TEST REPORT

Report No.: SHE190110011-01SE Date: 2020-01-03

Applicant	:	PCD., LLC
Address of Applicant	:	1500 Tradeport Drive, Suite A Orlando Florida 32824 United States
Product Name	:	MIFI
Model No.	:	J600
Sample No.	:	E19110011–01#03
Standards	:	FCC 47 CFR § 2.1093 IEEE Std1528-2013 ANSI C95.1-2005
Date of Receipt	:	2019-12-23
Date of Test	:	2019-12-24 ~ 2019-12-30
Date of Issue	:	2020-01-03

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Prepared by: Jennifer zhou Reviewed by: jesse Approved by: Guoyou Chi

(Jennifer Zhou) (Jesse) (Authorized signatory: Guoyou Chi)

Revision Record			
Version	**Date**	**Revisions**	**Revised By**
1.0	2020-01-03	Original	--

Contents

1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Services (Shanghai) Co., Ltd.
Address	No.1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Company Name	PCD, LLC
Address	7651 Southland Blvd. Orlando, FL 32809
Contact Person	Mauricio Velasco
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1.3 Details of EUT

Product Name	MIFI
Brand Name	PCD
Model No.	J600
FCC ID	2ALJJJ600
Serial Number	/
HW Version	PCD_J600_CLARO_DR_V5
SW Version	PCD_J600_CLARO_DR_V5
Mode of Operation	WCDMA/HSDPA/HSUPA Band II/V/VIII; LTE FDD Band 2/4//7/28; WLAN 802.11b/g/n(HT20/HT40) for 2.4GHz;
Duty Cycle	1 for WCDMA/CDMA/LTE FDD/WLAN
Modulation Type	QPSK for WCDMA/CDMA;QPSK/16QAM for LTE; DSSS/OFDM for WLAN 2.4GHz
Antenna Type	Internal antenna
Antenna Gain	WCDMA/LTE: -1.5 dBi WLAN: 0 dBi
Power Supply	DC 3.7V by Lithium ion polymer battery
Device Category	Portable Device
Exposure Category	General Population/Uncontrolled Exposure
EUT Type	Production Unit

Hotspot	Supported

Note(s):

1. WCDMA, LTE, WLAN 2.4GHz support Hotspot.
2. The WLAN chipset have two antennas, and the two antennas can simultaneous transmit. Details please see clause 6.2.

1.4 Identification of Auxiliary Equipment

AEID	Description	Model	Manufacturer	Type
AE1	Battery	BM600	Shenzhen Jiete Energy Technology Co., Ltd	2000mAh(7.4Wh)

1.5 The Highest Reported SAR Values

Equipment Class	Reported 1g SAR (W/Kg)		
	Head	**Body-Worn**	**Hotspot**
PCE	--	1.368	1.368
DTS (Antenna 1)	--	0.079	0.079
DTS (Antenna 2)	--	0.098	0.098
Simultaneous SAR	1.545		

1.6 Test Methodology

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE Std 1528-2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

☒	KDB 248227 D01 802.11 WLAN SAR v02r02
☒	KDB 447498 D01 General RF Exposure Guidance v06
☐	KDB 447498 D02 SAR Procedures for Dongle Xmtr v02r01
☐	KDB 615223 D01 802.16e WiMax SAR Guidance v01r01
☐	KDB 616217 D04 SAR for laptop and tablets v01r02
☐	KDB 643646 D01 SAR Test for PTT Radios v01r03
☐	KDB 648474 D03 Wireless Chargers Battery Cover v01r04
☐	KDB 648474 D04, Handset SAR v01r03
☐	KDB 680106 D01 RF Exposure Wireless Charging Apps v02
☒	KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
☒	KDB 941225 D01 3G SAR Procedures v03r01
☒	KDB 941225 D05 SAR for LTE Devices v02r05
☒	KDB 941225 D06 Hot Spot SAR v02r01
☒	KDB 941225 D07 UMPC Mini Tablet v01r02

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

1.7 SAR Limits

The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (“SAR”) in Section 4.2 of “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” ANSI/IEEE C95.1-1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. 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 Radiofrequency Electromagnetic Fields,” NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 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. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in §1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

1) The SAR limits for occupational/controlled exposure are 0.4 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 8 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a

cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit for occupational/controlled exposure is 20 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 6 minutes to determine compliance with occupational/controlled SAR limits.

2) The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

Exposure Limits	**FCC 1g SAR Limit (W/Kg)**	
	General Population/Uncontrolled Exposure	**Occupational/Controlled Exposure**
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1g of tissue)	1.6	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

2 Test Environment

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060
Ambient noise & Reflection（W/kg）	< 0.012

2.2 Equipment List

Dielectric Property Measurements

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Due Date
Network Analyzer	Anritsu	MS46121A	1618412	2020-09-20
Material Measurement Probe System	Poseidon	MMP	/	N/A

System Check

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Due Date
Signal Generator	Agilent	SMB 100	114400	2020-06-23
Power Meter	Agilent	NRP2	106036	2020-06-18
Power Sensor	Agilent	NRP8S	103592	2020-06-18
Amplifier	Mini-Circuits	ZVE-8G+	S0N560400742	2020-07-16
Amplifier	Mini-Circuits	ZHL-42+	SN784901545	2020-07-16
DC Power Supply	ACPOWER	ADC-0800025-15	D215010003	2020-03-15
E-Field Probe	SPEAG	EX3DV4	7475	2020-10-15
Data Acquisition Electronics	SPEAG	DAE4	787	2020-01-22
Dipole	SPEAG	D900V2	1d055	2020-03-20
Dipole	SPEAG	D1800V2	2d148	2020-03-22
Dipole	SPEAG	D2450V2	723	2020-03-20
Dipole	SPEAG	D750V3	1055	2020-06-25
Dipole	SPEAG	D835V2	4d061	2020-06-25
Dipole	SPEAG	D1900V2	5d092	2020-06-29
Dipole	SPEAG	D2100V2	1053	2020-07-09
Dipole	SPEAG	D2300V2	1040	2020-06-25
Dipole	SPEAG	D2600V2	723	2020-07-09

Dipole	SPEAG	D5GHzV2	1061	2020-06-28

Other

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	150835	2020-08-13
Robot	SPEAG	TX90 XL	F07/564YA1/A/01	N/A
Phantom	SPEAG	SAM	TP-1641	N/A
Phantom	SPEAG	SAM	TP-1642	N/A

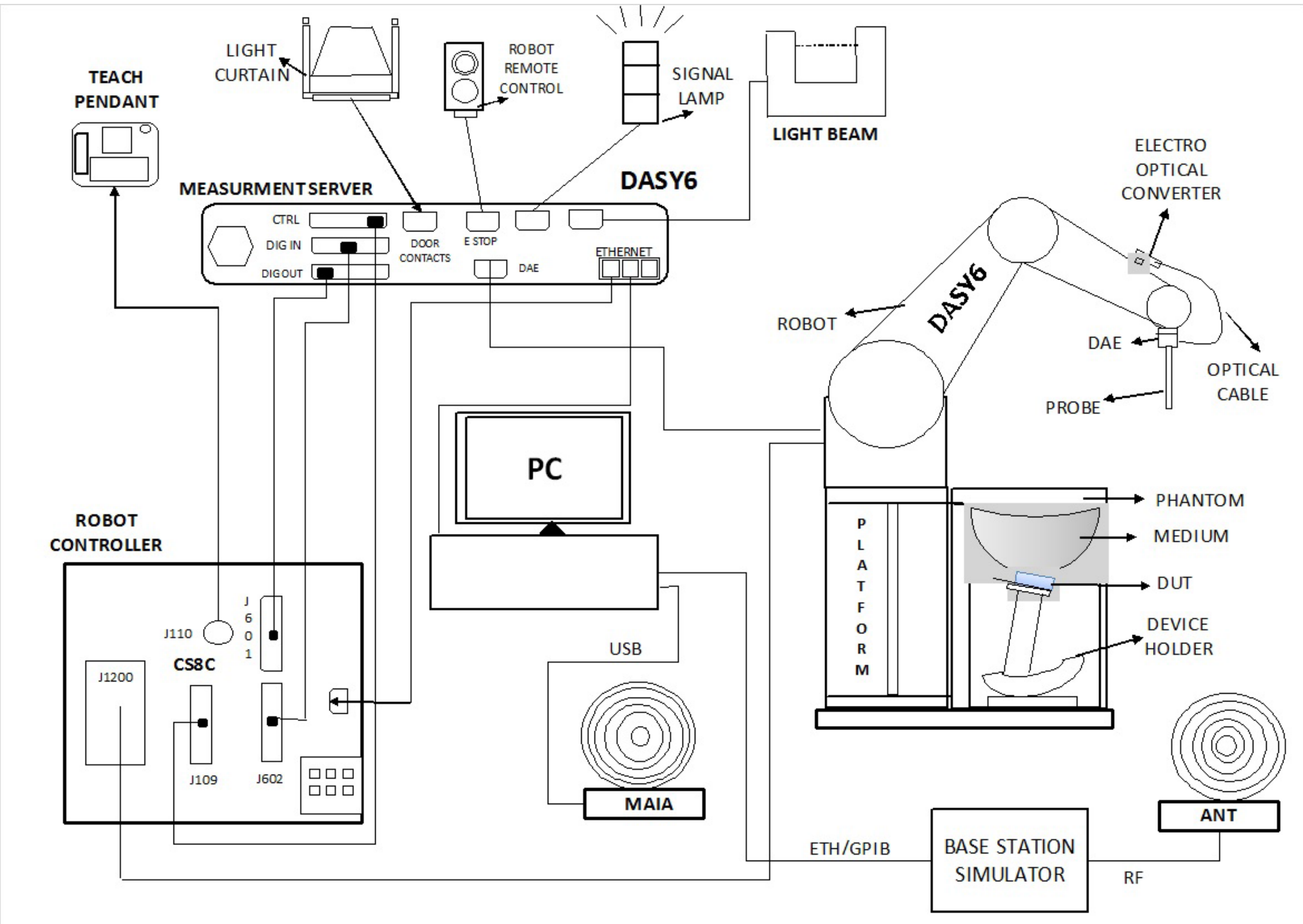
2.3 Measurement Uncertainty

Source of Uncertainty	Tol. (±%)	Prob. Dist.	Div.	c_i (1 g)	c_i (10 g)	1 g u_i (±%)	10 g u_i (±%)	v_i
Measurement System								
Probe Calibration (k=1)	2.4	N	1	1	1	2.4	2.4	∞
Axial isotropy	1.2	R	√3	1	1	0.69	0.69	∞
Hemispherical isotropy	3.2	R	√3	1	1	1.85	1.85	∞
Boundary Effect	7.4	R	√3	1	1	4.27	4.27	∞
Linearity	0.9	R	√3	1	1	0.52	0.52	∞
System Detection Limit	1	R	√3	1	1	0.6	0.6	∞
Readout Electronics	0.3	N	1	1	1	0.3	0.3	∞
Response Time	0	R	√3	1	1	0	0	∞
Integration Time	0	R	√3	1	1	0	0	∞
RF Ambient Condition - Noise	1	R	√3	1	1	0.6	0.6	∞
RF Ambient Condition - Reflections	1	R	√3	1	1	0.6	0.6	∞
Probe Positioner Mechanical Tolerance	0.8	R	√3	1	1	0.5	0.5	∞
Probe Positioning with respect to Phantom Shell	9.9	R	√3	1	1	5.7	5.7	∞
Extrapolation, Interpolation, and Integration Algorithms for Max. SAR Evaluation	4	R	√3	1	1	2.3	2.3	∞
Test Sample Related								
Test Sample Positioning	2.9	N	1	1	1	2.9	2.9	8
Device Holder Uncertainty	3.5	N	1	1	1	3.5	3.5	∞
Drift of Output Power	5	R	√3	1	1	2.9	2.9	∞
SAR scaling	2.18	R	√3	1	1	1.26	1.26	∞

Phantom and Setup								
Phantom Uncertainty (shape & thickness tolerance)	4	R	√3	1	1	2.3	2.3	∞
Uncertainty in SAR correction fordeviations in permittivity andconductivity	1.2	N	1	1	0.84	1.2	1.01	∞
Liquid Conductivity (target)	5	R	√3	0.64	0.43	1.85	1.24	∞
Liquid Conductivity (meas.)	2.93	N	1	0.64	0.43	1.88	1.26	9
Liquid Permittivity (target)	5	R	√3	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (meas.)	5.9	N	1	0.6	0.49	3.54	2.89	9
Combined Uncertainty		RSS	$u_c = \sqrt{\sum_{i=1}^{m} c_i^2 \cdot u_i^2}$			10.62	10.36	
Combined Uncertainty (coverage factor=2)		k=2	$u_e = 2u_c$			21.25	20.72	

3 SAR Measurement System

The DASY6 system for performing compliance tests consists of the following items:



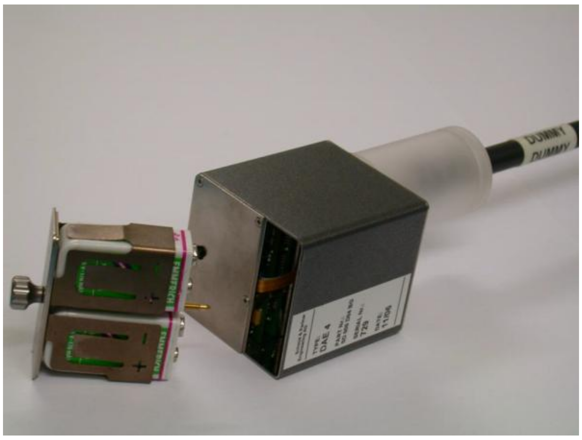
- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the 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 Win7 professional operating system and the DASY6 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

3.1 DASY6 Measurement Server

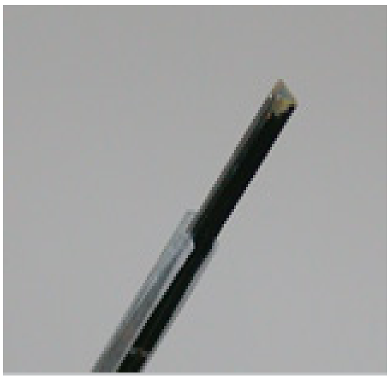
The DASY6 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chip-disk and 128MB RAM. The necessary circuits for communication with the DAE4 (or DAE3) electronics box, as well as the 16-bit AD converter system for optical detection and digital I/O interface are contained on the DASY6 I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluations of field measurements and surface detection, controls robot movements, and handles safety operations. The PC operating system cannot interfere with these time-critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program controlled robot movements. Furthermore, the measurement server is equipped with an expansion port, which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Connection of devices from any other supplier could seriously damage the measurement server.

