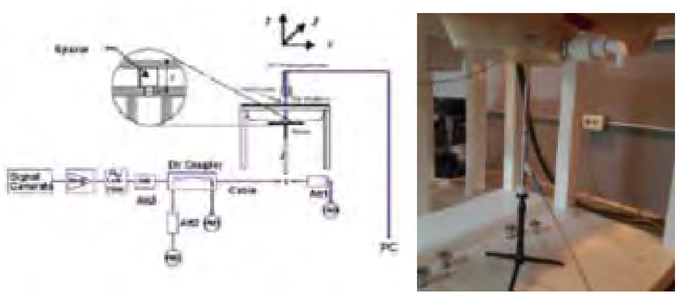

Figure 9.1 Dipole Verification Test Setup Diagram & Photo

10. SAR TEST RESULTS

10.1 Head SAR Results

Table 10.1.1 GSM/GPRS 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/ Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	# of Time Slots	Duty Cycle	1g SAR (W/kg)	Scaling Factor	1g Scaled SAR (W/kg)	Plots #
MHz	Ch													
836.6	190	GSM850	GSM	33.70	33.50	0.160	Left Touch	FCC #1	1	1:8.3	0.245	1.047	0.257	
836.6	190	GSM850	GSM	33.70	33.50	0.050	Right Touch	FCC #1	1	1:8.3	0.288	1.047	**0.302**	A1
836.6	190	GSM850	GSM	33.70	33.50	0.060	Left Tilt	FCC #1	1	1:8.3	0.172	1.047	0.180	
836.6	190	GSM850	GSM	33.70	33.50	0.080	Right Tilt	FCC #1	1	1:8.3	0.171	1.047	0.179	
836.6	190	GSM850	GPRS	28.20	28.20	0.040	Left Touch	FCC #1	4	1:2.075	0.280	1.000	0.280	
836.6	190	GSM850	GPRS	28.20	28.20	0.080	Right Touch	FCC #1	4	1:2.075	0.346	1.000	**0.346**	A2
836.6	190	GSM850	GPRS	28.20	28.20	-0.170	Left Tilt	FCC #1	4	1:2.075	0.192	1.000	0.192	
836.6	190	GSM850	GPRS	28.20	28.20	0.070	Right Tilt	FCC #1	4	1:2.075	0.203	1.000	0.203	
836.6	190	GSM850	GPRS	28.20	28.20	0.010	Right Touch	FCC #1	4	1:2.075	0.344	1.000	0.344	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Note(s):
1. Blue entries represent SIM2(This device supports Dual SIM and is 1 RF Path.) measurements.

Table 10.1.2 PCS/GPRS 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/ Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	# of Time Slots	Duty Cycle	1g SAR (W/kg)	Scaling Factor	1g Scaled SAR (W/kg)	Plots #
MHz	Ch													
1880.0	661	PCS1900	PCS	30.20	30.20	0.040	Left Touch	FCC #1	1	1:8.3	0.173	1.000	**0.173**	A3
1880.0	661	PCS1900	PCS	30.20	30.20	0.070	Right Touch	FCC #1	1	1:8.3	0.099	1.000	0.099	
1880.0	661	PCS1900	PCS	30.20	30.20	0.100	Left Tilt	FCC #1	1	1:8.3	0.117	1.000	0.117	
1880.0	661	PCS1900	PCS	30.20	30.20	0.080	Right Tilt	FCC #1	1	1:8.3	0.106	1.000	0.106	
1880.0	661	PCS1900	GPRS	25.20	25.10	0.080	Left Touch	FCC #1	4	1:2.075	0.251	1.023	**0.257**	A4
1880.0	661	PCS1900	GPRS	25.20	25.10	0.080	Right Touch	FCC #1	4	1:2.075	0.140	1.023	0.143	
1880.0	661	PCS1900	GPRS	25.20	25.10	-0.080	Left Tilt	FCC #1	4	1:2.075	0.165	1.023	0.169	
1880.0	661	PCS1900	GPRS	25.20	25.10	0.120	Right Tilt	FCC #1	4	1:2.075	0.149	1.023	0.152	
1880.0	661	PCS1900	GPRS	25.20	25.10	-0.140	Left Touch	FCC #1	4	1:2.075	0.241	1.023	0.247	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Note(s):
1. Blue entries represent SIM2(This device supports Dual SIM and is 1 RF Path.) measurements.

Table 10.1.3 WCDMA 850 Head SAR

MEASUREMENT RESULTS													
FREQUENCY		Mode/ Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Duty Cycle	1g SAR (W/kg)	Scaling Factor	1g Scaled SAR (W/kg)	Plots #
MHz	Ch												
836.6	4183	WCDMA 850	RMC	25.20	25.00	-0.010	Left Touch	FCC #1	1:1	0.296	1.047	0.310	
836.6	4183	WCDMA 850	RMC	25.20	25.00	0.110	Right Touch	FCC #1	1:1	0.359	1.047	**0.376**	A5
836.6	4183	WCDMA 850	RMC	25.20	25.00	0.140	Left Tilt	FCC #1	1:1	0.240	1.047	0.251	
836.6	4183	WCDMA 850	RMC	25.20	25.00	-0.140	Right Tilt	FCC #1	1:1	0.202	1.047	0.211	
836.6	4183	WCDMA 850	RMC	25.20	25.00	0.060	Right Touch	FCC #1	1:1	0.354	1.047	0.371	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Head 1.6 W/kg (mW/g) averaged over 1 gram					

Note(s):
1. Blue entries represent SIM2(This device supports Dual SIM and is 1 RF Path.) measurements.

Table 10.1.4 WCDMA 1900 Head SAR

MEASUREMENT RESULTS													
FREQUENCY		Mode/ Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Duty Cycle	1g SAR (W/kg)	Scaling Factor	1g Scaled SAR (W/kg)	Plots #
MHz	Ch												
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	0.150	Left Touch	FCC #1	1:1	0.362	1.033	**0.374**	A6
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	-0.030	Right Touch	FCC #1	1:1	0.210	1.033	0.217	
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	0.080	Left Tilt	FCC #1	1:1	0.228	1.033	0.236	
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	0.160	Right Tilt	FCC #1	1:1	0.226	1.033	0.233	
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	0.130	Left Touch	FCC #1	1:1	0.362	1.033	0.374	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Head 1.6 W/kg (mW/g) averaged over 1 gram					

Note(s):
1. Blue entries represent SIM2(This device supports Dual SIM and is 1 RF Path.) measurements.

Table 10.1.5 DTS Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode (Antenna)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	1g Scaled SAR (W/kg)	Plots #
MHz	Ch														
2437.0	6	802.11b	16.50	15.55	-0.060	Left Touch	FCC #2	0.179	1	99.0	0.177	1.245	1.010	0.223	
2437.0	6	802.11b	16.50	15.55	-0.060	Right Touch	FCC #2	0.507	1	99.0	0.448	1.245	1.010	**0.563**	A7
2437.0	6	802.11b	16.50	15.55	0.040	Left Tilt	FCC #2	0.246	1	99.0	0.245	1.245	1.010	0.308	
2437.0	6	802.11b	16.50	15.55	0.080	Right Tilt	FCC #2	0.401	1	99.0	0.357	1.245	1.010	0.449	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Head 1.6 W/kg (mW/g) averaged over 1 gram							

Adjusted SAR results for OFDM SAR												
FREQUENCY		Mode/ Antenna	Service	Maximum Allowed Power [dBm]	1g Scaled SAR (W/kg)	FREQUENCY [MHz]	Mode	Service	Maximum Allowed Power [dBm	Ratio of OFDM to DSSS	1g Adjusted SAR (W/kg)	Determine OFDM SAR
MHz	Ch											
2437.0	6	802.11b	DSSS	16.5	0.563	2437	802.11g	OFDM	15.5	0.794	**0.447**	X
2437.0	6	802.11b	DSSS	16.5	0.563	2437	802.11n	OFDM	14.0	0.562	**0.316**	X
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure						Head 1.6 W/kg (mW/g) averaged over 1 gram						

Note: SAR is not required for the following 2.4 GHz OFDM conditions. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Table 10.1.6 UNII Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode (Antenna)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	1g Scaled SAR (W/kg)	Plots #
MHz	Ch														
5320.0	64	802.11a	15.00	14.79	0.050	Left Touch	FCC #2	0.306	6	100.0	0.318	1.050	1.000	0.334	
5320.0	64	802.11a	15.00	14.79	0.000	Right Touch	FCC #2	0.383	6	100.0	0.401	1.050	1.000	0.421	
5320.0	64	802.11a	15.00	14.79	0.140	Left Tilt	FCC #2	0.352	6	100.0	0.368	1.050	1.000	0.386	
5320.0	64	802.11a	15.00	14.79	0.120	Right Tilt	FCC #2	0.478	6	100.0	0.518	1.050	1.000	**0.544**	A8
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Head 1.6 W/kg (mW/g) averaged over 1 gram							

Adjusted SAR results for UNII-1 and UNII-2A SAR												
FREQUENCY		Mode/ Antenna	Service	Maximum Allowed Power [dBm]	1g Scaled SAR (W/kg)	FREQUENCY [MHz]	Mode	Service	Maximum Allowed Power [dBm	Adjusted Factor	1g Adjusted SAR (W/kg)	SAR for the band with lower maximum output power
MHz	Ch											
5320.0	64	802.11a	OFDM	15.0	0.544	5240	802.11a	OFDM	14.0	0.794	**0.432**	X
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure						Head 1.6 W/kg (mW/g) averaged over 1 gram						

Note(s):

1. U-NII-1 and U-NII-2A Bands: When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration.

Table 10.1.7 UNII Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode (Antenna)	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	1g Scaled SAR (W/kg)	Plots #
MHz	Ch														
5660.0	132	802.11a	16.00	15.79	0.150	Left Touch	FCC #2	0.199	6	100.0	0.189	1.050	1.000	0.198	
5660.0	132	802.11a	16.00	15.79	0.120	Right Touch	FCC #2	0.370	6	100.0	0.389	1.050	1.000	0.408	
5660.0	132	802.11a	16.00	15.79	0.020	Left Tilt	FCC #2	0.320	6	100.0	0.326	1.050	1.000	0.342	
5660.0	132	802.11a	16.00	15.79	-0.150	Right Tilt	FCC #2	0.465	6	100.0	0.513	1.050	1.000	**0.539**	A9
5745.0	149	802.11a	16.50	15.89	0.030	Left Touch	FCC #2	0.168	6	100.0	0.147	1.151	1.000	0.169	
5745.0	149	802.11a	16.50	15.89	0.050	Right Touch	FCC #2	0.290	6	100.0	0.284	1.151	1.000	0.327	
5745.0	149	802.11a	16.50	15.89	0.180	Left Tilt	FCC #2	0.191	6	100.0	0.186	1.151	1.000	0.214	
5745.0	149	802.11a	16.50	15.89	0.160	Right Tilt	FCC #2	0.373	6	100.0	0.385	1.151	1.000	**0.443**	A10
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 10.1.8 Bluetooth Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Rate [Mbps]	Duty Cycle (%)	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	1g Scaled SAR (W/kg)	Plots #
MHz	Ch													
2441.0	39	Bluetooth	9.85	9.06	-0.110	Left Touch	FCC #2	1	76.8	0.026	1.199	1.302	0.041	
2441.0	39	Bluetooth	9.85	9.06	0.150	Right Touch	FCC #2	1	76.8	0.084	1.199	1.302	**0.131**	A11
2441.0	39	Bluetooth	9.85	9.06	-0.180	Left Tilt	FCC #2	1	76.8	0.036	1.199	1.302	0.056	
2441.0	39	Bluetooth	9.85	9.06	0.150	Right Tilt	FCC #2	1	76.8	0.062	1.199	1.302	0.097	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Head 1.6 W/kg (mW/g) averaged over 1 gram						

10.2 Standalone Body-Worn SAR Worn SAR Results

Table 10.2.1 GSM/PCS/GPRS/WCDMA Body-Worn SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/ Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Spacing [Side]	Device Serial Number	# of Time Slots	Duty Cycle	1g SAR (W/kg)	Scaling Factor	1g Scaled SAR (W/kg)	Plots #
MHz	Ch													
836.6	190	GSM850	GSM	33.70	33.50	-0.010	10 mm [Front]	FCC #1	1	1:8.3	0.423	1.047	0.443	
836.6	190	GSM850	GSM	33.70	33.50	-0.020	10 mm [Rear]	FCC #1	1	1:8.3	0.464	1.047	**0.486**	A12
836.6	190	GSM850	GPRS	28.20	28.20	0.040	10 mm [Front]	FCC #1	4	1:2.075	0.485	1.000	0.485	
836.6	190	GSM850	GPRS	28.20	28.20	-0.060	10 mm [Rear]	FCC #1	4	1:2.075	0.545	1.000	**0.545**	A13
836.6	190	GSM850	GPRS	28.20	28.20	-0.030	10 mm [Rear]	FCC #1	4	1:2.075	0.543	1.000	0.543	
1880.0	661	PCS1900	PCS	30.20	30.20	-0.070	10 mm [Front]	FCC #1	1	1:8.3	0.331	1.000	0.331	
1880.0	661	PCS1900	PCS	30.20	30.20	-0.060	10 mm [Rear]	FCC #1	1	1:8.3	0.394	1.000	**0.394**	A14
1880.0	661	PCS1900	GPRS	25.20	25.10	0.020	10 mm [Front]	FCC #1	4	1:2.075	0.467	1.023	0.478	
1880.0	661	PCS1900	GPRS	25.20	25.10	-0.100	10 mm [Rear]	FCC #1	4	1:2.075	0.551	1.023	**0.564**	A15
1880.0	661	PCS1900	GPRS	25.20	25.10	-0.030	10 mm [Rear]	FCC #1	4	1:2.075	0.485	1.023	0.496	
836.6	4183	WCDMA 850	RMC	25.20	25.00	0.050	10 mm [Front]	FCC #1	N/A	1:1	0.473	1.047	0.495	
836.6	4183	WCDMA 850	RMC	25.20	25.00	-0.080	10 mm [Rear]	FCC #1	N/A	1:1	0.611	1.047	**0.640**	A16
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	0.080	10 mm [Front]	FCC #1	N/A	1:1	0.689	1.033	0.712	
1852.4	9262	WCDMA 1900	RMC	23.70	23.65	-0.010	10 mm [Rear]	FCC #1	N/A	1:1	0.680	1.012	0.688	
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	-0.150	10 mm [Rear]	FCC #1	N/A	1:1	0.790	1.033	**0.816**	A17
1907.6	9538	WCDMA 1900	RMC	23.70	23.49	-0.140	10 mm [Rear]	FCC #1	N/A	1:1	0.770	1.050	0.809	
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	-0.030	10 mm [Rear]	FCC #1	N/A	1:1	0.734	1.033	0.758	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Body 1.6 W/kg (mW/g) averaged over 1 gram						

Note(s):
1. Blue entries represent SIM2(This device supports Dual SIM and is 1 RF Path.) measurements.

