FCC SAR Test Report

Equipment	**:**	**Handheld Computer**
Model No.	**:**	**DB7**
Standard	**:**	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2003**
Applicant **Manufacturer**	**:**	**MilDef Crete Inc.** 7F, No.250, Sec.3, Pei Shen Rd., Shen Keng District, New Taipei City Taiwan R.O.C.

The product sample received on Feb. 13, 2015 and completely tested on Mar. 12, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

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

Reviewed by:

Kevin Liang / Assistant Manager

TAF
Testing Laboratory
1190

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Revision History

Report No.	Version	Description	Issued Date
FA521326	Rev. 01	Initial issue of report	Mar. 25, 2015

1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing as follows.

Exposure Position	Frequency Band	Reported 1g SAR (W/kg)	Equipment Class	Highest Reported 1g SAR (W/kg)
Body	WLAN5.8GHz Band	0.598	NII	0.598
	WLAN2.4GHz Band	1.010	DTS	1.010

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

1.1 Guidance Standard

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

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2003
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- FCC KDB 865664 D02 SAR Reporting v01r01
- FCC KDB 447498 D01 General RF Exposure Guidance v05r02
- FCC KDB 248227 D01 SAR meas for 802 11abg v01r02
- FCC KDB 941225 D07 UMPC Mini Tablet v01r01

1.2 Testing Location Information

Testing Location					
HWA YA	ADD	:	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.		
	TEL	:	886-3-327-3456	FAX	: 886-3-327-0973

1.3 Device Category and SAR Limits

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

1.3.1 Test Conditions

Ambient Temperature	20 to 24 ℃
Humidity	< 60%

1.3.2 Test Configuration

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

- 2.4G: 802.11b, 1Mbps: 100%
- 2.4G: 802.11g, 6Mbps: 100%
- 2.4G: 802.11n-HT20, MCS8: 100%
- 2.4G: 802.11n-HT40, MCS8: 100%
- 5G: 802.11a, 6Mbps: 100%
- 5G: 802.11n-HT20, MCS8: 100%
- 5G: 802.11n-HT40, MCS8: 100%

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

2 Equipment Under Test (EUT)

2.1 General Information

Product Feature & Specification	
Equipment Name	Handheld Computer
Model Name	DB7
Frequency Range	WLAN 5.8GHz Band: 5725 MHz ~ 5850 MHz WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz
EUT Stage	Identical Prototype

Accessories				
AC Adapter	Brand Name	FSP GROUP INC.	Model Name	FSP036-RAB
	Power Rating	I/P: 100-240 Vac, 1.5A 50-60Hz, O/P: 12 Vdc, 3.0A		
	Power Cord	DC: 1.2 meter, non-shielded cable, with one ferrite core AC: 1.1 meter, shielded cable, W/O ferrite core		

3 RF Exposure Limits

3.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

3.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

4 Specific Absorption Rate (SAR)

4.1 Introduction

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

4.2 SAR Definition

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

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

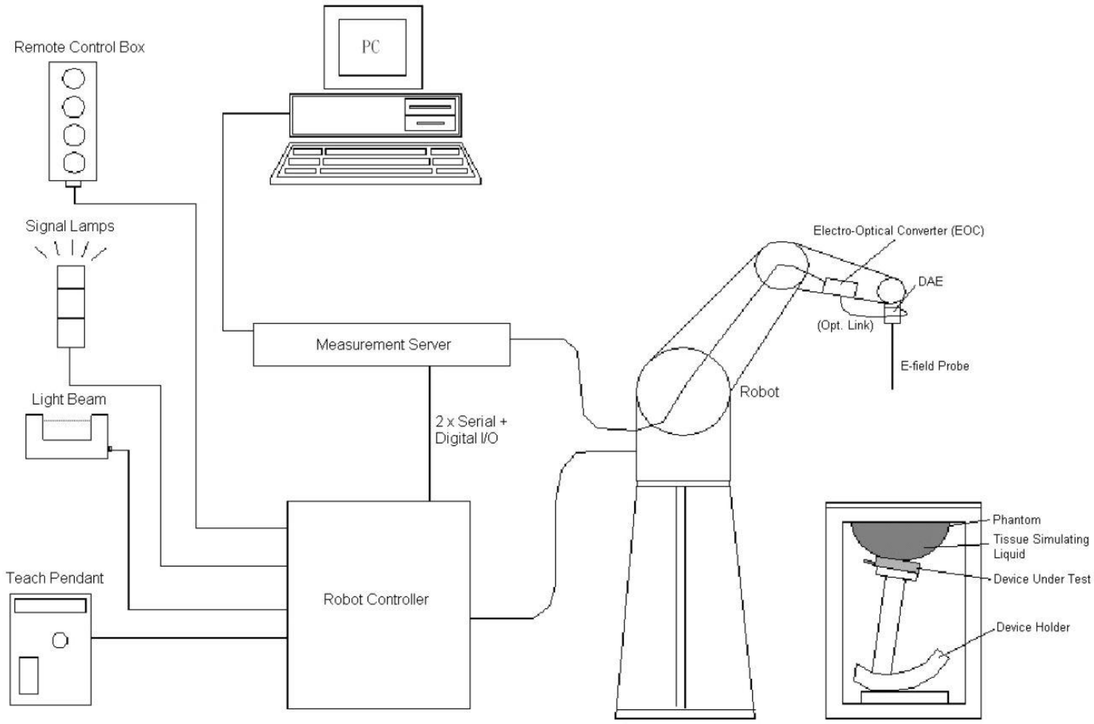
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

5 System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 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.

5.1 E-Field Probe

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

5.2 E-Field Probe Specification

<EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to 100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

5.3 E-Field Probe Calibration

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

5.4 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

5.5 Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90BL; DASY5: TX90XL) type from Stäubli SA (France). The Stäubli robot series have many features that are important for our application:

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

5.6 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY5: 400 MHz, Intel Celeron), chipdisk (DASY5: 128 MB), RAM (DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board. The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

5.7 Phantom

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

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

6 Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

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

<SAR measurement>

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

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

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

6.1 Spatial Peak SAR Evaluation

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

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

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

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

6.2 Power Reference Measurement

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

6.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz v01r01.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

6.4 Zoom Scan

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

Zoom scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz v01r01.

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

6.5 Volume Scan Procedures

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

6.6 Power Drift Monitoring

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

7 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Data Acquisition Electronics	DAE4	917	2014/12/29	2015/12/28
SPEAG	Dosimetric E-Field Probe	EX3DV4	7351	2015/1/8	2016/1/7
SPEAG	2450MHz System Validation Kit	D2450V2	735	2014/12/8	2015/2/11
SPEAG	5000MHz System Validation Kit	D5GHzV2	1040	2014/6/20	2015/6/19
SPEAG	Device Holder	N/A	N/A	NCR	NCR
Mini-Circuits	Power Amplifier	ZHL-42W+	15542	NCR	NCR
Mini-Circuits	Power Amplifier	ZVE-8G+	605601404	NCR	NCR
Agilent	ENA Series Network Analyzer	E5071C	MY46419201	2015/1/21	2016/1/20
Agilent	EXA Signal Analyzer	N9010A	MY54200432	2014/8/16	2015/8/15
Agilent	MXG-B RF Vector Signal Generator	N5182B	MY53050081	2014/4/8	2015/4/7
SPEAG	Dielectric Probe Kit	SM DAK 040CA	1146	NCR	NCR
Anritsu	Power Meter	ML2495A	1124009	2015/1/29	2016/1/28
Anritsu	Power sensor	MA2411B	1027452	2015/1/29	2016/1/28
SPEAG	Flat Phantom ELI5.0	QD OVA 002 AA	1238	NCR	NCR
Wisewind	Themometer	HTC1	HTC1	2014/12/25	2015/12/24
Wisewind	Themometer	YF-160A	130504609	2014/12/25	2015/12/24

General Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
3. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it
4. Attenuator 1 insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.
5. NCR: No calibration request.

8 System Verification

8.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 8.1.

