



A Test Lab Techno Corp.

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SAR EVALUATION REPORT



Test Report No.	: 0910FS12
Applicant	: Acer Incorporated
Product Type	: WLAN Module
Serial No.	: ZE80SK01B1935159EF2500
Trade Name	: acer
Model Number	: 512AN_HMW
Dates of Test	: Oct. 30 ~ Nov. 03, 2009
Test Environment	: Ambient Temperature : $22 \pm 2^{\circ}\text{C}$ Relative Humidity : 40 - 70 %
Test Specification	: Standard C95.1-2005 IEEE Std. 1528-2003 2.1093;FCC/OET Bulletin 65 Supplement C [July 2001] FCC:SAR Measurement Requirements For 802.11a/b/g Transmitters RSS-102 Issue 3 (June 2009) KDB 447498 "RF Exposure Procedures and Equipment Authorization Policies"
Max. SAR	: 0.530 W/kg Body SAR
Test Lab Location	: Chang-an Lab



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Sam Chuang
Approve Signer

20091103

Alex Wu
Testing Engineer

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1. Description of Equipment Under Test (EUT)

Applicant	:	Acer Incorporated
Applicant Address	:	8F, 88, Sec.1, Hsin Tai Wu Rd. Hsichih, Taipei Hsien 221 Taiwan, R.O.C.
Manufacturer	:	Quanta Computer Inc.
Manufacturer Address	:	No.211, Wen Hwa 2nd Rd., Kuei Shan Hsiang, Tao Yuan Shien, Taiwan, R.O.C.
Product Type	:	WLAN Module
Serial No.	:	ZE80SK01B1935159EF2500
Trade Name	:	acer
Model Number	:	512AN_HMW
Test Device	:	Production Unit
Tx Frequency	:	IEEE 802.11b / IEEE 802.11g: 2412MHz~2462MHz Draft 802.11n 2.4GHz Standard-20MHz: 2412MHz~2462MHz Draft 802.11n 2.4GHz Wide-40MHz: 2422MHz~2452MHz IEEE 802.11a 5GHz : 5180~5825 MHz Draft IEEE 802.11a 5GHz-20MHz: 5180~5825 MHz Draft IEEE 802.11a 5GHz-40MHz: 5190~5795MHz
RF Conducted Power (Avg.)	:	IEEE 802.11b: 0.066W (18.20 dBm) IEEE 802.11g: 0.062(17.93 dBm) Draft 802.11n 2.4GHz Standard-20MHz: 0.045 W (16.52 dBm) Draft 802.11n 2.4GHz Wide-40MHz: 0.047 W (16.70 dBm) IEEE 802.11a 5GHz : 0.061 W (17.83 dBm) Draft IEEE 802.11a 5GHz-20MHz: 0.057 W (17.55 dBm) Draft IEEE 802.11a 5GHz-40MHz: 0.046 W (16.66 dBm)
Max. SAR Measurement	:	0.530 W/kg Body SAR
HW Version	:	D2A
SW Version	:	V0.2103
Antenna Type	:	PIFA Type
Antenna Gain	:	IEEE 802.11b / IEEE 802.11g: 2.12 dBi IEEE 802.11a 5150~5350 MHz: 3.36 dBi IEEE 802.11a 5470~5725 MHz: 2.00 dBi IEEE 802.11a 5725~5850 MHz: 3.56 dBi Draft 802.11n Standard-20MHz: 2.12 dBi Draft 802.11n Wide-40MHz: 2.12 dBi
Device Category	:	Portable
RF Exposure Environment	:	General Population / Uncontrolled
Battery Option	:	Standard
Application Type	:	Certification
Host Laptop PC	:	Trade Name: acer, Gateway, Packard Bell Model Number: ZE8

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment / general population exposure limits specified in Standard C95.1-2005 / RSS-102 Issue 3 (June 2009) and had been tested in accordance with the measurement procedures specified in IEEE Std. 1528-2003.



2. Introduction

The A Test Lab Techno Corp. has performed measurements of the maximum potential exposure to the user of **Acer Incorporated Trade Name : acer Model(s) : 512AN_HMW**. The test procedures, as described in American National Standards, Institute C95.1 - 2005 [1] , FCC/OET Bulletin 65 Supplement C [July 2001] and RSS-102 Issue 3 (June 2009) were employed and they specify the maximum exposure limit of 1.6mW/g as averaged over any 1 gram of tissue for portable devices being used within 20cm between user and EUT in the uncontrolled environment. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the equipment used are included within this test report.

3. SAR Definition

Specific Absorption Rate (SAR) is defined as 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). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Figure 2).

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

Figure 2. SAR Mathematical Equation

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

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

Where :

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m³)

E = RMS electric field strength (V/m)

* **Note :**

The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane [2]



4. SAR Measurement Setup

These measurements were performed with the automated near-field scanning system DASY5 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than $\pm 0.02\text{mm}$. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length = 300mm) to the data acquisition unit.

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Measurement Server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chipdisk and 128MB RAM. The necessary circuits for communication with either the DAE4 (or DAE3) electronic 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. The PC consists of the Intel Core(TM)2 CPU @1.86GHz computer with Windows XP system and SAR Measurement Software DASY5, Post Processor SEMCAD, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection...etc. is connected to the Electro-optical converter (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the Measurement Server.

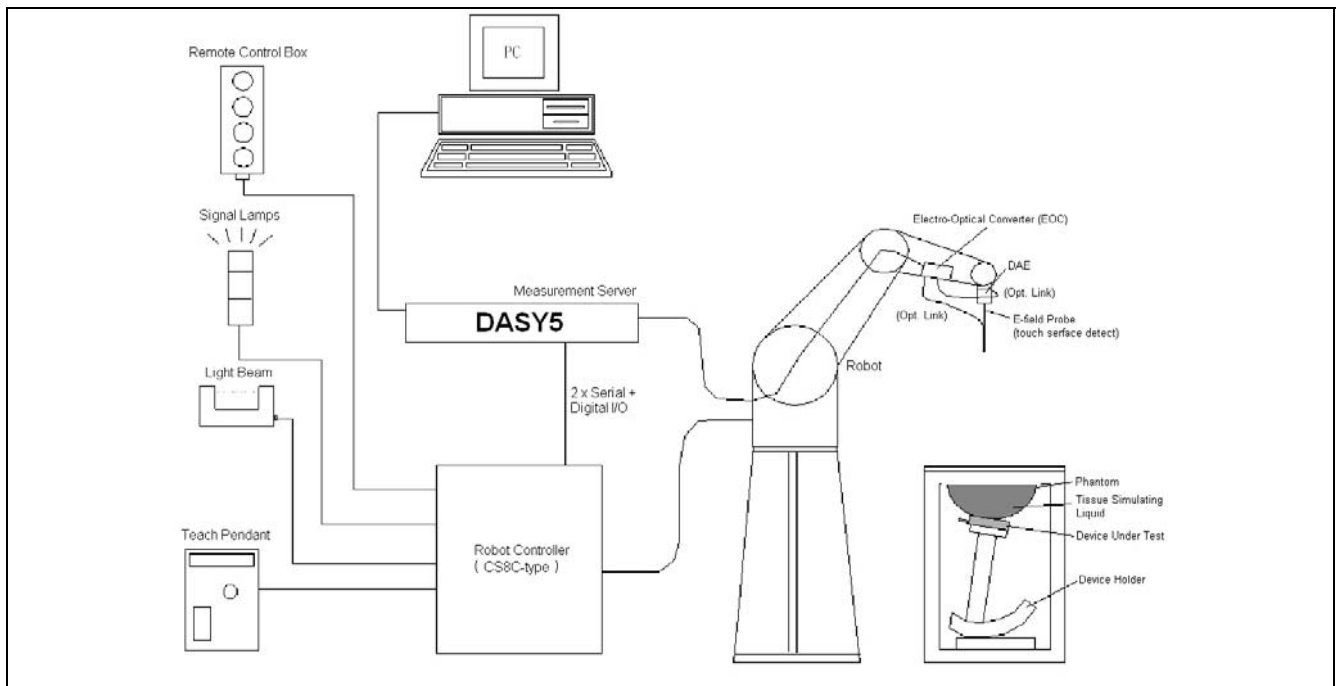


Figure 3. SAR Lab Test Measurement Setup

The DAE4 (or DAE3) 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 PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in [3] .

5. System Components

5.1 DASY5 E-Field Probe System

The SAR measurements were conducted with the dosimetric probe ES3DV3 or ET3DV6 (manufactured by SPEAG), designed in the classical triangular configuration [3] 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 DASY5 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped when reaching the maximum.

5.1.1 E-Field Probe Specification

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.q., glycol)
Calibration	In air from 10 MHz to 6 GHz In brain and muscle simulating tissue at frequencies of 2450MHz, 5200MHz, 5500MHz and 5800MHz (accuracy $\pm 8\%$) Calibration for other liquids and frequencies upon request
Frequency	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.3 dB in brain tissue (rotation around probe axis) ± 0.5 dB in brain tissue (rotation normal probe axis)
Dynamic Range	10 μW/g to > 100mW/g; Linearity: ± 0.2dB
Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surface
Dimensions	Overall length: 330mm Tip length: 20mm Body diameter: 12mm Tip diameter: 2.5mm Distance from probe tip to dipole centers: 1.0mm
Application	General dosimetry up to 6GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

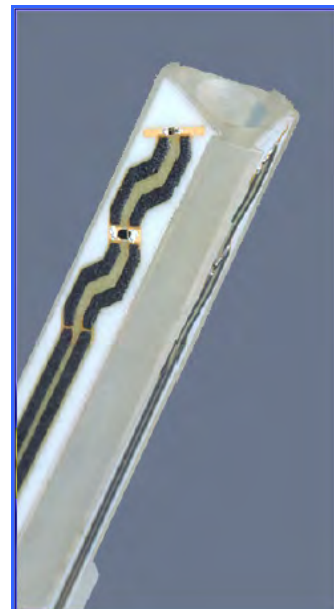


Figure 4. E-field Probe



Figure 5. Probe setup on robot



5.1.2 E-Field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure described in [4] with accuracy better than $\pm 10\%$. The spherical isotropy was evaluated with the procedure described in [5] and found to be better than $\pm 0.25\text{dB}$. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1GHz, and in a wave guide above 1GHz 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.

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

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

Where :

Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (head or body),

ΔT = Temperature increase due to RF exposure.

Or

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

Where :

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).



5.2 Data Acquisition Electronic (DAE) System

Cell Controller

Processor : Intel Core(TM)2 CPU
Clock Speed : @ 1.86GHz
Operating System : Windows XP Professional

Data Converter

Features : Signal Amplifier, multiplexer, A/D converter, and control logic
Software : DASY5 v5.0 (Build 125) & SEMCAD X Version 13.4 Build 125
Connecting Lines : Optical downlink for data and status info
Optical uplink for commands and clock

5.3 Robot

Positioner : Stäubli Unimation Corp. Robot Model: TX90XL
Repeatability : ± 0.02 mm
No. of Axis : 6

5.4 Measurement Server

Processor : PC/104 with a 400MHz intel ULV Celeron
I/O-board : Link to DAE4(or DAE3)
16-bit A/D converter for surface detection system
Digital I/O interface
Serial link to robot
Direct emergency stop output for robot

5.5 Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device (POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeat ably positioned according to the IEEE SCC34-SC2 and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).

***Note :** A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations [6] . To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Larger DUT cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values. Therefore those devices are normally only tested at the flat part of the SAM.



Figure 6. Device Holder

5.6 Phantom - SAM v4.0

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.