Table 10.2.2 DTS Body-Worn SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	SAR (W/kg)	Plots #
MHz	Ch														
2437.0	6	802.11b	16.50	15.55	0.050	10 mm [Front]	FCC #2	0.063	1	99.0	0.062	1.245	1.010	0.078	
2437.0	6	802.11b	16.50	15.55	0.080	10 mm [Rear]	FCC #2	0.130	1	99.0	0.127	1.245	1.010	**0.160**	A18
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Adjusted SAR results for OFDM SAR												
FREQUENCY		Mode/ Antenna	Service	Maximum Allowed Power [dBm]	1g Scaled SAR (W/kg)	FREQUENCY [MHz]	Mode	Service	Maximum Allowed Power [dBm]	Ratio of OFDM to DSSS	1g Adjusted SAR (W/kg)	Determine OFDM SAR
MHz	Ch											
2437.0	6	802.11b	DSSS	16.5	0.160	2437	802.11g	OFDM	15.5	0.794	**0.127**	X
2437.0	6	802.11b	DSSS	16.5	0.160	2437	802.11n	OFDM	14.0	0.562	**0.090**	X
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure						Body 1.6 W/kg (mW/g) averaged over 1 gram						

Note: SAR is not required for the following 2.4 GHz OFDM conditions. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Table 10.2.3 UNII Body-Worn SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	1g Scaled SAR (W/kg)	Plots #
MHz	Ch														
5320.0	64	802.11a	15.00	14.79	-0.050	10 mm [Front]	FCC #2	0.167	6	100.0	0.165	1.050	1.000	0.173	
5320.0	64	802.11a	15.00	14.79	-0.090	10 mm [Rear]	FCC #2	0.375	6	100.0	0.371	1.050	1.000	**0.390**	A19
ANSI / IEEE C95.1-2005– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Adjusted SAR results for UNII-1 and UNII-2A SAR												
FREQUENCY		Mode/ Antenna	Service	Maximum Allowed Power [dBm]	1g Scaled SAR (W/kg)	FREQUENCY [MHz]	Mode	Service	Maximum Allowed Power [dBm	Adjusted Factor	1g Adjusted SAR (W/kg)	SAR for the band with lower maximum output power
MHz	Ch											
5320.0	64	802.11a	OFDM	15.0	0.390	5240	802.11a	OFDM	14.0	0.794	**0.310**	X
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure						Body 1.6 W/kg (mW/g) averaged over 1 gram						

Note(s):
1. U-NII-1 and U-NII-2A Bands: When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration.

Table 10.2.4 UNII Body-Worn SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	1g Scaled SAR (W/kg)	Plots #
MHz	Ch														
5660.0	132	802.11a	16.00	15.79	-0.170	10 mm [Front]	FCC #2	0.101	6	100.0	0.094	1.050	1.000	0.099	
5660.0	132	802.11a	16.00	15.79	-0.050	10 mm [Rear]	FCC #2	0.358	6	100.0	0.371	1.050	1.000	**0.390**	A20
5745.0	149	802.11a	16.50	15.89	-0.130	10 mm [Front]	FCC #2	0.070	6	100.0	0.061	1.151	1.000	0.070	
5745.0	149	802.11a	16.50	15.89	-0.110	10 mm [Rear]	FCC #2	0.389	6	100.0	0.404	1.151	1.000	**0.465**	A21
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 10.2.5 Bluetooth Body-Worn SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Rate [Mbps]	Duty Cycle (%)	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	1g Scaled SAR (W/kg)	Plots #
MHz	Ch													
2441.0	39	Bluetooth	9.85	9.06	-0.050	10 mm [Front]	FCC #2	1	76.8	0.010	1.199	1.302	0.016	
2441.0	39	Bluetooth	9.85	9.06	0.070	10 mm [Rear]	FCC #2	1	76.8	0.020	1.199	1.302	**0.031**	A22
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Body 1.6 W/kg (mW/g) averaged over 1 gram						

10.3 Standalone Hotspot SAR Results

Table 10.3.1 GPRS/WCDMA Hotspot SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/ Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Spacing [Side]	Device Serial Number	# of Time Slots	Duty Cycle	1g SAR (W/kg)	Scaling Factor	1g Scaled SAR (W/kg)	Plots #
MHz	Ch													
836.6	190	GSM850	GPRS	28.20	28.20	-0.190	10 mm [Bottom]	FCC #1	4	1:2.075	0.385	1.000	0.385	
836.6	190	GSM850	GPRS	28.20	28.20	0.040	10 mm [Front]	FCC #1	4	1:2.075	0.485	1.000	0.485	
836.6	190	GSM850	GPRS	28.20	28.20	-0.060	10 mm [Rear]	FCC #1	4	1:2.075	0.545	1.000	**0.545**	A13
836.6	190	GSM850	GPRS	28.20	28.20	-0.080	10 mm [Right]	FCC #1	4	1:2.075	0.497	1.000	0.497	
836.6	190	GSM850	GPRS	28.20	28.20	-0.070	10 mm [Left]	FCC #1	4	1:2.075	0.256	1.000	0.256	
836.6	190	GSM850	GPRS	28.20	28.20	-0.030	10 mm [Rear]	FCC #1	4	1:2.075	0.543	1.000	0.543	
1880.0	661	PCS1900	GPRS	25.20	25.10	-0.070	10 mm [Bottom]	FCC #1	4	1:2.075	0.203	1.023	0.208	
1880.0	661	PCS1900	GPRS	25.20	25.10	0.020	10 mm [Front]	FCC #1	4	1:2.075	0.467	1.023	0.478	
1880.0	661	PCS1900	GPRS	25.20	25.10	-0.100	10 mm [Rear]	FCC #1	4	1:2.075	0.551	1.023	**0.564**	A15
1880.0	661	PCS1900	GPRS	25.20	25.10	-0.040	10 mm [Left]	FCC #1	4	1:2.075	0.451	1.023	0.461	
1880.0	661	PCS1900	GPRS	25.20	25.10	-0.030	10 mm [Rear]	FCC #1	4	1:2.075	0.485	1.023	0.496	
836.6	4183	WCDMA 850	RMC	25.20	25.00	0.010	10 mm [Bottom]	FCC #1	N/A	1:1	0.384	1.047	0.402	
836.6	4183	WCDMA 850	RMC	25.20	25.00	0.050	10 mm [Front]	FCC #1	N/A	1:1	0.473	1.047	0.495	
836.6	4183	WCDMA 850	RMC	25.20	25.00	-0.080	10 mm [Rear]	FCC #1	N/A	1:1	0.611	1.047	0.640	
836.6	4183	WCDMA 850	RMC	25.20	25.00	-0.030	10 mm [Right]	FCC #1	N/A	1:1	0.633	1.047	**0.663**	A23
836.6	4183	WCDMA 850	RMC	25.20	25.00	-0.050	10 mm [Left]	FCC #1	N/A	1:1	0.333	1.047	0.349	
836.6	4183	WCDMA 850	RMC	25.20	25.00	-0.030	10 mm [Right]	FCC #1	N/A	1:1	0.615	1.047	0.644	
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	-0.080	10 mm [Bottom]	FCC #1	N/A	1:1	0.309	1.033	0.319	
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	0.080	10 mm [Front]	FCC #1	N/A	1:1	0.689	1.033	0.712	
1852.4	9262	WCDMA 1900	RMC	23.70	23.65	-0.010	10 mm [Rear]	FCC #1	N/A	1:1	0.680	1.012	0.688	
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	-0.150	10 mm [Rear]	FCC #1	N/A	1:1	0.790	1.033	**0.816**	A17
1907.6	9538	WCDMA 1900	RMC	23.70	23.49	-0.140	10 mm [Rear]	FCC #1	N/A	1:1	0.770	1.050	0.809	
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	-0.110	10 mm [Left]	FCC #1	N/A	1:1	0.680	1.033	0.702	
1880.0	9400	WCDMA 1900	RMC	23.70	23.56	-0.030	10 mm [Rear]	FCC #1	N/A	1:1	0.734	1.033	0.758	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Body 1.6 W/kg (mW/g) averaged over 1 gram						

Note(s):
1. Blue entries represent SIM2(This device supports Dual SIM and is 1 RF Path.) measurements.

Table 10.3.2 DTS Hotspot SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	SAR (W/kg)	Plots #
MHz	Ch														
2437.0	6	802.11b	16.50	15.55	-0.050	10 mm [Top]	FCC #2	0.073	1	99.0	0.078	1.245	1.010	0.098	
2437.0	6	802.11b	16.50	15.55	0.050	10 mm [Front]	FCC #2	0.063	1	99.0	0.062	1.245	1.010	0.078	
2437.0	6	802.11b	16.50	15.55	0.080	10 mm [Rear]	FCC #2	0.130	1	99.0	0.127	1.245	1.010	**0.160**	A18
2437.0	6	802.11b	16.50	15.55	0.050	10 mm [Left]	FCC #2	0.060	1	99.0	0.060	1.245	1.010	0.075	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Adjusted SAR results for OFDM SAR												
FREQUENCY		Mode/ Antenna	Service	Maximum Allowed Power [dBm]	1g Scaled SAR (W/kg)	FREQUENCY [MHz]	Mode	Service	Maximum Allowed Power [dBm]	Ratio of OFDM to DSSS	1g Adjusted SAR (W/kg)	Determine OFDM SAR
MHz	Ch											
2437.0	6	802.11b	DSSS	16.5	0.160	2437	802.11g	OFDM	15.5	0.794	**0.127**	X
2437.0	6	802.11b	DSSS	16.5	0.160	2437	802.11n	OFDM	14.0	0.562	**0.090**	X
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure						Body 1.6 W/kg (mW/g) averaged over 1 gram						

Note: SAR is not required for the following 2.4 GHz OFDM conditions. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Table 10.3.3 UNII Hotspot SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	1g Scaled SAR (W/kg)	Plots #
MHz	Ch														
5240.0	48	802.11a	15.00	13.58	-0.040	10 mm [Top]	FCC #2	0.297	6	100.0	0.293	1.387	1.000	0.406	
5240.0	48	802.11a	15.00	13.58	-0.080	10 mm [Front]	FCC #2	0.126	6	100.0	0.124	1.387	1.000	0.172	
5240.0	48	802.11a	15.00	13.58	-0.100	10 mm [Rear]	FCC #2	0.314	6	100.0	0.303	1.387	1.000	**0.420**	A24
5240.0	48	802.11a	15.00	13.58	-0.030	10 mm [Left]	FCC #2	0.264	6	100.0	0.262	1.387	1.000	0.363	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 10.3.4 UNII Hotspot SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	1g Scaled SAR (W/kg)	Plots #
MHz	Ch														
5745.0	149	802.11a	16.50	15.89	-0.100	10 mm [Top]	FCC #2	0.183	6	100.0	0.177	1.151	1.000	0.204	
5745.0	149	802.11a	16.50	15.89	-0.130	10 mm [Front]	FCC #2	0.070	6	100.0	0.061	1.151	1.000	0.070	
5745.0	149	802.11a	16.50	15.89	-0.110	10 mm [Rear]	FCC #2	0.389	6	100.0	0.404	1.151	1.000	**0.465**	A21
5745.0	149	802.11a	16.50	15.89	-0.070	10 mm [Left]	FCC #2	0.185	6	100.0	0.187	1.151	1.000	0.215	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Note(s):
1. UNII-3 Band CH 165(5825 MHz) is not support Hotspot mode as described on operational description, so other required CHs are tested.

Table 10.3.5 Bluetooth Hotspot SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Rate [Mbps]	Duty Cycle (%)	1g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	1g Scaled SAR (W/kg)	Plots #
MHz	Ch													
2441.0	39	Bluetooth	9.85	9.06	-0.040	10 mm [Top]	FCC #2	1	76.8	0.009	1.199	1.302	0.015	
2441.0	39	Bluetooth	9.85	9.06	-0.050	10 mm [Front]	FCC #2	1	76.8	0.010	1.199	1.302	0.016	
2441.0	39	Bluetooth	9.85	9.06	0.070	10 mm [Rear]	FCC #2	1	76.8	0.020	1.199	1.302	**0.031**	A22
2441.0	39	Bluetooth	9.85	9.06	0.000	10 mm [Left]	FCC #2	1	76.8	0.006	1.199	1.302	0.010	
ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								Body 1.6 W/kg (mW/g) averaged over 1 gram						

10.4 Standalone Phablet SAR Results

Per FCC KDB Publication 648474 D04 Handset SAR, Phablet SAR tests were not required when Hotspot 1g SAR (scaled to maximum output power including tolerance) < 1.2 W/kg.

Table 10.4.1 UNII Phablet SAR

MEASUREMENT RESULTS

FREQUENCY MHz	FREQUENCY Ch	Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	10g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	10g Scaled SAR (W/kg)	Plots #
5320.0	64	802.11a	15.00	14.79	-0.180	0 mm [Top]	FCC #2	0.479	6	100.0	0.505	1.050	1.000	0.530	
5320.0	64	802.11a	15.00	14.79	0.160	0 mm [Front]	FCC #2	0.288	6	100.0	0.312	1.050	1.000	0.328	
5320.0	64	802.11a	15.00	14.79	-0.020	0 mm [Rear]	FCC #2	0.785	6	100.0	0.979	1.050	1.000	**1.028**	A25
5320.0	64	802.11a	15.00	14.79	0.100	0 mm [Left]	FCC #2	0.337	6	100.0	0.382	1.050	1.000	0.401	

ANSI / IEEE C95.1-1992– SAFETY LIMIT
Spatial Peak
Uncontrolled Exposure/General Population Exposure

Phablet
4.0 W/kg (mW/g)
averaged over 10 gram

Table 10.4.2 UNII Phablet SAR

MEASUREMENT RESULTS

FREQUENCY MHz	FREQUENCY Ch	Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	10g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	10g Scaled SAR (W/kg)	Plots #
5660.0	132	802.11a	16.00	15.79	-0.050	0 mm [Top]	FCC #2	0.361	6	100.0	0.390	1.050	1.019	0.417	
5660.0	132	802.11a	16.00	15.79	-0.130	0 mm [Front]	FCC #2	0.275	6	100.0	0.271	1.050	1.019	0.290	
5660.0	132	802.11a	16.00	15.79	-0.170	0 mm [Rear]	FCC #2	0.672	6	100.0	0.880	1.050	1.019	**0.942**	A26
5660.0	132	802.11a	16.00	15.79	0.080	0 mm [Left]	FCC #2	0.232	6	100.0	0.270	1.050	1.019	0.289	

ANSI / IEEE C95.1-1992– SAFETY LIMIT
Spatial Peak
Uncontrolled Exposure/General Population Exposure

Phablet
4.0 W/kg (mW/g)
averaged over 10 gram

Table 10.4.3 UNII Phablet SAR

MEASUREMENT RESULTS

FREQUENCY MHz	FREQUENCY Ch	Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Peak SAR of Area Scan	Data Rate [Mbps]	Duty Cycle	10g SAR (W/kg)	Scaling Factor	Scaling Factor (Duty Cycle)	10g Scaled SAR (W/kg)	Plots #
5825.0	165	802.11a	16.50	15.87	-0.110	0 mm [Top]	FCC #2	0.293	6	100.0	0.317	1.156	1.000	0.366	
5825.0	165	802.11a	16.50	15.87	-0.040	0 mm [Front]	FCC #2	0.155	6	100.0	0.155	1.156	1.000	0.179	
5825.0	165	802.11a	16.50	15.87	0.120	0 mm [Rear]	FCC #2	0.701	6	100.0	0.891	1.156	1.000	**1.030**	A27
5825.0	165	802.11a	16.50	15.87	0.110	0 mm [Left]	FCC #2	0.201	6	100.0	0.237	1.156	1.000	0.274	

ANSI / IEEE C95.1-1992– SAFETY LIMIT
Spatial Peak
Uncontrolled Exposure/General Population Exposure

Phablet
4.0 W/kg (mW/g)
averaged over 10 gram

Note(s):
1. UNII-3 Band CH 165 (5825 MHz) is not support Hotspot mode as described on operational description of this device, so phablet SAR is tested on this CH.

10.5 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery was used for all SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported boy-worn SAR was not > 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were performed.
8. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated.
9. SAR measurements were performed using the DASY5 automated system. The procedure for spatial peak SAR evaluation has been implemented according to the IEEE 1528 standard. During a maximum search, global and local maxima searches are automatically performed in 2-D after each area scan measurement. The algorithm will find the global maximum and all local maxima within 2 dB of the global maxima for all SAR distributions. All local maxima within 2 dB of the global maximum were searched and passed for the Zoom Scan measurement.

GSM Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. This device supports GSM VOIP in the head and body-worn configurations; therefore GPRS was additionally evaluated for head and body-worn compliance.
3. Justification for reduced test configurations per KDB Publication 941225 D01v03r01 and October2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot SAR.
4. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). Since the maximum output power variation across the required test channels is not > ½ dB, the middle channel was used for testing.

