



**KDB 865664 D01 SAR Measurement 100MHz to 6GHz  
FCC 47 CFR part 2 (2.1093)**

**SAR EVALUATION REPORT**

*For*

**Linea Pro 5 case for iPhone 5 (Contains FCC ID: YRWDATECSBT301)**

**Report Number UL-SAR-RP10488894JD01A V3.0**

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**REVISION HISTORY**

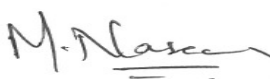

Rev.	Issue Date	Revisions	Revised By
--	30 April 2015	Initial Issue	--
1	29 February 2016	The following amendments are made in the report: <ol style="list-style-type: none"> <li>1. FCC ID of the sleeve is added</li> <li>2. In Section 1 and 6.1., DUT description is updated</li> <li>3. In Section 2,KDB list is updated to include latest KDB versions</li> <li>4. In Section 2, typo in Test specification – purpose of test is amended</li> <li>5. In Section 5, note added under the uncertainty budget tables</li> <li>6. In Section 6.3., the date of the original report is added</li> <li>7. In Section 7, the date of the original report is added</li> <li>8. In Sections 10.2. and 10.3., host test separation distance note is added</li> <li>9. In Sections 12.3. and 12.4., the FCC ID of the sleeve is added</li> <li>10. Section 12.8 ‘Baseline Plots’ added</li> </ol>	Sandhya Menon
2	24 May 2016	The following amendments are made in the report: <ol style="list-style-type: none"> <li>1. FCC ID of the sleeve is updated</li> <li>2. EUT description updated in section 1 and 6.1.</li> </ol>	Sandhya Menon

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### 1. Attestation of Test Results

Applicant Name:	Datecs Ltd				
Application Purpose	<input checked="" type="checkbox"/> Original Grant				
DUT Description	The Linea Pro 5 is a small handheld secured payment terminal with barcode reading. This terminal is designed to operate with FCC ID: BCG-E2599A				
Test Device is	An identical prototype				
Device category	Portable				
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)				
Date Tested	30 March 2015 to 29 April 2015				
The highest reported SAR values	RF Exposure Conditions	Equipment Class			
		Licensed	DTS	UNII	DSS
<b>Host Device Model: A1428</b>	Head	0.641 W/kg	0.105 W/kg	0.341 W/kg	N/A
	Body-worn Accessory	0.494 W/kg	0.112 W/kg	0.137 W/kg	0.059 W/kg
	Wireless Router (Hotspot)	0.494 W/kg	0.112 W/kg	N/A	N/A
	Simultaneous Transmission	0.982 W/kg	0.746 W/kg	0.982 W/kg	0.742 W/kg
<b>Host Device Model: A1429</b>	Head	0.890 W/kg	0.094 W/kg	0.395 W/kg	0.395 W/kg
	Body-worn Accessory	0.523 W/kg	0.075 W/kg	0.165 W/kg	0.042 W/kg
	Wireless Router (Hotspot)	0.523 W/kg	0.075 W/kg	N/A	N/A
	Simultaneous Transmission	1.285 W/kg	0.984 W/kg	1.285 W/kg	0.782 W/kg
Applicable Standards	FCC 47 CFR part 2 (2.1093) KDB publication IEEE Std 1528-2013				
Test Results	Pass				
<p>UL VS Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL VS Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties are in accordance with the above standard and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p><b>Note:</b> The results documented in this report apply only to the tested sample(s), under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL VS Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL VS Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by UKAS. This report is written to support regulatory compliance of the applicable standards stated above.</p>					
Approved & Released By:			Prepared By:		
					
Naseer Mirza Project Lead UL VS Ltd.			Sandhya Menon Senior Engineer UL VS Ltd.		

## **2. Test Specification, Methods and Procedures**

### **2.1. Test Specification**

<b>Reference:</b>	KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
<b>Title:</b>	SAR Measurement Requirements for 100 MHz to 6 GHz
<b>Purpose of Test:</b>	Field probes, tissue dielectric properties, SAR scans, measurement accuracy and variability of the measured results are discussed. The field probe and SAR scan requirements are derived from criteria considered in IEEE 1528: 2013.
The Equipment Under Test complied with the Specific Absorption Rate for general population/uncontrolled exposure limit of 1.6 W/kg as specified in FCC 47 CFR part 2 (2.1093) and ANSI C95.1-1992 and has been tested in accordance with the reference documents in section 2.2 of this report.	

### **2.2. Methods and Procedures Reference Documentation**

The methods and procedures used were as detailed in:

**IEEE 1528: 2013**

IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

Thomas Schmid, Oliver Egger and Neils Kuster, “Automated E-field scanning system for dosimetric assessments”, IEEE Transaction on microwave theory and techniques, Vol. 44, pp. 105-113, January 1996.

Neils Kuster, Ralph Kastle and Thomas Schmid, “Dosimetric evaluation of mobile communications equipment with known precision”, IEICE Transactions of communications, Vol. E80-B, No.5, pp. 645-652, May 1997.

**FCC KDB Publication:**

- 248227 D01 802.11 Wi-Fi SAR v02 r02
- 447498 D01 General RF Exposure Guidance v06
- 648474 D04 Handset SAR v01r03
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D06 Hotspot Mode v02r01
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 SAR Reporting v01r02
- Interim Sleeve Procedures
- RF Exposure Procedures TCB Workshop April 2015

### **2.3. Definition of Measurement Equipment**

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

### **3. Facilities and Accreditation**

The test sites and measurement facilities used to collect data are located at

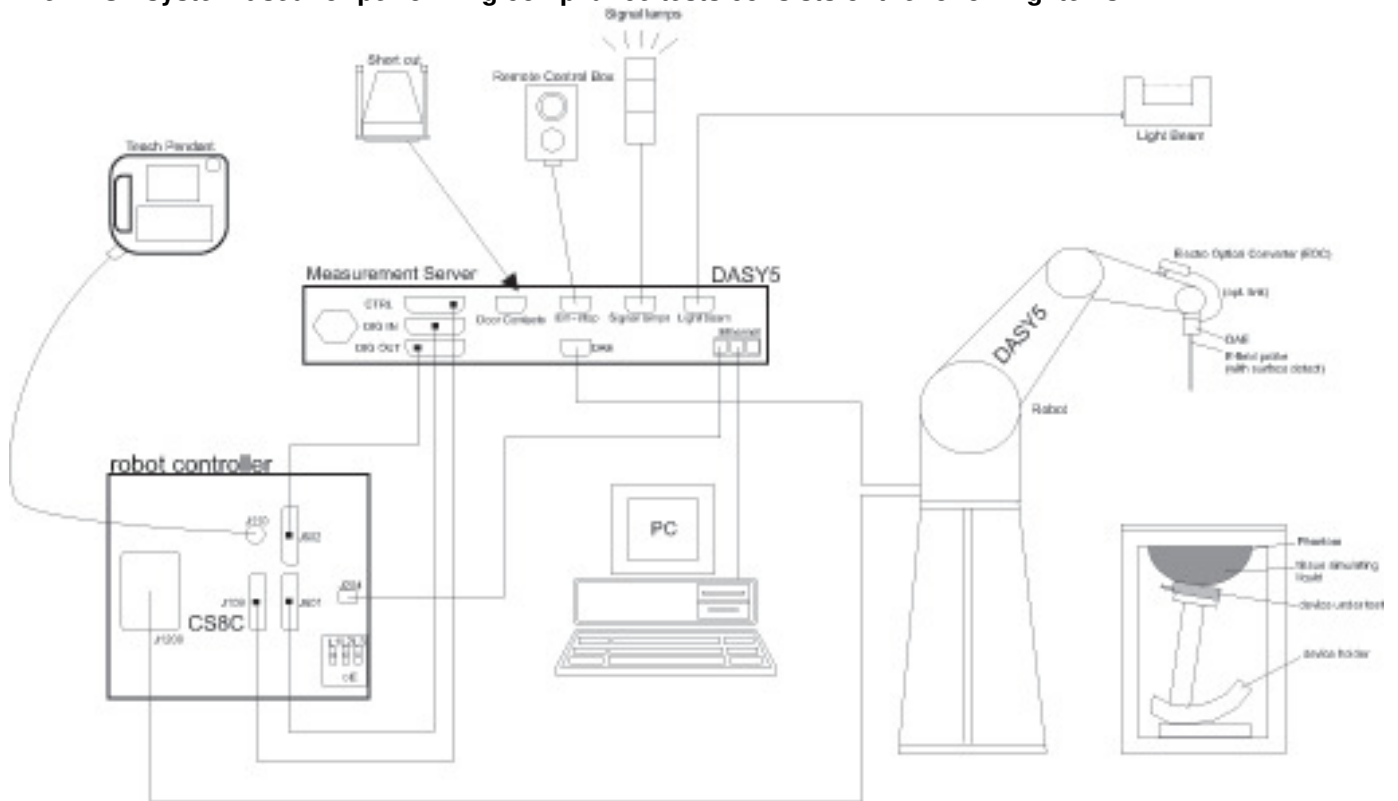
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG UK	Facility Type
SAR Lab 56	Controlled Environment Chamber
SAR Lab 57	Controlled Environment Chamber
SAR Lab 58	Controlled Environment Chamber
SAR Lab 59	Controlled Environment Chamber
SAR Lab 61	Controlled Environment Chamber

UL VS Ltd, is accredited by UKAS (United Kingdom Accreditation Service), Laboratory UKAS Code 0644.

