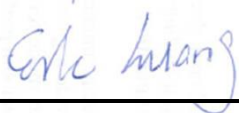


FCC SAR Test Report

APPLICANT : Motorola Solutions, Inc.
EQUIPMENT : Touch Computer
BRAND NAME : Motorola
MODEL NAME : TC55CH
FCC ID : UZ7TC55CH
STANDARD : FCC 47 CFR Part 2 (2.1093)
ANSI/IEEE C95.1-1992
IEEE 1528-2003

The product was testing completed on Jan. 29, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.



Reviewed by: Eric Huang / Deputy Manager



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA3O1108-01	Rev. 01	Initial issue of report	Feb. 10, 2014

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Motorola Solutions, Inc. Touch Computer, TC55CH** are as follows.

<Highest SAR Summary>

Exposure Position	Frequency Band	Reported 1g-SAR (W/kg)	Equipment Class	Highest Reported 1g-SAR (W/kg)
Head	CDMA2000 BC0	0.71	PCE	0.71
	CDMA2000 BC1	0.43		
	LTE Band 13	0.50		
	WLAN 5.2GHz Band	0.54	NII	0.70
	WLAN 5.3GHz Band	0.63		
	WLAN 5.5GHz Band	0.70		
	WLAN 5.8GHz Band	0.60	DTS	0.78
	WLAN 2.4GHz Band	0.78		
Hotspot (Separation 1cm)	CDMA2000 BC0	1.17	PCE	1.33
	CDMA2000 BC1	1.33		
	LTE Band 13	1.01		
	WLAN 2.4GHz Band	0.37	DTS	0.37
Body-worn (Separation 1.5cm)	CDMA2000 BC0	0.99	PCE	1.34
	CDMA2000 BC1	1.34		
	LTE Band 13	0.78		
	WLAN 5.2GHz Band	0.49	NII	0.57
	WLAN 5.3GHz Band	0.57		
	WLAN 5.5GHz Band	0.34		
	WLAN 5.8GHz Band	0.12	DTS	0.22
	WLAN 2.4GHz Band	0.22		

**<Highest Simultaneous transmission SAR>**

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Body-worn	CDMA2000 BC1	PCE	1.56
	WLAN 2.4GHz Band	DTS	

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Head	CDMA2000 BC1	PCE	1.37
	Bluetooth	DSS	

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Hotspot	CDMA2000 BC0	PCE	1.56
	WLAN 5.3GHz Band	NII	

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003.



2. Administration Data

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978

2.2 Applicant

Company Name	Motorola Solutions, Inc.
Address	One Motorola Plaza, Holtsville, NY 11742-1300 USA

2.3 Manufacturer

Company Name	Motorola Solutions, Inc.
Address	One Motorola Plaza, Holtsville, NY 11742-1300 USA

2.4 Application Details

Date of Start during the Test	Jan. 24, 2014
Date of End during the Test	Jan. 29, 2014

3. General Information

3.1 Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT	Touch Computer
Brand Name	Motorola
Model Name	TC55CH
FCC ID	UZ7TC55CH
IMEI Code	358240505002421
Wireless Technology and Frequency Range	CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2472 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	• CDMA2000 : 1xRTT/1xEv-Do(Rv.A) • LTE: QPSK, 16QAM • 802.11a/b/g/n HT20/HT40 • Bluetooth 3.0+EDR · Bluetooth 4.0+LE • NFC:ASK
Antenna Type	WWAN: Monopole Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna NFC: Loop Antenna
HW Version	DV2.2
SW Version	Android 4.1.2
FW Version	BSP 1.7
Transfer Mode Category	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype
Remark: 1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description. 2. 802.11n- HT40 is not supported in 2.4GHz frequency band. 3. Hotspot mode is supported in WLAN 2.4GHz frequency band, not supported in all 5GHz frequency bands	

The device supports 2 battery options:

Accessory		
Battery 1	Brand Name	MOTOROLA
	Model Name	82-164807-01
	Capacity	2940 mAh
Battery 2	Brand Name	MOTOROLA
	Model Name	82-172087-01
	Capacity	4410 mAh

3.2 Maximum RF output power among production units

Mode	CDMA2000 BC0	CDMA2000 BC1	CDMA2000 BC1
	Full power mode	Full power mode	Reduced power mode
Average Power (dBm)			
1xRTT RC1 SO55	24.5	24.5	22.5
1xRTT RC3 SO55	24.5	24.5	22.5
1xRTT RC3 SO32	24.5	24.5	22.5
1xEV-DO Rev 0 (RTAP 153.6kbps)	24.5	24.5	22.5
1xEV-DO Rev A (RETAP 4096 bits)	24.5	24.5	22.5

LTE Band 13					
Average Power (dBm)					
Modulation	BW (MHz)	RB size	Target MPR	Normal	Hotspot
QPSK	10	≤ 12	0	24	24
QPSK	10	> 12	1	23	23
16QAM	10	≤ 12	1	23	23
16QAM	10	> 12	2	22	22
QPSK	5	≤ 8	0	24	24
QPSK	5	> 8	1	23	23
16QAM	5	≤ 8	1	23	23
16QAM	5	> 8	2	22	22

WLAN2.4GHz	IEEE 802.11		
Center Freq (MHz)	11b	11g	11n-HT20
Average Power (dBm)			
Ch1	19.5	13.5	13.5
Ch2	19.5	16	16
Ch6	20	18	17
Ch7	20	18	17
Ch11	18	11	11
Ch12	14.5	10	10
Ch13	10	5	5

Mode / Band	Average Power (dBm)			
	1Mbps (GFSK)	2Mbps (π/4-DQPSK)	3Mbps (8-DPSK)	BT4.0-LE (GFSK)
2.4 GHz Bluetooth	3	1.5	1.5	2.5

WLAN5GHz Band	IEEE 802.11		
	11a	11n-HT20	11n-HT40
Average Power (dBm)			
Ch36	13.5	13.5	
Ch38			12
Ch40	17	16	
Ch44	17	16	
Ch46			15
Ch48	17	16	
Ch52	17	16	
Ch54			15
Ch56	17	16	
Ch60	17	16	
Ch62			11.5
Ch64	13.5	13.5	
Ch100	15	15	
Ch102			10.5
Ch104	17	16	
Ch108	17	16	
Ch110			15
Ch112	17	16	
Ch116	17	16	
Ch118			15
Ch120	17	16	
Ch124	17	16	
Ch126			15
Ch128	17	16	
Ch132	17	16	
Ch134			14.5
Ch136	17	16	
Ch140	13.5	13.5	
Ch149	15.5	15.5	
Ch151			14.5
Ch153	17	16	
Ch157	17	16	
Ch159			14.5
Ch161	17	16	
Ch165	15.5	15.5	

The table below summarized necessary items addressed in KDB 941225 D05 v02r03.

FCC ID		UZ7TC55CH								
EUT		Touch Computer								
Operating Frequency Range of each LTE transmission band		LTE Band 13: 779.5 MHz ~ 784.5 MHz								
Channel Bandwidth		LTE Band 13: 5MHz, 10MHz								
Transmission (H, M, L) channel numbers and frequencies in each LTE band										
Band 13										
	Bandwidth 5 MHz			Bandwidth 10 MHz						
	Channel #	Frequency (MHz)		Channel #	Frequency (MHz)					
L	23205	779.5		23230	782					
M	23230	782								
H	23255	784.5								
E category, uplink modulations used		Category 3, QPSK, and 16QAM								
LTE transmitter and antenna implementation (standalone or sharing hardware components / antennas)		A primary antenna is used for LTE and other wireless interfaces (CDMA) for transmitting and receiving. LTE and other wireless interfaces (CDMA) share the same antenna, and cannot transmit simultaneously A 2 nd antenna is used for LTE and other wireless interfaces (CDMA) for receiving only								
LTE Voice / Data requirements		Data only								
LTE MPR permanently built-in by design		Yes, per 3GPP TS 36.101 v11.0.0								
		Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3								
		Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)	
			1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
			QPSK	> 5	> 4	> 8	> 12	> 16		> 18
			16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16		≤ 18
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18				
LTE A-MPR		In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)								
Base station simulator used for Testing		Anritsu MT8820C								
Power reduction applied to satisfy SAR compliance		No								

Target Power reduction applied for each wireless mode

Exposure Position / wireless mode	Hotspot ⁽¹⁾
CDMA2000 BC1	2.0 dB

Remark:

- ⁽¹⁾; Reduced maximum limit applied by activation of Hotspot operation
- When hotspot mode is enabled, power reduction will be activated to limit the maximum power of CDMA2000 BC1 band.
- Power reduction is not applicable for WLAN and Bluetooth.



3.3 Applied Standard

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2003
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r02
- FCC KDB 865664 D02 SAR Reporting v01r01
- FCC KDB 447498 D01 General RF Exposure Guidance v05r01
- FCC KDB 648474 D04 Handset SAR v01r02
- FCC KDB 248227 D01 SAR meas for 802.11abg v01r02
- FCC KDB 941225 D05 SAR for LTE Devices v02r03
- FCC KDB 941225 D06 Hotspot Mode SAR v01r01

3.4 Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

3.5 Test Conditions

3.5.1 Ambient Condition

Ambient Temperature	20 to 24 °C
Humidity	< 60 %

3.5.2 Test Configuration

For WWAN SAR testing, the device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the EUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT.

During WLAN SAR testing EUT is configured with the WLAN continuous TX tool, and the transmission duty factor was monitored on the spectrum analyzer with zero-span setting

Duty factor observed as below:

802.11b, 1Mbps: 97.16%

802.11a, 6Mbps: 87.26%

For WLAN SAR testing, WLAN engineering testing software installed on the EUT can provide continuous transmitting RF signal.

4. Specific Absorption Rate (SAR)

4.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

4.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = C \left(\frac{\delta T}{\delta t} \right)$$

Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

5. SAR Measurement System

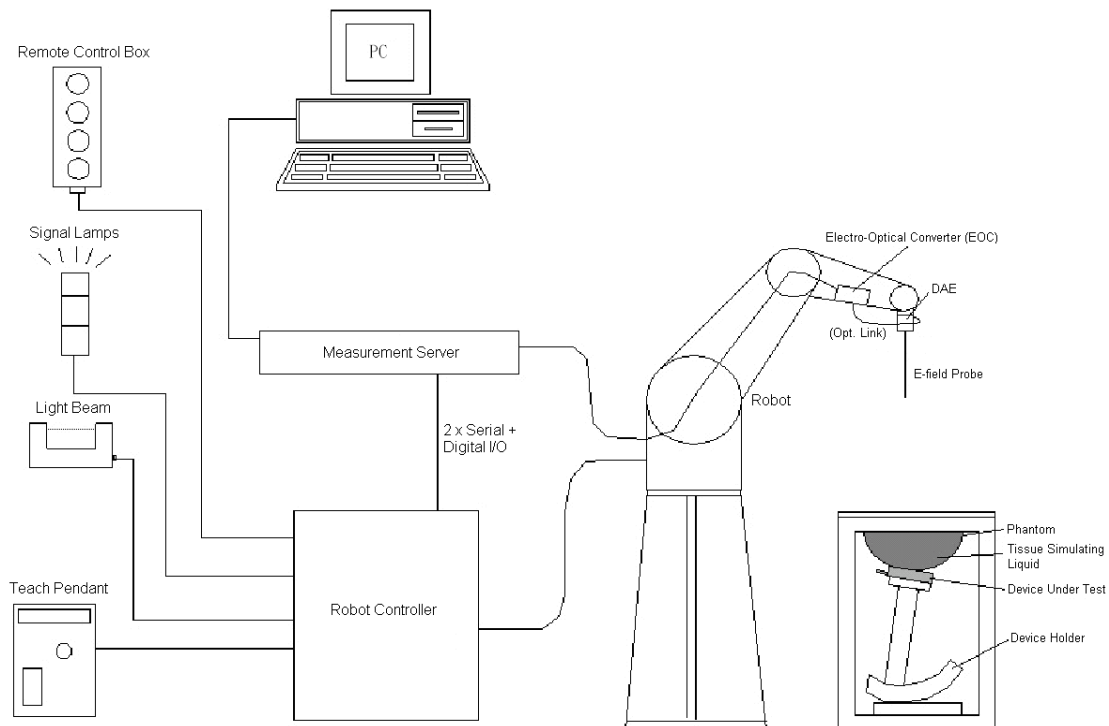


Fig 5.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY software
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Component details are described in in the following sub-sections.