WCDMA (UMTS) Notes:

1. WCDMA (UMTS) mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03r01. AMR and HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
2. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.

WLAN Notes:

1. The initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required duo to the maximum allowed powers and the highest reported DSSS SAR when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output and the adjust SAR is ≤ 1.2 W/kg.
3. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2 W/kg.
4. When the maximum reported 1g averaged SAR ≤ 0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg or all test channels were measured.
5. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor to determine compliance.

Bluetooth Notes:

1. Bluetooth SAR was measured with the device connected to a call with hopping disabled with DH5 operation.
   Per October 2016 TCB Workshop Notes, the reported SAR was scaled to the 100% transmission duty factor to determine compliance. Refer to section 9.5 for the time-domain plot and calculation for the duty factor of the device.

11. FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

11.1 Introduction

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

11.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v06 4.3.2 and IEEE 1528-2013 Section 6.3.4.1.2,simultaneous transmission SAR test exclusion may be applied when the sum of the sum 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is $\leq$ 1.6 W/kg. The different test positon in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1-g or 10-g SAR.

11.3 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, 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.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v06.

Table 11.3.1 Simultaneous Transmission Scenarios

No.	Capable TX Configuration	GSM 850/1900 (Voice)	GPRS/EDGE 850/1900 (Data)	WCDMA B5/B2 (Voice)	WCDMA B5/B2 (Data)	WIFI 2.4GHz 802.11b/g/n	WIFI 5GHz 802.11a/n/ac	Bluetooth 2.4GHz
1	GSM 850/1900 (Voice)		No	No	No	Yes	Yes	Yes
2	GPRS/EDGE 850/1900 (Data)	No		No	No	Yes	Yes	Yes
3	WCDMA B5/B2 (Voice)	No	No		No	Yes	Yes	Yes
4	WCDMA B5/B2 (Data)	No	No	No		Yes	Yes	Yes
5	WIFI 2.4GHz 802.11b/g/n	Yes	Yes	Yes	Yes		No	No
6	WIFI 5GHz 802.11a/n/ac	Yes	Yes	Yes	Yes	No		Yes
7	Bluetooth 2.4GHz	Yes	Yes	Yes	Yes	No	Yes	

Table 11.3.2 Simultaneous SAR Cases

No.	Capable Transmit Configuration	Head SAR	Body-Worn SAR	Hotspot SAR	Phablet SAR	Note
1	GSM Voice + Wi-Fi 2.4 GHz	Yes	Yes	N/A	Yes	
2	GSM Voice + Wi-Fi 5 GHz	Yes	Yes	N/A	Yes	
3	GSM Voice + Bluetooth 2.4 GHz	Yes	Yes	N/A	Yes	
4	GSM Voice + Bluetooth 2.4 GHz + Wi-Fi 5GHz	Yes	Yes	N/A	Yes	
5	WCDMA + Wi-Fi 2.4 GHz	Yes	Yes	Yes	Yes	
6	WCDMA + Wi-Fi 5 GHz	Yes	Yes	Yes*	Yes	* Hotspot of UNII-1 & UNII-3 can be operated simultaneous transmission.
7	WCDMA + Bluetooth 2.4 GHz	Yes	Yes	Yes	Yes	
8	WCMDA + Bluetooth 2.4 GHz + Wi-Fi 5GHz	Yes	Yes	Yes*	Yes	* Hotspot of UNII-1 & UNII-3 can be operated simultaneous transmission.
9	GPRS/EDGE + Wi-Fi 2.4 GHz	Yes	Yes	Yes	Yes	
10	GPRS/EDGE + Wi-Fi 5 GHz	Yes	Yes	Yes*	Yes	* Hotspot of UNII-1 & UNII-3 can be operated simultaneous transmission.
11	GPRS/EDGE + Bluetooth 2.4 GHz	Yes	Yes	Yes	Yes	
12	GPRS/EDGE + Bluetooth 2.4 GHz + Wi-Fi 5GHz	Yes	Yes	Yes*	Yes	* Hotspot of UNII-1 & UNII-3 can be operated simultaneous transmission.

Notes:

1. WiFi 2.4GHz is supported Hotspot and WiFi-Direct(GO/GC).
2. WiFi 5GHz is supported Hotspot in UNII B1,B3 and WiFi-Direct(GO/GC) in UNII B1,B3.
3. WCDMA, GPRS/EDGE is supported Hotspot.
4. VoIP is supported in WCDMA, GSM
5. Bluetooth and WiFi can not transmit simultaneously at 2.4G band.
6. GSM and WCDMA can not transmit simultaneously since they share the same chip.
7. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
8. Per the manufacturer, WIFI Direct is expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Simultaneous transmission scenarios involving WIFI direct are included in the above table.

11.4 Head SAR Simultaneous Transmission Analysis

Table 11.4.1 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.3 GHz W-LAN (Held to Ear)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5.3G W-LAN SAR (W/kg)	ΣSAR (W/kg)		
			1	2	3	1+2	1+3	1+2+3
Head SAR	GSM 850	Left Touch	0.257	0.041	0.334	0.297	0.590	0.631
		Right Touch	0.302	0.131	0.421	0.433	0.723	**0.854**
		Left Tilt	0.180	0.056	0.386	0.236	0.566	0.623
		Right Tilt	0.179	0.097	0.544	0.276	0.723	0.820
	GPRS 850	Left Touch	0.280	0.041	0.334	0.321	0.614	0.654
		Right Touch	0.346	0.131	0.421	0.477	0.767	**0.898**
		Left Tilt	0.192	0.056	0.386	0.248	0.578	0.635
		Right Tilt	0.203	0.097	0.544	0.300	0.747	0.844
	GSM 1900	Left Touch	0.173	0.041	0.334	0.214	0.507	0.547
		Right Touch	0.099	0.131	0.421	0.230	0.520	0.651
		Left Tilt	0.117	0.056	0.386	0.173	0.503	0.560
		Right Tilt	0.106	0.097	0.544	0.203	0.650	**0.747**
	GPRS 1900	Left Touch	0.257	0.041	0.334	0.297	0.591	0.631
		Right Touch	0.143	0.131	0.421	0.274	0.564	0.695
		Left Tilt	0.169	0.056	0.386	0.225	0.555	0.611
		Right Tilt	0.152	0.097	0.544	0.249	0.696	**0.793**
	WCDMA 850	Left Touch	0.310	0.041	0.334	0.351	0.644	0.684
		Right Touch	0.376	0.131	0.421	0.507	0.797	**0.928**
		Left Tilt	0.251	0.056	0.386	0.307	0.638	0.694
		Right Tilt	0.211	0.097	0.544	0.308	0.755	0.852
	WCDMA 1900	Left Touch	0.374	0.041	0.334	0.415	0.708	0.748
		Right Touch	0.217	0.131	0.421	0.348	0.638	0.769
		Left Tilt	0.236	0.056	0.386	0.292	0.622	0.678
		Right Tilt	0.233	0.097	0.544	0.330	0.777	**0.874**

Table 11.4.2 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.6 GHz W-LAN (Held to Ear)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5.6G W-LAN SAR (W/kg)	ΣSAR (W/kg)		
			1	2	3	1+2	1+3	1+2+3
Head SAR	GSM 850	Left Touch	0.257	0.041	0.198	0.297	0.455	0.496
		Right Touch	0.302	0.131	0.408	0.433	0.710	**0.841**
		Left Tilt	0.180	0.056	0.342	0.236	0.522	0.579
		Right Tilt	0.179	0.097	0.539	0.276	0.718	0.814
	GPRS 850	Left Touch	0.280	0.041	0.198	0.321	0.478	0.519
		Right Touch	0.346	0.131	0.408	0.477	0.754	**0.886**
		Left Tilt	0.192	0.056	0.342	0.248	0.534	0.591
		Right Tilt	0.203	0.097	0.539	0.300	0.742	0.838
	GSM 1900	Left Touch	0.173	0.041	0.198	0.214	0.371	0.412
		Right Touch	0.099	0.131	0.408	0.230	0.507	0.639
		Left Tilt	0.117	0.056	0.342	0.173	0.459	0.516
		Right Tilt	0.106	0.097	0.539	0.203	0.645	**0.741**
	GPRS 1900	Left Touch	0.257	0.041	0.198	0.297	0.455	0.496
		Right Touch	0.143	0.131	0.408	0.274	0.552	0.683
		Left Tilt	0.169	0.056	0.342	0.225	0.511	0.567
		Right Tilt	0.152	0.097	0.539	0.249	0.691	**0.788**
	WCDMA 850	Left Touch	0.310	0.041	0.198	0.351	0.508	0.549
		Right Touch	0.376	0.131	0.408	0.507	0.784	**0.915**
		Left Tilt	0.251	0.056	0.342	0.307	0.594	0.650
		Right Tilt	0.211	0.097	0.539	0.308	0.750	0.847
	WCDMA 1900	Left Touch	0.374	0.041	0.198	0.415	0.572	0.613
		Right Touch	0.217	0.131	0.408	0.348	0.625	0.757
		Left Tilt	0.236	0.056	0.342	0.292	0.578	0.634
		Right Tilt	0.233	0.097	0.539	0.330	0.772	**0.869**

Table 11.4.3 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.8 GHz W-LAN (Held to Ear)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5.8G W-LAN SAR (W/kg)	ΣSAR (W/kg)		
			1	2	3	1+2	1+3	1+2+3
Head SAR	GSM 850	Left Touch	0.257	0.041	0.169	0.297	0.426	0.466
		Right Touch	0.302	0.131	0.327	0.433	0.628	**0.760**
		Left Tilt	0.180	0.056	0.214	0.236	0.394	0.450
		Right Tilt	0.179	0.097	0.443	0.276	0.622	0.719
	GPRS 850	Left Touch	0.280	0.041	0.169	0.321	0.449	0.490
		Right Touch	0.346	0.131	0.327	0.477	0.673	**0.804**
		Left Tilt	0.192	0.056	0.214	0.248	0.406	0.462
		Right Tilt	0.203	0.097	0.443	0.300	0.646	0.743
	GSM 1900	Left Touch	0.173	0.041	0.169	0.214	0.342	0.383
		Right Touch	0.099	0.131	0.327	0.230	0.426	0.557
		Left Tilt	0.117	0.056	0.214	0.173	0.331	0.387
		Right Tilt	0.106	0.097	0.443	0.203	0.549	**0.646**
	GPRS 1900	Left Touch	0.257	0.041	0.169	0.297	0.426	0.467
		Right Touch	0.143	0.131	0.327	0.274	0.470	0.601
		Left Tilt	0.169	0.056	0.214	0.225	0.383	0.439
		Right Tilt	0.152	0.097	0.443	0.249	0.596	**0.692**
	WCDMA 850	Left Touch	0.310	0.041	0.169	0.351	0.479	0.520
		Right Touch	0.376	0.131	0.327	0.507	0.703	**0.834**
		Left Tilt	0.251	0.056	0.214	0.307	0.465	0.522
		Right Tilt	0.211	0.097	0.443	0.308	0.655	0.751
	WCDMA 1900	Left Touch	0.374	0.041	0.169	0.415	0.543	0.584
		Right Touch	0.217	0.131	0.327	0.348	0.544	0.675
		Left Tilt	0.236	0.056	0.214	0.292	0.450	0.506
		Right Tilt	0.233	0.097	0.443	0.330	0.677	**0.773**

Table 11.4.4 Simultaneous Transmission Scenario : 2G/3G/4G + 2.4 GHz W-LAN (Held to Ear)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	2.4G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Head SAR	GSM 850	Left Touch	0.257	0.223	0.479
		Right Touch	0.302	0.563	**0.865**
		Left Tilt	0.180	0.308	0.488
		Right Tilt	0.179	0.449	0.628
	GPRS 850	Left Touch	0.280	0.223	0.503
		Right Touch	0.346	0.563	**0.909**
		Left Tilt	0.192	0.308	0.500
		Right Tilt	0.203	0.449	0.652
	GSM 1900	Left Touch	0.173	0.223	0.396
		Right Touch	0.099	0.563	**0.662**
		Left Tilt	0.117	0.308	0.425
		Right Tilt	0.106	0.449	0.555
	GPRS 1900	Left Touch	0.257	0.223	0.479
		Right Touch	0.143	0.563	0.707
		Left Tilt	0.169	0.308	0.477
		Right Tilt	0.152	0.449	0.601
	WCDMA 850	Left Touch	0.310	0.223	0.533
		Right Touch	0.376	0.563	**0.939**
		Left Tilt	0.251	0.308	0.559
		Right Tilt	0.211	0.449	0.660
	WCDMA 1900	Left Touch	0.374	0.223	0.597
		Right Touch	0.217	0.563	**0.780**
		Left Tilt	0.236	0.308	0.544
		Right Tilt	0.233	0.449	0.682

Table 11.4.5 Simultaneous Transmission Scenario : 2G/3G/4G + 5.3 GHz W-LAN (Held to Ear)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	5.3G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Head SAR	GSM 850	Left Touch	0.257	0.334	0.590
		Right Touch	0.302	0.421	0.723
		Left Tilt	0.180	0.386	0.566
		Right Tilt	0.179	0.544	**0.723**
	GPRS 850	Left Touch	0.280	0.334	0.614
		Right Touch	0.346	0.421	**0.767**
		Left Tilt	0.192	0.386	0.578
		Right Tilt	0.203	0.544	0.747
	GSM 1900	Left Touch	0.173	0.334	0.507
		Right Touch	0.099	0.421	0.520
		Left Tilt	0.117	0.386	0.503
		Right Tilt	0.106	0.544	**0.650**
	GPRS 1900	Left Touch	0.257	0.334	0.591
		Right Touch	0.143	0.421	0.564
		Left Tilt	0.169	0.386	0.555
		Right Tilt	0.152	0.544	0.696
	WCDMA 850	Left Touch	0.310	0.334	0.644
		Right Touch	0.376	0.421	**0.797**
		Left Tilt	0.251	0.386	0.638
		Right Tilt	0.211	0.544	0.755
	WCDMA 1900	Left Touch	0.374	0.334	0.708
		Right Touch	0.217	0.421	0.638
		Left Tilt	0.236	0.386	0.622
		Right Tilt	0.233	0.544	**0.777**

Table 11.4.6 Simultaneous Transmission Scenario : 2G/3G/4G + 5.6 GHz W-LAN (Held to Ear)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	5.6G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Head SAR	GSM 850	Left Touch	0.257	0.198	0.455
		Right Touch	0.302	0.408	0.710
		Left Tilt	0.180	0.342	0.522
		Right Tilt	0.179	0.539	**0.718**
	GPRS 850	Left Touch	0.280	0.198	0.478
		Right Touch	0.346	0.408	**0.754**
		Left Tilt	0.192	0.342	0.534
		Right Tilt	0.203	0.539	0.742
	GSM 1900	Left Touch	0.173	0.198	0.371
		Right Touch	0.099	0.408	0.507
		Left Tilt	0.117	0.342	0.459
		Right Tilt	0.106	0.539	**0.645**
	GPRS 1900	Left Touch	0.257	0.198	0.455
		Right Touch	0.143	0.408	0.552
		Left Tilt	0.169	0.342	0.511
		Right Tilt	0.152	0.539	0.691
	WCDMA 850	Left Touch	0.310	0.198	0.508
		Right Touch	0.376	0.408	**0.784**
		Left Tilt	0.251	0.342	0.594
		Right Tilt	0.211	0.539	0.750
	WCDMA 1900	Left Touch	0.374	0.198	0.572
		Right Touch	0.217	0.408	0.625
		Left Tilt	0.236	0.342	0.578
		Right Tilt	0.233	0.539	**0.772**