## 4. SAR Measurement System & Test Equipment

### 4.1. SAR Measurement System

The DASY system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.



## 4.2. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A1184	Data Acquisition Electronics	SPEAG	DAE3	394	16 May 2014	12
A1234	Data Acquisition Electronics	SPEAG	DAE3	450	16 Sept 2014	12
A2110	Data Acquisition Electronics	SPEAG	DAE3	431	04 Nov 2014	12
A2111	Data Acquisition Electronics	SPEAG	DAE3	432	20 Aug 2014	12
A2546	Data Acquisition Electronics	SPEAG	DAE4	1435	15 Apr 2014	12
A1186	Probe	SPEAG	ET3 DV6	1529	22 May 2014	12
A2544	Probe	SPEAG	EX3 DV4	3994	07 May 2014	12
A2436	Probe	SPEAG	ES3 DV3	3335	29 Aug 2014	12
A2243	Probe	SPEAG	ES3 DV3	3304	21 Aug 2014	12
A2077	Probe	SPEAG	EX3 DV4	3814	18 Sept 2014	12
A1985	750 MHz Dipole Kit	SPEAG	D750V3	1011	16 Jan 2015	12
A2588	900 MHz Dipole Kit	SPEAG	D900V2	1d168	14 May 2014	12
A1190	1800 MHz Dipole Kit	SPEAG	D1800V2	264	18 Aug 2014	12
A1237	1900 MHz Dipole Kit	SPEAG	D1900V2	540	08 Dec 2014	12
A1322	2450 MHz Dipole Kit	SPEAG	D2450V2	725	08 Dec 2014	12
A1377	5.0 GHz Dipole Kit	SPEAG	D5GHzV2	1016	24 Feb 2014	12
G0528	Robot Power Supply	SPEAG	DASY4	None	Calibrated before use	-
GO591	Robot Power Supply	SPEAG	DASY4	None	Calibrated before use	-
G0592	Robot Power Supply	SPEAG	DASY52	None	Calibrated before use	-
G0610	Robot Power Supply	SPEAG	DASY52	None	Calibrated before use	-
G0611	Robot Power Supply	SPEAG	DASY52	None	Calibrated before use	-
G0612	Robot Power Supply	SPEAG	DASY52	None	Calibrated before use	-
M1047	Robot Arm	Staubli	RX908 L	F00/SD89A1/A/01	Calibrated before use	-
M1653	Robot Arm	Staubli	RX908 L	F01/5J86A1/C/01	Calibrated before use	-
M1680	Robot Arm	Staubli	TX60 L	F12/5MZ7A1/A/01	Calibrated before use	-
M1875	Robot Arm	Staubli	TX60 L	F13/5SC6F1/A/01	Calibrated before use	-
M1876	Robot Arm	Staubli	TX60 L	F14/5T5ZA1/A/01	Calibrated before use	-
M1877	Robot Arm	Staubli	TX60 L	F14/5UA6A1/A/01	Calibrated before use	-
A1328	Handset Positioner	SPEAG	Modification	SD 000 H01 DA	-	-
A1182	Handset Positioner	SPEAG	V3.0	None	-	-
A2443	Handset Positioner	SPEAG	MD4HHTV5	None	-	-
A172	Handset Positioner	SPEAG	MD4HHTV5	None	-	-
M1755	DAK Fluid Probe	SPEAG	SM DAK 040 CA	1089	Calibrated before use	-
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	26 Sept 2014	12
A2621	Digital Camera	Nikon	S3600	41010357	-	-
M1908	Signal Generator	R&S	SMIQ03B	1125555503	02 Dec 2014	12
M1839	Signal Generator	R&S	SME06	837633/001	27 Mar 2015	12
M1841	Dual Channel Power Meter	R & S	NRVD	834501/069	27 Mar 2015	12

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
M1023	Dual Channel Power Meter	R & S	NRVD	863715/030	01 May 2014	12
M1044	Power Sensor	R & S	ZRPZ1	893350/0019	05 Sep 2014	12
M1842	Power Sensor	R & S	ZRPZ1	890212/015	27 Mar 2015	12
M1634	Power Sensor	R & S	NRVZ1	860462/016	02 May 2014	12
M1635	Power Sensor	R & S	ZRPZ1	826515/015	02 May 2014	12
M1848	Power Sensor	R & S	ZRPZ1	831430/004	20 Apr 2015	12
M1847	Power Sensor	R & S	ZRPZ1	831430/003	20 Apr 2015	12
A2100	Directional Coupler	RF-Lambda	11101300748	None	Calibrated as part of system	-
A1097	Directional Coupler	MiDISCO	MDC6223-30	None	Calibrated as part of system	-
A1938	Amplifier	Mini-Circuits	ZHL-42	QA0826002	Calibrated as part of system	-
A1474	Amplifier	Mini-Circuits	ZVE-8G	638700305	Calibrated as part of system	-
A2403	Amplifier	Mini-Circuits	ZHL-42W	15542	Calibrated as part of system	-

**4.3. SAR System Specifications**

<b>Robot System</b>	
<b>Positioner:</b>	Stäubli Unimation Corp. Robot Model: RX90L
<b>Repeatability:</b>	0.025 mm
<b>No. of Axis:</b>	6
<b>Serial Number(s):</b>	F00/SD89A1/A/01; F01/5J86A1/A/01
<b>Reach:</b>	1185 mm
<b>Payload:</b>	3.5 kg
<b>Control Unit:</b>	CS7
<b>Programming Language:</b>	V+
<b>Robot System</b>	
<b>Positioner:</b>	Stäubli Unimation Corp. Robot Model: TX60L
<b>Repeatability:</b>	±0.030 mm
<b>No. of Axis:</b>	6
<b>Serial Number(s):</b>	F12/5MZ7A1/A/01; F13/5SC6F1/A/01; F14/5T5ZA1/A/01; F14/5UA6A1/A/01
<b>Reach:</b>	920 mm
<b>Payload:</b>	2.0 kg
<b>Control Unit:</b>	CS8C
<b>Programming Language:</b>	V+
<b>Data Acquisition Electronic (DAE) System</b>	
<b>Serial Number:</b>	DAE3 SN: 394, 431, 432, 450 DAE4 SN: 1435
<b>PC Controller</b>	
<b>PC:</b>	Dell Precision 340
<b>Operating System:</b>	Windows 2000
<b>Data Card:</b>	DASY4 and DASY5 Measurement Servers
<b>Serial Number:</b>	1080
<b>Data Converter</b>	
<b>Features:</b>	Signal Amplifier, multiplexer, A/D converted and control logic.
<b>Software:</b>	DASY4 and DASY5 PRO Software
<b>Connecting Lines:</b>	Optical downlink for data and status info. Optical uplink for commands and clock.
<b>PC Interface Card</b>	
<b>Function:</b>	24 bit (64 MHz) DSP for real time processing Link to DAE3 and DAE4 16 bit A/D converter for surface detection system serial link to robot direct emergency stop output for robot.

**SAR System Specifications (Continued):**

<b>E-Field Probe</b>	
<b>Model:</b>	EX3DV6
<b>Serial No:</b>	3994; 3814
<b>Construction:</b>	Triangular core
<b>Frequency:</b>	10 MHz to 6 GHz
<b>Linearity:</b>	±0.2 dB (30 MHz to 6 GHz)
<b>Probe Length (mm):</b>	337
<b>Probe Diameter (mm):</b>	10
<b>Tip Length (mm):</b>	9
<b>Tip Diameter (mm):</b>	2.5
<b>Sensor X Offset (mm):</b>	1
<b>Sensor Y Offset (mm):</b>	1
<b>Sensor Z Offset (mm):</b>	1
<b>E-Field Probe</b>	
<b>Model:</b>	ES3DV3
<b>Serial No:</b>	3304; 3335
<b>Construction:</b>	Triangular core
<b>Frequency:</b>	10 MHz to >4 GHz
<b>Linearity:</b>	±0.2 dB (30 MHz to 4 GHz)
<b>Probe Length (mm):</b>	337
<b>Probe Diameter (mm):</b>	10
<b>Tip Length (mm):</b>	10
<b>Tip Diameter (mm):</b>	4
<b>Sensor X Offset (mm):</b>	2
<b>Sensor Y Offset (mm):</b>	2
<b>Sensor Z Offset (mm):</b>	2
<b>E-Field Probe</b>	
<b>Model:</b>	ET3DV6
<b>Serial No:</b>	1529
<b>Construction:</b>	Triangular core
<b>Frequency:</b>	10 MHz to 2.55GHz
<b>Linearity:</b>	±0.2 dB (30 MHz to 2.55GHz)
<b>Probe Length (mm):</b>	337
<b>Probe Diameter (mm):</b>	10
<b>Tip Length (mm):</b>	10
<b>Tip Diameter (mm):</b>	6.8
<b>Sensor X Offset (mm):</b>	2.7
<b>Sensor Y Offset (mm):</b>	2.7
<b>Sensor Z Offset (mm):</b>	2.7
<b>Phantom</b>	
<b>Phantom:</b>	SAM; Eli Phantom
<b>Shell Material:</b>	Fibreglass
<b>Thickness:</b>	2.0 ±0.1 mm

## 4.4. SAR Measurement Procedure

### 4.4.1. Normal SAR Measurement Procedure

#### Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties

#### Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209-1 / IEC 62209-2 standards. If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$	≤ 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.	