5.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG). The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

5.1.1 E-Field Probe Specification

<EX3DV4 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
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to 100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μ W/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



Fig 5.2 Photo of EX3DV4/ES3DV4

5.1.2 E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

5.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists 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 and 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 input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



Fig 5.3 Photo of DAE

5.3 Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90BL; DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ± 0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



Fig 5.4 Photo of DASY4

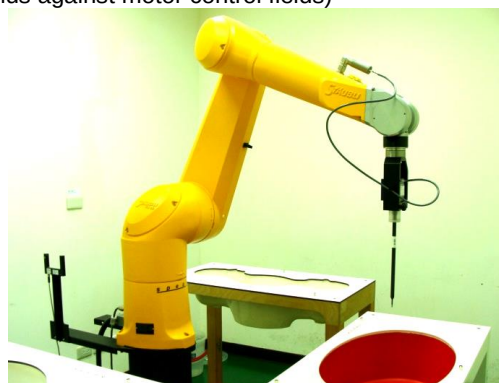


Fig 5.5 Photo of DASY5

5.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chipdisk (DASY4: 32 MB; DASY5: 128 MB), RAM (DASY4: 64 MB, DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.



Fig 5.6 Photo of Server for DASY4



Fig 5.7 Photo of Server for DASY5

5.5 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



Fig 5.8 Photo of SAM Phantom

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI4 Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm

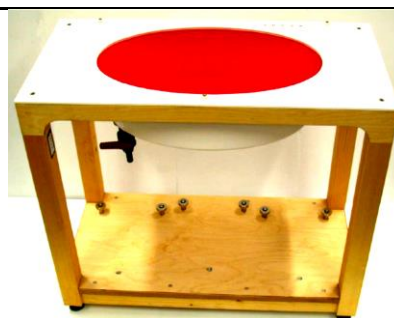


Fig 5.9 Photo of ELI4 Phantom

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

5.6 Device Holder

<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 5 mm distance, a positioning uncertainty of ± 0.5 mm 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 different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center 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 $\epsilon = 3$ and loss tangent $\delta = 0.02$. 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.



Fig 5.10 Device Holder

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

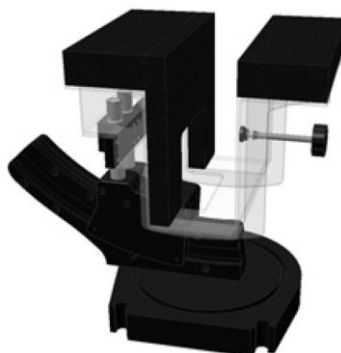


Fig 5.11 Laptop Extension Kit

5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [A/m], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

5.7.2 Data Evaluation

The DASY post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software :

Probe parameters :	- Sensitivity	Norm _i , a _{i0} , a _{i1} , a _{i2}
	- Conversion factor	ConvF _i
	- Diode compression point	dcp _i
Device parameters :	- Frequency	f
	- Crest factor	cf
Media parameters :	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.

The formula for each channel can be given as :

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with V_i = compensated signal of channel i, (i = x, y, z)
 U_i = input signal of channel i, (i = x, y, z)
 cf = crest factor of exciting field (DASY parameter)
 dcp_i = diode compression point (DASY parameter)

From the compensated input signals, the primary field data for each channel can be evaluated :

$$\text{E-field Probes : } E_i = \sqrt{\frac{V_i}{\text{Norm}_i \cdot \text{ConvF}}}$$

$$\text{H-field Probes : } H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

with V_i = compensated signal of channel i, (i = x, y, z)
 Norm_i = sensor sensitivity of channel i, (i = x, y, z), $\mu\text{V}/(\text{V/m})^2$ for E-field Probes
 ConvF = sensitivity enhancement in solution
 a_{ij} = sensor sensitivity factors for H-field probes
 f = carrier frequency [GHz]
 E_i = electric field strength of channel i in V/m
 H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude) :

$$E_{\text{tot}} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$\text{SAR} = E_{\text{tot}}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with SAR = local specific absorption rate in mW/g
 E_{tot} = total field strength in V/m
 σ = conductivity in [mho/m] or [Siemens/m]
 ρ = equivalent tissue density in g/cm^3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

5.8 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1099	Nov. 11, 2013	Nov. 10, 2014
SPEAG	835MHz System Validation Kit	D835V2	4d162	Nov. 11, 2013	Nov. 10, 2014
SPEAG	1900MHz System Validation Kit	D1900V2	5d182	Nov. 12, 2013	Nov. 11, 2014
SPEAG	2450MHz System Validation Kit	D2450V2	924	Nov. 13, 2013	Nov. 12, 2014
SPEAG	5GHz System Validation Kit	D5GHzV2	1128	Jul. 24, 2013	Jul. 23, 2014
SPEAG	Data Acquisition Electronics	DAE3	577	May. 08, 2013	May. 07, 2014
SPEAG	Data Acquisition Electronics	DAE3	495	May. 08, 2013	May. 07, 2014
SPEAG	Data Acquisition Electronics	DAE4	1399	Nov. 07, 2013	Nov. 06, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3935	Nov. 04, 2013	Nov. 03, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3931	Sep. 10, 2013	Sep. 09, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3925	Jun. 12, 2013	Jun. 11, 2014
Wisewind	Thermometer	HTC-1	TM642	Oct. 22, 2013	Oct. 21, 2014
Agilent	Wireless Communication Test Set	E5515C	MY48360820	Jan. 10, 2014	Jan. 09, 2015
SPEAG	Device Holder	N/A	N/A	NCR	NCR
R&S	Signal Generator	SMF 100A	101107	May. 27, 2013	May. 26, 2014
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Jul. 23, 2013	Jul. 22, 2014
Agilent	ENA Network Analyzer	E5071C	MY46316648	Feb. 07, 2013	Feb. 06, 2014
Anritsu	Power Meter	ML2495A	1132003	Aug. 28, 2013	Aug. 27, 2014
Anritsu	Power Sensor	MA2411B	1126017	Aug. 27, 2013	Aug. 26, 2014
Agilent	Dual Directional Coupler	778D	50422	Note 2	
Woken	Attenuator 1	WK0602-XX	N/A	Note 2	
PE	Attenuator 2	PE7005-10	N/A	Note 2	
PE	Attenuator 3	PE7005- 3	N/A	Note 2	
AR	Power Amplifier	5S1G4M2	328767	Note 3	
R&S	Spectrum Analyzer	FSP 7	101131	Jul. 09, 2013	Jul. 08, 2014

Table 5.1 Test Equipment List

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
3. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it
4. Attenuator 1 insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.

6. Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.2.



Fig 6.1 Photo of Liquid Height for Head SAR



Fig 6.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ϵ_r)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

Table 6.1 Recipes of Tissue Simulating Liquid

Simulating Liquid for 5G, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an SPEAG DAK-3.5 Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid.

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
750	Head	22.3	0.879	41.000	0.89	41.90	-1.24	-2.15	±5	2014/1/25
750	Body	22.4	0.961	53.900	0.96	55.50	0.10	-2.88	±5	2014/1/25
835	Head	22.6	0.885	42.000	0.90	41.50	-1.67	1.20	±5	2014/1/26
835	Body	22.6	0.963	54.536	0.97	55.20	-0.72	-1.20	±5	2014/1/24
835	Body	22.6	0.963	54.536	0.97	55.20	-0.72	-1.20	±5	2014/1/24
1900	Head	22.5	1.410	38.300	1.40	40.00	0.71	-4.25	±5	2014/1/26
1900	Body	22.5	1.535	52.471	1.52	53.30	0.99	-1.56	±5	2014/1/24
1900	Body	22.5	1.535	52.471	1.52	53.30	0.99	-1.56	±5	2014/1/24
1900	Body	22.5	1.535	52.471	1.52	53.30	0.99	-1.56	±5	2014/1/24
2450	Head	22.2	1.840	39.300	1.80	39.20	2.22	0.26	±5	2014/1/28
2450	Head	22.2	1.840	39.300	1.80	39.20	2.22	0.26	±5	2014/1/28
2450	Body	22.8	2.020	53.900	1.95	52.70	3.59	2.28	±5	2014/1/28
2450	Body	22.8	2.020	53.900	1.95	52.70	3.59	2.28	±5	2014/1/28
5200	Head	22.3	4.78	35.30	4.66	36.00	2.58	-1.94	±5	2014/1/29
5200	Body	22.6	5.330	48.600	5.30	49.00	0.57	-0.82	±5	2014/1/29
5300	Head	22.3	4.88	35.20	4.76	35.87	2.52	-1.87	±5	2014/1/29
5300	Body	22.6	5.470	48.500	5.42	48.88	0.92	-0.78	±5	2014/1/29
5600	Head	22.3	5.18	34.60	5.06	35.53	2.37	-2.62	±5	2014/1/29
5600	Body	22.6	5.850	47.700	5.77	48.47	1.39	-1.59	±5	2014/1/29
5800	Head	22.3	5.37	34.30	5.27	35.30	1.90	-2.83	±5	2014/1/29
5800	Body	22.6	6.110	47.400	6.00	48.20	1.83	-1.66	±5	2014/1/29

Table 6.2 Measuring Results for Simulating Liquid

7. System Verification Procedures

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

7.1 Purpose of System Performance check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

7.2 System Setup

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

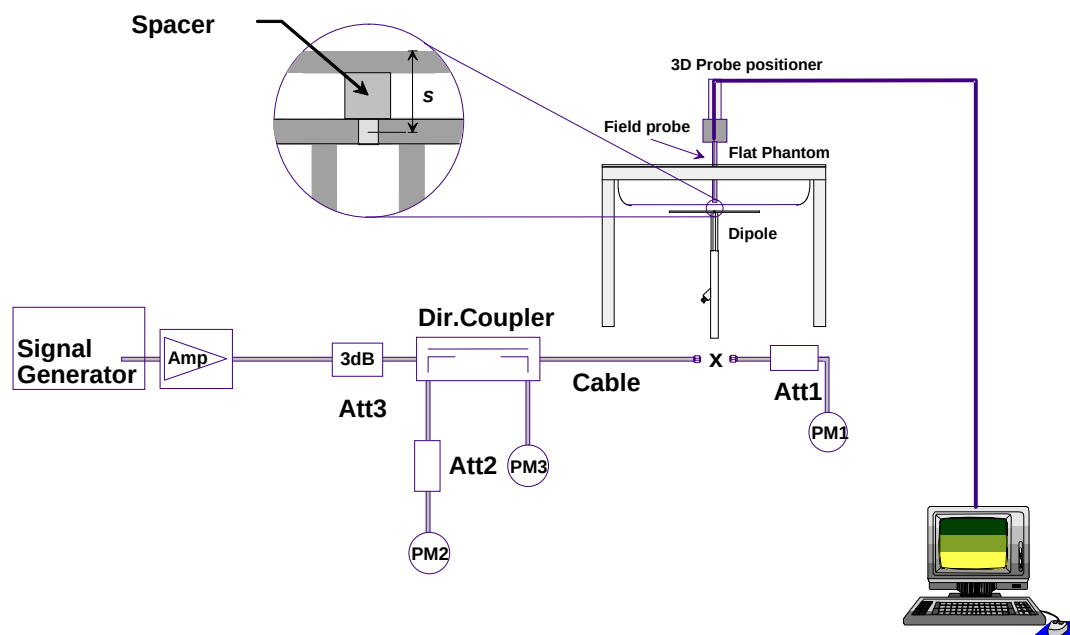


Fig 7.1 System Setup for System Evaluation

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole


Fig 7.2 Photo of Dipole Setup

7.3 SAR System Verification Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Table 7.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured SAR (W/kg)	Targeted SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
2014/1/25	750	Head	250	D750V3-1099	3925	495	2.08	8.42	8.32	-1.19
2014/1/25	750	Body	250	D750V3-1099	3925	495	2.28	8.56	9.12	6.54
2014/1/26	835	Head	250	D835V2-4d162	3935	1399	2.47	9.53	9.88	3.67
2014/1/24	835	Body	250	D835V2-4d162	3935	1399	2.41	9.28	9.64	3.88
2014/1/24	835	Body	250	D835V2-4d162	3925	495	2.40	9.28	9.6	3.45
2014/1/26	1900	Head	250	D1900V2-5d182	3935	1399	9.37	40.10	37.48	-6.53
2014/1/24	1900	Body	250	D1900V2-5d182	3935	1399	9.73	39.50	38.92	-1.47
2014/1/24	1900	Body	250	D1900V2-5d182	3931	577	9.72	39.50	38.88	-1.57
2014/1/24	1900	Body	250	D1900V2-5d182	3925	495	9.78	39.50	39.12	-0.96
2014/1/28	2450	Head	250	D2450V2-924	3925	495	12.90	52.40	51.6	-1.53
2014/1/28	2450	Head	250	D2450V2-924	3931	577	13.10	52.40	52.4	0.00
2014/1/28	2450	Body	250	D2450V2-924	3931	577	13.20	50.20	52.8	5.18
2014/1/28	2450	Body	250	D2450V2-924	3925	495	12.80	50.20	51.2	1.99
2014/1/29	5200	Head	100	D5GHzV2-1128	3925	495	7.88	78.20	78.8	0.77
2014/1/29	5200	Body	100	D5GHzV2-1128	3925	495	7.73	73.40	77.3	5.31
2014/1/29	5300	Head	100	D5GHzV2-1128	3925	495	8.49	80.60	84.9	5.33
2014/1/29	5300	Body	100	D5GHzV2-1128	3925	495	7.39	74.30	73.9	-0.54
2014/1/29	5600	Head	100	D5GHzV2-1128	3925	495	8.60	80.50	86	6.83
2014/1/29	5600	Body	100	D5GHzV2-1128	3925	495	8.28	77.80	82.8	6.43
2014/1/29	5800	Head	100	D5GHzV2-1128	3925	495	7.24	77.20	72.4	-6.22
2014/1/29	5800	Body	100	D5GHzV2-1128	3925	495	7.45	72.20	74.5	3.19