Table 11.4.7 Simultaneous Transmission Scenario : 2G/3G/4G + 5.8 GHz W-LAN (Held to Ear)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	5.8G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Head SAR	GSM 850	Left Touch	0.257	0.169	0.426
		Right Touch	0.302	0.327	**0.628**
		Left Tilt	0.180	0.214	0.394
		Right Tilt	0.179	0.443	0.622
	GPRS 850	Left Touch	0.280	0.169	0.449
		Right Touch	0.346	0.327	**0.673**
		Left Tilt	0.192	0.214	0.406
		Right Tilt	0.203	0.443	0.646
	GSM 1900	Left Touch	0.173	0.169	0.342
		Right Touch	0.099	0.327	0.426
		Left Tilt	0.117	0.214	0.331
		Right Tilt	0.106	0.443	**0.549**
	GPRS 1900	Left Touch	0.257	0.169	0.426
		Right Touch	0.143	0.327	0.470
		Left Tilt	0.169	0.214	0.383
		Right Tilt	0.152	0.443	0.596
	WCDMA 850	Left Touch	0.310	0.169	0.479
		Right Touch	0.376	0.327	**0.703**
		Left Tilt	0.251	0.214	0.465
		Right Tilt	0.211	0.443	0.655
	WCDMA 1900	Left Touch	0.374	0.169	0.543
		Right Touch	0.217	0.327	0.544
		Left Tilt	0.236	0.214	0.450
		Right Tilt	0.233	0.443	**0.677**

Table 11.4.8 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth (Held to Ear)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Head SAR	GSM 850	Left Touch	0.257	0.041	0.297
		Right Touch	0.302	0.131	**0.433**
		Left Tilt	0.180	0.056	0.236
		Right Tilt	0.179	0.097	0.276
	GPRS 850	Left Touch	0.280	0.041	0.321
		Right Touch	0.346	0.131	**0.477**
		Left Tilt	0.192	0.056	0.248
		Right Tilt	0.203	0.097	0.300
	GSM 1900	Left Touch	0.173	0.041	0.214
		Right Touch	0.099	0.131	**0.230**
		Left Tilt	0.117	0.056	0.173
		Right Tilt	0.106	0.097	0.203
	GPRS 1900	Left Touch	0.257	0.041	0.297
		Right Touch	0.143	0.131	0.274
		Left Tilt	0.169	0.056	0.225
		Right Tilt	0.152	0.097	0.249
	WCDMA 850	Left Touch	0.310	0.041	0.351
		Right Touch	0.376	0.131	**0.507**
		Left Tilt	0.251	0.056	0.307
		Right Tilt	0.211	0.097	0.308
	WCDMA 1900	Left Touch	0.374	0.041	**0.415**
		Right Touch	0.217	0.131	0.348
		Left Tilt	0.236	0.056	0.292
		Right Tilt	0.233	0.097	0.330

Table 11.4.9 Simultaneous Transmission Scenario : Bluetooth + 5 GHz W-LAN (Held to Ear)

Exposure Condition	Mode	Configuration	Bluetooth SAR (W/kg)	5G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Head SAR	5.3G W-LAN	Left Touch	0.041	0.334	0.374
		Right Touch	0.131	0.421	0.552
		Left Tilt	0.056	0.386	0.443
		Right Tilt	0.097	0.544	0.641
	5.6G W-LAN	Left Touch	0.041	0.198	0.239
		Right Touch	0.131	0.408	0.540
		Left Tilt	0.056	0.342	0.399
		Right Tilt	0.097	0.539	0.635
	5.8G W-LAN	Left Touch	0.041	0.169	0.210
		Right Touch	0.131	0.327	0.458
		Left Tilt	0.056	0.214	0.270
		Right Tilt	0.097	0.443	0.540

11.5 Body-Worn Simultaneous Transmission Analysis

Table 11.5.1 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.3 GHz W-LAN (Body-Worn at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5.3G W-LAN SAR (W/kg)	ΣSAR (W/kg)		
			1	2	3	1+2	1+3	1+2+3
Body-Worn SAR	GSM 850	Front	0.443	0.016	0.173	0.458	0.616	0.632
		Rear	0.486	0.031	0.390	0.517	0.875	**0.907**
	GPRS 850	Front	0.485	0.016	0.173	0.501	0.658	0.674
		Rear	0.545	0.031	0.390	0.576	0.935	**0.966**
	GSM 1900	Front	0.331	0.016	0.173	0.347	0.504	0.520
		Rear	0.394	0.031	0.390	0.425	0.784	**0.815**
	GPRS 1900	Front	0.478	0.016	0.173	0.493	0.651	0.667
		Rear	0.564	0.031	0.390	0.595	0.953	**0.984**
	WCDMA 850	Front	0.495	0.016	0.173	0.511	0.668	0.684
		Rear	0.640	0.031	0.390	0.671	1.029	**1.060**
	WCDMA 1900	Front	0.712	0.016	0.173	0.727	0.885	0.901
		Rear	0.816	0.031	0.390	0.847	1.206	**1.237**

Table 11.5.2 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.6 GHz W-LAN (Body-Worn at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5.6G W-LAN SAR (W/kg)	ΣSAR (W/kg)		
			1	2	3	1+2	1+3	1+2+3
Body-Worn SAR	GSM 850	Front	0.443	0.016	0.099	0.458	0.542	0.557
		Rear	0.486	0.031	0.390	0.517	0.875	**0.907**
	GPRS 850	Front	0.485	0.016	0.099	0.501	0.584	0.599
		Rear	0.545	0.031	0.390	0.576	0.935	**0.966**
	GSM 1900	Front	0.331	0.016	0.099	0.347	0.430	0.445
		Rear	0.394	0.031	0.390	0.425	0.784	**0.815**
	GPRS 1900	Front	0.478	0.016	0.099	0.493	0.576	0.592
		Rear	0.564	0.031	0.390	0.595	0.953	**0.984**
	WCDMA 850	Front	0.495	0.016	0.099	0.511	0.594	0.610
		Rear	0.640	0.031	0.390	0.671	1.029	**1.060**
	WCDMA 1900	Front	0.712	0.016	0.099	0.727	0.810	0.826
		Rear	0.816	0.031	0.390	0.847	1.206	**1.237**

Table 11.5.3 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.8 GHz W-LAN (Body-Worn at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5.8G W-LAN SAR (W/kg)	ΣSAR (W/kg)		
			1	2	3	1+2	1+3	1+2+3
Body-Worn SAR	GSM 850	Front	0.443	0.016	0.070	0.458	0.513	0.529
		Rear	0.486	0.031	0.465	0.517	0.951	**0.982**
	GPRS 850	Front	0.485	0.016	0.070	0.501	0.555	0.571
		Rear	0.545	0.031	0.465	0.576	1.010	**1.041**
	GSM 1900	Front	0.331	0.016	0.070	0.347	0.401	0.417
		Rear	0.394	0.031	0.465	0.425	0.859	**0.890**
	GPRS 1900	Front	0.478	0.016	0.070	0.493	0.548	0.564
		Rear	0.564	0.031	0.465	0.595	1.029	**1.060**
	WCDMA 850	Front	0.495	0.016	0.070	0.511	0.565	0.581
		Rear	0.640	0.031	0.465	0.671	1.105	**1.136**
	WCDMA 1900	Front	0.712	0.016	0.070	0.727	0.782	0.798
		Rear	0.816	0.031	0.465	0.847	1.281	**1.312**

Table 11.5.4 Simultaneous Transmission Scenario : 2G/3G/4G + 2.4 GHz W-LAN (Body-Worn at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	2.4G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Body-Worn SAR	GSM 850	Front	0.443	0.078	0.521
		Rear	0.486	0.160	**0.646**
	GPRS 850	Front	0.485	0.078	0.563
		Rear	0.545	0.160	**0.705**
	GSM 1900	Front	0.331	0.078	0.409
		Rear	0.394	0.160	**0.554**
	GPRS 1900	Front	0.478	0.078	0.556
		Rear	0.564	0.160	0.723
	WCDMA 850	Front	0.495	0.078	0.573
		Rear	0.640	0.160	**0.799**
	WCDMA 1900	Front	0.712	0.078	0.790
		Rear	0.816	0.160	**0.976**

Table 11.5.5 Simultaneous Transmission Scenario : 2G/3G/4G + 5.3 GHz W-LAN (Body-Worn at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	5.3G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Body-Worn SAR	GSM 850	Front	0.443	0.173	0.616
		Rear	0.486	0.390	**0.875**
	GPRS 850	Front	0.485	0.173	0.658
		Rear	0.545	0.390	**0.935**
	GSM 1900	Front	0.331	0.173	0.504
		Rear	0.394	0.390	**0.784**
	GPRS 1900	Front	0.478	0.173	0.651
		Rear	0.564	0.390	0.953
	WCDMA 850	Front	0.495	0.173	0.668
		Rear	0.640	0.390	**1.029**
	WCDMA 1900	Front	0.712	0.173	0.885
		Rear	0.816	0.390	**1.206**

Table 11.5.6 Simultaneous Transmission Scenario : 2G/3G/4G + 5.6 GHz W-LAN (Body-Worn at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	5.6G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Body-Worn SAR	GSM 850	Front	0.443	0.099	0.542
		Rear	0.486	0.390	**0.875**
	GPRS 850	Front	0.485	0.099	0.584
		Rear	0.545	0.390	**0.935**
	GSM 1900	Front	0.331	0.099	0.430
		Rear	0.394	0.390	**0.784**
	GPRS 1900	Front	0.478	0.099	0.576
		Rear	0.564	0.390	0.953
	WCDMA 850	Front	0.495	0.099	0.594
		Rear	0.640	0.390	**1.029**
	WCDMA 1900	Front	0.712	0.099	0.810
		Rear	0.816	0.390	**1.206**

Table 11.5.7 Simultaneous Transmission Scenario : 2G/3G/4G + 5.8 GHz W-LAN (Body-Worn at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	5.8G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Body-Worn SAR	GSM 850	Front	0.443	0.070	0.513
		Rear	0.486	0.465	**0.951**
	GPRS 850	Front	0.485	0.070	0.555
		Rear	0.545	0.465	**1.010**
	GSM 1900	Front	0.331	0.070	0.401
		Rear	0.394	0.465	**0.859**
	GPRS 1900	Front	0.478	0.070	0.548
		Rear	0.564	0.465	1.029
	WCDMA 850	Front	0.495	0.070	0.565
		Rear	0.640	0.465	**1.105**
	WCDMA 1900	Front	0.712	0.070	0.782
		Rear	0.816	0.465	**1.281**

Table 11.5.8 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth (Body-Worn at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Body-Worn SAR	GSM 850	Front	0.443	0.016	0.458
		Rear	0.486	0.031	**0.517**
	GPRS 850	Front	0.485	0.016	0.501
		Rear	0.545	0.031	**0.576**
	GSM 1900	Front	0.331	0.016	0.347
		Rear	0.394	0.031	**0.425**
	GPRS 1900	Front	0.478	0.016	0.493
		Rear	0.564	0.031	0.595
	WCDMA 850	Front	0.495	0.016	0.511
		Rear	0.640	0.031	**0.671**
	WCDMA 1900	Front	0.712	0.016	0.727
		Rear	0.816	0.031	**0.847**

Table 11.5.9 Simultaneous Transmission Scenario : Bluetooth + 5 GHz W-LAN (Body-Worn at 10 mm)

Exposure Condition	Mode	Configuration	Bluetooth SAR (W/kg)	5G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Body-Worn SAR	5.3G W-LAN	Front	0.016	0.173	0.189
		Rear	0.031	0.390	0.421
	5.6G W-LAN	Front	0.016	0.099	0.114
		Rear	0.031	0.390	0.421
	5.8G W-LAN	Front	0.016	0.070	0.086
		Rear	0.031	0.465	0.496

11.6 Hotspot SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 941225 D06v02r01, the device edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR ("-").

Table 11.6.1 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.2 GHz W-LAN (Hotspot at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5.2G W-LAN SAR (W/kg)	ΣSAR (W/kg)		
			1	2	3	1+2	1+3	1+2+3
Hotspot SAR	GPRS 850	Top	-	0.015	0.406	0.015	0.406	0.421
		Bottom	0.385	-	-	0.385	0.385	0.385
		Front	0.485	0.016	0.172	0.501	0.657	0.673
		Rear	0.545	0.031	0.436	0.576	0.981	**1.012**
		Right	0.497	-	-	0.497	0.497	0.497
		Left	0.256	0.010	0.363	0.266	0.619	0.629
	GPRS 1900	Top	-	0.015	0.406	0.015	0.406	0.421
		Bottom	0.208	-	-	0.208	0.208	0.208
		Front	0.478	0.016	0.172	0.493	0.650	0.665
		Rear	0.564	0.031	0.436	0.595	0.999	**1.030**
		Right	-	-	-	-	-	-
		Left	0.461	0.010	0.363	0.471	0.825	0.835
	WCDMA 850	Top	-	0.015	0.406	0.015	0.406	0.421
		Bottom	0.402	-	-	0.402	0.402	0.402
		Front	0.495	0.016	0.172	0.511	0.667	0.683
		Rear	0.640	0.031	0.436	0.671	1.075	**1.106**
		Right	0.663	-	-	0.663	0.663	0.663
		Left	0.349	0.010	0.363	0.359	0.712	0.722
	WCDMA 1900	Top	-	0.015	0.406	0.015	0.406	0.421
		Bottom	0.319	-	-	0.319	0.319	0.319
		Front	0.712	0.016	0.172	0.727	0.884	0.899
		Rear	0.816	0.031	0.436	0.847	1.252	**1.283**
		Right	-	-	-	-	-	-
		Left	0.702	0.010	0.363	0.713	1.066	1.076

Table 11.6.2 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.8 GHz W-LAN (Hotspot at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5.8G W-LAN SAR (W/kg)	ΣSAR (W/kg)		
			1	2	3	1+2	1+3	1+2+3
Hotspot SAR	GPRS 850	Top	-	0.015	0.204	0.015	0.204	0.218
		Bottom	0.385	-	-	0.385	0.385	0.385
		Front	0.485	0.016	0.070	0.501	0.555	0.571
		Rear	0.545	0.031	0.465	0.576	1.010	**1.041**
		Right	0.497	-	-	0.497	0.497	0.497
		Left	0.256	0.010	0.215	0.266	0.471	0.481
	GPRS 1900	Top	-	0.015	0.204	0.015	0.204	0.218
		Bottom	0.208	-	-	0.208	0.208	0.208
		Front	0.478	0.016	0.070	0.493	0.548	0.564
		Rear	0.564	0.031	0.465	0.595	1.029	**1.060**
		Right	-	-	-	-	-	-
		Left	0.461	0.010	0.215	0.471	0.677	0.687
	WCDMA 850	Top	-	0.015	0.204	0.015	0.204	0.218
		Bottom	0.402	-	-	0.402	0.402	0.402
		Front	0.495	0.016	0.070	0.511	0.565	0.581
		Rear	0.640	0.031	0.465	0.671	1.105	**1.136**
		Right	0.663	-	-	0.663	0.663	0.663
		Left	0.349	0.010	0.215	0.359	0.564	0.574
	WCDMA 1900	Top	-	0.015	0.204	0.015	0.204	0.218
		Bottom	0.319	-	-	0.319	0.319	0.319
		Front	0.712	0.016	0.070	0.727	0.782	0.798
		Rear	0.816	0.031	0.465	0.847	1.281	**1.312**
		Right	-	-	-	-	-	-
		Left	0.702	0.010	0.215	0.713	0.918	0.928

Table 11.6.3 Simultaneous Transmission Scenario : 2G/3G/4G + 2.4 GHz W-LAN (Hotspot at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	2.4G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Hotspot SAR	GPRS 850	Top	-	0.098	0.098
		Bottom	0.385	-	0.385
		Front	0.485	0.078	0.563
		Rear	0.545	0.160	**0.705**
		Right	0.497	-	0.497
		Left	0.256	0.075	0.331
	GPRS 1900	Top	-	0.098	0.098
		Bottom	0.208	-	0.208
		Front	0.478	0.078	0.556
		Rear	0.564	0.160	**0.723**
		Right	-	-	-
		Left	0.461	0.075	0.537
	WCDMA 850	Top	-	0.098	0.098
		Bottom	0.402	-	0.402
		Front	0.495	0.078	0.573
		Rear	0.640	0.160	**0.799**
		Right	0.663	-	0.663
		Left	0.349	0.075	0.424
	WCDMA 1900	Top	-	0.098	0.098
		Bottom	0.319	-	0.319
		Front	0.712	0.078	0.790
		Rear	0.816	0.160	**0.976**
		Right	-	-	-
		Left	0.702	0.075	0.778