**Step 3: Zoom Scan**

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$ , $\Delta y_{Zoom}$			≤ 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 1 <sup>st</sup> 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 · $\Delta z_{Zoom}(n-1)$	
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: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <i>reported</i> SAR from the area scan based <i>1-g SAR estimation</i> procedures of KDB 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.				

**Step 4: Power drift measurement**

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

**Step 5: Z-Scan (FCC only)**

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z- direction.

## **4.5. Volumetric Scan Procedure**

### **Step 1: Repeat Step 1-4 in Section 4.3**

### **Step 2: Volume Scan**

Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

### **Step 3: Power drift measurement**

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

## 5. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Test Name	Confidence Level	Calculated Uncertainty
Uncertainty- GSM 850 / WCDMA FDD 5 / CDMA BC 0 / CDMA BC 10 / LTE Band 5 / LTE Band 13 / LTE Band 17 Head Configuration 1g	95%	±18.77%
Uncertainty- GSM / GPRS / EDGE 850 / WCDMA FDD 5 / CDMA BC 0 / CDMA BC 10 / LTE Band 5 / LTE Band 13 / LTE Band 17 Body Configurations 1g	95%	±18.36%
Uncertainty- WCDMA FDD 4 / LTE Band 4 Head Configuration 1g	95%	±18.45%
Uncertainty- WCDMA FDD 4 / LTE Band 4 Body Configuration 1g	95%	±18.45%
Uncertainty- PCS 1900 / WCDMA FDD 2/ CDMA BC 0 / LTE Band 2 / LTE Band 25 Head Configuration 1g	95%	±18.88%
Uncertainty- PCS / GPRS / EDGE 1900 / WCDMA FDD 2 / CDMA BC 0 / LTE Band 2 / LTE Band 25 Body Configuration 1g	95%	±18.26%
Uncertainty- Wi-Fi 2450 MHz Head Configuration 1g	95%	±18.13%
Uncertainty- Wi-Fi 2450 MHz Body Configuration 1g	95%	±18.35%
Uncertainty- Wi-Fi 5GHz Head Configuration 1g	95%	±21.25%
Uncertainty- Wi-Fi 5GHz Body Configuration 1g	95%	±19.90%

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

**Note:** The calculated uncertainty depicted in the table above and shown in the following tables is indicative of the worst case amongst the bands listed.



**5.1. Uncertainty - GSM 850 / WCDMA FDD 5 / CDMA BC 0 / CDMA BC 10 / LTE Band 5 / LTE Band 13 / LTE Band 17 Head Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (1g)	Standard Uncertainty		U <sub>i</sub> or U <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.510	2.510	normal (k=1)	1.0000	1.0000	2.510	2.510	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	2.950	2.950	normal (k=1)	1.0000	0.6400	1.888	1.888	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.840	2.840	normal (k=1)	1.0000	0.6000	1.704	1.704	5
	Combined standard uncertainty			t-distribution			9.58	9.58	>500
	Expanded uncertainty			k = 1.96			18.77	18.77	>500

**5.2. Uncertainty Rate- GSM / GPRS / EDGE 850 / WCDMA FDD 5 / CDMA BC 0 / CDMA BC 10 / LTE Band 5 / LTE Band 13 / LTE Band 17 Body Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (1g)	Standard Uncertainty		U <sub>i</sub> or U <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration /Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.510	2.510	normal (k=1)	1.0000	1.0000	2.510	2.510	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	2.000	2.000	normal (k=1)	1.0000	0.6400	1.280	1.280	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	1.560	1.560	normal (k=1)	1.0000	0.6000	0.936	0.936	5
	Combined standard uncertainty			t-distribution			9.37	9.37	>500
	Expanded uncertainty			k = 1.96			18.36	18.36	>500

**5.3. Uncertainty – WCDMA FDD 4 / LTE Band 4 Head Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (1g)	Standard Uncertainty		U <sub>i</sub> or U <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration/ Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.440	2.440	normal (k=1)	1.0000	1.0000	2.440	2.440	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	2.120	2.120	normal (k=1)	1.0000	0.6400	1.357	1.357	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.270	2.270	normal (k=1)	1.0000	0.6000	1.362	1.362	5
	Combined standard uncertainty			t-distribution			9.41	9.41	>500
	Expanded uncertainty			k = 1.96			18.45	18.45	>500

**5.4. Uncertainty -WCDMA FDD 4 / LTE Band 4 Body Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (1g)	Standard Uncertainty		U <sub>i</sub> Or U <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration/ Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.460	2.460	normal (k=1)	1.0000	1.0000	2.460	2.460	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	2.210	2.210	normal (k=1)	1.0000	0.6400	1.414	1.414	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.150	2.150	normal (k=1)	1.0000	0.6000	1.290	1.290	5
	Combined standard uncertainty			t-distribution			9.42	9.42	>500
	Expanded uncertainty			k = 1.96			18.45	18.45	>500

**5.5. Uncertainty - PCS 1900 / WCDMA FDD 2/ CDMA BC 0 / LTE Band 2 / LTE Band 25  
Head Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (1g)	Standard Uncertainty		U <sub>i</sub> or U <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with Regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.490	2.490	normal (k=1)	1.0000	1.0000	2.490	2.490	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	3.560	3.560	normal (k=1)	1.0000	0.6400	2.278	2.278	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.620	2.620	normal (k=1)	1.0000	0.6000	1.572	1.572	5
	Combined standard uncertainty			t-distribution			9.63	9.63	>500
	Expanded uncertainty			k = 1.96			18.88	18.88	>500

**5.6. Uncertainty - PCS / GPRS / EDGE 1900 / WCDMA FDD 2 / CDMA BC 0 / LTE Band 2 / LTE Band 25 Body Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (1g)	Standard Uncertainty		U <sub>i</sub> or U <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	1.860	1.860	normal (k=1)	1.0000	1.0000	1.860	1.860	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	2.610	2.610	normal (k=1)	1.0000	0.6400	1.670	1.670	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.140	2.140	normal (k=1)	1.0000	0.6000	1.284	1.284	5
	Combined standard uncertainty			t-distribution			9.32	9.32	>500
	Expanded uncertainty			k = 1.96			18.26	18.26	>500

**5.7. Uncertainty – LTE Band 7 / Wi-Fi 2450 MHz Head Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (1g)	Standard Uncertainty		U <sub>i</sub> or U <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.180	2.180	normal (k=1)	1.0000	1.0000	2.180	2.180	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	1.840	1.840	normal (k=1)	1.0000	0.6400	1.178	1.178	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.030	2.030	normal (k=1)	1.0000	0.6000	1.218	1.218	5
	Combined standard uncertainty			t-distribution			9.25	9.25	>500
	Expanded uncertainty			k = 1.96			18.13	18.13	>500

**5.8. Uncertainty – LTE Band 7 / Wi-Fi 2450 MHz Body Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (1g)	Standard Uncertainty		U <sub>i</sub> or U <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.440	2.440	normal (k=1)	1.0000	1.0000	2.440	2.440	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	2.260	2.260	normal (k=1)	1.0000	0.6400	1.446	1.446	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.150	2.150	normal (k=1)	1.0000	0.6000	1.290	1.290	5
	Combined standard uncertainty			t-distribution			9.36	9.36	>500
	Expanded uncertainty			k = 1.96			18.35	18.35	>500



**5.9. Uncertainty - Wi-Fi 5GHz Head Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (1g)	Standard Uncertainty		v <sub>i</sub> or v <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.550	6.550	normal (k=1)	1.0000	1.0000	6.550	6.550	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.380	2.380	normal (k=1)	1.0000	1.0000	2.380	2.380	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	6.220	6.220	normal (k=1)	1.0000	0.6400	3.981	3.981	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	5.580	5.580	normal (k=1)	1.0000	0.6000	3.348	3.348	5
	Combined standard uncertainty			t-distribution			10.84	10.84	>150
	Expanded uncertainty			k = 1.96			21.25	21.25	>150

**5.10. Uncertainty - Wi-Fi 5GHz Body Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (1g)	Standard Uncertainty		U <sub>i</sub> or U <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.550	6.550	normal (k=1)	1.0000	1.0000	6.550	6.550	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	1.960	1.960	normal (k=1)	1.0000	1.0000	1.960	1.960	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.370	4.370	normal (k=1)	1.0000	0.6400	2.797	2.797	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.270	4.270	normal (k=1)	1.0000	0.6000	2.562	2.562	5
	Combined standard uncertainty			t-distribution			10.15	10.15	>450
	Expanded uncertainty			k = 1.96			19.90	19.90	>450