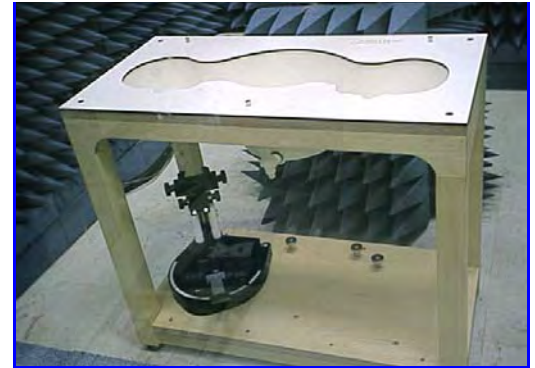


Figure 7. SAM Twin Phantom

Shell Thickness	2 $\pm$ 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	810x1000x500 mm (HxLxW)

Table 1. Specification of SAM v4.0

5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY5 software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension .DA4. The post processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

5.7.2 Data Evaluation

The DASY5 post processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software :

Probe parameters :	- Sensitivity	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	dcp _i
Device parameters :	- Frequency	f
	- Crest factor	cf
Media parameters :	- Conductivity	σ
	- Density	ρ

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

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

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

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

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

E-field probes :

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes :

$$H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

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

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

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

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

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

with **SAR** = local specific absorption rate in mW/g
 E_{tot} = total field strength in V/m
 σ = conductivity in [mho/m] or [Siemens/m]
 ρ = equivalent tissue density in g/cm³

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

The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770} \quad \text{or} \quad P_{pwe} = \frac{H_{tot}^2}{37.7}$$

with P_{pwe} = equivalent power density of a plane wave in mW/cm²
 E_{tot} = total electric field strength in V/m
 H_{tot} = total magnetic field strength in A/m



6. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Dosimetric E-Field Probe	ES3DV3	3150	Apr. 28, 2009	Apr. 28, 2010
SPEAG	Dosimetric E-Field Probe	EX3DV4	3578	Jun. 26, 2009	Jun. 26, 2010
SPEAG	2450MHz System Validation Kit	D2450V2	712	Feb. 11, 2009	Feb. 11, 2010
SPEAG	5100MHz ~ 5800MHz System Validation Kit	D5GHZV2	1021	Mar. 19, 2009	Mar. 19, 2010
SPEAG	Data Acquisition Electronics	DAE4	779	Nov. 11, 2008	Nov. 11, 2009
SPEAG	Device Holder	N/A	N/A	NCR	NCR
SPEAG	Phantom	SAM V4.0	TP-1150	NCR	NCR
SPEAG	Robot	Staubli TX90XL	F07/564ZA1/C/01	NCR	NCR
SPEAG	Software	DASY5 V5.0 Build 125	N/A	NCR	NCR
SPEAG	Software	SEMCAD X V13.4 Build 125	N/A	NCR	NCR
SPEAG	Measurement Server	SE UMS 011 AA	1025	NCR	NCR
R&S	Wireless Communication Test Set	CMU200	112387	Oct. 31, 2008	Oct. 31, 2009
Agilent	Wireless Communication Test Set	E5515C	GB47020167	May 25, 2009	May 25, 2010
Agilent	ENA Series Network Analyzer	E5071B	MY42402996	Nov. 04, 2008	Nov. 04, 2009
Agilent	Dielectric Probe Kit	85070C	US99360094	NCR	NCR
R&S	Power Sensor	NRP-Z22	100179	May 17, 2009	May 17, 2010
Agilent	Signal Generator	E8257D	MY44320425	Mar. 09, 2009	Mar. 09, 2010
Agilent	Dual Directional Coupler	778D	50334	NCR	NCR
Mini-Circuits	Power Amplifier	ZHL-42W-SMA	D111103#5	NCR	NCR
Mini-Circuits	Power Amplifier	ZVE-8G-SMA	D042005 671800514	NCR	NCR

Table 2. Test Equipment List

7. Tissue Simulating Liquids

The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the tissue.

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an 85070C Dielectric Probe Kit and an 8720ES Network Analyzer.

IEEE SCC-34/SC-2 in 1528 recommended Tissue Dielectric Parameters

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in human head. Other head and body tissue parameters that have not been specified in 1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equation and extrapolated according to the head parameter specified in 1528.

Target Frequency	Head		Body	
(MHz)	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 - 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00
(ϵ_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m ³)				

Table 3. Tissue dielectric parameters for head and body phantoms

7.1 Ingredients

The following ingredients are used:

- Water: deionized water (pure H₂O), resistivity $\geq 16 \text{ M } \Omega$ -as basis for the liquid
- Sugar: refined white sugar (typically 99.7 % sucrose, available as crystal sugar in food shops)
-to reduce relative permittivity
- Salt: pure NaCl -to increase conductivity
- Cellulose: Hydroxyethyl-cellulose, medium viscosity (75-125 mPa.s, 2% in water, 20 °C), CAS # 54290 -to increase viscosity and to keep sugar in solution.
- Preservative: Preventol D-7 Bayer AG, D-51368 Leverkusen, CAS # 55965-84-9 -to prevent the spread of bacteria and molds
- DGBE: Diethylenglycol-monobutyl ether (DGBE), Fluka Chemie GmbH, CAS # 112-34-5 -to reduce relative permittivity

7.2 Recipes

The following tables give the recipes for tissue simulating liquids to be used in different frequency bands.

Note: The goal dielectric parameters (at 22 °C) must be achieved within a tolerance of $\pm 5\%$ for ϵ and $\pm 5\%$ for σ .

Liquid type	MSL 2450-B	
Ingredient	Weight (g)	Weight (%)
Water	686.35	68.64
DGBE	313.65	31.37
Salt	-	0.00
Total amount	1,000.00	100.00
Goal dielectric parameters		
Frequency [MHz]	2450	
Relative Permittivity	52.7	
Conductivity [S/m]	1.95	

7.3 Liquid Confirmation

7.3.1 Parameters

Liquid Verify								
Ambient Temperature : 22 ± 2 °C ; Relative Humidity : 40 -70%								
Liquid Type	Frequency	Temp (°C)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)	Measured Date
2450MHz Body	2400MHz	22.0	ϵ_r	52.7	50.9	-3.42 %	± 5	Oct. 30, 2009
			σ	1.95	1.88	-3.59 %	± 5	
	2450MHz	22.0	ϵ_r	52.7	50.9	-3.42 %	± 5	
			σ	1.95	1.95	0.00 %	± 5	
	2500MHz	22.0	ϵ_r	52.7	50.6	-3.98 %	± 5	
			σ	1.95	2.00	2.56 %	± 5	
5200MHz Body	5150MHz	22.0	ϵ_r	49.0	47.8	-2.45 %	± 5	Oct. 30, 2009
			σ	5.30	5.17	-2.45 %	± 5	
	5200MHz	22.0	ϵ_r	49.0	49.0	0.00 %	± 5	
			σ	5.30	5.30	0.00 %	± 5	
	5250MHz	22.0	ϵ_r	49.0	50.28	2.61 %	± 5	
			σ	5.30	5.44	2.64 %	± 5	
5500MHz Body	5450MHz	22.0	ϵ_r	48.6	47.4	-2.47 %	± 5	Oct. 30, 2009
			σ	5.64	5.51	-2.30 %	± 5	
	5500MHz	22.0	ϵ_r	48.6	48.6	0.00 %	± 5	
			σ	5.64	5.65	0.18 %	± 5	
	5550MHz	22.0	ϵ_r	48.6	49.8	2.47 %	± 5	
			σ	5.64	5.79	2.66 %	± 5	
5500MHz Body	5450MHz	22.0	ϵ_r	48.6	47.4	-2.47 %	± 5	Nov. 03, 2009
			σ	5.64	5.51	-2.30 %	± 5	
	5500MHz	22.0	ϵ_r	48.6	48.6	0.00 %	± 5	
			σ	5.64	5.65	0.18 %	± 5	
	5550MHz	22.0	ϵ_r	48.6	49.8	2.47 %	± 5	
			σ	5.64	5.79	2.66 %	± 5	
5800MHz Body	5750MHz	22.0	ϵ_r	48.2	47.8	-0.83 %	± 5	Oct. 30, 2009
			σ	6.00	5.81	-3.17 %	± 5	
	5800MHz	22.0	ϵ_r	48.2	47.8	-0.83 %	± 5	
			σ	6.00	5.80	-3.33 %	± 5	
	5850MHz	22.0	ϵ_r	48.2	47.9	-0.62 %	± 5	
			σ	6.00	5.87	-2.17 %	± 5	

Table 4. Measured Tissue dielectric parameters for head and body phantoms - 1

7.3.2 Liquid Depth

The liquid level was during measurement 15cm $\pm$ 0.5cm.

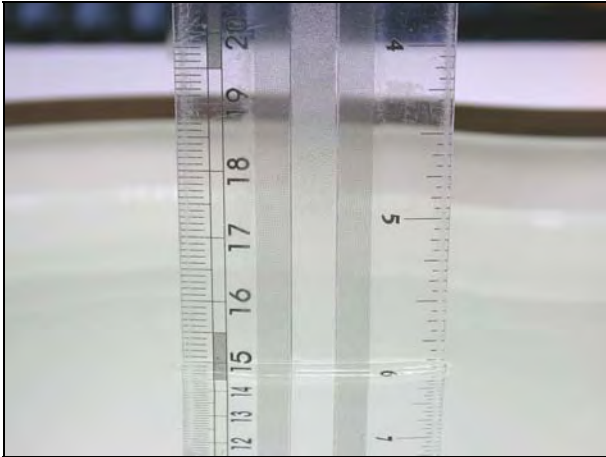


Figure 8. Head-Tissue-Simulating-Liquid



Figure 9. Body-Tissue-Simulating-Liquid



8. Measurement Process

8.1 Device and Test Conditions

The Test Device was provided by **Acer Incorporated** for this evaluation. The spatial peak SAR values were assessed for the lowest, middle and highest channels defined by **WLAN 802.11a / 802.11b / 802.11n_HT20** (#1=2412MHz, #6=2437MHz, #11=2462MHz) systems and **WLAN 802.11n_HT40** (#1=2422MHz, #6=2437MHz, #11=2452MHz) systems.

Usage:	Operates with a test mode by client (802.11a/802.11b//802.11n)
Simulating human Head/Body:	Body
EUT Battery:	Fully-charged with Li-ion batteries.
Comment:	The SAR test mode is chosen by the max conducted power.

8.2 Test mode Description

- (1) Laptop Mode: Lap-held with the display open at 90° to the keyboard
Note: WLAN main antenna is more than 20(cm) from phantom for laptop mode, so SAR test is not required.
- (2) Tablet Mode: The SAR value is LCD Tip Close Body>Right Side Close Body>Bottom Close Body. Only test LCD Tip Close Body Mode
- (3) 802.11b's conducted Avg. Power is more than 0.25dB of 802.11g. The 802.11g SAR is not required.
- (4) Tablet Mode – LCD Tip Close Body Mode: The 1g- SAR value is 0.53mw/g of 802.11b ch6 rate: 1MHz. The Lowest and Highest are not required of channels.
The Acer Incorporated model 512AN_HMW is a 2x1 MISO 802.11abgn radio module that is designed to be installed in laptops. The module supports 802.11b, 802.11g and 802.11n protocols in the 2400 – 2483.5 MHz band and 802.11a and 802.11n in the 5150 – 5250 MHz, 5250 – 5350 MHz, 5470 – 5725 MHz and 5725 – 5850 MHz bands. In 802.11n mode it supports both 20-MHz and 40-MHz channels. It can operate in SISO (1x1) and MISO (2x1) configurations.
- (5) Choose the maximum Avg. Power to test SAR in each band:

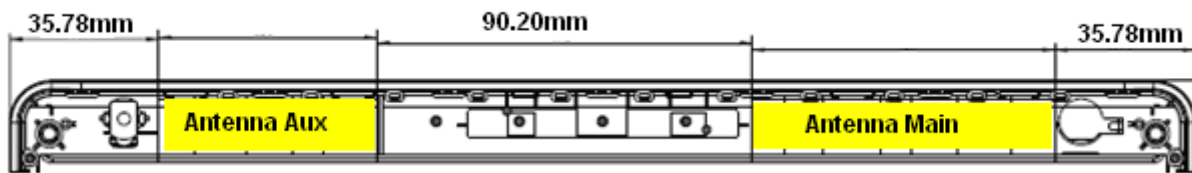
2450MHz						
Band	Data Rate	CH	Frequency (MHz)	Average Conducted power (dBm)		Worst Case
				Before	After	
802.11 b	1M	1	2412.0	16.79	16.69	☐
		6	2437.0	18.20	18.12	☒
		11	2462.0	16.75	16.67	☐
802.11 g	6M	1	2412.0	13.94	13.84	☐
		6	2437.0	17.93	17.81	☐
		11	2462.0	15.51	15.43	☐
802.11n_HT20	6M	1	2412.0	14.26	14.17	☐
		6	2437.0	16.52	16.43	☐
		11	2462.0	14.38	14.28	☐
802.11n_HT40	15M	3	2422.0	8.91	8.82	☐
		6	2437.0	16.70	16.62	☐
		9	2452.0	9.96	9.85	☐

