Industrial Internet Innovation Center (Shanghai) Co.,Ltd.

SAR TEST REPORT

PRODUCT	4G Smart Phone
BRAND	MobiWire,MobiWire,Vodafone,Orange
MODEL	H5028,Smart Green,Vodafone Lite,Orange Neva sparkle
FCC ID	QPN-H5028
APPLICANT	MobiWire SAS
ISSUE DATE	November 7, 2022
STANDARD(S)	ANSI/IEEE C95.1-1992, IEEE std 1528-2013

Prepared by: Chen Jintao **Reviewed by: Yan Hang** **Approved by: Zhang Min**

CONTENTS

1 Summary of Test Report

1.1 Test Standard (s)

No.	Test Standard(s)	Title	Version
1	ANSI/IEEE C95.1	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.	1992
2	IEEE Std 1528	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.	2013

1.2 Reference Documents

No.	Reference Document(s)	Title	Version
1	KDB447498	General RF Exposure Guidance	D01 v06
2	KDB865664	SAR Measurement 100 MHz to 6 GHz	D01 v01r04
3	KDB865664	RF Exposure Reporting	D02 v01r02
4	KDB941225	3G SAR Procedures	D01 v03r01
5	KDB941225	SAR for LTE Devices	D05 v02r05
6	KDB941225	Hotspot SAR	D06 v02r01
7	KDB248227	802.11 Wi-Fi SAR	D01 v02r02

1.3 Summary of Test Results

1.3.1 The maximum results of Specific Absorption Rate (SAR) in standalone mode are as follows.

Band	Reported SAR 1g(W/Kg)			Detailed Results
	Head	Worn(10mm)	Hotspot(10mm)	
GSM850	0.355	1.032	1.032	See section 14.1
GSM1900	0.226	0.712	1.423	See section 14.1
WCDMA Band Ⅱ	0.191	0.464	1.048	See section 14.1
WCDMA Band Ⅴ	0.420	0.807	0.807	See section 14.1
LTE Band7	0.257	0.835	1.400	See section 14.1
Wi-Fi 2.4G	0.612	0.168	0.168	See section 14.1
Wi-Fi 5G	0.414	0.243	0.243	See section 14.1
NOTE1: The H5028,Smart Green,Vodafone Lite,Orange Neva sparkle manufactured by MobiWire SAS is a new product for testing. NOTE2: Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 4 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 1 of this test report.				

1.3.2 The maximum results of Specific Absorption Rate (SAR) in simultaneous mode are as follows.

Highest Reported SAR 1g(W/kg)			
Mode	Position	Simultaneous Transmission SAR	Detailed Results
WCDMA Band Ⅴ &Wi-Fi 2.4G	Head	0.968	See section 14.2
GSM850&Wi-Fi 5G	Worn(10mm)	1.275	See section 14.2
GSM1900&Wi-Fi 2.4G	Hotspot(10mm)	1.423	See section 14.2

2 General Information of The Laboratory

2.1 Testing Laboratory

Lab Name	Industrial Internet Innovation Center (Shanghai) Co.,Ltd.
Address	Building 4， No. 766， Jingang Road， Pudong， Shanghai， China
Telephone	021-68866880
FCC Registration No.	958356
FCC Designation No.	CN1177

2.2 Laboratory Environmental Requirements

Temperature	18℃~25℃
Relative Humidity	25%RH~75%RH

2.3 Project Information

Project Manager	Xu Yuting
Test Date	September 29, 2022 to October 18,2022

3 General Information of The Customer

3.1 Applicant

Company	MobiWire SAS
Address	107 Boulevard de la Mission Marchand, 92400 Courbevoie, France.
Telephone	+33625028368

3.2 Manufacturer

Company	MobiWire SAS
Address	107 Boulevard de la Mission Marchand, 92400 Courbevoie, France.

4 General Information of The Product

4.1 Product Description for Equipment under Test (EUT)

Product	4G Smart Phone
Model	H5028,Smart Green,Vodafone Lite,Orange Neva sparkle
Date of Receipt	September 23, 2022
EUT ID*	S04aa
SN/IMEI	352243540001872/352243540001880
Supported Radio Technology and Bands	GSM850/GSM900/GSM1800/GSM1900 WCDMA Band I/Band II/Band V/Band VIII LTE Band 1/3/7/20/28 BT5.0,BLE Wi-Fi 802.11b/g/n/a
Tx Frequency	824.2-848.8 MHz (GSM850) 1850.2-1909.8 MHz (GSM1900) 1852.4-1907.6 MHz (WCDMA Band Ⅱ) 826.4-846.6 MHz (WCDMA Band V) 2502.5-2567.5 MHz (LTE Band7) 2412-2462 MHz (Wi-Fi 2.4G) 5180-5240 MHz (U-NII-1) 5260-5320 MHz (U-NII-2A) 5500-5720 MHz (U-NII-2C) 5745-5825 MHz (U-NII-3) 2402-2480 MHz (BT)
Hardware Version	V01A
Software Version	Mobiwire_H5028_V01
Dimension	140.8mmx67.8mmx10.7mm
NOTE: EUT ID is the internal identification code of the laboratory.	

4.2 Description for Auxiliary Equipment (AE)

AE ID*	Description	Model	SN/Remark
BA02	Battery	178227880	27880V2061003597
AA03	Headset	JWEP1191-M01H	N/A
NOTE: AE ID is the internal identification code of the laboratory.			

5 Test Configuration Information

5.1 Test Equipments Utilized

No.	Name	Model	S/N	Manufacturer	Cal. Date	Cal. Interval
1	Network analyzer	N5242A	MY51221755	Agilent	Oct.23, 2021	1 Year
2	Power meter	NRX	103851	R&S	Aug.22, 2022	1 Year
3	Power sensor	NRP18S-10	101841	R&S	Aug.22, 2022	1 Year
4	Power sensor	NRP18S-10	101842	R&S	Aug.22, 2022	1 Year
5	Signal Generator	E8247C	MY43000157	Agilent	Aug.22, 2022	1 Year
6	Amplifier	NTWAP-07605	22039018	RFLIGHT	Aug.22, 2022	1 Year
7	BTS	MT8820C	6201240338	Anritsu	Oct.23, 2021	1 Year
8	BTS	CMU200	123102	R&S	Aug.23, 2022	1 Year
9	E-field Probe	EX3DV4	7633	SPEAG	Mar.31, 2022	1 Year
10	DAE	DAE4	1244	SPEAG	Mar.9, 2022	1 Year
11	Dipole Validation Kit	D835V2	4d112	SPEAG	Sept.21, 2022	1 Year
12	Dipole Validation Kit	D1900V2	5d232	SPEAG	Dec.3, 2021	1 Year
13	Dipole Validation Kit	D2450V2	858	SPEAG	Sept.19, 2022	1 Year
14	Dipole Validation Kit	D2600V2	1031	SPEAG	Sept.21, 2022	1 Year
15	Dipole Validation Kit	D5GHzV2	1172	SPEAG	Mar.15, 2022	1 Year

5.2 Measurement Uncertainty

Item	Uncertainty
SAR	$U_{SAR(1g)}$=21.70%, $U_{SAR(10g)}$=21.44%

NOTE: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

5.3 EUT Connection Diagram of Test System

5.3.1 SAR

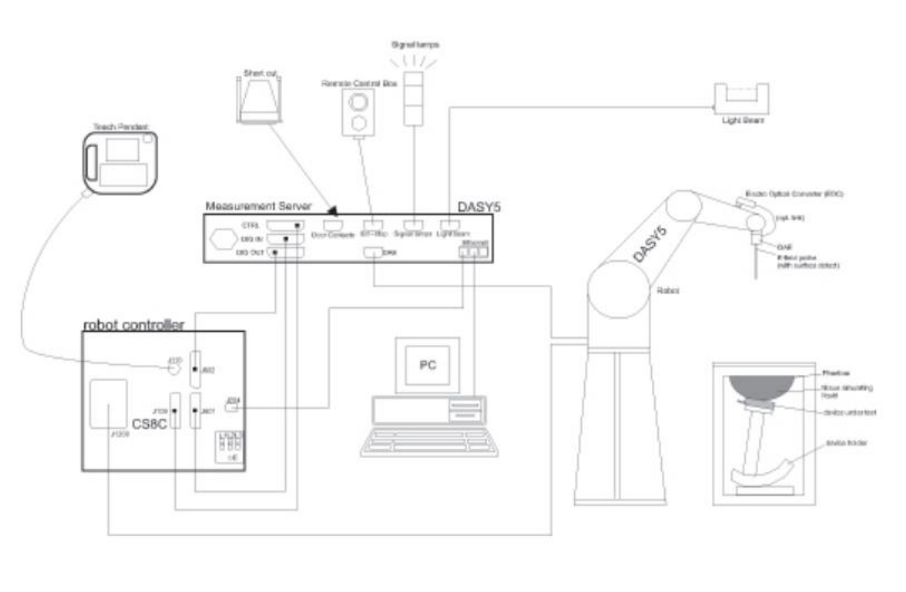


Figure 5.3.1-1 SAR Connection Diagram

6 Specific Absorption Rate(SAR)

6.1 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.

6.2 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 head 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 tissue, which is normally set to 1g/cm^3

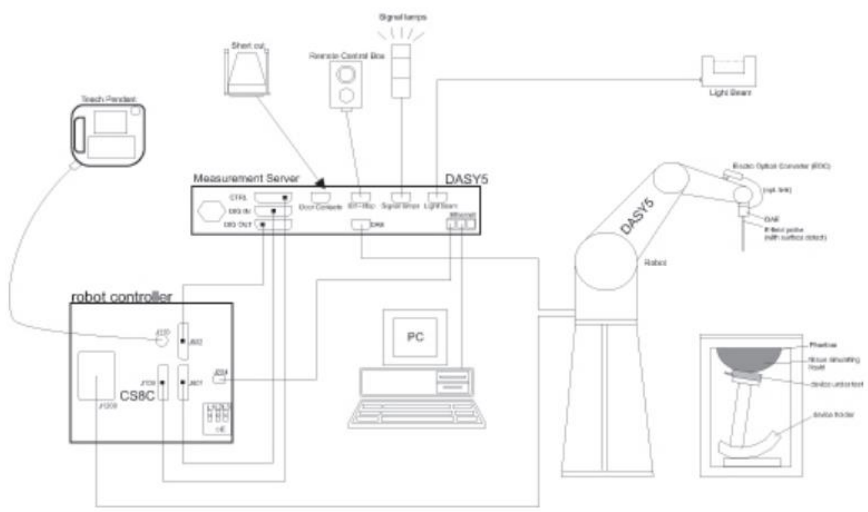
E is the RMS electrical field strength

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

7 SAR Measurement System Introduction

7.1 Measurement Set-up

The DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Figures 7.1-1 SAR Measurement Set-up

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

The phantom, the device holder and other accessories according to the targeted measurement.

7.2 E-field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY software reads the reflection during a software approach and looks for the maximum using 2nd order curve fitting. The approach is stopped at reaching the maximum.

Probe Specifications	
Model	EX3DV4
Frequency Range	4 MHz – 10 GHz
Calibration	In head simulating tissue at frequency from 650MHz to 5900MHz
Linearity	±0.2 dB (30 MHz – 10 GHz)
Dynamic Range	10 µW/g – >100 mW/g
Probe Length	337 mm
Probe Tip Length	20 mm
Body Diameter	12 mm
Tip Diameter	2.5 mm
Tip-Center	1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better than 30%.

Figure 7.2-1 Detail of Probe

Figure 7.2-2 E-field Probe

7.3 E-field Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm2) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm2..

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:

Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

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

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

7.4 Other Test Equipment

7.4.1 Data Acquisition Electronics (DAE)

The data acquisition electronics consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

Figure 7.4.1-1: DAE

7.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX90) type from Stäubli SA (France).
For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application

- ➢ High precision (repeatability 0.02mm)
- ➢ High reliability (industrial design)
- ➢ Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- ➢ Jerk-free straight movements (brushless synchronal motors; no stepper motors)
- ➢ Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Figure 7.4.2-1: DASY5

7.4.3 Measurement Server

The DASY5 measurement server is based on a PC/104 CPU board with a 400 MHz intel ULV Celeron, 128 MB chipdisk and 128 MB RAM. The necessary circuits for communication with either the DAE4 (or DAE3) electronics box as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.

Figure 7.4.3-1 Server for DASY5

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

7.4.4 Device Holder for Phantom

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

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


Figure 7.4.4-1: Device Holder

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

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 positioner. The extension is fully compatible with the Twin-SAM and ELI phantoms.	 Figure 7.4.4-2: Laptop Extension Kit
The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε =3 and loss tangent δ =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.	

7.4.5 Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

Shell Thickness	2 ± 0.2 mm	 Figure 7.4.5-1: SAM Twin Phantom
Available	Special	
Filling Volume	Approx. 25 liters	
Dimensions	810 mm x l000 mm x 500 mm (H x L x W)	

8 Test Position in Relation to the Phantom

8.1 General considerations

This standard specifies two handset test positions against the head phantom – the “cheek” position and the “tilt” position.

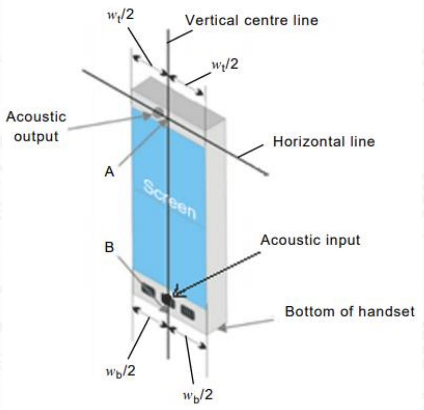


Figure 8.1-1 full touch screen smart phone (top)

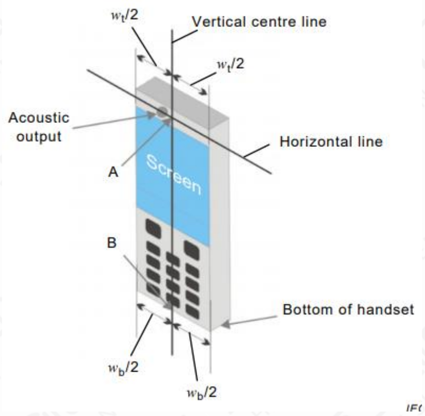


Figure 8.1-2 keyboard handset (bottom)

W_t	Width of the handset at the level of the acoustic output
W_b	Width of the bottom of the handset
A	Midpoint of the width W_t of the DUT at the level of the acoustic output
B	Midpoint of the width W_b of the bottom of the handset

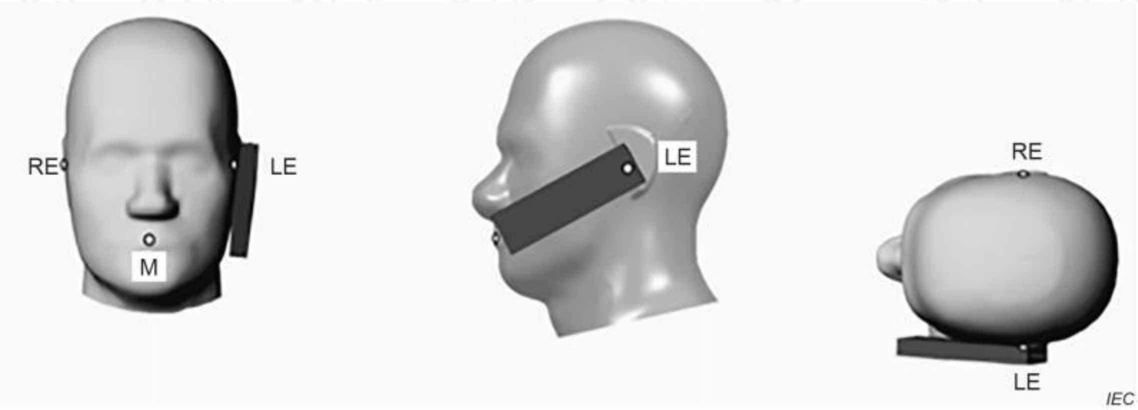


Figure 8.1-3 Cheek position of the wireless device on the left side of SAM

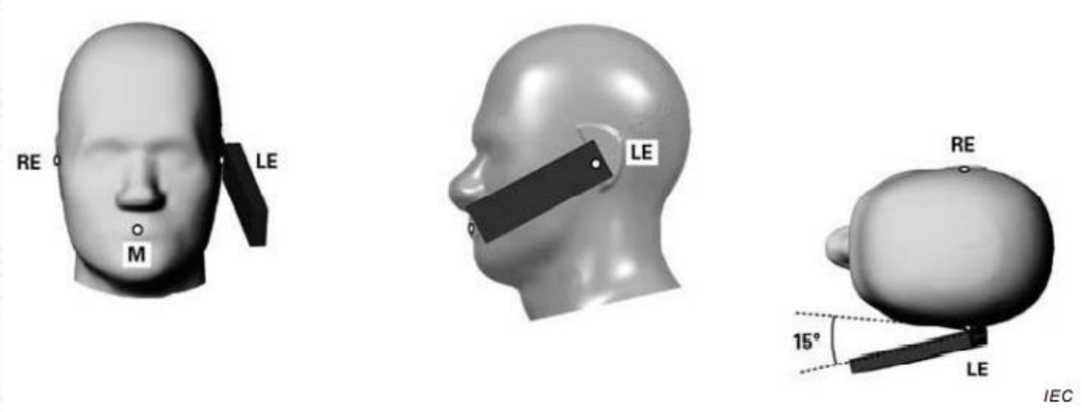


Figure 8.1-4 Tilt position of the wireless device on the left side of SAM

8.2 Body-worn device

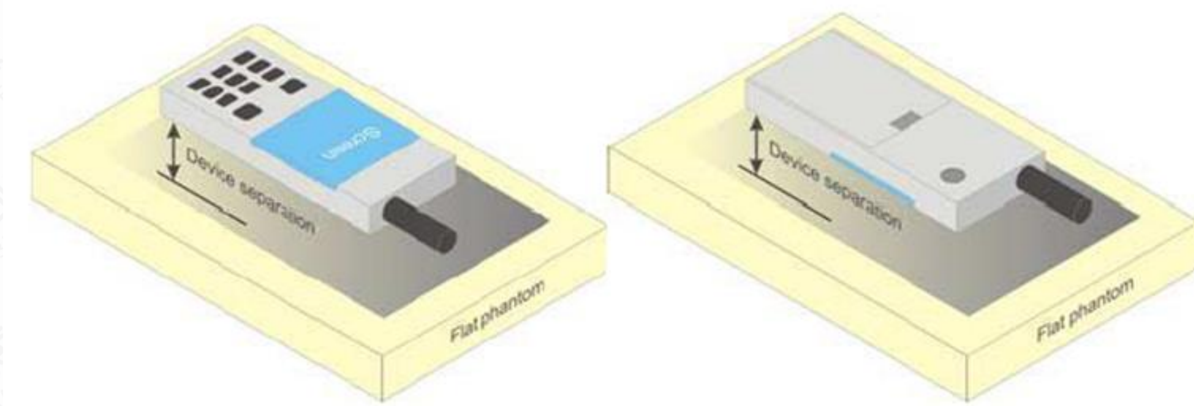
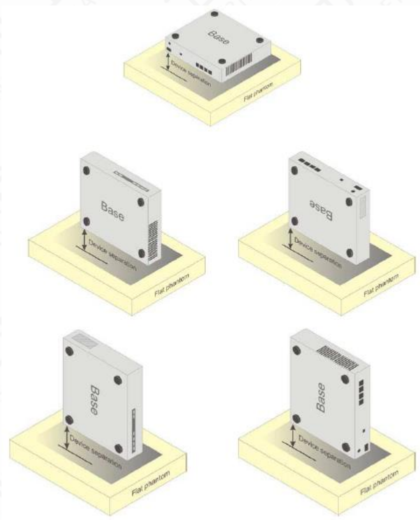


Figure 8.2-1 Test positions for body-worn devices

A typical example of a body-worn device is a mobile phone, wireless enabled PDA (personal digital assistant) or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer.

8.3 Desktop device

<table>
<tr><td>A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.</td><td rowspan="4">
Figure 8.3-1 Test positions for desktop devices</td></tr>
<tr><td>The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions.</td></tr>
<tr><td>Tests shall be performed for all antenna positions specified.</td></tr>
<tr><td>Picture 8-6 shows positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat</td></tr>
</table>

9 Tissue Simulating Liquids

9.1 Equivalent Tissues Composition

The liquid used for the frequency range of 650-6000 MHz consisted of water, sugar, salt, preventol, glycol monobutyl and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table 9.1 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE Std 1528.