Table 11.6.4 Simultaneous Transmission Scenario : 2G/3G/4G + 5.2 GHz W-LAN (Hotspot at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	5.2G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Hotspot SAR	GPRS 850	Top	-	0.406	0.406
		Bottom	0.385	-	0.385
		Front	0.485	0.172	0.657
		Rear	0.545	0.436	**0.981**
		Right	0.497	-	0.497
		Left	0.256	0.363	0.619
	GPRS 1900	Top	-	0.406	0.406
		Bottom	0.208	-	0.208
		Front	0.478	0.172	0.650
		Rear	0.564	0.436	**0.999**
		Right	-	-	-
		Left	0.461	0.363	0.825
	WCDMA 850	Top	-	0.406	0.406
		Bottom	0.402	-	0.402
		Front	0.495	0.172	0.667
		Rear	0.640	0.436	**1.075**
		Right	0.663	-	0.663
		Left	0.349	0.363	0.712
	WCDMA 1900	Top	-	0.406	0.406
		Bottom	0.319	-	0.319
		Front	0.712	0.172	0.884
		Rear	0.816	0.436	**1.252**
		Right	-	-	-
		Left	0.702	0.363	1.066

Table 11.6.5 Simultaneous Transmission Scenario : 2G/3G/4G + 5.8 GHz W-LAN (Hotspot at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	5.8G W-LAN SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Hotspot SAR	GPRS 850	Top	-	0.204	0.204
		Bottom	0.385	-	0.385
		Front	0.485	0.070	0.555
		Rear	0.545	0.465	**1.010**
		Right	0.497	-	0.497
		Left	0.256	0.215	0.471
	GPRS 1900	Top	-	0.204	0.204
		Bottom	0.208	-	0.208
		Front	0.478	0.070	0.548
		Rear	0.564	0.465	**1.029**
		Right	-	-	-
		Left	0.461	0.215	0.677
	WCDMA 850	Top	-	0.204	0.204
		Bottom	0.402	-	0.402
		Front	0.495	0.070	0.565
		Rear	0.640	0.465	**1.105**
		Right	0.663	-	0.663
		Left	0.349	0.215	0.564
	WCDMA 1900	Top	-	0.204	0.204
		Bottom	0.319	-	0.319
		Front	0.712	0.070	0.782
		Rear	0.816	0.465	**1.281**
		Right	-	-	-
		Left	0.702	0.215	0.918

Table 11.6.6 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth (Hotspot at 10 mm)

Exposure Condition	Mode	Configuration	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Hotspot SAR	GPRS 850	Top	-	0.015	0.015
		Bottom	0.385	-	0.385
		Front	0.485	0.016	0.501
		Rear	0.545	0.031	**0.576**
		Right	0.497	-	0.497
		Left	0.256	0.010	0.266
	GPRS 1900	Top	-	0.015	0.015
		Bottom	0.208	-	0.208
		Front	0.478	0.016	0.493
		Rear	0.564	0.031	**0.595**
		Right	-	-	-
		Left	0.461	0.010	0.471
	WCDMA 850	Top	-	0.015	0.015
		Bottom	0.402	-	0.402
		Front	0.495	0.016	0.511
		Rear	0.640	0.031	**0.671**
		Right	0.663	-	0.663
		Left	0.349	0.010	0.359
	WCDMA 1900	Top	-	0.015	0.015
		Bottom	0.319	-	0.319
		Front	0.712	0.016	0.727
		Rear	0.816	0.031	**0.847**
		Right	-	-	-
		Left	0.702	0.010	0.713

Table 11.6.7 Simultaneous Transmission Scenario : Bluetooth + 5 GHz W-LAN (Hotspot at 10 mm)

Exposure Condition	Mode	Configuration	Bluetooth SAR (W/kg)	5G W-LAN Ant.2 SAR (W/kg)	ΣSAR (W/kg)
			1	2	1+2
Hotspot SAR	5.2G W-LAN	Top	0.015	0.406	0.421
		Bottom	-	-	-
		Front	0.016	0.172	0.188
		Rear	0.031	0.436	0.467
		Right	-	-	-
		Left	0.010	0.363	0.373
	5.8G W-LAN	Top	0.015	0.204	0.218
		Bottom	-	-	-
		Front	0.016	0.070	0.086
		Rear	0.031	0.465	0.496
		Right	-	-	-
		Left	0.010	0.215	0.225

11.7 Phablet SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 648474 D04 Handset SAR, Phablet SAR tests were not required of Hotspot 1g SAR (scaled to maximum output power, including tolerance) < 1.2 W/kg. Therefore no further analysis was required to for Phablet Simultaneous Transmission Analysis.

11.8 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528-2013 Section 6.3.4.1.2.

12. SAR MEASUREMENT VARIABILITY

12.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

1. When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2. A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3. A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4. Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg
5. The same procedures should be adapted for measurements according to extremity exposure limits by applying a factor of 2.5 for extremity exposure to the corresponding SAR thresholds.

12.2 Measurement Uncertainty

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

13. EQUIPMENT LIST

Table 13.1.1 Test Equipment Calibration

	Type	Manufacturer	Model	Cal.Date	Next.Cal.Date	S/N
☒	SEMITEC Engineering	SEMITEC	N/A	N/A	N/A	Shield Room
☒	SEMITEC Engineering	SEMITEC	N/A	N/A	N/A	Shield Room
☒	SEMITEC Engineering	SEMITEC	N/A	N/A	N/A	Shield Room
☒	SEMITEC Engineering	SEMITEC	N/A	N/A	N/A	Shield Room
☒	Robot	SPEAG	TX90XL	N/A	N/A	F13/5P9GA1/A/01
☒	Robot	SPEAG	TX90XL	N/A	N/A	F13/5RR2A1/A/01
☒	Robot	SPEAG	TX60L	N/A	N/A	F12/5LP5A1/A/01
☒	Robot	SPEAG	TX60L	N/A	N/A	F14/5WV5D1/A/01
☒	Robot Controller	SPEAG	CS8C	N/A	N/A	F13/5P9GA1/C/01
☒	Robot Controller	SPEAG	CS8C	N/A	N/A	F13/5RR2A1/C/01
☒	Robot Controller	SPEAG	CS8C	N/A	N/A	F12/5LP5A1/C/01
☒	Robot Controller	SPEAG	CS8C	N/A	N/A	F14/5WV3D1/C/01
☒	Joystick	SPEAG	N/A	N/A	N/A	S-12450905
☒	Joystick	SPEAG	N/A	N/A	N/A	S-13200990
☒	Joystick	SPEAG	N/A	N/A	N/A	S-12030401
☒	Joystick	SPEAG	N/A	N/A	N/A	D21142605A
☒	Intel Core i7-3770 3.40 GHz Windows 7 Professional	N/A	N/A	N/A	N/A	N/A
☒	IntelCorei7-3770 3.40 GHz Windows 7 Professional	N/A	N/A	N/A	N/A	N/A
☒	Intel Core i7-2600 3.40 GHz Windows 7 Professional	N/A	N/A	N/A	N/A	N/A
☒	Intel Core i7-4770 3.40 GHz Windows 7 Professional	N/A	N/A	N/A	N/A	N/A
☒	Probe Alignment Unit LB	N/A	N/A	N/A	N/A	SE UKS 030 AA
☒	Probe Alignment Unit LB	N/A	N/A	N/A	N/A	SE UKS 030 AA
☒	Probe Alignment Unit LB	N/A	N/A	N/A	N/A	SE UKS 030 AA
☒	Probe Alignment Unit LB	N/A	N/A	N/A	N/A	SE UKS 030 AA
☒	Device Holder	SPEAG	SD000H01HA	N/A	N/A	N/A
☒	Device Holder	SPEAG	SD000H01HA	N/A	N/A	N/A
☒	Device Holder	SPEAG	SD000H01HA	N/A	N/A	N/A
☒	Device Holder	SPEAG	SD000H01KA	N/A	N/A	N/A
☒	Twin SAM Phantom	SPEAG	QD000P40CD	N/A	N/A	1782
☒	Twin SAM Phantom	SPEAG	QD000P40CD	N/A	N/A	1783
☒	Twin SAM Phantom	SPEAG	QD000P40CD	N/A	N/A	1786
☒	Twin SAM Phantom	SPEAG	QD000P40CD	N/A	N/A	1679
☒	Twin SAM Phantom	SPEAG	QD000P40CD	N/A	N/A	1837
☒	Data Acquisition Electronics	SPEAG	DAE3V1	2018-11-16	2019-11-16	520
☒	Data Acquisition Electronics	SPEAG	DAE4V1	2018-08-22	2019-08-22	1396
☒	Data Acquisition Electronics	SPEAG	DAE4V1	2018-07-23	2019-07-23	1335
☒	Data Acquisition Electronics	SPEAG	DAE4V1	2018-04-24	2019-04-24	1391
☒	Dosimetric E-Field Probe	SPEAG	ES3DV3	2018-08-28	2019-08-28	3327
☒	Dosimetric E-Field Probe	SPEAG	EX3DV4	2018-09-25	2019-09-25	3933
☒	Dosimetric E-Field Probe	SPEAG	EX3DV4	2018-07-26	2019-07-26	3930
☒	Dosimetric E-Field Probe	SPEAG	EX3DV4	2018-04-25	2019-04-25	3916
☒	835MHz SAR Dipole	SPEAG	D835V2	2018-08-23	2020-08-23	4d159
☒	1900MHz SAR Dipole	SPEAG	D1900V2	2018-08-27	2020-08-27	5d176
☒	2450MHz SAR Dipole	SPEAG	D2450V2	2018-08-24	2020-08-24	920
☒	5GHz SAR Dipole	SPEAG	D5GHzV2	2019-02-28	2021-02-28	1103
☒	Network Analyzer	Agilent	E5071C	2018-12-19	2019-12-19	MY46111534
☒	Signal Generator	Agilent	E4438C	2018-07-04	2019-07-04	US41461520
☒	Amplifier	EMPOWER	BBS3Q7ELU	2018-07-10	2019-07-10	1020
☒	High Power RF Amplifier	EMPOWER	BBS3Q8CCJ	2018-07-06	2019-07-06	1005
☒	Power Meter	HP	EPM-442A	2018-12-19	2019-12-19	GB37170267
☒	Power Meter	HP	EPM-442A	2018-12-18	2019-12-18	GB37170413
☒	Power Meter	Anritsu	ML2495A	2018-07-04	2019-07-04	1435003
☒	Power Sensor	Anritsu	MA2490A	2018-07-04	2019-07-04	1409034
☒	Power Sensor	HP	8481A	2018-12-18	2019-12-18	US37294267
☒	Power Sensor	HP	8481A	2018-12-19	2019-12-19	3318A96566
☒	Power Sensor	HP	8481A	2018-12-19	2019-12-19	2702A65976
☒	Dual Directional Coupler	Agilent	778D-012	2018-12-19	2019-12-19	50228
☒	Directional Coupler	HP	772D	2018-07-03	2019-07-03	2889A01064
☒	Low Pass Filter 1.5GHz	Micro LAB	LA-15N	2018-07-05	2019-07-05	2
☒	Low Pass Filter 3.0GHz	Micro LAB	LA-30N	2018-07-05	2019-07-05	2
☒	Low Pass Filter 6.0GHz	Micro LAB	LA-60N	2018-12-19	2019-12-19	03942
☒	Attenuators(3 dB)	Agilent	8491B	2018-12-19	2019-12-19	MY39260700
☒	Attenuators(10 dB)	WEINSCHEL	23-10-34	2018-12-19	2019-12-19	BP4387
☒	Dielectric Probe kit	SPEAG	DAK-3.5	2018-07-24	2019-07-24	1046
☒	8960 Series 10 Wireless Comms. Test Set	Agilent	E5515C	2018-07-04	2019-07-04	GB41321164
☒	Wideband Radio Communication Tester	Rohde Schwarz	CMW500	2019-03-06	2020-03-06	127323
☒	Wideband Radio Communication Tester	Rohde Schwarz	CMW500	2018-12-19	2019-12-19	101414
☒	Radio Communication Analyzer	KEYSIGHT	E7515A	2018-07-06	2019-07-06	MY55210201
☒	Radio Communication Analyzer	KEYSIGHT	E7515A	2018-12-19	2019-12-19	MY57270113
☒	Power Splitter	Anritsu	K241B	2018-12-18	2019-12-18	1301183
☒	Bluetooth Tester	TESCOM	TC-3000B	2018-12-18	2019-12-18	3000B770243

NOTE(S):

1. The E-field probe was calibrated by SPEAG, by temperature measurement procedure. Dipole Verification measurement is performed by DT&C before each test. The brain and muscle simulating material are calibrated by DT&C using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain and muscle-equivalent material. Each equipment item was used solely within its respective calibration period.
2. 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. 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.

14. MEASUREMENT UNCERTAINTIES

835 MHz Head (SN: 3327)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.0	Normal	1	1	1	± 6.0 %	± 6.0 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 4.2	Normal	1	0.78	0.71	± 3.3 %	± 3.0 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 3.9	Normal	1	0.23	0.26	± 0.9 %	± 1.0 %	10
Temp. unc. - Conductivity	± 1.8	Rectangular	√3	0.78	0.71	± 0.8 %	± 0.7 %	∞
Temp. unc. - Permittivity	± 1.8	Rectangular	√3	0.23	0.26	± 0.2%	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.7 %**	**± 11.5 %**	330
Expanded Uncertainty (k=2)						**± 23.4 %**	**± 23.0 %**	

The above measurement uncertainties are according to IEEE Std 1528

835 MHz Body (SN: 3327)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.0	Normal	1	1	1	± 6.0 %	± 6.0 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 3.9	Normal	1	0.78	0.71	± 3.0 %	± 2.8 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.1	Normal	1	0.23	0.26	± 0.9 %	± 1.1 %	10
Temp. unc. - Conductivity	± 1.9	Rectangular	√3	0.78	0.71	± 0.9 %	± 0.8 %	∞
Temp. unc. - Permittivity	± 1.8	Rectangular	√3	0.23	0.26	± 0.2%	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.6 %**	**± 11.4 %**	330
Expanded Uncertainty (k=2)						**± 23.2 %**	**± 22.8 %**	

The above measurement uncertainties are according to IEEE Std 1528

1900 MHz Head (SN: 3327)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.0	Normal	1	1	1	± 6.0 %	± 6.0 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 3.9	Normal	1	0.78	0.71	± 3.0 %	± 2.8 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.3	Normal	1	0.23	0.26	± 1.0 %	± 1.1 %	10
Temp. unc. - Conductivity	± 1.8	Rectangular	√3	0.78	0.71	± 0.8 %	± 0.7 %	∞
Temp. unc. - Permittivity	± 1.9	Rectangular	√3	0.23	0.26	± 0.3 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.6 %**	**± 11.4 %**	330
Expanded Uncertainty (k=2)						**± 23.2 %**	**± 22.8 %**	

The above measurement uncertainties are according to IEEE Std 1528

1900 MHz Body (SN: 3327)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.0	Normal	1	1	1	± 6.0 %	± 6.0 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 3.7	Normal	1	0.78	0.71	± 2.9 %	± 2.6 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.2	Normal	1	0.23	0.26	± 1.0 %	± 1.1 %	10
Temp. unc. - Conductivity	± 1.8	Rectangular	√3	0.78	0.71	± 0.8 %	± 0.7 %	∞
Temp. unc. - Permittivity	± 1.8	Rectangular	√3	0.23	0.26	± 0.2 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.6 %**	**± 11.4 %**	330
Expanded Uncertainty (k=2)						**± 23.2 %**	**± 22.8 %**	