5200MHz						
Band	Rate	CH	Frequency (MHz)	Average Conducted power (dBm)		Worst Case
				Before	After	
802.11a	6	36	5180.0	14.86	14.76	☐
		40	5200.0	17.60	17.50	☒
		44	5220.0	15.55	15.45	☐
		48	5240.0	17.44	17.34	☐
802.11n_HT20 (5GHz)	6	36	5180.0	14.55	14.45	☐
		40	5200.0	17.55	17.45	☐
		44	5220.0	15.50	15.40	☐
		48	5240.0	17.47	17.37	☐
802.11n_HT40 (5GHz)	15	38	5190.0	10.33	10.23	☐
		46	5230.0	16.42	16.32	☐

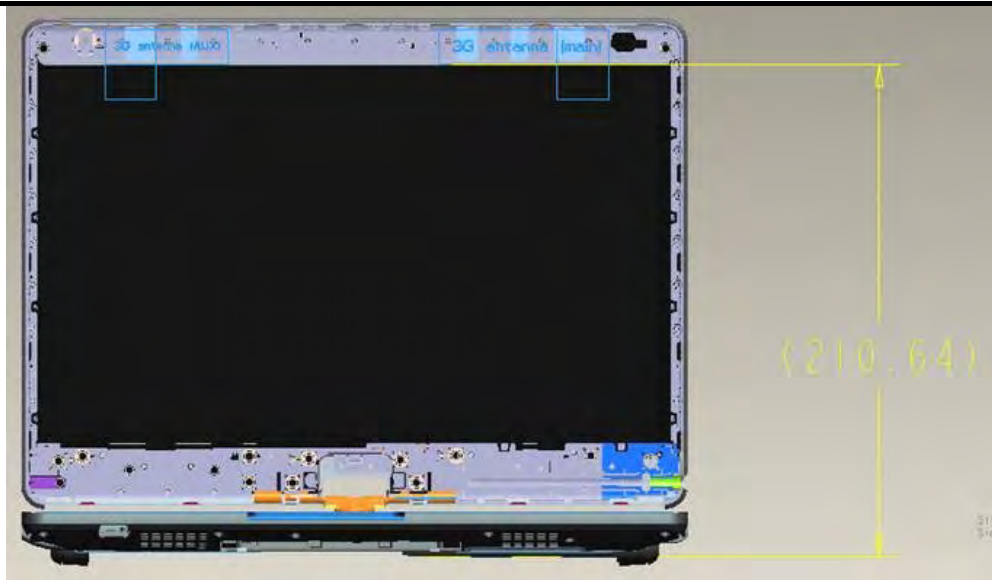
5300MHz						
Band	Rate	CH	Frequency (MHz)	Average Conducted power (dBm)		Worst Case
				Before	After	
802.11a	6	52	5260.0	17.17	17.07	☐
		56	5280.0	17.32	17.22	☐
		60	5300.0	15.42	15.32	☐
		64	5320.0	14.68	14.58	☐
802.11n_HT20 (5GHz)	6	52	5260.0	16.51	16.41	☐
		56	5280.0	17.51	17.41	☒
		60	5300.0	15.05	14.95	☐
		64	5320.0	14.57	14.47	☐
802.11n_HT40 (5GHz)	15	54	5270.0	16.57	16.47	☐
		62	5310.0	10.35	10.25	☐

5500MHz						
Band	Rate	CH	Frequency (MHz)	Average Conducted power (dBm)		Worst Case
				Before	After	
802.11a	6	100	5500.0	17.53	17.43	☐
		104	5520.0	14.40	14.30	☐
		108	5540.0	13.80	13.70	☐
		112	5560.0	13.71	13.61	☐
		116	5580.0	13.69	13.59	☐
		120	5600.0	17.83	17.73	☒
		124	5620.0	13.34	13.24	☐
		128	5640.0	13.31	13.21	☐
		132	5660.0	13.16	13.06	☐
		136	5680.0	13.12	13.02	☐
		140	5700.0	17.21	17.11	☐
802.11n_HT20 (5GHz)	6	100	5500.0	17.53	17.43	☐
		104	5520.0	13.75	13.65	☐
		108	5540.0	13.58	13.48	☐
		112	5560.0	13.59	13.49	☐
		116	5580.0	13.55	13.45	☐
		120	5600.0	16.54	16.44	☐
		124	5620.0	13.27	13.17	☐
		128	5640.0	13.14	13.04	☐
		132	5660.0	13.12	13.02	☐
		136	5680.0	13.01	12.91	☐
		140	5700.0	16.52	16.42	☐
802.11n_HT40 (5GHz)	15	102	5510.0	13.72	13.62	☐
		110	5550.0	14.06	13.96	☐
		118	5590.0	16.64	16.54	☐
		126	5630.0	13.71	13.61	☐
		134	5670.0	16.53	16.43	☐

5800MHz						
Band	Rate	CH	Frequency (MHz)	Average Conducted power (dBm)		Worst Case
				Before	After	
802.11a	6	149	5745.0	17.58	17.48	☐
		153	5765.0	12.51	12.41	☐
		157	5785.0	17.82	17.72	☒
		161	5805.0	12.06	11.96	☐
		165	5825.0	17.33	17.23	☐
802.11n_HT20 (5GHz)	6	149	5745.0	16.51	16.41	☐
		153	5765.0	12.42	12.32	☐
		157	5785.0	16.52	16.42	☐
		161	5805.0	12.03	11.93	☐
		165	5825.0	16.53	16.43	☐
802.11n_HT40 (5GHz)	15	151	5755.0	16.54	16.44	☐
		159	5795.0	16.66	16.56	☐



Antenna Main to Aux



Antenna to Person

8.3 System Performance Check

8.3.1 Symmetric Dipoles for System Validation

Construction	Symmetrical dipole with 1/4 balun enables measurement of feed point impedance with NWA matched for use near flat phantoms filled with head simulating solutions Includes distance holder and tripod adaptor Calibration Calibrated SAR value for specified position and input power at the flat phantom in head simulating solutions.
Frequency	2450 MHz, 5200 MHz, 5500 MHz and 5800 MHz
Return Loss	> 20 dB at specified validation position
Power Capability	> 100 W ($f < 1\text{GHz}$); > 40 W ($f > 1\text{GHz}$)
Options	Dipoles for other frequencies or solutions and other calibration conditions are available upon request
Dimensions	D2450V2 : dipole length 51.5 mm; overall height 300 mm D5GHZV2 : dipole length 20.0 mm; overall height 300 mm



Figure 10. Validation Kit

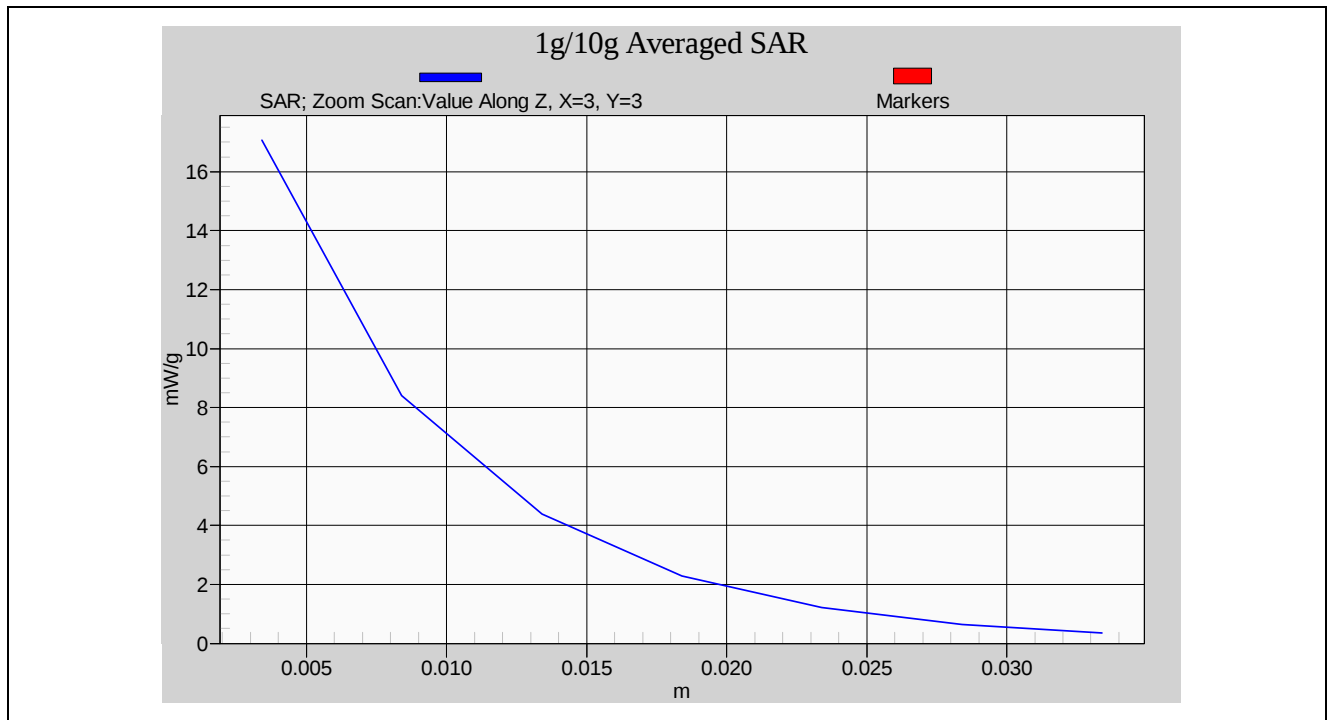
8.3.2 Validation

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of $\pm 7\%$. The validation was performed at 2450 MHz, 5200 MHz, 5500 MHz and 5800 MHz.

Validation kit		Mixture Type	SAR _{1g} [mW/g]		SAR _{10g} [mW/g]		Date of Calibration
D2450V2-SN712		Body	52.8		24.72		Feb. 11, 2009
D5200MHzV2-SN1021		Body	76.5		21.3		Feb. 20, 2009
D5500MHzV2-SN1021		Body	82.7		22.8		Feb. 20, 2009
D5800MHzV2-SN1021		Body	73.1		20.1		Feb. 20, 2009
Frequency (MHz)	Power (dBm)	SAR _{1g} (mW/g)	SAR _{10g} (mW/g)	Drift (dB)	Difference percentage		Date
					1g	10g	
2450 (Body)	250mW	13.5	6.24	-0.112	2.3 %	1.0 %	Oct. 30, 2009
	Normalize to 1 Watt	54.0	24.96				
5200 (Body)	250mW	7.59	2.13	-0.191	-0.8 %	0.0 %	Oct. 30, 2009
	Normalize to 1 Watt	75.9	21.3				
5500 (Body)	250mW	8.44	2.31	-0.132	2.1 %	1.3 %	Oct. 30, 2009
	Normalize to 1 Watt	84.4	23.1				
5500 (Body)	250mW	8.39	2.30	-0.121	1.5 %	0.9 %	Nov. 03, 2009
	Normalize to 1 Watt	83.9	23.0				
5800 (Body)	250mW	7.12	1.95	0.128	-2.6 %	-3.0 %	Oct. 30, 2009
	Normalize to 1 Watt	71.2	19.5				