Table 7.1 Target and Measurement SAR after Normalized

8. EUT Testing Position

8.1 Define two imaginary lines on the handset

- The vertical centerline passes through two points on the front side of the handset - the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.
- The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.
- The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

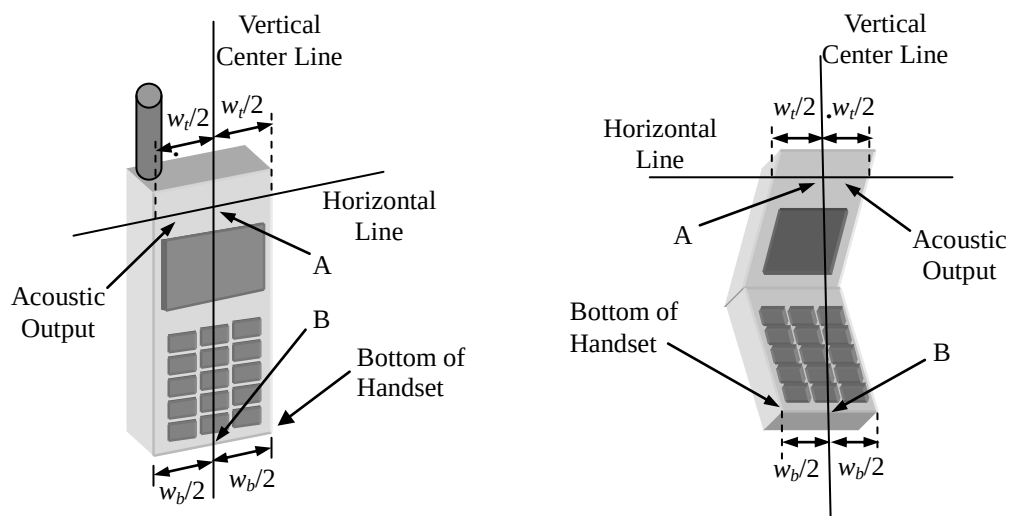


Fig 8.1 Illustration for Handset Vertical and Horizontal Reference Lines

8.2 Cheek Position

- To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
- To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig. 8.2).

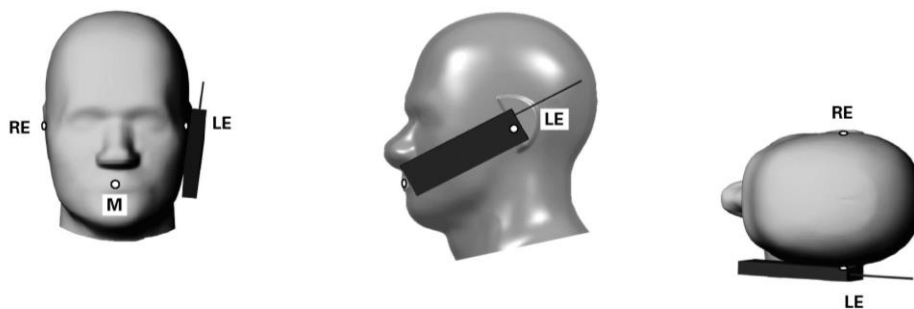


Fig 8.2 Illustration for Cheek Position

8.3 Tilted Position

- To position the device in the “cheek” position described above.
- While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see Fig. 8.3).

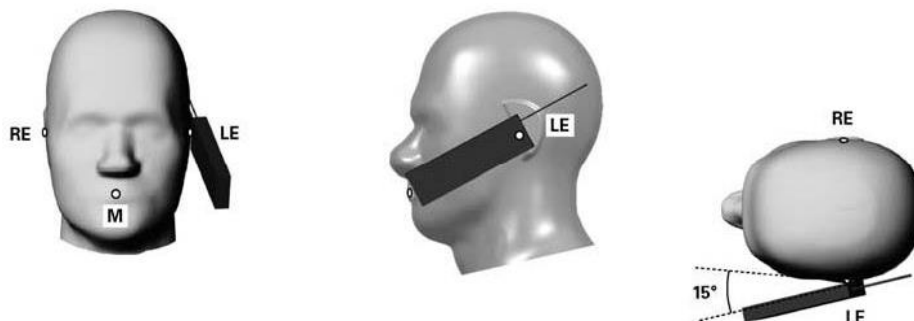


Fig 8.3 Illustration for Tilted Position

8.4 Body Worn Position

- (a) To position the device parallel to the phantom surface with either keypad up or down.
- (b) To adjust the device parallel to the flat phantom.
- (c) To adjust the distance between the device surface and the flat phantom to 1.5 cm.
- (d) To adjust the distance between the device with Holster and the flat phantom to 0cm.

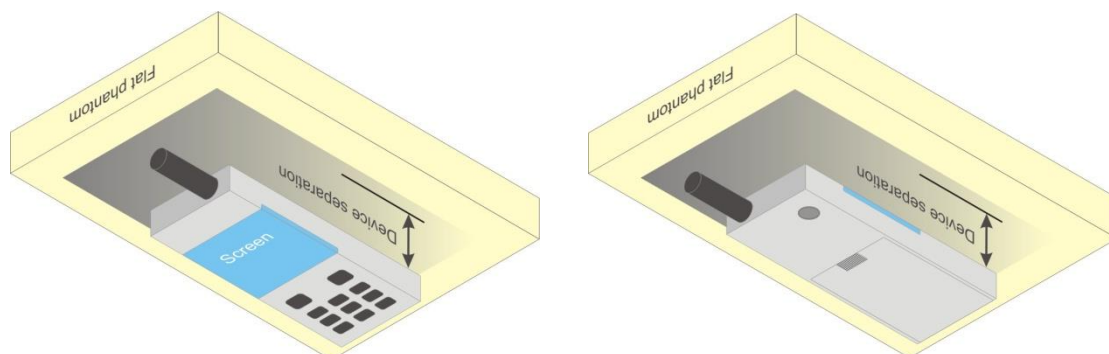


Fig 8.4 Illustration for Body Worn Position

8.5 Hotspot Position

- (a) To position the device parallel to the phantom surface with all sides and either keypad up or down.
- (b) To adjust the device parallel to the flat phantom.
- (c) To adjust the distance between the device and the flat phantom to 1.0cm.

<EUT Setup Photos>

Please refer to Appendix D for the test setup photos.

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

- (a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- (b) Read the WWAN RF power level from the base station simulator.
- (c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
- (d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

- (a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- (b) Place the EUT in the positions as Appendix D demonstrates.
- (c) Set scan area, grid size and other setting on the DASY software.
- (d) Measure SAR results for the highest power channel on each testing position.
- (e) Find out the largest SAR result on these testing positions of each band
- (f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

9.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

9.2 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. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

9.3 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r02 quoted below.

When the 1-g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom} , Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1" two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

9.4 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

9.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

9.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

10. Bluetooth Exclusions Applied

Mode Band	Average power(dBm)	
	Bluetooth v3.0+EDR	Bluetooth v4.0+LE
2.4GHz Bluetooth	3.0	2.5

Note:

- Per KDB 447498 D01v05r01, 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:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$$
for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
 - f(GHz) is the RF channel transmit frequency in GHz
 - Power and distance are rounded to the nearest mW and mm before calculation
 - The result is rounded to one decimal place for comparison

Bluetooth Max Power (dBm)	Test Distance (mm)	Frequency (GHz)	exclusion thresholds
3	5	2.48	0.63

- Per KDB 447498 D01v05r01 exclusion thresholds is $0.63 < 3$, RF exposure evaluation is not required.

11. Conducted RF Output Power (Unit: dBm)

<CDMA2000 Conducted Power>

Note:

- Referring to KDB 941225 D01v02, the data device SAR is tested with Ev-Do Rev 0 (RTAP 153.6kbps). If 1xRTT and Ev-Do Rev A (RETAP 4096 bits) power is less than 1/4dB higher than Re v0, SAR tests with those settings are not necessary.
- Considering VOIP capability, 1xEv-Do Rev. A SAR was repeated on the worst position of 1xRTT head SAR and body-worn SAR testing.
- According to KDB 941225 D01v02, Head SAR for RC1+SO55 is not required because the maximum average output power of RC1 is less than 1/4 dB higher than RC3+SO55.
- Referring to KDB 941225 D01v02, in Hotspot mode EUT is treated as data device and SAR is tested with Ev-Do Rev 0 (RTAP 153.6kbps). If 1xRTT and Ev-Do Rev A(RETAP 4096 bits) power is less than 1/4dB higher than Re v0, SAR tests with those settings are not necessary.

Hotspot inactive - full power mode

Band TX Channel	CDMA2000 BC0			Tune-up Limit (dBm)	CDMA2000 BC1			Tune-up Limit (dBm)
	1013	384	777		25	600	1175	
Frequency (MHz)	824.7	836.52	848.31		1851.25	1880	1908.75	
1xRTT RC1 SO55	24.38	24.43	24.35	24.50	24.42	24.42	24.46	24.50
1xRTT RC3 SO55	24.39	24.46	24.37	24.50	24.42	24.41	24.44	24.50
1xRTT RC3 SO32(+ F-SCH)	24.39	24.44	24.37	24.50	24.46	24.47	24.47	24.50
1xRTT RC3 SO32(+SCH)	24.38	24.45	24.34	24.50	24.44	24.45	24.49	24.50
1xEVDO RTAP 153.6Kbps	24.39	24.39	24.36	24.50	24.46	24.40	24.44	24.50
1xEVDO RETAP 4096Bits	24.36	24.42	24.33	24.50	24.42	24.40	24.48	24.50

Hotspot active - reduced power mode

Band TX Channel	CDMA2000 BC1			Tune-up Limit (dBm)
	25	600	1175	
Frequency (MHz)	1851.25	1880	1908.75	
1xRTT RC1 SO55	22.44	22.47	22.40	22.50
1xRTT RC3 SO55	22.38	22.36	22.35	22.50
1xRTT RC3 SO32(+ F-SCH)	22.42	22.36	22.42	22.50
1xRTT RC3 SO32(+SCH)	22.43	22.40	22.43	22.50
1xEVDO RTAP 153.6Kbps	22.44	22.44	22.46	22.50
1xEVDO RETAP 4096Bits	22.41	22.43	22.45	22.50

**<LTE Conducted Power>****Note:**

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r03, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r03, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r03, when reported SAR of 1RB and 50%RB allocation for QPSK $\leq 0.8\text{W/kg}$, and 100%RB with QPSK output power is less than 1RB and 50%RB, 100%RB allocation for QPSK is not required.
6. Per KDB 941225 D05v02r03, when reported SAR of 1RB and 50%RB allocation for QPSK $> 0.8\text{W/kg}$ for any exposure position, SAR testing of 100%RB allocation for QPSK is performed at the highest power channel.
7. 16QAM output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is $\leq 1.45\text{ W/kg}$; Per KDB 941225 D05v02r03, 16QAM SAR testing is not required.
8. Smaller bandwidth output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is $\leq 1.45\text{ W/kg}$; Per KDB 941225 D05v02r03, smaller bandwidth SAR testing is not required.

<LTE Band 13 Conducted Power>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	Target MPR (dB)
Channel					23230		24.0	0
Frequency (MHz)					782			
10	QPSK	1	0		23.94			
10	QPSK	1	24		23.92		23.0	1
10	QPSK	1	49		23.97			
10	QPSK	25	0		22.60			
10	QPSK	25	12		22.67		23.0	1
10	QPSK	25	24		22.57			
10	QPSK	50	0		22.53			
10	16QAM	1	0		22.88		23.0	1
10	16QAM	1	24		22.91			
10	16QAM	1	49		22.96			
10	16QAM	25	0		21.51		22.0	2
10	16QAM	25	12		21.57			
10	16QAM	25	24		21.49			
10	16QAM	50	0		21.52			
Channel				23205	23230	23255	Tune up Limit (dBm)	Target MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	23.81	23.81	23.69	24.0	0
5	QPSK	1	12	23.84	23.82	23.80		
5	QPSK	1	24	23.87	23.90	23.79		
5	QPSK	12	0	22.79	22.78	22.91	23.0	1
5	QPSK	12	6	22.77	22.71	22.84		
5	QPSK	12	11	22.74	22.79	22.73		
5	QPSK	25	0	22.63	22.61	22.67	23.0	1
5	16QAM	1	0	22.74	22.79	22.74		
5	16QAM	1	12	22.87	22.78	22.78		
5	16QAM	1	24	22.90	22.86	22.80	22.0	2
5	16QAM	12	0	21.71	21.78	21.87		
5	16QAM	12	6	21.79	21.82	21.79		
5	16QAM	12	11	21.85	21.84	21.76		
5	16QAM	25	0	21.55	21.60	21.55		

<WLAN 2.4GHz Conducted Power>
Note:

1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. 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
3. Apply the test exclusion rule in KDB 248227 D01 v01r02 11g, 11n-HT20 output power is less than 1/4dB higher than 11b mode, thus the SAR can be excluded.