Fig 8.1 Photo of Liquid Height for Body SAR

8.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

8.3 Test Conditions

<Ambient Condition>

Ambient Temperature	23 to 24 ℃
Humidity	63 to 65%

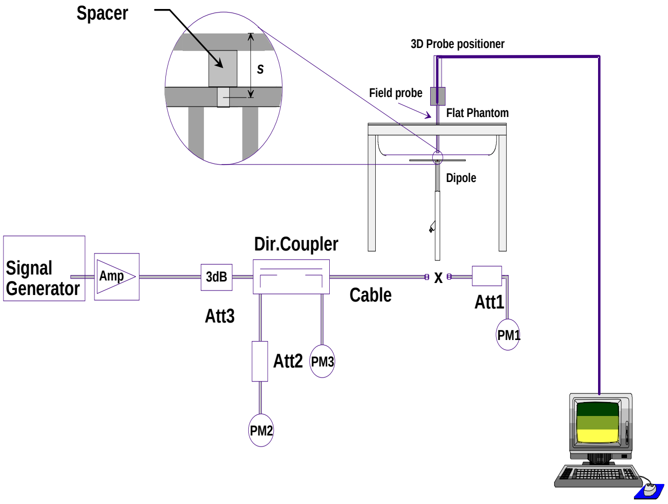
<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (εr)	Conductivity Target (σ)	Permittivity Target (εr)	Delta (σ) (%)	Delta (εr) (%)	Limit (%)	Date
2450	22.1	2.002	51.299	1.95	52.7	2.67	-2.66	±5	2015/3/5
5800	21.6	6.189	48.005	6	48.2	3.15	-0.40	±5	2015/3/4

8.4 System Performance Check Results

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

Frequency (MHz)	Input Power (mW)	Targeted SAR (W/kg)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)	Probe S/N	DAE S/N	Dipole S/N	Date
2450	250mW	51.1	12.4	49.60	-2.935	7351	917	735	2015/3/5
5800	100mW	77.3	7.25	72.50	-6.210	7351	917	1040	2015/3/4



System Performance Check Setup

Setup Photo

9 RF Exposure Positions

9.1 RF Exposure Position

Figure 10.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled "M," the left ear reference point (ERP) is marked "LE," and the right ERP is marked "RE." Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 10.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 10.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 10.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

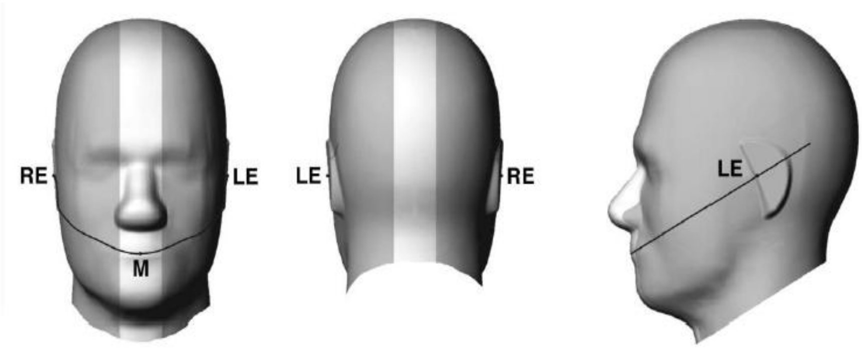


Fig 10.1.1 Front, back, and side views of SAM twin phantom

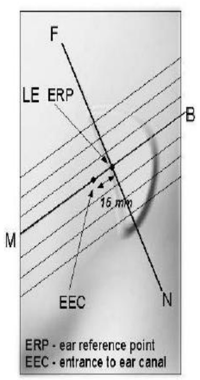


Fig 10.1.2 Close-up side view of phantom showing the ear region.

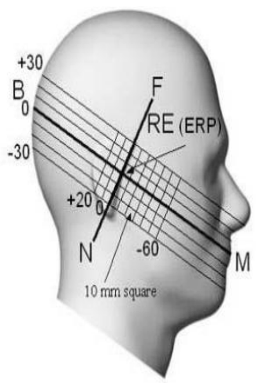


Fig 10.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

9.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset—the midpoint of the width wt of the handset at the level of the acoustic output (point A in Figure 10.2.1 and Figure 10.2.2), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 10.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 10.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 10.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 10.2.3. The actual rotation angles should be documented in the test report.

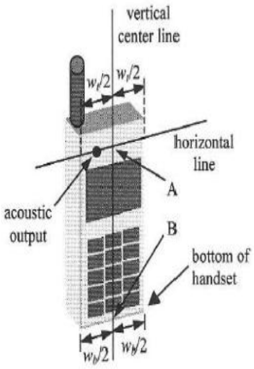


Fig 10.2.1 Handset vertical and horizontal reference lines—"fixed case

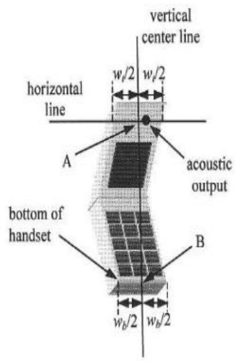


Fig 10.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

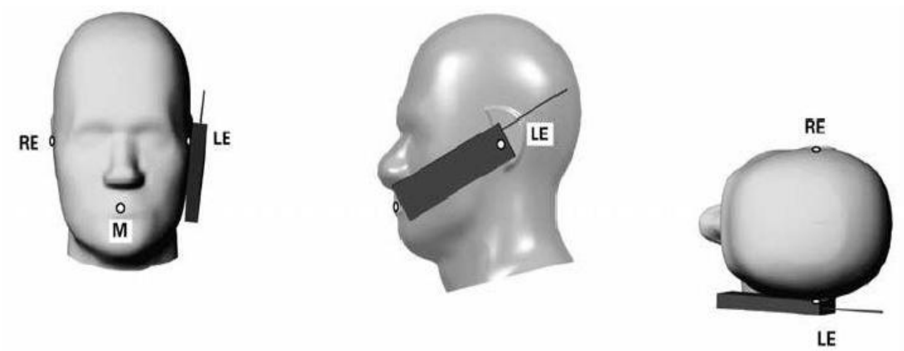


Fig 10.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

9.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See below figure10.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

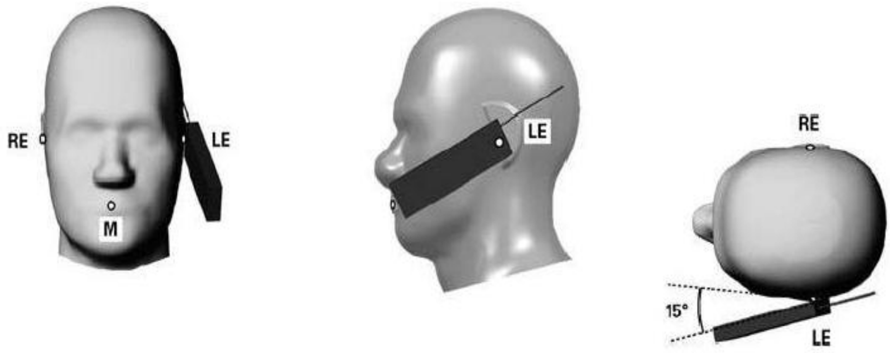


Fig 10.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

9.4 Tablet Computer

Per EN62209-2, a tablet for factor portable computer for which SAR should be separately assessed with each surface and the separation distances positioned against the flat phantom that correspond to the intended use as specified by the manufacturer. If the intended use is not specified in the user instructions, the device shall be tested directly against the flat phantom in all usable orientations.

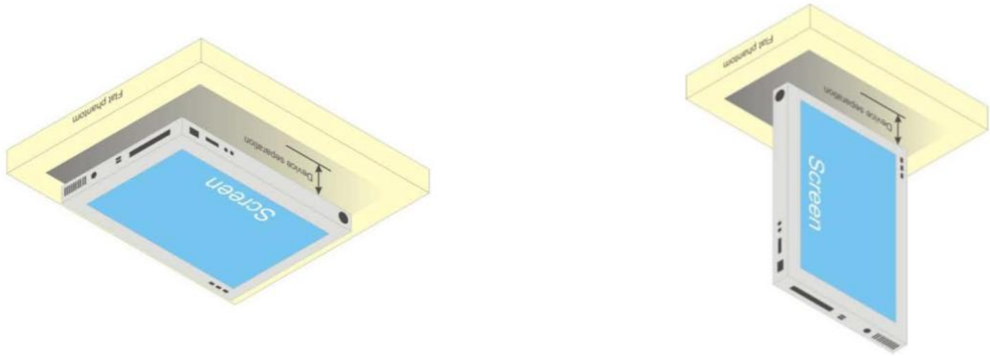


Illustration for Lap-touching Position

10 Conducted RF Output Power (Unit: dBm)

<WLAN Conducted Power>

General Note:

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

<2.4GHz WLAN Antenna>

WLAN 2.4GHz 802.11b Average Power (dBm)			Tune up Limit (dBm)
Power vs. Channel			
Channel	Frequency (MHz)	Data Rate	
		1Mbps	
CH 1	2412	15.48	15.50
CH 6	2437	15.45	
CH 11	2462	15.02	

WLAN 2.4GHz 802.11g Average Power (dBm)			Tune up Limit (dBm)
Power vs. Channel			
Channel	Frequency (MHz)	Data Rate	
		6Mbps	
CH 1	2412	15.41	15.50
CH 6	2437	15.23	
CH 11	2462	15.21	

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)			Tune up Limit (dBm)
Power vs. Channel			
Channel	Frequency (MHz)	MCS Index	
		MCS0	
CH 1	2412	15.31	15.50
CH 6	2437	15.01	
CH 11	2462	15.10	

WLAN 2.4GHz 802.11n-HT40 Average Power (dBm)			Tune up Limit (dBm)
Power vs. Channel			
Channel	Frequency (MHz)	MCS Index	
		MCS0	
CH 3	2422	15.39	15.50
CH 6	2437	15.31	
CH 9	2452	15.08	

General Note:

1. Per FCC KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate.

<5.8GHz WLAN Antenna>

WLAN 5.8GHz 802.11a Average Power (dBm)			Tune up Limit (dBm)
Power vs. Channel			
Channel	Frequency (MHz)	Data Rate	
		6Mbps	
CH 149	5745	9.95	10.00
CH 153	5765	9.48	
CH 157	5785	9.75	
CH 161	5805	9.43	
CH 165	5825	9.65	

WLAN 5.8GHz 802.11n-HT20 Average Power (dBm)			Tune up Limit (dBm)
Power vs. Channel			
Channel	Frequency (MHz)	MCS Index	
		MCS0	
CH 149	5745	9.54	10.00
CH 153	5765	9.91	
CH 157	5785	9.74	
CH 161	5805	9.65	
CH 165	5825	9.51	

WLAN 5.8GHz 802.11n-HT40 Average Power (dBm)			Tune up Limit (dBm)
Power vs. Channel			
Channel	Frequency (MHz)	MCS Index	
		MCS0	
CH 151	5755	9.82	10.00
CH 159	5795	9.51	

<u><2.4GHz WLAN Antenna></u> **2TX Ant 0+1**

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)				Tune up Limit (dBm)
Power vs. Channel				
Channel	Frequency (MHz)	MCS Index		
		MCS8 (Ant0)	MCS8 (Ant1)	
CH 1	2412	12.36	12.61	15.50
CH 6	2437	12.34	11.94	
CH 11	2462	12.60	11.56	

WLAN 2.4GHz 802.11n-HT40 Average Power (dBm)				Tune up Limit (dBm)
Power vs. Channel				
Channel	Frequency (MHz)	MCS Index		
		MCS8 (Ant0)	MCS8 (Ant1)	
CH 3	2422	12.64	12.25	15.50
CH 6	2437	12.61	12.08	
CH 9	2452	12.70	12.22	

<u><5.8GHz WLAN Antenna></u>**2TX Ant 0+1**

WLAN 5.8GHz 802.11n-HT20 Average Power (dBm)				Tune up Limit (dBm)
Power vs. Channel				
Channel	Frequency (MHz)	MCS Index		
		MCS8 (Ant0)	MCS8 (Ant1)	
CH 149	5745	7.01	6.86	10.00
CH 153	5765	6.71	6.31	
CH 157	5785	7.22	6.68	
CH 161	5805	7.28	6.63	
CH 165	5825	7.21	6.40	

WLAN 5.8GHz 802.11n-HT40 Average Power (dBm)				Tune up Limit (dBm)
Power vs. Channel				
Channel	Frequency (MHz)	MCS Index		
		MCS8 (Ant0)	MCS8 (Ant1)	
CH 151	5755	6.85	6.92	10.00
CH 159	5795	6.52	6.42	

11 SAR Exclusion Calculations

<1g-SAR Exclusion Calculations for Wi-Fi Antenna < 50mm from the User>

According to KDB 447498 v05 r02 in section 4.3.1:

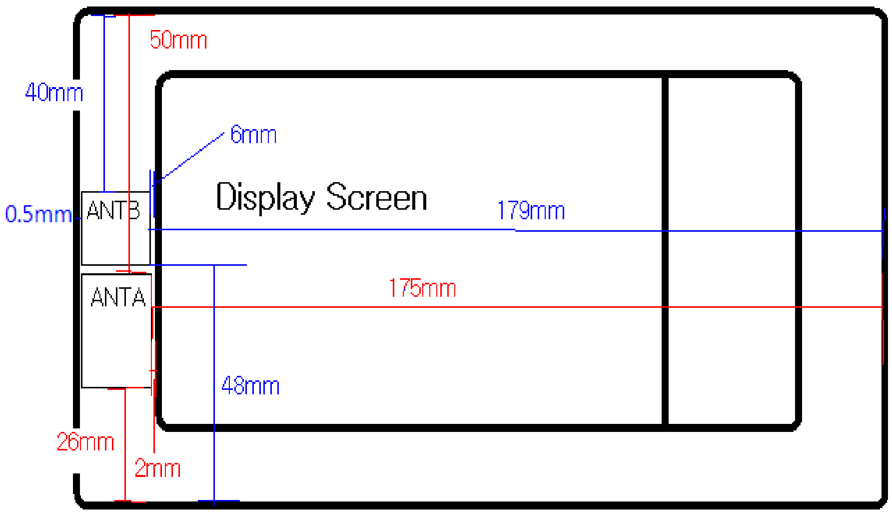
The 1-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

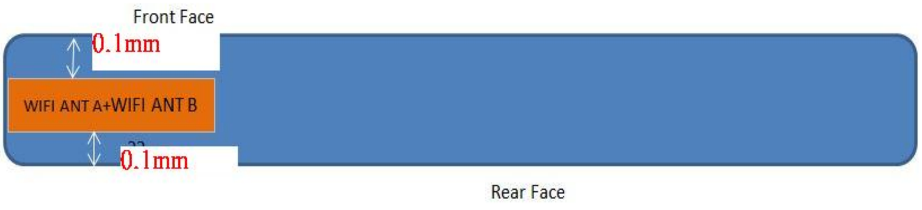
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR,where

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

ANT.	Freq (MHz)	Turn-Up (dBm)	Turn-UP (mW)	1g/10g		Rear Face	Left Side	Right Side	Top Side	Bottom Side
					Test separation distance(mm)	0.1	0.5	175	50	26
2.4GHz WLAN	2412	15.5	35.48	1g	Sar exclusion threshold	551.05	110.21	1346.58	1.10	2.12
					Test requirements	Yes	Yes	No	No	No
5.8GHz WLAN	2462	15.5	35.48	1g	Sar exclusion threshold	556.73	111.35	1385.60	1.39	1.16
					Test requirements	Yes	Yes	No	No	No

12 Antenna Location





13 SAR Test Results

General Note:

1. Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
2. Per KDB 447498 D01v05r02, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. When the WLAN transmission was verified using a spectrum analyzer.

13.1 Body SAR

<DTS WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Tune-Up Limit (dBm)	Average Power (dBm)	Power Drift (dB)	Measured 1g SAR (W/kg)	Tune-up Scaling Factor	Reported 1g SAR (W/kg)
1	802.11b	-	Rear Face	0	1	2412	15.5	15.48	0.01	0.399	1.00	0.401
2	802.11b	-	Left Side	0	1	2412	15.5	15.48	-0.08	1.01	1.00	**1.010**
31	802.11b	-	Left Side	0	6	2437	15.5	15.45	-0.01	0.708	1.01	0.716
32	802.11b	-	Left Side	0	11	2462	15.5	15.02	0.01	0.648	1.12	0.724
33	802.11b	-	Left Side	0	1	2412	15.5	15.48	-0.02	0.948	1.00	0.952
11	802.11n	HT20	Rear Face	0	1	2412	15.5	15.5	0.06	0.119	1.00	0.119
12	802.11n	HT20	Left Side	0	1	2412	15.5	15.5	-0.1	0.598	1.00	**0.598**
16	802.11a	-	Rear Face	0	149	5745	10	9.95	-0.04	0.181	1.01	**0.183**
17	802.11a	-	Left Side	0	149	5745	10	9.95	-0.09	0.08	1.01	0.081
26	802.11n	HT20	Rear Face	0	161	5805	10	9.98	-0.04	0.161	1.01	0.162
27	802.11n	HT20	Left Side	0	161	5805	10	9.98	-0.04	0.347	1.01	**0.349**

14 Uncertainty Assessment

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

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

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

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	1/k[(b)]	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

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

(b) κ is the coverage factor

Standard Uncertainty for Assumed Distribution

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

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

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (±%) (1g)
Measurement System					
Probe Calibration	6.0	Normal	1.0	1.0	6.0
Axial Isotropy	4.7	Rectangular	√3	0.7	1.9
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	3.9
Boundary effects	1.0	Rectangular	√3	1.0	0.6
Linearity	4.7	Rectangular	√3	1.0	2.7
System Detection Limits	1.0	Rectangular	√3	1.0	0.6
Modulation Response	2.4	Rectangular	√3	1.0	1.4
Readout Electronics	0.3	Normal	1.0	1.0	0.3
Response Time	0.8	Rectangular	√3	1.0	0.5
Integration Time	2.6	Rectangular	√3	1.0	1.5
RF Ambient Noise	3.0	Rectangular	√3	1.0	1.7
RF Ambient Reflections	3.0	Rectangular	√3	1.0	1.7
Probe Positioner	0.4	Rectangular	√3	1.0	0.2
Probe Positioning	2.9	Rectangular	√3	1.0	1.7
Max. SAR Eval.	2.0	Rectangular	√3	1.0	1.2
Dipole Related					
Device Positioning	2.9	Normal	1.0	1.0	2.9
Device Holder	3.6	Normal	1.0	1.0	3.6
Power Drift	5.0	Rectangular	√3	1.0	2.9
Power Scaling	0.0	Rectangular	√3	1.0	0.0
Phantom and Tissue parameters					
Phantom Uncertainty	6.1	Rectangular	√3	1.0	3.5
SAR corrction	1.9	Normal	1.0	1.0	1.9
Liquid Conductivity (measurement)	2.0	Normal	1.0	0.8	1.6
Liquid Permittivity (measurement)	2.1	Normal	1.0	0.3	0.5
Temp. unc. - Conduct	3.4	Rectangular	√3	0.8	1.5
Temp. unc. - Permittivity	0.4	Rectangular	√3	0.2	0.1
Combined Standard Uncertainty					11.2
Coverage Factor for 95 %					Kp=2
Expanded Uncertainty					22.4