Table 9.1-1: Composition of the Head Tissue Equivalent Matter

Frequency (MHz)	**835**	**900**	**1800**	**1950**	**2300**	**2450**	**2600**	**5800**
Ingredients (% by weight)								
Water	41.45	40.92	55.242	54.89	56.34	58.79	58.79	65.53
Sugar	56.0	56.5	/	/	/	/	/	
Salt	1.45	1.48	0.306	0.18	0.14	0.06	0.06	
Preventol	0.1	0.1	/	/	/	/	/	
Cellulose	1.0	1.0	/	/	/	/	/	
GlycolMonobutyl	/	/	44.452	44.93	43.52	41.15	41.15	
Diethylenglycol momohexylether	/	/	/	/	/	/	/	17.24
Triton X-100	/	/	/	/	/	/	/	17.23
Dielectric Parameters Target Value	ε=41.5 σ=0.90	ε=41.5 σ=0.97	ε=40.0 σ=1.40	ε=40.0 σ=1.40	ε=39.5 σ=1.67	ε=39.2 σ=1.80	ε=39.0 σ=1.96	ε=35.3 σ=5.27

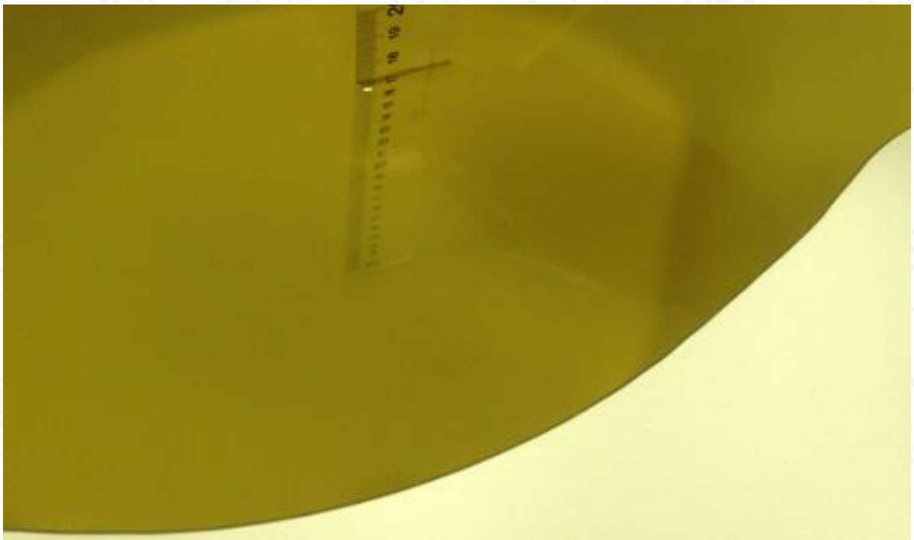
Table 9.1-2: Targets for tissue simulating liquid

Frequency (MHz)	Liquid Type	Conductivity (σ)	± 5% Range	Permittivity (ε)	± 5% Range
835	Head	0.90	0.874~0.97	41.5	39.4~43.6
900	Head	0.97	0.92~1.02	41.5	39.4~43.6
1800	Head	1.40	1.33~1.47	40.0	38.0~42.0
1950	Head	1.40	1.33~1.47	40.0	38.0~42.0
2300	Head	1.67	1.59~1.75	39.5	37.5~41.4
2450	Head	1.80	1.71~1.89	39.2	37.2~41.2
2600	Head	1.96	1.86~2.06	39.0	37.5~40.95
5200	Head	4.66	4.43~4.89	35.99	34.19~37.79
5300	Head	4.76	4.52~4.99	35.87	34.08~37.66
5500	Head	4.96	4.71~5.2	35.6	33.82~37.38
5600	Head	5.07	4.82~5.32	35.53	33.75~37.30
5800	Head	5.27	5.01~5.53	35.3	33.54~37.05

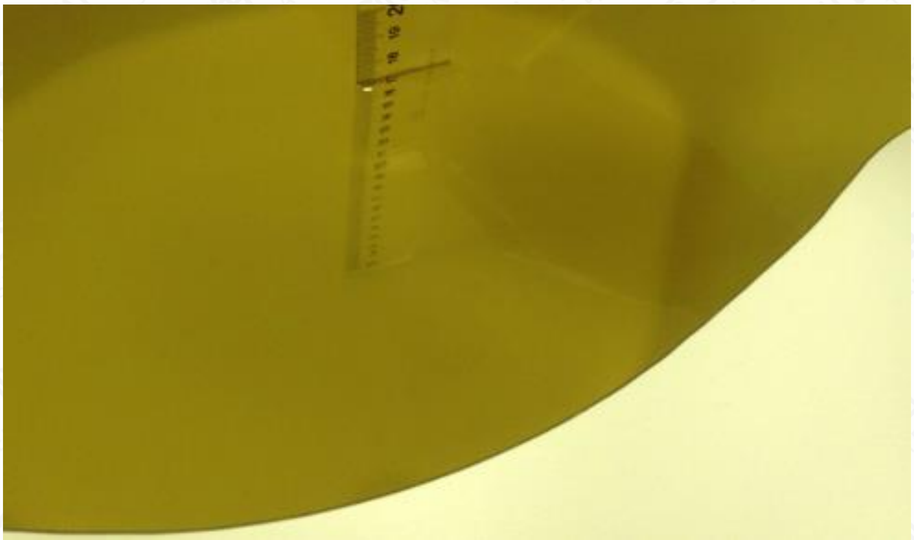
9.2 Liquid depth

The Measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0±0.2mm (bottom Plate) filled with Body or Head simulating Liquid.

The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm with ≤ ±0.5 cm variation for SAR measurements ≤ 3 GHz and ≥ 10.0 cm with ≤± 0.5 cm variation for measurements > 3 GHz.



Picture 9.2-1 Liquid depth in the Flat Phantom for SAR measurements ≤ 3 GHz



Picture 9.2-2 Liquid depth in the Flat Phantom for SAR measurements > 3 GHz

9.3 Dielectric Performance of TSL

Table 9.3-1: Dielectric Performance of Head Tissue Simulating Liquid

Tissue Simulating Liquid								
Frequency (MHz)	Head(Standard)		Temperature	Date	Test Result		Deviation (%)	
	Permittivity ε	Conductivity σ			Permittivity ε	Conductivity σ	Permittivity ε	Conductivity σ
835	41.50	0.90	20.4℃	September 29, 2022	42.995	0.920	3.60%	2.22%
835	41.50	0.90	20.2℃	October 9, 2022	43.221	0.899	4.15%	-0.11%
1900	40.00	1.40	20.0℃	October 13, 2022	39.849	1.395	-0.38%	-0.36%
1900	40.00	1.40	20.2℃	October 18, 2022	39.526	1.425	-1.18%	1.79%
2450	39.20	1.80	20.3℃	October 9, 2022	38.246	1.828	-2.43%	1.56%
2600	39.00	1.96	20.4℃	September 26, 2022	37.599	1.935	-3.59%	-1.28%
5200	36.00	4.66	20.4℃	October 10, 2022	36.151	4.735	0.42%	1.61%
5600	35.50	5.07	20.4℃	October 10, 2022	35.356	5.203	-0.41%	2.62%
5800	35.30	5.27	20.4℃	October 10, 2022	34.916	5.436	-1.09%	3.15%

10 System Check

10.1 System Check

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.

10.2 System Setup

In the simplified setup for system evaluation, the DUT 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:

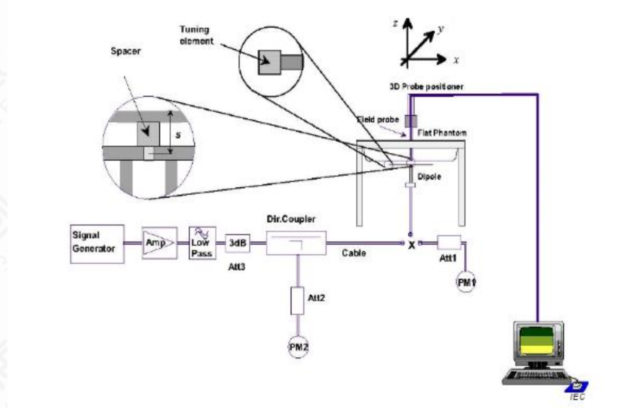


Figure 10.2-1 Set-up for the system check

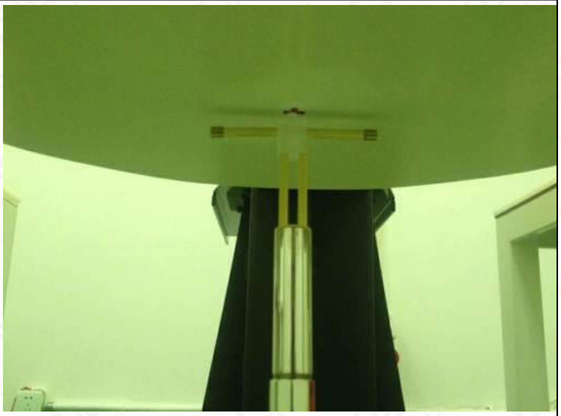


Figure 10.2-2. Setup for Dipole

10.3 System Check Result

Table 10.3-1: System Check Result of SAR

SAR System Check								
Frequency (MHz)	Target Value (w/kg)		Temperature	Date	Test Result (w/kg)		Deviation (%)	
	10g	1g			10g	1g	10g	1g
835	6.29	9.66	21.5℃	September 29, 2022	6.28	9.80	-0.16%	1.45%
835	6.29	9.66	21.6℃	October 9, 2022	6.16	9.60	-1.12%	-0.31%
1900	20.20	39.70	21.5℃	October 13, 2022	20.40	39.60	0.99%	-0.25%
1900	20.20	39.70	21.4℃	October 18, 2022	21.24	41.20	5.15%	3.78%
2450	24.90	52.80	21.7℃	October 9, 2022	24.56	52.80	-1.37%	0.00%
2600	24.80	55.10	21.5℃	September 26, 2022	24.68	54.80	-0.48%	-0.54%
5200	21.80	75.70	21.6℃	October 10, 2022	23.40	81.70	7.34%	7.93%
5600	22.80	80.00	21.6℃	October 10, 2022	23.10	81.80	1.32%	2.25%
5800	21.50	76.70	21.6℃	October 10, 2022	23.10	82.20	7.44%	7.17%
NOTE: The system verifies that the measured input power level is equivalent to 250mW for 0.6GHz to 3GHz and above 3GHz is equivalent to 100mW, and the measured results are compared with the target value by converting to 1W.								

11 Measurement Procedures

11.1 Test Steps

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

(a) Power reference measurement

The reference and drift jobs are useful for monitoring the power drift of the device under test in the batch process. Both jobs measure the electric field strength at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

(b) Area scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought up, grid was at to 15mm * 15mm and can be edited by users.

(c) Zoom scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1g and 10g of simulated tissue. The default zoom scan measures 5 * 5 * 7 points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more than one maximum, the number of Zoom Scans has to be enlarged accordingly.

(d) Power drift measurement

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same setting. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under within a batch process. In the properties of the drift job, the user can specify a limit for the drift and have DASY software stop the measurements if this limit is exceeded. This ensures that the power drift during one measurement is within 5%.

The SAR measurement procedures for each of test conditions are as follows:

(a) Make EUT to transmit it maximum output power

(b) Measure conducted output power through RF cable

(c) Place the EUT in the specific position of phantom

(d) Measure SAR results for Middle channel or the highest power channel on each testing position

(e) 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

(f) Record the SAR value

11.2 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE Std 1528 standard. It can be conducted for 1g and 10g.

The DASY system allows evaluations that combine measured data and robot positions, such as:

(a) Maximum Search

During a maximum search, global and local maximum searches are automatically performed in 2D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2dB of the global maxima for all SAR distributions.

(b) Extrapolation

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. Several measurements at different distances are necessary for the extrapolation.

Extrapolation routines require at least 10 measurement points in 3D space. They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 5*5*5 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10 cubes.

(c) Boundary effect

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosi-metric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$\mathrm{S} \approx \mathrm{So} + \mathrm{Sb} * \exp\left(-\frac{z}{a}\right) * \cos\left(\pi\frac{z}{\lambda}\right)$$

Since the decay of the boundary effect dominates for small probe ($a \ll \lambda$), the cos-term can be omitted. Factors Sb (parameter Alpha in the DASY software) and a (parameter Delta in the DASY software) and assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- The boundary curvature is small
- The probe axis is angled less than 30_to the boundary normal
- The distance between probe and boundary is larger than 25% of the probe diameter
- The probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during post processing.

11.3 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013. The results should be documented as part of the system validation records and may be requested to support test results when all the measurement parameters in the following table are not satisfied.

Table 11.3-1: Test Resolution Requirement

<table>
<tr><th colspan="3">Items</th><th>≤3GHz</th><th>>3GHz</th></tr>
<tr><td colspan="3">Maximum Distance</td><td>5mm ±1mm</td><td>$\frac{1}{2} * \delta * \ln(2)$ mm ±0.5mm</td></tr>
<tr><td colspan="3">Maximum probe angle</td><td>30±1°</td><td>20±1°</td></tr>
<tr><td colspan="3" rowspan="3">Maximum Area Scan spatial resolution: Δx_{Area} , Δy_{Area}</td><td>≤2GHz: ≤15mm</td><td>3-4GHz: ≤12mm</td></tr>
<tr><td>2-3GHz: ≤12mm</td><td>4-6GHz: ≤10mm</td></tr>
<tr><td colspan="2">when the x or y dimension of the device , in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the device with at least one measurement point on the device</td></tr>
<tr><td colspan="3" rowspan="2">Maximum Zoom Scan spatial resolution: Δx_{Zoom} , Δy_{Zoom}</td><td>≤2GHz: ≤8mm</td><td>3-4GHz: ≤5mm</td></tr>
<tr><td>2-3GHz: ≤5mm</td><td>4-6GHz: ≤4mm</td></tr>
<tr><td rowspan="3">maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤5mm</td><td>3-4GHz: ≤4mm
4-5GHz: ≤3mm
5-6GHz: ≤2mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤4mm</td><td>3-4GHz: ≤3mm
4-5GHz: ≤2.5mm
5-6GHz: ≤2mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$ between subsequent points</td><td colspan="2">≤1.5*</td></tr>
<tr><td>minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥30mm</td><td>3-4GHz: ≥28mm
4-5GHz: ≥25mm
5-6GHz: ≥22mm</td></tr>
</table>

Notes:
δ is the penetration depth of a plane-wave at normal incidence to the tissue medium in IEEE Std 1528-2013.
When Zoom Scan is required and reported SAR from the Area Scan based 1-g SAR estimation procedure of KDB publication 447498 is ≤1.4 W/kg, ≤8mm for 2GHz-3GHz, ≤7mm for 3GHz-4GHz, ≤5mm for 4GHz-6GHz Zoom Scan resolution may be applied.

11.4 GSM/GPRS Measurement Procedures

GSM/GPRS/EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Other configurations of GSM/GPRS/EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is s $\leq \frac{1}{4}$dB higher than the primary mode, SAR measurement is not required for the secondary mode.

11.5 WCDMA Measurement Procedures

The following procedures are applicable to WCDMA handsets operating under 3GPP Release99, Release 5 and Release 6. The default test configuration is to measure SAR with an established radio link between the DUT and a communication test set using a 12.2kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH & DPDCH), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Both uplink and downlink should be configured with the same RMC or AMR, when required. SAR for Release 5 HSDPA and Release 6 HSPA are measured using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified according to applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. When Maximum Power Reduction (MPR) is not implemented according to Cubic Metric (CM) requirements for Release 6 HSPA, the following procedures do not apply.

Table 11.5-1: HSDPA setting for Release 5

Sub-test	β_c	β_d	β_d (SF)	β_c / β_d	β_{hs}	CM (dB)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	1.5	0.5
2	12/15	15/15	64	12/15	24/25	2.0	1
3	15/15	8/15	64	15/8	30/15	2.0	1
4	15/15	4/15	64	15/4	30/15	2.0	1

Table 11.5-2: HSUPA setting for Release 6

Sub-test	β_c	β_d	β_d (SF)	β_c / β_d	β_{hs}	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (dB)	MPR (dB)	AG Index	E-TFCI

1	11/15	15/15	64	11/15	22/15	209/225	1039/225	4	1	2.0	1.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	3.0	2.0	15	92
4	2/15	15/15	64	2/15	4/15	4/15	56/75	4	1	2.0	1.0	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	2.0	1.0	21	81

11.6 LTE Measurement Procedure

SAR tests for LTE are performed with a base station simulator. Closed loop power control was used so the UE transmits with maximum output power during SAR testing.

(a) KDB 941225 D05, 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.

(b) 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.

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

(d) 16QAM/64QAM 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 ≤ 1.45 W/kg; 16QAM/64QAM SAR testing is not required.

(e) 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 ≤ 1.45 W/kg; smaller bandwidth SAR testing is not required.

(f) For LTE Band 12/26 the maximum bandwidth does not support three non-overlapping channels, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

(g) LTE band 17/2/5/38/4 SAR test was covered by Band 12/25/26/41/66; according to TCB workshop, SAR test for overlapping LTE bands can be reduced if

- The maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion.
- The channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.

11.6.1 LTE Carrier Aggregation Conducted Power (Downlink)

Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.

11.6.2 LTE Carrier Aggregation Conducted Power (Uplink)

UL CA shall be tested based on the worst-case SAR configuration determined from non-CA SAR testing result. The channel BW, channel number, RB allocation, etc. would be selected to allow contiguous CA of PCC and SCC. Uplink output power for UL CA is the total power measured across the PCC and SCC.

UL CA power measurements were performed for each antennas at with QPSK modulation based on the worst-case standalone SAR.

The UL CA mode power measurements represent the total power across both carriers. Measurements were made for all supported PCC bandwidths using the channel/RB combination resulting in the highest standalone output power at the least MPR (0 dB). SCCs were set to use configurations similar to the PCC to establish conservative or worst case equivalent SAR test conditions (highest maximum power with MPR of 0 dB).

The standalone power measurement is the power for the PCC in the non-CA mode (i.e. single carrier power). In all cases the UL CA power is less than or equal to the standalone power.

11.6.3 LTE TDD Considerations

Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

SAR was tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special sub-frame configuration 7.

Table 11.6.3-1 Calculated Duty Cycle for LTE TDD

Uplink-Downlink Configuration		**Sub-frame Number**										**Calculated**
Config	Periodicity	1	2	3	4	5	6	7	8	9	10	Duty Cycle (%)
0	5 ms	D	S	U	U	U	D	S	U	U	U	63.33
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.33
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.33
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.67
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.67
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.67

6	5 ms	D	S	U	U	U	D	S	U	U	D	53.33

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:

Calculated Duty Cycle = (5120 × Ts × 2 + 6 ms) / 10ms = 63.33%

Where

Ts = 1/(15000 x 2048) seconds

11.7 Bluetooth & Wi-Fi Measurement Procedures

Normal network operating configurations are not suitable for measuring the SAR of IEEE 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

11.8 Area Scan Based 1g SAR

According to the KDB447498 D01, a first class of fast SAR techniques is based on a modified measurement procedure and post processing algorithms. In practice, these methods require a special software, for example DASY52 form SPEAG.

When the implementation is based the specific polynomial fit algorithm as presented at the 29th Bio-electromagnetics Society meeting (2007) and the estimated 1-g SAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz) and for both 1-g and 10-g averaged SAR using a sample of 264 SAR measurements from 55 wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm are 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

In the second step, the same research group optimized the fitting algorithm to an Polynomial fit whereby the frequency validity was extended to cover the range 30MHz-6000MHz. Details of this study can be found in the BEMS 2007 Proceedings.

12 Simultaneous Transmission SAR Considerations

12.1 Reference Document

The following procedures adopted from "FCC SAR Considerations for Cell Phones with Multiple Transmitters" are applicable to handsets with built-in unlicensed transmitters such as IEEE 802.11 a/b/g/n/ac/ax and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

12.2 Antenna Separation Distances

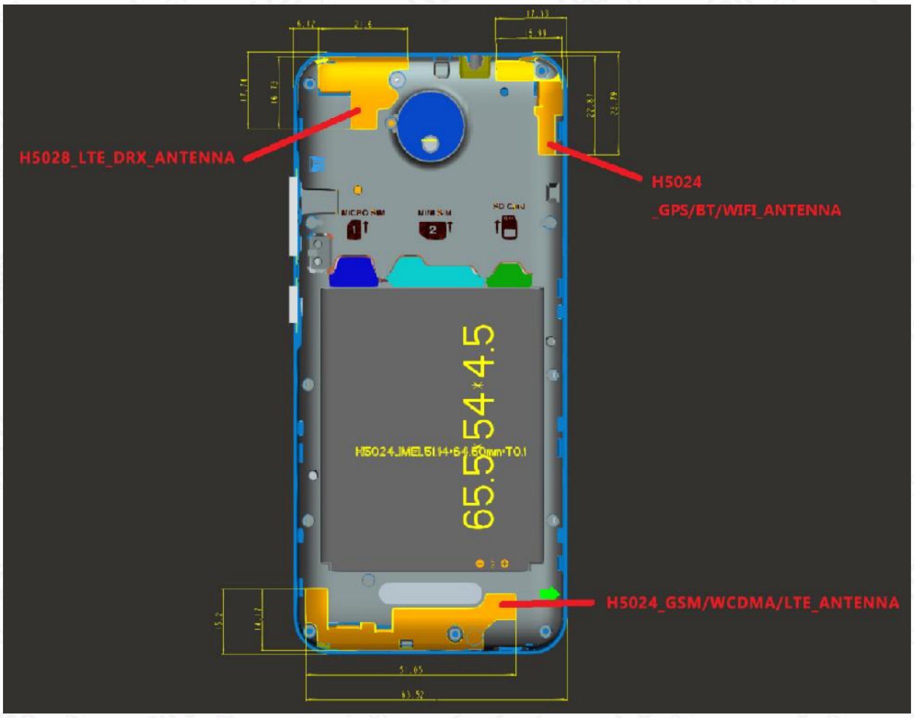


Figure 12.2-1 Antenna Locations

12.3 SAR Measurement Positions

The edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

Table 12.3-1: SAR measurement Positions

Antenna Mode	Front	Back	Left	Right	Top	Bottom
GSM/WCDMA/LTE	Yes	Yes	Yes	Yes	No	Yes
BT/ Wi-Fi	Yes	Yes	Yes	Yes	Yes	No

12.4 Low Power Transmitters SAR Consideration

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation for low power transmitters is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

The 1-g SAR test exclusion threshold for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$\frac{(max.power\ of\ channel, including\ tune-up\ tolerance, mW)}{(min.test\ separation\ distance, mm)} \times \sqrt{Frequency(GHz)} \leq 3.0$$

Where:

- Frequency (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

According to the KDB447498 appendix A, the SAR test exclusion threshold for 2450MHz at 5mm test separation distances is 10mW. That means the transmitters with tune-up power below 10mW are excluded for SAR measurement.