## **6. Device Under Test (DUT) Information**

### **6.1. DUT Description**

#### **Phone Cover (Sleeve)**

<b>DUT Description:</b>	The Linea Pro 5 is a small handheld secured payment terminal with barcode reading. This terminal is designed to operate with FCC ID: BCG-E2599A
<b>Model Number:</b>	LP5
<b>Serial Number:</b>	MAR003414UN14
<b>Hardware Version Number:</b>	None Stated
<b>Software Version Number:</b>	None Stated
<b>Country of Manufacture:</b>	Bulgaria
<b>Date of Receipt:</b>	26 March 2015

## 6.2. Wireless Technologies

### Phone Cover (Sleeve)

<b>Tx Frequencies</b>	Bluetooth: 2402 – 2480 MHz
<b>Mode</b>	Bluetooth 2.0 Class 2

### Host Device

	<b>Model: A1428</b>	<b>Model: A1429</b>
<b>Tx Frequencies</b>	<ul style="list-style-type: none"> <li>• GSM850: 824-849 MHz</li> <li>• GSM1900: 1850-1910 MHz</li> <li>• WCDMA Band 2: 1850-1910 MHz</li> <li>• WCDMA Band 4: 1710-1755 MHz</li> <li>• WCDMA Band 5: 824-849 MHz</li> <li>• LTE Band 2: 1850-1910 MHz</li> <li>• LTE Band 4: 1710-1755 MHz</li> <li>• LTE Band 5: 824-849 MHz</li> <li>• LTE Band 17: 704-716 MHz</li> <li>• 802.11 a/b/g/n: 2412-2462 MHz 5180-5825 MHz</li> <li>• Bluetooth: 2402-2480 MHz</li> </ul>	<ul style="list-style-type: none"> <li>• GSM850: 824-849 MHz</li> <li>• GSM1900: 1850-1910 MHz</li> <li>• WCDMA Band 2: 1850-1910 MHz</li> <li>• WCDMA Band 5: 824-849 MHz</li> <li>• CDMA BC 0: 1850-1910 MHz</li> <li>• CDMA BC10: 817.9-823.1 MHz</li> <li>• LTE Band 5: 824-849 MHz</li> <li>• LTE Band 13: 777-787 MHz</li> <li>• LTE Band 25: 1850-1915 MHz</li> <li>• 802.11 a/b/g/n: 2412-2462 MHz 5180-5825 MHz</li> <li>• Bluetooth: 2402-2480 MHz</li> </ul>
<b>Mode</b>	<ul style="list-style-type: none"> <li>• GSM/GPRS/EGPRS</li> <li>• UMTS Rel 99</li> <li>• HSDPA (Rel 7, CAT 14)</li> <li>• HSUPA (Rel 6, CAT 6)</li> <li>• DC-HSDPA (Rel 8, CAT 24)</li> <li>• HSPA+ (Rel 6, CAT 6)</li> <li>• 802.11 a/b/g/n HT20</li> <li>• Bluetooth 4.0 LE</li> </ul>	<ul style="list-style-type: none"> <li>• GSM/GPRS/EGPRS</li> <li>• UMTS Rel 99</li> <li>• HSDPA (Rel 7, CAT 14)</li> <li>• HSUPA (Rel 6, CAT 6)</li> <li>• DC-HSDPA (Rel 8, CAT 24)</li> <li>• HSPA+ (Rel 6, CAT 6)</li> <li>• CDMA 1xRTT</li> <li>• CDMA 1xAdvanced</li> <li>• EVDO Rev.0, Rev.A, Rev.B (Rel B in BC0 for 16QAM only)</li> <li>• 802.11 a/b/g/n HT20</li> <li>• Bluetooth 4.0 LE</li> </ul>

### 6.3. Nominal and Maximum Output Power

#### Host Device

All nominal and maximum output power measurements are as documented in the original FCC SAR reports **11U14136-7A1** and **12U14759-2C** issued on **6<sup>th</sup> Sept 2012**.

## **7. RF Exposure Conditions (Test Configurations)**

Standalone measurements are performed on the host device and compared to the original grant reported levels for all bands on the indicated worst case position in the original SAR report for the host device.

As per the interim sleeve procedure, the highest SAR configuration among the different wireless modes in each frequency band and any SAR configuration in the original report > 75% of the SAR limit; should be measured separately for head, body-worn accessories and hotspot modes when applicable on the host device. When the measured SAR values of the highest SAR configurations are identical (before rounding up), select the configuration with the highest maximum output power. The SAR results should be each scaled with respect to the power level tested by to determine compliance.

After completing the initial (Standalone) measurements on the host device, the runs are repeated using the phone cover (Sleeve) attached. Section 10 contains the SAR test results obtained with and without the phone cover (Sleeve) attached along with the deviation in results with respect to the original FCC SAR reports **11U14136-7A1** and **12U14759-2C** issued on **6<sup>th</sup> Sept 2012**.

## **8. Conducted output power measurements**

This section contains the conducted power measurements that are carried out on the Host EUT prior to performing the standalone testing.

### **A1428**

Technology/ Band	Test Configuration	Mode	Antenna	Channel No.	Frequency (MHz)	Meas. power (dBm)
GSM850	Head	GSM (Voice)	Primary	190	836.6	33.50
	Body Worn	GSM (Voice)	Primary	190	836.6	33.50
	Hotspot	GPRS 2 Slots	Primary	251	848.8	31.20
GSM1900	Head	GSM (Voice)	Primary	512	1850.2	30.90
	Body Worn	GSM (Voice)	Primary	661	1880.0	31.00
	Hotspot	GPRS 2 Slots	Primary	810	1909.8	29.50
WCDMA Band 2	Head	Rel 99 RMC 12.2Kbps	Primary	9262	1852.4	22.20
	Body worn & Hotspot	Rel 99 RMC 12.2Kbps	Primary	9400	1880.0	22.20
WCDMA Band 4	Head	Rel 99 RMC 12.2Kbps	Primary	1413	1732.6	22.70
	Body worn & Hotspot	Rel 99 RMC 12.2Kbps	Primary	1413	1732.6	22.60
WCDMA Band 5	Head	Rel 99 RMC 12.2Kbps	Secondary	4233	846.6	23.90
	Body worn & Hotspot	Rel 99 RMC 12.2Kbps	Primary	4233	846.6	24.20
LTE Band 2	Body worn & Hotspot	20 MHz (QPSK) RB 1/49	Primary	18900	1880.0	22.50
LTE Band 4	Head	20 MHz (QPSK) RB 1/99	Primary	20050	1720.0	23.70
		20 MHz (QPSK) RB 1/99	Primary	20300	1745.0	23.60
		20 MHz (QPSK) RB 1/0	Secondary	20050	1720.0	22.80
		20 MHz (QPSK) RB 1/49	Secondary	20300	1745.0	23.00
	Body worn & Hotspot	20 MHz (QPSK) RB 1/49	Primary	20175	1732.5	23.70
LTE Band 5	Body worn & Hotspot	10 MHz (QPSK) RB 1/24	Primary	20525	836.5	23.80
LTE Band 17	Body worn & Hotspot	10 MHz (QPSK) RB 1/24	Primary	23790	710.0	23.70
Wi-Fi 2.4 GHz	Head	802.11b 1Mbps	-	6	2437.0	15.90
	Body worn & Hotspot	802.11b 1Mbps	-	6	2437.0	15.90
Wi-Fi 5.2 GHz	Head	802.11a 6Mbps	-	48	5240.0	13.90
	Body Worn	802.11a 6Mbps	-	48	5240.0	13.90
Wi-Fi 5.3 GHz	Head	802.11a 6Mbps	-	52	5260.0	13.50
	Body Worn	802.11a 6Mbps	-	64	5320.0	13.50
Wi-Fi 5.5 GHz	Head	802.11a 6Mbps	-	136	5680.0	12.00
	Body Worn	802.11a 6Mbps	-	124	5620.0	12.00
Wi-Fi 5.8 GHz	Head	802.11a 6Mbps	-	157	5785.0	13.00
	Body Worn	802.11a 6Mbps	-	149	5745.0	12.80