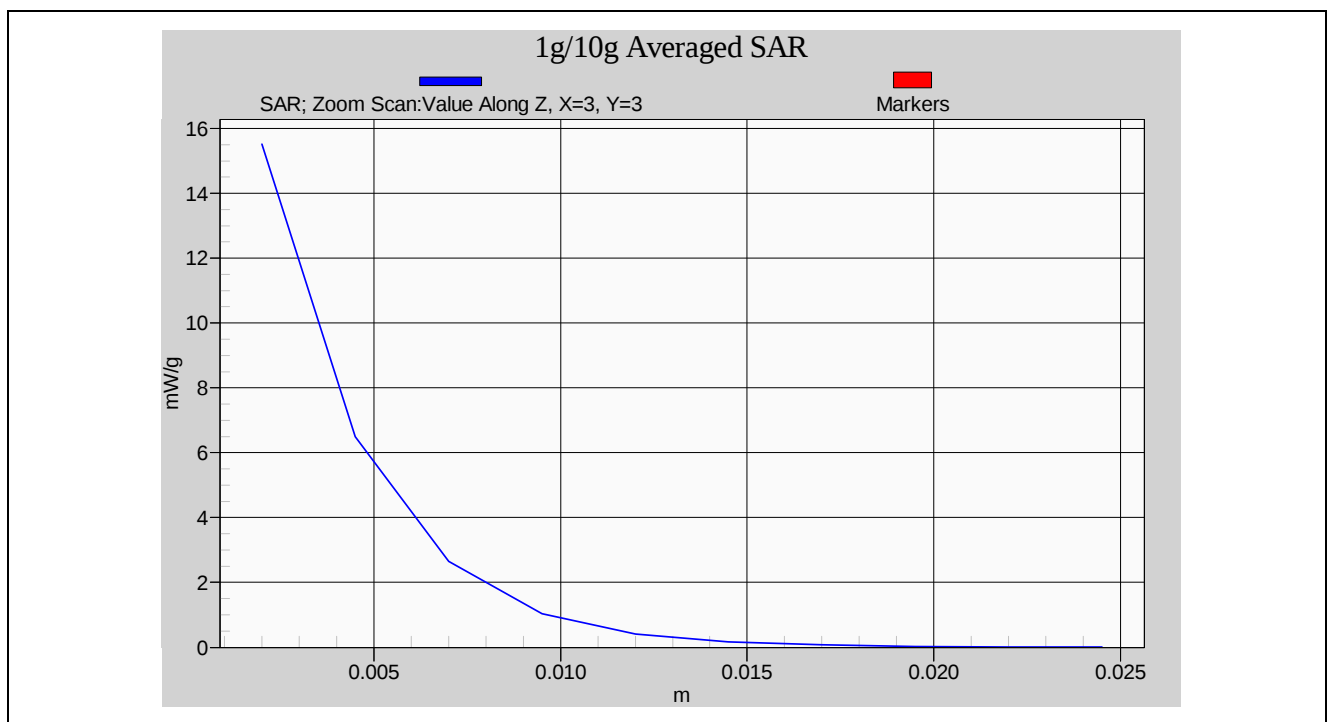


Z-axis Plot of System Performance Check



Body-Tissue-Simulating-Liquid 2450MHz_ 10/30/2009

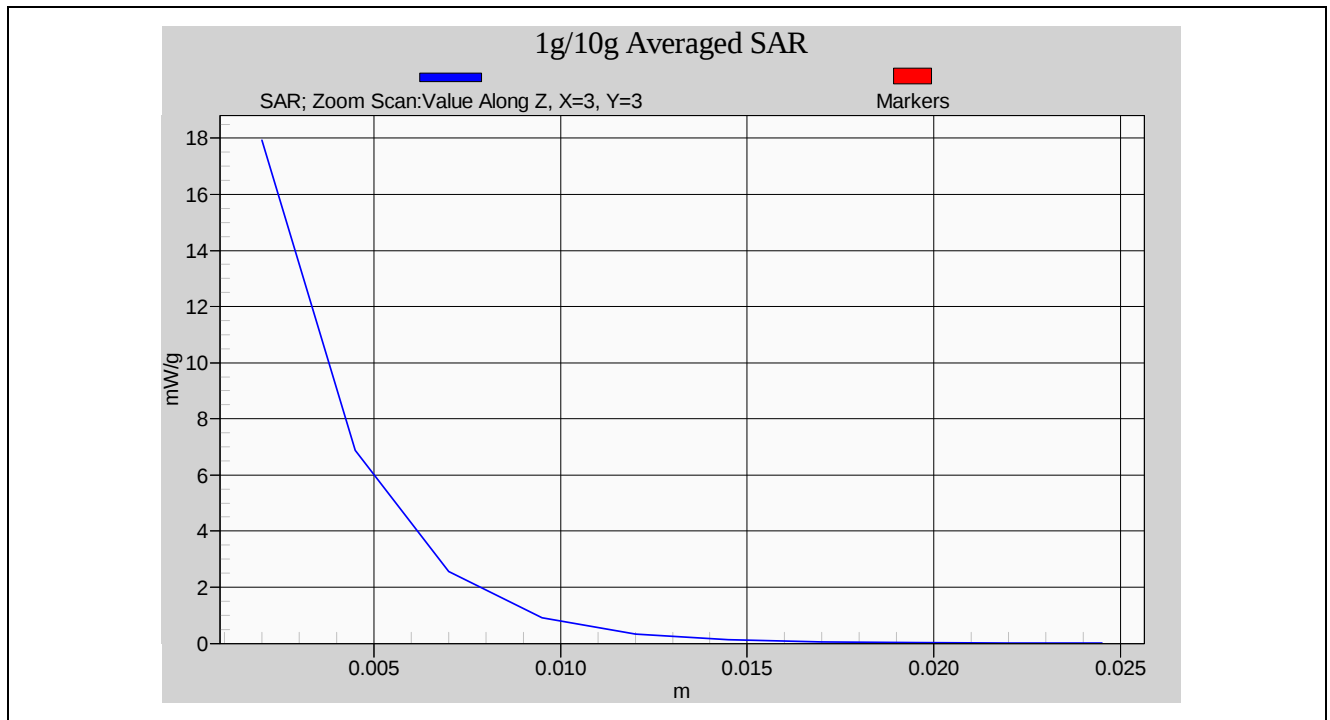
Z-axis Plot of System Performance Check



Body-Tissue-Simulating-Liquid 5200MHz_ 10/30/2009

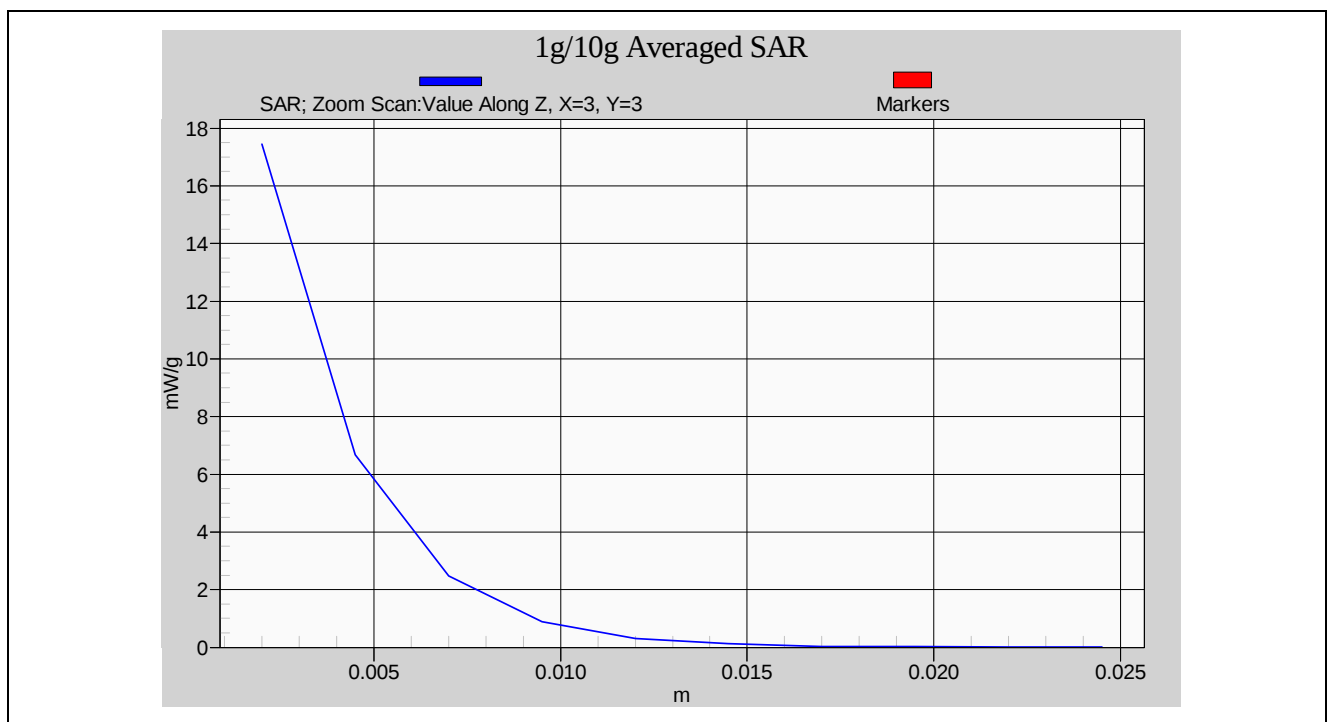


Z-axis Plot of System Performance Check



Body-Tissue-Simulating-Liquid 5500MHz_ 10/30/2009

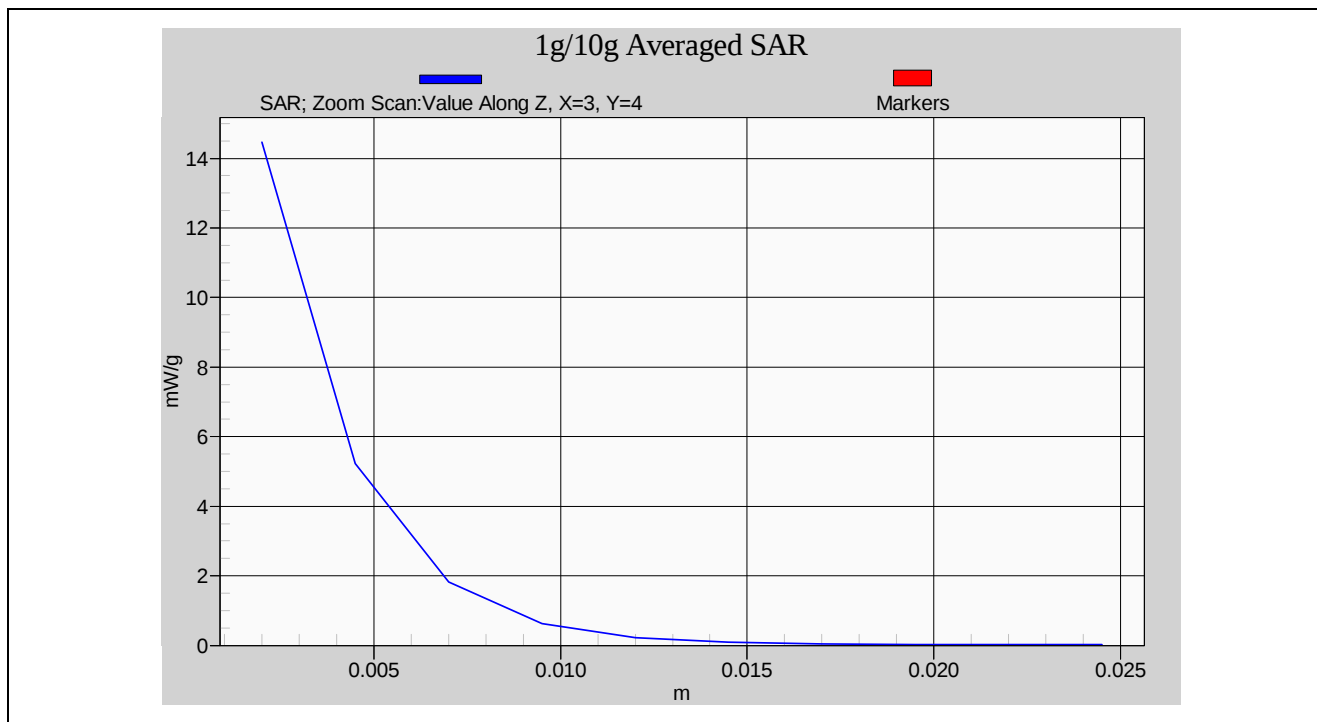
Z-axis Plot of System Performance Check



Body-Tissue-Simulating-Liquid 5500MHz_ 11/03/2009



Z-axis Plot of System Performance Check



Body-Tissue-Simulating-Liquid 5800MHz_ 10/30/2009

8.4 Dosimetric Assessment Setup

8.4.1 Body Test Position

Body - Worn Configuration

Body - Worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device.