According to the KDB447498, When an antenna qualifies for the standalone SAR test exclusion and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria.

for test separation distances ≤ 50 mm:

$$estimated\ SAR = \frac{(max.power\ of\ channel, including\ tune-up\ tolerance, mW)}{(min.test\ separation\ distance, mm)} \times \frac{\sqrt{Frequency(GHz)}}{x}$$

where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.

SAR head value of BT is 0.265 W/Kg,SAR body value of BT is 0.132 W/Kg.

12.5 Simultaneous Transmission Table

Table 12.5-1: Simultaneous Transmission Configurations

Items	Capable Transmit Configurations
1	GSM/GPRS/EDGE + BT
2	GSM/GPRS/EDGE + Wi-Fi 2.4G
3	GSM/GPRS/EDGE + Wi-Fi 5G
4	WCDMA + BT
5	WCDMA+ Wi-Fi 2.4G
6	WCDMA+ Wi-Fi 5G
7	LTE + BT
8	LTE + Wi-Fi 2.4G
9	LTE + Wi-Fi 5G
NOTE: For the DUT, the Wi-Fi and BT modules sharing a single antenna, and so these two modules can't transmit signal simultaneously. GSM/WCDMA/LTE modules sharing a single antenna, so these two modules can't transmit signal simultaneously. So we can get following combination that can transmit signal simultaneously.	

13 Conducted Output Power

13.1 GSM Measurement result

Table 13.1-1: The conducted power for GSM850

GSM			GSM850								
Model	Modulation	Time Slot	Tune up (dBm)	Measure Power(dBm)			Devision Factor (dB)	Tune up Max	Average Power(dBm)		
				128/824.2	190/836.6	251/848.8			128/824.2	190/836.6	251/848.8
GSM	GMSK	1 Tx	34.00	32.97	33.06	33.00	-9.03	24.97	23.94	24.03	23.97
GPRS	GMSK	1 Tx	34.00	32.98	33.02	32.99	-9.03	24.97	23.95	23.99	23.96
		2 Tx	32.00	31.40	31.47	31.41	-6.02	25.98	25.38	25.45	25.39
		3 Tx	30.00	29.39	29.41	29.40	-4.26	25.74	25.13	25.15	25.14
		4 Tx	29.50	28.38	28.46	28.41	-3.01	26.49	25.37	25.45	25.40
EGPRS	8PSK	1 Tx	28.00	27.27	27.44	27.26	-9.03	18.97	18.24	18.41	18.23
		2 Tx	26.50	25.85	26.07	26.13	-6.02	20.48	19.83	20.05	20.11
		3 Tx	24.00	23.54	23.60	23.56	-4.26	19.74	19.28	19.34	19.30
		4 Tx	22.50	22.00	22.15	22.14	-3.01	19.49	18.99	19.14	19.13

Table 13.1-2: The conducted power for GSM1900

GSM			GSM1900								
Model	Modulation	Time Slot	Tune up (dBm)	Measure Power(dBm)			Devision Factor (dB)	Tune up Max	Average Power(dBm)		
				512/1850.2	661/1880	810/1909.8			512/1850.2	661/1880	810/1909.8
GSM	GMSK	1 Tx	31.50	30.01	30.38	30.78	-9.03	22.47	20.98	21.35	21.75
GPRS	GMSK	1 Tx	31.50	30.01	30.37	30.77	-9.03	22.47	20.98	21.34	21.74
		2 Tx	29.50	28.41	28.83	29.15	-6.02	23.48	22.39	22.81	23.13
		3 Tx	27.50	26.38	26.75	27.17	-4.26	23.24	22.12	22.49	22.91
		4 Tx	26.50	25.42	25.77	26.16	-3.01	23.49	22.41	22.76	23.15
EGPRS	8PSK	1 Tx	28.00	26.89	26.91	27.63	-9.03	18.97	17.86	17.88	18.60
		2 Tx	27.00	25.70	25.78	26.64	-6.02	20.98	19.68	19.76	20.62
		3 Tx	25.00	23.64	23.70	24.47	-4.26	20.74	19.38	19.44	20.21
		4 Tx	24.00	22.39	22.50	23.31	-3.01	20.99	19.38	19.49	20.30

NOTES:

1) Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

According to the conducted power as above, the body measurements are performed with 4Txslots for GSM850 and 4Txslots for GSM1900.

13.2 WCDMA Measurement result

Table 13.2-1: The conducted Power for WCDMA Band Ⅱ

WCDMA		WCDMA Band Ⅱ			
Mode	Test Mode	Tune up	Channel/Frequency(MHz)		
			9262/1852.4	9400/1880	9538/1907.6
WCDMA	RMC	23.50	22.61	22.68	22.51
HSDPA	Subtest1	22.50	22.03	22.18	21.93
	Subtest2	22.50	22.17	22.06	22.09
	Subtest3	22.00	21.53	21.68	21.65
	Subtest4	22.00	21.61	21.56	21.57
HSUPA	Subtest1	22.50	22.09	22.28	21.99
	Subtest2	21.50	21.19	21.26	21.11
	Subtest3	22.50	21.69	21.58	21.59
	Subtest4	21.50	20.99	21.24	21.13
	Subtest5	23.00	22.13	22.32	22.03

Table 13.2-2: The conducted Power for WCDMA Band Ⅴ

WCDMA		WCDMA Band Ⅴ			
Mode	Test Mode	Tune up	Channel/Frequency(MHz)		
			4132/826.4	4183/836.6	4233/846.6
WCDMA	RMC	24.00	22.93	22.94	22.87
HSDPA	Subtest1	23.50	22.37	22.50	22.43
	Subtest2	23.50	22.55	22.60	22.41
	Subtest3	23.00	22.07	22.04	22.01
	Subtest4	23.00	22.03	21.98	21.93
HSUPA	Subtest1	23.50	22.59	22.54	22.29
	Subtest2	22.00	21.35	21.28	21.33
	Subtest3	23.00	21.83	21.96	21.97
	Subtest4	22.00	21.43	21.52	21.35
	Subtest5	23.00	22.41	22.60	22.37

13.3 LTE Measurement result

Table 13.3-1: The conducted Power for LTE Band 7

LTE			LTE B7			
Modulation	RB	RB Offset	Tune up	5MHz		
				20775/2502.5	21100/2535	21425/2567.5
QPSK	1	Low	22.80	21.64	21.59	21.60
		Middle		21.80	21.95	21.82
		High		21.60	21.58	21.61
	50%	Low	21.80	20.68	20.70	20.77
		Middle		20.78	20.82	20.87
		High		20.74	20.69	20.71
	100%	/	21.80	20.77	20.80	20.74
16QAM	1	Low	21.80	20.99	20.89	20.73
		Middle		21.24	21.17	20.98
		High		21.00	20.93	20.72
	50%	Low	20.80	19.80	19.75	19.86
		Middle		19.89	19.82	19.92
		High		19.86	19.69	19.84
	100%	/	20.80	19.76	19.74	19.74
Modulation	RB	RB Offset	Tune up	10MHz		
				20800/2505	21100/2535	21400/2565
QPSK	1	Low	22.80	21.74	21.68	21.68
		Middle		21.86	21.92	21.80
		High		21.73	21.72	21.73
	50%	Low	21.80	20.74	20.76	20.89
		Middle		20.75	20.85	20.83
		High		20.81	20.86	20.76
	100%	/	21.80	20.79	20.83	20.88
16QAM	1	Low	21.80	20.91	20.90	20.95
		Middle		21.02	21.14	21.15
		High		20.95	20.93	20.95
	50%	Low	20.80	19.79	19.87	19.88
		Middle		19.84	19.87	19.90
		High		19.85	19.91	19.85
	100%	/	20.80	19.87	19.75	19.86
Modulation	RB	RB Offset	Tune up	15MHz		
				20825/2507.5	21100/2535	21375/2562.5
QPSK	1	Low	22.80	21.68	21.67	21.61
		Middle		21.81	21.76	21.77
		High		21.69	21.63	21.69
	50%	Low	21.80	20.73	20.73	20.87
		Middle		20.78	20.76	20.88

		High		20.83	20.82	20.78
	100%	/	21.80	20.84	20.78	20.83
16QAM	1	Low	21.80	20.94	20.95	20.85
		Middle		21.13	21.01	21.01
		High		20.99	20.87	20.91
	50%	Low	20.80	19.87	19.75	19.77
		Middle		19.81	19.82	19.87
		High		19.89	19.83	19.86
	100%	/	20.80	19.80	19.76	19.79

Modulation	RB	RB Offset	Tune up	20MHz		
				20850/2510	21100/2535	21350/2560
QPSK	1	Low	22.80	21.51	21.46	21.42
		Middle		21.95	21.89	21.83
		High		21.59	21.53	21.59
	50%	Low	21.80	20.79	20.82	20.86
		Middle		20.80	20.83	20.83
		High		20.82	20.84	20.85
	100%	/	21.80	20.80	20.78	20.83
16QAM	1	Low	21.80	20.63	20.93	20.85
		Middle		21.12	21.25	21.05
		High		20.90	20.98	20.81
	50%	Low	20.80	19.77	19.76	19.85
		Middle		19.79	19.86	19.91
		High		19.83	19.78	19.83
	100%	/	20.80	19.73	19.80	19.78

13.4 BT Measurement result

Table 13.4-1: The conducted power for Bluetooth

BlueTooth		BT					
Mode	Channel	DH5		2DH5		3DH5	
		Tune up	Output Power	Tune up	Output Power	Tune up	Output Power
BT5.0	0	6.00	5.60	6.00	4.52	6.00	4.86
	39	8.00	7.16	7.00	5.85	7.00	6.05
	78	7.00	6.31	6.00	4.94	6.00	5.52
BlueTooth		BLE					
Mode		Channel		Tune up		Output Power	
BLE		0		6.00		5.637	
		19		8.00		7.056	
		39		7.00		6.186	

13.5 Wi-Fi Measurement result

Table 13.5-1: The average conducted power for Wi-Fi 2.4G

Wi-Fi			Wi-Fi 2.4G conducted power(dBm)	
Mode	**BW**	**Channel/Frequency(MHz)**	**Tune up**	**Output Power**
802.11b	20M	1/2412	17.50	16.24
		6/2437	16.50	15.64
		11/2462	16.50	15.57
802.11g	20M	1/2412	15.00	14.33
		6/2437	15.00	13.88
		11/2462	15.00	14.17
802.11n	20M	1/2412	14.00	12.91
		6/2437	14.00	12.75
		11/2462	14.00	12.73

Table 13.5-2: The average conducted power for Wi-Fi 5G

Wi-Fi			Wi-Fi 5G conducted power(dBm)	
Mode	**BW**	**Channel/Frequency(MHz)**	**Tune up**	**Output Power**
802.11a	20M	36/5180	10.50	9.50
		40/5200	9.50	8.46
		48/5240	9.00	7.95
		52/5260	8.50	7.23
		56/5280	8.50	7.61
		64/5320	8.50	7.02
		100/5500	8.50	7.36
		120/5600	8.50	7.73
		140/5700	8.50	7.25
802.11a	20M	149/5745	8.50	7.38

Wi-Fi			Wi-Fi 5G conducted power(dBm)	
Mode	**BW**	**Channel/Frequency(MHz)**	**Tune up**	**Output Power**
802.11a	20M	157/5785	8.50	7.72
		165/5825	9.00	8.13
802.11n	20M	36/5180	9.00	7.56
		40/5200	9.00	7.09
		48/5240	8.00	6.85
		52/5260	7.50	6.27
		56/5280	7.50	6.01
		64/5320	7.50	5.82
		100/5500	7.50	5.89
		120/5600	8.50	7.52
		140/5700	8.00	6.79
		149/5745	8.00	6.78
		157/5785	8.00	6.90
		165/5825	8.00	7.06

14 Test Results

14.1 Standalone SAR Test Result

14.1.1 Limit/Criterion

At frequencies between 100 kHz and 6 GHz, the MPE (Maximum Permissible Exposure) in population/ uncontrolled environments for electromagnetic field strengths may be exceeded if

(a) The exposure conditions can be shown by appropriate techniques to produce SARs below 0.08W/kg, as averaged over the whole body, and spatial peak SAR values not exceeding 1.6 W/kg, as averaged over any 1g of tissue (defined as a tissue volume in the shape of a cube), except for the hands, wrists, feet, and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10g of tissue (defined as a tissue volume in the shape of a cube); and

(b) The induced currents in the body confirm with the MPE in table 2, Part B in ANSI/IEEE C95.1-1992.

14.1.2 Test Results

Table 14.1.2-1: SAR Values for GSM850

Test Position	Cover Type	Mode	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
								Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR											
Left Touch	Standard	GSM850	190	836.6	33.06	34.00	0.19	0.286	1.24	0.355	B.1-1
Left Tilt 15°	Standard	GSM850	190	836.6	33.06	34.00	0.01	0.189	1.24	0.235	/
Right Touch	Standard	GSM850	190	836.6	33.06	34.00	0.04	0.247	1.24	0.307	/
Right Tilt 15°	Standard	GSM850	190	836.6	33.06	34.00	0.00	0.171	1.24	0.212	/
Body SAR (Hotspot 10mm)											
Front Side	Standard	GPRS 4TS	190	836.6	28.46	29.50	-0.08	0.500	1.27	0.635	/
Back Side	Standard	GPRS 4TS	190	836.6	28.46	29.50	0.04	0.748	1.27	0.950	/
Left Side	Standard	GPRS 4TS	190	836.6	28.46	29.50	-0.03	0.488	1.27	0.620	/
Right Side	Standard	GPRS 4TS	190	836.6	28.46	29.50	-0.12	0.473	1.27	0.601	/
Bottom Side	Standard	GPRS 4TS	190	836.6	28.46	29.50	0.18	0.132	1.27	0.168	/
Back Side	Standard	GPRS 4TS	128	824.2	28.38	29.50	-0.05	0.686	1.29	0.888	/
Back Side	Standard	GPRS 4TS	251	848.8	28.41	29.50	0.04	0.802	1.29	1.031	/
Back Side	Repeated	GPRS 4TS	251	848.8	28.41	29.50	0.01	0.803	1.29	1.032	B.1-2
Body SAR (Worn 10mm)											
Front Side	Standard	GPRS 4TS	190	836.6	28.46	29.50	-0.08	0.500	1.27	0.635	/
Back Side	Standard	GPRS 4TS	190	836.6	28.46	29.50	0.04	0.748	1.27	0.950	/
Back Side	Standard	GPRS 4TS	128	824.2	28.38	29.50	-0.05	0.686	1.29	0.888	/
Back Side	Standard	GPRS 4TS	251	848.8	28.41	29.50	0.04	0.802	1.29	1.031	/
Back Side	Repeated	GPRS 4TS	251	848.8	28.41	29.50	0.01	0.803	1.29	1.032	/
Body SAR (Worn 10mm) Headset											
Back Side	Standard	GPRS 4TS	251	848.8	28.41	29.50	-0.03	0.580	1.29	0.745	/

Table 14.1.2-2: SAR Values for GSM1900

Test Position	Cover Type	Mode	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
								Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR											
Left Touch	Standard	GSM1900	661	1880	30.38	31.50	-0.18	0.134	1.29	0.173	/
Left Tilt 15°	Standard	GSM1900	661	1880	30.38	31.50	0.17	0.036	1.29	0.046	/
Right Touch	Standard	GSM1900	661	1880	30.38	31.50	0.15	0.175	1.29	0.226	B.1-3
Right Tilt 15°	Standard	GSM1900	661	1880	30.38	31.50	0.12	0.034	1.29	0.043	/
Body SAR (Hotspot 10mm)											
Front Side	Standard	GPRS 4TS	661	1880	25.77	26.50	-0.05	0.542	1.18	0.641	/
Back Side	Standard	GPRS 4TS	661	1880	25.77	26.50	-0.17	0.602	1.18	0.712	/
Left Side	Standard	GPRS 4TS	661	1880	25.77	26.50	0.19	0.091	1.18	0.108	/
Right Side	Standard	GPRS 4TS	661	1880	25.77	26.50	-0.02	0.185	1.18	0.219	/
Bottom Side	Standard	GPRS 4TS	661	1880	25.77	26.50	-0.12	1.040	1.18	1.230	/
Bottom Side	Standard	GPRS 4TS	512	1850.2	25.42	26.50	0.05	1.110	1.28	1.423	B.1-4
Bottom Side	Standard	GPRS 4TS	810	1909.8	26.16	26.50	0.14	0.974	1.08	1.053	/
Bottom Side	Repeated	GPRS 4TS	512	1850.2	25.42	26.50	0.12	1.090	1.28	1.398	/
Body SAR (Worn 10mm)											
Front Side	Standard	GPRS 4TS	661	1880	25.77	26.50	-0.05	0.542	1.18	0.641	/
Back Side	Standard	GPRS 4TS	661	1880	25.77	26.50	-0.17	0.602	1.18	0.712	/

Table 14.1.2-3: SAR Values for WCDMA Band II

Test Position	Cover Type	Mode	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
								Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR											
Left Touch	Standard	RMC12.2k	9400	1880	22.68	23.50	-0.08	0.147	1.21	0.178	/
Left Tilt 15°	Standard	RMC12.2k	9400	1880	22.68	23.50	0.05	0.062	1.21	0.075	/
Right Touch	Standard	RMC12.2k	9400	1880	22.68	23.50	-0.03	0.158	1.21	0.191	B.1-5
Right Tilt 15°	Standard	RMC12.2k	9400	1880	22.68	23.50	0.06	0.025	1.21	0.031	/
Body SAR (Hotspot 10mm)											
Front Side	Standard	RMC12.2k	9400	1880	22.68	23.50	-0.02	0.354	1.21	0.428	/
Back Side	Standard	RMC12.2k	9400	1880	22.68	23.50	-0.09	0.384	1.21	0.464	/
Left Side	Standard	RMC12.2k	9400	1880	22.68	23.50	0.01	0.059	1.21	0.072	/
Right Side	Standard	RMC12.2k	9400	1880	22.68	23.50	-0.10	0.111	1.21	0.134	/
Bottom Side	Standard	RMC12.2k	9400	1880	22.68	23.50	-0.18	0.868	1.21	1.048	B.1-6
Bottom Side	Standard	RMC12.2k	9262	1852.4	22.61	23.50	-0.10	0.780	1.23	0.957	/
Bottom Side	Standard	RMC12.2k	9538	1907.6	22.51	23.50	-0.10	0.598	1.26	0.751	/
Bottom Side	Repeated	RMC12.2k	9400	1880	22.68	23.50	0.11	0.828	1.21	1.000	/
Body SAR (Worn 10mm)											
Front Side	Standard	RMC12.2k	9400	1880	22.68	23.50	-0.02	0.354	1.21	0.428	/
Back Side	Standard	RMC12.2k	9400	1880	22.68	23.50	-0.09	0.384	1.21	0.464	/