Mode	Channel	Frequency (MHz)	Average power (dBm)				Tune-Up Limit
			Data Rate				
			1Mbps	2Mbps	5.5Mbps	11Mbps	
802.11b	CH 1	2412	19.21	19.08	19.18	18.91	19.5
	CH2	2417	19.25	19.07	19.15	19.19	19.5
	CH 6	2437	19.65	19.48	19.59	19.35	20
	CH7	2442	19.80	19.79	19.78	19.79	20
	CH 11	2462	17.89	17.63	17.61	17.50	18
	CH12	2467	14.26	14.23	14.23	14.18	14.5
	CH 13	2472	9.03	8.82	8.69	8.48	10

Mode	Channel	Frequency (MHz)	Average power (dBm)								Tune-Up Limit
			Data Rate								
			6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps	
802.11g	CH 1	2412	13.21	12.86	12.81	12.79	12.88	13.03	12.95	13.03	13.5
	CH2	2417	15.63	15.55	15.62	15.57	15.59	15.60	15.62	15.60	16
	CH 6	2437	17.90	17.88	17.87	17.82	17.54	17.85	17.74	17.89	18
	CH7	2442	17.77	17.59	17.69	17.62	17.43	17.60	17.48	17.67	18
	CH 11	2462	10.98	10.85	10.94	10.77	10.84	10.87	10.71	10.71	11
	CH12	2467	9.72	9.57	9.64	9.63	9.70	9.67	9.70	9.68	10
	CH 13	2472	1.10	0.09	0.22	0.35	0.44	0.51	0.43	0.61	5

Mode	Channel	Frequency (MHz)	Average power (dBm)								Tune-up Limit
			MCS Index								
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
802.11n-HT20	CH 1	2412	13.20	13.16	13.16	13.24	13.12	13.04	13.06	13.14	13.5
	CH2	2417	15.88	15.76	15.66	15.60	15.68	15.56	15.73	15.64	16
	CH 6	2437	16.70	16.74	16.46	16.57	16.64	16.44	16.49	16.67	17
	CH7	2442	16.85	16.84	16.79	16.80	16.58	16.62	16.66	16.57	17
	CH 11	2462	10.94	10.77	10.60	10.52	10.54	10.58	10.78	10.70	11
	CH12	2467	9.69	9.42	9.51	9.53	9.46	9.60	9.67	9.62	10
	CH 13	2472	0.12	0.10	0.10	0.11	0.07	0.10	0.08	0.09	5

<WLAN 5GHz Conducted Power>
Note:

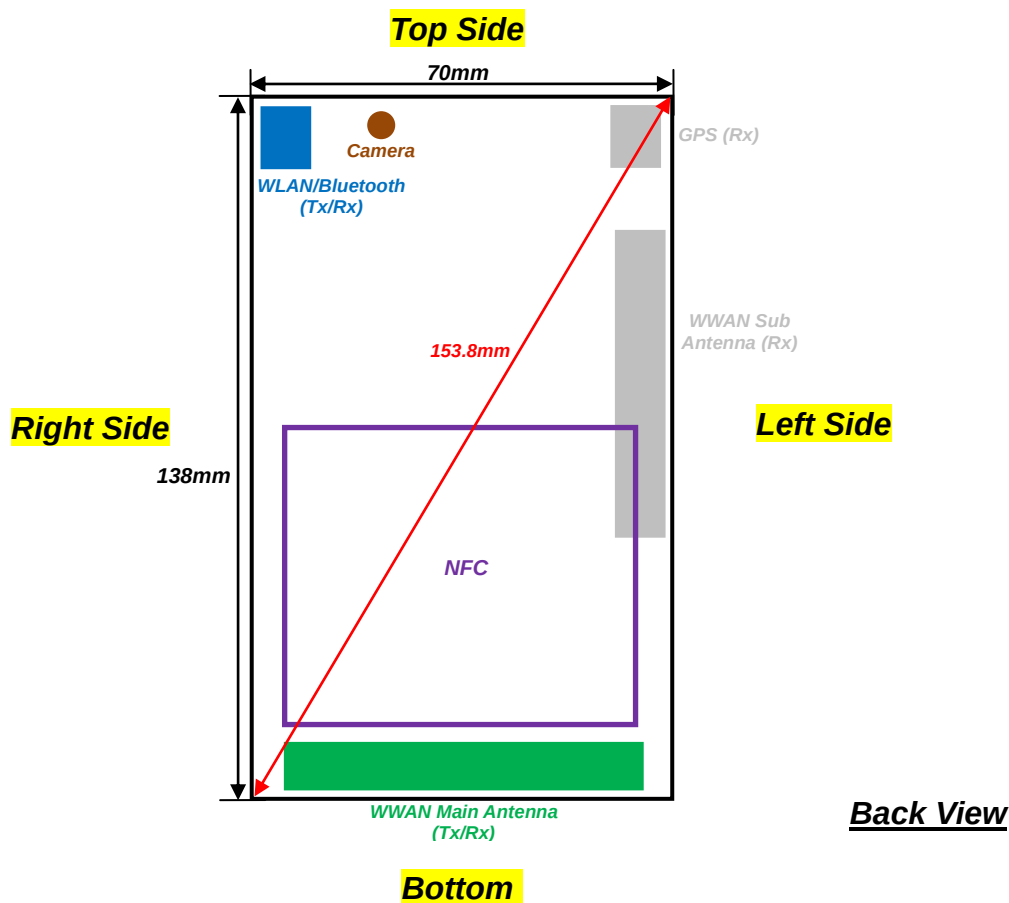
1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate.
3. Apply the test exclusion rule in KDB 248227 D01 v01r02, 11n-HT20/HT40 output power is less than 1/4dB higher than 802.11a mode, thus the SAR can be excluded.

Mode	Channel	Frequency (MHz)	Average Power (dBm)								Tune-up Limit
			Data Rate								
			6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps	
802.11a	CH 36	5180	13.08	13.03	13.03	13.07	13.07	13.07	13.04	13.03	13.5
	CH 40	5200	16.84	16.83	16.80	16.81	16.83	16.81	16.79	16.80	17
	CH 44	5220	16.84	16.75	16.80	16.70	16.83	16.82	16.82	16.79	17
	CH 48	5240	16.73	16.72	16.67	16.71	16.69	16.68	16.69	16.68	17
	CH 52	5260	16.86	16.85	16.82	16.84	16.85	16.83	16.82	16.82	17
	CH 56	5280	16.83	16.81	16.78	16.77	16.79	16.81	16.82	16.81	17
	CH 60	5300	16.52	16.50	16.51	16.50	16.50	16.50	16.50	16.48	17
	CH 64	5320	13.28	13.25	13.24	13.24	13.20	13.23	13.24	13.24	13.5
	CH 100	5500	14.71	14.69	14.69	14.68	14.66	14.70	14.63	14.63	15
	CH 104	5520	16.67	16.65	16.65	16.64	16.60	16.65	16.64	16.62	17
	CH 108	5540	16.63	16.59	16.50	16.61	16.46	16.61	16.55	16.52	17
	CH 112	5560	16.60	16.52	16.41	16.55	16.49	16.55	16.57	16.54	17
	CH 116	5580	16.57	16.46	16.40	16.47	16.55	16.53	16.53	16.43	17
	CH 120	5600	16.53	16.51	16.41	16.51	16.47	16.41	16.52	16.48	17
	CH 124	5620	16.54	16.49	16.53	16.53	16.46	16.53	16.43	16.50	17
	CH 128	5640	16.55	16.44	16.50	16.44	16.46	16.53	16.47	16.50	17
	CH 132	5660	16.66	16.62	16.50	16.54	16.50	16.63	16.54	16.58	17
	CH 136	5680	16.64	16.55	16.62	16.61	16.63	16.61	16.60	16.58	17
	CH 140	5700	13.31	13.27	13.30	13.27	13.29	13.30	13.27	13.30	13.5
	CH 149	5745	15.13	15.01	14.91	15.10	15.09	15.12	15.03	15.11	15.5
	CH 153	5765	16.82	16.67	16.65	16.68	16.69	16.70	16.66	16.70	17
	CH 157	5785	16.71	16.67	16.65	16.68	16.69	16.70	16.66	16.70	17
	CH 161	5805	16.70	16.61	16.59	16.62	16.63	16.64	16.60	16.64	17
	CH 165	5825	15.02	15.11	15.04	15.19	15.11	15.22	15.14	15.30	15.5

Mode	Channel	Frequency (MHz)	Average Power (dBm)								Tune-up Limit
			MCS Index								
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
802.11n-HT20	CH 36	5180	13.14	13.13	13.12	13.11	13.09	13.13	13.08	13.11	13.5
	CH 40	5200	15.38	15.35	15.33	15.27	15.29	15.33	15.28	15.37	16
	CH 44	5220	15.49	15.45	15.44	15.41	15.42	15.40	15.40	15.43	16
	CH 48	5240	15.55	15.49	15.43	15.43	15.47	15.51	15.51	15.46	16
	CH 52	5260	15.60	15.58	15.52	15.57	15.53	15.55	15.58	15.54	16
	CH 56	5280	15.46	15.45	15.39	15.44	15.40	15.39	15.28	15.36	16
	CH 60	5300	15.73	15.69	15.70	15.72	15.70	15.69	15.68	15.70	16
	CH 64	5320	13.40	13.36	13.29	13.36	13.38	13.39	13.28	13.33	13.5
	CH 100	5500	14.78	14.74	14.76	14.77	14.76	14.71	14.77	14.68	15
	CH 104	5520	15.51	15.25	15.22	15.11	15.32	15.39	15.30	15.36	16
	CH 108	5540	15.58	15.55	15.39	15.37	15.49	15.43	15.48	15.56	16
	CH 112	5560	15.46	15.45	15.40	14.35	14.39	14.40	14.38	14.36	16
	CH 116	5580	15.55	15.52	15.47	15.51	15.43	15.53	15.48	15.50	16
	CH 120	5600	15.54	15.52	15.39	15.35	15.49	15.41	15.28	15.47	16
	CH 124	5620	15.47	15.45	15.40	15.44	15.39	15.41	15.28	15.37	16
	CH 128	5640	15.56	15.48	15.50	15.48	14.47	14.53	14.48	14.55	16
	CH 132	5660	15.60	15.57	15.59	15.58	15.59	15.59	15.28	15.37	16
	CH 136	5680	15.63	15.59	15.59	15.58	15.59	15.59	15.50	15.56	16
	CH 140	5700	13.37	13.31	13.33	13.36	13.33	13.30	13.31	13.36	13.5
	CH 149	5745	15.46	15.42	15.44	15.43	15.43	15.43	15.44	15.32	15.5
	CH 153	5765	15.69	15.26	15.43	15.40	15.61	15.47	15.10	15.17	16
	CH 157	5785	15.63	15.58	15.54	15.58	15.60	15.62	15.60	15.61	16
	CH 161	5805	15.54	15.20	15.37	15.34	15.55	15.41	15.04	15.11	16
	CH 165	5825	15.18	15.14	15.08	15.16	15.08	15.18	15.17	15.15	15.5

Mode	Channel	Frequency (MHz)	Average Power (dBm)								Tune-up Limit
			MCS Index								
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
802.11n-HT40	CH 38	5190	11.80	11.74	11.57	11.57	11.56	11.58	11.67	11.70	12
	CH 46	5230	14.71	14.62	14.69	14.69	14.68	14.65	14.60	14.68	15
	CH 54	5270	14.82	14.74	14.78	14.80	14.75	14.81	14.81	14.76	15
	CH 62	5310	11.17	11.05	11.09	11.02	11.12	11.16	11.16	11.06	11.5
	CH 102	5510	10.46	10.44	10.38	10.37	10.44	10.42	10.36	10.36	10.5
	CH 110	5550	14.83	14.81	14.69	14.74	14.75	14.82	14.71	14.77	15
	CH 118	5590	14.46	14.34	14.41	14.39	14.44	14.33	14.16	14.16	15
	CH 126	5630	14.75	14.74	14.74	14.73	14.7	14.71	14.69	14.68	15
	CH 134	5670	13.96	13.94	13.91	13.94	13.91	13.86	13.93	13.87	14.5
	CH 151	5755	13.89	13.80	13.85	13.82	13.87	13.88	13.87	13.81	14.5
	CH 159	5795	13.98	13.97	13.97	13.92	13.97	13.97	13.96	13.97	14.5