Body - Worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 15 mm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances.

For this test :

☐ The EUT is placed into the holster/belt clip and the holster is positioned against the surface of the phantom in a normal operating position.

☒ Since this EUT doesn't supply any body-worn accessory to the end user, for **WLAN 802.11a / WLAN 802.11b / WLAN 802.11n** the distance of **2mm** was tested to confirm the necessary "minimum SAR separation distance".

(* Note : This distance includes the 2 mm phantom shell thickness.)



8.4.2 Measurement Procedures

The evaluation was performed with the following procedures :

- Surface Check :** A surface checks job gathers data used with optical surface detection. It determines the distance from the phantom surface where the reflection from the optical detector has its peak. Any following measurement jobs using optical surface detection will then rely on this value. The surface check performs its search a specified number of times, so that the repeatability can be verified. The probe tip distance is 1.3mm to phantom inner surface during scans.
- Reference :** The reference job measures the field at a specified reference position, at 4 mm from the selected section's grid reference point.
- 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 can find the maximum locations even in relatively coarse grids. When an area scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. Any following zoom scan within the same procedure will then perform fine scans around these maxima. The area covered the entire dimension of the EUT and the horizontal grid spacing was 15 mm x 15 mm.
- Zoom Scan :** Zoom scans are used to assess the highest averaged SAR for cubic averaging volumes with 1 g and 10 g of simulated tissue. The zoom scan measures 7 x 7 x 9 points in a 30 x 30 x 24 mm cube whose base faces are centered around the maxima returned from a preceding area scan within the same procedure.
- Drift :** The drift job measures the field at the same location as the most recent reference job within the same procedure, with the same settings. The drift measurement gives the field difference in dB from the last reference measurement. Several drift measurements are possible for each reference measurement. This allows monitoring of the power drift of the device in the batch process. If the value changed by more than 5%, the evaluation was repeated.



8.5 Spatial Peak SAR Evaluation

The DASY5 software includes all numerical procedures necessary to evaluate the spatial peak SAR values. Based on the Draft: SCC-34, SC-2, WG-2 - Computational Dosimetry, IEEE P1529/D0.0 (Draft Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) Associated with the Use of Wireless Handsets - Computational Techniques), a new algorithm has been implemented. The spatial-peak SAR can be computed over any required mass.

The base for the evaluation is a "cube" measurement in a volume of $(32 \times 32 \times 30) \text{mm}^3$ ($5 \times 5 \times 7$ points). 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. If the 10g cube or both cubes are not entirely inside the measured volumes, the system issues a warning regarding the evaluated spatial peak values within the Postprocessing engine (SEMCAD). This means that if the measured volume is shifted, higher values might be possible. To get the correct values you can use a finer measurement grid for the area scan. In complicated field distributions, a large grid spacing for the area scan might miss some details and give an incorrectly interpolated peak location.

The entire evaluation of the spatial peak values is performed within the Postprocessing 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 three stages:

Interpolation and Extrapolation

The probe is calibrated at the center of the dipole sensors which is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated.

In DASY5, the choice of the coordinate system defining the location of the measurement points has no influence on the uncertainty of the interpolation, Maxima Search and SAR extrapolation routines. The interpolation, Maxima Search and extrapolation routines are all based on the modified Quadratic Shepard's method [7].

9. **Measurement Uncertainty**

Measurement uncertainties in SAR measurements are difficult to quantify due to several variables including biological, physiological, and environmental. However, we estimate the measurement uncertainties in SAR to be less than $\pm 21.9\%$ [8] .

According to Std. C95.3 [9] , the overall uncertainties are difficult to assess and will vary with the type of meter and usage situation. However, accuracy's of ± 1 to 3 dB can be expected in practice, with greater uncertainties in near-field situations and at higher frequencies (shorter wavelengths), or areas where large reflecting objects are present. Under optimum measurement conditions, SAR measurement uncertainties of at least ± 2 dB can be expected.

According to CENELEC [10] , typical worst-case uncertainty of field measurements is ± 5 dB. For well-defined modulation characteristics the uncertainty can be reduced to ± 3 dB.

Error Description	Uncertainty value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) v _{eff}
Measurement System								
Probe Calibration	± 5.9 %	N	1	1	1	± 5.9 %	± 5.9 %	
Axial Isotropy	± 4.7 %	R		0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical Isotropy	± 9.6 %	R	$\sqrt{3}$	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary Effects	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Linearity	± 4.7 %	R	$\sqrt{3}$	1	1	± 2.7 %	± 2.7 %	∞
System Detection Limits	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Readout Electronics	± 0.3 %	N	1	1	1	± 0.3 %	± 0.3 %	∞
Response Time	± 0.8 %	R	$\sqrt{3}$	1	1	± 0.5 %	± 0.5 %	∞
Integration Time	± 2.6 %	R	$\sqrt{3}$	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Noise	± 3.0 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Reflections	± 3.0 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.4 %	R	$\sqrt{3}$	1	1	± 0.2 %	± 0.2 %	∞
Probe Positioning	± 2.9 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Max. SAR Eval.	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Test Sample Related								
Device Positioning	± 2.9 %	N	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6 %	N	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0 %	R	$\sqrt{3}$	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Setup								
Phantom Uncertainty	± 4.0 %	R	$\sqrt{3}$	1	1	± 2.3 %	2.3 %	∞
Liquid Conductivity (target)	± 5.0 %	R	$\sqrt{3}$	0.64	0.43	± 1.8 %	1.2 %	∞
Liquid Conductivity (meas.)	± 2.5 %	N	1	0.64	0.43	± 1.6 %	1.1 %	∞
Liquid Permittivity (target)	± 5.0 %	R	$\sqrt{3}$	0.6	0.49	± 1.7 %	1.4 %	∞
Liquid Permittivity (meas.)	± 2.5 %	N	1	0.6	0.49	± 1.5 %	1.2 %	∞
Combined Std. Uncertainty						± 10.9 %	± 10.7 %	387
Expanded STD Uncertainty						± 21.9 %	± 21.4 %	

Table 5. Uncertainty Budget of DASY



10. SAR Test Results Summary

10.1 WLAN 802.11b - Body SAR

Ambient :

Temperature (°C) : 22 ± 2

Relative HUMIDITY (%) : 40-70

Liquid :

Mixture Type : MSL2450

Liquid Temperature (°C) : 22.0

Depth of liquid (cm) : 15

Measurement :

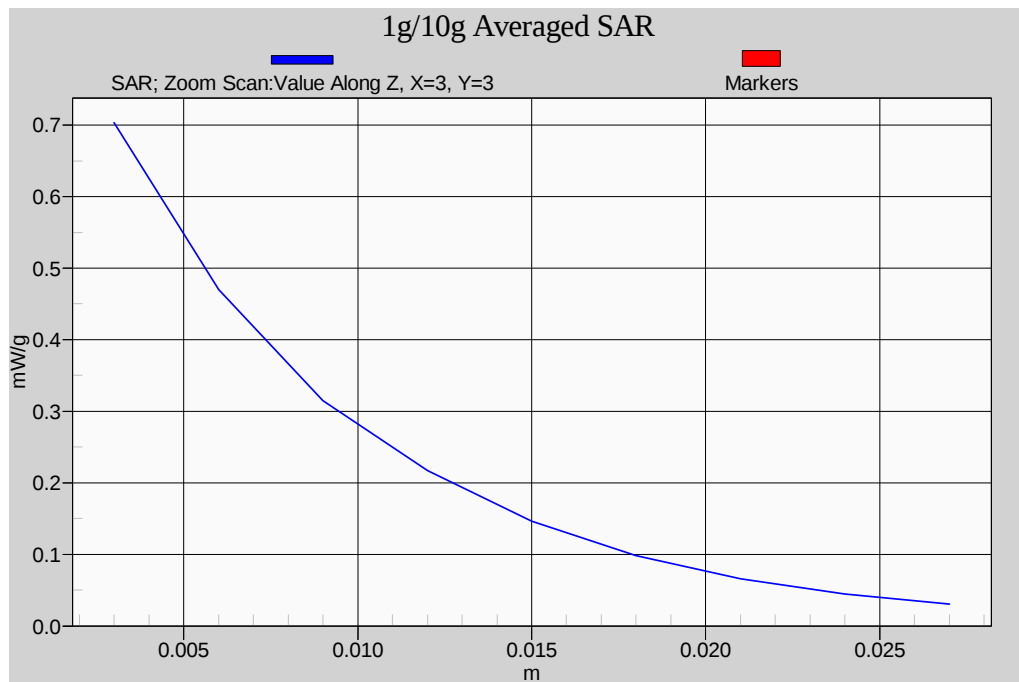
Duty Cycle : 1:1

Probe S/N : 3150

Frequency		Rate	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
2437	6	1M	18.20	Flat	PIFA	N/A	0.095	0.191	Tablet Mode LCD Right side Close Body
2437	6	1M	18.20	Flat	PIFA	N/A	0.021	0.173	Tablet Mode Bottom Close Body
2437	6	1M	18.20	Flat	PIFA	N/A	0.530	-0.061	Tablet Mode LCD Tip Close Body
Std. C95.1-2005 - Safety Limit RSS-102-2009 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population						1.6 W/kg (mW/g) Averaged over 1 gram			

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Flat WLAN 802.11b CH 6 (Rate 1M)



10.2 WLAN 802.11n (2.4G)_HT20 Body SAR

Ambient :

Temperature (°C) : 22 ± 2

Relative HUMIDITY (%) :

40-70

Liquid :

Mixture Type : MSL2450

Liquid Temperature (°C) :

22.0

Depth of liquid (cm) :

15

Measurement :

Duty Cycle : 1:1

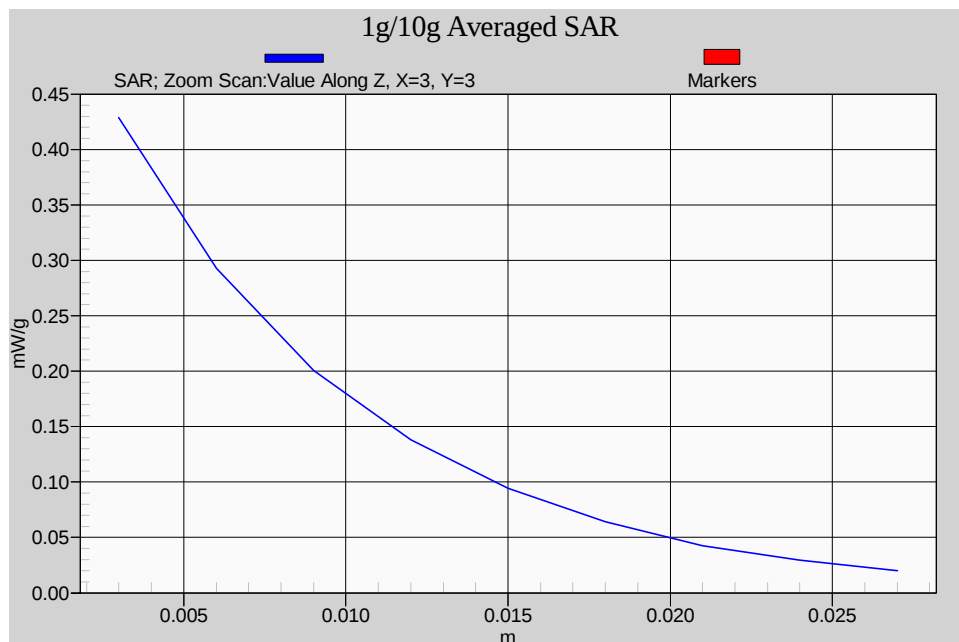
Probe S/N :

3150

Frequency		Rate	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
2437	6	6M	16.52	Flat	PIFA	N/A	0.330	0.015	Tablet Mode LCD Tip Close Body
Std. C95.1-2005 - Safety Limit RSS-102-2009 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population						1.6 W/kg (mW/g) Averaged over 1 gram			

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Flat WLAN 802.11n CH 6 (Rate 6M)

10.3 WLAN 802.11n (2.4G)_HT40 Body SAR

Ambient :

Temperature (°C) : 22 ± 2 Relative HUMIDITY (%) : 40-70

Liquid :