Uncertainty Budget for frequency range 30 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (±%) (1g)
Measurement System					
Probe Calibration	6.6	Normal	1.0	1.0	6.6
Axial Isotropy	4.7	Rectangular	√3	0.7	1.9
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	3.9
Boundary effects	2.0	Rectangular	√3	1.0	1.2
Linearity	4.7	Rectangular	√3	1.0	2.7
System Detection Limits	1.0	Rectangular	√3	1.0	0.6
Modulation Response	2.4	Rectangular	√3	1.0	1.4
Readout Electronics	0.3	Normal	1.0	1.0	0.3
Response Time	0.8	Rectangular	√3	1.0	0.5
Integration Time	2.6	Rectangular	√3	1.0	1.5
RF Ambient Noise	3.0	Rectangular	√3	1.0	1.7
RF Ambient Reflections	3.0	Rectangular	√3	1.0	1.7
Probe Positioner	0.8	Rectangular	√3	1.0	0.5
Probe Positioning	6.7	Rectangular	√3	1.0	3.9
Max. SAR Eval.	4.0	Rectangular	√3	1.0	2.3
Dipole Related					
Device Positioning	2.9	Normal	1.0	1.0	2.9
Device Holder	3.6	Normal	1.0	1.0	3.6
Power Drift	5.0	Rectangular	√3	1.0	2.9
Power Scaling	0.0	Rectangular	√3	1.0	0.0
Phantom and Tissue parameters					
Phantom Uncertainty	6.6	Rectangular	√3	1.0	3.8
SAR corrction	1.9	Normal	1.0	1.0	1.9
Liquid Conductivity (measurement)	2.0	Normal	1.0	0.8	1.6
Liquid Permittivity (measurement)	2.1	Normal	1.0	0.3	0.5
Temp. unc. - Conduct	3.4	Rectangular	√3	0.8	1.5
Temp. unc. - Permittivity	0.4	Rectangular	√3	0.2	0.1
Combined Standard Uncertainty					12.3
Coverage Factor for 95 %					Kp=2
Expanded Uncertainty					24.7

Uncertainty Budget for frequency range 3 GHz to 6 GHz

15 References

[1] Council Recommendation 1999/519/EC of July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

[2] EN 50566:2013, “Product standard to demonstrate compliance of radio frequency fields from handheld and body-mounted wireless communication devices used by the general public (30 MHz - 6 GHz)” March 2013.

[3] EN 62311:2008, “Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz)”, January 2008

[4] EN 62209-2:2010, "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices. Human models, instrumentation, and procedures. 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)", August 2010

[5] EN 62479:2010 "Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)", December 2010

[6] SPEAG DASY System Handbook

System Check_B2450_150305

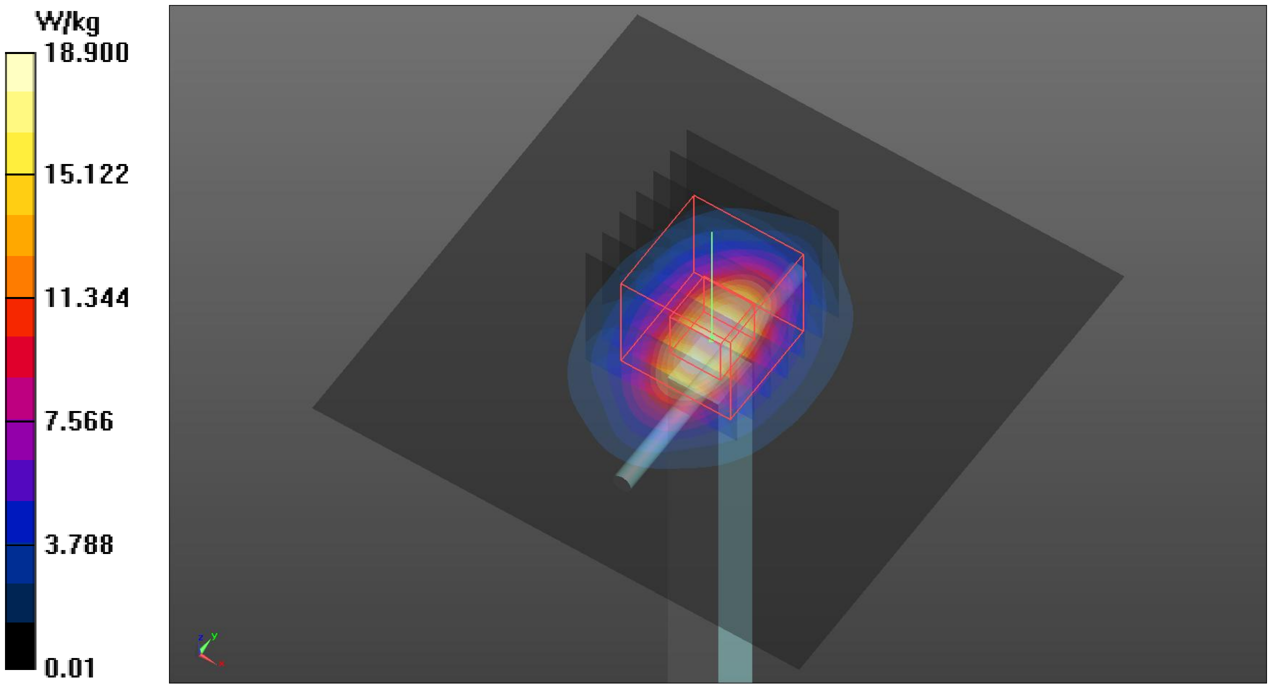
DUT: Dipole D2450V2_ SN: 735

Communication System: CW ; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: B2450_150305 Medium parameters used: f = 2450 MHz; σ = 2.002 S/m; ε_r = 51.299; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; **Liquid Temperature**：22.1 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(7.51, 7.51, 7.51); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 18.9 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.93 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 25.4 W/kg
SAR(1 g) = 12.4 W/kg; SAR(10 g) = 5.77 W/kg
Maximum value of SAR (measured) = 18.9 W/kg



System Check_B5800_150304

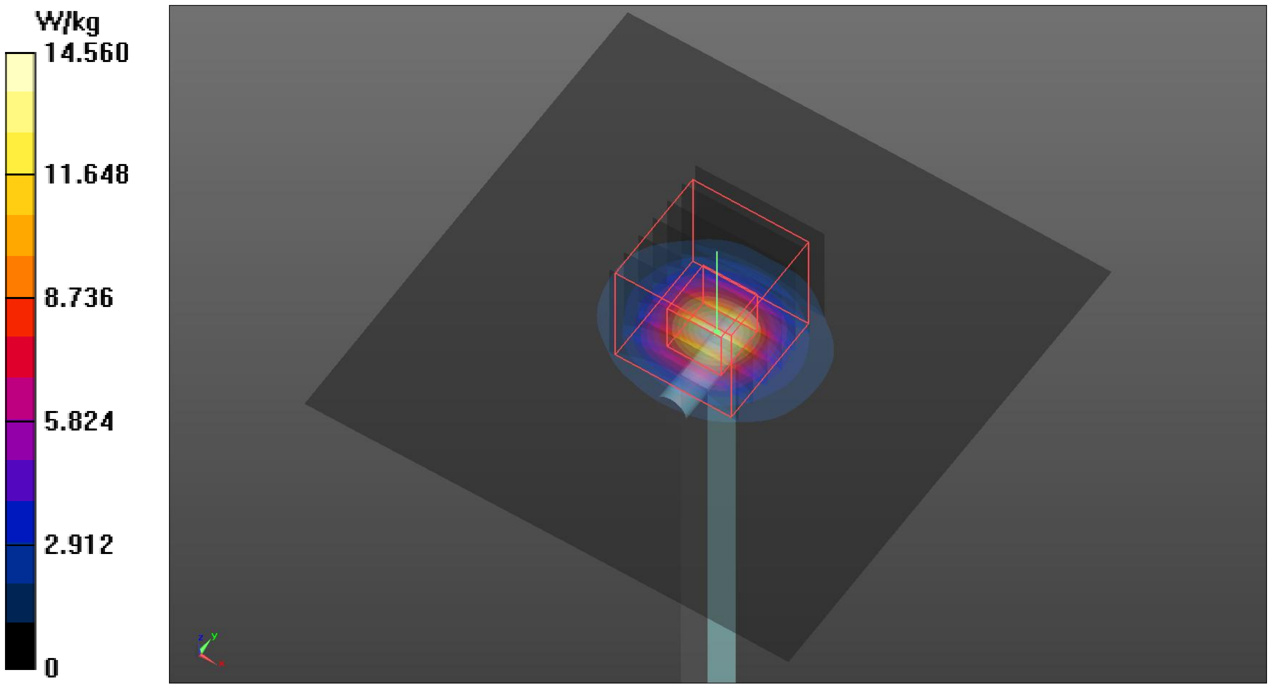
DUT: Dipole 5 GHz_ SN: 1040

Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: B5G_150304 Medium parameters used: f = 5800 MHz; σ = 6.189 S/m; ε_r = 48.005; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; **Liquid Temperature**：21.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(4.28, 4.28, 4.28); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=100mW/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 14.6 W/kg

Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 55.63 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 30.6 W/kg
SAR(1 g) = 7.25 W/kg; SAR(10 g) = 2.04 W/kg
Maximum value of SAR (measured) = 15.3 W/kg



P01 802.11b_Rear Face_0cm_Ch1_Ant A

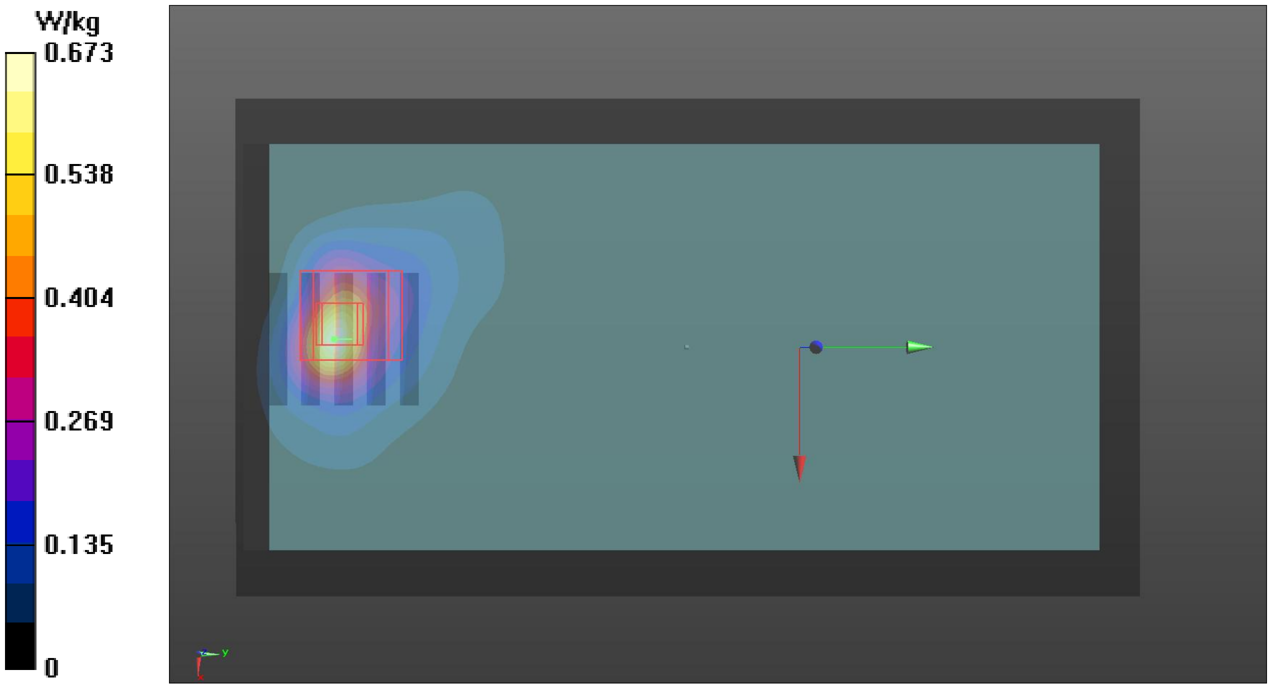
DUT: 521326

Communication System: WLAN_2.4G; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: B2450_150305 Medium parameters used: f = 2412 MHz; σ = 1.954 S/m; ε_r = 51.423; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; **Liquid Temperature**：22.1 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(7.51, 7.51, 7.51); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1/Area Scan (101x181x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.673 W/kg

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.20 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.820 W/kg
SAR(1 g) = 0.399 W/kg; SAR(10 g) = 0.181 W/kg
Maximum value of SAR (measured) = 0.566 W/kg



P02 802.11b_Left Side_0cm_Ch1_Ant A

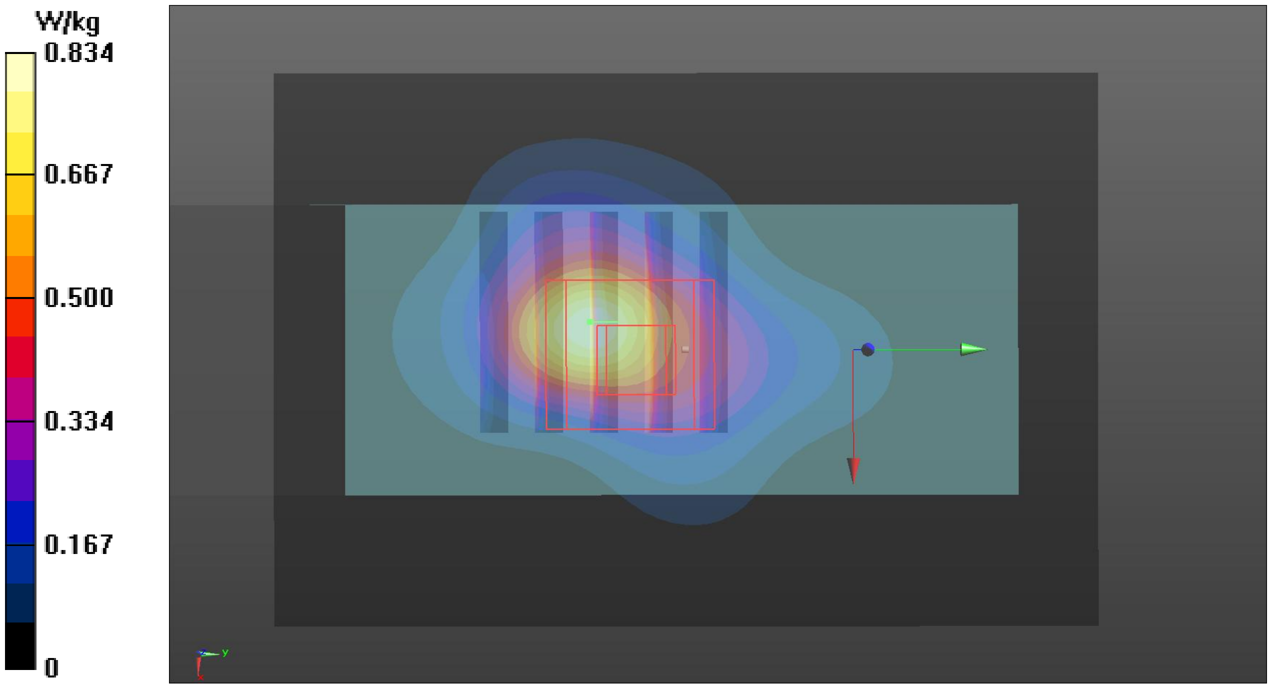
DUT: 521326

Communication System: WLAN_2.4G; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: B2450_150305 Medium parameters used: f = 2412 MHz; σ = 1.954 S/m; ε_r = 51.423; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; **Liquid Temperature**：22.1 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(7.51, 7.51, 7.51); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1/Area Scan (71x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.834 W/kg

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.61 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 2.50 W/kg
SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.416 W/kg
Maximum value of SAR (measured) = 1.65 W/kg