12. Antenna Location



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	≤ 25mm	≤ 25mm	119mm	≤ 25mm	≤ 25mm	≤ 25mm
BT&WLAN	≤ 25mm	≤ 25mm	≤ 25mm	126mm	≤ 25mm	53mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	Yes	Yes	No	Yes	Yes	Yes
BT&WLAN	Yes	Yes	Yes	No	Yes	No

Note:

- Referring to KDB 941225 D06 v01r01, when the overall device length and width are $\geq 9\text{cm} \times 5\text{cm}$, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge

13. SAR Test Results

Note:

1. Per KDB 447498 D01v05r01, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
 - c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
 - d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 648474 D04v01r02, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
3. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
4. According to reduction plan to perform SAR testing, related SAR test procedures refer to "reduction plan"

13.1 Head SAR

<CDMA SAR>

Plot No.	Band	Mode	Test Position	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
1	CDMA BC0	1xRTT RC3 SO55	Right Cheek	Battery1	With Scanner	384	836.52	24.46	24.5	1.009	-0.032	0.705	0.712
3	CDMA BC0	1xRTT RC3 SO55	Right Tilted	Battery1	With Scanner	384	836.52	24.46	24.5	1.009	0.005	0.542	0.547
4	CDMA BC0	1xRTT RC3 SO55	Left Cheek	Battery1	With Scanner	384	836.52	24.46	24.5	1.009	-0.031	0.691	0.697
5	CDMA BC0	1xRTT RC3 SO55	Left Tilted	Battery1	With Scanner	384	836.52	24.46	24.5	1.009	-0.08	0.457	0.461
6	CDMA BC0	RETAP 4096 bits	Right Cheek	Battery1	With Scanner	384	836.52	24.42	24.5	1.019	-0.01	0.666	0.678
7	CDMA BC0	1xRTT RC3 SO55	Right Cheek	Battery2	With Scanner	384	836.52	24.46	24.5	1.009	-0.057	0.650	0.656
8	CDMA BC0	1xRTT RC3 SO55	Right Cheek	Battery1	Without Scanner	384	836.52	24.46	24.5	1.009	0.11	0.685	0.691
9	CDMA BC0	1xRTT RC3 SO55	Right Cheek	Battery1	With Scanner	1013	824.7	24.39	24.5	1.026	0.015	0.552	0.566
10	CDMA BC0	1xRTT RC3 SO55	Right Cheek	Battery1	With Scanner	777	848.31	24.37	24.5	1.030	0.043	0.517	0.533
2	CDMA BC1	1xRTT RC3 SO55	Right Cheek	Battery1	With Scanner	1175	1908.75	24.44	24.5	1.014	-0.062	0.428	0.434
11	CDMA BC1	1xRTT RC3 SO55	Right Cheek	Battery1	With Scanner	25	1851.25	24.42	24.5	1.019	0.038	0.371	0.378
12	CDMA BC1	1xRTT RC3 SO55	Right Cheek	Battery1	With Scanner	600	1880	24.41	24.5	1.021	-0.022	0.389	0.397

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
13	LTE Band 13	10M	QPSK	1	49	Right Cheek	Battery1	With Scanner	23230	782	23.97	24	1.007	-0.044	0.497	0.500
14	LTE Band 13	10M	QPSK	1	49	Right Tilted	Battery1	With Scanner	23230	782	23.97	24	1.007	-0.09	0.299	0.301
15	LTE Band 13	10M	QPSK	1	49	Left Cheek	Battery1	With Scanner	23230	782	23.97	24	1.007	-0.04	0.474	0.477
16	LTE Band 13	10M	QPSK	1	49	Left Tilted	Battery1	With Scanner	23230	782	23.97	24	1.007	0.057	0.289	0.291
17	LTE Band 13	10M	QPSK	1	49	Right Cheek	Battery2	With Scanner	23230	782	23.97	24	1.007	-0.073	0.483	0.486
18	LTE Band 13	10M	QPSK	1	49	Right Cheek	Battery1	Without Scanner	23230	782	23.97	24	1.007	0.064	0.485	0.488
19	LTE Band 13	10M	QPSK	25	12	Right Cheek	Battery1	With Scanner	23230	782	22.67	23	1.079	-0.045	0.317	0.342

<WLAN SAR DTS>

Plot No.	Band	Mode	Test Position	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
21	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	Battery1	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	0.02	0.664	0.741
22	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	Battery1	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	0.006	0.694	0.775
23	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	Battery1	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	0.038	0.513	0.573
24	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	Battery1	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	0.111	0.538	0.601
25	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	Battery2	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	-0.025	0.624	0.697
26	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	Battery1	Without Scanner	6	2437	19.65	20	1.085	97.16	1.029	-0.01	0.621	0.693
27	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	Battery1	With Scanner	1	2412	19.21	19.5	1.070	97.16	1.029	0.071	0.561	0.618
28	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	Battery1	With Scanner	11	2462	17.89	18	1.027	97.16	1.029	-0.06	0.649	0.686
32	WLAN5GHz	802.11a 6Mbps	Right Cheek	Battery1	With Scanner	153	5765	16.82	17	1.042	87.26	1.146	0.058	0.181	0.216
45	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	153	5765	16.82	17	1.042	87.26	1.146	0.116	0.498	0.595
46	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	157	5785	16.71	17	1.069	87.26	1.146	0.115	0.410	0.502
47	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	161	5805	16.7	17	1.072	87.26	1.146	0.141	0.457	0.561

<WLAN SAR NII>

Plot No.	Band	Mode	Test Position	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
29	WLAN5GHz	802.11a 6Mbps	Right Cheek	Battery1	With Scanner	40	5200	16.84	17	1.037	87.26	1.146	-0.113	0.308	0.366
33	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	40	5200	16.84	17	1.037	87.26	1.146	-0.008	0.293	0.348
34	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	40	5200	16.84	17	1.037	87.26	1.146	0.121	0.401	0.477
35	WLAN5GHz	802.11a 6Mbps	Left Tilted	Battery1	With Scanner	40	5200	16.84	17	1.037	87.26	1.146	0.083	0.330	0.392
36	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery2	With Scanner	40	5200	16.84	17	1.037	87.26	1.146	-0.105	0.385	0.458
37	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	Without Scanner	40	5200	16.84	17	1.037	87.26	1.146	0.001	0.328	0.390
38	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	44	5220	16.84	17	1.037	87.26	1.146	0.152	0.452	0.537
30	WLAN5GHz	802.11a 6Mbps	Right Cheek	Battery1	With Scanner	52	5260	16.86	17	1.032	87.26	1.146	-0.042	0.279	0.330
39	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	52	5260	16.86	17	1.032	87.26	1.146	-0.013	0.532	0.629
40	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	60	5300	16.52	17	1.116	87.26	1.146	0.072	0.395	0.505
31	WLAN5GHz	802.11a 6Mbps	Right Cheek	Battery1	With Scanner	104	5520	16.67	17	1.078	87.26	1.146	0.108	0.170	0.210
41	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	104	5520	16.67	17	1.078	87.26	1.146	0.048	0.559	0.691
42	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	112	5560	16.60	17	1.096	87.26	1.146	0.031	0.553	0.695
43	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	128	5640	16.55	17	1.109	87.26	1.146	0.069	0.430	0.546
44	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	136	5680	16.64	17	1.086	87.26	1.146	0.119	0.541	0.673

13.2 Hotspot SAR

Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	≤ 25mm	≤ 25mm	119mm	≤ 25mm	≤ 25mm	≤ 25mm
BT&WLAN	≤ 25mm	≤ 25mm	≤ 25mm	126mm	≤ 25mm	53mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	Yes	Yes	No	Yes	Yes	Yes
BT&WLAN	Yes	Yes	Yes	No	Yes	No

Note:

- Referring to KDB 941225 D06 v01r01, when the overall device length and width are $\geq 9\text{cm} \times 5\text{cm}$, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge

<CDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
48	CDMA BC0	RTAP 153.6Kbps	Back	1cm	Battery1	With Scanner	384	836.52	24.39	24.5	1.026	-0.125	1.140	1.169
59	CDMA BC0	RTAP 153.6Kbps	Back	1cm	Battery1	With Scanner	1013	824.7	24.39	24.5	1.026	0.05	0.971	0.996
60	CDMA BC0	RTAP 153.6Kbps	Back	1cm	Battery1	With Scanner	777	848.31	24.36	24.5	1.033	-0.022	0.788	0.814
50	CDMA BC1	RTAP 153.6Kbps	Front	1cm	Battery1	With Scanner	1175	1908.75	22.46	22.5	1.009	0.061	0.704	0.711
49	CDMA BC1	RTAP 153.6Kbps	Back	1cm	Battery1	With Scanner	1175	1908.75	22.46	22.5	1.009	0.102	1.320	1.332
51	CDMA BC1	RTAP 153.6Kbps	Right Side	1cm	Battery1	With Scanner	1175	1908.75	22.46	22.5	1.009	0.122	0.200	0.202
52	CDMA BC1	RTAP 153.6Kbps	Left Side	1cm	Battery1	With Scanner	1175	1908.75	22.46	22.5	1.009	0.101	0.080	0.081
53	CDMA BC1	RTAP 153.6Kbps	Bottom Side	1cm	Battery1	With Scanner	1175	1908.75	22.46	22.5	1.009	0.011	1.300	1.312
55	CDMA BC1	RTAP 153.6Kbps	Back	1cm	Battery2	With Scanner	1175	1908.75	22.46	22.5	1.009	-0.011	0.704	0.711
56	CDMA BC1	RTAP 153.6Kbps	Back	1cm	Battery1	Without Scanner	1175	1908.75	22.46	22.5	1.009	-0.102	1.300	1.312
57	CDMA BC1	RTAP 153.6Kbps	Back	1cm	Battery1	With Scanner	25	1851.25	22.44	22.5	1.014	0.109	1.260	1.278
58	CDMA BC1	RTAP 153.6Kbps	Back	1cm	Battery1	With Scanner	600	1880	22.44	22.5	1.014	-0.165	1.260	1.278

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (cm)	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
73	LTE Band 13	10M	QPSK	1	49	Front	1cm	Battery1	With Scanner	23230	782	23.97	24	1.007	0.014	0.710	0.715
72	LTE Band 13	10M	QPSK	1	49	Back	1cm	Battery1	With Scanner	23230	782	23.97	24	1.007	-0.034	1.000	1.007
74	LTE Band 13	10M	QPSK	1	49	Right Side	1cm	Battery1	With Scanner	23230	782	23.97	24	1.007	-0.028	0.673	0.678
75	LTE Band 13	10M	QPSK	1	49	Left Side	1cm	Battery1	With Scanner	23230	782	23.97	24	1.007	0.04	0.636	0.640
77	LTE Band 13	10M	QPSK	1	49	Bottom Side	1cm	Battery1	With Scanner	23230	782	23.97	24	1.007	0.042	0.082	0.083
78	LTE Band 13	10M	QPSK	1	49	Back	1cm	Battery2	With Scanner	23230	782	23.97	24	1.007	-0.039	0.758	0.763
79	LTE Band 13	10M	QPSK	1	49	Back	1cm	Battery1	Without Scanner	23230	782	23.97	24	1.007	0.01	0.981	0.988
80	LTE Band 13	10M	QPSK	25	12	Back	1cm	Battery1	With Scanner	23230	782	22.67	23	1.079	0.018	0.719	0.776
81	LTE Band 13	10M	QPSK	50	0	Back	1cm	Battery1	With Scanner	23230	782	22.53	23	1.114	-0.039	0.678	0.755

<WLAN SAR DTS>

Plot No.	Band	Mode	Test Position	Gap (cm)	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
87	WLAN2.4GHz	802.11b 1Mbps	Front	1cm	Battery1	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	-0.111	0.257	0.287
88	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	Battery1	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	-0.034	0.334	0.373
89	WLAN2.4GHz	802.11b 1Mbps	Right Side	1cm	Battery1	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	-0.078	0.249	0.278
92	WLAN2.4GHz	802.11b 1Mbps	Top Side	1cm	Battery1	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	-0.014	0.219	0.245
93	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	Battery2	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	-0.013	0.198	0.221
94	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	Battery1	Without Scanner	6	2437	19.65	20	1.085	97.16	1.029	-0.127	0.289	0.323
95	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	Battery1	With Scanner	1	2412	19.21	19.5	1.070	97.16	1.029	-0.129	0.300	0.330
96	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	Battery1	With Scanner	11	2462	17.89	18	1.027	97.16	1.029	-0.059	0.316	0.334