Mixture Type : MSL2450 Liquid Temperature (°C) : 22.0
Depth of liquid (cm) : 15

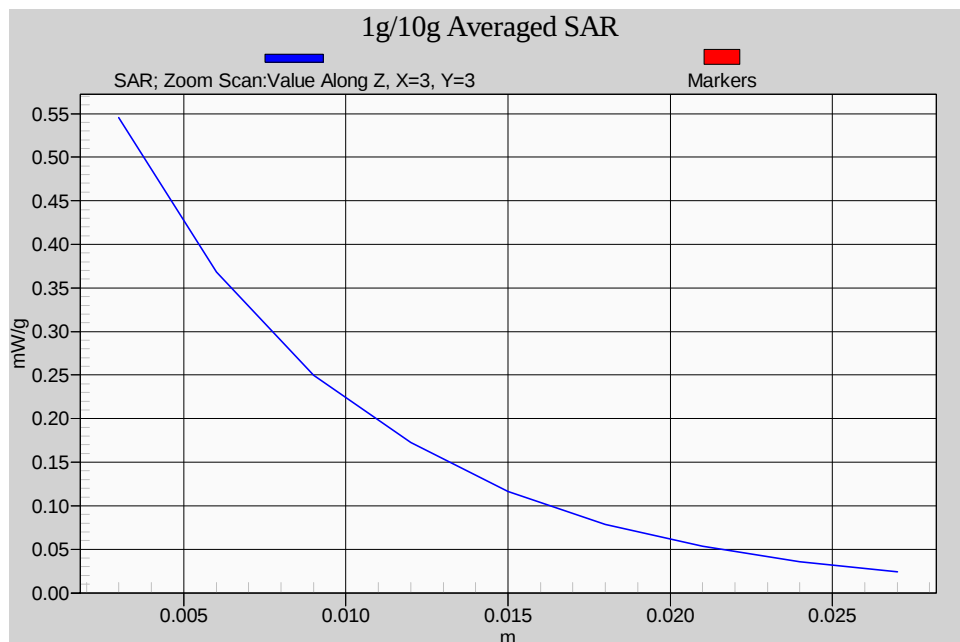
Measurement :

Duty Cycle : 1:1 Probe S/N : 3150

Frequency		Rate	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
2437	6	15M	16.70	Flat	PIFA	N/A	0.415	-0.021	Tablet Mode LCD Tip Close Body
Std. C95.1-2005 - Safety Limit RSS-102-2009 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population						1.6 W/kg (mW/g) Averaged over 1 gram			

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Flat WLAN 802.11n CH 6 (Rate 15M)



10.4 WLAN 802.11a (5.2 ~ 5.8G) Body SAR

Ambient :

Temperature (°C) : 22 ± 2

Relative HUMIDITY (%) :

40-70

Liquid :

Mixture Type : MSL5200/5500/5800

Liquid Temperature (°C) :

22.0

Depth of liquid (cm) :

15

Measurement :

Duty Cycle : 1:1

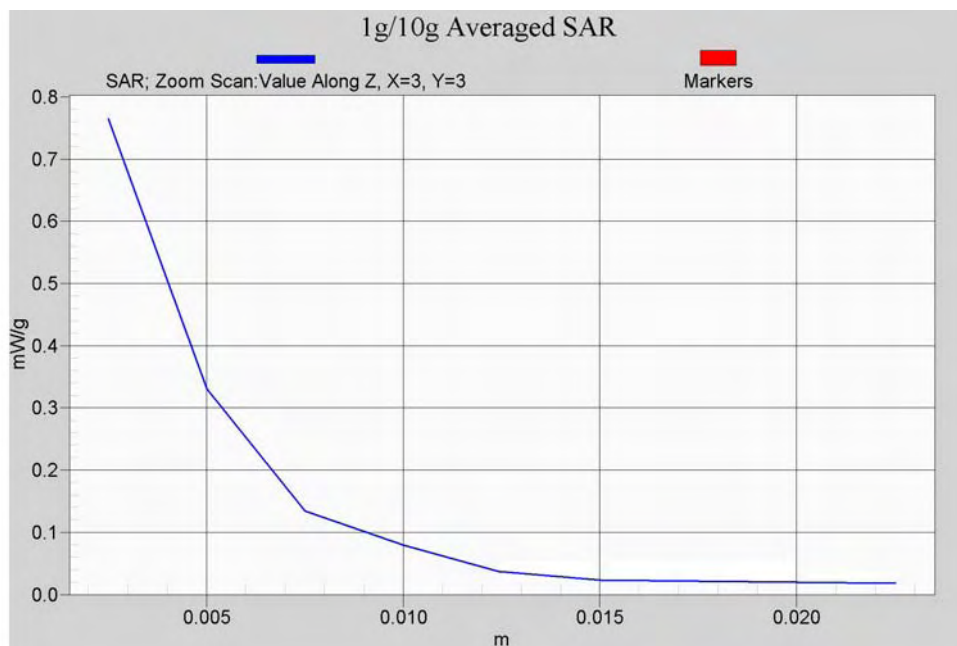
Probe S/N :

3578

Frequency		Rate	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
5200	40	6M	17.60	Flat	PIFA	N/A	0.330	-0.156	Tablet Mode LCD Tip Close Body
5600	120	6M	17.83	Flat	PIFA	N/A	0.446	-0.047	Tablet Mode LCD Tip Close Body
5600	120	6M	17.83	Flat	PIFA	N/A	0.057	0.111	Tablet Mode Bottom Close Body
5600	120	6M	17.83	Flat	PIFA	N/A	0.146	-0.076	Tablet Mode LCD Right side Close Body
5785	157	6M	17.82	Flat	PIFA	N/A	0.265	0.112	Tablet Mode LCD Tip Close Body
Std. C95.1-2005 - Safety Limit RSS-102-2009 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population						1.6 W/kg (mW/g) Averaged over 1 gram			

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Flat WLAN 802.11a CH 120 (Rate 6M)

10.5 WLAN 802.11n (5.2 ~ 5.8G)_HT20 Body SAR

Ambient :

Temperature (°C) : 22 ± 2

Relative HUMIDITY (%) : 40-70

Liquid :

Mixture Type : MSL5200/5500/5800

Liquid Temperature (°C) : 22.0

Depth of liquid (cm) : 15

Measurement :

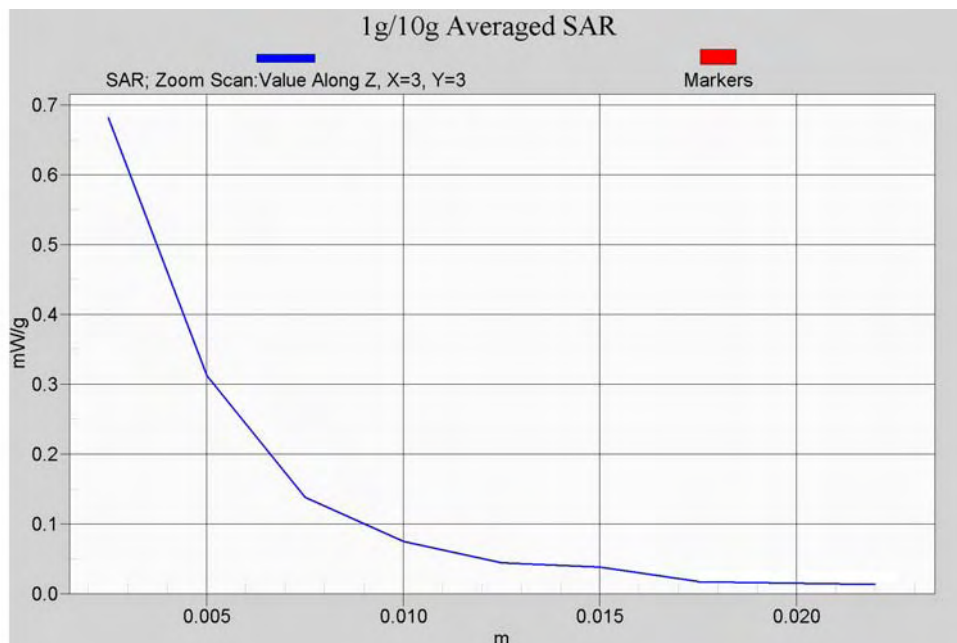
Duty Cycle : 1:1

Probe S/N : 3578

Frequency		Rate	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
5280	56	6M	17.51	Flat	PIFA	N/A	0.396	0.065	Tablet Mode LCD Tip Close Body
Std. C95.1-2005 - Safety Limit RSS-102-2009 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population						1.6 W/kg (mW/g) Averaged over 1 gram			

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Flat WLAN 802.11n CH 56 (Rate 6M)

10.6 Std. C95.1-2005 RF Exposure Limit

Human Exposure	Population Uncontrolled Exposure (W/kg) or (mW/g)	Occupational Controlled Exposure (W/kg) or (mW/g)
Spatial Peak SAR* (head)	1.60	8.00
Spatial Peak SAR** (Whole Body)	0.08	0.40
Spatial Peak SAR*** (Partial-Body)	1.60	8.00
Spatial Peak SAR**** (Hands / Feet / Ankle / Wrist)	4.00	20.00

Table 6. Safety Limits for Partial Body Exposure

Notes :

- * The Spatial Peak value of the SAR averaged over any 1 gram of tissue.
(defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
- ** The Spatial Average value of the SAR averaged over the whole – body.
- *** The Spatial Average value of the SAR averaged over the partial – body.
- **** The Spatial Peak value of the SAR averaged over any 10 grams of tissue.
(defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Population / Uncontrolled Environments : are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Occupational / 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).

11. Conclusion

The SAR test values found for the portable mobile phone **Acer Incorporated Trade Name : acer Model(s) : 512AN_HMW** is below the maximum recommended level of 1.6 W/kg (mW/g).

12. References

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- [7] Robert J. Renka, "Multivariate Interpolation Of Large Sets Of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988 , pp. 139-148.
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- [10] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10KHz-300GHz, Jan. 1995.
- [11] RSS-102, Issue 3 (June 2009), Radio Standards Specification 102.



Appendix A - System Performance Check

See following Attached Pages for System Performance Check.



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/30/2009 4:49:36 AM

System Performance Check at 2450MHz_20091030_Body

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:712

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

Medium parameters used: $f = 2450 \text{ MHz}$; $\sigma = 1.95 \text{ mho/m}$; $\epsilon_r = 50.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.23, 4.23, 4.23); Calibrated: 1/20/2009
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

System Performance Check at 2450MHz/Area Scan (61x61x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 17 mW/g

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

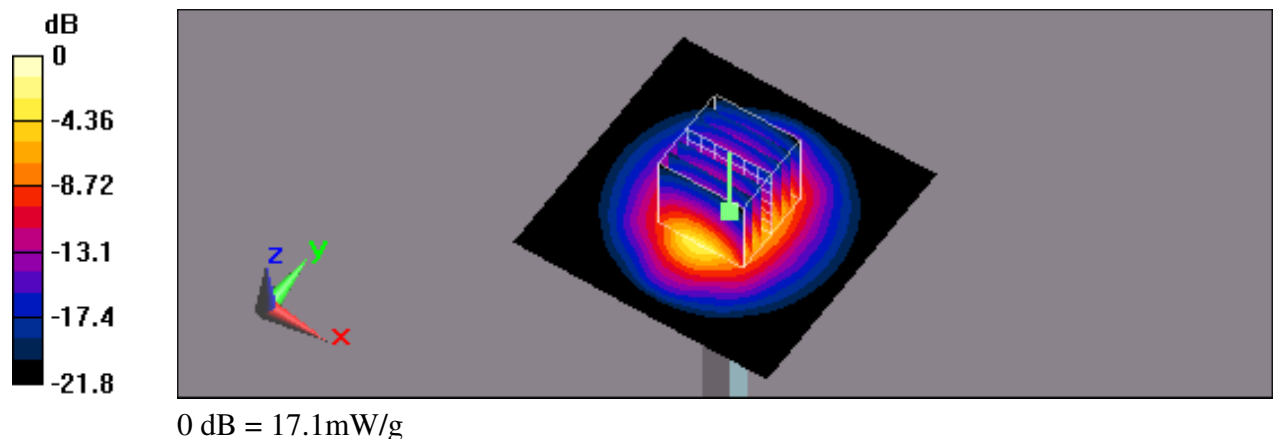
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 95.6 V/m; Power Drift = -0.112 dB