**A1429**

Technology/ Band	Test Configuration		Mode	Antenna	Channel No.	Freq. (MHz)	Meas. power (dBm)
GSM850	Head	Left Touch	GSM Voice	Primary	190	836.6	33.10
	Body Worn	Back	GSM Voice	Primary	251	848.8	33.10
	Hotspot	Back	GPRS 2 Slots	Primary	251	848.8	31.20
GSM 1900	Head	Right Touch	GSM (Voice)	Secondary	810	1909.8	30.40
	Body Worn	Back	GSM Voice	Primary	810	1909.8	30.40
	Hotspot	Back	GPRS 2 Slots	Primary	512	1850.2	29.40
WCDMA Band 2	Head	Right Touch	Rel 99 RMC 12.2kps	Primary	9262	1852.4	23.70
	Body worn & Hotspot	Back	Rel 99 RMC 12.2kps with headset	Primary	9400	1880.0	24.10
WCDMA Band 5	Head	Left Touch	Rel 99 RMC 12.2Kbps	Secondary	4132	826.4	22.40
	Body worn & Hotspot	Back	Rel 99 RMC 12.2kps	Primary	4233	846.6	22.20
CDMA BC 0	Head	Left Touch	1xRTT (RC3, SO55)	Secondary	777	848.3	23.70
	Body worn & Hotspot	Back	1xRTT (RC3, SO32)	Primary	777	848.3	24.10
	Body worn & Hotspot	Back	1xEvDO(Rel 0)	Primary	777	848.3	24.20
CDMA BC 1	Head	Right Touch	1xRTT (RC3, SO55)	Primary	600	1880.0	22.10
	Body worn & Hotspot	Back	1xRTT (RC3, SO32) with headset	Primary	600	1880.0	22.10
	Body worn & Hotspot	Back	1xEVDO (REL.) with headset	Primary	600	1880.0	22.10
CDMA BC 10	Head	Left Touch	1xRTT (RC3, SO55)	Secondary	684	923.1	23.20
	Body worn & Hotspot	Back	1xRTT (RC3, SO32)	Primary	684	823.1	23.80
	Body worn & Hotspot	Back	1xEVDO (REL.)	Primary	684	823.1	23.80
LTE Band 5	Body worn & Hotspot	Back	10 MHz (QPSK) RB 1/24	Primary	20525	836.5	22.90
LTE Band 13	Head	Left Touch	10 MHz (QPSK) RB 1/24	Secondary	23230	782.0	22.00
	Body worn & Hotspot	Back	10 MHz (QPSK) RB 1/0	Primary	23230	782.0	22.90
LTE Band 25	Body worn & Hotspot	Back	20 MHz (QPSK) RB 1/49 Headset	Primary	26365	1882.5	21.80
Wi-Fi 2.4 GHz	Head	Right Touch	802.11b 1Mbps	-	6	2437.0	16.00
	Body worn & Hotspot	Back	802.11b 1Mbps with headset	-	6	2437.0	16.00
Wi-Fi 5.2 GHz	Head	Left Touch	802.11a 6Mbps	-	48	5240.0	14.00
	Body Worn	Front	802.11a 6Mbps	-	48	5240.0	14.00
Wi-Fi 5.3 GHz	Head	Right Touch	802.11a 6Mbps	-	52	5260.0	13.40
	Body Worn	Front	802.11a 6Mbps	-	64	5320.0	13.50
Wi-Fi 5.5 GHz	Head	Right Touch	802.11a 6Mbps	-	124	5620.0	11.90
	Body Worn	Front	802.11a 6Mbps	-	116	5580.0	12.00
Wi-Fi 5.8 GHz	Head	Right Touch	802.11a 6Mbps	-	157	5785.0	12.80
	Body Worn	Front	802.11a 6Mbps with headset	-	149	5745.0	12.80



## 9. Dielectric Property Measurements & System Check

### 9.1. Tissue Dielectric Parameters

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

#### FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz; IEEE1528:2013 & IEC 62209-1:2005

Target Frequency (MHz)	Head		Body (FCC only)	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
750	41.9	0.89	-	-
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1500	40.4	1.23	-	-
1610	40.3	1.29	53.8	1.40
1640	40.2	1.31	-	-
1750	40.1	1.37	-	-
1800	40	1.40	53.3	1.52
1900	40	1.40	53.3	1.52
2000	40	1.40	53.3	1.52
2100	39.8	1.49	-	-
2300	39.5	1.67	-	-
2450	39.2	1.80	52.7	1.95
2600	39	1.96	-	-
3000	38.5	2.40	52.0	2.73
3500	37.9	2.91	-	-
4000	37.4	3.43	-	-
4500	36.8	3.94	-	-
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00
6000	35.1	5.48	-	-

**NOTE:** For convenience, permittivity and conductivity values at some frequencies that are not part of the original data from Drossos et al. [B60] or the extension to 5800 MHz are provided (i.e., the values shown in italics). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6000 MHz that were linearly extrapolated from the values at 3000 MHz and 5800 MHz.

## 9.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

## 9.3. Reference Target SAR Values

The reference SAR values are obtained from the calibration certificate of system validation dipoles. The measured values are normalised to 1 Watt.

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (mW/g)		
				1g/10g	Head	Body
D750V3	1011	16 Jan 2015	750	1g	8.09	8.54
				10g	5.32	5.66
D900V2	1d168	14 May 2014	900	1g	10.30	10.60
				10g	6.60	6.87
D1800V2	264	18 Aug 2014	1800	1g	38.60	37.80
				10g	20.30	20.10
D1900V2	540	08 Dec 2014	1900	1g	40.10	40.00
				10g	20.90	21.10
D2450V2	725	08 Dec 2014	2450	1g	50.80	49.90
				10g	23.70	23.20
D5GHzV2	1016	24 Feb 2015	5250	1g	79.00	76.00
				10g	22.70	21.20
			5600	1g	80.90	77.70
				10g	23.00	21.40
			5750	1g	35.40	74.40
				10g	5.22	20.50

### 9.4. Dielectric Property Measurements & System Check Results

The 1-g SAR and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target. The internal limit is set to 5%.

**SAR Lab 56**

**System Check 750 Head**

Date: 09/04/2015

Validation Dipole and Serial Number: D750V3 SN: 1011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	750	24.0	22.0	$\epsilon_r$	41.96	42.44	1.14	5.00
				$\sigma$	0.89	0.85	-4.73	5.00
				1g SAR	8.09	8.16	0.87	5.00
				10g SAR	5.32	5.44	2.26	5.00

**System Check 750 Body**

Date: 09/04/2015

Validation Dipole and Serial Number: D750V3 SN: 1011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	750	23.0	21.9	$\epsilon_r$	55.55	54.13	-2.56	5.00
				$\sigma$	0.96	0.96	0.22	5.00
				1g SAR	8.54	8.44	-1.17	5.00
				10g SAR	5.66	5.60	-1.06	5.00

**System Check 900 Head**

Date: 30/03/2015

Validation Dipole and Serial Number: D900V2 SN: 1d168

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0	21.9	$\epsilon_r$	41.50	40.91	-1.42	5.00
				$\sigma$	0.97	0.93	-3.76	5.00
				1g SAR	10.30	10.00	-2.91	5.00
				10g SAR	6.60	6.56	-0.61	5.00

**System Check 900 Head**

Date: 07/04/2015

Validation Dipole and Serial Number: D900V2 SN: 1d168

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0	21.7	$\epsilon_r$	41.50	40.65	-2.05	5.00
				$\sigma$	0.97	0.95	-2.37	5.00
				1g SAR	10.30	10.44	1.36	5.00
				10g SAR	6.60	6.80	3.03	5.00

**SAR Lab 56 (Continued)****System Check 900 Body**

Date: 30/03/2015

Validation Dipole and Serial Number: D900V2 SN: 1d168

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0	22.0	$\epsilon_r$	55.00	53.14	-3.38	5.00
				$\sigma$	1.05	1.04	-0.76	5.00
				1g SAR	10.60	10.56	-0.38	5.00
				10g SAR	6.87	7.00	1.89	5.00

**System Check 900 Body**

Date: 07/04/2015

Validation Dipole and Serial Number: D900V2 SN: 1d168

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0	22.1	$\epsilon_r$	55.00	53.41	-2.89	5.00
				$\sigma$	1.05	1.06	0.52	5.00
				1g SAR	10.60	10.76	1.51	5.00
				10g SAR	6.87	7.12	3.64	5.00

**System Check 2450 Body**

Date: 29/04/2015

Validation Dipole and Serial Number: D2450V2 SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	23.0	24.0	$\epsilon_r$	52.70	51.94	-1.44	5.00
				$\sigma$	1.95	1.95	-0.12	5.00
				1g SAR	49.90	49.20	-1.40	5.00
				10g SAR	23.20	22.60	-2.59	5.00

**SAR Lab 57****System Check 2450 Head**

Date: 14/04/2015

Validation Dipole and Serial Number: D2450V2 SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	2450	23.0	22.0	$\epsilon_r$	39.20	37.98	-3.11	5.00
				$\sigma$	1.80	1.83	1.40	5.00
				1g SAR	50.80	52.00	2.36	5.00
				10g SAR	23.70	23.92	0.93	5.00

**System Check 2450 Body**

Date: 07/04/2015

Validation Dipole and Serial Number: D2450V2 SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	23.0	24.0	$\epsilon_r$	52.70	52.56	0.27	5.00
				$\sigma$	1.95	2.02	3.58	5.00
				1g SAR	49.90	49.20	-1.40	5.00
				10g SAR	23.20	22.76	-1.90	5.00

**SAR Lab 58****System Check 1800 Head**

Date: 13/04/2015

Validation Dipole and Serial Number: D1800V2 SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1800	23.0	23.4	$\epsilon_r$	40.00	39.81	-0.47	5.00
				$\sigma$	1.40	1.38	-1.64	5.00
				1g SAR	38.60	38.44	-0.41	5.00
				10g SAR	20.30	20.40	0.49	5.00

**System Check 1800 Body**

Date: 13/04/2015

Validation Dipole and Serial Number: D1800V2 SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	23.0	23.0	$\epsilon_r$	53.30	51.87	-2.68	5.00
				$\sigma$	1.52	1.55	2.17	5.00
				1g SAR	37.80	38.76	2.54	5.00
				10g SAR	20.10	20.32	1.09	5.00