3.2 Data Acquisition Electronics



The data acquisition electronics (DAE4) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.
The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.
The input impedance of both the DAE4 as well as of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



3.3 EX3DV4 E-Field Probe

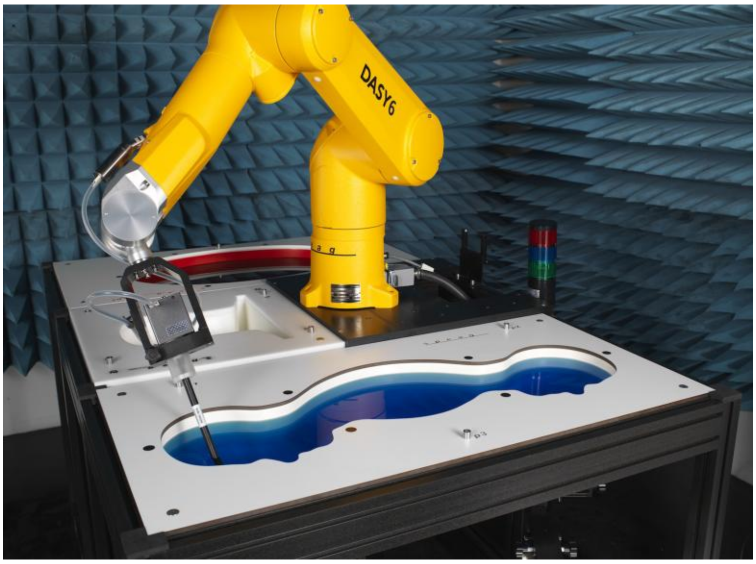
Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB

	(30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

3.4 SAM Phantom

The SAM-Twin phantom (shown in front of DASY6) is a fiberglass shell phantom with shell thickness 2 mm, except in the ear region where the thickness is increased to 6 mm. The phantom has three measurement areas:

- Left hand
- Right hand
- Flat phantom

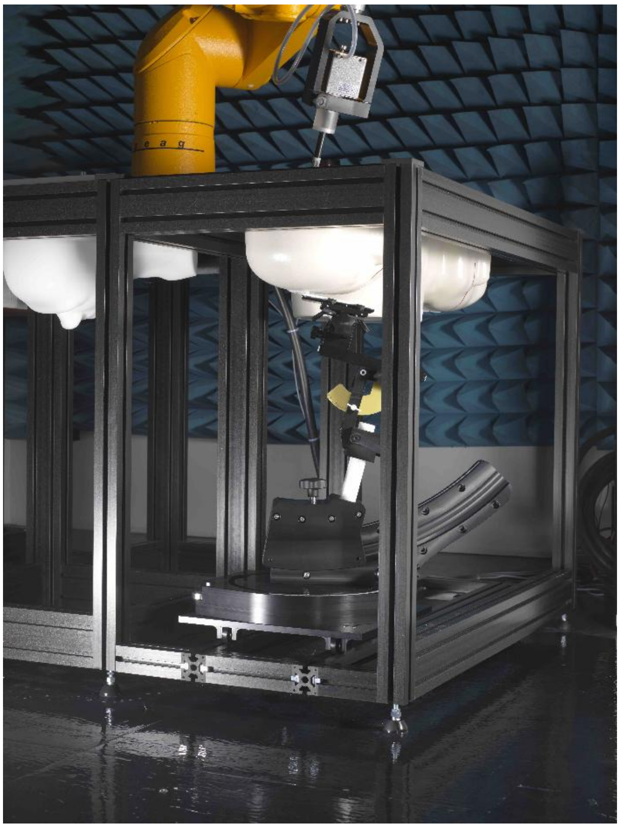


The phantom table for the DASY systems based on the TX90XL and RX160L robots have the size of 100 x 50 x 85 cm (L x W x H). These tables are reinforced for mounting of the robot onto the table. For easy dislocation these tables have fork lift cut outs at the bottom. The bottom plate contains three pairs of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. Only one device holder is necessary if two phantoms are used (e.g., for different liquids)

A white cover is provided to cover the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on top of this phantom cover are possible.

Three reference marks are provided on the phantom counter. These reference marks are used to teach the absolute phantom position relative to the robot.

3.5 Device Holder for SAM Twin Phantom



The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity =3 and loss tangent =0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

4 SAR Measurement Procedures

4.1 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 mm / 4 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties.

4.2 Area Scan Procedures

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot.Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

<table>
<tr><th></th><th>$\leq$ 3 GHz</th><th>$>$ 3 GHz</th></tr>
<tr><td>Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 mm ± 1 mm</td><td>½·δ·ln(2) mm ± 0.5 mm</td></tr>
<tr><td>Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>$\leq$ 2 GHz: $\leq$ 15 mm
2 – 3 GHz: $\leq$ 12 mm</td><td>3 – 4 GHz: $\leq$ 12 mm
4 – 6 GHz: $\leq$ 10 mm</td></tr>
<tr><td colspan="2">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 $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
</table>

4.3 Zoom Scan Procedures

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

<table>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\le 1.5 \cdot \Delta z_{Zoom}(n-1)$ mm</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">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 <u>reported</u> 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.</td></tr>
</table>

4.4 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 Power Reference Measurement.

4.5 Position of the wireless device in relation to the phantom

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 Figure 1). 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.

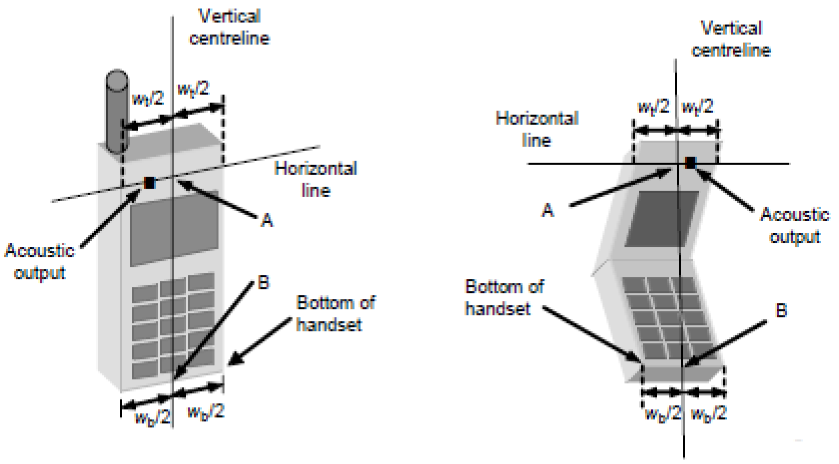


Figure 1 Handset Vertical Center & Horizontal Line Reference Points

4.6 Definition for Touch and Tilt

The cheek position is established in points a) to i) as follows.

a) Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the device can also be used with the cover closed,both configurations shall be tested.

b) Define two imaginary lines on the handset, the vertical centreline and the horizontal line,for the handset in vertical orientation as shown in Figures 1. The verticalcentreline passes through two points on the front side of the handset: the midpoint of the width wt of the handset at the level of the acoustic output (point A in Figures 1), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centreline and passes through the centre of the acoustic output (see Figures 1). The two lines intersect at point A. Note that for many handsets, point A coincides with the centre of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centreline is not necessarily parallel to the front face of the handset (see Figure 1), especially for clam-shell handsets, handsets with flip cover pieces, and other irregularly shaped handsets.

c) Position 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 2). The plane defined by the vertical centreline and the horizontal line of the device must be parallel to the sagittal plane of the phantom.

d) Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the ear.

e) Rotate the handset around the (virtual) LE-RE Line until the DUT vertical centreline is in the reference plane.

f) Rotate the device around its vertical centreline until the plane defined by the DUT vertical centreline and horizontal line is parallel to the N-F Line, then translate the handset towards the phantom along the LE-RE line until DUT point A touches the ear at the ERP.

g) While keeping point A on the line passing through RE and LE and maintaining the handset in contact with the pinna, rotate the handset about the line N-F until any point on the handset is in contact with a phantom point below the pinna (cheek) (see Figure 2). The physical angles of rotation shall be documented. While keeping DUT point A in contact with the ERP, rotate the handset around a line perpendicular to the plane defined by the DUT vertical centreline and horizontal line and passing through DUT point A, until the DUT vertical centreline is in the reference plane.

h) Verify that the cheek position is correct as follows:

— the N-F line is in the plane defined by the DUT vertical centreline and horizontal line,

— DUT point A touches the pinna at the ERP, and

— the DUT vertical centreline is in the reference plane.

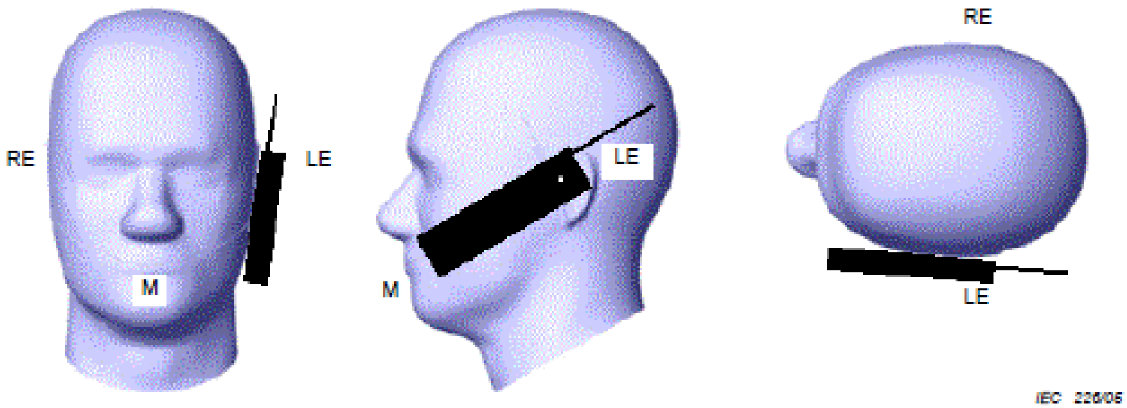


Figure 2 Cheek position of the wireless device on the left side of SAM

The tilt position is established in points a) to d) as follows.

a) Repeat steps a) to i) of above section to place the device in the cheek position (see Figure 2).

b) While maintaining the orientation of the device, retract the device parallel to the reference plane far enough away from the phantom to enable a rotation of the device by 15°.

c) Rotate the device around the horizontal line by 15° (see Figure 3).

d) While maintaining the orientation of the handset, move the handset towards the phantom on a line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna, e.g., the antenna with the back of the phantom head, the angle of the handset shall be reduced. In this case, the tilt position is obtained if any part of the handset is in contact with the pinna as well as a second part of the handset is in contact with the phantom, e.g., the antenna with the back of the head.

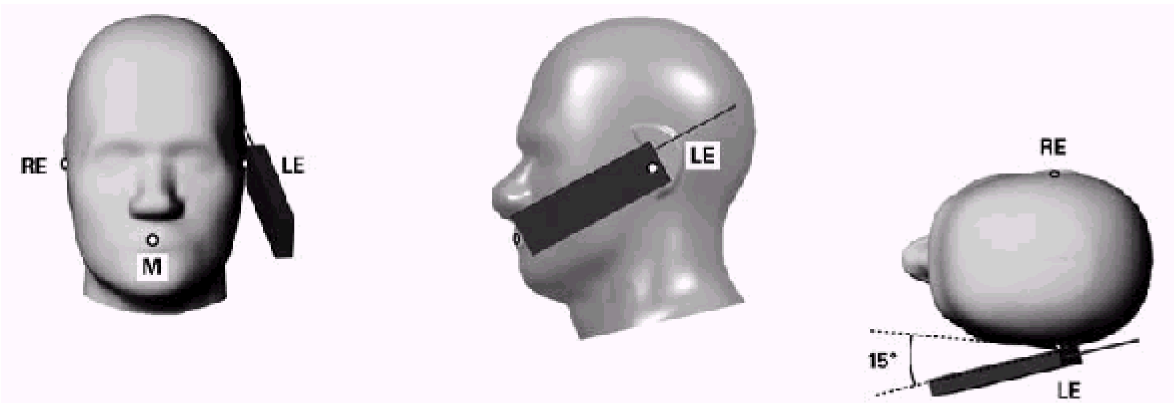


Figure 3 Tilt position of the wireless device on the left side of SAM

4.7 Definition for Body-Worn Accessory Configurations

Body-Worn operation configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. A device with a headset output is tested with a headset connected to the device.

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 supplied with the device, the device is tested with each accessory that contains a unique metallic component. 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 of available as options for some devices intended to be authorized for Body-Worn use. In this case, a test configuration where a separation distances between the back of the device and the flat phantom is used. Test position spacing was documented.

4.8 Definition for Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WLAN simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the Body-Worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some Body-Worn accessory SAR tests.

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

4.9 Dielectric Property Measurements

The dielectric properties for this simulant fluid were measured by using the Dielectric Probe in conjunction with Network Analyzer(300 kHz - 6 GHz) by using a procedure detailed in KDB 865664 D01v01r04.

Dielectric properties of the tissue-equivalent liquid

Target Frequency	Head		Body	
(MHz)	ε_r	σ (S/m)	ε_r	σ (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
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
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

Dielectric Property Measurements Results

Frequency	Target Tissue		Measured Tissue		Limit (±5% Dev.)		Temp (℃)	Test Date
	ε_r	σ(s/m)	ε_r	σ(s/m)	ε_r	σ(s/m)		
835 Body	55.2	0.97	56.15	0.998	1.72%	2.89%	21.5	2019-12-24
1800 Body	53.3	1.52	52.23	1.54	-2.01%	1.32%	21.5	2019-12-25
1900 Body	53.3	1.52	52.44	1.55	-1.61%	1.97%	21.5	2019-12-26
2450 Body	52.7	1.95	52.53	2.03	-0.32%	4.10%	21.5	2019-12-27
2600 Body	52.5	2.16	52.93	2.21	0.82%	2.31%	21.5	2019-12-30

4.10 SAR System Verification

The purpose of the system check is to verify that the system operates within its specifications at the decice test frequency. The system check is simple check of repeatability to make sure that the system works correctly at the time of the compliance test.

A system check measurement was made following the determination of the dielectric parameters of the simulates, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY6 system.