P31 802.11b_Left Side_0cm_Ch6_Ant A

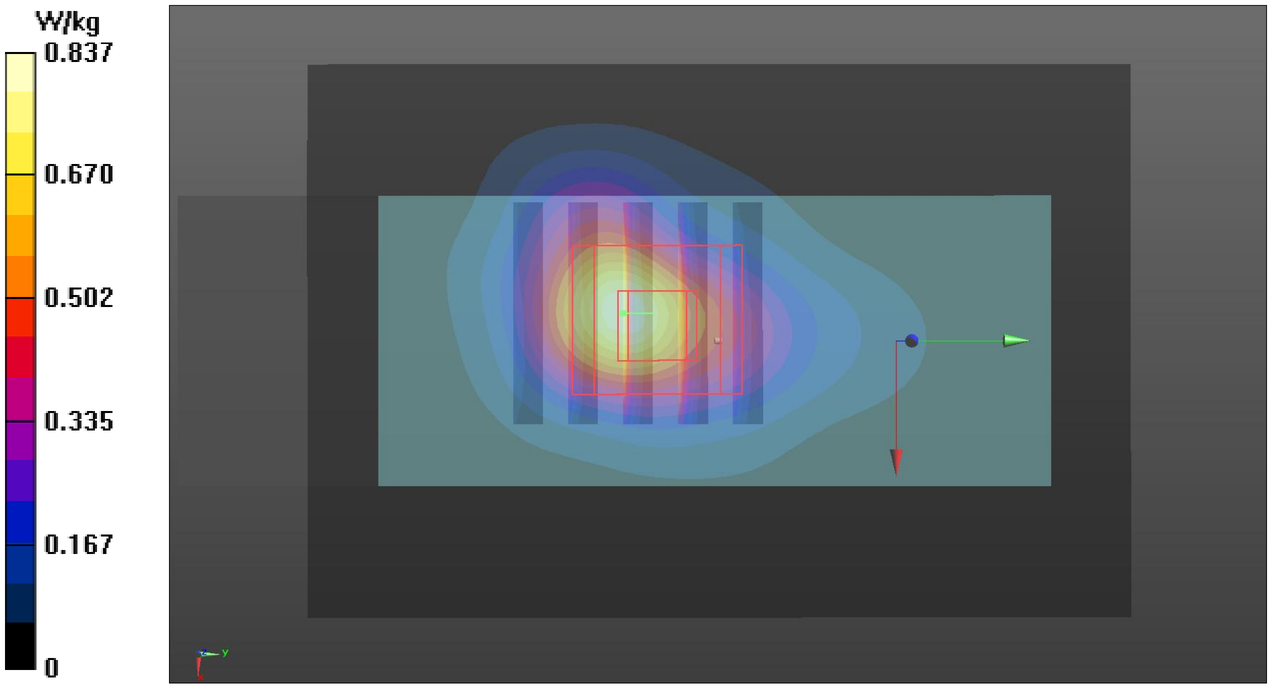
DUT: 521326

Communication System: WLAN_2.4G; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: B2450_150305 Medium parameters used: f = 2437 MHz; σ = 1.985 S/m; ε_r = 51.34; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; **Liquid Temperature**：22.1 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(7.51, 7.51, 7.51); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch6/Area Scan (71x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.837 W/kg

Ch6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.89 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.51 W/kg
SAR(1 g) = 0.708 W/kg; SAR(10 g) = 0.341 W/kg
Maximum value of SAR (measured) = 0.951 W/kg



P32 802.11b_Left Side_0cm_Ch11_Ant A

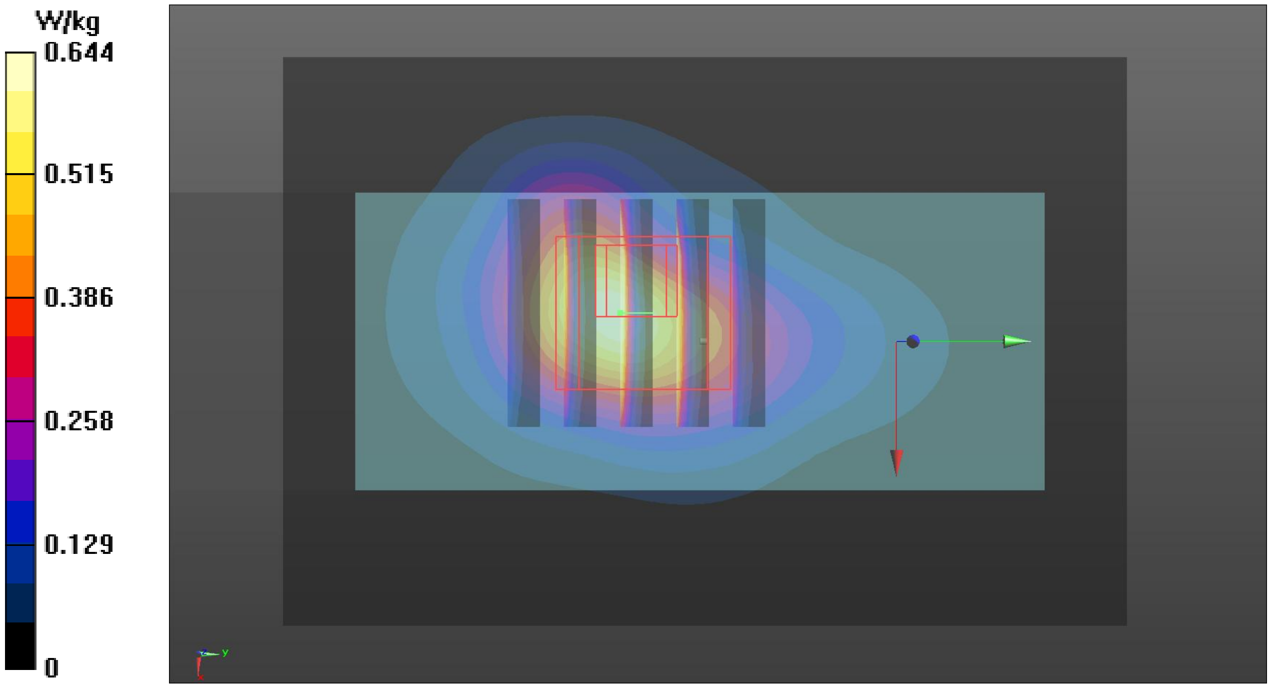
DUT: 521326

Communication System: WLAN_2.4G; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: B2450_150305 Medium parameters used: f = 2462 MHz; σ = 2.018 S/m; ε_r = 51.266; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; **Liquid Temperature**：22.1 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(7.51, 7.51, 7.51); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch11/Area Scan (71x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.644 W/kg

Ch11/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.83 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.54 W/kg
SAR(1 g) = 0.648 W/kg; SAR(10 g) = 0.305 W/kg
Maximum value of SAR (measured) = 1.06 W/kg



P33 802.11b_Left Side_0cm_Ch1_Ant A

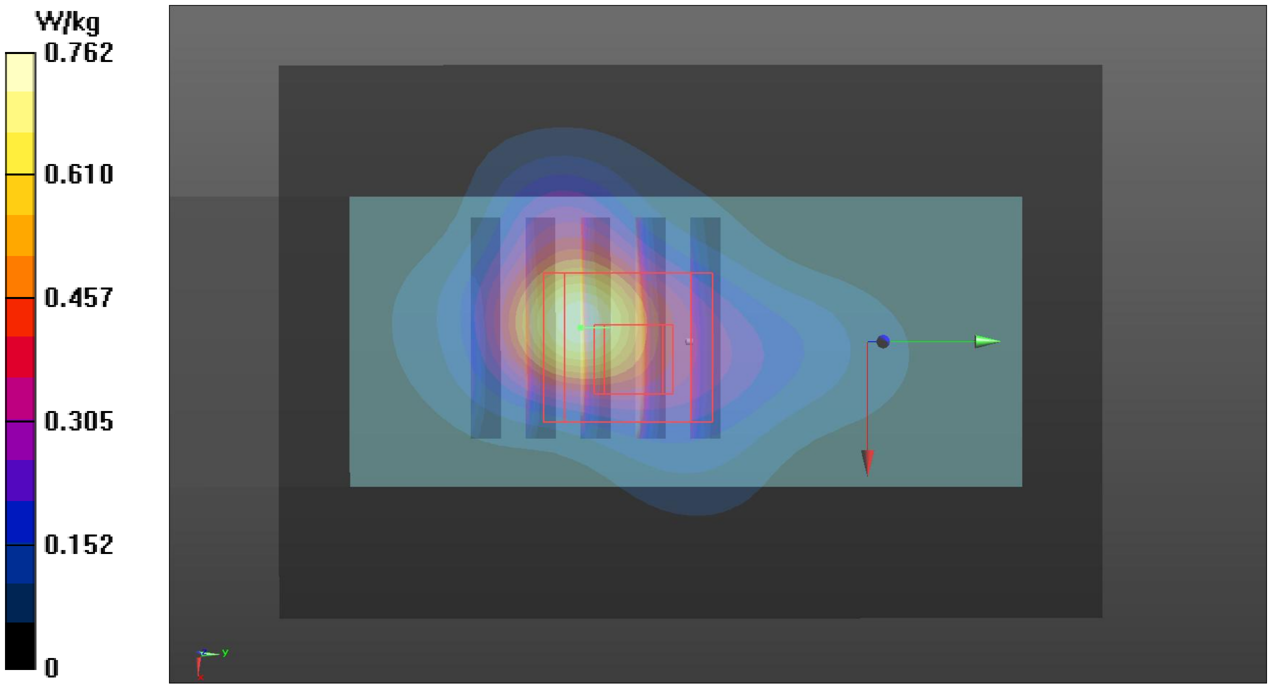
DUT: 521326

Communication System: WLAN_2.4G; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: B2450_150305 Medium parameters used: f = 2412 MHz; σ = 1.954 S/m; ε_r = 51.423; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; **Liquid Temperature**：22.1 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(7.51, 7.51, 7.51); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1/Area Scan (71x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.762 W/kg

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.61 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 2.29 W/kg
SAR(1 g) = 0.948 W/kg; SAR(10 g) = 0.376 W/kg
Maximum value of SAR (measured) = 1.54 W/kg