**System Check 1900 Head**

Date: 14/04/2015

Validation Dipole and Serial Number: D1900V2 SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	23.0	23.5	$\epsilon_r$	40.00	39.03	-2.43	5.00
				$\sigma$	1.40	1.43	2.01	5.00
				1g SAR	40.10	40.00	-0.25	5.00
				10g SAR	20.90	20.92	0.10	5.00

**System Check 1900 Body**

Date: 16/04/2015

Validation Dipole and Serial Number: D1900V2 SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.0	22.0	$\epsilon_r$	53.30	54.17	1.63	5.00
				$\sigma$	1.52	1.57	3.47	5.00
				1g SAR	40.00	40.00	1.00	5.00
				10g SAR	21.10	20.84	-1.23	5.00

**SAR Lab 59**

**System Check 5.25/5.6/5.75 GHz Head**

**Date: 16/04/2015**

**Validation Dipole and Serial Number: D1016V2 SN: 1016**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5250	23.0	23.0	$\epsilon_r$	35.90	34.48	-3.96	5.00
				$\sigma$	4.71	4.58	-2.78	5.00
				<b>1g SAR</b>	79.00	80.90	2.41	5.00
				<b>10g SAR</b>	22.70	22.50	-0.88	5.00
Head	5600	23.0	23.0	$\epsilon_r$	35.50	33.99	-4.25	5.00
				$\sigma$	5.07	4.94	-2.49	5.00
				<b>1g SAR</b>	80.90	80.60	-0.37	5.00
				<b>10g SAR</b>	23.00	22.10	-3.91	5.00
Head	5750	23.0	23.0	$\epsilon_r$	35.40	33.84	-4.41	5.00
				$\sigma$	5.22	5.12	-1.96	5.00
				<b>1g SAR</b>	79.10	33.84	-4.41	5.00
				<b>10g SAR</b>	22.50	5.12	-1.96	5.00

**SAR Lab 61****System Check 5.25/5.6/5.75 GHz Body**

Date: 13/04/2015

Validation Dipole and Serial Number: D1016V2 SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5250	24.0	24.0	$\epsilon_r$	48.90	48.27	-1.29	5.00
				$\sigma$	5.36	5.33	-0.53	5.00
				<b>1g SAR</b>	76.00	73.80	-2.89	5.00
				<b>10g SAR</b>	21.20	20.30	-4.25	5.00
Body	5600	23.0	23.0	$\epsilon_r$	48.50	47.43	-2.21	5.00
				$\sigma$	5.77	5.88	1.91	5.00
				<b>1g SAR</b>	77.70	75.30	-3.09	5.00
				<b>10g SAR</b>	21.40	20.40	-4.67	5.00
Body	5750	23.0	22.0	$\epsilon_r$	48.30	47.05	-2.59	5.00
				$\sigma$	5.94	6.12	3.09	5.00
				<b>1g SAR</b>	74.40	74.0	-0.54	5.00
				<b>10g SAR</b>	20.50	20.00	-2.44	5.00



## **10. Measurements, Examinations and Derived Results**

### **10.1. General Comments**

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 8 for details of measurement uncertainties.

**10.2. Specific Absorption Rate - Test Results – A1428**  
**For All SAR measurement in this report the 1g-SAR limit tested to is 1.6 W/Kg**

WORST CASE DETERMINED FROM ORIGINAL FCC SAR REPORT								STANDALONE MEASUREMENTS (Host Device)				Host Device + Sleeve				Scan No.	
Technology/ Band	Test Configuration		Mode	Antenna	Channel No.	Freq. (MHz)	Tune up Power (dBm)	Highest 1g Reported SAR (W/Kg)	Meas. power (dBm)	1g SAR Meas. (W/Kg)	1g SAR Reported (W/Kg)	Difference (Standalone w.r.t. Original Report)	1g SAR Meas. (W/Kg)	1g SAR Reported (W/Kg)	Difference (Case attached w.r.t Original Report)		Scaled 1g SAR Reported (W/kg)*
GSM850	Head	Left Touch	GSM (Voice)	Primary	190	836.6	33.50	0.716	33.50	0.562	0.562	-21.5%	0.131	0.131	-81.7%	<b>0.167</b>	1
	Body Worn	Back	GSM (Voice)	Primary	190	836.6	33.50	0.896	33.50	0.792	0.792	-11.6%	0.102	0.102	-88.6%	<b>0.115</b>	2
	Hotspot	Back	GPRS 2 Slots	Primary	251	848.8	31.40	0.831	31.20	0.831	0.870	4.7%	0.123	0.129	-84.5%	<b>0.129</b>	3
GSM1900	Head	Right Touch	GSM (Voice)	Primary	512	1850.2	31.00	1.030	30.90	0.925	0.947	-8.1%	0.228	0.233	-77.3%	<b>0.254</b>	4
	Body Worn	Back	GSM (Voice)	Primary	661	1880.0	31.00	0.821	31.00	0.722	0.722	-12.1%	0.272	0.272	-66.9%	<b>0.309</b>	5
	Hotspot	Back	GPRS 2 Slots	Primary	810	1909.8	30.00	1.080	29.50	0.792	0.889	-17.7%	0.286	0.321	-70.3%	<b>0.390</b>	6
WCDMA Band 2	Head	Right Touch	Rel 99 RMC 12.2Kbps	Primary	9262	1852.4	22.50	1.130	22.20	1.090	1.168	3.4%	0.221	0.237	-79.0%	<b>0.237</b>	7
	Body worn & Hotspot	Back	Rel 99 RMC 12.2Kbps	Primary	9400	1880.0	22.50	1.140	22.20	1.060	1.136	-0.4%	0.398	0.426	-62.6%	<b>0.428</b>	8
WCDMA Band 4	Head	Right Touch	Rel 99 RMC 12.2Kbps	Primary	1413	1732.6	23.00	1.060	22.70	1.120	1.200	13.2%	0.380	0.407	-61.6%	<b>0.407</b>	9
	Body worn & Hotspot	Front	Rel 99 RMC 12.2Kbps	Primary	1413	1732.6	23.00	0.977	22.60	0.955	1.047	7.2%	0.283	0.310	-68.2%	<b>0.310</b>	10
WCDMA Band 5	Head	Left Touch	Rel 99 RMC 12.2Kbps	Secondary	4233	846.6	23.90	0.826	23.90	0.762	0.762	-7.7%	0.591	0.591	-28.5%	<b>0.641</b>	11
	Body worn & Hotspot	Back	Rel 99 RMC 12.2Kbps	Primary	4233	846.6	24.50	0.913	24.20	0.786	0.842	-7.8%	0.096	0.102	-88.8%	<b>0.111</b>	12
LTE Band 2	Body worn & Hotspot	Back	20 MHz (QPSK) RB 1/49	Primary	18900	1880.0	22.50	1.170	22.50	1.150	1.150	-1.7%	0.486	0.486	-58.5%	<b>0.494</b>	13
LTE Band 4	Head	Right Touch	20 MHz (QPSK) RB 1/99	Primary	20050	1720.0	23.90	1.240	23.70	1.390	1.456	17.4%	0.401	0.420	-66.1%	<b>0.420</b>	14
		Right Touch	20 MHz (QPSK) RB 1/99	Primary	20300	1745.0	23.80	1.240	23.60	1.040	1.089	-12.2%	0.371	0.388	-68.7%	<b>0.442</b>	15
		Right Touch	20 MHz (QPSK) RB 1/0	Secondary	20050	1720.0	22.90	1.220	22.80	1.290	1.320	8.2%	0.573	0.586	-51.9%	<b>0.586</b>	16
		Right Touch	20 MHz (QPSK) RB 1/49	Secondary	20300	1745.0	23.00	1.250	23.00	1.160	1.160	-7.2%	0.463	0.463	-63.0%	<b>0.499</b>	17
Body worn & Hotspot	Back	20 MHz (QPSK) RB 1/49	Primary	20175	1732.5	23.90	1.180	23.70	1.300	1.361	15.4%	0.443	0.464	-60.7%	<b>0.464</b>	18	
LTE Band 5	Body worn & Hotspot	Front	10 MHz (QPSK) RB 1/24	Primary	20525	836.5	24.00	0.724	23.80	0.687	0.719	-0.6%	0.217	0.227	-68.6%	<b>0.229</b>	19