Peak SAR (extrapolated) = 28.7 W/kg

SAR(1 g) = 13.5 mW/g; SAR(10 g) = 6.24 mW/g

Maximum value of SAR (measured) = 17.1 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/30/2009 8:38:45 PM

System Performance Check at 5200MHz_20091030_Body

DUT: Dipole 5GHzV2; Type: D5GHz; Serial: 1021

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

Medium parameters used: $f = 5200 \text{ MHz}$; $\sigma = 5.3 \text{ mho/m}$; $\epsilon_r = 49$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3578; ConvF(3.7, 3.7, 3.7); Calibrated: 6/26/2009
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

System Performance Check at 5200MHz/Area Scan (61x61x1):

Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 16.6 mW/g

System Performance Check at 5200MHz/Zoom Scan (8x8x10)/Cube 0:

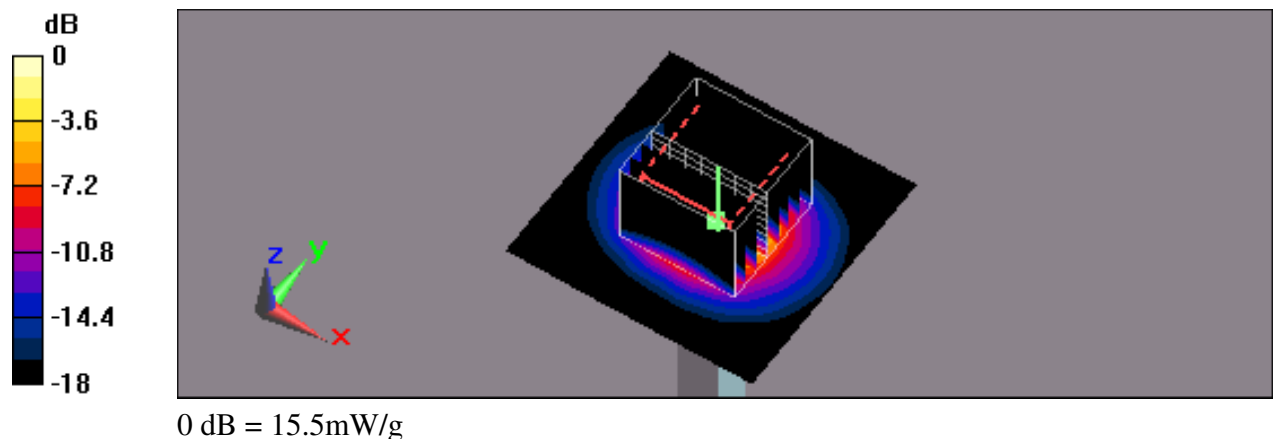
Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2.5\text{mm}$

Reference Value = 59.8 V/m; Power Drift = -0.191 dB

Peak SAR (extrapolated) = 31.5 W/kg

SAR(1 g) = 7.59 mW/g; SAR(10 g) = 2.13 mW/g

Maximum value of SAR (measured) = 15.5 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/30/2009 7:41:34 PM

System Performance Check at 5500MHz_20091030_Body

DUT: Dipole 5GHzV2; Type: D5GHz; Serial: 1021

Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5500$ MHz; $\sigma = 5.65$ mho/m; $\epsilon_r = 48.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3578; ConvF(3.42, 3.42, 3.42); Calibrated: 6/26/2009
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

System Performance Check at 5500MHz/Area Scan (61x61x1):

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

Maximum value of SAR (interpolated) = 18.5 mW/g

System Performance Check at 5500MHz/Zoom Scan (8x8x10)/Cube 0:

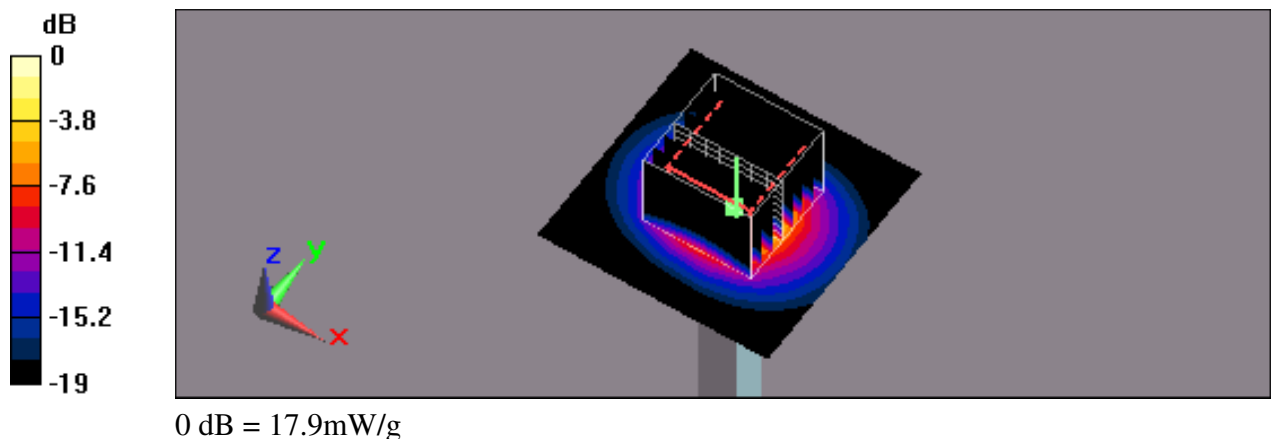
Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 60.3 V/m; Power Drift = -0.132 dB

Peak SAR (extrapolated) = 34.1 W/kg

SAR(1 g) = 8.44 mW/g; SAR(10 g) = 2.31 mW/g

Maximum value of SAR (measured) = 17.9 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 11/3/2009 5:03:42 AM

System Performance Check at 5500MHz_20091103_Body

DUT: Dipole 5GHzV2; Type: D5GHz; Serial: 1021

Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5500 \text{ MHz}$; $\sigma = 5.65 \text{ mho/m}$; $\epsilon_r = 48.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3578; ConvF(3.42, 3.42, 3.42); Calibrated: 6/26/2009
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

System Performance Check at 5500MHz/Area Scan (61x61x1):

Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 18.4 mW/g

System Performance Check at 5500MHz/Zoom Scan (8x8x10)/Cube 0:

Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2.5\text{mm}$

Reference Value = 61.3 V/m; Power Drift = -0.121 dB

Peak SAR (extrapolated) = 34.4 W/kg

SAR(1 g) = 8.39 mW/g; SAR(10 g) = 2.3 mW/g

Maximum value of SAR (measured) = 17.4 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/30/2009 10:07:27 PM

System Performance Check at 5800MHz_20091030_Body

DUT: Dipole 5GHzV2; Type: D5GHz; Serial: 1021

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

Medium parameters used: $f = 5800 \text{ MHz}$; $\sigma = 5.8 \text{ mho/m}$; $\epsilon_r = 47.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3578; ConvF(3.4, 3.4, 3.4); Calibrated: 6/26/2009
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

System Performance Check at 5800MHz/Area Scan (61x61x1):

Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 16.1 mW/g

System Performance Check at 5800MHz/Zoom Scan (8x8x10)/Cube 0:

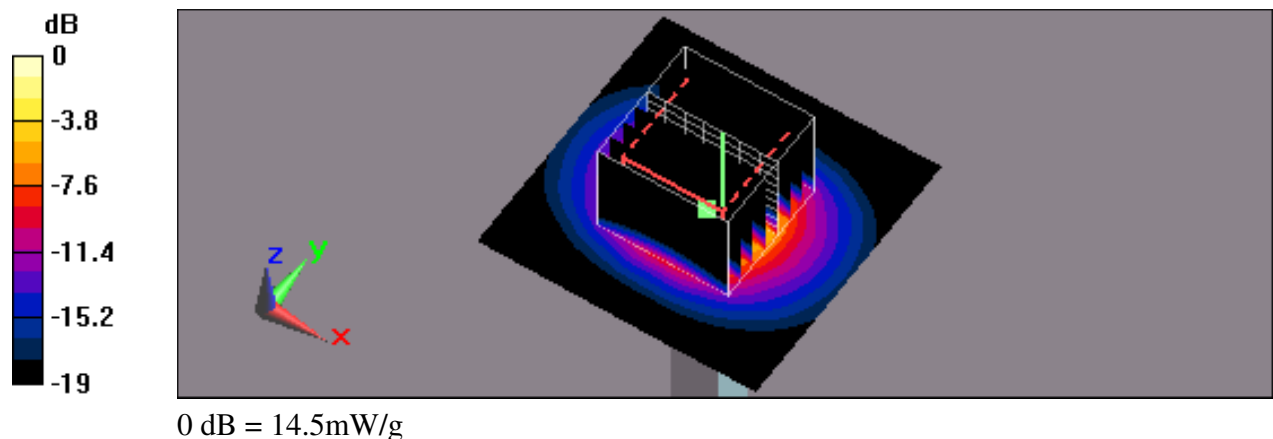
Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2.5\text{mm}$

Reference Value = 56.5 V/m; Power Drift = 0.128 dB

Peak SAR (extrapolated) = 32.2 W/kg

SAR(1 g) = 7.12 mW/g; SAR(10 g) = 1.95 mW/g

Maximum value of SAR (measured) = 14.5 mW/g





Appendix B - SAR Measurement Data

See following Attached Pages for SAR Measurement Data.

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/30/2009 6:13:36 PM

Flat_802.11b CH6_1M_Tablet Mode LCD Right side Close Body

DUT: 512AN_HMW_Tablet Mode LCD Right side; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

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

Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 1.93 \text{ mho/m}$; $\epsilon_r = 50.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.23, 4.23, 4.23); Calibrated: 1/20/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (81x111x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.121 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 3.28 V/m; Power Drift = 0.191 dB

Peak SAR (extrapolated) = 0.224 W/kg

SAR(1 g) = 0.095 mW/g; SAR(10 g) = 0.044 mW/g

Maximum value of SAR (measured) = 0.130 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/30/2009 5:29:02 PM

Flat_802.11b CH6_1M_Tablet Mode Bottom Close Body

DUT: 512AN_HMW_Tablet mode_Bottom; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

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

Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 1.93 \text{ mho/m}$; $\epsilon_r = 50.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.23, 4.23, 4.23); Calibrated: 1/20/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (81x111x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.026 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 0.992 V/m; Power Drift = 0.173 dB

Peak SAR (extrapolated) = 0.043 W/kg

SAR(1 g) = 0.021 mW/g; SAR(10 g) = 0.012 mW/g

Maximum value of SAR (measured) = 0.025 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/30/2009 4:33:47 PM

Flat_802.11b CH6_1M_Tablet Mode LCD Tip Close Body

DUT: 512AN_HMW_Tablet mode_LCD Tip; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

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

Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 1.93 \text{ mho/m}$; $\epsilon_r = 50.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.23, 4.23, 4.23); Calibrated: 1/20/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x111x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.705 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

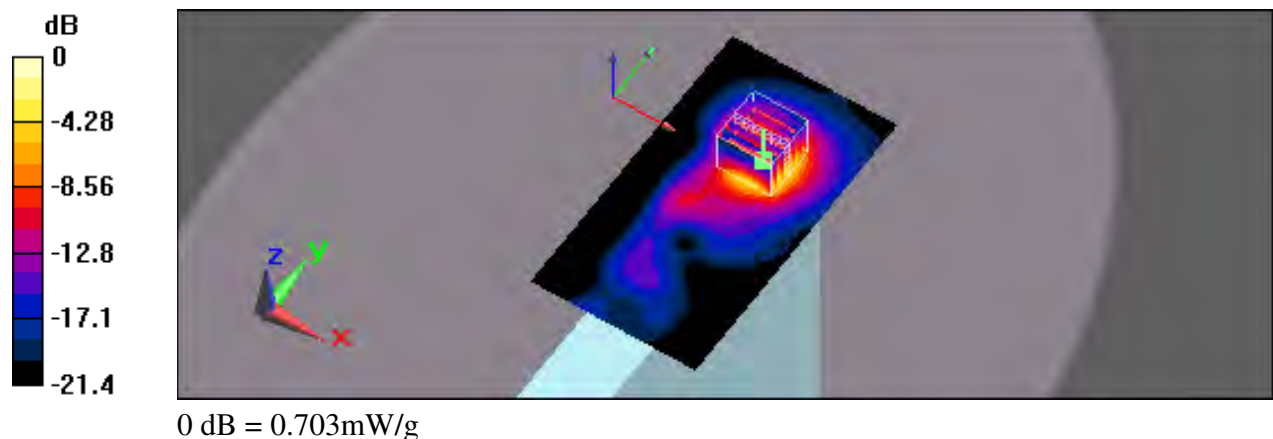
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 1.82 V/m; Power Drift = -0.061 dB