Table 14.1.2-4: SAR Values for WCDMA Band V

Test Position	Cover Type	Mode	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
								Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR											
Left Touch	Standard	RMC12.2k	4183	836.6	22.94	24.00	-0.15	0.329	1.28	0.420	B.1-7
Left Tilt 15°	Standard	RMC12.2k	4183	836.6	22.94	24.00	0.05	0.185	1.28	0.236	/
Right Touch	Standard	RMC12.2k	4183	836.6	22.94	24.00	0.16	0.279	1.28	0.356	/
Right Tilt 15°	Standard	RMC12.2k	4183	836.6	22.94	24.00	0.02	0.199	1.28	0.254	/
Body SAR (Hotspot 10mm)											
Front Side	Standard	RMC12.2k	4183	836.6	22.94	24.00	-0.04	0.436	1.28	0.557	/
Back Side	Standard	RMC12.2k	4183	836.6	22.94	24.00	-0.01	0.632	1.28	0.807	B.1-8
Left Side	Standard	RMC12.2k	4183	836.6	22.94	24.00	0.14	0.473	1.28	0.604	/
Right Side	Standard	RMC12.2k	4183	836.6	22.94	24.00	0.15	0.387	1.28	0.494	/
Bottom Side	Standard	RMC12.2k	4183	836.6	22.94	24.00	0.12	0.122	1.28	0.156	/
Body SAR (Worn 10mm)											
Front Side	Standard	RMC12.2k	4183	836.6	22.94	24.00	-0.04	0.436	1.28	0.557	/
Back Side	Standard	RMC12.2k	4183	836.6	22.94	24.00	-0.01	0.632	1.28	0.807	/

Table 14.1.2-5: SAR Values for LTE Band7

Test Position	Cover Type	Mode				Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
		Modulation	BW(MHz)	RB Allocation	RB Offset						Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR														
Left Touch	Standard	QPSK	20	1	mid	21100	2535	21.89	22.80	-0.05	0.118	1.23	0.146	/
Left Tilt 15°	Standard	QPSK	20	1	mid	21100	2535	21.89	22.80	-0.04	0.085	1.23	0.105	/
Right Touch	Standard	QPSK	20	1	mid	21100	2535	21.89	22.80	-0.12	0.223	1.23	0.275	B.1-9
Right Tilt 15°	Standard	QPSK	20	1	mid	21100	2535	21.89	22.80	-0.03	0.045	1.23	0.056	/
Left Touch	Standard	QPSK	20	50%	low	21100	2535	20.82	21.80	-0.02	0.105	1.25	0.132	/
Left Tilt 15°	Standard	QPSK	20	50%	low	21100	2535	20.82	21.80	0.18	0.066	1.25	0.082	/
Right Touch	Standard	QPSK	20	50%	low	21100	2535	20.82	21.80	0.05	0.181	1.25	0.227	/
Right Tilt 15°	Standard	QPSK	20	50%	low	21100	2535	20.82	21.80	0.06	0.035	1.25	0.044	/
Body SAR (Hotspot 10mm)														
Front Side	Standard	QPSK	20	1	mid	21100	2560	21.89	22.80	-0.03	0.487	1.23	0.601	/
Back Side	Standard	QPSK	20	1	mid	21100	2560	21.89	22.80	-0.02	0.726	1.23	0.895	/
Left Side	Standard	QPSK	20	1	mid	21100	2535	21.89	22.80	-0.01	0.068	1.23	0.084	/
Right Side	Standard	QPSK	20	1	mid	21100	2535	21.89	22.80	0.02	0.135	1.23	0.166	/
Bottom Side	Standard	QPSK	20	1	mid	21100	2535	21.89	22.80	-0.14	1.120	1.23	1.381	/
Bottom Side	Standard	QPSK	20	1	mid	20850	2510	21.95	22.80	-0.03	0.965	1.22	1.174	/
Bottom Side	Standard	QPSK	20	1	mid	21350	2560	21.83	22.80	0.01	1.120	1.25	1.400	B.1-10
Front Side	Standard	QPSK	20	50%	low	21100	2560	20.82	21.80	-0.03	0.384	1.25	0.481	/
Back Side	Standard	QPSK	20	50%	low	21100	2560	20.82	21.80	0.03	0.576	1.25	0.722	/
Left Side	Standard	QPSK	20	50%	low	21100	2535	20.82	21.80	0.16	0.049	1.25	0.062	/
Right Side	Standard	QPSK	20	50%	low	21100	2535	20.82	21.80	0.12	0.105	1.25	0.132	/
Bottom Side	Standard	QPSK	20	50%	low	21100	2535	20.82	21.80	0.00	0.897	1.25	1.124	/
Bottom Side	Standard	QPSK	20	50%	low	20850	2510	20.79	21.80	0.15	0.835	1.26	1.054	/
Bottom Side	Standard	QPSK	20	50%	low	21350	2560	20.86	21.80	-0.08	0.927	1.24	1.151	/
Bottom Side	Repeated	QPSK	20	1	mid	21100	2535	21.89	22.80	-0.17	1.080	1.23	1.332	/
Body SAR (Worn 10mm)														
Front Side	Standard	QPSK	20	1	mid	21100	2560	21.89	22.80	-0.03	0.487	1.23	0.601	/
Back Side	Standard	QPSK	20	1	mid	21100	2560	21.89	22.80	-0.02	0.726	1.23	0.895	/
Front Side	Standard	QPSK	20	50%	low	21100	2560	20.82	21.80	-0.03	0.384	1.25	0.481	/
Back Side	Standard	QPSK	20	50%	low	21100	2560	20.82	21.80	0.03	0.576	1.25	0.722	/

Table 14.1.2-6: SAR Values for Wi-Fi2.4G

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
										Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR													
Left Touch	Standard	802.11b	20	1:1	1	2412	16.24	17.50	-0.14	0.192	1.34	0.257	/
Left Tilt 15°	Standard	802.11b	20	1:1	1	2412	16.24	17.50	-0.13	0.157	1.34	0.210	/
Right Touch	Standard	802.11b	20	1:1	1	2412	16.24	17.50	0.08	0.458	1.34	0.612	B.1-11
Right Tilt 15°	Standard	802.11b	20	1:1	1	2412	16.24	17.50	-0.15	0.221	1.34	0.295	/
Body SAR (Hotspot 10mm)													
Front Side	Standard	802.11b	20	1:1	1	2412	16.24	17.50	0.08	0.082	1.34	0.109	/
Back Side	Standard	802.11b	20	1:1	1	2412	16.24	17.50	0.14	0.126	1.34	0.168	B.1-12
Left Side	Standard	802.11b	20	1:1	1	2412	16.24	17.50	0.16	0.079	1.34	0.106	/
Right Side	Standard	802.11b	20	1:1	1	2412	16.24	17.50	0.00	0.008	1.34	0.010	/
Top Side	Standard	802.11b	20	1:1	1	2412	16.24	17.50	-0.05	0.049	1.34	0.066	/
Body SAR (Worn 10mm)													
Front Side	Standard	802.11b	20	1:1	1	2412	16.24	17.50	0.08	0.082	1.34	0.109	/
Back Side	Standard	802.11b	20	1:1	1	2412	16.24	17.50	0.14	0.126	1.34	0.168	/

Table 14.1.2-7: SAR Values for Wi-Fi5G U-NII-1&2A

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
										Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR													
Left Touch	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.00	0.096	1.26	0.120	/
Left Tilt 15°	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.00	0.094	1.26	0.118	/
Right Touch	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.00	0.296	1.26	0.373	B.1-13
Right Tilt 15°	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.00	0.251	1.26	0.316	/
Right Touch	Standard	802.11a	20	1:1	56	5280	7.61	8.50	0.00	0.259	1.23	0.318	/
Body SAR (Hotspot 10mm)													
Front Side	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.00	0.053	1.26	0.066	/
Back Side	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.00	0.074	1.26	0.093	/
Left Side	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.17	0.138	1.26	0.174	B.1-14
Right Side	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.00	0.000	1.26	0.000	/
Top Side	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.00	0.075	1.26	0.094	/
Left Side	Standard	802.11a	20	1:1	56	5280	7.61	8.50	0.00	0.102	1.23	0.125	/
Body SAR (Worn 10mm)													
Front Side	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.00	0.053	1.26	0.066	/
Back Side	Standard	802.11a	20	1:1	36	5180	9.50	10.50	0.00	0.074	1.26	0.093	/

Table 14.1.2-8: SAR Values for Wi-Fi5G U-NII-2C

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
										Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR													
Left Touch	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.072	1.19	0.086	/
Left Tilt 15°	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.063	1.19	0.076	/
Right Touch	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.162	1.19	0.193	B.1-15
Right Tilt 15°	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.101	1.19	0.121	/
Body SAR (Hotspot 10mm)													
Front Side	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.032	1.19	0.038	/
Back Side	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.082	1.19	0.098	/
Left Side	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.088	1.19	0.105	B.1-16
Right Side	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.000	1.19	0.000	/
Top Side	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.036	1.19	0.043	/
Body SAR (Worn 10mm)													
Front Side	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.032	1.19	0.038	/
Back Side	Standard	802.11a	20	1:1	120	5600	7.73	8.50	0.00	0.082	1.19	0.098	/

Table 14.1.2-9: SAR Values for Wi-Fi5G U-NII-3

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
										Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR													
Left Touch	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.111	1.22	0.136	/
Left Tilt 15°	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.106	1.22	0.130	/
Right Touch	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.339	1.22	0.414	B.1-17
Right Tilt 15°	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.189	1.22	0.231	/
Body SAR (Hotspot 10mm)													
Front Side	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.072	1.22	0.088	/
Back Side	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.199	1.22	0.243	B.1-18
Left Side	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.177	1.22	0.216	/
Right Side	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.000	1.22	0.000	/
Top Side	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.107	1.22	0.131	/
Body SAR (Worn 10mm)													
Front Side	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.072	1.22	0.088	/
Back Side	Standard	802.11a	20	1:1	165	5875	8.13	9.00	0.00	0.199	1.22	0.243	/

14.2 Simultaneous SAR Evaluation

Table 14.2-1 Simultaneous transmission SAR

FCC SAR Test		Cellular					Max. of Cellular	Non-Cellular					Simultanuous Transmission		
		G850	G1900	W B2	W B5	L B7		BT	Wi-Fi2.4G	Wi-Fi5G U-NII-1&2A	Wi-Fi5G U-NII-2C	Wi-Fi5G U-NII-3	Max(Cel.)+ BT	Max(Cel.)+ Wi-Fi2.4G	Max(Cel.)+ Wi-Fi5G
Head	Left Touch	0.355	0.173	0.178	0.420	0.146	0.420	0.265	0.257	0.120	0.086	0.136	0.685	0.677	0.556
	Left Tilt 15°	0.235	0.046	0.075	0.236	0.105	0.236	0.265	0.210	0.118	0.076	0.130	0.501	0.446	0.366
	Right Touch	0.307	0.226	0.191	0.356	0.275	0.356	0.265	0.612	0.373	0.193	0.414	0.621	0.968	0.770
	Right Tilt 15°	0.212	0.043	0.031	0.254	0.056	0.254	0.265	0.295	0.316	0.121	0.231	0.519	0.549	0.570
Hotspot (10mm)	Top								0.066	0.094	0.043	0.131		0.066	0.131
	Left	0.620	0.108	0.072	0.604	0.084	0.620	0.132	0.106	0.174	0.105	0.216	0.752	0.726	0.836
	Right	0.601	0.219	0.134	0.494	0.166	0.601	0.132	0.010				0.733	0.611	0.601
	Front	0.635	0.641	0.428	0.557	0.601	0.641	0.132	0.109	0.066	0.038	0.088	0.773	0.750	0.729
	Back	1.032	0.712	0.464	0.807	0.895	1.032	0.132	0.168	0.093	0.098	0.243	1.164	1.200	1.275
	Bottom	0.168	1.423	1.048	0.156	1.400	1.423						1.423	1.423	1.423
Worn (10mm)	Front	0.635	0.641	0.428	0.557	0.481	0.641	0.132	0.109	0.066	0.038	0.088	0.773	0.750	0.729
	Back	1.032	0.712	0.464	0.807	0.722	1.032	0.132	0.168	0.093	0.098	0.243	1.164	1.200	1.275

According to the conducted power measurement result, we can draw the conclusion that: stand-alone SAR for Wi-Fi should be performed. Then, simultaneous transmission SAR for Wi-Fi/BT is considered with measurement results of GSM/WCDMA/LTE and Wi-Fi/BT.

According to the above table, the sum of reported SAR values for partial-body GSM/WCDMA/LTE and Wi-Fi < 1.6W/kg; the sum of reported SAR values for Limb GSM/WCDMA/LTE and Wi-Fi < 4.0W/kg. So the simultaneous transmission SAR is not required for Wi-Fi/BT transmitter.

14.3 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

(a) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps(b) through (d) do not apply.

(b) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

(c) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45W/kg (~ 10% from the 1-g SAR limit).

(d) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Table 14.3-1: SAR Measurement Variability (1g)

Channel	Frequency (MHz)	Configuration	Test Position	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio
251	848.8	GPRS 4TS	Back Side 10mm	0.802	0.803	1.001
512	1850.2	GPRS 4TS	Bottom Side 10mm	1.110	1.090	1.018
9400	1880	RMC12.2k	Bottom Side 10mm	0.868	0.828	1.048
21100	2535	QPSK 20MHz 1RB 50offset	Bottom Side 10mm	1.120	1.080	1.037

Note: According to the KDB 865664 D01 repeated measurement is not required when the original highest measured SAR is < 0.8 W/kg.

Annex A: Measurement Data

A.1 SAR Graph Results

GSM850 Left Cheek Mode Middle

Date/Time: 2022/10/9

Electronics: DAE4 Sn1244

Medium parameters used: f = 837 MHz; σ = 0.9 S/m; εr = 43.615; ρ = 1000 kg/m3

Ambient Temperature:21.6°C   Liquid Temperature:20.5°C

Communication System: GSM Professional 900MHz;   Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Probe: EX3DV4 - SN7633ConvF(10.55, 10.55, 10.55) @ 836.6 MHz

GSM850 Left Cheek Mode Middle/Area Scan (11x7x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.333 W/kg

GSM850 Left Cheek Mode Middle/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.368 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.363 W/kg

SAR(1 g) = 0.286 W/kg; SAR(10 g) = 0.218 W/kg

Maximum of SAR (measured) = 0.335 W/kg

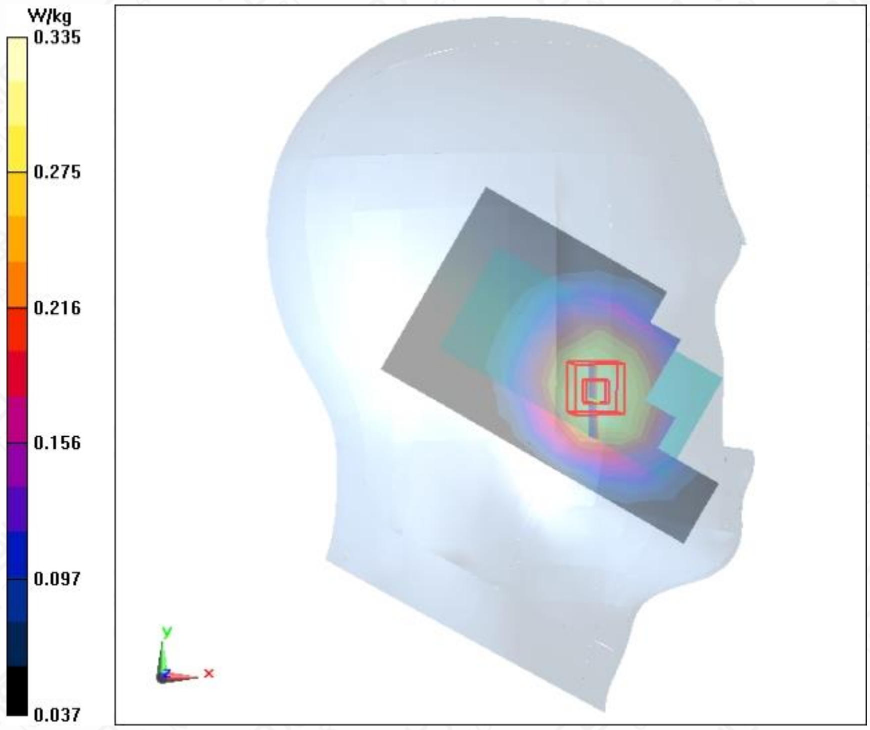


Figure B.1-1 GSM850 Left Cheek Mode Middle

GSM850 GPRS 4TS Back Mode High 10mm

Date/Time: 2022/10/9

Electronics: DAE4 Sn1244

Medium parameters used: f = 849 MHz; σ = 0.905 S/m; εr = 43.574; ρ = 1000 kg/m3

Ambient Temperature:21.6°C   Liquid Temperature:20.5°C

Communication System: GSM 900MHz GPRS 4TS (0);   Frequency: 848.8 MHz; Duty Cycle: 1:2

Probe: EX3DV4 - SN7633ConvF(10.55, 10.55, 10.55) @ 848.8 MHz

GSM850 GPRS 4TS Back Mode High 10mm/Area Scan (7x11x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.952 W/kg

GSM850 GPRS 4TS Back Mode High 10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 33.01 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.09 W/kg

SAR(1 g) = 0.803 W/kg; SAR(10 g) = 0.604 W/kg

Maximum value of SAR (measured) = 0.980 W/kg

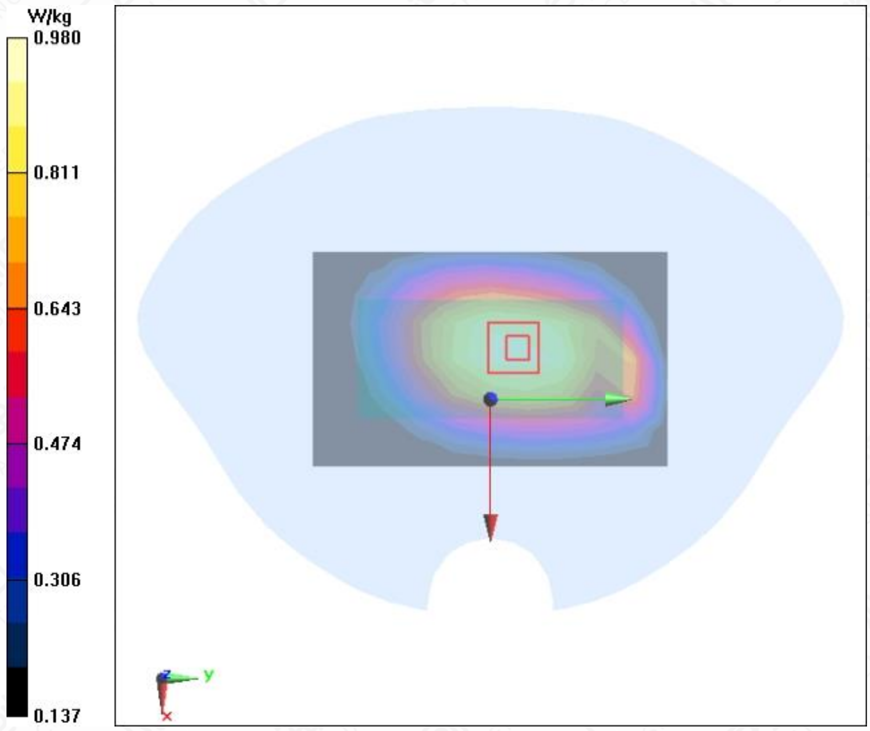


Figure B.1-2 GSM850 GPRS 4TS Back Mode High 10mm

GSM1900 Right Cheek Mode Middle
Date/Time: 2022/10/13
Electronics: DAE4 Sn1244
Medium: Head 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.385 S/m; εr = 39.952; ρ = 1000 kg/m3
Ambient Temperature:21.6°C Liquid Temperature:20.5°C
Communication System: GSM Professional 1900MHz; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Probe: EX3DV4 - SN7633ConvF(8.6, 8.6, 8.6) @ 1880 MHz
GSM1900 Right Cheek Mode Middle/Area Scan (11x7x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.187 W/kg
GSM1900 Right Cheek Mode Middle/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.642 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 0.281 W/kg
SAR(1 g) = 0.175 W/kg; SAR(10 g) = 0.107 W/kg
Maximum value of SAR (measured) = 0.242 W/kg