**Specific Absorption Rate - Test Results – A1428 (Continued)**

WORST CASE DETERMINED FROM ORIGINAL FCC SAR REPORT								STANDALONE MEASUREMENTS (Host Device)				Host Device + Sleeve				Scan No.	
Technology/ Band	Test Configuration		Mode	Antenna	Channel No.	Freq. (MHz)	Tune up Power (dBm)	Highest 1g Reported SAR (W/Kg)	Meas. power (dBm)	1g SAR Meas. (W/Kg)	1g SAR Reported (W/Kg)	Difference (Standalone w.r.t. Original Report)	1g SAR Meas. (W/Kg)	1g SAR Reported (W/Kg)	Difference (Case attached w.r.t Original Report)		Scaled 1g SAR Reported (W/kg)*
LTE Band 17	Body worn & Hotspot	Front	10 MHz (QPSK) RB 1/24	Primary	23790	710.0	24.00	0.547	23.70	0.498	0.534	-2.4%	0.182	0.195	-64.3%	<b>0.200</b>	20
Wi-Fi 2.4 GHz	Head	Right Touch	802.11b 1Mbps	-	6	2437.0	16.00	0.572	15.90	0.531	0.543	-5.0%	0.098	0.100	-82.5%	<b>0.105</b>	21
	Body worn & Hotspot	Back	802.11b 1Mbps	-	6	2437.0	16.00	0.198	15.90	0.147	0.150	-24.0%	0.083	0.085	-57.1%	<b>0.112</b>	22
Wi-Fi 5.2 GHz	Head	Right Touch	802.11a 6Mbps	-	48	5240.0	14.00	0.594	13.90	0.543	0.556	-6.5%	0.312	0.319	-46.3%	<b>0.341</b>	23
	Body Worn	Front	802.11a 6Mbps	-	48	5240.0	14.00	0.065	13.90	0.060	0.061	-5.7%	0.078	0.080	22.6%	<b>0.085</b>	24
Wi-Fi 5.3 GHz	Head	Right Touch	802.11a 6Mbps	-	52	5260.0	13.50	0.538	13.50	0.457	0.457	-15.1%	0.257	0.257	-52.2%	<b>0.303</b>	25
	Body Worn	Front	802.11a 6Mbps	-	64	5320.0	13.50	0.071	13.50	0.067	0.067	-6.3%	0.057	0.057	-20.1%	<b>0.061</b>	26
Wi-Fi 5.5 GHz	Head	Right Touch	802.11a 6Mbps	-	136	5680.0	12.00	0.593	12.00	0.450	0.450	-24.1%	0.225	0.225	-62.1%	<b>0.297</b>	27
	Body Worn	Front	802.11a 6Mbps	-	124	5620.0	12.00	0.085	12.00	0.041	0.041	-51.8%	0.066	0.066	-224%	<b>0.137</b>	28
Wi-Fi 5.8 GHz	Head	Right Touch	802.11a 6Mbps	-	157	5785.0	13.00	0.580	13.00	0.665	0.665	14.7%	0.316	0.316	-45.5%	<b>0.316</b>	29
	Body Worn	Front	802.11a 6Mbps	-	149	5745.0	13.00	0.067	12.80	0.096	0.100	49.6%	0.058	0.061	-9.4%	<b>0.061</b>	30
Bluetooth	Body Worn	Front	GFSK	-	39	2441.0	13.40	0.109	13.40	0.100	0.100	-8.3%	0.055	0.055	-50.0%	<b>0.059</b>	31

**Note(s):**

\* Body worn & Hotspot in the original report were performed at 10mm.

\* Scaled 1g SAR Reported is calculated based on the following KDB inquiry response:

1. When the reported SAR of the test sample measured without accessory (sleeve) attached is equal to or higher than the reported SAR of the same test configuration in the original equipment certification filing, used the reported SAR of the test sample with accessory (sleeve) attached as the SAR result for the test configuration.
2. When the reported SAR of the test sample measured without accessory (sleeve) attached is lower than the reported SAR of the same test configuration in the original equipment certification filing, adjust the reported SAR of the test sample **with accessory (sleeve) attached** by the ratio of reported SAR in the original filing to the reported SAR of the test sample **without the accessory (sleeve) attached** as the SAR result for the test configuration.
3. An alternative proposal to test *Bluetooth* was submitted and approved by the FCC under the scenario since, the host manufacturer was unable to provide the necessary tools to drive the host device into *Bluetooth* test mode. The proposal to use Wi-Fi antenna to simulate BT transmission at the appropriate power level was used in light of the shared frequencies. All SAR measurements/calculations showing the host+sleeve complying with standalone and simultaneous transmissions (as outlined in the TCB sleeve guidance) were submitted to this inquiry prior to authorization.

**10.3. Specific Absorption Rate - Test Results – A1429**  
**For All SAR measurement in this report the 1g-SAR limit tested to is 1.6 W/Kg**

WORST CASE DETERMINED FROM ORIGINAL FCC SAR REPORT									STANDALONE MEASUREMENTS (Host Device)				Host Device + Sleeve				Scan No.
Technology/ Band	Test Configuration		Mode	Antenna	Channel No.	Freq. (MHz)	Tune up Power (dBm)	Highest 1g Reported SAR (W/Kg)	Meas. power (dBm)	1g SAR Meas. (W/Kg)	1g SAR Reported (W/Kg)	Difference (Standalone w.r.t. Original Report)	1g SAR Meas. (W/Kg)	1g SAR Reported (W/Kg)	Difference (Case attached w.r.t Original Report)	Scaled 1g SAR Reported (W/kg)*	
GSM850	Head	Left Touch	GSM Voice	Primary	190	836.6	33.50	0.737	33.10	0.484	0.531	-28.0%	0.024	0.026	-96.5%	0.036	1
	Body Worn	Back	GSM Voice	Primary	251	848.8	33.50	0.866	33.10	0.697	0.764	-11.7%	0.060	0.066	-92.4%	0.074	2
	Hotspot	Back	GPRS 2 Slots	Primary	251	848.8	31.40	1.040	31.20	0.802	0.840	-19.3%	0.092	0.096	-90.7%	0.119	3
GSM 1900	Head	Right Touch	GSM (Voice)	Secondary	810	1909.8	30.5	0.956	30.40	0.908	0.929	-2.8%	0.612	0.626	-34.5%	0.644	4
	Body Worn	Back	GSM Voice	Primary	810	1909.8	31.00	0.864	30.40	0.670	0.769	-11.0%	0.307	0.352	-59.2%	0.396	5
	Hotspot	Back	GPRS 2 Slots	Primary	512	1850.2	29.90	1.130	29.40	0.952	1.068	-5.5%	0.394	0.442	-60.9%	0.468	6
WCDMA Band 2	Head	Right Touch	Rel 99 RMC 12.2kps	Primary	9262	1852.4	22.50	1.130	22.40	1.110	1.136	0.5%	0.194	0.199	-82.4%	0.199	7
	Body worn & Hotspot	Back	Rel 99 RMC 12.2kps with headset	Primary	9400	1880.0	22.50	1.180	22.20	0.993	1.064	-9.8%	0.437	0.468	-60.3%	0.519	8
WCDMA Band 5	Head	Left Touch	Rel 99 RMC 12.2Kbps	Secondary	4132	826.4	24.00	0.796	23.70	0.760	0.814	2.3%	0.645	0.691	-13.2%	0.691	9
	Body worn & Hotspot	Back	Rel 99 RMC 12.2kps	Primary	4233	846.6	24.50	0.837	24.10	0.757	0.830	-0.8%	0.060	0.066	-92.1%	0.067	10
CDMA BC 0	Head	Left Touch	1xRTT (RC3, SO55)	Secondary	777	848.3	24.50	0.972	23.70	0.813	0.977	0.6%	0.680	0.818	-15.9%	0.818	11
	Body worn & Hotspot	Back	1xRTT (RC3, SO32)	Primary	777	848.3	24.80	0.982	24.10	0.718	0.844	-14.1%	0.053	0.062	-93.7%	0.072	12
	Body worn & Hotspot	Back	1xEVDO(Rel 0)	Primary	777	848.3	25.00	0.942	24.20	-0.80	0.761	-2.9%	0.051	0.061	-93.5%	0.063	13
CDMA BC 1	Head	Right Touch	1xRTT (RC3, SO55)	Primary	600	1880.0	22.50	1.180	22.10	1.170	1.283	8.7%	0.401	0.440	-62.7%	0.440	14
	Body worn & Hotspot	Back	1xRTT (RC3, SO32) with headset	Primary	600	1880.0	22.50	1.180	22.10	1.000	1.096	-7.1%	0.425	0.466	-60.5%	0.502	15
	Body worn & Hotspot	Back	1xEVDO (REL.) with headset	Primary	600	1880.0	22.50	1.130	22.10	0.984	1.079	-4.5%	0.455	0.499	-55.8%	0.523	16
CDMA BC 10	Head	Left Touch	1xRTT (RC3, SO55)	Secondary	684	923.1	24.00	0.925	23.20	0.555	0.667	-27.9%	0.534	0.642	-30.6%	0.890	17
	Body worn & Hotspot	Back	1xRTT (RC3, SO32)	Primary	684	823.1	24.50	0.876	23.80	0.658	0.773	-11.7%	0.075	0.088	-90.0%	0.100	18
	Body worn & Hotspot	Back	1xEVDO (REL.)	Primary	684	823.1	24.50	0.867	23.80	0.630	0.740	-14.6%	0.037	0.044	-94.9%	0.051	19
LTE Band 5	Body worn & Hotspot	Back	10 MHz (QPSK) RB 1/24	Primary	20525	836.5	24.00	0.703	22.90	0.545	0.702	-0.1%	0.037	0.048	-93.1%	0.048	20