P11 802.11n_HT20_Rear Face_0cm_Ch1_Ant A+B

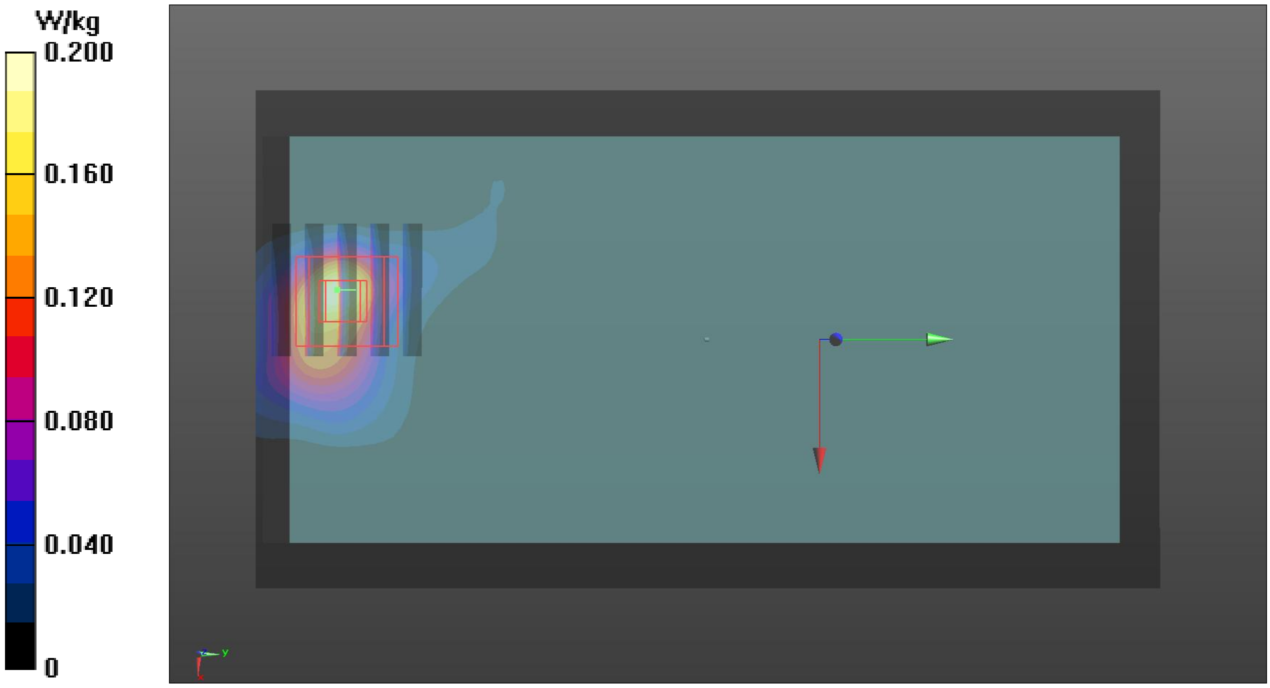
DUT: 521326

Communication System: WLAN_2.4G; Frequency: 2412 MHz;Duty Cycle: 1:1.035
Medium: B2450_150305 Medium parameters used: f = 2412 MHz; σ = 1.954 S/m; ε_r = 51.423; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; **Liquid Temperature**：22.1 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(7.51, 7.51, 7.51); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1/Area Scan (71x181x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.200 W/kg

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.443 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.241 W/kg
SAR(1 g) = 0.119 W/kg; SAR(10 g) = 0.057 W/kg
Maximum value of SAR (measured) = 0.170 W/kg



P12 802.11n_HT20_Left Side_0cm_Ch1_Ant A+B

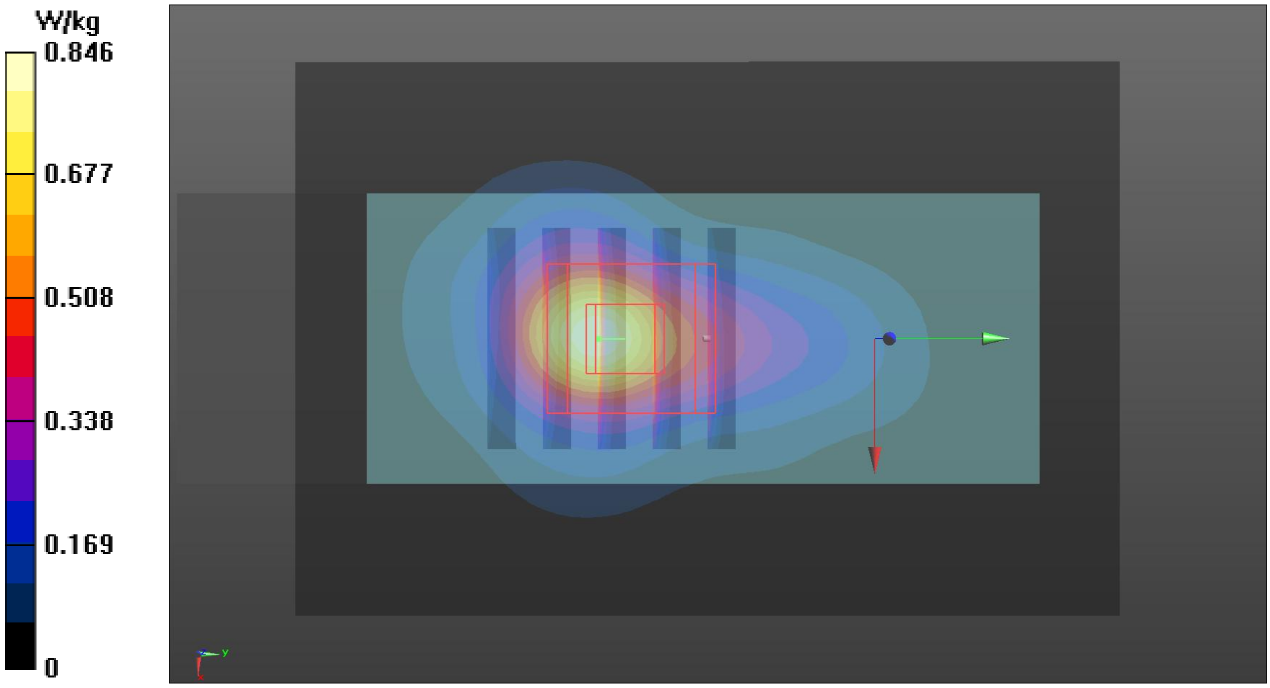
DUT: 521326

Communication System: WLAN_2.4G; Frequency: 2412 MHz;Duty Cycle: 1:1.035
Medium: B2450_150305 Medium parameters used: f = 2412 MHz; σ = 1.954 S/m; ε_r = 51.423; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; **Liquid Temperature**：22.1 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(7.51, 7.51, 7.51); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1/Area Scan (71x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.846 W/kg

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.04 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 1.26 W/kg
SAR(1 g) = 0.598 W/kg; SAR(10 g) = 0.288 W/kg
Maximum value of SAR (measured) = 0.885 W/kg



P16 802.11a_Rear Face_0cm_Ch149_Ant A

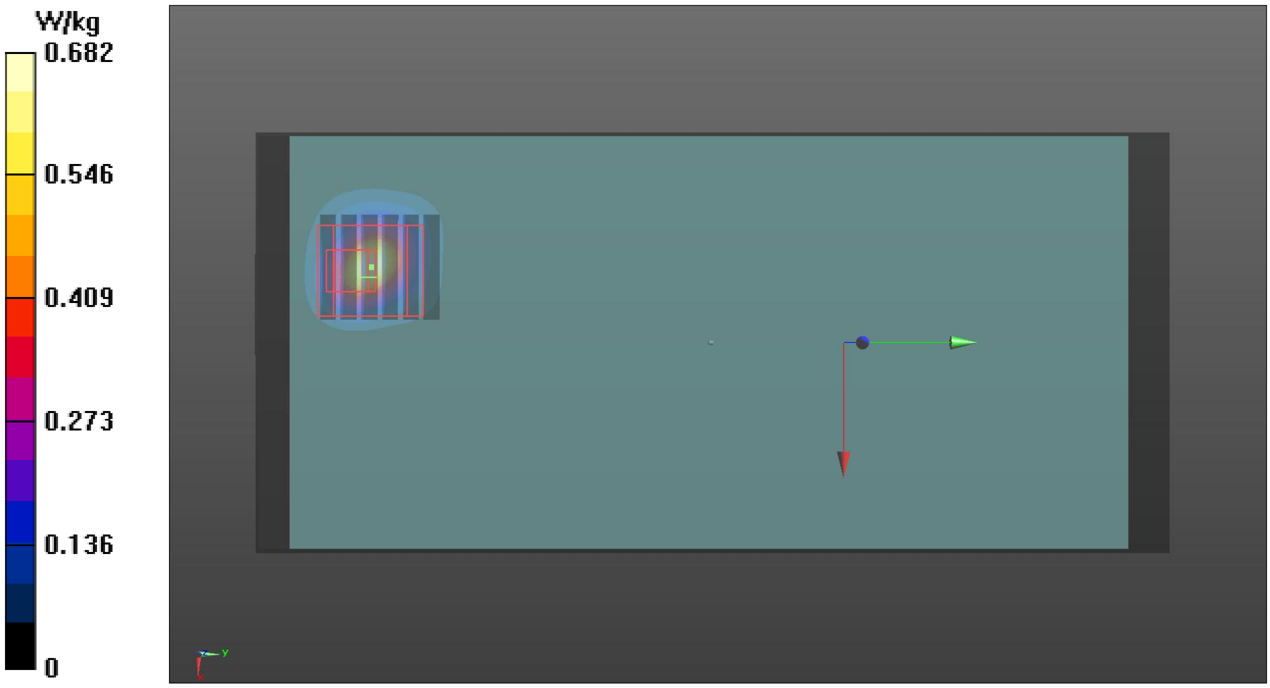
DUT: 521326

Communication System: WLAN_5G; Frequency: 5745 MHz;Duty Cycle: 1:1
Medium: B5G_150304 Medium parameters used: f = 5745 MHz; σ = 6.114 S/m; ε_r = 48.115; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; **Liquid Temperature**：21.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(4.28, 4.28, 4.28); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch149/Area Scan (101x221x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.682 W/kg