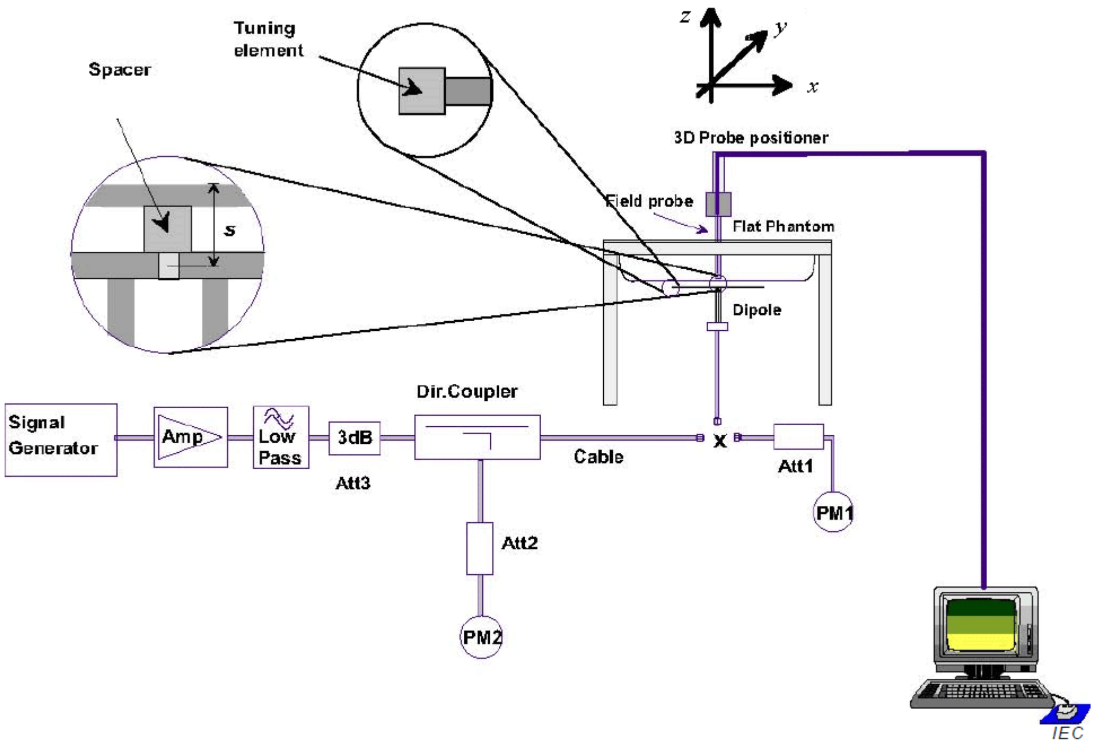


Figure 4 System Check Set-up

System Verification Results

Frequency & Tissue Type	1W Target (W/Kg)		250mW Measured (W/Kg)		1W Normalized (W/Kg)		Temp (℃)	1g Limit (±10% Dev.)	Test Date
	1g SAR	10g SAR	1g SAR	10g SAR	1g SAR	10g SAR			
835 Body	9.53	6.27	2.53	1.65	10.12	6.60	21.5	6.19%	2019-12-24
1800 Body	39.3	21.1	9.84	5.20	39.36	20.80	21.5	0.15%	2019-12-25
1900 Body	39.9	21.0	10.30	5.33	41.20	21.32	21.5	3.26%	2019-12-26
2450 Body	50.5	23.3	13.58	6.16	54.32	24.64	21.5	7.56%	2019-12-27
2600 Body	54.3	24.4	14.40	6.19	57.60	24.76	21.5	6.08%	2019-12-30

Note(s):

1. Target Values used from the calibration certificate by SPEAG and CTTL in collaboration with SPEAG.

5 SAR Measurement Procedure

5.1 Conducted Power Measurement

Conducted power measurements were performed using a base station simulator under digital average power. The handset was placed into a simulated call using a base station simulator in shielded chamber. SAR measurements were taken with a fully charged battery. In order to verify that the device was tested and maintained at full power, this was configured with the base station simulator. The SAR measurement Software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5 % occurred, the tests were repeated.

5.2 GSM Test Configuration

SAR test for GSM band, a communication link is set up with a System Simulator (SS) by air link. The power level is set to “5” for GSM 850, set to “0” for GSM 1900. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslots is 5. The EDGE class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslots is 5.
SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. GSM voice and GPRS data use GMSK, which is a constant amplitude modulation with minimal peak to average power difference within the time-slot burst. For EDGE, GMSK is used for MCS 1 – MCS 4 and 8-PSK is used for MCS 5 – MCS 9; where 8-PSK has an inherently higher peak-to-average power ratio. The GMSK and 8-PSK EDGE configurations are considered separately for SAR compliance. The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance. The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode.

5.3 UMTS Test Configuration

Output power Verification

Maximum output power is verified on the High, Middle and Low channel according to the procedures described in section 5.2 of 3GPP TS 34. 121, using the appropriate RMC or AMR with TPC(transmit power control) set to all up bits for WCDMA/HSDPA or applying the required inner loop power control procedures to the maximum output power while HSUPA is active. Results for all applicable physical channel configuration (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) should be tabulated in the SAR report. All configuration that are not supported by the DUT or can not be measured due to technical or equipment limitations should be clearly identified

Head SAR

SAR for head exposure configurations in voice mode is measured using a 12.2kbps RMC with TPC bits configured to all up bits. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2kbps AMR is less than 1/4 dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2kbps AMR with a 3.4 kbps SRB(Signaling radio bearer) using the exposure configuration that results in the highest SAR in 12.2kbps RMC for that RF channel.

Body-Worn Accessory SAR

SAR for body exposure configurations in voice and data modes is measured using 12.2kbps RMC with TPC bits configured to all up bits. SAR for other spreading codes and multiple DPDCHn, when supported by the DUT, are not required when the maximum average output of each RF channel, for each spreading code and DPDCHn configuration, are less than 1/4 dB higher than those measured in 12.2kbps RMC. Otherwise, SAR is measured on the maximum output channel with an applicable RMC configuration for the corresponding spreading code or DPDCHn using the exposure configuration that results in the highest SAR with 12.2 kbps RMC. When more than 2 DPDCHn are supported by the DUT, it may be necessary to configure additional DPDCHn for a DUT using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

HSDPA Test Configuration

SAR for body exposure configurations is measured according to the 'Body SAR Measurements' procedures of that section. In addition,body SAR is also measured for HSDPA when the maximum average output of each RF channel with HSDPA active is at least ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA.

HSDPA should be configured according to the UE category of a test device.The number of HSDSCH/ HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(βc, βd), and HS-DPCCH power offset parameters (ΔACK, ΔNACK, ΔCQI) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

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 β_c/β_d =12/15, β_{hs}/β_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 β_c = 11/15 and β_d = 15/15.

HSUPA Test Configuration

Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.2 kbps RMC without HSPA.

Due to inner loop power control requirements in HSPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E- DCH configurations for HSPA should be configured according to the β values indicated below as well as other applicable procedures described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Devices' sections of 3 G device.

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.

HSPA, HSPA+ and DC-HSDPA Test Configuration

SAR test exclusion for HSPA, HSPA+ and DC-HSDPA is determined according to the following:

a) The HSPA procedures are applied to configure 3GPP Rel. 6 HSPA devices in the required sub-test mode(s) to determine SAR test exclusion.

b) SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode.36 Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.

c) 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.

d) Regardless of whether a PAG is required, the following information must be verified and included in the SAR report for devices supporting HSPA, HSPA+ or DC-HSDPA:

1) The output power measurement results and applicable release version(s) of 3GPP TS 34.121.

i) Power measurement difficulties due to test equipment setup or availability must be resolved between the grantee and its test lab.

2) The power measurement results are in agreement with the individual device implementation and specifications. When Enhanced MPR (E-MPR) applies, the normal MPR targets may be modified according to the Cubic Metric (CM) measured by the device, which must be taken into consideration.

3) The UE category, operating parameters, such as theβand ∆values used to configure the device for testing, power setback procedures described in 3GGPP TS 34.121 for the power measurements, and HSPA/HSPA+

channel conditions (active and stable) for the entire duration of the measurement according to the required E-TFCI and AG index values.

e) When SAR measurement is required, the test configurations, procedures and power measurement results must be clearly described to confirm that the required test parameters are used, including E-TFCI and AG index stability and output power conditions.

5.4 CDMA Test Configuration

Output power Verification

Maximum output power is verified on the high, middle and low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. Results for at least steps 3, 4 and 10 of the power measurement procedures are required in the SAR report. Steps 3 and 4 are measured using Loopback Service Option SO55 with power control bits in “All Up” condition. TDSO/SO32 may be used instead of SO55 for step 4. Step 10 is measured using TDSO/SO32 with power control bits in the “Bits Hold” condition (i.e. alternative Up/Down Bits). All power measurements defined in C.S0011/TIA-98-E that are inapplicable to the handset or cannot be measured due to technical or equipment limitations must be clearly identified in the test report.

Head SAR

SAR for next to the ear head exposure is measured in RC3 with the handset configured to transmit at full rate in SO55. The 3G SAR test reduction procedure is applied to RC1 with RC3 as the primary mode; otherwise, SAR is required for the channel with maximum measured output in RC1 using the head exposure configuration that results in the highest reported SAR in RC3.

Body-Worn Accessory SAR

Body-Worn accessory SAR is measured in RC3 with the handset configured in TDSO/SO32 to transmit at full rate on FCH only with all other code channels disabled. The Body-Worn accessory procedures in KDB Publication 447498 D01 are applied. The 3G SAR test reduction procedure is applied to the multiple code channel configuration (FCH+SCHn), with FCH only as the primary mode. Otherwise, SAR is required for multiple code channel configuration (FCH + SCHn), with FCH at full rate and SCH0 enabled at 9600 bps, using the highest reported SAR configuration for FCH only. When multiple code channels are enabled, the transmitter output can shift by more than 0.5 dB and may lead to higher SAR drifts and SCH dropouts.

The 3G SAR test reduction procedure is applied to Body-Worn accessory SAR in RC1 with RC3 as the primary mode.Otherwise, SAR is required for RC1, with SO55 and full rate, using the highest reported SAR configuration for Body-Worn accessory exposure in RC3.

1x Ev-Do Test Configuration

For handsets with Ev-Do capabilities, the 3G SAR test reduction procedure is applied to Ev-Do Rev. 0 with 1x RTT RC3 as the primary mode to determine Body-Worn accessory test requirements. Otherwise, Body-Worn accessory SAR is required for Rev. 0, at 153.6 kbps, using the highest reported SAR configuration for Body-Worn accessory exposure in RC3.

The 3G SAR test reduction procedure is applied separately to Rev. A and Rev. B, with Rev. 0 as the primary mode to determine Body-Worn accessory SAR test requirements. When SAR is not required for Rev. 0, the 3G SAR test reduction is applied with 1x RTT RC3 as the primary mode. Otherwise, SAR is required for Rev. A or Rev. B, with a

Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 and 3 Physical Layer configurations, using the highest reported SAR configuration for Body-Worn accessory exposure in Rev. 0 or RC3, as appropriate.
A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with ACK Channel transmitting in all slots is configured in the downlink for Rev. 0, Rev. A and Rev. B.

5.5 LTE Test Configuration

QPSK with 1 RB allocation

Start with the largest channel bandwidth then measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle, and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

QPSK with 50% RB allocation

The procedures required for 1 RB allocation in above section are applied to measure the SAR for QPSK with 50% RB allocation.

QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations, and the highest reported SAR for 1 RB and 50% RB allocation in above two sections are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in above sections to determine the channels and RB configurations that need SAR testing, then only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration, or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg. The equivalent channel configuration for the RB allocation, RB offset and modulation, etc., is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5 MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing.

5.6 WLAN Test Configuration

The SAR measurement and test reduction procedures are structured according to either the DSSS or OFDM transmission mode configurations used in each standalone frequency band and aggregated band. For devices that operate in exposure configurations that require multiple test positions, additional SAR test reduction may be applied. The maximum output power specified for production units, including tune-up tolerance, are used to determine initial SAR test requirements for the 802.11 transmission modes in a frequency band. SAR is measured using the highest measured maximum output power channel for the initial test configuration. SAR measurement and test reduction for the remaining 802.11 modes and test channels are determined according to measured or specified maximum output power and reported SAR of the initial measurements. The general test reduction and SAR measurement approaches are summarized in the following:

1) The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures. Channels with measured maximum output power within ¼ dB are considered to have the same maximum output.
2) For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, an “initial test configuration” is first determined for each standalone and aggregated frequency band according to the maximum output power and tune-up tolerance specified for production units.
   a. When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band.
   b. SAR is measured for OFDM configurations using the initial test configuration procedures. Additional frequency band specific SAR test reduction may be considered for individual frequency bands
   c. Depending on the reported SAR of the highest maximum output power channel tested in the initial test configuration, SAR test reduction may apply to subsequent highest output channels in the initial test configuration to reduce the number of SAR measurements.
3) The Initial test configuration does not apply to DSSS. The 2.4 GHz band SAR test requirements and 802.11b DSSS procedures are used to establish the transmission configurations required for SAR measurement.
4) An “initial test position”is applied to further reduce the number of SAR tests for devices operating in next to the ear, UMPC mini-tablet or hotspot mode exposure configurations that require multiple test positions .

a. SAR is measured for 802.11b according to the 2.4 GHz DSSS procedure using the exposure condition established by the initial test position.

b. SAR is measured for 2.4 GHz and 5 GHz OFDM configurations using the initial test configuration. 802.11b/g/n operating modes are tested independently according to the service requirements in each frequency band. 802.11b/g/n modes are tested on the maximum average output channel.

5) The Initial test position does not apply to devices that require a fixed exposure test position. SAR is measured in a fixed exposure test position for these devices in 802.11b according to the 2.4 GHz DSSS procedure or in 2.4 GHz and 5 GHz OFDM configurations using the initial test configuration procedures .
6) The “subsequent test configuration”procedures are applied to determine if additional SAR measurements are required for the remaining OFDM transmission modes that have not been tested in the initial test configuration.

SAR test exclusion is determined according to reported SAR in the initial test configuration and maximum output power specified or measured for these other OFDM configurations.

2.4 GHz and 5GHz SAR Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. The SAR test exclusion requirements for 802.11g/n OFDM configurations are described in section 5.2.2.

1. 802.11b DSSS 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:

a. When the reported SAR of the highest measured maximum output power channel (section 3.1) for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

b. 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. 2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3). SAR is not required for the following 2.4 GHz OFDM conditions.

a. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration

b. 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.

3. SAR Test Requirements for OFDM Configurations

When SAR measurement is required for 802.11 a/g/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements.20 In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

4. OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements

The initial test configuration for 2.4 GHz and 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures (section 4)

When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

a. The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.

b. If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
c. If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
d. When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.
After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.
a. Channels with measured maximum output power within ¼ dB of each other are considered to have the same maximum output.
b. When there are multiple test channels with the same measured maximum output power, the channel closest to mid-band frequency is selected for SAR measurement.
c. When there are multiple test channels with the same measured maximum output power and equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement. Initial Test Configuration Procedures
An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2). SAR test reduction of subsequent highest output test channels is based on the reported SAR of the initial test configuration. For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode.23 For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration. When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
5. Subsequent Test Configuration Procedures
SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. The initial test position procedure is applied to next to the ear, UMPC mini-tablet and hotspot mode configurations.
When the same maximum output power is specified for multiple transmission modes, the procedures in section 5.3.2 are applied to determine the test configuration. Additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. The subsequent test configuration and SAR measurement procedures are described in the following.
a. When SAR test exclusion provisions of KDB Publication 447498 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power

transmission mode subsequent test configuration(s) in that frequency band or aggregated band and exposure configuration.

b. When the highest reported SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

c. The number of channels in the initial test configuration and subsequent test configuration can be different due to differences in channel bandwidth. When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel. This step requires additional power measurement to identify the highest maximum output power channel in the subsequent test configuration to determine SAR test reduction.

1). SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.

2). SAR for subsequent highest measured maximum output power channels in the subsequent test configuration is required only when the reported SAR of the preceding higher maximum output power channel(s) in the subsequent test configuration is > 1.2 W/kg or until all required channels are tested.

a) For channels with the same measured maximum output power, SAR should be measured using the channel closest to the center frequency of the larger channel bandwidth channel in the initial test configuration.

d. SAR measurements for the remaining highest specified maximum output power OFDM transmission mode configurations that have not been tested in the initial test configuration (highest maximum output) or subsequent test configuration(s) (subsequent next highest maximum output power) is determined by applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:

1) replace “subsequent test configuration” with “next subsequent test configuration” (i.e., subsequent next highest specified maximum output power configuration)

2) replace “initial test configuration” with “all tested higher output power configurations.

5.7 Measurement Variability

Per FCC KDB Publication 865664 D01, 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 preformed 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

5.8 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. Test highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

6 Test Results

6.1 Conducted Power Results

Conducted Power Measurement Results for WCDMA/HSDPA/HSPUA

WCDMA Band II	Mode	Conducted Power (dBm)		
		Channel		
		Low	Mid	High
RMC	12.2 kbps	22.82	22.95	**23.30**
HSDPA	Sub - Test 1	21.82	21.97	22.25
	Sub - Test 2	21.84	21.98	22.35
	Sub - Test 3	21.42	21.48	21.86
	Sub - Test 4	21.39	21.47	21.86
HSUPA	Sub - Test 1	21.22	21.27	21.38
	Sub - Test 2	21.14	21.18	21.25
	Sub - Test 3	21.33	21.41	21.49
	Sub - Test 4	20.02	20.13	20.16
	Sub - Test 5	20.41	20.37	20.77

WCDMA Band V	Mode	Conducted Power (dBm)		
		Channel		
		Low	Mid	High
RMC	12.2 kbps	22.88	22.74	**22.84**
HSDPA	Sub - Test 1	21.84	21.79	21.87
	Sub - Test 2	21.84	21.82	21.9
	Sub - Test 3	21.31	21.31	21.39
	Sub - Test 4	21.31	21.31	21.4
HSUPA	Sub - Test 1	21.33	21.25	21.37
	Sub - Test 2	20.59	20.42	20.63
	Sub - Test 3	20.14	20.08	20.18
	Sub - Test 4	21.43	21.27	21.48
	Sub - Test 5	20.46	20.35	20.55

Conducted power measurement results for LTE

FDD LTE Band 2							
Bandwidth (MHz)	RB Set	Power (dBm)					
		QPSK			16QAM		
	Channel	18700	18900	19100	18700	18900	19100
20MHz	1 (RB_Pos:0)	22.47	**23.22**	22.65	21.53	21.72	21.55

	1 (RB_Pos:49)	22.82	23.19	22.95	21.36	21.6	21.65
	1 (RB_Pos:99)	22.45	22.71	22.92	21.35	21.24	21.95
	50 (RB_Pos:0)	21.7	21.71	21.82	20.7	20.84	20.66
	50 (RB_Pos:24)	21.71	21.73	21.8	20.82	20.74	20.78
	50 (RB_Pos:49)	21.62	21.85	**21.86**	20.75	20.56	20.65
	100 (RB_Pos:0)	21.67	21.73	**21.86**	20.57	20.65	20.58
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	18675	18900	19125	18675	18900	19125
15MHz	1 (RB_Pos:0)	22.69	22.59	22.73	21.6	21.73	22.08
	1 (RB_Pos:37)	22.7	22.98	22.67	21.48	21.67	22.51
	1 (RB_Pos:74)	22.71	22.74	23	21.46	21.04	22.14
	36 (RB_Pos:0)	21.71	21.58	21.83	20.54	20.66	20.79
	36 (RB_Pos:18)	21.68	21.71	21.77	20.66	20.75	20.75
	36 (RB_Pos:37)	21.63	21.71	21.84	20.53	20.68	20.64
	75 (RB_Pos:0)	21.58	21.68	21.8	20.58	20.7	20.63
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	18650	18900	19150	18650	18900	19150
10MHz	1 (RB_Pos:0)	22.69	22.41	23.05	21.59	21.42	21.88
	1 (RB_Pos:24)	22.77	23.07	22.92	21.17	21.75	21.81
	1 (RB_Pos:49)	22.46	22.56	23.2	21.38	21.51	22
	25 (RB_Pos:0)	21.56	21.71	21.76	20.73	20.73	20.83
	25 (RB_Pos:12)	21.72	21.85	21.81	20.72	20.87	20.99
	25 (RB_Pos:24)	21.72	21.68	21.83	20.55	20.7	20.82
	50 (RB_Pos:0)	21.79	21.79	21.89	20.57	20.69	20.73
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	18625	18900	19175	18625	18900	19175
5MHz	1 (RB_Pos:0)	22.45	22.43	22.77	21.13	21.57	21.43
	1 (RB_Pos:12)	22.53	22.73	22.96	21.2	21.64	21.21
	1 (RB_Pos:24)	22.46	22.4	22.92	21.01	21.09	21.44
	12 (RB_Pos:0)	21.52	21.81	21.93	20.41	20.71	20.99
	12 (RB_Pos:6)	21.58	21.81	21.9	20.37	20.76	20.97
	12 (RB_Pos:11)	21.57	21.66	22.05	20.36	20.6	20.8
	25 (RB_Pos:0)	21.54	21.78	22.01	20.59	20.75	20.89
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	18615	18900	19185	18615	18900	19185
3MHz	1 (RB_Pos:0)	23.21	22.57	22.92	21.41	21.72	21.61

	1 (RB_Pos:7)	23.15	22.76	22.93	21.34	21.51	21.77
	1 (RB_Pos:14)	23.24	22.89	22.93	21.31	21.46	21.72
	8 (RB_Pos:0)	22.29	21.92	22.04	20.32	20.7	21.08
	8 (RB_Pos:4)	22.20	21.86	21.93	20.36	20.65	21.1
	8 (RB_Pos:7)	22.25	21.79	21.93	20.33	20.57	20.77
	15 (RB_Pos:0)	22.22	21.85	22.06	20.47	20.81	21.02
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	18607	18900	19193	18607	18900	19193
1.4MHz	1 (RB_Pos:0)	22.64	22.66	22.84	21.56	21.64	21.82
	1 (RB_Pos: 2)	22.73	22.69	23.01	21.64	21.54	21.95
	1 (RB_Pos:5)	22.79	22.64	22.92	21.7	21.42	21.98
	3 (RB_Pos:0)	22.17	22.23	22.35	20.51	20.78	21.21
	3 (RB_Pos:1)	22.21	22.15	22.14	20.55	20.79	21.17
	3 (RB_Pos:2)	22.07	22.16	22.28	20.47	20.59	21.06
	6 (RB_Pos:0)	21.53	21.76	22.05	20.72	20.47	20.91

FDD LTE Band 4							
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	20050	20175	20300	20050	20175	20300
20MHz	1 (RB_Pos:0)	22.04	22.23	22.26	21.13	21.4	21.03
	1 (RB_Pos:49)	22.29	**22.47**	22.22	21.34	21.02	20.96
	1 (RB_Pos:99)	21.82	21.82	21.99	20.49	20.48	20.72
	50 (RB_Pos:0)	21.03	**21.21**	21.05	20.05	20.08	19.95
	50 (RB_Pos:24)	21.16	21.12	21.18	20.18	20.05	19.99
	50 (RB_Pos:49)	21.05	20.96	21.08	20.07	19.99	20.01
	100 (RB_Pos:0)	21.09	**21.12**	21.05	20.03	20.14	20.03
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	20025	20175	20325	20025	20175	20325
15MHz	1 (RB_Pos:0)	22.31	22.07	22.18	21.15	21.16	21.41
	1 (RB_Pos:37)	22.03	22.19	22.08	21.29	20.98	21.26
	1 (RB_Pos:74)	22.1	22	22.03	20.98	20.18	21.38
	36 (RB_Pos:0)	21.08	21.13	21.04	19.97	20.19	20.02
	36 (RB_Pos:18)	21.14	21.11	21.15	20.22	20.05	20.05
	36 (RB_Pos:37)	21.04	21	21.09	20.14	19.96	19.98
	75 (RB_Pos:0)	20.97	21.13	20.98	20.07	20.07	20.1
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		

	Channel	20000	20175	20350	20000	20175	20350
10MHz	1 (RB_Pos:0)	22.22	21.96	22.2	20.95	20.75	21.06
	1 (RB_Pos:24)	22.41	22.52	22.42	21.34	20.82	21.04
	1 (RB_Pos:49)	22.05	21.88	22.11	20.94	20.18	20.6
	25 (RB_Pos:0)	21.24	21.16	21.01	20.02	20.1	20.01
	25 (RB_Pos:12)	21.27	21.08	21.21	20.18	20.24	20.31
	25 (RB_Pos:24)	21.14	20.94	21.08	20.04	20.09	20.17
	50 (RB_Pos:0)	21.18	21.04	21	20.16	19.97	20.04
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	19975	20175	20375	19975	20175	20.95
5MHz	1 (RB_Pos:0)	22.1	22.03	22.1	21.03	21.09	20.84
	1 (RB_Pos:12)	22.1	22.01	22.12	21.01	21.08	20.87
	1 (RB_Pos:24)	22.13	22.03	22.24	21.03	21.04	19.82
	12 (RB_Pos:0)	21.2	21.22	21.21	20.32	20.01	19.92
	12 (RB_Pos:6)	21.23	21.22	21.16	20.52	20.01	19.95
	12 (RB_Pos:11)	21.25	21.18	21.21	20.28	20	20
	25 (RB_Pos:0)	21.2	21.19	21.12	20.19	20.04	20.35
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	19965	20175	20385	19965	20175	20385
3MHz	1 (RB_Pos:0)	22.26	22.28	21.89	21.26	20.96	21.01
	1 (RB_Pos:7)	22.18	22.18	21.96	21.16	20.86	21.17
	1 (RB_Pos:14)	22.19	22.18	21.93	21.09	20.79	21.04
	8 (RB_Pos:0)	21.36	21.22	20.91	20.34	20.03	19.76
	8 (RB_Pos:4)	21.2	21.18	20.96	20.28	20.28	19.91
	8 (RB_Pos:7)	21.16	21.11	21	20.26	20.19	19.96
	15 (RB_Pos:0)	21.14	21.16	21.03	20.18	20.21	19.79
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	19957	20175	20393	19957	20175	20393
1.4MHz	1 (RB_Pos:0)	22.31	22.06	22.03	21.34	20.99	20.59
	1 (RB_Pos: 2)	22.29	22.14	22.16	21.06	21.02	20.59
	1 (RB_Pos:5)	22.12	21.96	22.04	21.01	20.91	20.67
	3 (RB_Pos:0)	21.23	21.16	21.14	20.68	20.52	20.42
	3 (RB_Pos:1)	21.25	21.3	21.13	20.61	20.59	20.09
	3 (RB_Pos:2)	21.22	21.23	21.26	20.47	20.51	20.05
	6 (RB_Pos:0)	21.4	21.13	20.99	20.31	19.73	19.99

FDD LTE Band 7							
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	20850	21100	21350	20850	21100	21350
20MHz	1 (RB_Pos:0)	**22.33**	21.85	21.41	21.19	20.5	20.67
	1 (RB_Pos:49)	22.03	22.16	21.71	21.09	20.82	20.27
	1 (RB_Pos:99)	21.78	21.63	21.25	20.46	20.2	19.95
	50 (RB_Pos:0)	**21.25**	20.9	20.51	20.34	20.06	19.36
	50 (RB_Pos:24)	21.1	20.85	20.55	20.23	20.11	19.53
	50 (RB_Pos:49)	21.08	20.78	20.52	20.09	19.7	19.53
	100 (RB_Pos:0)	**21.2**	20.85	20.51	20.3	19.92	19.44
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	20825	21100	21375	20825	21100	21375
15MHz	1 (RB_Pos:0)	22.18	21.83	21.56	21.23	20.79	21.03
	1 (RB_Pos:37)	22.07	21.83	21.5	21.2	20.68	20.57
	1 (RB_Pos:74)	22.17	21.38	21.31	20.81	20.04	20.28
	36 (RB_Pos:0)	21.2	20.89	20.51	20.16	19.96	19.48
	36 (RB_Pos:18)	21.2	20.82	20.48	20.08	19.89	19.59
	36 (RB_Pos:37)	21.07	20.76	20.55	20.05	19.73	19.46
	75 (RB_Pos:0)	21.12	20.8	20.44	20.12	19.85	19.47
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	20800	21100	21400	20800	21100	21400
10MHz	1 (RB_Pos:0)	22.36	21.78	21.46	21.19	20.7	20.63
	1 (RB_Pos:24)	22.37	22.03	21.86	21.14	20.69	20.53
	1 (RB_Pos:49)	22.06	21.58	21.28	20.94	19.96	20.39
	25 (RB_Pos:0)	21.2	20.85	20.47	20.42	19.9	19.79
	25 (RB_Pos:12)	21.17	20.85	20.59	20.26	19.89	19.8
	25 (RB_Pos:24)	21.08	20.77	20.52	20.3	19.81	19.45
	50 (RB_Pos:0)	21.13	20.81	20.52	20.34	19.84	19.47
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	20775	21100	21425	20775	21100	21425
5MHz	1 (RB_Pos:0)	22.18	21.65	21.12	20.6	20.76	20.29
	1 (RB_Pos:12)	22.14	21.7	21.19	20.67	20.87	20.22
	1 (RB_Pos:24)	21.9	21.5	21.3	20.59	20.14	19.97
	12 (RB_Pos:0)	21.27	20.82	20.46	20.26	19.69	19.55
	12 (RB_Pos:6)	21.15	20.8	20.48	20.24	19.68	19.4
	12 (RB_Pos:11)	21.15	20.73	20.38	20.13	19.6	19.28

	25 (RB_Pos:0)	21.24	20.72	20.41	20.42	19.83	19.32

Conducted power measurement results for WLAN Antenna 1 (2.4 GHz)

Mode	Worst case Data rate	Conducted Power (dBm)		
		Channel		
		1	6	11
802.11b	**11 Mbps**	11.08	**11.09**	10.16
802.11g	**48 Mbps**	7.28	7.41	6.70
802.11n(HT20)	**MCS3**	7.40	7.80	6.77