**Specific Absorption Rate - Test Results – A1429 (Continued)**

WORST CASE DETERMINED FROM ORIGINAL FCC SAR REPORT								STANDALONE MEASUREMENTS (Host Device)				Host Device + Sleeve				Scan No.	
Technology/ Band	Test Configuration		Mode	Antenna	Channel No.	Freq. (MHz)	Tune up Power (dBm)	Highest 1g Reported SAR (W/Kg)	Meas. power (dBm)	1g SAR Meas. (W/Kg)	1g SAR Reported (W/Kg)	Difference (Standalone w.r.t. Original Report)	1g SAR Meas. (W/Kg)	1g SAR Reported (W/Kg)	Difference (Case attached w.r.t Original Report)		Scaled 1g SAR Reported (W/kg)*
LTE Band 13	Head	Left Touch	10 MHz (QPSK) RB 1/24	Secondary	23230	782.0	23.40	0.616	22.00	0.354	0.489	-20.7%	0.234	0.323	-47.6%	0.407	21
	Body worn & Hotspot	Back	10 MHz (QPSK) RB 1/0	Primary	23230	782.0	24.00	0.645	22.90	0.576	0.742	15.0%	0.099	0.128	-80.2%	0.128	22
LTE Band 25	Body worn & Hotspot	Back	20 MHz (QPSK) RB 1/49 Headset	Primary	26365	1882.5	22.50	1.180	21.80	0.975	1.146	-2.9%	0.342	0.402	-65.9%	0.414	23
Wi-Fi 2.4 GHz	Head	Right Touch	802.11b 1Mbps	-	6	2437.0	16.00	0.522	16.00	0.528	0.528	1.1%	0.094	0.094	-82.0%	0.094	24
	Body worn & Hotspot	Back	802.11b 1Mbps with headset	-	6	2437.0	16.00	0.171	16.00	0.163	0.163	-4.7%	0.071	0.071	-58.4%	0.075	25
Wi-Fi 5.2 GHz	Head	Left Touch	802.11a 6Mbps	-	48	5240.0	14.00	0.587	14.00	0.680	0.680	15.8%	0.395	0.395	-32.7%	0.395	26
	Body Worn	Front	802.11a 6Mbps	-	48	5240.0	14.00	0.130	14.00	0.106	0.106	-18.5%	0.059	0.059	-54.8%	0.072	27
Wi-Fi 5.3 GHz	Head	Right Touch	802.11a 6Mbps	-	52	5260.0	13.50	0.575	13.40	0.663	0.678	18.0%	0.368	0.377	-34.5%	0.377	28
	Body Worn	Front	802.11a 6Mbps	-	64	5320.0	13.50	0.114	13.50	0.084	0.084	-26.3%	0.056	0.056	-50.9%	0.076	29
Wi-Fi 5.5 GHz	Head	Right Touch	802.11a 6Mbps	-	124	5620.0	12.00	0.580	11.90	0.612	0.626	8.0%	0.299	0.306	-47.2%	0.306	30
	Body Worn	Front	802.11a 6Mbps	-	116	5580.0	12.00	0.089	12.00	0.103	0.103	15.7%	0.097	0.097	9.0%	0.097	31
Wi-Fi 5.8 GHz	Head	Right Touch	802.11a 6Mbps	-	157	5785.0	13.00	0.593	12.80	0.603	0.631	6.5%	0.302	0.316	-46.7%	0.316	32
	Body Worn	Front	802.11a 6Mbps with headset	-	149	5745.0	13.00	0.066	12.80	0.064	0.066	0.7%	0.158	0.165	150.7%	0.165	33
Bluetooth	Body Worn	Back	GFSK	-	39	2441.0	13.40	0.105	13.40	0.095	0.095	-9.3%	0.039	0.039	-63.3%	0.042	34

**Note(s):**

\* Body worn & Hotspot in the original report were performed at 10mm.

\* Scaled 1g SAR Reported is calculated based on the following KDB inquiry response:

1. When the reported SAR of the test sample measured without accessory (sleeve) attached is equal to or higher than the reported SAR of the same test configuration in the original equipment certification filing, used the reported SAR of the test sample with accessory (sleeve) attached as the SAR result for the test configuration.
2. When the reported SAR of the test sample measured without accessory (sleeve) attached is lower than the reported SAR of the same test configuration in the original equipment certification filing, adjust the reported SAR of the test sample **with accessory (sleeve) attached** by the ratio of reported SAR in the original filing to the reported SAR of the test sample **without the accessory (sleeve) attached** as the SAR result for the test configuration.
3. An alternative proposal to test *Bluetooth* was submitted and approved by the FCC under the scenario since, the host manufacturer was unable to provide the necessary tools to drive the host device into *Bluetooth* test mode. The proposal to use Wi-Fi antenna to simulate BT transmission at the appropriate power level was used in light of the shared frequencies. All SAR measurements/calculations showing the host+sleeve complying with standalone and simultaneous transmissions (as outlined in the TCB sleeve guidance) were submitted to this inquiry prior to authorization.

## 10.4. Bluetooth (Phone Cover)

### 10.4.1. Standalone SAR Test Exclusion Considerations

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ , for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

- $f_{(\text{GHz})}$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

#### Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
4.0	2.5	10	2.40	0.39

#### Conclusion:

The computed value is  $< 3$ ; therefore, Bluetooth qualifies for Standalone SAR test exclusion.

### 10.4.2. Estimated SAR

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})/x}] \text{ W/kg}$  for test separation distances  $\leq 50$  mm; where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is  $> 50$  mm.

#### Estimated SAR Result for Body-worn Accessory Conditions:

Test Configuration	Max. tune-up tolerance limit (mW)	Min. test separation distance (mm)	Frequency (GHz)	Estimated 1-g SAR (W/kg)
Back/Front	2.5	10	2.4	0.052

### 11. Simultaneous Transmission Analysis

According to the worst case configuration Simultaneous transmission analysis of worst cases is shown in the tables below.

**Overall Worst Case:**

1. WWAN + WLAN 2.4 GHz
2. WWAN + WLAN 5.0 GHz
3. WWAN + WPAN
4. WPAN + WLAN 5.0 GHz
5. WWAN + WLAN 5.0 GHz + WPAN

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Exposure Configuration	Combination under consideration	Technology Band	Host Device with Sleeve attached			Sleeve	Simultaneous transmission SUM (W/kg)	SPLSR Ratio
			Highest Reported 1g SAR (W/kg)	Equipment Class	Highest Reported Sum-1g-SAR (W/kg)	Estimated Bluetooth 1g-SAR (W/kg)		
HEAD	WWAN + WLAN 2.4GHz	WCDMA Band 5	0.641	PCE	0.746	N/A	0.746	N/A
		Wi-Fi 2.4GHz	0.105	DTS				
	WWAN + WLAN 5.0GHz	WCDMA Band 5	0.641	PCE	0.982	N/A	0.982	N/A
		Wi-Fi 5.2GHz	0.341	NII				
HOTSPOT	WWAN + WLAN 2.4GHz	LTE Band 2	0.494	PCE	0.606	0.052	0.658	N/A
		Wi-Fi 2.4GHz	0.112	DTS				
BODY-WORN	WWAN + WLAN 2.4GHz	LTE Band 2	0.494	PCE	0.606	0.052	0.658	N/A
		Wi-Fi 2.4GHz	0.112	DTS				
	WWAN + WLAN 5.0GHz	LTE Band 2	0.494	PCE	0.631	0.052	0.683	N/A
		Wi-Fi 5.5GHz	0.137	NII				
	WWAN + WPAN	LTE Band 2	0.494	PCE	0.553	0.052	0.605	N/A
		Bluetooth	0.059	DSS				
	WLAN 5.0GHz + WPAN	LTE Band 2	0.494	PCE	0.690	0.052	0.742	N/A
		Wi-Fi 5.5GHz	0.137	NII				
		Bluetooth	0.059	DSS				

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			Host Device with Sleeve attached			Sleeve		
Exposure Configuration	Combination under consideration	Technology Band	Highest Reported 1g SAR (W/kg)	Equipment Class	Highest Reported Sum-1g-SAR (W/kg)	Estimated Bluetooth 1g-SAR (W/kg)	Simultaneous transmission SUM (W/kg)	SPLSR Ratio
HEAD	WWAN + WLAN 2.4GHz	CDMA BC10	0.890	PCE	0.984	N/A	0.984	N/A
		Wi-Fi 2.4GHz	0.094	DTS				
	WWAN + WLAN 5.0GHz	CDMA BC10	0.890	PCE	1.285	N/A	1.285	N/A
		Wi-Fi 5.2GHz	0.395	NII				
HOTSPOT	WWAN + WLAN 2.4GHz	CDMA BC1	0.523	PCE	0.598	0.052	0.650	N/A
		Wi-Fi 2.4GHz	0.075	DTS				
BODY-WORN	WWAN + WLAN 2.4GHz	CDMA BC1	0.523	PCE	0.598	0.052	0.650	N/A
		Wi-Fi 2.4GHz	0.075	DTS				
	WWAN + WLAN 5.0GHz	CDMA BC1	0.523	PCE	0.688	0.052	0.740	N/A
		Wi-Fi 5.8GHz	0.165	NII				
	WWAN + WPAN	CDMA BC1	0.523	PCE	0.565	0.052	0.617	N/A
		Bluetooth	0.042	DSS				
	WLAN 5.0GHz + WPAN	CDMA BC1	0.523	PCE	0.730	0.052	0.782	N/A
		Wi-Fi 5.8GHz	0.165	NII				
		Bluetooth	0.042	DSS				