The above measurement uncertainties are according to IEEE Std 1528

2450 MHz Head (SN: 3933)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.0	Normal	1	1	1	± 6.0 %	± 6.0 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 3.8	Normal	1	0.78	0.71	± 3.0 %	± 2.7 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.0	Normal	1	0.23	0.26	± 0.9 %	± 1.0 %	10
Temp. unc. - Conductivity	± 1.9	Rectangular	√3	0.78	0.71	± 0.9 %	± 0.8 %	∞
Temp. unc. - Permittivity	± 1.8	Rectangular	√3	0.23	0.26	± 0.2 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.6 %**	**± 11.4 %**	330
Expanded Uncertainty (k=2)						**± 23.2 %**	**± 22.8 %**	

The above measurement uncertainties are according to IEEE Std 1528

2450 MHz Body (SN: 3933)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.0	Normal	1	1	1	± 6.0 %	± 6.0 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 3.7	Normal	1	0.78	0.71	± 2.9 %	± 2.6 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.2	Normal	1	0.23	0.26	± 1.0 %	± 1.1 %	10
Temp. unc. - Conductivity	± 1.9	Rectangular	√3	0.78	0.71	± 0.9 %	± 0.8 %	∞
Temp. unc. - Permittivity	± 1.9	Rectangular	√3	0.23	0.26	± 0.3 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.6 %**	**± 11.4 %**	330
Expanded Uncertainty (k=2)						**± 23.2 %**	**± 22.8 %**	

The above measurement uncertainties are according to IEEE Std 1528

5200 MHz Head (SN: 3916)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.55	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 4.3	Normal	1	0.78	0.71	± 3.4 %	± 3.1 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 3.9	Normal	1	0.23	0.26	± 0.9 %	± 1.0 %	10
Temp. unc. - Conductivity	± 1.9	Rectangular	√3	0.78	0.71	± 0.9 %	± 0.8 %	∞
Temp. unc. - Permittivity	± 1.8	Rectangular	√3	0.23	0.26	± 0.2 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 12.0 %**	**± 11.8 %**	330
Expanded Uncertainty (k=2)						**± 24.0 %**	**± 23.6 %**	

The above measurement uncertainties are according to IEEE Std 1528

5200 MHz Body (SN: 3930)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.55	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 4.0	Normal	1	0.78	0.71	± 3.1%	± 2.8 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 3.8	Normal	1	0.23	0.26	± 0.9 %	± 1.0 %	10
Temp. unc. - Conductivity	± 1.8	Rectangular	√3	0.78	0.71	± 0.8%	± 0.7%	∞
Temp. unc. - Permittivity	± 1.7	Rectangular	√3	0.23	0.26	± 0.2 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.9 %**	**± 11.7 %**	330
Expanded Uncertainty (k=2)						**± 23.8 %**	**± 23.4 %**	

The above measurement uncertainties are according to IEEE Std 1528

5300 MHz Head (SN: 3916)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.55	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 4.1	Normal	1	0.78	0.71	± 3.2 %	± 2.9 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.0	Normal	1	0.23	0.26	± 0.9 %	± 1.0 %	10
Temp. unc. - Conductivity	± 1.9	Rectangular	√3	0.78	0.71	± 0.9 %	± 0.8 %	∞
Temp. unc. - Permittivity	± 2.0	Rectangular	√3	0.23	0.26	± 0.3 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.9 %**	**± 11.7 %**	330
Expanded Uncertainty (k=2)						**± 23.8 %**	**± 23.4 %**	

The above measurement uncertainties are according to IEEE Std 1528

5300 MHz Body (SN: 3930)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.55	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 3.9	Normal	1	0.78	0.71	± 3.0 %	± 2.8 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.1	Normal	1	0.23	0.26	± 0.9 %	± 1.1 %	10
Temp. unc. - Conductivity	± 1.9	Rectangular	√3	0.78	0.71	± 0.9 %	± 0.8 %	∞
Temp. unc. - Permittivity	± 1.9	Rectangular	√3	0.23	0.26	± 0.3 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.9 %**	**± 11.7 %**	330
Expanded Uncertainty (k=2)						**± 23.8 %**	**± 23.4 %**	

The above measurement uncertainties are according to IEEE Std 1528

5500 MHz Head (SN: 3916)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.55	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 3.8	Normal	1	0.78	0.71	± 3.0 %	± 2.7 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.1	Normal	1	0.23	0.26	± 0.9 %	± 1.1 %	10
Temp. unc. - Conductivity	± 1.8	Rectangular	√3	0.78	0.71	± 0.8 %	± 0.7 %	∞
Temp. unc. - Permittivity	± 1.8	Rectangular	√3	0.23	0.26	± 0.2 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.9 %**	**± 11.7 %**	330
Expanded Uncertainty (k=2)						**± 23.8 %**	**± 23.4 %**	

The above measurement uncertainties are according to IEEE Std 1528

5500 MHz Body (SN: 3930)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.55	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 3.8	Normal	1	0.78	0.71	± 3.0 %	± 2.7 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 3.9	Normal	1	0.23	0.26	± 0.9 %	± 1.0 %	10
Temp. unc. - Conductivity	± 1.7	Rectangular	√3	0.78	0.71	± 0.8 %	± 0.7 %	∞
Temp. unc. - Permittivity	± 1.8	Rectangular	√3	0.23	0.26	± 0.2 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.9 %**	**± 11.7 %**	330
Expanded Uncertainty (k=2)						**± 23.8 %**	**± 23.4 %**	

The above measurement uncertainties are according to IEEE Std 1528

5600 MHz Head (SN: 3916)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.55	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 4.1	Normal	1	0.78	0.71	± 3.2 %	± 2.9 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.3	Normal	1	0.23	0.26	± 1.0 %	± 1.1 %	10
Temp. unc. - Conductivity	± 1.8	Rectangular	√3	0.78	0.71	± 0.8 %	± 0.7 %	∞
Temp. unc. - Permittivity	± 1.8	Rectangular	√3	0.23	0.26	± 0.2 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.9 %**	**± 11.7 %**	330
Expanded Uncertainty (k=2)						**± 23.8 %**	**± 23.4 %**	

The above measurement uncertainties are according to IEEE Std 1528

5600 MHz Body (SN: 3930)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.55	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 3.9	Normal	1	0.78	0.71	± 3.0 %	± 2.8 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.1	Normal	1	0.23	0.26	± 0.9 %	± 1.1 %	10
Temp. unc. - Conductivity	± 1.9	Rectangular	√3	0.78	0.71	± 0.9 %	± 0.8 %	∞
Temp. unc. - Permittivity	± 1.9	Rectangular	√3	0.23	0.26	± 0.3 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.9 %**	**± 11.7 %**	330
Expanded Uncertainty (k=2)						**± 23.8 %**	**± 23.4 %**	

The above measurement uncertainties are according to IEEE Std 1528

5800 MHz Head (SN: 3916)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.55	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 4.2	Normal	1	0.78	0.71	± 3.3 %	± 3.0 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 3.9	Normal	1	0.23	0.26	± 0.9 %	± 1.0 %	10
Temp. unc. - Conductivity	± 1.8	Rectangular	√3	0.78	0.71	± 0.8 %	± 0.7 %	∞
Temp. unc. - Permittivity	± 2.0	Rectangular	√3	0.23	0.26	± 0.3 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.9 %**	**± 11.8 %**	330
Expanded Uncertainty (k=2)						**± 23.8 %**	**± 23.6 %**	

The above measurement uncertainties are according to IEEE Std 1528

5800 MHz Body (SN: 3930)

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard (1g)	Standard (10g)	vi 2 or Veff
Measurement System								
Probe calibration	± 6.55	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Isotropy	± 1.3	Normal	1	1	1	± 1.3 %	± 1.3 %	∞
Boundary Effects	± 2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe Linearity	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Probe modulation response	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Detection limits	± 0.25	Rectangular	√3	1	1	± 0.14 %	± 0.14 %	∞
Readout Electronics	± 0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Integration time	± 2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions – Noise	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions – Reflections	± 3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.8	Rectangular	√3	1	1	± 0.46 %	± 0.46 %	∞
Probe Positioning	± 6.7	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Algorithms for Max. SAR Eval.	± 4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device Positioning	± 2.9	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
SAR Scaling	± 0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Physical Parameters								
Phantom Shell	± 7.6	Rectangular	√3	1	1	± 4.4 %	± 4.4 %	∞
SAR correction	± 0.0	Normal	1	1	0.84	± 0.0 %	± 0.0 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (Meas.)	± 4.0	Normal	1	0.78	0.71	± 3.1 %	± 2.8 %	10
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.60	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (Meas.)	± 4.1	Normal	1	0.23	0.26	± 0.9 %	± 1.1 %	10
Temp. unc. - Conductivity	± 1.9	Rectangular	√3	0.78	0.71	± 0.9 %	± 0.8 %	∞
Temp. unc. - Permittivity	± 1.8	Rectangular	√3	0.23	0.26	± 0.2 %	± 0.3 %	∞
Combined Standard Uncertainty						**± 11.9 %**	**± 11.7 %**	330
Expanded Uncertainty (k=2)						**± 23.8 %**	**± 23.4 %**	

The above measurement uncertainties are according to IEEE Std 1528

15. CONCLUSION

Measurement Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC. These measurements are taken to simulate the RF effects exposure under the worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect to all parameters subject to the test. The test results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are every 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 impossible biological effect 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 innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

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APPENDIX A. – Probe Calibration Data

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **DT&C (Dymstec)**

Certificate No: **ES3-3327_Aug18**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3327
Calibration procedure(s)	QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	August 28, 2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-18 (No. 217-02682)	Apr-19
Reference Probe ES3DV2	SN: 3013	30-Dec-17 (No. ES3-3013_Dec17)	Dec-18
DAE4	SN: 660	21-Dec-17 (No. DAE4-660_Dec17)	Dec-18
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 30, 2018

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3327

Manufactured: January 10, 2012
Calibrated: August 28, 2018

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.15	1.10	1.03	± 10.1 %
DCP (mV)[B]	104.8	103.1	108.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	197.7	±3.0 %
		Y	0.0	0.0	1.0		199.9	
		Z	0.0	0.0	1.0		193.5	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	41.9	0.89	6.57	6.57	6.57	0.67	1.25	± 12.0 %
835	41.5	0.90	6.35	6.35	6.35	0.80	1.14	± 12.0 %
900	41.5	0.97	6.18	6.18	6.18	0.44	1.51	± 12.0 %
1750	40.1	1.37	5.50	5.50	5.50	0.80	1.30	± 12.0 %
1900	40.0	1.40	5.27	5.27	5.27	0.80	1.25	± 12.0 %
2450	39.2	1.80	4.56	4.56	4.56	0.76	1.33	± 12.0 %
2600	39.0	1.96	4.48	4.48	4.48	0.80	1.35	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

ES3DV3– SN:3327 August 28, 2018

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

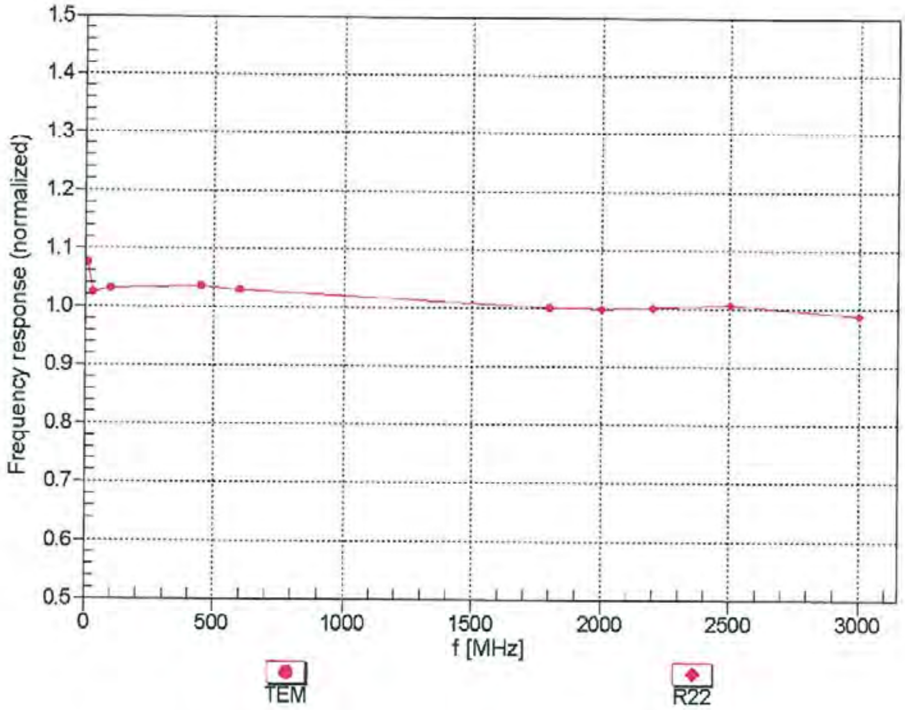
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	55.5	0.96	6.38	6.38	6.38	0.80	1.16	± 12.0 %
835	55.2	0.97	6.24	6.24	6.24	0.80	1.15	± 12.0 %
900	55.0	1.05	6.21	6.21	6.21	0.63	1.29	± 12.0 %
1750	53.4	1.49	5.15	5.15	5.15	0.71	1.40	± 12.0 %
1900	53.3	1.52	4.91	4.91	4.91	0.55	1.65	± 12.0 %
2450	52.7	1.95	4.50	4.50	4.50	0.77	1.35	± 12.0 %
2600	52.5	2.16	4.30	4.30	4.30	0.80	1.25	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

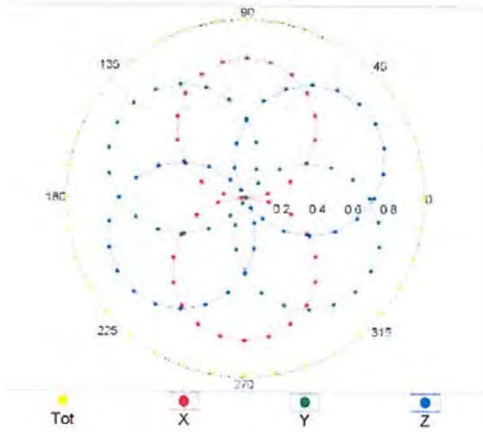
(TEM-Cell:ifi110 EXX, Waveguide: R22)



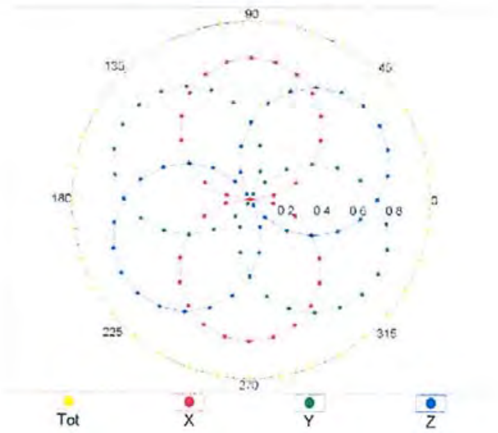
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

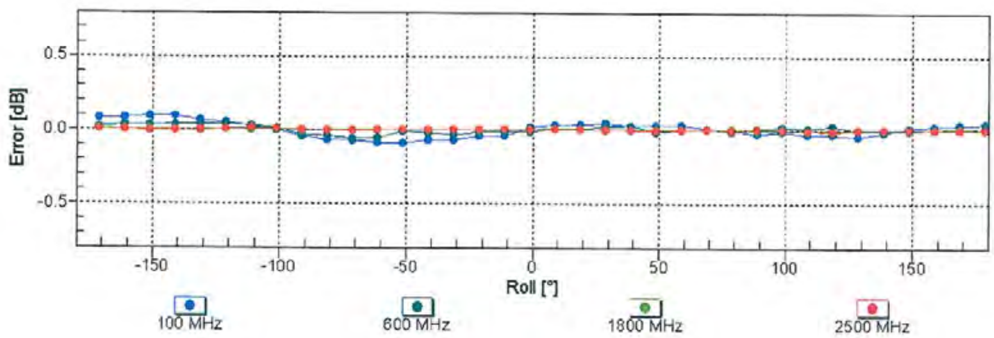
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