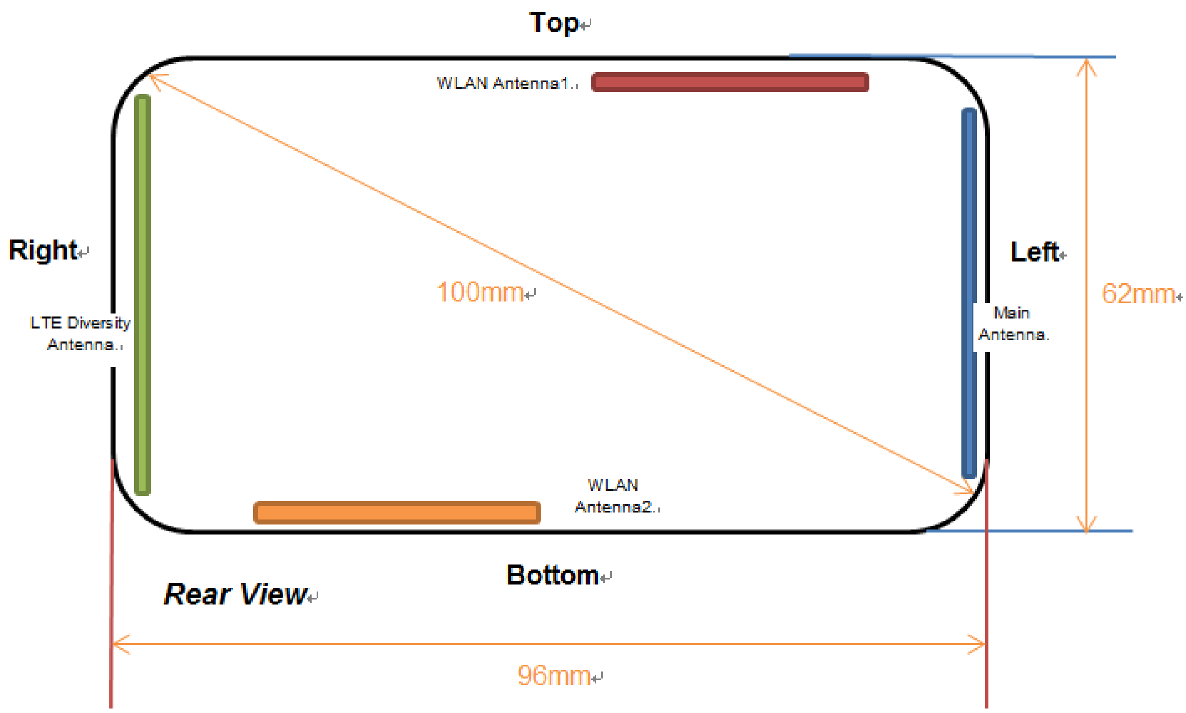
Mode	Worst case Data rate	Conducted Power (dBm)		
		Channel		
		3	6	9
802.11n(HT40)	**MCS0**	10.21	10.29	9.31

Conducted power measurement results for WLAN Antenna 2 (2.4 GHz)

Mode	Worst case Data rate	Conducted Power (dBm)		
		Channel		
		1	6	11
802.11b	**11 Mbps**	11.21	**13.19**	11.61
802.11g	**54 Mbps**	7.65	8.96	8.10
802.11n(HT20)	**MCS3**	8.26	10.36	8.84

Mode	Worst case Data rate	Conducted Power (dBm)		
		Channel		
		3	6	9
802.11n(HT40)	**MCS3**	10.89	8.86	8.27

6.2 Transmit Antennas and SAR Measurement Position



Antenna information:

Main Antenna	WCDMA/LTE TX/RX
LTE Diversity antenna	Only RX
WLAN Antenna 1	WLAN TX/RX
WLAN Antenna 2	WLAN TX/RX

Distance of The Antenna to the EUT surface and edge (mm)						
Antenna	**Front**	**Rear**	**Top**	**Bottom**	**Left**	**Right**
Main Antenna	0.77	1.69	7.83	6.55	1.02	81.52
WLAN Antenna 1	1.53	8.26	2.72	51.75	23.14	49.19
WLAN Antenna 2	1.53	8.26	51.44	2.25	57.77	15.89

Note(s):

1. Per KDB648474 D04, because the overall diagonal distance of this devices is 100mm<160mm, it is considered as “Mini Table“ device.
2. Per KDB648474 D04, 10-g extremity SAR is not required when Body-Worn mode 1-g reported SAR < 1.2 W/Kg.
3. According to the KDB941225 D06 Hot Spot SAR v02, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.
4. Referring to KDB 941225 D06 v02, When the overall device length and width are ≥9cm*5cm, the test distance is 10mm, SAR must be measured for all sides and surfaces with a transmitting antenna located with 25mm from that surface or edge.

6.3 SAR Test Exclusion Consideration Table

According with FCC KDB 447498 D01, Appendix A, <SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm> Table, this Device SAR test configurations consider as below.

SAR Test Exclusion Consideration Table:

Band	Mode	Max. Tune-up Power		Test Position Configurations					
		dBm	mW	Head	Front/ Back	Left Edge	Right Edge	Top Edge	Bottom Edge
WCDMA Band 2	Distance to User			N/A	<5mm	1.02mm	81.52mm	7.83mm	6.55mm
	RMC	23.50	223.87	N/A	Yes	Yes	No	Yes	Yes
WCDMA Band 5	Distance to User			N/A	<5mm	1.02mm	81.52mm	7.83mm	6.55mm
	RMC	23.50	223.87	N/A	Yes	Yes	No	Yes	Yes
LTE Band 2	Distance to User			N/A	<5mm	1.02mm	81.52mm	7.83mm	6.55mm
	QPSK	23.30	213.80	N/A	Yes	Yes	No	Yes	Yes
LTE Band 4	Distance to User			N/A	<5mm	1.02mm	81.52mm	7.83mm	6.55mm
	QPSK	23.00	199.53	N/A	Yes	Yes	No	Yes	Yes
LTE Band 7	Distance to User			N/A	<5mm	1.02mm	81.52mm	7.83mm	6.55mm
	QPSK	22.50	177.83	N/A	Yes	Yes	No	Yes	Yes
WLAN Antenna 1 2.4 G	Distance to User			N/A	<10mm	23.14mm	49.19mm	2.72mm	51.75mm
	802.11b	11.50	14.13	N/A	Yes	Yes	No	Yes	No
	802.11g	8.00	6.31	N/A	No	No	No	No	No
	802.11n(HT20)	8.00	6.31	N/A	No	No	No	No	No
	802.11n(HT40)	10.50	11.22	N/A	No	No	No	No	No
WLAN Antenna 2 2.4 G	Distance to User			N/A	<10mm	57.77mm	15.89mm	51.44mm	2.25mm
	802.11b	13.50	22.39	N/A	Yes	No	Yes	No	Yes
	802.11g	9.50	8.91	N/A	No	No	No	No	No
	802.11n(HT20)	10.50	11.22	N/A	No	No	No	No	No
	802.11n(HT40)	11.00	12.59	N/A	No	No	No	No	No

Note(s):

1. Maximum power is the source-based time-average power and represents the maximum RF output power including tune-up tolerance among production units
2. Per KDB 447498 D01, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
3. Per KDB 447498 D01, standalone SAR test exclusion threshold is applied; If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold
4. Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
   [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   a. f(GHz) is the RF channel transmit frequency in GHz

b. Power and distance are rounded to the nearest mW and mm before calculation

c. The result is rounded to one decimal place for comparison

d. For < 50 mm distance, we just calculate mW of the exclusion threshold value (3.0) to do compare.

This formula is [3.0] / [√f(GHz)] · [(min. test separation distance, mm)] = exclusion threshold of mW.

5. Per KDB 447498 D01, at 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following

   a. [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz

   b. [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

6. Per KDB 941225 D01, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA /HSUPA /DC-HSDPA output power is < 0.25dB higher than RMC12.2Kbps, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA/DC-HSDPA SAR evaluation can be excluded.

7. Per KDB 248227 D01, choose the highest output power channel to test SAR and determine further SAR exclusion.8. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate

8. Per KDB 248227 D01 SAR is not required for the following 2.4 GHz OFDM conditions.

   a. When KDB Publication 447498 D01 SAR test exclusion applies to the OFDM configuration.

   b. 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.

9. Per KDB 248227 D01 SAR is not required for the following U-NII-1 and U-NII-2A bands conditions.

   a. 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.

   b. 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.

6.4 SAR Measurement Results

WCDMA Band II

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	1 g Scaled SAR (W/Kg)	Meas. No.
Body-Worn & Hotspot											
RCM	Front Side	10	9262	1852.40	-0.030	1.080	22.82	23.50	1.169	1.263	1#
			9400	1880.00	-0.020	1.110	22.95	23.50	1.135	1.260	
			9538	1907.60	-0.050	1.050	23.30	23.50	1.047	1.099	
	Back Side	10	9262	1852.40	-0.040	0.888	22.82	23.50	1.169	1.039	
			9400	1880.00	-0.100	0.882	22.95	23.50	1.135	1.001	
			9538	1907.60	0.000	0.807	23.30	23.50	1.047	0.845	
	Left Edge	10	9400	1880.00	0.010	0.499	22.95	23.50	1.135	0.566	
	Top Edge	10	9400	1880.00	-0.201	0.191	22.95	23.50	1.135	0.217	
	Bottom Edge	10	9400	1880.00	-0.080	0.438	22.95	23.50	1.135	0.497	

WCDMA Band V

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	1 g Scaled SAR (W/Kg)	Meas. No.
Body-Worn & Hotspot											
RCM	Front Side	10	4182	836.40	0.090	0.520	22.74	23.50	1.191	0.619	2#
	Back Side	10	4182	836.40	0.040	0.374	22.74	23.50	1.191	0.446	
	Left Edge	10	4182	836.40	-0.020	0.297	22.74	23.50	1.191	0.354	
	Top Edge	10	4182	836.40	0.100	0.085	22.74	23.50	1.191	0.101	
	Bottom Edge	10	4182	836.40	0.010	0.231	22.74	23.50	1.191	0.275	

Note(s):

1. WCDMA mode in Body SAR was tested under RMC 12.2 kbps without HSPA inactive per KDB Publication 941225 D01v03. 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.

LTE Band 2 (20MHz Bandwidth**)**

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	RB Numb.	RB Start	Power Drift (dB)	1 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	1 g Scaled SAR (W/Kg)	Meas. No.
Body-worn Accessory& Hotspot													
QPSK	Front Side	10	18700	1860.00	1	Low	-0.070	1.130	22.470	23.300	1.211	1.368	3#
			18900	1880.00	1	Low	0.180	1.180	23.220	23.300	1.019	1.202	
			19100	1900.00	1	Low	-0.140	1.070	22.650	23.300	1.161	1.243	
			18700	1860.00	50	High	-0.140	0.900	21.620	22.500	1.225	1.102	
			18900	1880.00	50	High	-0.020	0.881	21.850	22.500	1.161	1.023	
			19100	1900.00	50	High	-0.060	0.841	21.860	22.500	1.159	0.975	
			19100	1900.00	100	Low	-0.080	0.620	21.860	22.500	1.159	0.718	
	Back Side	10	18700	1860.00	1	Low	0.040	0.640	22.470	23.300	1.211	0.775	
			18900	1880.00	1	Low	-0.160	0.828	23.220	23.300	1.019	0.843	
			19100	1900.00	1	Low	0.095	0.698	22.650	23.300	1.161	0.811	
			19100	1900.00	50	High	-0.080	0.631	21.860	22.500	1.159	0.731	
			19100	1900.00	100	Low	-0.191	0.608	21.860	22.500	1.159	0.705	
	Left Edge	10	18900	1880.00	1	Low	0.097	0.486	23.220	23.300	1.019	0.495	
			19100	1900.00	50	High	0.060	0.427	21.860	22.500	1.159	0.495	
	Top Edge	10	18900	1880.00	1	Low	0.020	0.161	23.220	23.300	1.019	0.164	
			19100	1900.00	50	High	0.000	0.133	21.860	22.500	1.159	0.154	
	Bottom Edge	10	18900	1880.00	1	Low	-0.002	0.528	23.220	23.300	1.019	0.538	
			19100	1900.00	50	High	0.120	0.355	21.860	22.500	1.159	0.411	

LTE Band 4 (20MHz Bandwidth**)**

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	RB Numb.	RB Start	Power Drift (dB)	1 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	1 g Scaled SAR (W/Kg)	Meas. No.
Body-worn Accessory& Hotspot													
QPSK	Front Side	10	20175	1732.50	1	Middle	-0.080	0.707	22.470	23.000	1.130	**0.799**	4#
			20175	1732.50	50	Low	-0.070	0.508	21.210	22.000	1.199	0.609	
	Back Side	10	20175	1732.50	1	Middle	0.060	0.480	22.470	23.000	1.130	0.542	
			20175	1732.50	50	Low	-0.080	0.344	21.210	22.000	1.199	0.413	
	Left Edge	10	20175	1732.50	1	Middle	-0.020	0.301	22.470	23.000	1.130	0.340	
			20175	1732.50	50	Low	-0.040	0.213	21.210	22.000	1.199	0.255	
	Top Edge	10	20175	1732.50	1	Middle	-0.210	0.124	22.470	23.000	1.130	0.140	
			20175	1732.50	50	Low	0.100	0.083	21.210	22.000	1.199	0.100	
	Bottom Edge	10	20175	1732.50	1	Middle	0.087	0.329	22.470	23.000	1.130	0.372	
			20175	1732.50	50	Low	0.160	0.219	21.210	22.000	1.199	0.263	

LTE Band 7 (20MHz Bandwidth**)**

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	RB Numb.	RB Start	Power Drift (dB)	1 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	1 g Scaled SAR (W/Kg)	Meas. No.
Body-worn Accessory& Hotspot													
QPSK	Front Side	10	20850	2510.00	1	Low	-0.040	0.669	22.330	22.500	1.040	0.696	
			20850	2510.00	50	Low	0.060	0.545	21.250	22.000	1.189	0.648	
	Back Side	10	20850	2510.00	1	Low	-0.070	0.341	22.330	22.500	1.040	0.355	
			20850	2510.00	50	Low	0.130	0.272	21.250	22.000	1.189	0.323	
	Left Edge	10	20850	2510.00	1	Low	-0.020	0.704	22.330	22.500	1.040	**0.732**	5#
			20850	2510.00	50	Low	-0.010	0.589	21.250	22.000	1.189	0.700	
	Top Edge	10	20850	2510.00	1	Low	0.110	0.037	22.330	22.500	1.040	0.038	
			20850	2510.00	50	Low	-0.190	0.030	21.250	22.000	1.189	0.036	
	Bottom Edge	10	20850	2510.00	1	Low	-0.080	0.331	22.330	22.500	1.040	0.344	
			20850	2510.00	50	Low	-0.100	0.240	21.250	22.000	1.189	0.285	

Note(s):

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r05.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results.