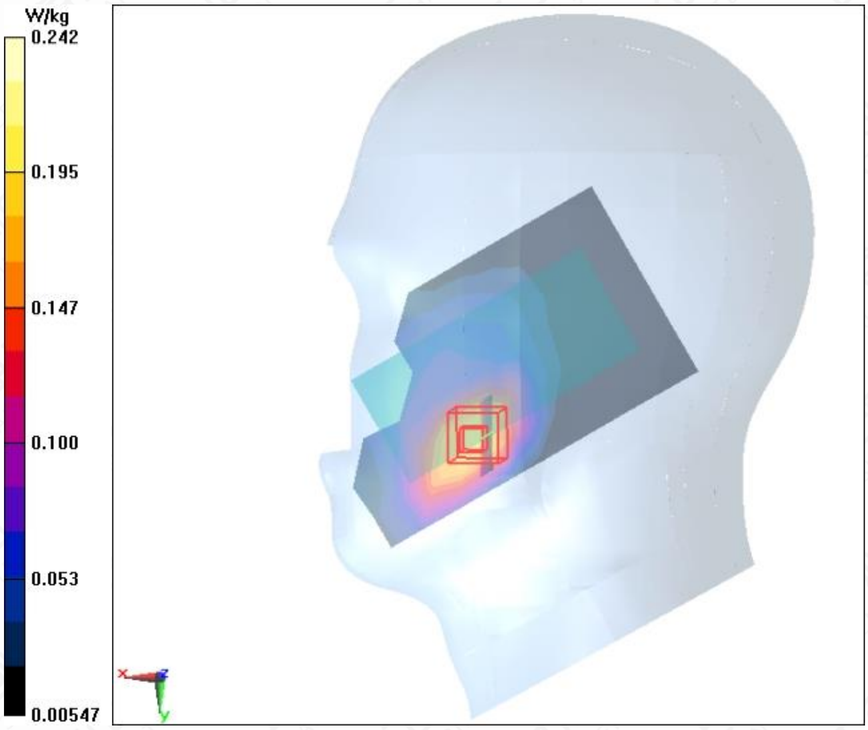


Figure B.1-3 GSM1900 Right Cheek Mode Middle

GSM1900 GPRS 4TS Bottom Mode Low 10mm
Date/Time: 2022/10/13
Electronics: DAE4 Sn1244
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.37 S/m; εr = 40.099; ρ = 1000 kg/m3
Ambient Temperature:21.6°C Liquid Temperature:20.5°C
Communication System: GSM 1900MHz GPRS 4TS (0); Frequency: 1850.2 MHz; Duty Cycle: 1:2
Probe: EX3DV4 - SN7633ConvF(8.6, 8.6, 8.6) @ 1850.2 MHz
GSM1900 GPRS 4TS Bottom Mode Low 10mm/Area Scan (6x9x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.18 W/kg
GSM1900 GPRS 4TS Bottom Mode Low 10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 36.12 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 2.07 W/kg
SAR(1 g) = 1.11 W/kg; SAR(10 g) = 0.569 W/kg
Maximum value of SAR (measured) = 1.74 W/kg

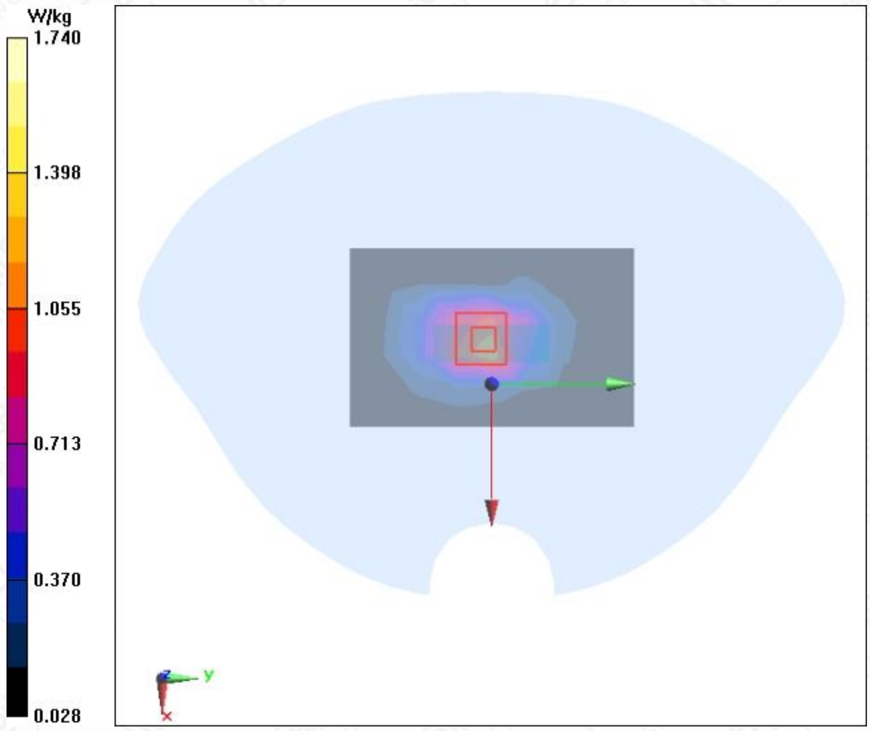


Figure B.1-4 GSM1900 GPRS 4TS Bottom Mode Low 10mm

WCDMA BandII RMC Right Cheek Mode Middle
Date/Time: 2022/10/18
Electronics: DAE4 Sn1244
Medium parameters used: f = 1880 MHz; σ = 1.413 S/m; εr = 39.563; ρ = 1000 kg/m3
Ambient Temperature:21.6°C Liquid Temperature:20.5°C
Communication System: WCDMA Professional Band Ⅱ; Frequency: 1880 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(8.6, 8.6, 8.6) @ 1880 MHz
WCDMA BandII RMC Right Cheek Mode Middle/Area Scan (11x7x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.196 W/kg
WCDMA BandII RMC Right Cheek Mode Middle/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.760 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.250 W/kg
SAR(1 g) = 0.158 W/kg; SAR(10 g) = 0.097 W/kg
Maximum value of SAR (measured) = 0.218 W/kg

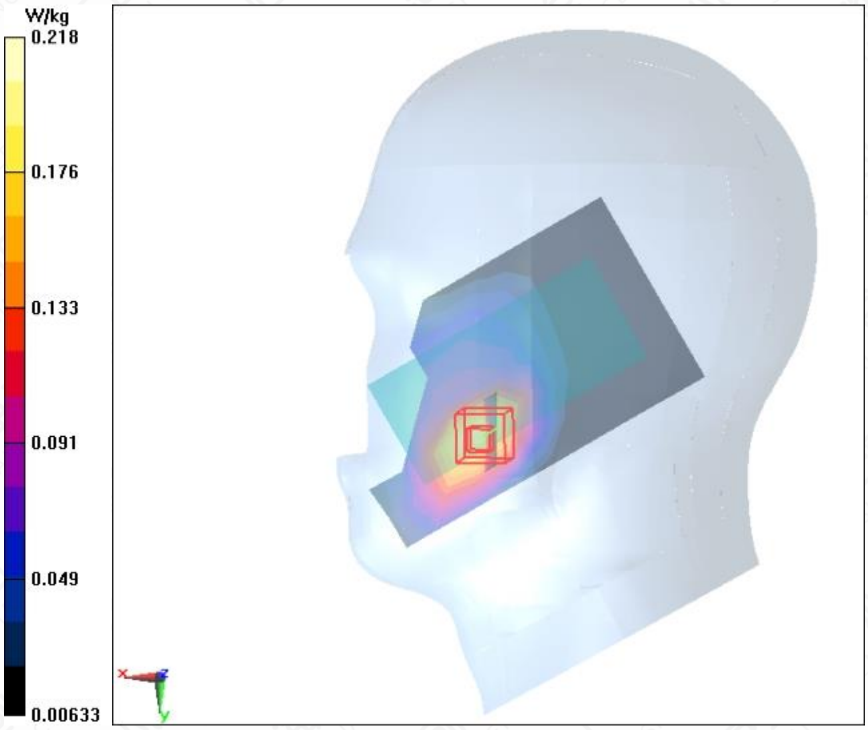


Figure B.1-5 WCDMA BandII RMC Right Cheek Mode Middle

WCDMA BandII RMC Bottom Mode Middle 10mm
Date/Time: 2022/10/18
Electronics: DAE4 Sn1244
Medium parameters used: f = 1880 MHz; σ = 1.413 S/m; εr = 39.563; ρ = 1000 kg/m3
Ambient Temperature:21.6°C Liquid Temperature:20.5°C
Communication System: WCDMA Professional Band Ⅱ; Frequency: 1880 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(8.6, 8.6, 8.6) @ 1880 MHz
WCDMA BandII RMC Bottom Mode Middle 10mm/Area Scan (6x9x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.889 W/kg
WCDMA BandII RMC Bottom Mode Middle 10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 32.27 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 1.68 W/kg
SAR(1 g) = 0.868 W/kg; SAR(10 g) = 0.433 W/kg
Maximum value of SAR (measured) = 1.39 W/kg

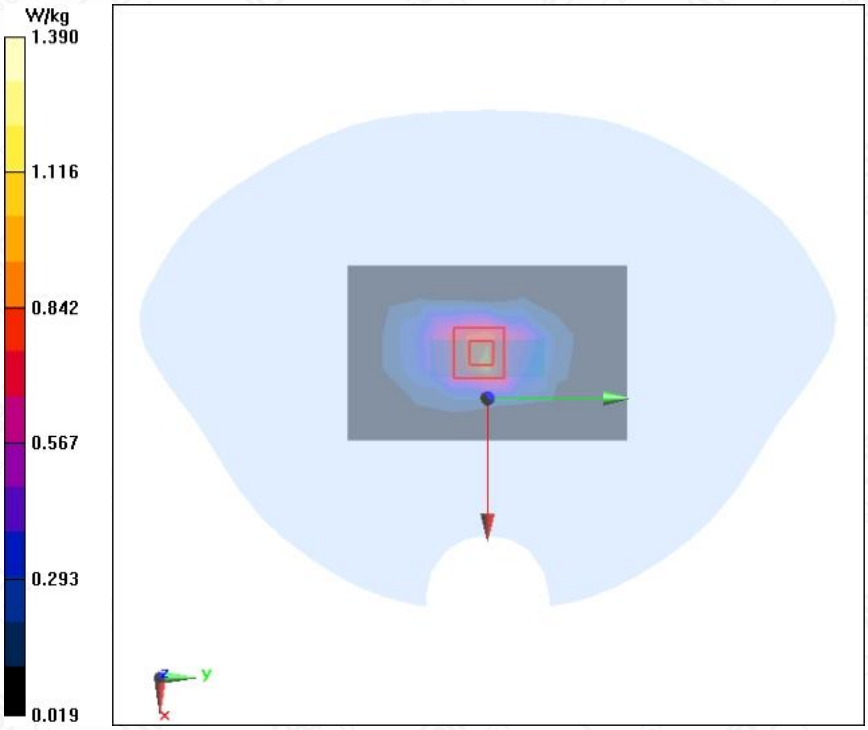


Figure B.1-6 WCDMA BandII RMC Bottom Mode Middle 10mm

WCDMA BandV RMC Left Cheek Mode Middle

Date/Time: 2022/9/29

Electronics: DAE4 Sn1244

Medium parameters used: f = 837 MHz; σ = 0.92 S/m; εr = 43.59; ρ = 1000 kg/m3

Ambient Temperature:21.6°C Liquid Temperature:20.5°C

Communication System: WCDMA Professional Band Ⅷ; Frequency: 836.6 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(10.55, 10.55, 10.55) @ 836.6 MHz

WCDMA BandV RMC Left Cheek Mode Middle/Area Scan (11x7x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.403 W/kg

WCDMA BandV RMC Left Cheek Mode Middle/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.849 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.429 W/kg

SAR(1 g) = 0.329 W/kg; SAR(10 g) = 0.246 W/kg

Maximum value of SAR (measured) = 0.395 W/kg

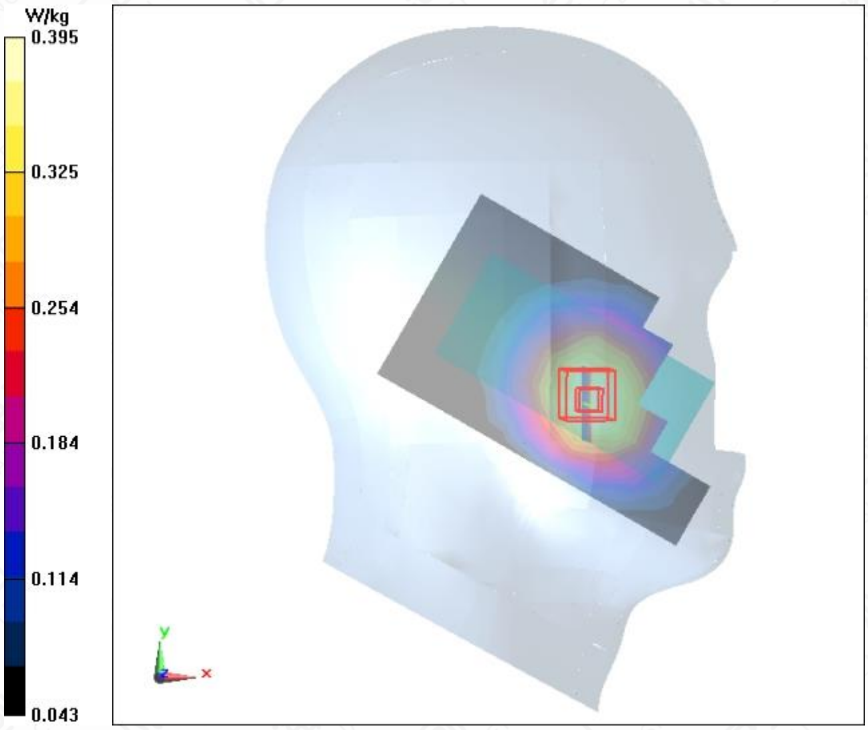


Figure B.1-7 WCDMA BandV RMC Left Cheek Mode Middle

WCDMA BandV RMC Back Mode Middle 10mm

Date/Time: 2022/9/29

Electronics: DAE4 Sn1244

Medium parameters used: f = 837 MHz; σ = 0.92 S/m; εr = 43.59; ρ = 1000 kg/m3

Ambient Temperature:21.6°C Liquid Temperature:20.5°C

Communication System: WCDMA Professional Band Ⅷ; Frequency: 836.6 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(10.55, 10.55, 10.55) @ 836.6 MHz

WCDMA BandV RMC Back Mode Middle 10mm/Area Scan (7x11x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.774 W/kg

WCDMA BandV RMC Back Mode Middle 10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 29.77 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.870 W/kg

SAR(1 g) = 0.632 W/kg; SAR(10 g) = 0.466 W/kg

Maximum value of SAR (measured) = 0.785 W/kg

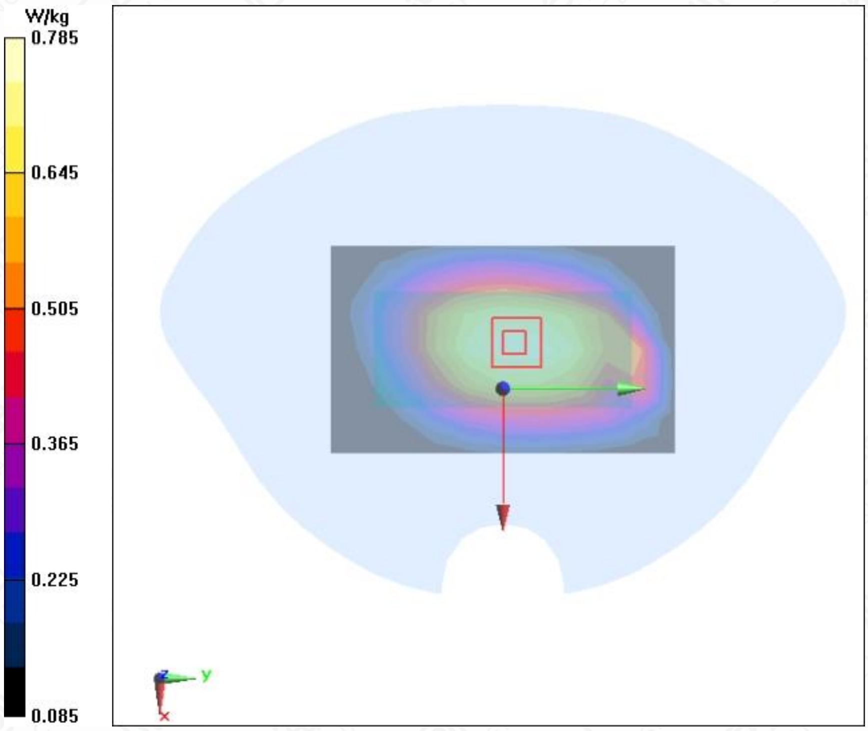


Figure B.1-8 WCDMA BandV RMC Back Mode Middle 10mm

LTE B7 20MHz 1RB 50offset Cheek Mode Middle

Date/Time: 2022/9/26

Electronics: DAE4 Sn1244

Medium parameters used: f = 2535 MHz; σ = 1.883 S/m; εr = 37.694; ρ = 1000 kg/m3

Ambient Temperature:21.5°C   Liquid Temperature:20.3°C

Communication System: LTE B7 2450MHz; Frequency: 2535 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(7.85, 7.85, 7.85) @ 2535 MHz

LTE B7 20MHz 1RB 50offset Cheek Mode Middle/Area Scan (13x8x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.321 W/kg

LTE B7 20MHz 1RB 50offset Cheek Mode Middle/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.372 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.520 W/kg

SAR(1 g) = 0.223 W/kg; SAR(10 g) = 0.108 W/kg

Maximum of SAR (measured) = 0.328 W/kg

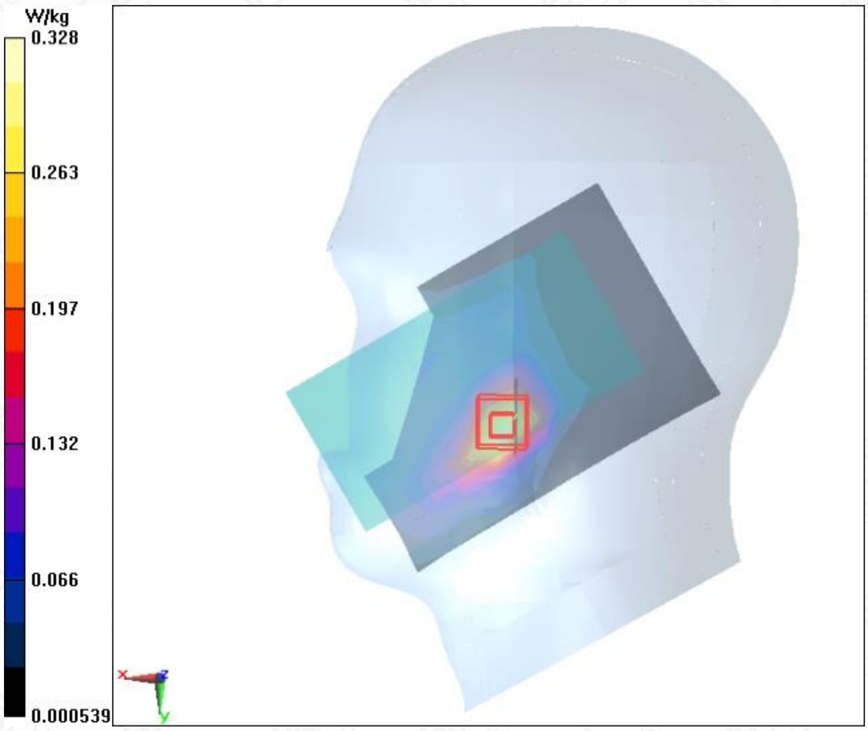


Figure B.1-9 LTE B7 20MHz 1RB 50offset Cheek Mode Middle

LTE B7 1RB 50offset Bottom Mode High 10mm
Date/Time: 2022/9/26
Electronics: DAE4 Sn1244
Medium parameters used: f = 2560 MHz; σ = 1.903 S/m; εr = 37.657; ρ = 1000 kg/m3
Ambient Temperature:21.5°C   Liquid Temperature:20.3°C
Communication System: LTE B7 2450MHz; Frequency: 2560 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(7.52, 7.52, 7.52) @ 2560 MHz
LTE B7 1RB 50offset Bottom Mode High 10mm/Area Scan (6x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.75 W/kg
LTE B7 1RB 50offset Bottom Mode High 10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 31.21 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.30 W/kg
SAR(1 g) = 1.12 W/kg; SAR(10 g) = 0.528 W/kg
Maximum value of SAR (measured) = 1.85 W/kg

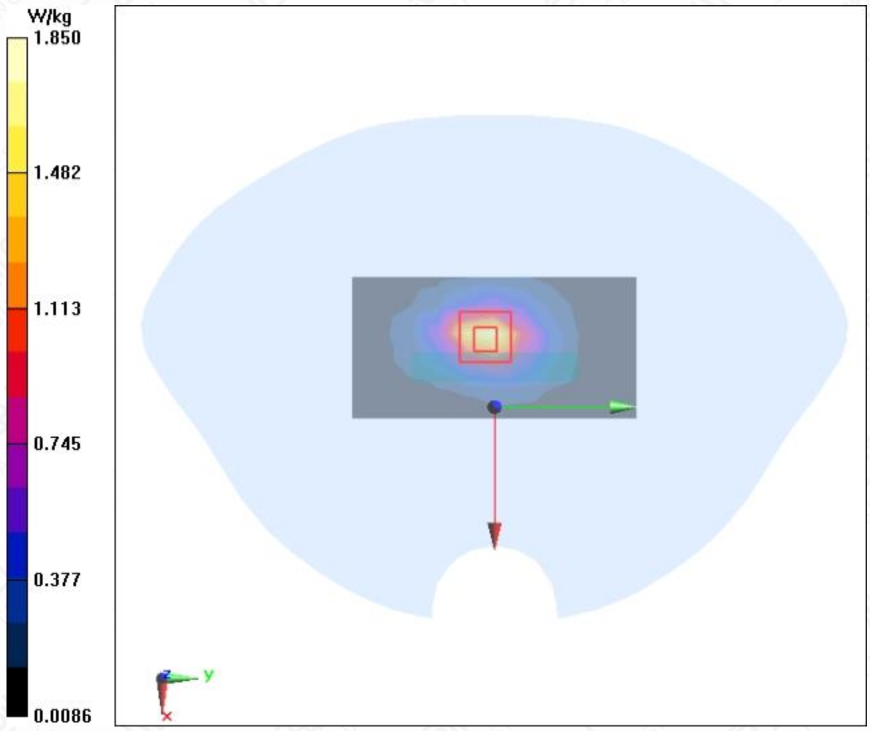


Figure B.1-10 LTE B7 1RB 50offset Bottom Mode High 10mm

Wi-Fi2.4G 11b Right Cheek Mode Low

Date/Time: 2022/10/9

Electronics: DAE4 Sn1244

Medium parameters used: f = 2412 MHz; σ = 1.798 S/m; εr = 38.303; ρ = 1000 kg/m3

Ambient Temperature:21.4°C Liquid Temperature:20.5°C

Communication System: Wifi 2450 2450MHz; Frequency: 2412 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(7.96, 7.96, 7.96) @ 2412 MHz