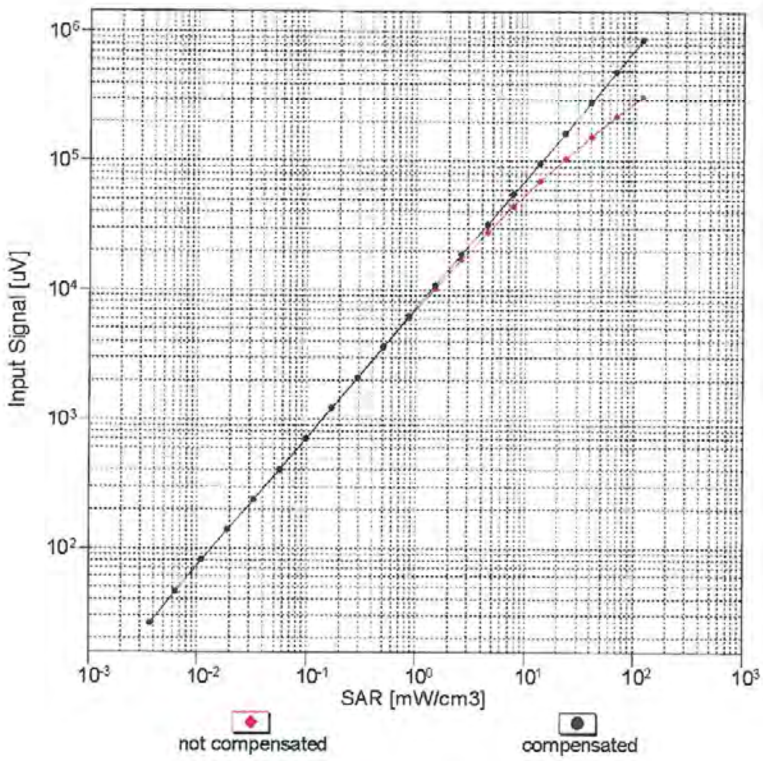


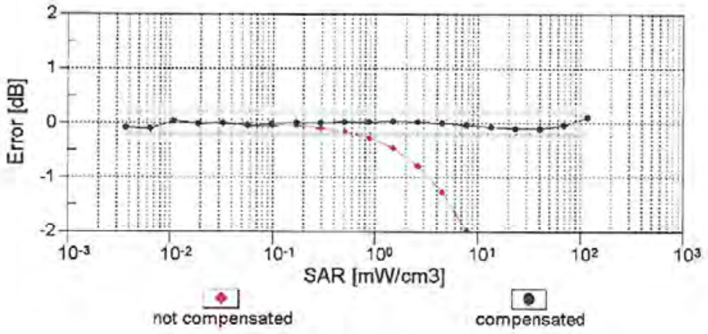


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

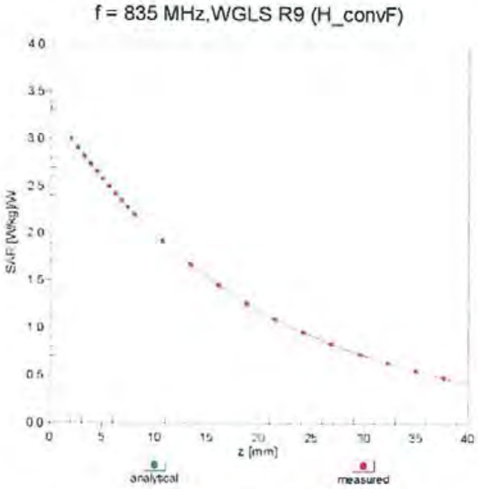
(TEM cell , f_{eval}= 1900 MHz)

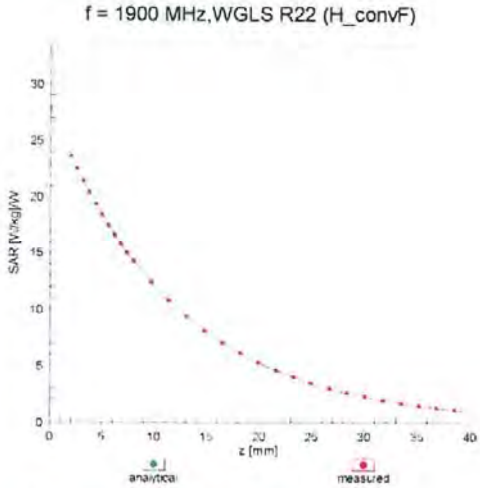




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

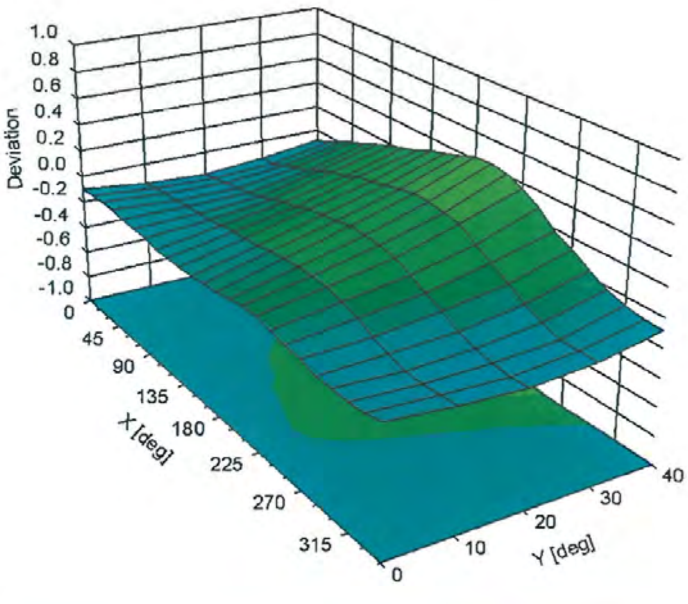
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	8.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 0108

Client **DT&C (Dymstec)**

Certificate No: **EX3-3933_Sep18**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3933

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: September 25, 2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-18 (No. 217-02682)	Apr-19
Reference Probe ES3DV2	SN: 3013	30-Dec-17 (No. ES3-3013_Dec17)	Dec-18
DAE4	SN: 660	21-Dec-17 (No. DAE4-660_Dec17)	Dec-18
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 27, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:3933

Manufactured: July 24, 2013
Calibrated: September 25, 2018

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3933

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (μV/(V/m)^2)[A]	0.50	0.52	0.19	± 10.1 %
DCP (mV)[B]	104.5	98.7	93.5	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	144.0	±2.7 %
		Y	0.0	0.0	1.0		147.5	
		Z	0.0	0.0	1.0		142.5	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3933

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	41.9	0.89	10.76	10.76	10.76	0.35	1.00	± 12.0 %
835	41.5	0.90	10.26	10.26	10.26	0.46	0.83	± 12.0 %
900	41.5	0.97	9.91	9.91	9.91	0.43	0.80	± 12.0 %
1750	40.1	1.37	8.83	8.83	8.83	0.34	0.83	± 12.0 %
1900	40.0	1.40	8.54	8.54	8.54	0.25	0.80	± 12.0 %
2300	39.5	1.67	7.90	7.90	7.90	0.41	0.80	± 12.0 %
2450	39.2	1.80	7.61	7.61	7.61	0.21	1.16	± 12.0 %
2600	39.0	1.96	7.41	7.41	7.41	0.25	1.00	± 12.0 %
3500	37.9	2.91	7.30	7.30	7.30	0.27	1.20	± 13.1 %
3700	37.7	3.12	7.13	7.13	7.13	0.25	1.20	± 13.1 %
5200	36.0	4.66	5.24	5.24	5.24	0.40	1.80	± 13.1 %
5300	35.9	4.76	5.02	5.02	5.02	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.87	4.87	4.87	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.71	4.71	4.71	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.77	4.77	4.77	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3933

Calibration Parameter Determined in Body Tissue Simulating Media

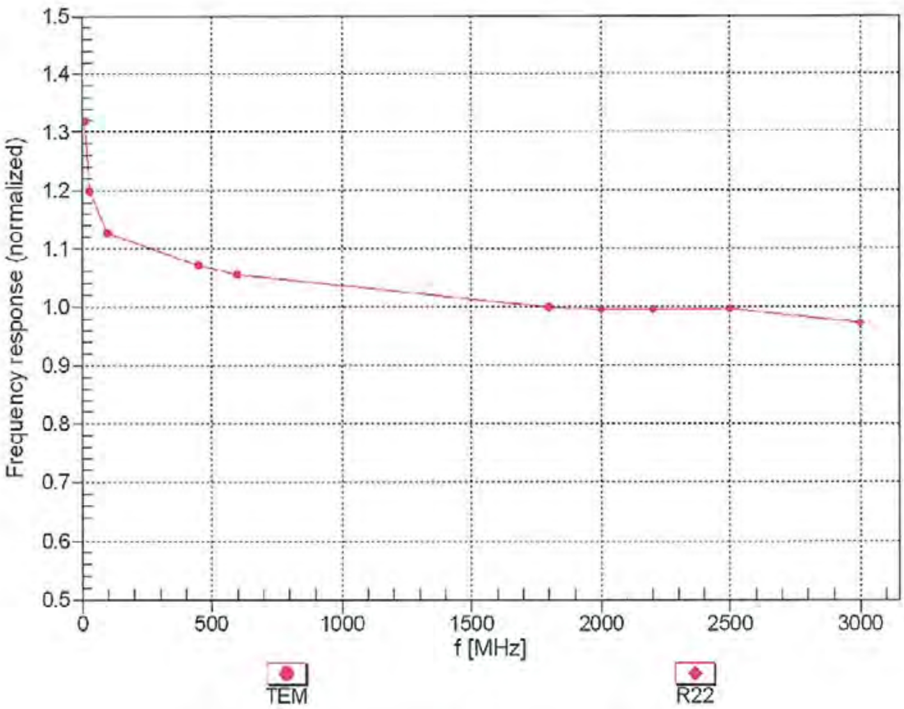
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	55.5	0.96	10.43	10.43	10.43	0.32	1.02	± 12.0 %
835	55.2	0.97	10.27	10.27	10.27	0.44	0.80	± 12.0 %
900	55.0	1.05	10.20	10.20	10.20	0.42	0.80	± 12.0 %
1750	53.4	1.49	8.62	8.62	8.62	0.31	0.88	± 12.0 %
1900	53.3	1.52	8.21	8.21	8.21	0.38	0.80	± 12.0 %
2300	52.9	1.81	7.86	7.86	7.86	0.34	0.88	± 12.0 %
2450	52.7	1.95	7.75	7.75	7.75	0.34	0.95	± 12.0 %
2600	52.5	2.16	7.63	7.63	7.63	0.31	0.95	± 12.0 %
3500	51.3	3.31	7.13	7.13	7.13	0.30	1.25	± 13.1 %
3700	51.0	3.55	7.08	7.08	7.08	0.30	1.25	± 13.1 %
5200	49.0	5.30	4.67	4.67	4.67	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.51	4.51	4.51	0.50	1.90	± 13.1 %
5500	48.6	5.65	4.14	4.14	4.14	0.50	1.90	± 13.1 %
5600	48.5	5.77	4.01	4.01	4.01	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.10	4.10	4.10	0.50	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

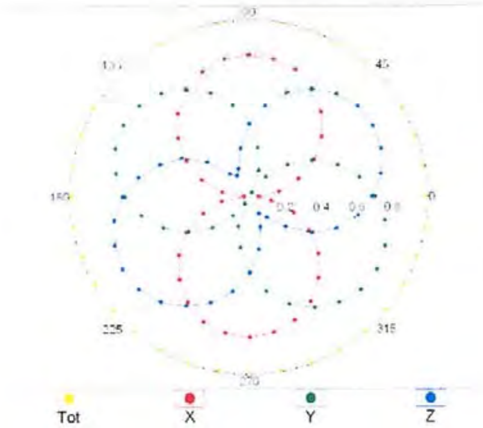
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



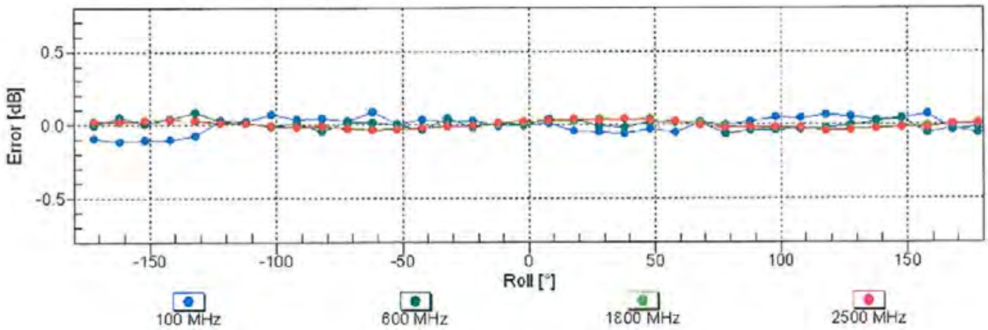
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM

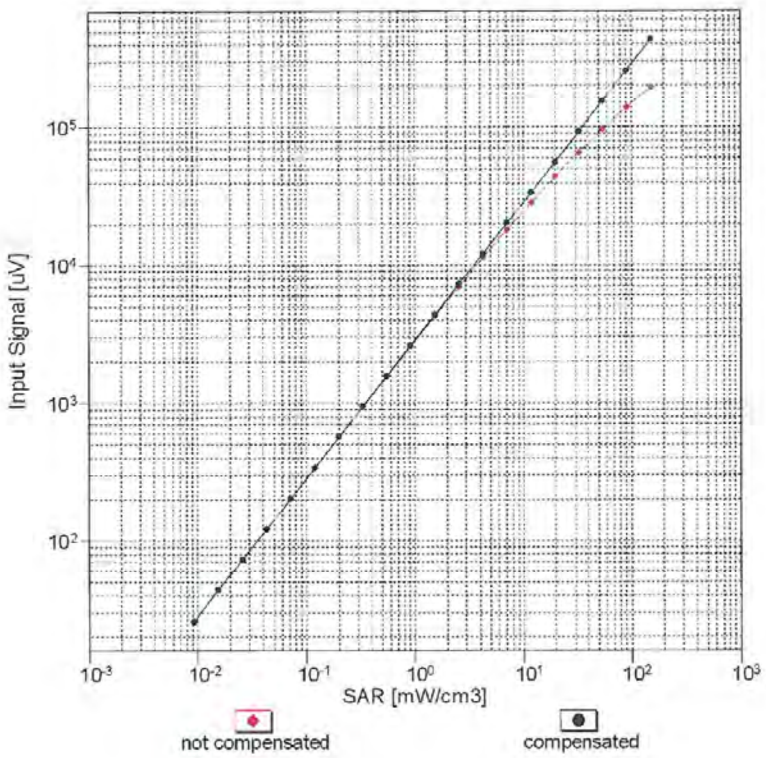


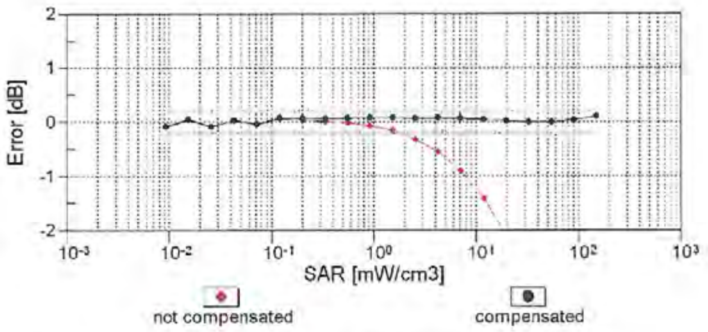
f=1800 MHz,R22



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)