WLAN Antenna 1 2.4GHz

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	Duty cycle (%)	Duty Factor	1 g Scaled SAR (W/Kg)	Meas. No.
Body-Worn & Hotspot													
802.11b	Front Side	10	6	2437	-0.095	0.070	11.09	11.50	1.099	96.86	1.032	0.079	6#
	Back Side	10	6	2437	-0.020	0.023	11.09	11.50	1.099	96.86	1.032	0.026	
	Left Edge	10	6	2437	-0.160	0.019	11.09	11.50	1.099	96.86	1.032	0.022	
	Top Edge	10	6	2437	0.195	0.044	11.09	11.50	1.099	96.86	1.032	0.050	

WLAN Antenna 2 2.4GHz

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	Duty cycle (%)	Duty Factor	1 g Scaled SAR (W/Kg)	Meas. No.
Body-Worn & Hotspot													
802.11b	Front Side	10	6	2437	-0.200	0.088	13.19	13.50	1.074	96.86	1.032	0.098	7#
	Back Side	10	6	2437	-0.140	0.044	13.19	13.50	1.074	96.86	1.032	0.049	
	Right Edge	10	6	2437	-0.134	0.016	13.19	13.50	1.074	96.86	1.032	0.018	
	Bottom Edge	10	6	2437	0.207	0.082	13.19	13.50	1.074	96.86	1.032	0.091	

Note(s):

1. Per KDB 248227 D01 SAR is not required for the following 2.4 GHz OFDM conditions.
   a. 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.
   b. 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.
2. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
3. Per KDB 248227 D01 5G WLAN Subsequent Test Configuration Procedures
   SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units.
   a. When SAR test exclusion provisions of KDB Publication 447498 D01 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and exposure configuration.
   b. When the highest reported SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

General Note(s):

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, FCC KDB Publication 865664 D01v01r04 and FCC KDB Publication 447498 D01v06.
2. All modes of operation were investigated, and worst-case results are reported.

3. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.
4. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
5. Per FCC KDB Publication 648474 D04v01r03, body worn SAR was evaluated without a headset connected to the device. Since the standalone reported SAR was ≤1.2 W/kg, no additional body worn SAR evaluations using a headset cable were required.
6. Per FCC KDB Publication 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than 0.8 W/kg.
7. 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>1/2 dB, instead of the middle channel, the highest output power channel must be used.

6.5 SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Frequency band	Test Position	Mode	Ch.	Original 1g SAR (W/kg)	1st Repeated 1g SAR (W/kg)	Largest to Smallest SAR Ratio
WCDMA Band2	Front	RMC	9400	1.110	1.100	1.009
WCDMA Band2	Back	RMC	9400	0.882	0.895	1.015
LTE Band2	Front	QPSK	18900	1.180	1.190	1.008
LTE Band2	Back	QPSK	18900	0.828	0.817	1.013

Note(s):

Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

6.6 Standalone SAR Test Exclusion Considerations and Estimated SAR

KDB 447498 D01v06 General RF Exposure Guidance v06, introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / R_i$$

Where:

SAR_1 is the highest reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR_2 is the highest reported or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

R_i is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

A new threshold of 0.04 is also introduced in the draft KDB. Thus, in order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$$(SAR_1 + SAR_2)^{1.5} / R_i < 0.04$$

6.7 Simultaneous Transmission SAR Considerations

Sum of the SAR for WCDMA + WLAN

Condition	Simultaneous Transmission Scenario (W/Kg)				Max Σ 1-g SAR (W/Kg)	SPLSR (Yes/ No)
	WCDMA	WLAN Antenna 1 DTS Band	WLAN Antenna 2 DTS Band	Bluetooth		
Hotspot	1.263	0.079	0.098	--	1.44	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

Sum of the SAR for LTE + WLAN

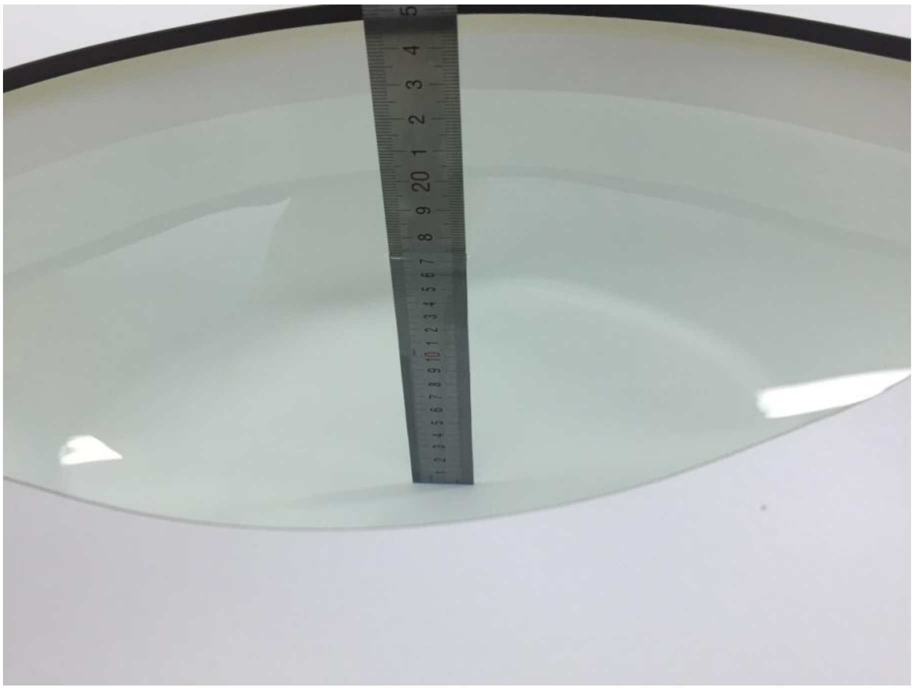
Condition	Simultaneous Transmission Scenario (W/Kg)				Max Σ 1-g SAR (W/Kg)	SPLSR (Yes/ No)
	LTE	WLAN Antenna 1 DTS Band	WLAN Antenna 2 DTS Band	Bluetooth		
Hotspot	1.368	0.079	0.098	--	1.545	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