13.3 Body Worn SAR
<CDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Headset	Holster	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
61	CDMA BC0	1xRTT RC3 SO32	Back	1.5cm			Battery1	With Scanner	384	836.52	24.44	24.5	1.014	0.011	0.976	0.990
70	CDMA BC0	1xRTT RC3 SO32	Back	1.5cm			Battery1	With Scanner	1013	824.7	24.39	24.5	1.026	0.011	0.837	0.858
71	CDMA BC0	1xRTT RC3 SO32	Back	1.5cm			Battery1	With Scanner	777	848.31	24.37	24.5	1.030	-0.058	0.673	0.693
62	CDMA BC1	1xRTT RC3 SO32	Back	1.5cm			Battery1	With Scanner	1175	1908.75	24.47	24.5	1.007	-0.027	1.330	1.339
63	CDMA BC1	RETAP 4096 bits	Back	1.5cm			Battery1	With Scanner	1175	1908.75	24.48	24.5	1.005	0.013	1.230	1.236
64	CDMA BC1	1xRTT RC3 SO32	Back	0cm		Holster	Battery1	With Scanner	1175	1908.75	24.47	24.5	1.007	0.09	0.836	0.842
65	CDMA BC1	1xRTT RC3 SO32	Back	1.5cm	Headset		Battery1	With Scanner	1175	1908.75	24.47	24.5	1.007	0.016	1.290	1.299
66	CDMA BC1	1xRTT RC3 SO32	Back	1.5cm	Headset		Battery1	With Scanner	25	1851.25	24.46	24.5	1.009	-0.025	1.070	1.080
67	CDMA BC1	1xRTT RC3 SO32	Back	1.5cm	Headset		Battery1	With Scanner	600	1880	24.47	24.5	1.007	-0.011	1.180	1.188
68	CDMA BC1	1xRTT RC3 SO32	Back	1.5cm			Battery1	With Scanner	25	1851.25	24.46	24.5	1.009	-0.004	0.941	0.950
69	CDMA BC1	1xRTT RC3 SO32	Back	1.5cm			Battery1	With Scanner	600	1880	24.47	24.5	1.007	0.137	1.010	1.017

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (cm)	Holster	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
83	LTE Band 13	10M	QPSK	1	49	Back	1.5cm		Battery1	With Scanner	23230	782	23.97	24	1.007	-0.008	0.779	0.784
84	LTE Band 13	10M	QPSK	1	49	Back	0cm	Holster	Battery1	With Scanner	23230	782	23.97	24	1.007	-0.153	0.738	0.743
86	LTE Band 13	10M	QPSK	25	12	Back	1.5cm		Battery1	With Scanner	23230	782	22.67	23	1.079	0.081	0.547	0.590

<WLAN SAR DTS>

Plot No.	Band	Mode	Test Position	Gap (cm)	Holster	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
97	WLAN2.4GHz	802.11b 1Mbps	Back	1.5cm		Battery1	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	-0.047	0.183	0.204
98	WLAN2.4GHz	802.11b 1Mbps	Back	0cm	Holster	Battery1	With Scanner	6	2437	19.65	20	1.085	97.16	1.029	-0.085	0.167	0.186
100	WLAN2.4GHz	802.11b 1Mbps	Back	1.5cm		Battery1	With Scanner	1	2412	19.21	19.5	1.070	97.16	1.029	-0.018	0.171	0.188
101	WLAN2.4GHz	802.11b 1Mbps	Back	1.5cm		Battery1	With Scanner	11	2462	17.89	18	1.027	97.16	1.029	0.014	0.208	0.220
105	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	153	5765	16.82	17	1.042	87.26	1.146	-0.196	0.098	0.117
115	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	157	5785	16.711848	17	1.069	87.26	1.146	0	0.101	0.124
116	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	161	5805	16.7	17	1.072	87.26	1.146	0	0.085	0.104

<WLAN SAR NII>

Plot No.	Band	Mode	Test Position	Gap (cm)	Holster	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
106	WLAN5GHz	802.11a 6Mbps	Front	1.5cm		Battery1	With Scanner	40	5200	16.84	17	1.037	87.26	1.146	0.025	0.035	0.042
102	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	40	5200	16.84	17	1.037	87.26	1.146	-0.103	0.366	0.435
107	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery2	With Scanner	40	5200	16.84	17	1.037	87.26	1.146	0.051	0.307	0.365
108	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	Without Scanner	40	5200	16.84	17	1.037	87.26	1.146	-0.019	0.324	0.385
109	WLAN5GHz	802.11a 6Mbps	Back	0cm	Holster	Battery1	With Scanner	40	5200	16.84	17	1.037	87.26	1.146	-0.002	0.225	0.267
110	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	44	5220	16.84	17	1.037	87.26	1.146	-0.011	0.411	0.488
103	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	52	5260	16.86	17	1.032	87.26	1.146	-0.018	0.333	0.394
111	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	60	5300	16.52	17	1.116	87.26	1.146	-0.025	0.444	0.568
104	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	104	5520	16.67	17	1.078	87.26	1.146	0.015	0.212	0.262
112	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	112	5560	16.60	17	1.096	87.26	1.146	-0.048	0.269	0.338
113	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	128	5640	16.55	17	1.109	87.26	1.146	-0.016	0.182	0.231
114	WLAN5GHz	802.11a 6Mbps	Back	1.5cm		Battery1	With Scanner	136	5680	16.64	17	1.086	87.26	1.146	0.17	0.169	0.210

13.4 Repeated SAR Measurement

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (cm)	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
48	CDMA BC0					RTAP 153.6Kbps	Back	1cm	Battery1	With Scanner	384	836.52	24.39	24.5	1.026	-0.125	1.140	-	1.169
117	CDMA BC0					RTAP 153.6Kbps	Back	1cm	Battery1	With Scanner	384	836.52	24.39	24.5	1.026	0.02	1.120	1.02	1.149
62	CDMA BC1					1xRTT RC3 SO32	Back	1.5cm	Battery1	With Scanner	1175	1908.75	24.47	24.5	1.007	-0.027	1.330	-	1.339
118	CDMA BC1					1xRTT RC3 SO32	Back	1.5cm	Battery1	With Scanner	1175	1908.75	24.47	24.5	1.007	-0.09	1.290	1.03	1.299
72	LTE Band 13	10M	QPSK	1	49		Back	1cm	Battery1	With Scanner	23230	782	23.97	24	1.007	-0.034	1.000	-	1.007
119	LTE Band 13	10M	QPSK	1	49		Back	1cm	Battery1	With Scanner	23230	782	23.97	24	1.007	-0.05	0.998	1.00	1.005

Note:

- Per KDB 865664 D01v01r02, for each frequency band, repeated SAR measurement is required only when the measured SAR is $\geq 0.8\text{W/kg}$
- Per KDB 865664 D01v01r02, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR $< 1.45\text{W/kg}$, only one repeated measurement is required.
- The ratio is the largest SAR to the smallest SAR among original and repeated measurement.
- All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

13.5 Highest SAR Plot

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2014/1/24

#48_CDMA BC0_RTAP 153.6Kbps_Back_1cm_Ch384;Battery1;With Scanner

Communication System: CDMA ; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium: MSL_850_140124 Medium parameters used: $f = 837$ MHz; $\sigma = 0.965$ mho/m; $\epsilon_r = 54.5$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.6 °C; Liquid Temperature : 22.6 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3935; ConvF(10.09, 10.09, 10.09); Calibrated: 2013/11/4
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1399; Calibrated: 2013/11/7
- Phantom: SAM_Right; Type: SAM; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch384/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.28 mW/g

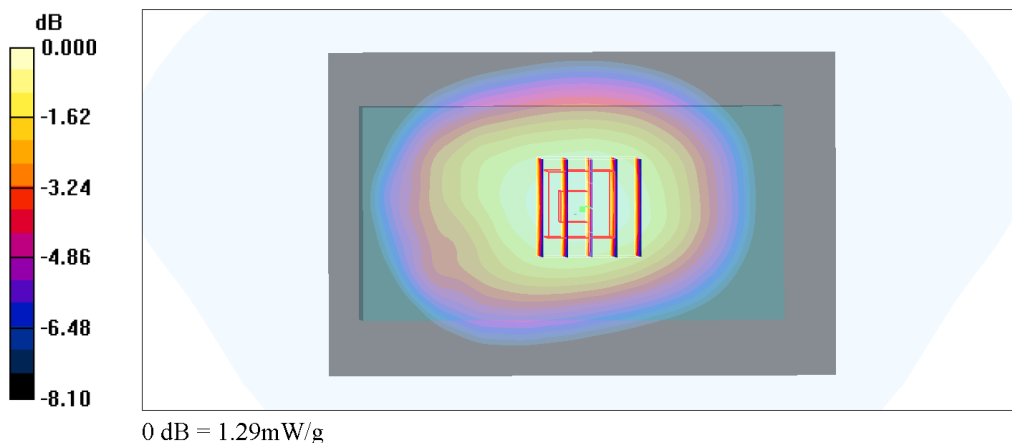
Ch384/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 37.9 V/m; Power Drift = -0.125 dB

Peak SAR (extrapolated) = 1.41 W/kg

SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.871 mW/g

Maximum value of SAR (measured) = 1.29 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2014/1/24

#62_CDMA BC1_1xRTT RC3 SO32_Back_1.5cm_Ch1175;Battery1;With Scanner

Communication System: CDMA ; Frequency: 1908.75 MHz;Duty Cycle: 1:1

Medium: MSL_1900_140124 Medium parameters used: $f = 1909$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 52.4$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3935; ConvF(7.85, 7.85, 7.85); Calibrated: 2013/11/4
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1399; Calibrated: 2013/11/7
- Phantom: SAM_Right; Type: SAM; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1175/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.71 mW/g

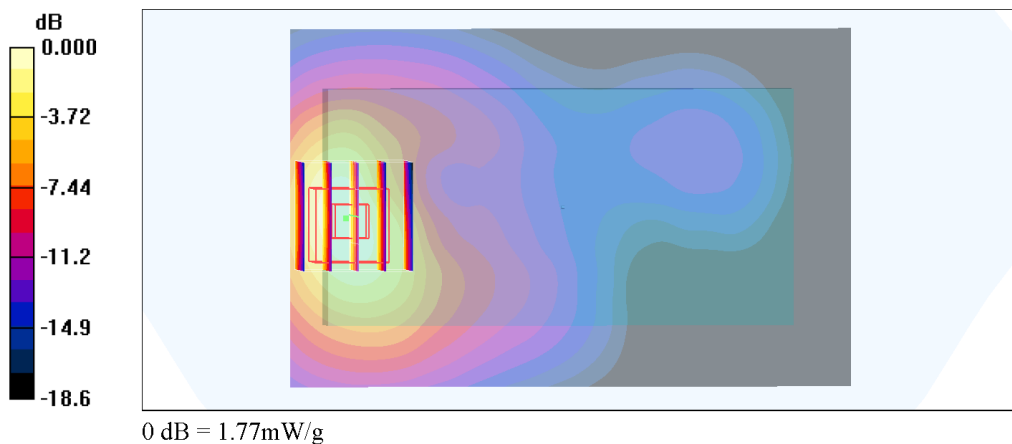
Ch1175/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 34.2 V/m; Power Drift = -0.027 dB

Peak SAR (extrapolated) = 2.17 W/kg

SAR(1 g) = 1.33 mW/g; SAR(10 g) = 0.746 mW/g

Maximum value of SAR (measured) = 1.77 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2014/1/25

#72_LTE Band 13_10M_QPSK_1RB_49offset_Back_1cm_Ch23230;Battery1;With Scanner

Communication System: LTE; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: MSL_750_140125 Medium parameters used: $f = 782 \text{ MHz}$; $\sigma = 0.986 \text{ mho/m}$; $\epsilon_r = 53.2$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.4 °C; Liquid Temperature : 22.4 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3925; ConvF(10.24, 10.24, 10.24); Calibrated: 2013/6/12
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn495; Calibrated: 2013/5/8
- Phantom: SAM_Right; Type: SAM; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch23230/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.21 mW/g

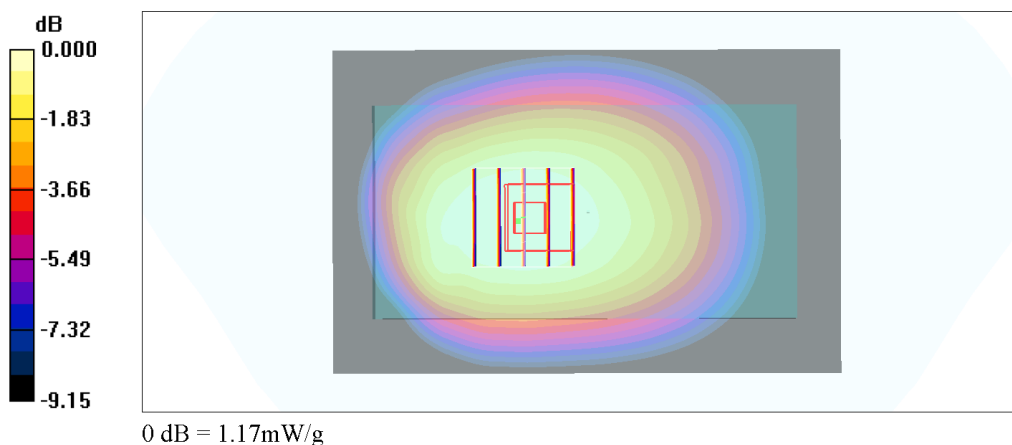
Ch23230/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 35.3 V/m; Power Drift = -0.034 dB