Ch149/Zoom Scan (6x6x12)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm
Reference Value = 6.736 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.819 W/kg
SAR(1 g) = 0.181 W/kg; SAR(10 g) = 0.055 W/kg
Maximum value of SAR (measured) = 0.415 W/kg



P17 802.11a_Left Side_0cm_Ch149_Ant A

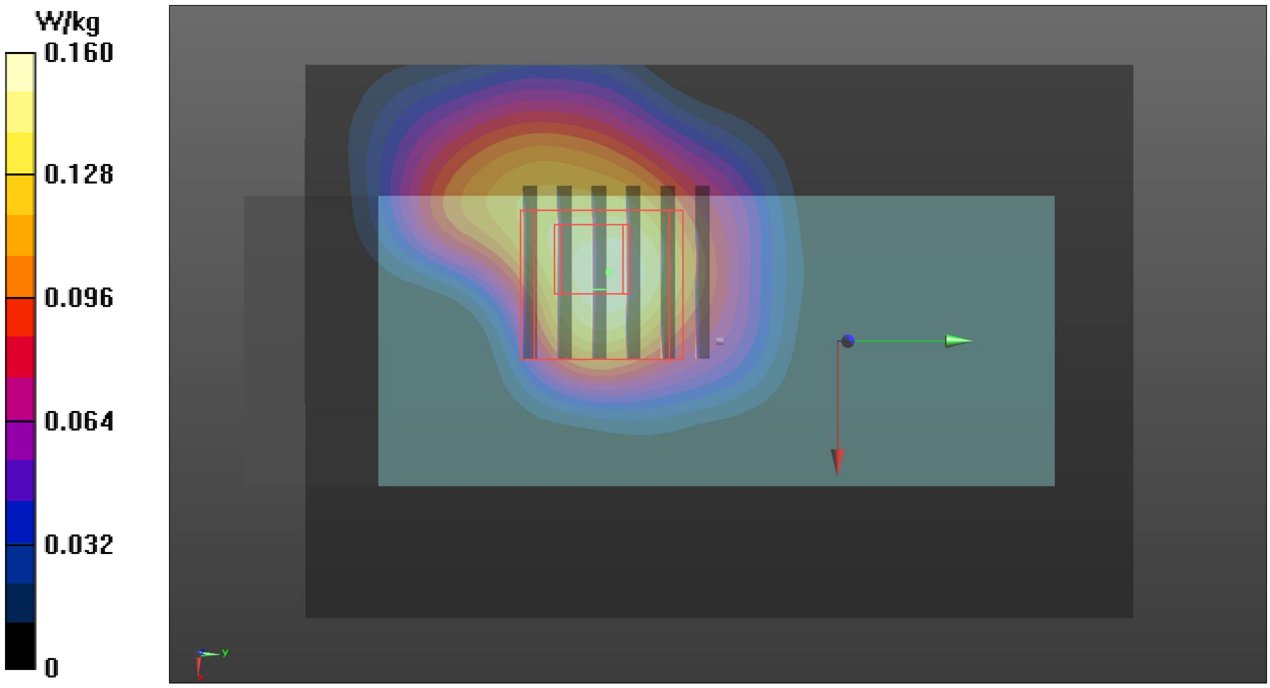
DUT: 521326

Communication System: WLAN_5G; Frequency: 5745 MHz;Duty Cycle: 1:1
Medium: B5G_150304 Medium parameters used: f = 5745 MHz; σ = 6.114 S/m; ε_r = 48.115; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; **Liquid Temperature**：21.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(4.28, 4.28, 4.28); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch149/Area Scan (81x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.160 W/kg

Ch149/Zoom Scan (6x6x12)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm
Reference Value = 5.125 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.676 W/kg
SAR(1 g) = 0.080 W/kg; SAR(10 g) = 0.025 W/kg
Maximum value of SAR (measured) = 0.309 W/kg



P26 802.11n_HT20_Rear Face_0cm_Ch161_Ant A+B

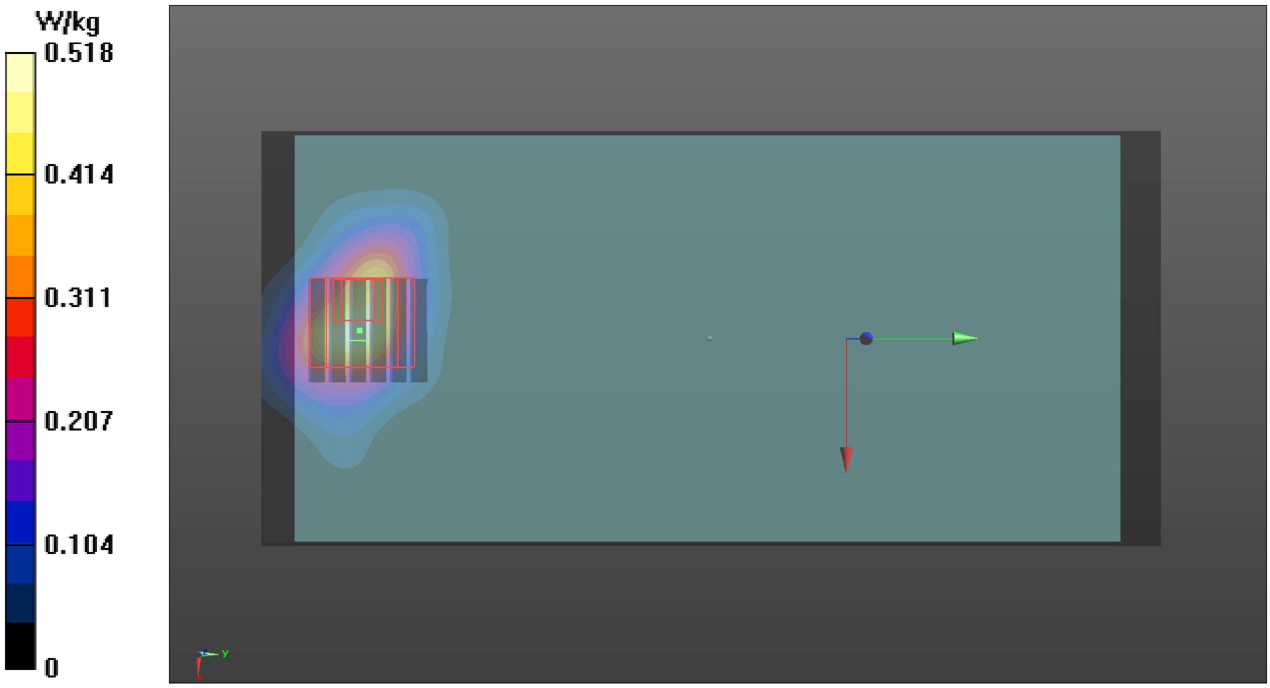
DUT: 521326

Communication System: WLAN_5G; Frequency: 5805 MHz;Duty Cycle: 1:1.037
Medium: B5G_150304 Medium parameters used: f = 5805 MHz; σ = 6.2 S/m; ε_r = 48.007; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; **Liquid Temperature**：21.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(4.28, 4.28, 4.28); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch161/Area Scan (101x221x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.518 W/kg

Ch161/Zoom Scan (6x6x12)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm
Reference Value = 8.360 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.762 W/kg
SAR(1 g) = 0.161 W/kg; SAR(10 g) = 0.057 W/kg
Maximum value of SAR (measured) = 0.385 W/kg



Test Laboratory: Sporton International Inc. SAR Testing Lab Date: 2015/3/4

P27 802.11n_HT20_Left Side_0cm_Ch161_Ant A+B

DUT: 521326

Communication System: WLAN_5G; Frequency: 5805 MHz;Duty Cycle: 1:1.037
Medium: B5G_150304 Medium parameters used: f = 5805 MHz; σ = 6.2 S/m; ε_r = 48.007; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; **Liquid Temperature**：21.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(4.28, 4.28, 4.28); Calibrated: 2015/1/8;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2014/12/29
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1238
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch161/Area Scan (81x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.388 W/kg

Ch161/Zoom Scan (6x6x12)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm
Reference Value = 8.052 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 2.74 W/kg
SAR(1 g) = 0.347 W/kg; SAR(10 g) = 0.104 W/kg
Maximum value of SAR (measured) = 1.18 W/kg