Wi-Fi2.4G 11b Right Cheek Mode Low/Area Scan (11x7x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.607 W/kg

Wi-Fi2.4G 11b Right Cheek Mode Low/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.93 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.943 W/kg

SAR(1 g) = 0.458 W/kg; SAR(10 g) = 0.231 W/kg

Maximum value of SAR (measured) = 0.734 W/kg

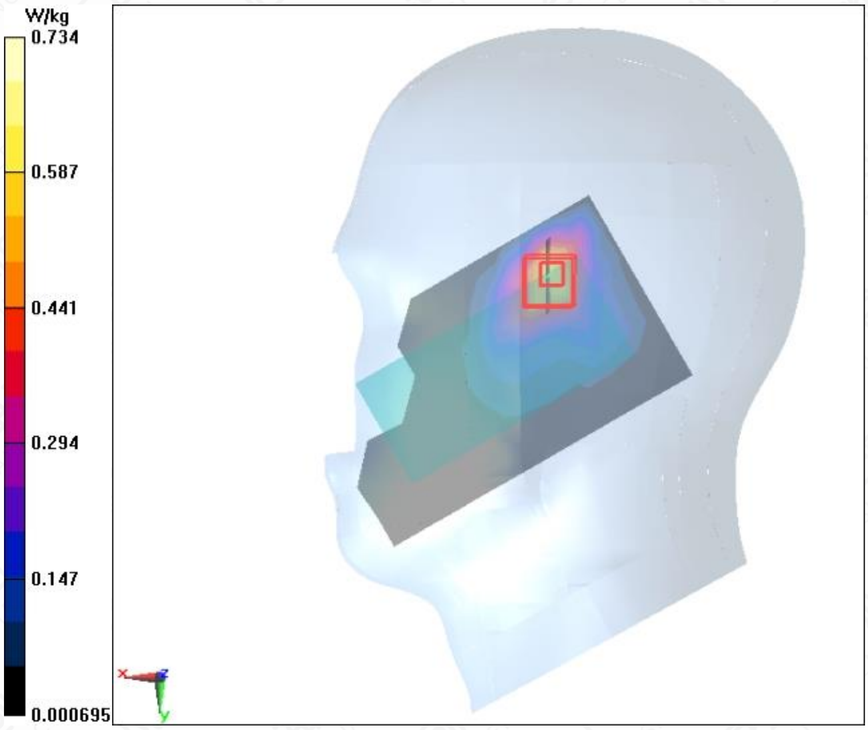


Figure B.1-11 Wi-Fi2.4G 11b Right Cheek Mode Low

Wi-Fi2.4G 11b Back Mode Low 10mm
Date/Time: 2022/10/9
Electronics: DAE4 Sn1244
Medium parameters used: f = 2412 MHz; σ = 1.798 S/m; εr = 38.303; ρ = 1000 kg/m3
Ambient Temperature:21.4°C   Liquid Temperature:20.5°C
Communication System: Wifi 2450 2450MHz;   Frequency: 2412 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(7.96, 7.96, 7.96) @ 2412 MHz
Wi-Fi2.4G 11b Back Mode Low 10mm/Area Scan (7x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.177 W/kg
Wi-Fi2.4G 11b Back Mode Low 10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.978 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.250 W/kg
SAR(1 g) = 0.126 W/kg; SAR(10 g) = 0.062 W/kg
Maximum value of SAR (measured) = 0.197 W/kg

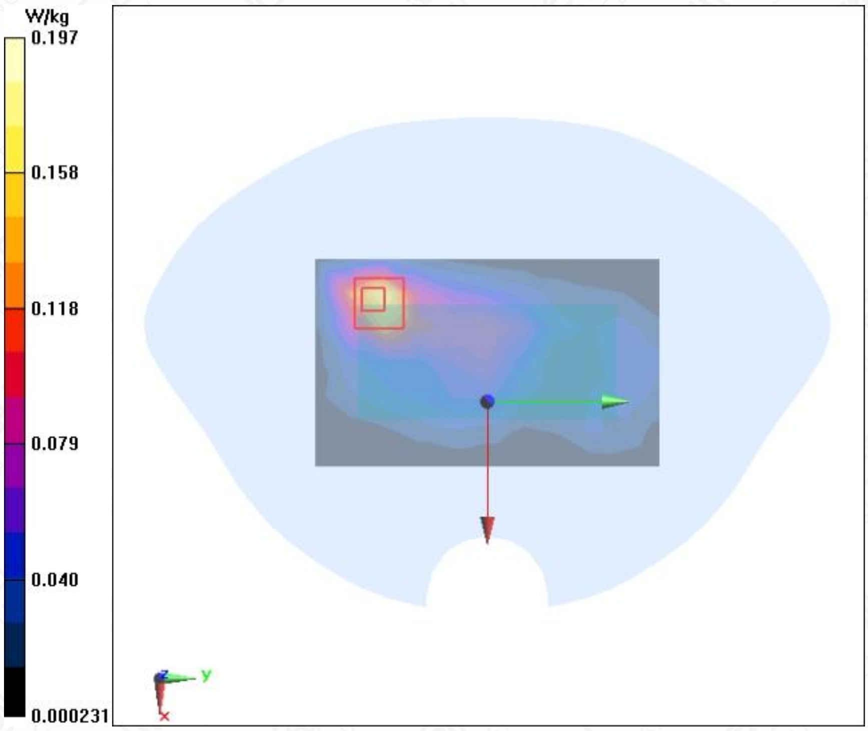


Figure B.1-12 Wi-Fi2.4G 11b Back Mode Low 10mm

Wi-Fi5G U-NII-1 11a Right Cheek Mode Low
Date/Time: 2022/10/10
Electronics: DAE4 Sn1244
Medium parameters used: f = 5180 MHz; σ = 4.712 S/m; εr = 36.192; ρ = 1000 kg/m3
Ambient Temperature:21.5°C Liquid Temperature:20.4°C
Communication System: 5GHz U-NII-1 5GHz; Frequency: 5180 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(5.7, 5.7, 5.7) @ 5180 MHz
Wi-Fi5G U-NII-1 11a Right Cheek Mode Low/Area Scan (11x7x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.799 W/kg
Wi-Fi5G U-NII-1 11a Right Cheek Mode Low/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 1.457 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.37 W/kg
SAR(1 g) = 0.296 W/kg; SAR(10 g) = 0.076 W/kg
Maximum of SAR (measured) = 0.811 W/kg

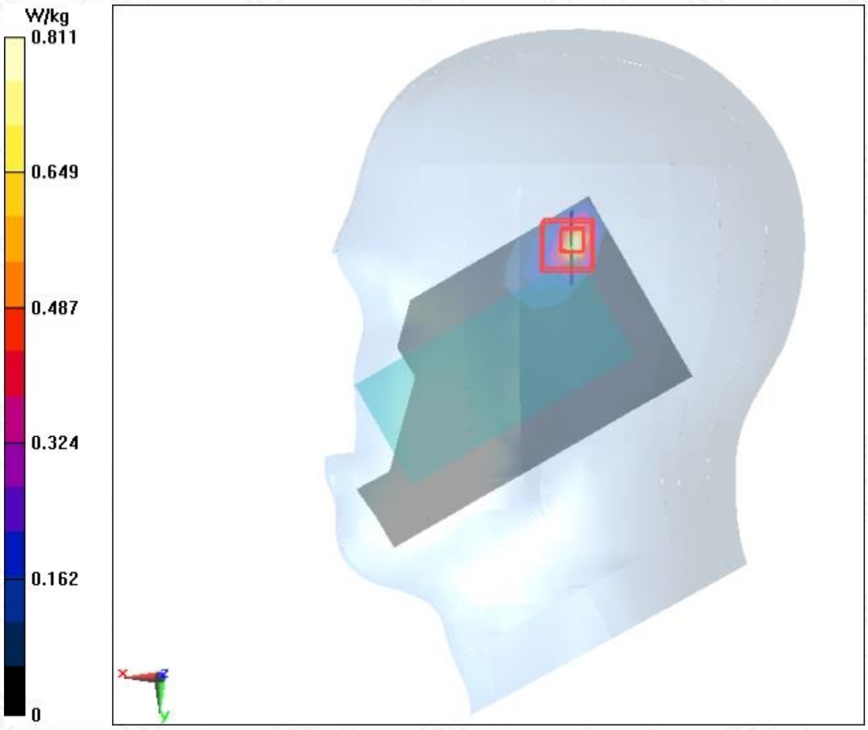


Figure B.1-13 Wi-Fi5G U-NII-1 11a Right Cheek Mode Low

Wi-Fi5G U-NII-1 11a Left Mode Low 10mm
Date/Time: 2022/10/10
Electronics: DAE4 Sn1244
Medium parameters used: f = 5180 MHz; σ = 4.712 S/m; εr = 36.192; ρ = 1000 kg/m3
Ambient Temperature:21.6°C Liquid Temperature:20.5°C
Communication System: 5GHz U-NII-1 5GHz; Frequency: 5180 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(5.7, 5.7, 5.7) @ 5180 MHz
Wi-Fi5G U-NII-1 11a Left Mode Low 10mm/Area Scan (5x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.286 W/kg
Wi-Fi5G U-NII-1 11a Left Mode Low 10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.087 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.759 W/kg
SAR(1 g) = 0.138 W/kg; SAR(10 g) = 0.045 W/kg
Maximum of SAR (measured) = 0.303 W/kg

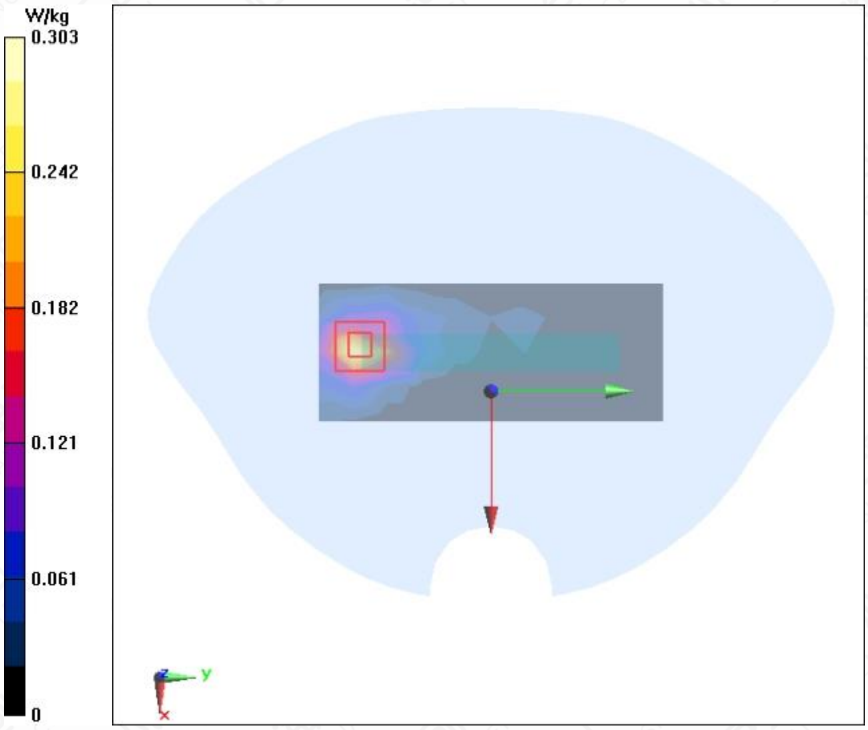


Figure B.1-14 Wi-Fi5G U-NII-1 11a Left Mode Low 10mm

Wi-Fi5G U-NII-2C 11a Right Cheek Mode Middle
Date/Time: 2022/10/10
Electronics: DAE4 Sn1244
Medium parameters used: f = 5600 MHz; σ = 5.203 S/m; εr = 35.356; ρ = 1000 kg/m3
Ambient Temperature:21.6°C Liquid Temperature:20.5°C
Communication System: 5GHz U-NII-2C 5GHz; Frequency: 5600 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(5.13, 5.13, 5.13) @ 5600 MHz
Wi-Fi5G U-NII-2C 11a Right Cheek Mode Middle/Area Scan (11x7x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.365 W/kg
Wi-Fi5G U-NII-2C 11a Right Cheek Mode Middle/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.849 W/kg
SAR(1 g) = 0.162 W/kg; SAR(10 g) = 0.042 W/kg
Maximum of SAR (measured) = 0.548 W/kg

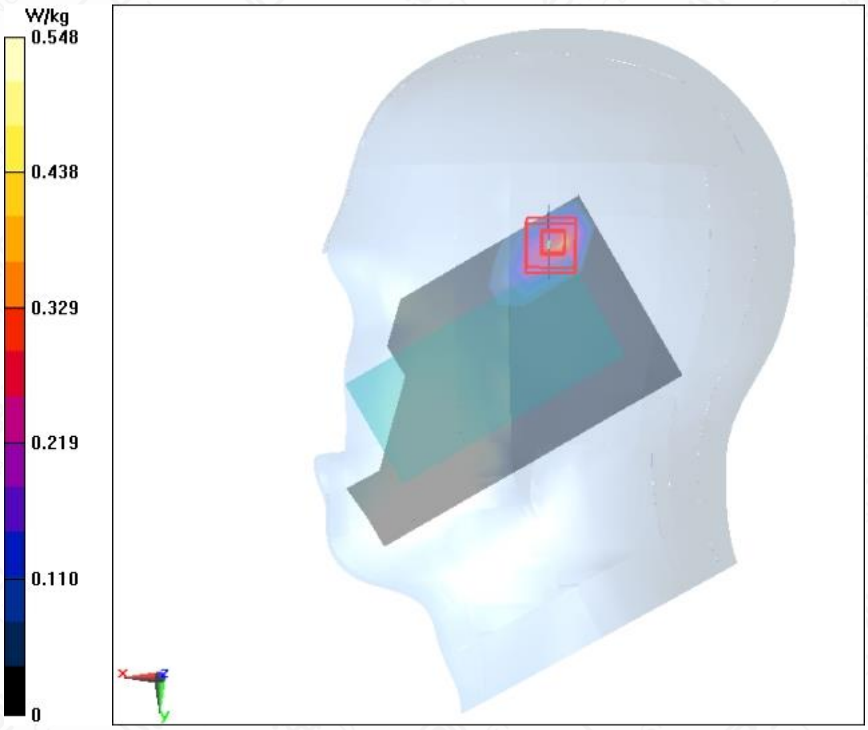


Figure B.1-15 Wi-Fi5G U-NII-2C 11a Right Cheek Mode Middle

Wi-Fi5G U-NII-2C 11a Left Mode Middle 10mm

Date/Time: 2022/10/10

Electronics: DAE4 Sn1244

Medium parameters used: f = 5600 MHz; σ = 5.203 S/m; εr = 35.356; ρ = 1000 kg/m3

Ambient Temperature:21.6°C Liquid Temperature:20.5°C

Communication System: 5GHz U-NII-2C 5GHz; Frequency: 5600 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(5.13, 5.13, 5.13) @ 5600 MHz

Wi-Fi5G U-NII-2C 11a Left Mode Middle 10mm/Area Scan (5x11x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.192 W/kg

Wi-Fi5G U-NII-2C 11a Left Mode Middle 10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.2750 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.354 W/kg

SAR(1 g) = 0.088 W/kg; SAR(10 g) = 0.031 W/kg

Maximum value of SAR (measured) = 0.228 W/kg

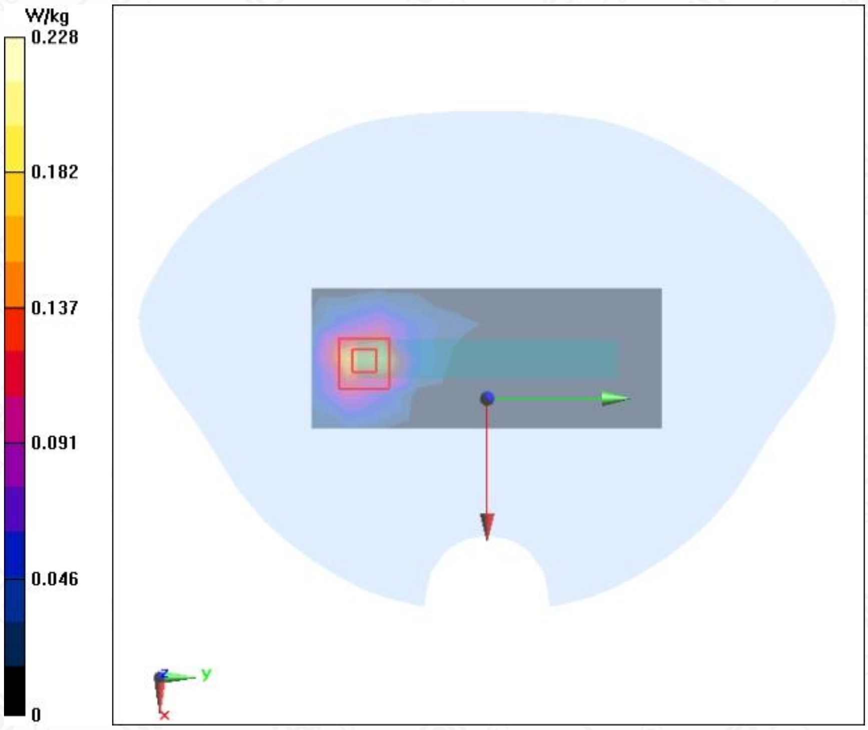


Figure B.1-16 Wi-Fi5G U-NII-2C 11a Left Mode Middle 10mm

Wi-Fi5G U-NII-3 11a Right Cheek Mode High
Date/Time: 2022/10/10
Electronics: DAE4 Sn1244
Medium parameters used: f = 5825 MHz; σ = 5.464 S/m; εr = 34.861; ρ = 1000 kg/m3
Ambient Temperature:21.6°C Liquid Temperature:20.5°C
Communication System: 5GHz U-NII-3 5GHz; Frequency: 5825 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(5.17, 5.17, 5.17) @ 5825 MHz
Wi-Fi5G U-NII-3 11a Right Cheek Mode High/Area Scan (11x7x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.805 W/kg
Wi-Fi5G U-NII-3 11a Right Cheek Mode High/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.48 W/kg
SAR(1 g) = 0.339 W/kg; SAR(10 g) = 0.086 W/kg
Maximum of SAR (measured) = 1.01 W/kg

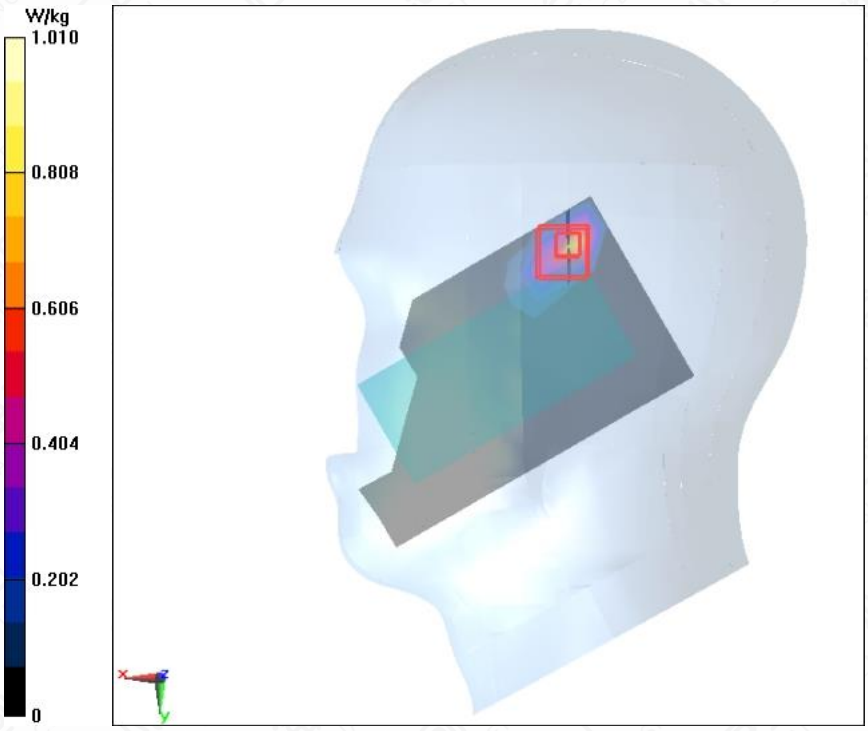


Figure B.1-17 Wi-Fi5G U-NII-3 11a Right Cheek Mode High

Wi-Fi5G U-NII-3 11a Back Mode High 10mm
Date/Time: 2022/10/10
Electronics: DAE4 Sn1244
Medium parameters used: f = 5825 MHz; σ = 5.464 S/m; εr = 34.861; ρ = 1000 kg/m3
Ambient Temperature:21.6°C Liquid Temperature:20.5°C
Communication System: 5GHz U-NII-3 5GHz; Frequency: 5825 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(5.17, 5.17, 5.17) @ 5825 MHz
Wi-Fi5G U-NII-3 11a Back Mode High 10mm/Area Scan (8x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.426 W/kg
Wi-Fi5G U-NII-3 11a Back Mode High 10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.26 W/kg
SAR(1 g) = 0.199 W/kg; SAR(10 g) = 0.061 W/kg
Maximum of SAR (measured) = 0.408 W/kg