Peak SAR (extrapolated) = 1.30 W/kg

SAR(1 g) = 1 mW/g; SAR(10 g) = 0.753 mW/g

Maximum value of SAR (measured) = 1.17 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2014/1/28

#22_WLAN2.4GHz_802.11b 1Mbps_Right Tilted_Ch6;Battery1;With Scanner

Communication System: 802.11b ; Frequency: 2437 MHz;Duty Cycle: 1:1.029

Medium: HSL_2450_140128 Medium parameters used: $f = 2437$ MHz; $\sigma = 1.82$ mho/m; $\epsilon_r = 39.4$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.2 °C ; Liquid Temperature : 22.2 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3925; ConvF(7.25, 7.25, 7.25); Calibrated: 2013/6/12
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn495; Calibrated: 2013/5/8
- Phantom: SAM_Left; Type: SAM; Serial: TP-1150
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch6/Area Scan (81x131x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.980 mW/g

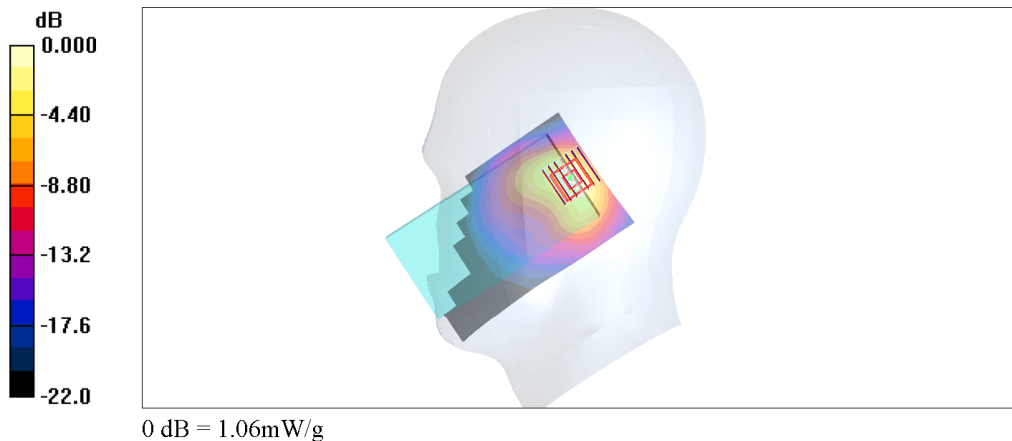
Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.7 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 1.43 W/kg

SAR(1 g) = 0.694 mW/g; SAR(10 g) = 0.323 mW/g

Maximum value of SAR (measured) = 1.06 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2014/1/29

#42_WLAN5GHz_802.11a 6Mbps_Left Cheek_Ch112;Battery1;With Scanner

Communication System: 802.11a; Frequency: 5560 MHz; Duty Cycle: 1:1.146

Medium: HSL_5G_140129 Medium parameters used: $f = 5560$ MHz; $\sigma = 5.14$ mho/m; $\epsilon_r = 34.7$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.3 °C; Liquid Temperature : 22.3 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3925; ConvF(4.73, 4.73, 4.73); Calibrated: 2013/6/12
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn495; Calibrated: 2013/5/8
- Phantom: SAM_Left; Type: SAM; Serial: TP-1150
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch112/Area Scan (121x201x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.920 mW/g

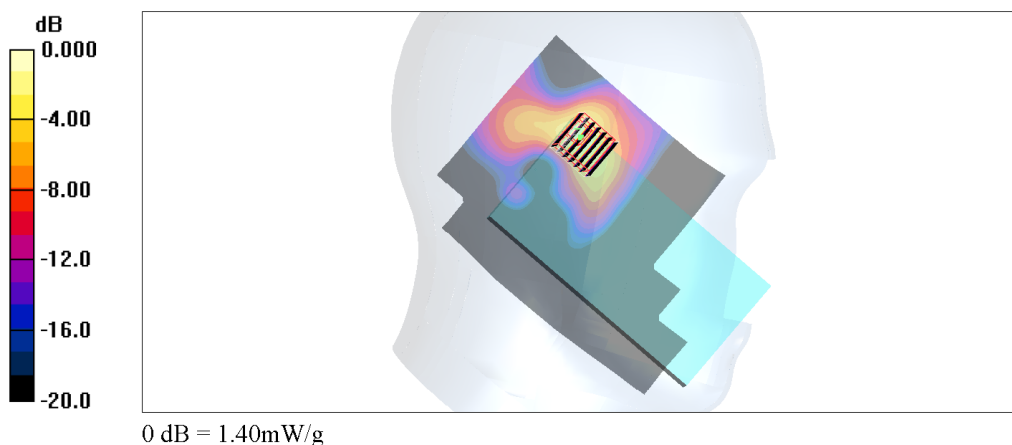
Ch112/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 16.3 V/m; Power Drift = 0.031 dB

Peak SAR (extrapolated) = 2.38 W/kg

SAR(1 g) = 0.553 mW/g; SAR(10 g) = 0.171 mW/g

Maximum value of SAR (measured) = 1.40 mW/g



14. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Phone			Note
		Head	Body-worn	Hotspot	
1.	CDMA(Voice) + WLAN2.4GHz(data)	Yes	Yes		
2.	CDMA(Voice) + Bluetooth(data)	Yes	Yes		
3.	CDMA(Voice) + WLAN5GHz(data)	Yes	Yes		
4.	CDMA(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
5.	LTE(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
6.	CDMA(Data) + Bluetooth(data)	Yes	Yes	Yes	Bluetooth Tethering
7.	LTE(Data) + Bluetooth(data)	Yes	Yes	Yes	Bluetooth Tethering
8.	CDMA(data) + WLAN5 GHz(data)	No	No	No	
9.	LTE(data) + WLAN5GHz(data)	No	No	No	

Note:

- WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
- By design, WLAN 5GHz frequency band does not support mobile hotspot operation or WiFi Direct operation, therefore, when CDMA/LTE operate in data mode cannot transmit simultaneously with WLAN 5GHz.
- EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
- The Scaled SAR summation is calculated based on the same configuration and test position.
- Per KDB 447498 D01v05r01, simultaneous transmission SAR is compliant if,
 - Scalar SAR summation < 1.6W/kg.
 - $SPLSR = (SAR_1 + SAR_2)^{1.5} / (min. \text{ separation distance, mm})$, and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the zoom scan
If $SPLSR \leq 0.04$, simultaneously transmission SAR measurement is not necessary
 - Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg
- For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r01 based on the formula below.
 - $(max. \text{ power of channel, including tune-up tolerance, mW}) / (min. \text{ test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$ for test separation distances $\leq 50 \text{ mm}$; where $x = 7.5$ for 1-g SAR, and $x = 18.75$ for 10-g SAR.
 - When the minimum test separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
 - 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

Bluetooth Max Power	Exposure Position	Head	Hotspot	Body worn	Body worn (with Holster)
	Test separation	0 mm	10 mm	15 mm	0 mm
3.0 dBm	Estimated SAR (W/kg)	0.084 W/kg	0.042 W/kg	0.028 W/kg	0.084 W/kg

14.1 Head Exposure Conditions

<WWAN + WLAN 2.4 GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Right Cheek	CDMA2000 BC0	1	0.712	21	0.741	1.45		
	CDMA2000 BC1	2	0.434	21	0.741	1.18		
	LTE Band 13	13	0.500	21	0.741	1.24		
Right Tilted	CDMA2000 BC0	3	0.547	22	0.775	1.32		
	LTE Band 13	14	0.301	22	0.775	1.08		
Left Cheek	CDMA2000 BC0	4	0.697	23	0.573	1.27		
	LTE Band 13	15	0.477	23	0.573	1.05		
Left Tilted	CDMA2000 BC0	5	0.461	24	0.601	1.06		
	LTE Band 13	16	0.291	24	0.601	0.89		

<WWAN + WLAN 5.2 GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Right Cheek	CDMA2000 BC0	1	0.712	29	0.366	1.08		
	CDMA2000 BC1	2	0.434	29	0.366	0.80		
Right Tilted	CDMA2000 BC0	3	0.547	33	0.348	0.90		
Left Cheek	CDMA2000 BC0	4	0.697	38	0.537	1.23		
Left Tilted	CDMA2000 BC0	5	0.461	35	0.392	0.85		

<WWAN + WLAN 5.3 GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Right Cheek	CDMA2000 BC0	1	0.712	30	0.33	1.04		
	CDMA2000 BC1	2	0.434	30	0.33	0.76		
Right Tilted	CDMA2000 BC0	3	0.547			0.55		
Left Cheek	CDMA2000 BC0	4	0.697	39	0.629	1.33		
Left Tilted	CDMA2000 BC0	5	0.461			0.46		

<WWAN + WLAN 5.5 GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Right Cheek	CDMA2000 BC0	1	0.712	31	0.210	0.92		
	CDMA2000 BC1	2	0.434	31	0.210	0.64		
Right Tilted	CDMA2000 BC0	3	0.547			0.55		
Left Cheek	CDMA2000 BC0	4	0.697	42	0.695	1.39		
Left Tilted	CDMA2000 BC0	5	0.461			0.46		

<WWAN + WLAN 5.8 GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Right Cheek	CDMA2000 BC0	1	0.712	32	0.216	0.93		
	CDMA2000 BC1	2	0.434	32	0.216	0.65		
Right Tilted	CDMA2000 BC0	3	0.547			0.55		
Left Cheek	CDMA2000 BC0	4	0.697	45	0.595	1.29		
Left Tilted	CDMA2000 BC0	5	0.461			0.46		

<WWAN + Bluetooth>

Position	WWAN			Bluetooth	Summed SAR (W/kg)
	WWAN Band	Plot No	SAR (W/kg)	Estimated SAR (W/kg)	
Right Cheek	CDMA2000 BC0	1	0.712	0.084	0.80
	CDMA2000 BC1	2	0.434	0.084	0.52
	LTE Band 13	13	0.500	0.084	0.58
Right Tilted	CDMA2000 BC0	3	0.547	0.084	0.63
	LTE Band 13	14	0.301	0.084	0.39
Left Cheek	CDMA2000 BC0	4	0.697	0.084	0.78
	LTE Band 13	15	0.477	0.084	0.56
Left Tilted	CDMA2000 BC0	5	0.461	0.084	0.55
	LTE Band 13	16	0.291	0.084	0.38

14.2 Hotspot Exposure Conditions

<WWAN + WLAN 2.4 GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Front	CDMA2000 BC0			87	0.287	0.29		
	CDMA2000 BC1	50	0.711	87	0.287	1.00		
	LTE Band 13	73	0.715	87	0.287	1.00		
Back	CDMA2000 BC0	48	1.169	88	0.373	1.54		
	CDMA2000 BC1	49	1.332	88	0.373	1.71	0.02	1
	CDMA2000 BC1	57	1.278	88	0.373	1.65	0.02	2
	CDMA2000 BC1	58	1.278	88	0.373	1.65	0.02	3
	CDMA2000 BC1	49	1.332	95	0.330	1.66	0.02	4
	CDMA2000 BC1	57	1.278	95	0.330	1.61	0.02	5
	CDMA2000 BC1	58	1.278	95	0.330	1.61	0.02	6
	CDMA2000 BC1	49	1.332	96	0.334	1.67	0.02	7
	CDMA2000 BC1	57	1.278	96	0.334	1.61	0.02	8
	CDMA2000 BC1	58	1.278	96	0.334	1.61	0.02	9
	LTE Band 13	72	1.007	88	0.373	1.38		
Left Side	CDMA2000 BC1	52	0.081			0.08		
	LTE Band 13	75	0.640			0.64		
Right Side	CDMA2000 BC0			89	0.278	0.28		
	CDMA2000 BC1	51	0.202	89	0.278	0.48		
	LTE Band 13	74	0.678	89	0.278	0.96		
Top Side	CDMA2000 BC0			92	0.245	0.25		
	CDMA2000 BC1			92	0.245	0.25		
	LTE Band 13			92	0.245	0.25		
Bottom Side	CDMA2000 BC1	53	1.312			1.31		
	LTE Band 13	77	0.083			0.08		