7 Appendixes

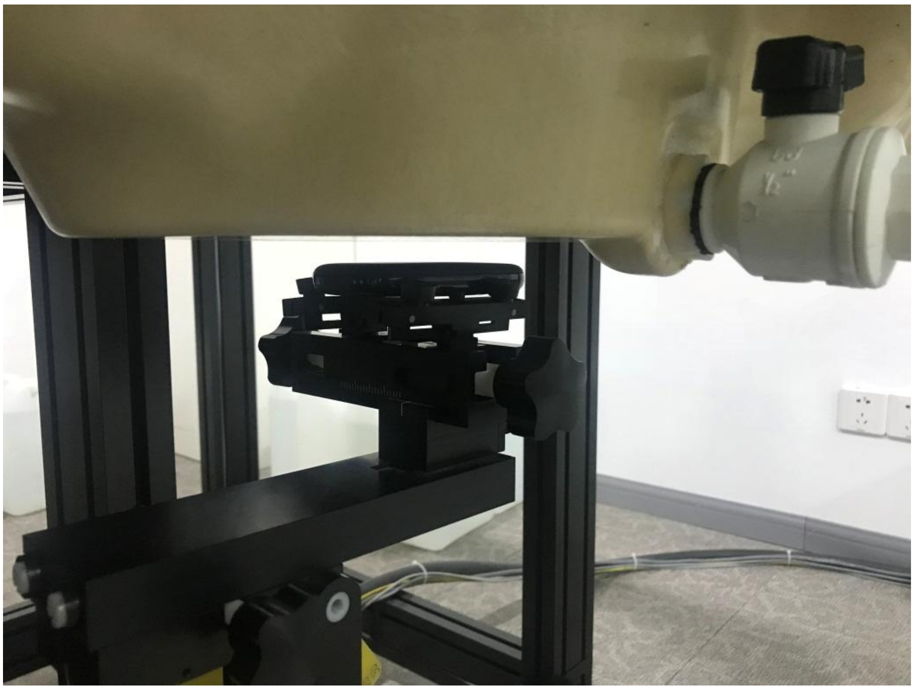
7.1 Liquid depth



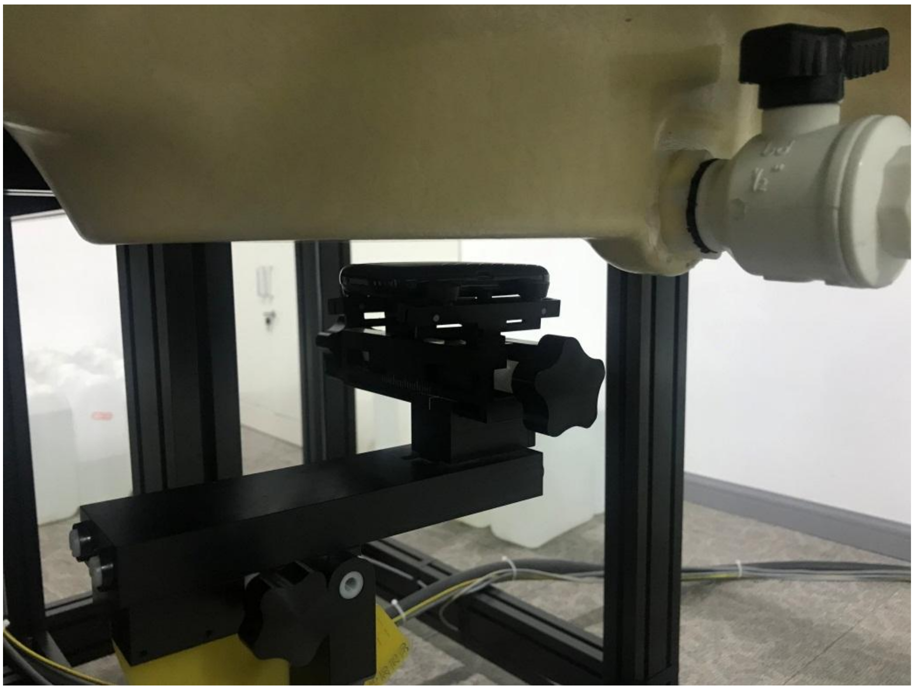
7.2 Sample and Set-up Photos

Front of the sample

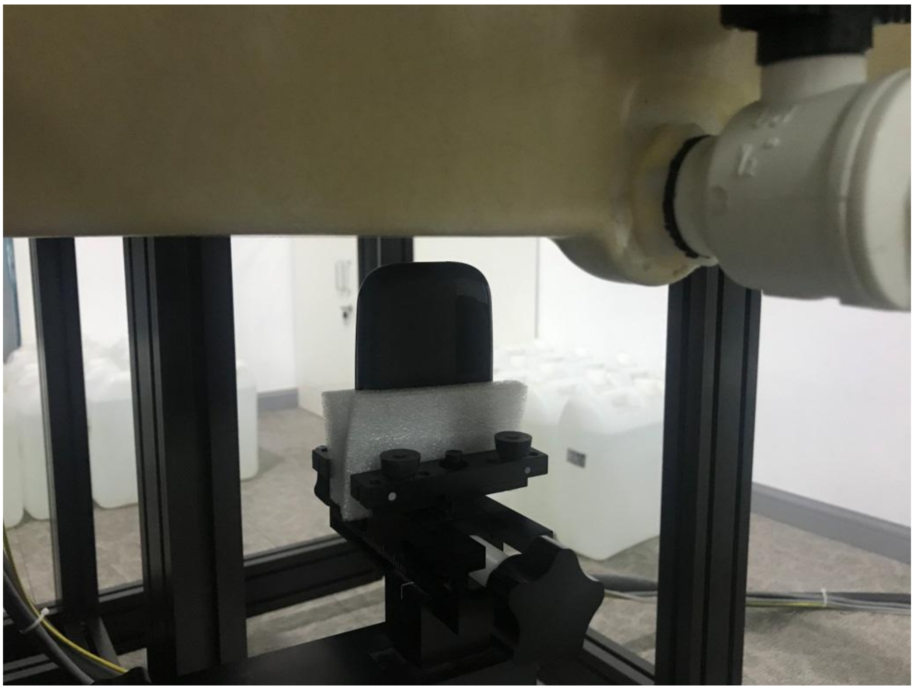
Rear of the sample



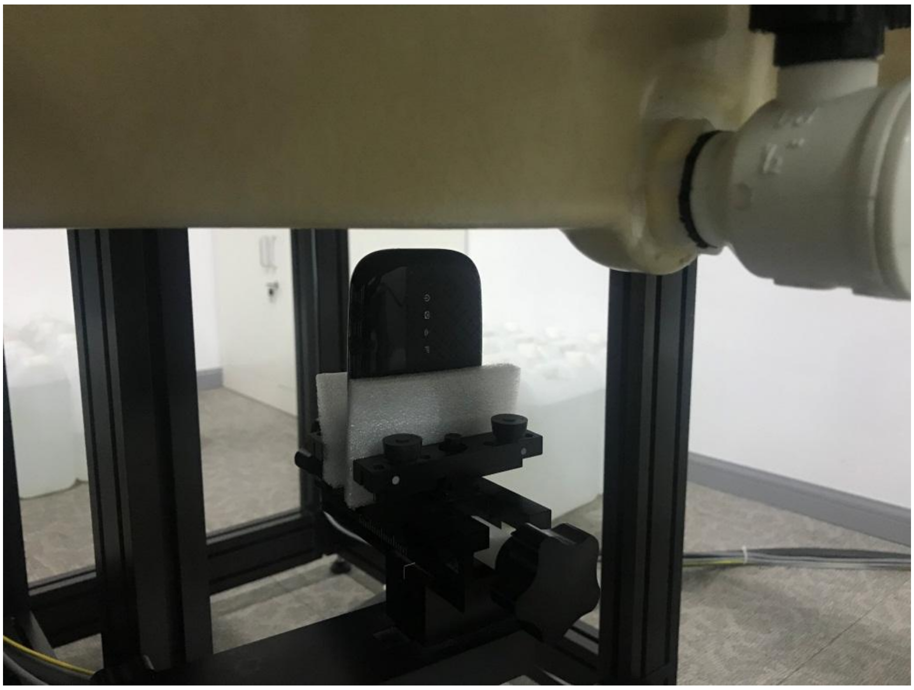
Front - 10mm



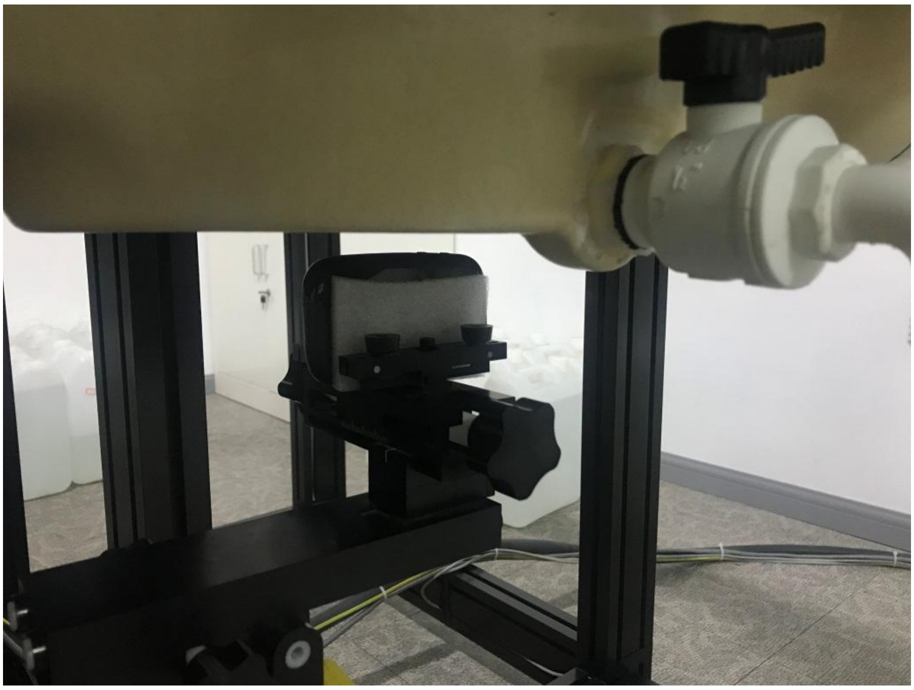
Back - 10mm



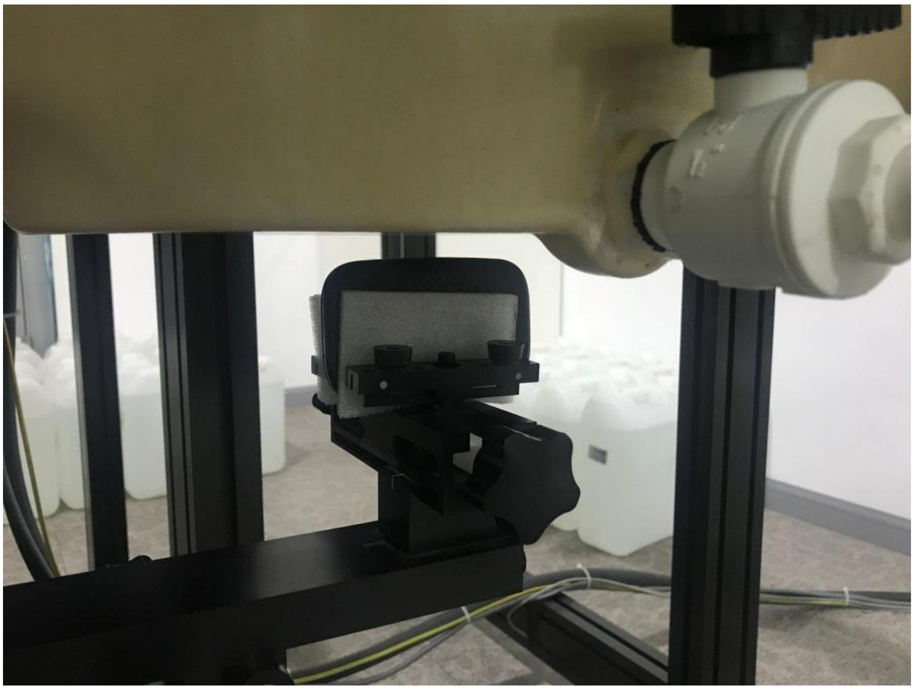
Left - 10mm



Right - 10mm



Top - 10mm



Bottom - 10mm

7.3 System Verification Plots

System Validation for 835MHz Body _2019-12-24

Measurement Report for D835V2 SN4d061, FRONT, D835, UID 0 -, Channel 50 (835.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
D835V2 SN4d061,	160.0 x 120.0 x 340.0	/	Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 15.00	D835	CW, 0--	835.0, 50	9.98	0.998	56.15

Hardware Setup

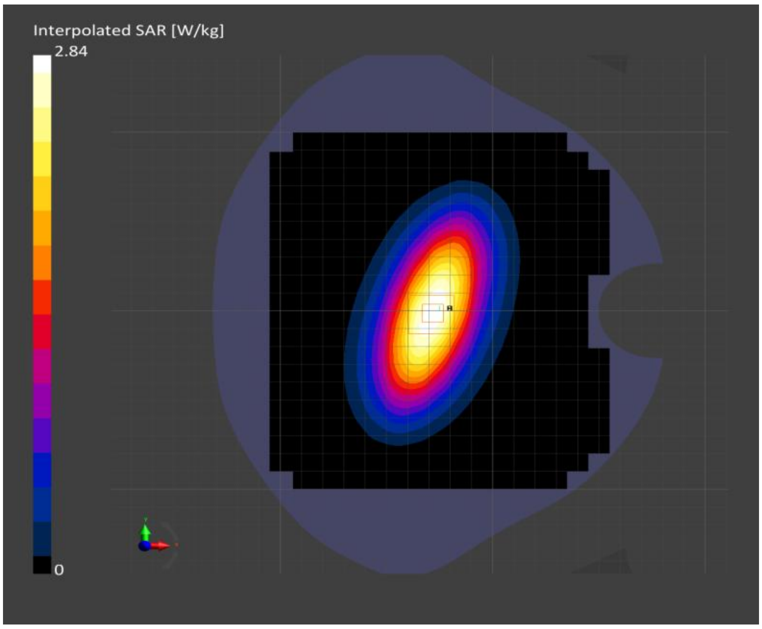
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1462	MSL900 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	160.0 x 200.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	2.46	2.53
psSAR10g [W/Kg]	1.63	1.65
Power Drift [dB]	0.00	-0.00
M2/M1 [%]		15.3
Dist 3dB Peak [mm]		65.5



System Validation for 1800MHz Body _2019-12-25

Measurement Report for D1800V2 SN1d148, FRONT, D1800, UID 0 -, Channel 50 (1800.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
D1800V2 SN1d148,	74.0 x 100.0 x 300.0	/	Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 10.00	D1800	CW, 0--	1800.0, 50	8.18	1.54	52.23

Hardware Setup

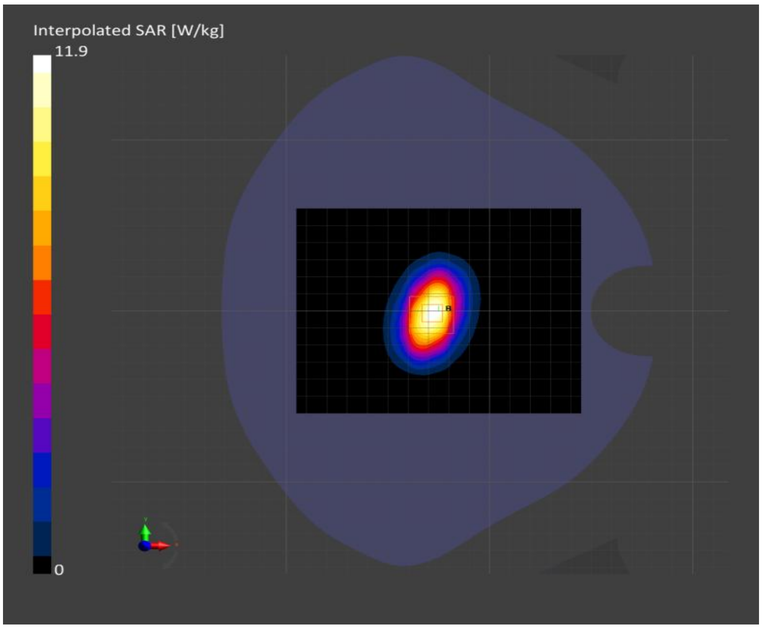
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1461	MSL1800 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	140.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	9.58	9.84
psSAR10g [W/Kg]	5.07	5.20
Power Drift [dB]	-0.03	0.00
M2/M1 [%]		9.5
Dist 3dB Peak [mm]		55.8



System Validation for 1900MHz Body _2019-12-26

Measurement Report for D1900V2 SN5d092, FRONT, D1900, UID 0 -, Channel 50 (1900.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
D1900V2 SN5d092,	68.0 x 100.0 x 300.0	/	Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 10.00	D1900	CW, 0--	1900.0, 50	7.77	1.55	52.44

Hardware Setup

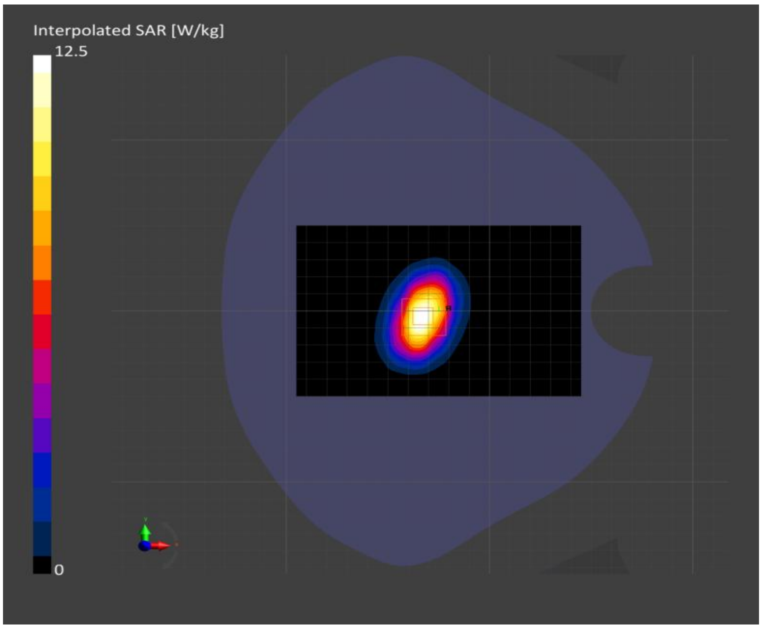
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1461	MSL1900 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	140.0 x 100.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	10.1	10.3
psSAR10g [W/Kg]	5.21	5.33
Power Drift [dB]	0.01	0.01
M2/M1 [%]		8.9
Dist 3dB Peak [mm]		54.9



System Validation for 2450MHz Body _2019-12-27

Measurement Report for D2450V2 SN723, FRONT, D2450, UID 0 -, Channel 50 (2450.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
D2450V2 SN723,	52.0 x 100.0 x 290.0	/	Phone

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 10.00	D2450	CW, 0--	2450.0, 50	7.56	2.03	52.53

Hardware Setup

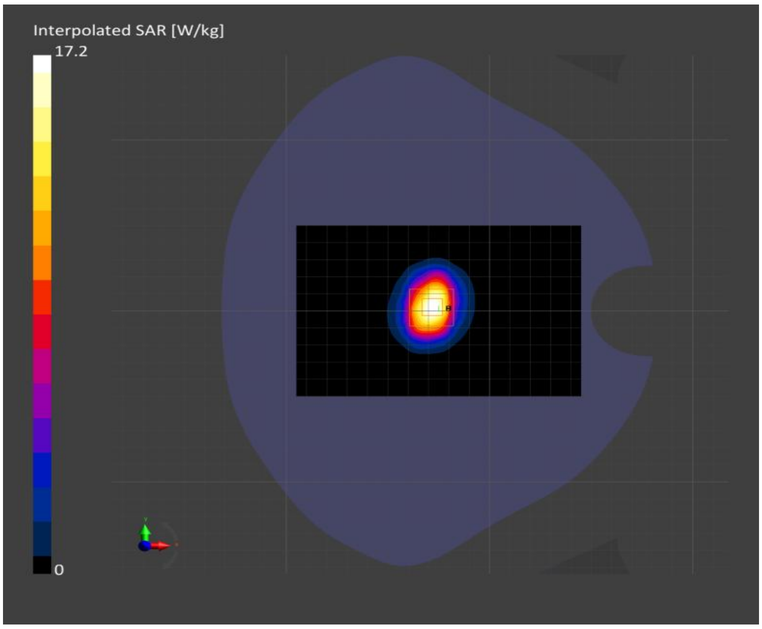
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1462	MSL2450 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	140.0 x 100.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	13.5	13.58
psSAR10g [W/Kg]	6.33	6.16
Power Drift [dB]	-0.04	0.01
M2/M1 [%]		8.0
Dist 3dB Peak [mm]		45.7



System Validation for 2600MHz Body _2019-12-30

Measurement Report for D2600V2 SN1142, FRONT, D2600, UID 0 -, Channel 50 (2600.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
D2600V2 SN1142,	50.0 x 100.0 x 290.0	/	Phone

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 10.00	D2600	CW, 0--	2600.0, 50	7.46	2.21	52.93

Hardware Setup

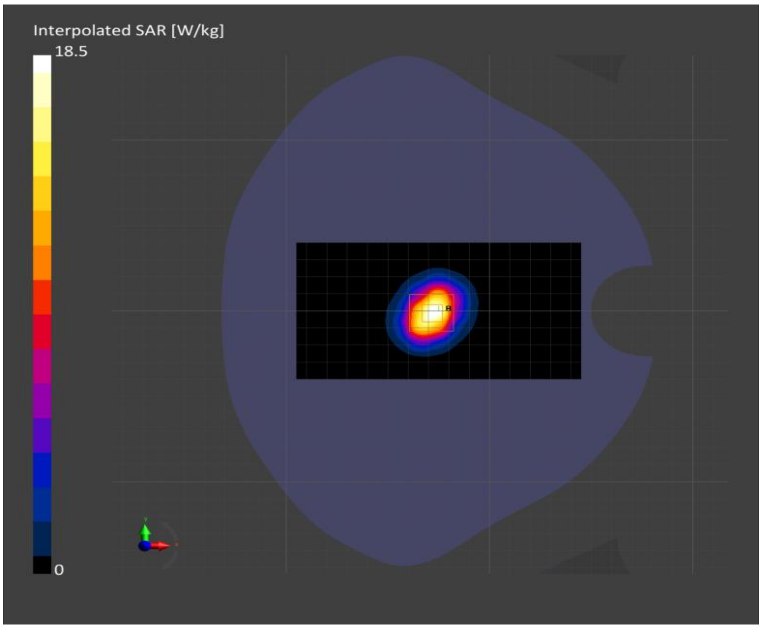
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1462	MSL2600 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	140.0 x 80.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	14.1	14.4
psSAR10g [W/Kg]	6.42	6.19
Power Drift [dB]	-0.03	0.17
M2/M1 [%]		8.2
Dist 3dB Peak [mm]		45.2



7.4 Highest SAR Test Plots

Meas. 1 Measurement Report for J600, FRONT, Band 2, UTRA/FDD, UID 10011 CAB, Channel 9262 (1852.4MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
J600,	100.0 x 62.0 x 12.0	/	Tablet

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 10.00	Band 2, UTRA/FDD	WCDMA, 10011-CAB	1852.4, 9262	7.77	1.52	52.64