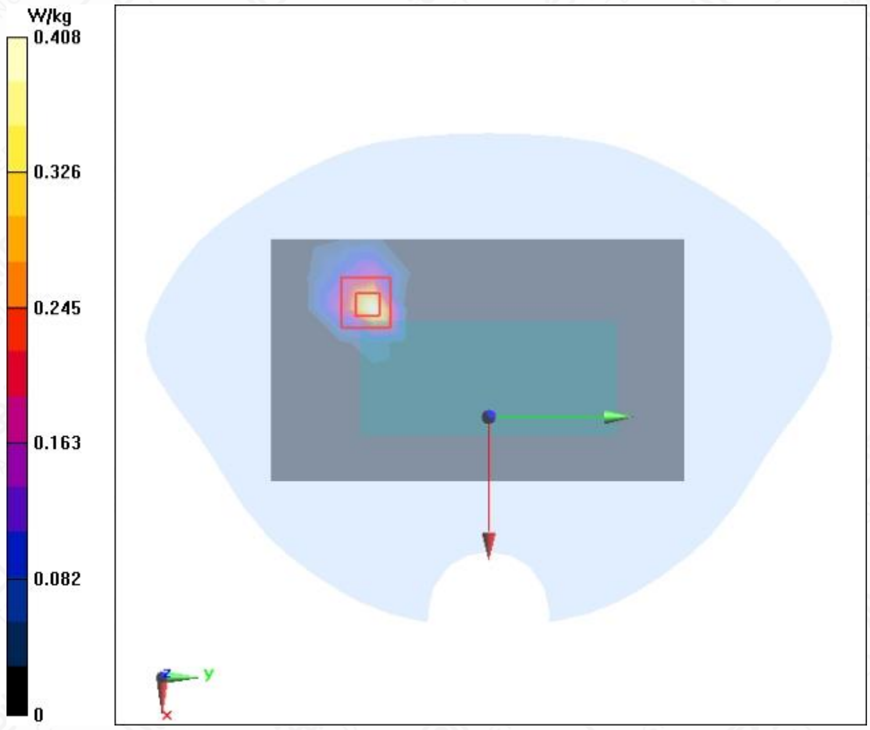


Figure B.1-18 Wi-Fi5G U-NII-3 11a Back Mode High 10mm

A.2 System Check Graph Results

Head 835MHz
Date/Time: 2022/9/29
Electronics: DAE4 Sn1244
Medium parameters used: f = 835 MHz; σ = 0.92 S/m; εr = 42.995; ρ = 1000 kg/m3
Ambient Temperature:21.5°C   Liquid Temperature:20.4°C
Communication System: CW 900MHz;   Frequency: 835 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(10.55, 10.55, 10.55) @ 835 MHz
System Check Head 835MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 3.00 W/kg
System Check Head 835MHz/Zoom Scan (7x7x7) (5x5x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 64.06 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.92 W/kg
SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.57 W/kg
Maximum value of SAR (measured) = 3.39 W/kg

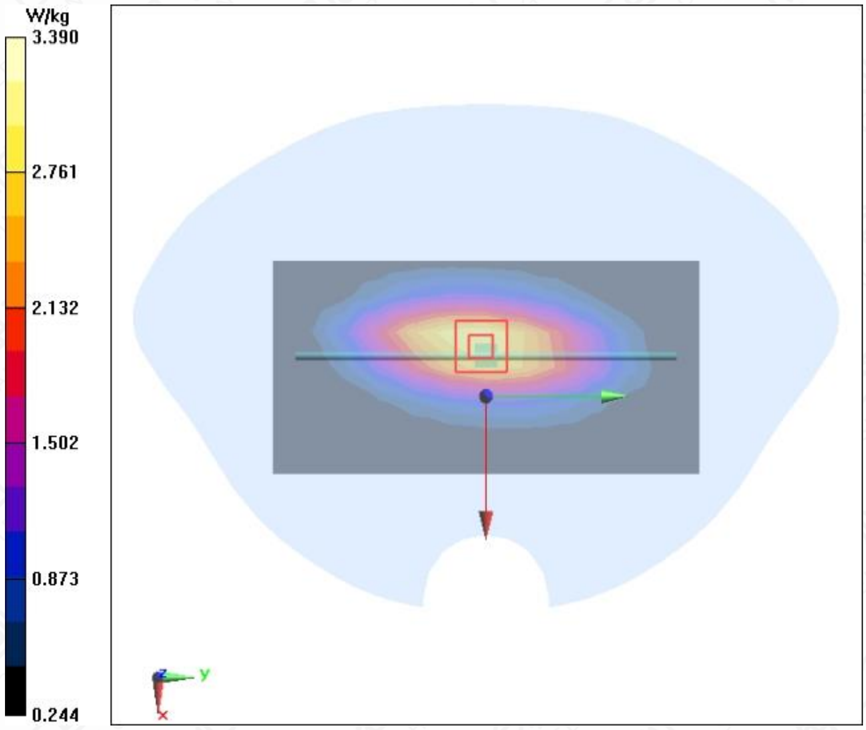


Figure A.2-1 Head 835MHz

Head 835MHz

Date/Time: 2022/10/9

Electronics: DAE4 Sn1244

Medium parameters used: f = 835 MHz; σ = 0.899 S/m; εr = 43.221; ρ = 1000 kg/m3

Ambient Temperature:21.6°C   Liquid Temperature:20.4°C

Communication System: CW 900MHz; Frequency: 835 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(10.55, 10.55, 10.55) @ 835 MHz

System Check Head 835MHz/Area Scan (7x13x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 2.94 W/kg

System Check Head 835MHz/Zoom Scan (7x7x7) (5x5x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 64.06 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 3.83 W/kg

SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.54 W/kg

Maximum value of SAR (measured) = 3.32 W/kg

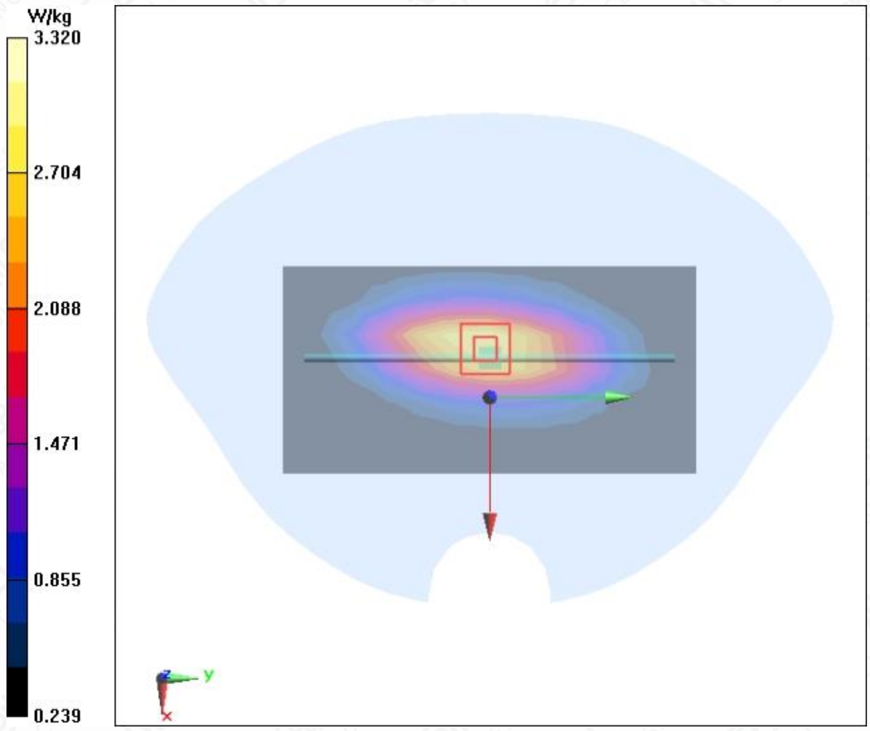


Figure A.2-2 Head 835MHz

Head 1900MHz
Date/Time: 2022/10/13
Electronics: DAE4 Sn1244
Medium parameters used: f = 1900 MHz; σ = 1.395 S/m; εr = 39.849; ρ = 1000 kg/m3
Ambient Temperature:21.6°C Liquid Temperature:20.3°C
Communication System: CW 1750; Frequency: 1900 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7633ConvF(8.6, 8.6, 8.6) @ 1900 MHz
System Check Head 1900MHz/Area Scan (8x7x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 13.1 W/kg
System Check Head 1900MHz/Zoom Scan (7x7x7) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.9 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 19.0 W/kg
SAR(1 g) = 9.9 W/kg; SAR(10 g) = 5.1 W/kg
Maximum value of SAR (measured) = 15.5 W/kg

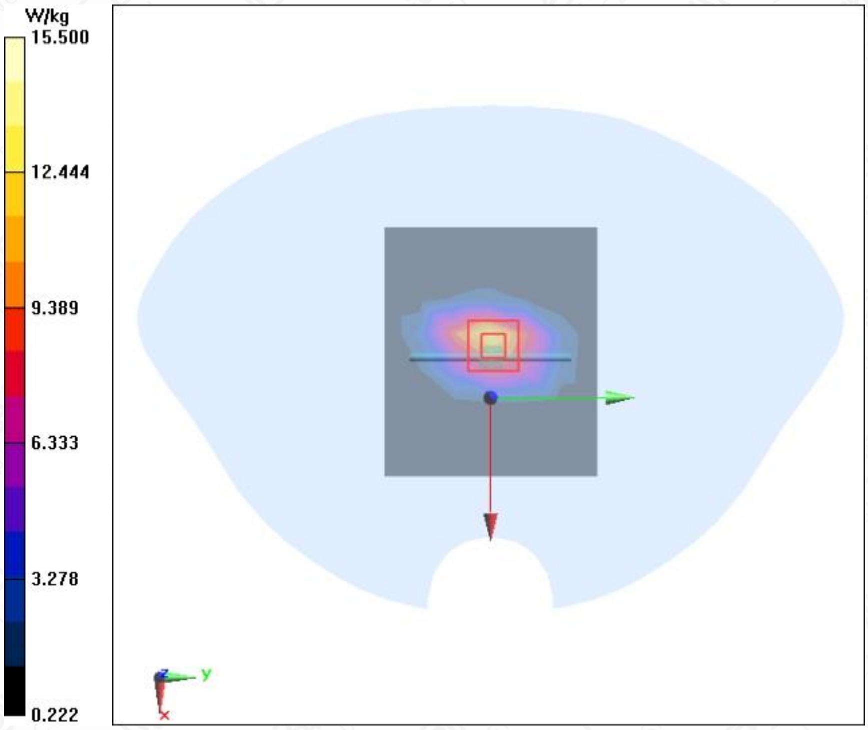


Figure A.2-3 Head 1900MHz

Head 1900MHz

Date/Time: 2022/10/18

Electronics: DAE4 Sn1244

Medium parameters used: f = 1900 MHz; σ = 1.425 S/m; εr = 39.526; ρ = 1000 kg/m3

Ambient Temperature:21.5°C Liquid Temperature:20.2°C

Communication System: CW 1750; Frequency: 1900 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(8.6, 8.6, 8.6) @ 1900 MHz

System Check Head 1900MHz/Area Scan (8x7x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 13.7 W/kg

System Check Head 1900MHz/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.4 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 19.7 W/kg

SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.31 W/kg

Maximum value of SAR (measured) = 16.1 W/kg

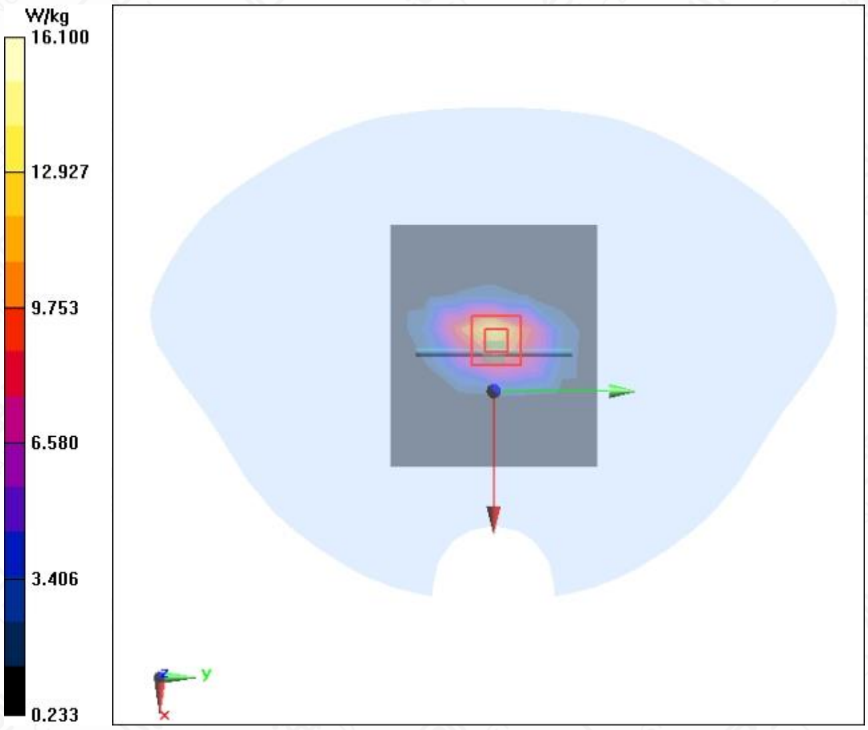


Figure A.2-4 Head 1900MHz

Head 2450MHz

Date/Time: 2022/10/9

Electronics: DAE4 Sn1244

Medium parameters used: f = 2450 MHz; σ = 1.828 S/m; εr = 38.245; ρ = 1000 kg/m3

Ambient Temperature:21.6°C   Liquid Temperature:20.4°C

Communication System: CW 2600MHz; Frequency: 2450 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(7.96, 7.96, 7.96) @ 2450 MHz

System Check Head 2450MHz/Area Scan (8x8x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 19.4 W/kg

System Check Head 2450MHz/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 113.3 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 27.7 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.14 W/kg

Maximum value of SAR (measured) = 22.4 W/kg

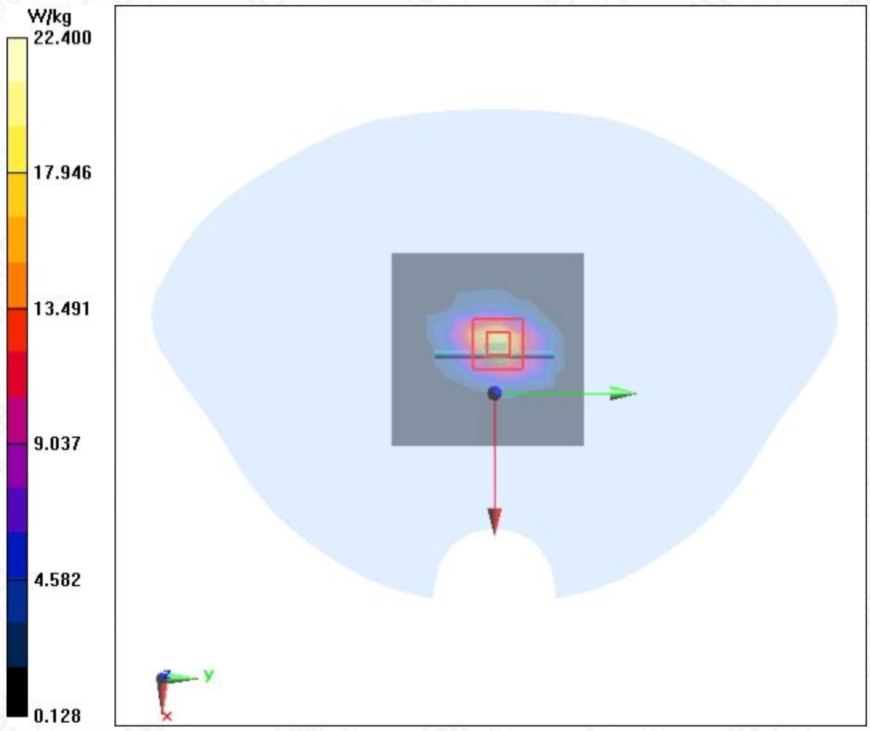


Figure A.2-5 Head 2450MHz

Head 2600MHz

Date/Time: 2022/9/26

Electronics: DAE4 Sn1244

Medium parameters used: f = 2600 MHz; σ = 1.926 S/m; εr = 37.358; ρ = 1000 kg/m3

Ambient Temperature:21.5°C   Liquid Temperature:20.5°C

Communication System: CW 2600MHz; Frequency: 2600 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(7.73, 7.73, 7.73) @ 2600 MHz

System Check Head 2600MHz/Area Scan (8x8x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 20.1 W/kg

System Check Head 2600MHz/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 111.5 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 29.1 W/kg

SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.17 W/kg

Maximum value of SAR (measured) = 23.2 W/kg

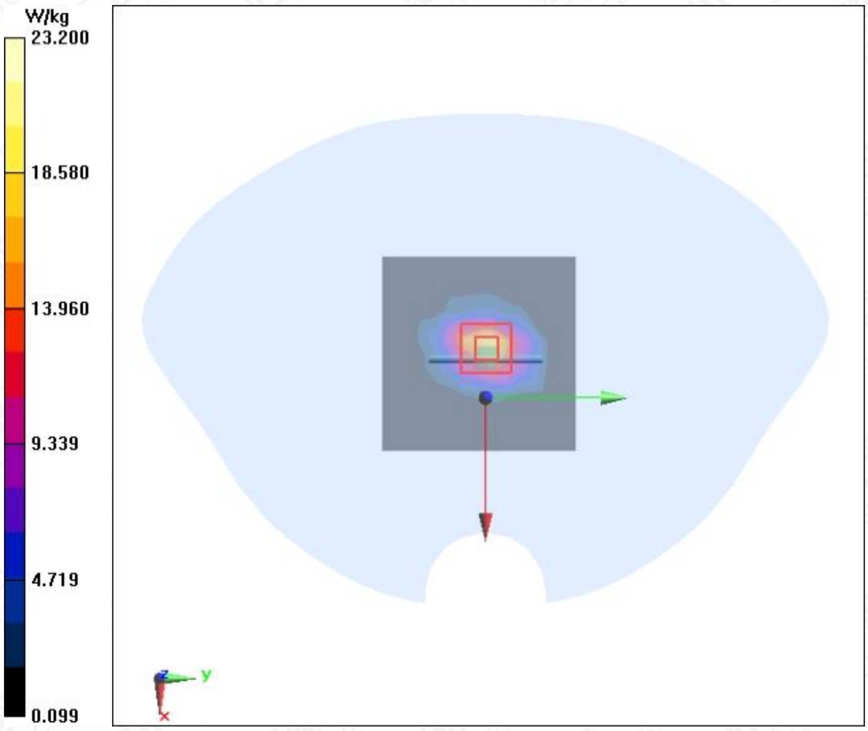


Figure A.2-6 Head 2600MHz

Head 5200MHz

Date/Time: 2022/10/10

Electronics: DAE4 Sn1244

Medium parameters used: f = 5200 MHz; σ = 4.735 S/m; εr = 36.151; ρ = 1000 kg/m3

Ambient Temperature:21.5°C   Liquid Temperature:20.4°C

Communication System: CW 5GHz;   Frequency: 5200 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(5.7, 5.7, 5.7) @ 5200 MHz

System Check Head 5200MHz/Area Scan (10x10x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 17.6 W/kg

System Check Head 5200MHz/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 67.18 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 33.5 W/kg

SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.34 W/kg

Maximum of SAR (measured) = 20.5 W/kg

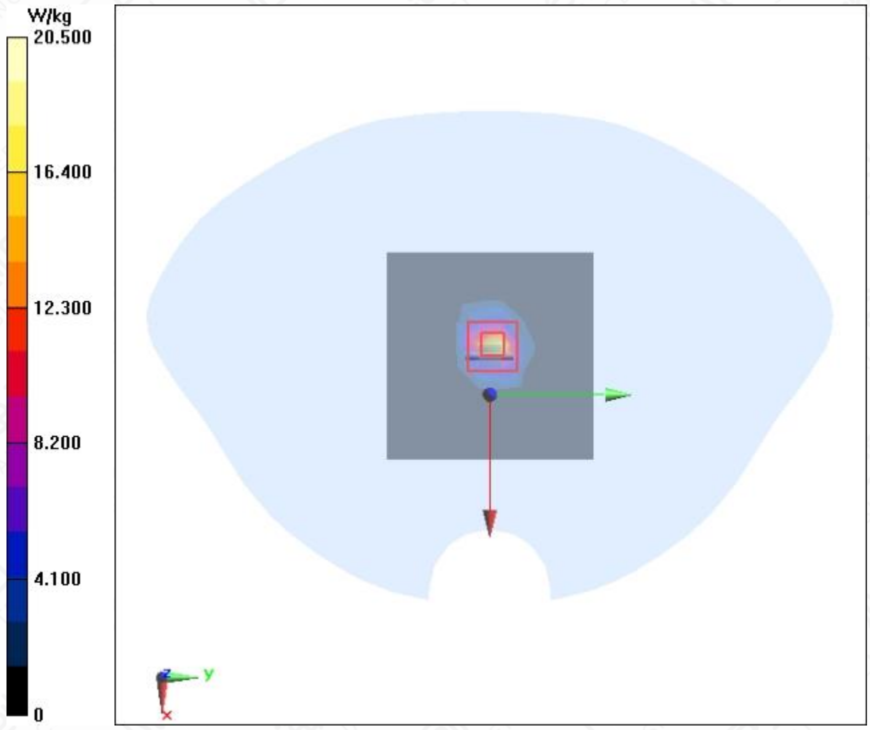


Figure A.2-7 Head 5200MHz

Head 5600MHz

Date/Time: 2022/10/10

Electronics: DAE4 Sn1244

Medium parameters used: f = 5600 MHz; σ = 5.203 S/m; εr = 35.356; ρ = 1000 kg/m3

Ambient Temperature:21.4°C Liquid Temperature:20.3°C

Communication System: CW 5GHz; Frequency: 5600 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(5.13, 5.13, 5.13) @ 5600 MHz

System Check Head 5600MHz/Area Scan (10x10x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 16.6 W/kg

System Check Head 5600MHz/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 67.95 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 37.0 W/kg

SAR(1 g) = 8.18 W/kg; SAR(10 g) = 2.31 W/kg

Maximum of SAR (measured) = 21.5 W/kg

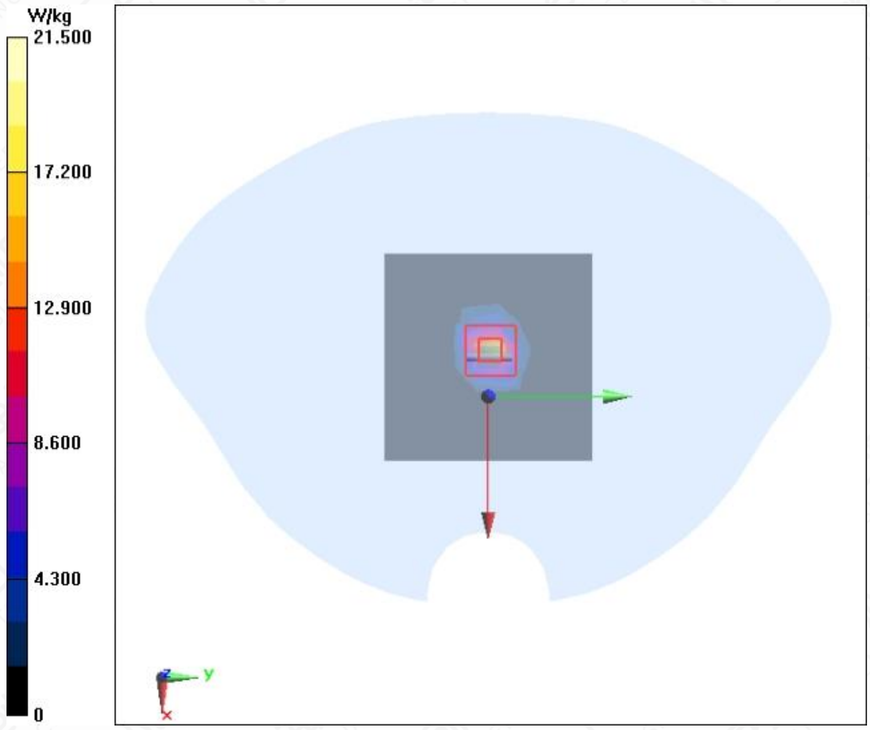


Figure A.2-8 Head 5600MHz

Head 5800MHz

Date/Time: 2022/10/10

Electronics: DAE4 Sn1244

Medium parameters used: f = 5800 MHz; σ = 5.436 S/m; εr = 34.916; ρ = 1000 kg/m3

Ambient Temperature:21.6°C Liquid Temperature:20.5°C

Communication System: CW 5GHz; Frequency: 5800 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7633ConvF(5.17, 5.17, 5.17) @ 5800 MHz

System Check Head 5800MHz/Area Scan (10x10x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 19.7 W/kg

System Check Head 5800MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (7x7x7)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 60.13 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 37.0 W/kg

SAR(1 g) = 8.22 W/kg; SAR(10 g) = 2.31 W/kg

Maximum of SAR (measured) = 22.0 W/kg

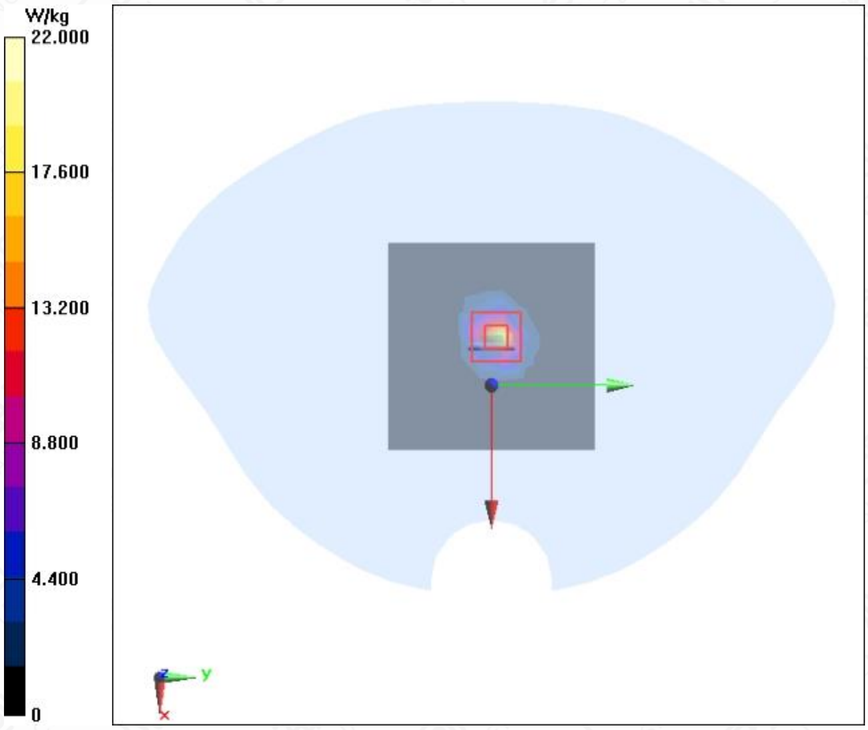


Figure A.2-9 Head 5800MHz

Annex B: Calibration Certificate

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Client : 3in

Certificate No: Z22-60063

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1244
Calibration Procedure(s)	FF-Z11-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	March 09, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	15-Jun-21 (CTTL, No.J21X04465)	Jun-22

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: March 11, 2022

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

Certificate No: Z22-60063 Page 1 of 3

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Glossary:

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	403.832 ± 0.15% (k=2)	403.556 ± 0.15% (k=2)	404.475 ± 0.15% (k=2)
Low Range	3.95285 ± 0.7% (k=2)	3.96959 ± 0.7% (k=2)	3.97877 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	23.5° ± 1 °

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Client 3in Certificate No: Z22-60064

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN : 7633
Calibration Procedure(s)	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	March 31, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Power sensor NRP-Z91	101547	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Power sensor NRP-Z91	101548	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Reference 10dBAttenuator	18N50W-10dB	20-Jan-21(CTTL, No.J21X00486)	Jan-23
Reference 20dBAttenuator	18N50W-20dB	20-Jan-21(CTTL, No.J21X00485)	Jan-23
Reference Probe EX3DV4	SN 7307	26-May-21(SPEAG, No.EX3-7307_May21)	May-22
Reference Probe EX3DV4	SN 7464	26-Jan-22(SPEAG, No.EX3-7464_Jan22)	Jan-23
DAE4	SN 1555	20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2)	Aug-22
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGenerator MG3700A	6201052605	16-Jun-21(CTTL, No.J21X04467)	Jun-22
Network Analyzer E5071C	MY46110673	14-Jan-22(CTTL, No.J22X00406)	Jan-23

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: April 06, 2022

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

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

Certificate No:Z22-60064 Page 2 of 9

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7633

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm(μV/(V/m)^2)[A]	0.66	0.65	0.68	±10.0%
DCP(mV)[B]	111.2	112.3	113.8	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (*k*=2)
0	CW	X	0.0	0.0	1.0	0.00	214.3	±2.2%
		Y	0.0	0.0	1.0		212.4	
		Z	0.0	0.0	1.0		221.3	

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

[A] The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7633

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	10.90	10.90	10.90	0.14	1.44	±12.1%
835	41.5	0.90	10.55	10.55	10.55	0.13	1.59	±12.1%
900	41.5	0.97	10.53	10.53	10.53	0.15	1.38	±12.1%
1750	40.1	1.37	8.90	8.90	8.90	0.30	0.86	±12.1%
1900	40.0	1.40	8.60	8.60	8.60	0.26	0.98	±12.1%
2000	40.0	1.40	8.63	8.63	8.63	0.23	1.08	±12.1%
2300	39.5	1.67	8.20	8.20	8.20	0.55	0.72	±12.1%
2450	39.2	1.80	7.96	7.96	7.96	0.58	0.71	±12.1%
2600	39.0	1.96	7.73	7.73	7.73	0.65	0.67	±12.1%
3300	38.2	2.71	7.42	7.42	7.42	0.41	0.98	±13.3%
3500	37.9	2.91	7.20	7.20	7.20	0.41	0.95	±13.3%
3700	37.7	3.12	6.83	6.83	6.83	0.44	1.01	±13.3%
3900	37.5	3.32	6.85	6.85	6.85	0.35	1.33	±13.3%
4100	37.2	3.53	6.73	6.73	6.73	0.40	1.15	±13.3%
4200	37.1	3.63	6.65	6.65	6.65	0.35	1.35	±13.3%
4400	36.9	3.84	6.55	6.55	6.55	0.35	1.35	±13.3%
4600	36.7	4.04	6.41	6.41	6.41	0.45	1.25	±13.3%
4800	36.4	4.25	6.37	6.37	6.37	0.40	1.40	±13.3%
4950	36.3	4.40	6.06	6.06	6.06	0.40	1.40	±13.3%
5250	35.9	4.71	5.70	5.70	5.70	0.50	1.20	±13.3%
5600	35.5	5.07	5.13	5.13	5.13	0.50	1.30	±13.3%
5750	35.4	5.22	5.17	5.17	5.17	0.50	1.30	±13.3%

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

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

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

Certificate No:Z22-60064 Page 4 of 9

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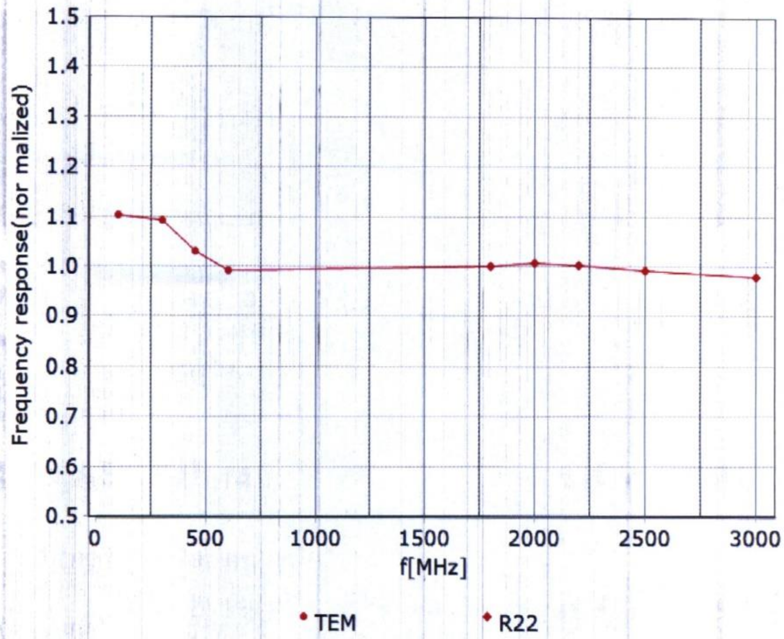
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)

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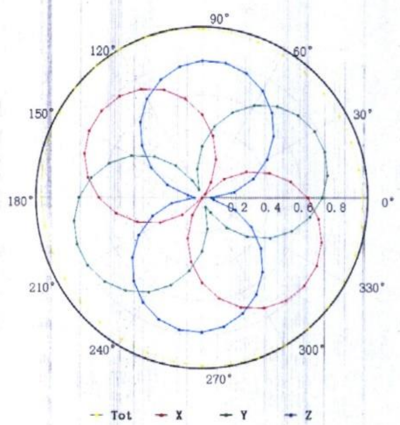
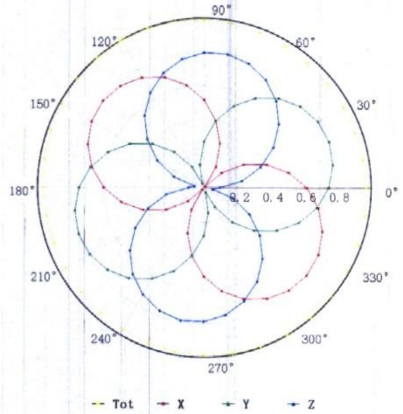
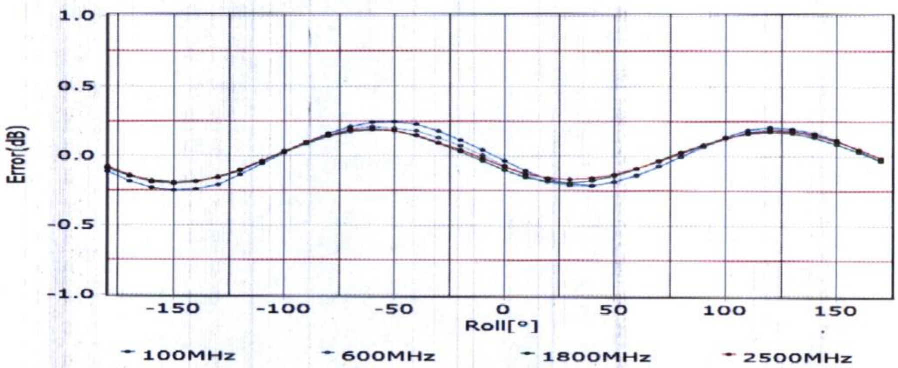
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM

f=1800 MHz, R22







Uncertainty of Axial Isotropy Assessment: ±1.2% (*k*=2)

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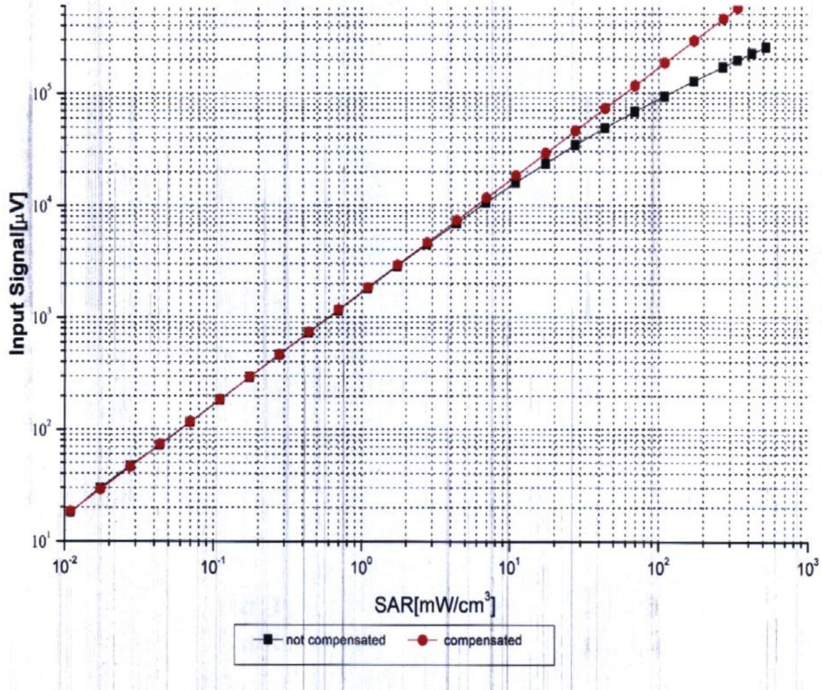
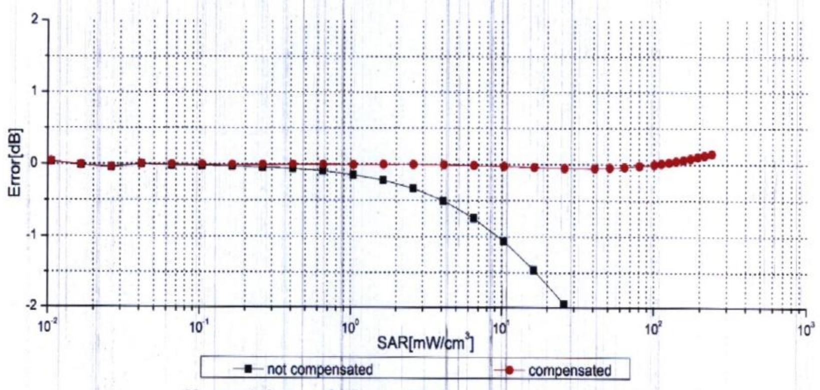
Dynamic Range f(SAR$_{head}$)
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (*k*=2)

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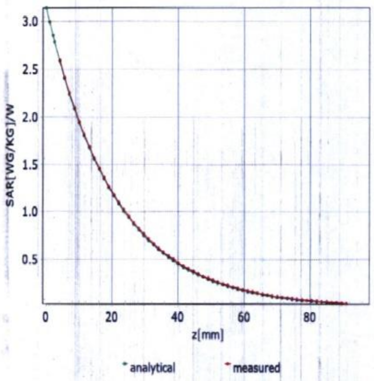
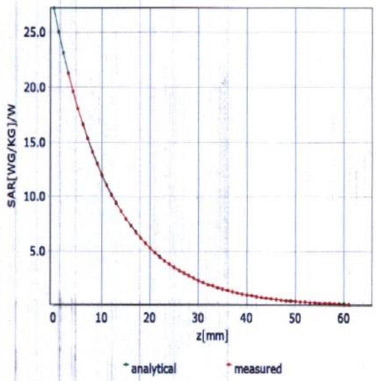
Conversion Factor Assessment

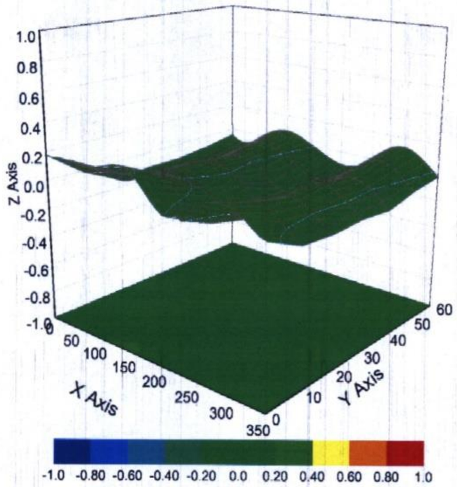
f=750 MHz,WGLS R9(H_convF)



f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7633

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	26.4
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

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Client 3in Certificate No: Z22-60399

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d112
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	September 21, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7464	26-Jan-22(SPEAG,No.EX3-7464_Jan22)	Jan-23
DAE4	SN 1556	12-Jan-22(CTTL-SPEAG,No.Z22-60007)	Jan-23
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	13-Jan-22 (CTTL, No.J22X00409)	Jan-23
Network Analyzer E5071C	MY46110673	14-Jan-22 (CTTL, No.J22X00406)	Jan-23

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: September 27, 2022

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 ℃	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ±0.2) ℃	42.3 ±6 %	0.90 mho/m ±6 %
Head TSL temperature change during test	<1.0 ℃	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.66 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.29 W/kg ± 18.7 % (*k*=2)**

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