<WWAN + Bluetooth>

Position	WWAN			Bluetooth	Summed SAR (W/kg)
	WWAN Band	Plot No	SAR (W/kg)	Estimated SAR (W/kg)	
Front	CDMA2000 BC0			0.042	0.04
	CDMA2000 BC1	50	0.711	0.042	0.75
	LTE Band 13	73	0.715	0.042	0.76
Back	CDMA2000 BC0	48	1.169	0.042	1.21
	CDMA2000 BC1	49	1.332	0.042	1.37
	CDMA2000 BC1	57	1.278	0.042	1.32
	CDMA2000 BC1	58	1.278	0.042	1.32
	CDMA2000 BC1	49	1.332	0.042	1.37
	CDMA2000 BC1	57	1.278	0.042	1.32
	CDMA2000 BC1	58	1.278	0.042	1.32
	CDMA2000 BC1	49	1.332	0.042	1.37
	CDMA2000 BC1	57	1.278	0.042	1.32
	CDMA2000 BC1	58	1.278	0.042	1.32
	LTE Band 13	72	1.007	0.042	1.05
Left Side	CDMA2000 BC0			0.042	0.04
	CDMA2000 BC1	52	0.081	0.042	0.12
	LTE Band 13	75	0.640	0.042	0.68
Right Side	CDMA2000 BC0			0.042	0.04
	CDMA2000 BC1	51	0.202	0.042	0.24
	LTE Band 13	74	0.678	0.042	0.72
Top Side	CDMA2000 BC0			0.042	0.04
	CDMA2000 BC1			0.042	0.04
	LTE Band 13			0.042	0.04
Bottom Side	CDMA2000 BC0			0.042	0.04
	CDMA2000 BC1	53	1.312	0.042	1.35
	LTE Band 13	77	0.083	0.042	0.13

14.3 Body-Worn Exposure Conditions

<WWAN + WLAN 2.4 GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Back	CDMA2000 BC0	61	0.990	101	0.220	1.21		
	CDMA2000 BC1	62	1.339	101	0.220	1.56		
	LTE Band 13	83	0.784	101	0.220	1.00		
Back (with Headset)	CDMA2000 BC1	65	1.299			1.30		

<WWAN + WLAN 5.2 GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Back	CDMA2000 BC0	61	0.99	110	0.488	1.48		
	CDMA2000 BC1	62	1.339	110	0.488	1.83	0.02	10
	CDMA2000 BC1	62	1.339	102	0.435	1.77	0.02	11
Back (with Headset)	CDMA2000 BC1	65	1.299			1.30		

<WWAN + WLAN 5.3 GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Back	CDMA2000 BC0	61	0.99	111	0.568	1.56		
	CDMA2000 BC1	62	1.339	111	0.568	1.91	0.02	12
	CDMA2000 BC1	62	1.339	103	0.394	1.73	0.02	13
Back (with Headset)	CDMA2000 BC1	65	1.299			1.30		

<WWAN + WLAN 5.5 GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Back	CDMA2000 BC0	61	0.99	112	0.338	1.33		
	CDMA2000 BC1	62	1.339	112	0.338	1.68	0.02	14
	CDMA2000 BC1	62	1.339	104	0.262	1.60	0.02	15
Back (with Headset)	CDMA2000 BC1	65	1.299			1.30		

<WWAN + WLAN 5.8 GHz Band>

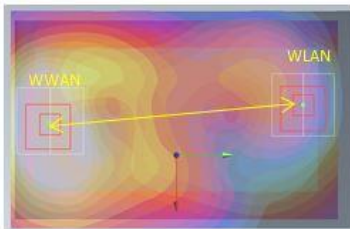
Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Back	CDMA2000 BC0	61	0.99	115	0.124	1.11		
	CDMA2000 BC1	62	1.339	115	0.124	1.46		
Back (with Headset)	CDMA2000 BC1	65	1.299			1.30		

<WWAN + Bluetooth>

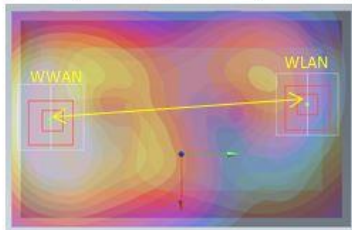
Position	WWAN			Bluetooth	Summed SAR (W/kg)
	WWAN Band	Plot No	SAR (W/kg)	Estimated SAR (W/kg)	
Back	CDMA2000 BC0	61	0.990	0.028	1.02
	CDMA2000 BC1	62	1.339	0.028	1.37
	LTE Band 13	83	0.784	0.028	0.81
Back (with Headset)	CDMA2000 BC1	65	1.299	0.028	1.33

14.4 SPLSR Evaluation and Analysis

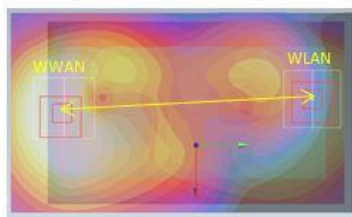
Case 1	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
49	CDMA BC1	Back	1.332	0	-0.0165	-0.061	-0.202	122.4	1.71	0.02	Not required
88	WLAN2.4G		0.373	0	-0.0242	0.0612	-0.203				



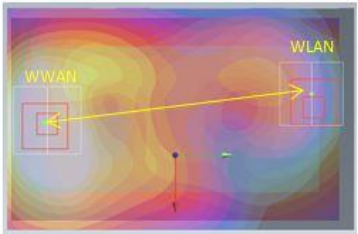
Case 2	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
57	CDMA BC1	Back	1.278	0	-0.018	-0.0635	-0.202	124.9	1.65	0.02	Not required
88	WLAN2.4G		0.373	0	-0.0242	0.0612	-0.203				



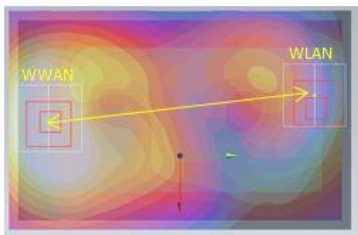
Case 3	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
58	CDMA BC1	Back	1.278	0	-0.0195	-0.0695	-0.202	130.8	1.65	0.02	Not required
88	WLAN2.4G		0.373	0	-0.0242	0.0612	-0.203				



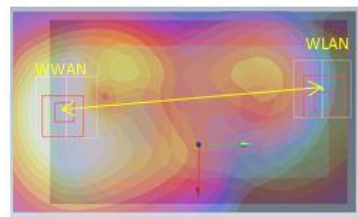
Case 4	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
49	CDMA BC1	Back	1.332	0	-0.0165	-0.061	-0.202	125.8	1.66	0.02	Not required
95	WLAN2.4G		0.33	0	-0.019	0.0648	-0.203				



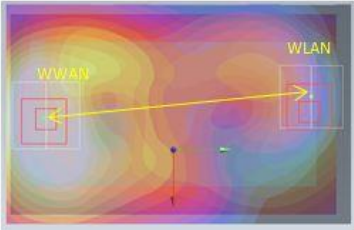
Case 5	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
57	CDMA BC1	Back	1.278	0	-0.018	-0.0635	-0.202	128.3	1.61	0.02	Not required
95	WLAN2.4G		0.33	0	-0.019	0.0648	-0.203				



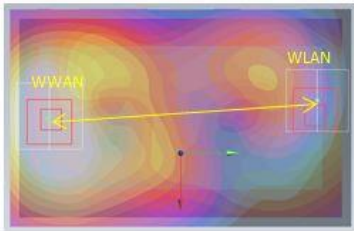
Case 6	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
58	CDMA BC1	Back	1.278	0	-0.0195	-0.0695	-0.202	134.3	1.61	0.02	Not required
95	WLAN2.4G		0.33	0	-0.019	0.0648	-0.203				



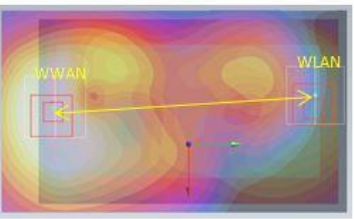
Case 7	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
49	CDMA BC1	Back	1.332	0	-0.0165	-0.061	-0.202	127.0	1.67	0.02	Not required
96	WLAN2.4G		0.334	0	-0.0154	0.066	-0.203				



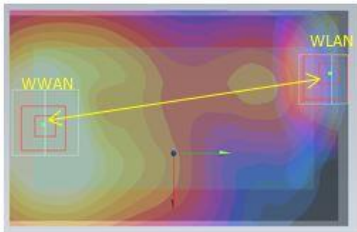
Case 8	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
57	CDMA BC1	Back	1.278	0	-0.018	-0.0635	-0.202	129.5	1.61	0.02	Not required
96	WLAN2.4G		0.334	0	-0.0154	0.066	-0.203				



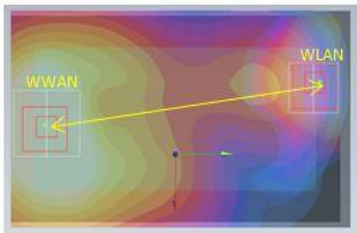
Case 9	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
58	CDMA BC1	Back	1.278	0	-0.0195	-0.0695	-0.202	135.6	1.61	0.02	Not required
96	WLAN2.4G		0.334	0	-0.0154	0.066	-0.203				



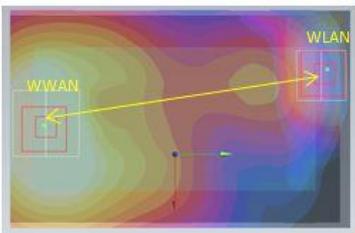
Case 10	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
62	CDMA BC1	Back	1.339	0	-0.015	-0.0625	-0.202	141.7	1.83	0.02	Not required
110	WLAN5G Band I		0.488	0	-0.04	0.077	-0.203				



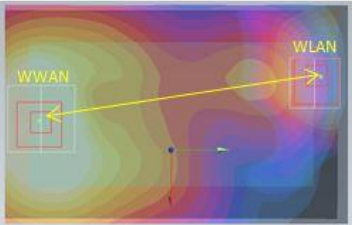
Case 11	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
62	CDMA BC1	Back	1.339	0	-0.015	-0.0625	-0.202	131.2	1.77	0.02	Not required
102	WLAN5G Band I		0.435	0	-0.036	0.067	-0.203				



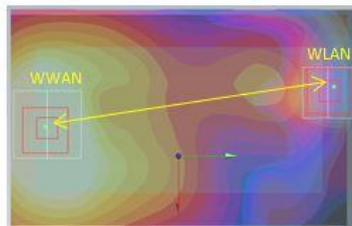
Case 12	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
62	CDMA BC1	Back	1.339	0	-0.015	-0.0625	-0.202	135.5	1.91	0.02	Not required
111	WLAN5G Band II		0.568	0	-0.038	0.071	-0.203				



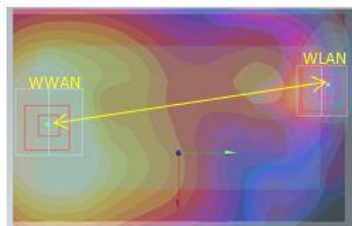
Case 13	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
62	CDMA BC1	Back	1.339	0	-0.015	-0.0625	-0.202	133.2	1.73	0.02	Not required
103	WLAN5G Band II		0.394	0	-0.036	0.069	-0.203				



Case 14	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
62	CDMA BC1	Back	1.339	0	-0.015	-0.0625	-0.202	134.3	1.68	0.02	Not required
112	WLAN5G Band III		0.338	0	-0.03	0.071	-0.203				



Case 15	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
62	CDMA BC1	Back	1.339	0	-0.015	-0.0625	-0.202	132.4	1.60	0.02	Not required
104	WLAN5G Band III		0.262	0	-0.03	0.069	-0.203				



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15. Uncertainty Assessment

The component of uncertainty may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainty by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table 14.1

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor ^(a)	1/k ^(b)	1/√3	1/√6	1/√2

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

Table 15.1. Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.0	Normal	1	1	1	± 6.0 %	± 6.0 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.4	Rectangular	√3	1	1	± 0.2 %	± 0.2 %
Probe Positioning	2.9	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Max. SAR Eval.	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 11.0 %	± 10.8 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						± 22.0 %	± 21.5 %

Table 15.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.55	Normal	1	1	1	± 6.55 %	± 6.55 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Probe Positioning	9.9	Rectangular	√3	1	1	± 5.7 %	± 5.7 %
Max. SAR Eval.	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 12.8 %	± 12.6 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						± 25.6 %	± 25.2 %

Table 15.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

16. References

- [1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
- [2] ANSI/IEEE Std. C95.1-1992, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", September 1992
- [3] IEEE Std. 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 248227 D01 v01r02, "SAR Measurement Procedures for 802.11 a/b/g Transmitters", May 2007
- [6] FCC KDB 447498 D01 v05r01, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", May 2013
- [7] FCC KDB 648474 D04 v01r01r02, "SAR Evaluation Considerations for Wireless Handsets", Dec 2013
- [8] FCC KDB 941225 D05 v02r03, "SAR Evaluation Considerations for LTE Devices", Dec 2013
- [9] FCC KDB 941225 D06 v01r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", May 2013
- [10] FCC KDB 865664 D01 v01r02, "SAR Measurement Requirements for 100 MHz to 6 GHz", Dec 2013.