Peak SAR (extrapolated) = 1.08 W/kg

SAR(1 g) = 0.530 mW/g; SAR(10 g) = 0.242 mW/g

Maximum value of SAR (measured) = 0.703 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/30/2009 6:50:51 PM

Flat_802.11n(2.4GHz) CH6_6M_HT20_Tablet Mode LCD Tip Close Body

DUT: 512AN_HMW_Tablet mode_LCD Tip; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

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

Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 1.93 \text{ mho/m}$; $\epsilon_r = 50.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.23, 4.23, 4.23); Calibrated: 1/20/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x111x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.470 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

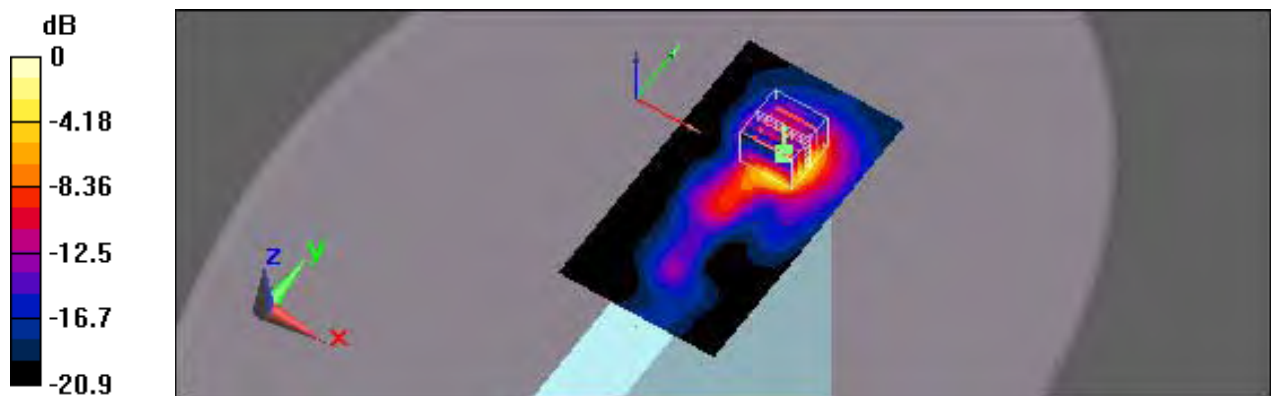
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 1.9 V/m; Power Drift = 0.015 dB

Peak SAR (extrapolated) = 0.653 W/kg

SAR(1 g) = 0.330 mW/g; SAR(10 g) = 0.150 mW/g

Maximum value of SAR (measured) = 0.429 mW/g



0 dB = 0.429mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/30/2009 7:20:54 PM

Flat_802.11n(2.4GHz) CH6_15M_HT40_Tablet Mode LCD Tip Close Body

DUT: 512AN_HMW_Tablet mode_LCD Tip; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

Communication System: IEEE 802.11n(2.4GHz); Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 1.93 \text{ mho/m}$; $\epsilon_r = 50.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.23, 4.23, 4.23); Calibrated: 1/20/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x111x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.610 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

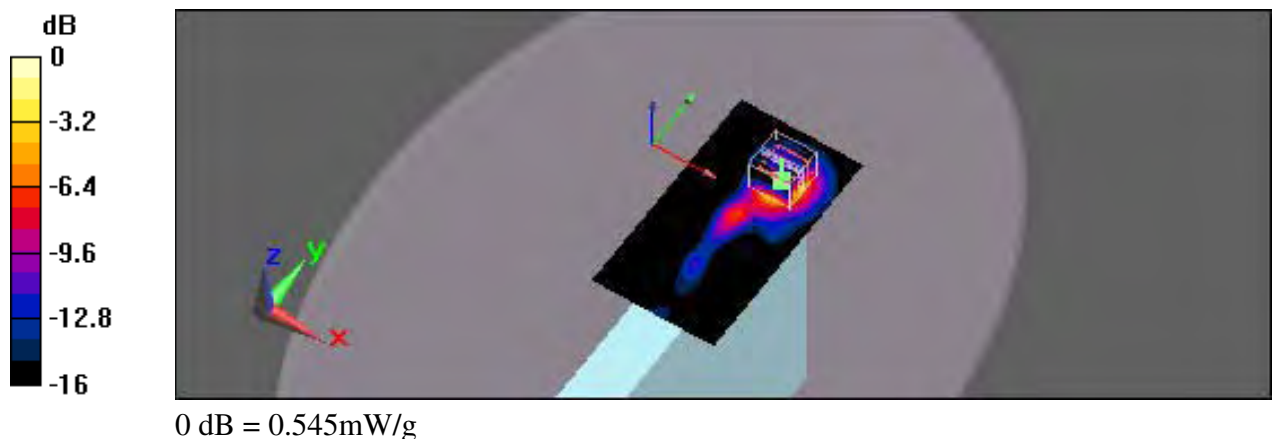
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 3.52 V/m; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 0.829 W/kg

SAR(1 g) = 0.415 mW/g; SAR(10 g) = 0.189 mW/g

Maximum value of SAR (measured) = 0.545 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/31/2009 2:25:59 AM

Flat_802.11a(5.2GHz) CH40_6M_Tablet Mode LCD Tip Close Body

DUT: 512AN_HMW_Tablet mode_LCD Tip; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

Communication System: IEEE 802.11a; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5200 \text{ MHz}$; $\sigma = 5.3 \text{ mho/m}$; $\epsilon_r = 49$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section
Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3578; ConvF(3.7, 3.7, 3.7); Calibrated: 6/26/2009
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (91x131x1):

Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 0.560 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2.5\text{mm}$

Reference Value = 2.09 V/m; Power Drift = -0.156 dB

Peak SAR (extrapolated) = 1.36 W/kg

SAR(1 g) = 0.330 mW/g; SAR(10 g) = 0.118 mW/g

Maximum value of SAR (measured) = 0.577 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/31/2009 1:24:10 AM

Flat_802.11a(5.5GHz) CH120_6M_Tablet Mode LCD Tip Close Body

DUT: 512AN_HMW_Tablet mode_LCD Tip; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

Communication System: IEEE 802.11a; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5600 \text{ MHz}$; $\sigma = 5.92 \text{ mho/m}$; $\epsilon_r = 50$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3578; ConvF(3.4, 3.4, 3.4); Calibrated: 6/26/2009
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (91x131x1):

Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 0.699 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2.5\text{mm}$

Reference Value = 2.36 V/m; Power Drift = -0.047 dB

Peak SAR (extrapolated) = 1.95 W/kg

SAR(1 g) = 0.446 mW/g; SAR(10 g) = 0.157 mW/g

Maximum value of SAR (measured) = 0.765 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 11/3/2009 10:47:56 AM

Flat_802.11a(5.5GHz) CH120_6M_Tablet Mode Bottom Close Body

DUT: 512AN_HMW_Tablet mode_Bottom; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

Communication System: IEEE 802.11a; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.92$ mho/m; $\epsilon_r = 50$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3578; ConvF(3.4, 3.4, 3.4); Calibrated: 6/26/2009
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (121x161x1):

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

Maximum value of SAR (interpolated) = 0.065 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

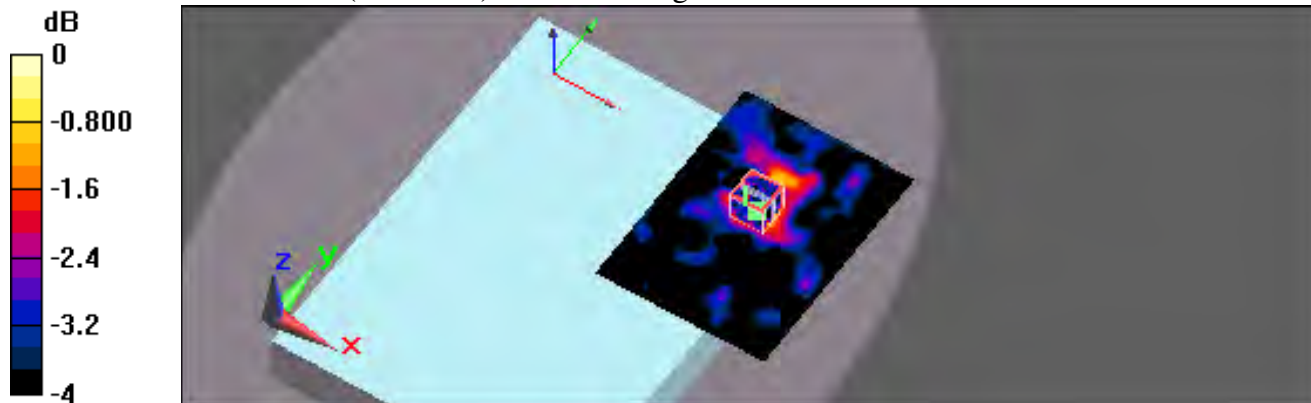
Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2.5$ mm

Reference Value = 1.72 V/m; Power Drift = 0.111 dB

Peak SAR (extrapolated) = 0.245 W/kg

SAR(1 g) = 0.057 mW/g; SAR(10 g) = 0.041 mW/g

Maximum value of SAR (measured) = 0.071 mW/g



0 dB = 0.071mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 11/3/2009 10:12:07 AM

Flat_802.11a(5.5GHz) CH120_6M_Tablet Mode LCD Right side Close Body

DUT: 512AN_HMW_Tablet mode_LCD Right side; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

Communication System: IEEE 802.11a; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.92$ mho/m; $\epsilon_r = 50$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3578; ConvF(3.4, 3.4, 3.4); Calibrated: 6/26/2009
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (121x161x1):

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

Maximum value of SAR (interpolated) = 0.211 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2.5$ mm

Reference Value = 1.85 V/m; Power Drift = -0.076 dB

Peak SAR (extrapolated) = 0.911 W/kg

SAR(1 g) = 0.146 mW/g; SAR(10 g) = 0.080 mW/g

Maximum value of SAR (measured) = 0.235 mW/g



0 dB = 0.235mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/31/2009 3:05:42 AM

Flat_802.11a(5.8GHz) CH157_6M_Tablet Mode LCD Tip Close Body

DUT: 512AN_HMW_Tablet mode_LCD Tip; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

Communication System: IEEE 802.11a; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 5785 \text{ MHz}$; $\sigma = 5.8 \text{ mho/m}$; $\epsilon_r = 47.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3578; ConvF(3.4, 3.4, 3.4); Calibrated: 6/26/2009
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (91x131x1):

Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 0.425 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2.5\text{mm}$

Reference Value = 2.34 V/m; Power Drift = 0.112 dB

Peak SAR (extrapolated) = 1.01 W/kg

SAR(1 g) = 0.265 mW/g; SAR(10 g) = 0.111 mW/g

Maximum value of SAR (measured) = 0.465 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/31/2009 1:53:46 AM

Flat_802.11n(5.3GHz) CH56_6M_HT20_Tablet Mode LCD Tip Close Body

DUT: 512AN_HMW_Tablet mode_LCD Tip; Type: WLAN Module;

Serial: ZE80S01B1935159EF2500

Communication System: IEEE 802.11n(5GHz)HT20; Frequency: 5280 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5280$ MHz; $\sigma = 5.5$ mho/m; $\epsilon_r = 51$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3578; ConvF(3.55, 3.55, 3.55); Calibrated: 6/26/2009
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/11/2008
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (91x131x1):

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

Maximum value of SAR (interpolated) = 0.684 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 2.17 V/m; Power Drift = 0.065 dB

Peak SAR (extrapolated) = 1.81 W/kg

SAR(1 g) = 0.396 mW/g; SAR(10 g) = 0.135 mW/g

Maximum value of SAR (measured) = 0.681 mW/g



0 dB = 0.681mW/g