Hardware Setup

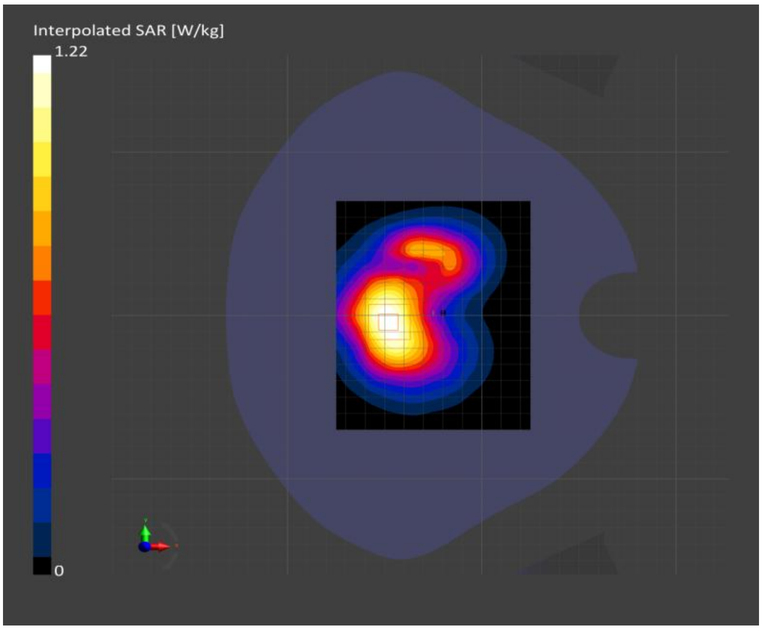
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1461	MSL1900 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 140.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	1.02	1.08
psSAR10g [W/Kg]	0.612	0.673
Power Drift [dB]	-0.03	-0.03
M2/M1 [%]		11.4
Dist 3dB Peak [mm]		60.4



Meas. 2 Measurement Report for J600, FRONT, Band 5, UTRA/FDD, UID 10011 CAB, Channel 4182 (836.4MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
J600,	100.0 x 62.0 x 12.0	/	Tablet

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 10.00	Band 5, UTRA/FDD	WCDMA, 10011-CAB	836.4, 4182	9.98	0.998	56.15

Hardware Setup

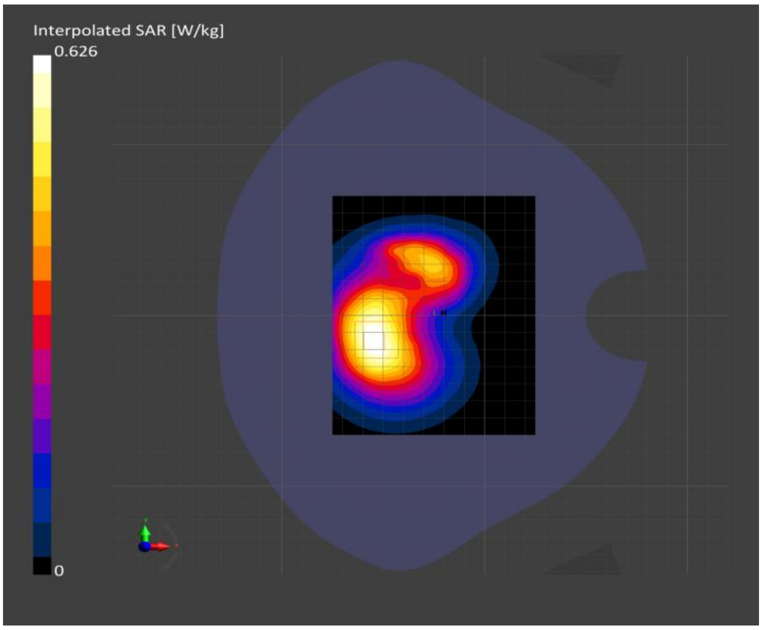
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1462	MSL900 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 140.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	0.542	0.520
psSAR10g [W/Kg]	0.357	0.306
Power Drift [dB]	-0.01	0.09
M2/M1 [%]		16.1
Dist 3dB Peak [mm]		58.3



Meas. 3 Measurement Report for J600, FRONT, Band 2, E-UTRA/FDD, UID 10169 CAE, Channel 18700 (1860.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
J600,	100.0 x 62.0 x 12.0	/	Tablet

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 10.00	Band 2, E-UTRA/FDD	LTE-FDD, 10169-CAE	1860.0, 18700	7.77	1.52	52.7

Hardware Setup

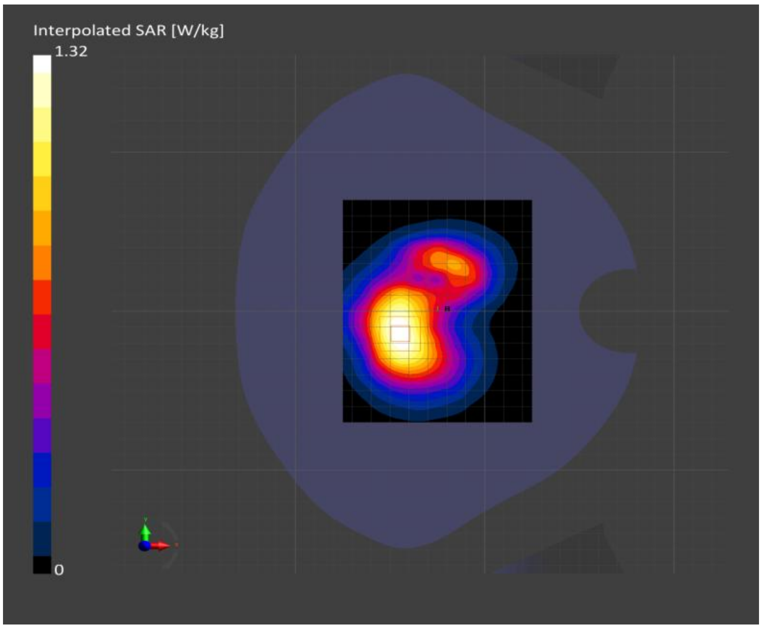
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1461	MSL1900 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 140.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2019-12-26, 11:40	2019-12-26, 11:54
psSAR1g [W/Kg]	1.10	1.13
psSAR10g [W/Kg]	0.657	0.707
Power Drift [dB]	-0.16	-0.07
M2/M1 [%]		10.4
Dist 3dB Peak [mm]		58.8



Meas. 4 Measurement Report for J600, FRONT, Band 4, E-UTRA/FDD, UID 10169 CAE, Channel 20175 (1732.5MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
J600,	100.0 x 62.0 x 12.0	/	Tablet

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 10.00	Band 4, E-UTRA/FDD	LTE-FDD, 10169-CAE	1732.5, 20175	8.18	1.48	52.26

Hardware Setup

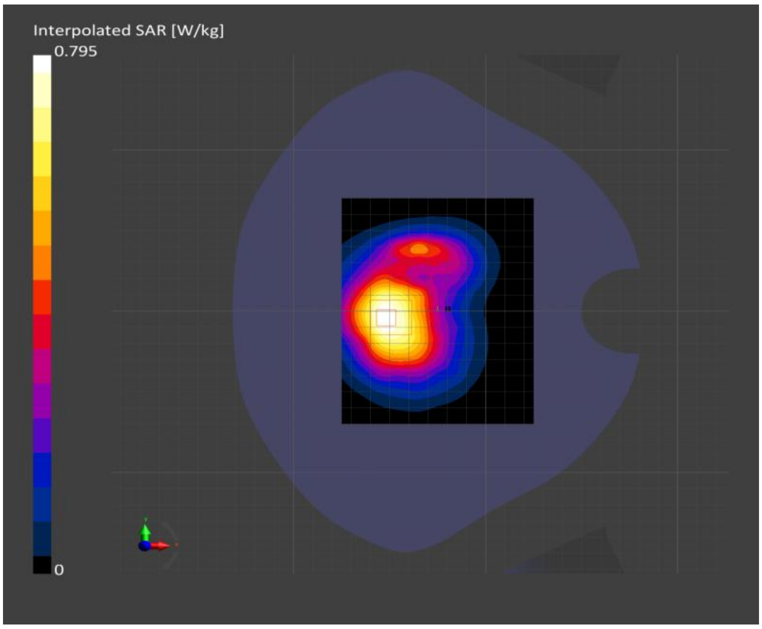
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1461	MSL1800 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 140.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	0.667	0.707
psSAR10g [W/Kg]	0.408	0.457
Power Drift [dB]	-0.03	-0.08
M2/M1 [%]		18.4
Dist 3dB Peak [mm]		63.9



Meas. 5 Measurement Report for J600, EDGE LEFT, Band 7, E-UTRA/FDD, UID 10169 CAE, Channel 20850 (2510.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
J600,	62.0 x 100.0 x 12.0	/	Tablet

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	EDGE LEFT, 10.00	Band 7, E-UTRA/FDD	LTE-FDD, 10169-CAE	2510.0, 20850	7.46	2.13	53.2

Hardware Setup

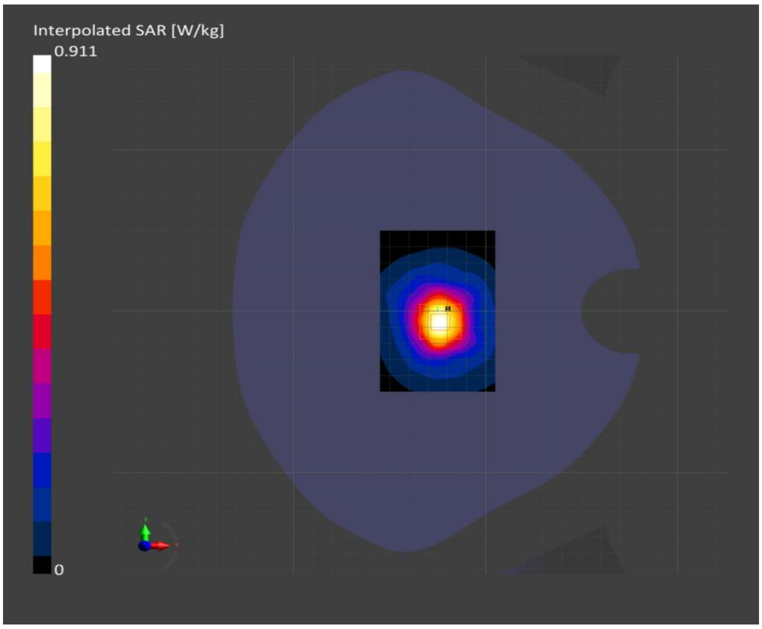
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1462	MSL2600 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	60.0 x 100.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	0.706	0.704
psSAR10g [W/Kg]	0.343	0.340
Power Drift [dB]	0.01	-0.02
M2/M1 [%]		11.0
Dist 3dB Peak [mm]		47.8



Meas. 6 Measurement Report for J600, FRONT, WLAN Antenna 1 2.4GHz, UID 10061 CAB, Channel 6 (2437.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
J600,	100.0 x 62.0 x 12.0	/	Tablet

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 10.00	WLAN 2.4GHz	WLAN, 10061-CAB	2437.0, 6	7.56	2.02	52.68

Hardware Setup

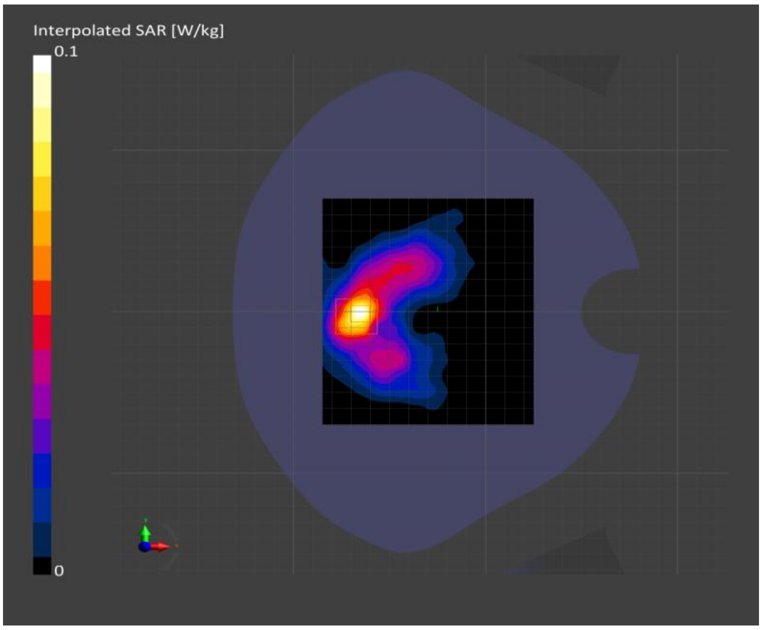
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1462	MSL2450 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	140.0 x 100.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	Unknown method	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	0.002	0.070
psSAR10g [W/Kg]	0	0.031
Power Drift [dB]	n/a	-0.095
M2/M1 [%]		-10.52
Dist 3dB Peak [mm]		56.25



Meas. 7 Measurement Report for J600, FRONT, WLAN Antenna 2 2.4GHz, UID 10061 CAB, Channel 6 (2437.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
J600,	100.0 x 62.0 x 12.0	/	Tablet

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	FRONT, 10.00	WLAN 2.4GHz	WLAN, 10061-CAB	2437.0, 6	7.56	2.02	52.68

Hardware Setup

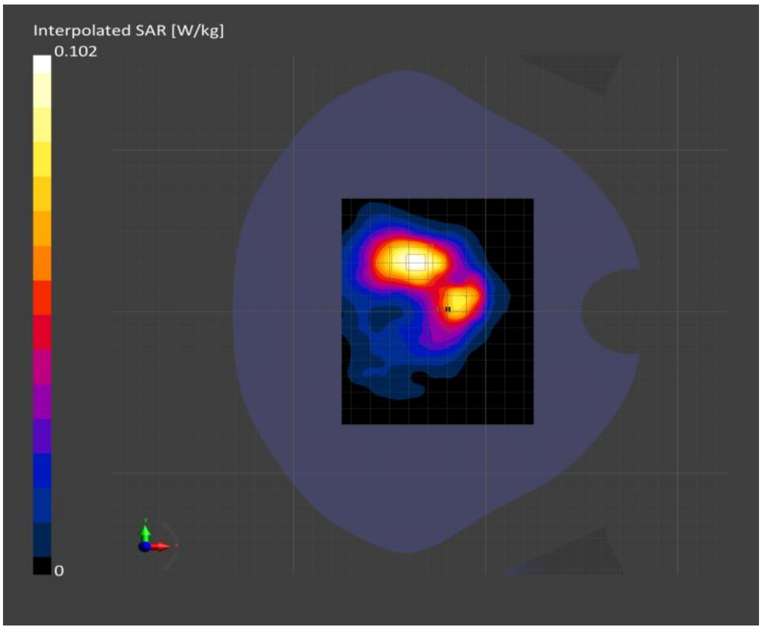
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 1462	MSL2450 Charge: xxxx, --	EX3DV4 - SN7475, 2019-10-16	DAE4 Sn787, 2019-01-23

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 140.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	0.081	0.088
psSAR10g [W/Kg]	0.043	0.045
Power Drift [dB]	0.23	-0.20
M2/M1 [%]		10.35
Dist 3dB Peak [mm]		-54.15



End of the report