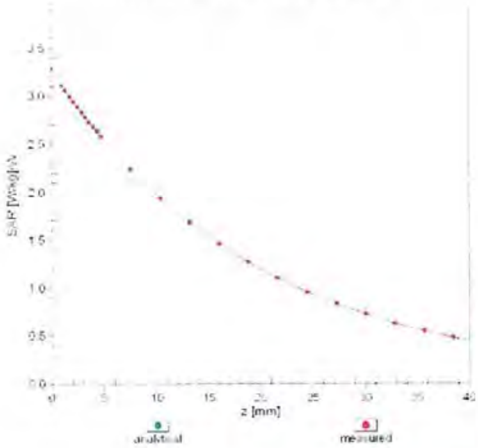


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

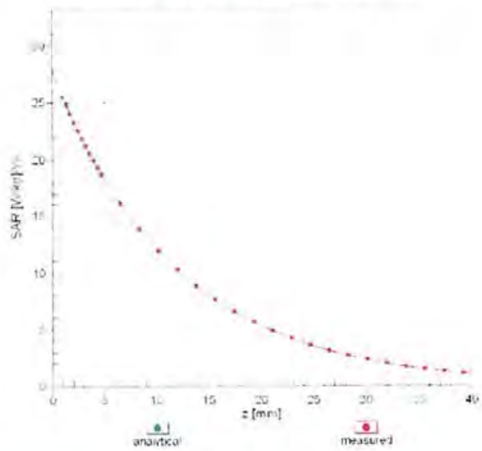
EX3DV4– SN:3933 September 25, 2018

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

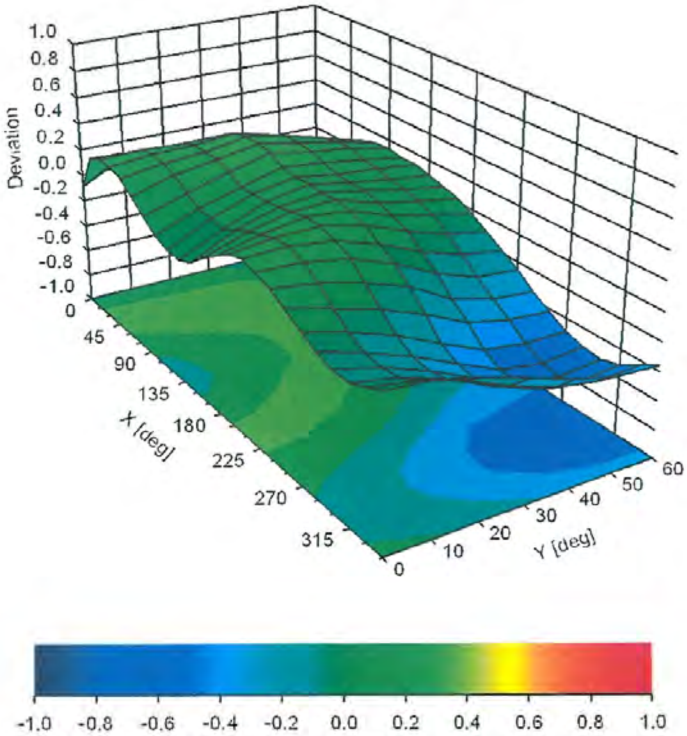


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3933

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	77.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Calibration Laboratory of
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Accreditation No.: **SCS 0108**

Client **DT&C (Dymstec)**

Certificate No: **EX3-3916_Apr18**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3916

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: April 25, 2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-18 (No. 217-02682)	Apr-19
Reference Probe ES3DV2	SN: 3013	30-Dec-17 (No. ES3-3013_Dec17)	Dec-18
DAE4	SN: 660	21-Dec-17 (No. DAE4-660_Dec17)	Dec-18
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 26, 2018

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Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:3916

Manufactured: December 18, 2012
Calibrated: April 25, 2018

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3916

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.56	0.47	0.52	± 10.1 %
DCP (mV)[B]	99.6	101.3	99.8	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	148.6	±3.5 %
		Y	0.0	0.0	1.0		159.6	
		Z	0.0	0.0	1.0		142.3	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3916

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
2450	39.2	1.80	7.72	7.72	7.72	0.36	0.85	± 12.0 %
2600	39.0	1.96	7.51	7.51	7.51	0.37	0.84	± 12.0 %
5200	36.0	4.66	5.38	5.38	5.38	0.35	1.80	± 13.1 %
5300	35.9	4.76	5.04	5.04	5.04	0.40	1.80	± 13.1 %
5500	35.6	4.96	5.01	5.01	5.01	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.84	4.84	4.84	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.94	4.94	4.94	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3916

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
2450	52.7	1.95	7.69	7.69	7.69	0.36	0.90	± 12.0 %
2600	52.5	2.16	7.42	7.42	7.42	0.41	0.90	± 12.0 %
5200	49.0	5.30	4.66	4.66	4.66	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.44	4.44	4.44	0.50	1.90	± 13.1 %
5500	48.6	5.65	4.23	4.23	4.23	0.50	1.90	± 13.1 %
5600	48.5	5.77	4.02	4.02	4.02	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.31	4.31	4.31	0.50	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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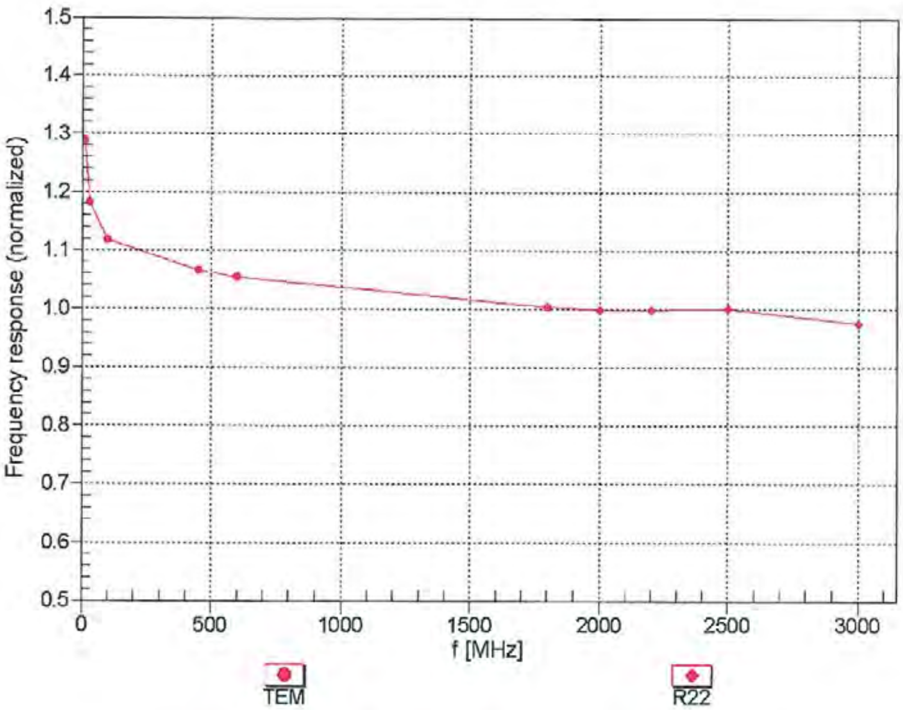
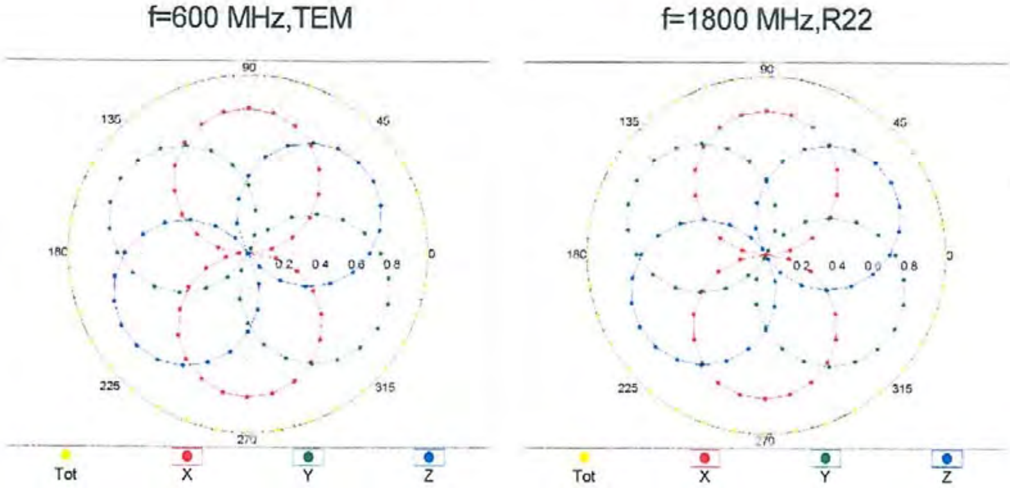
Frequency Response of E-Field

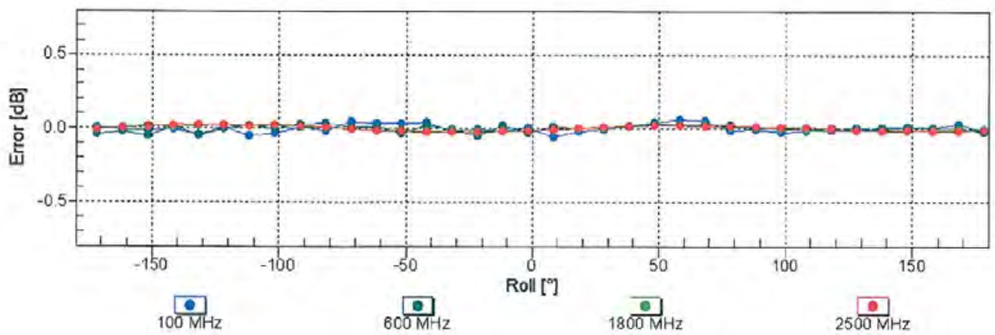
(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$





Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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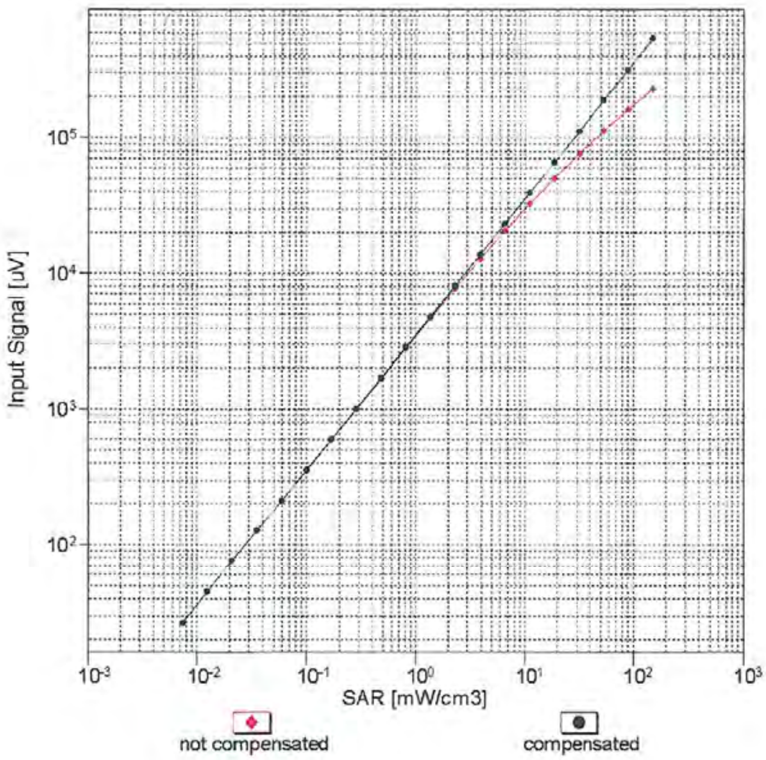
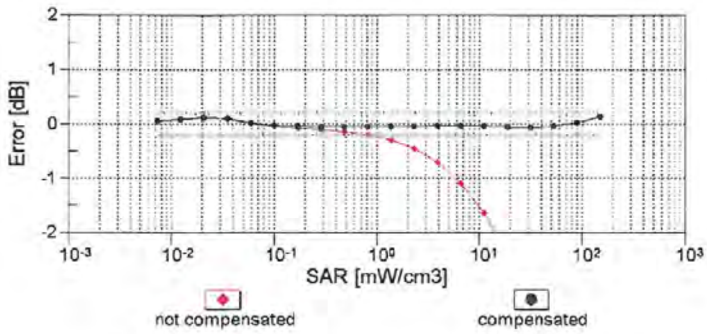
Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)



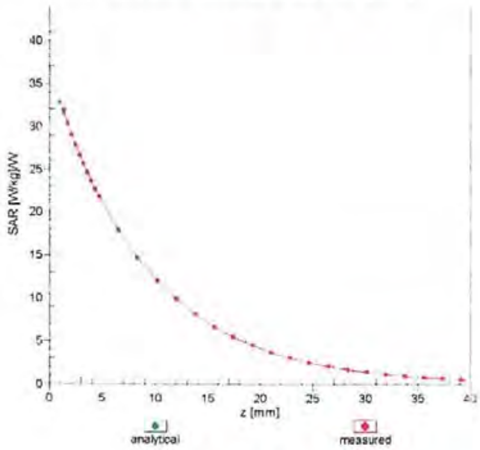


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

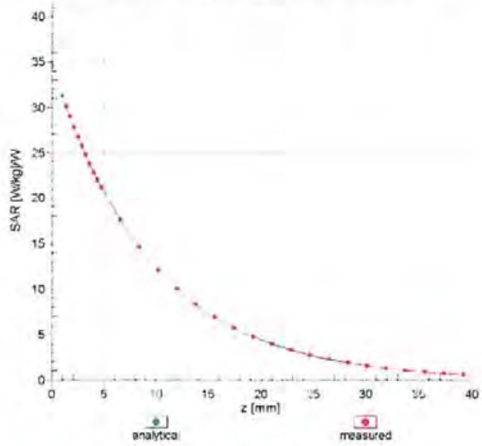
EX3DV4– SN:3916 April 25, 2018

Conversion Factor Assessment

f = 2450 MHz,WGLS R22 (H_convF)

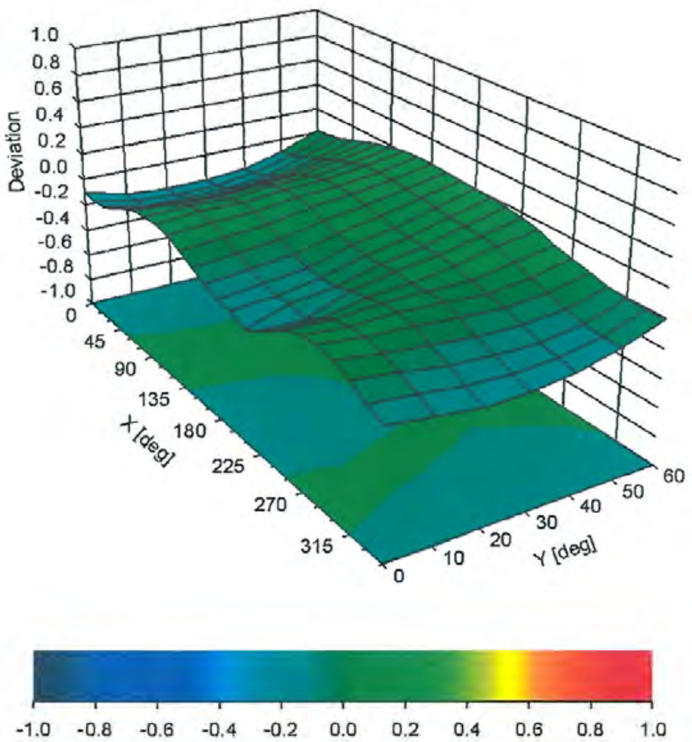


f = 2450 MHz,WGLS R22 (M_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: EX3-3916_Apr18 Page 10 of 11

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3916

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	88.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm