A Test Lab Techno Corp.

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SAR EVALUATION REPORT

Testing Laboratory 1330

Test Report No.	:	**09121S13**
Applicant	:	**Giant Electronics Limited**
FCC ID：	:	**K7GMAABJ**
Trade Mark	:	**Motorola**
Model Number	:	**MA120**
Battery Type	:	**Alkaline Battery X 3 (1.5V AAA)**
Product Name	:	**Two Way Radio with GMRS ,FRS**
Date of Test	:	**Dec. 16, 2009**
Test Environment	:	**Ambient Temperature： 22 ± 3 ℃** **Relative Humidity：40 - 70 %**
Test Specification	:	**Standard C95.1-2005** **IEEE Std. 1528-2003** **2.1093;FCC/OET Bulletin 65 Supplement C [July 2001]**
Max. SAR	:	**0.216 W/kg FRS FACE SAR_15mm (50% Duty Cycle)** **0.176 W/kg GMRS FACE SAR_15mm (50% Duty Cycle)** **0.206 W/kg FRS Body SAR_15mm(50% Duty Cycle)** **0.153 W/kg GMRS Body SAR_15mm(50% Duty Cycle)** **(Condition: 50% Duty Cycle and positive power drift)**
Test Lab	:	**Changan Lab.**

1. The test operations have to be performed with cautious behavior, the test results are as attached.
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Sam Chuang **20091218**
Approve Signer

Alex Wu **20091218**
Testing Engineer

Contents

1. Description of Equipment Under Test (EUT)

Applicant : **Giant Electronics Limited**
7/F, Elite Industrial Building, 135 - 137 Hoi Bun Rd, Kwun Tong, Kowloon, HK

Manufacturer	:	Giant Electronics Limited
Manufacturer Address	:	7/F, Elite Industrial Building, 135 - 137 Hoi Bun Rd, Kwun Tong, Kowloon, HK
FCC ID	:	K7GMAABJ
Product Name	:	Two Way Radio with GMRS ,FRS
Trade Mark	:	Motorola
Model Number	:	MA120
Battery Type	:	ALKALINE Battery X 3 (1.5V AAA)
Test Device	:	Production Unit
TX Frequency	:	467.5625 - 467.7125 MHz (FRS CH8 - CH 14)
		462.5500 - 462.7250 MHz (GMRS CH1 - CH 7, CH15 - CH 22)
Max. RF Output Power	:	0.19 W ERP (22.80dBm) FRS
		0.18 W ERP (22.60 dBm) GMRS
Max. SAR Measurement	:	0.216 W/kg FRS Face SAR _15mm (50% Duty Cycle)
		0.176 W/kg GMRS Face SAR _15mm (50% Duty Cycle)
		0.206 W/kg FRS Body SAR _15mm (50% Duty Cycle)
		0.153 W/kg GMRS Body SAR _15mm (50% Duty Cycle)
		(Condition: 50% Duty Cycle and positive power drift)
Antenna Type	:	Fixed Type
Antenna Gain	:	0dBi
Device Category	:	Portable
RF Exposure Environment	:	General Population / Uncontrolled
Battery Option	:	Standard
Application Type	:	Certification

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 and had been tested in accordance with the measurement procedures specified in IEEE Std. 1528-2003.

	
Front view	**Back view**

Figure 1. EUT Photo

2. Other Accessories

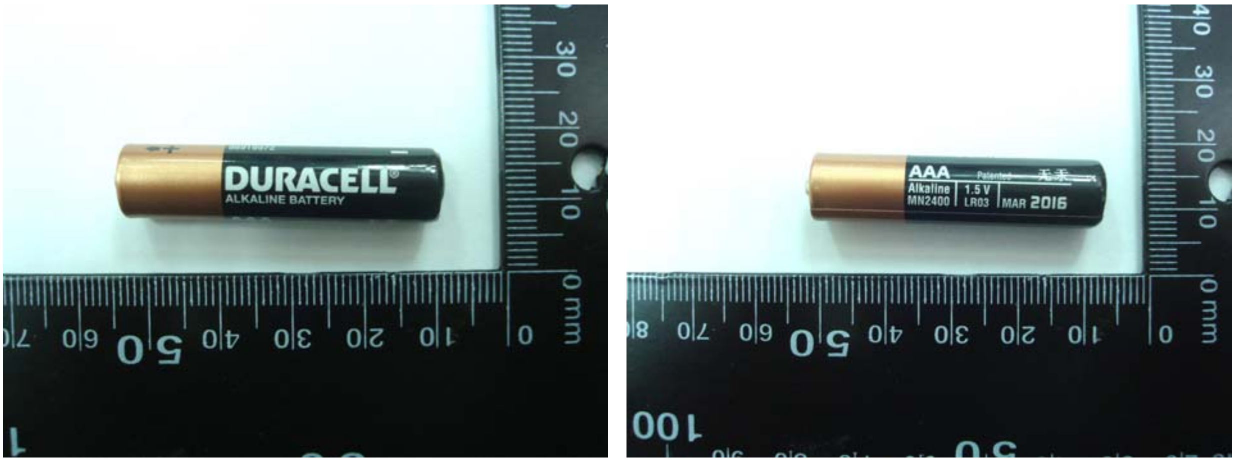


Figure 4. ALKALINE Battery (1.5V AAA)

3. Introduction

The A Test Lab Techno Corp. RF Testing Laboratory has performed measurements of the maximum potential exposure to the user of **Giant Electronics Limited Trade Mark：Motorola Model(s) ：MA120**. The test procedures, as described in American National Standards, , Institute C95.1 - 2005〔1〕, FCC/OET Bulletin 65 Supplement C [July 2001] 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.

4. 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 9).

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

Figure 5. SAR Mathematical Equation

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

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

Where：

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m^3)

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〕

5. 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 ±0.025mm. 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 166MHz low-power Pentium, 32MB chipdisk and 64MB RAM. The necessary circuits for communication with either the DAE3 electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4 I/O-board, which is directly connected to the PC/104 bus of the CPU board. The PC consists of the Intel Pentium 4 2.4GHz computer with Windows2000 system and SAR Measurement Software DASY4, 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.

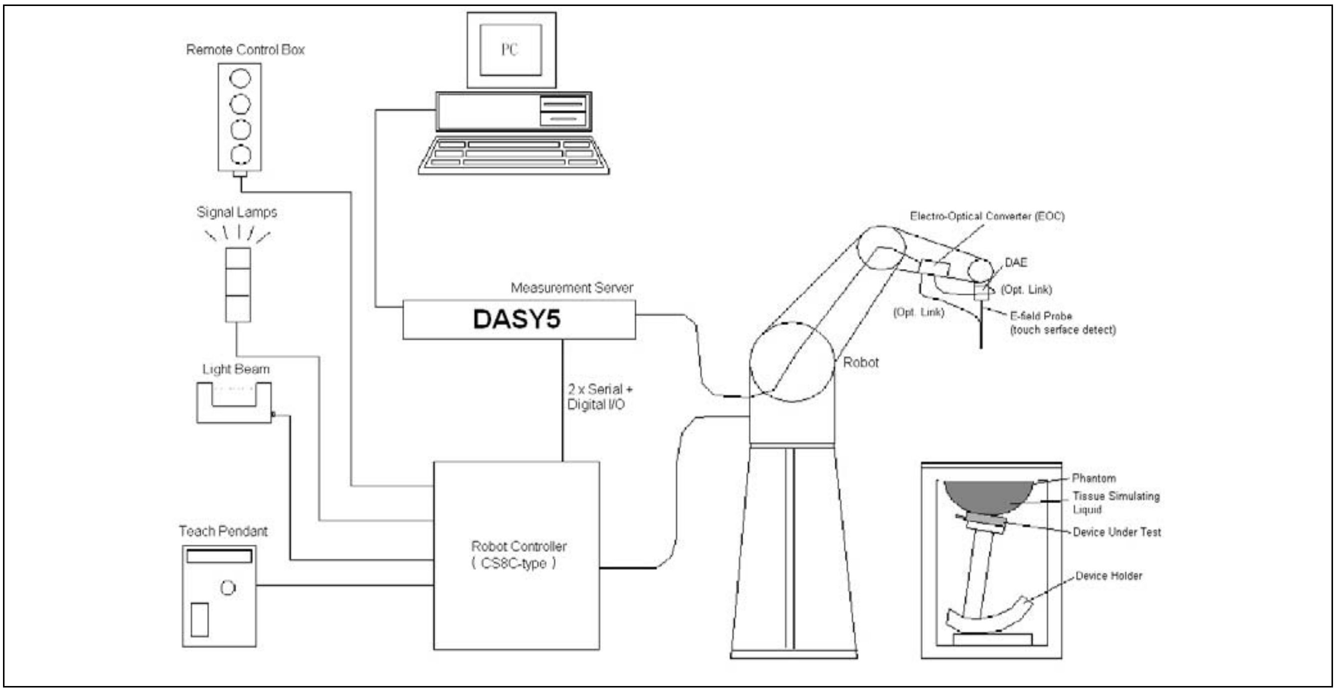


Figure 6. SAR Lab Test Measurement Setup

The DAE3 or DAE4 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〕.

6. System Components

6.1 DASY5 E-Field Probe System

The SAR measurements were conducted with the dosimetric probe ET3DV6 (manufactured by SPEAG), designed in the classical triangular configuration〔3〕and optimized for dosimetric evaluation. The probes 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.

6.1.1 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 450MHz
	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 7.
E-field Probe

Figure 8.
Probe setup on robot

6.1.2 E-Field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure described in〔4〕with accuracy better than ±10%. The spherical isotropy was evaluated with the procedure described in〔5〕and found to be better than ±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 free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 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.

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

Where：

Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

Or

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

Where：

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

6.2 Data Acquisition Electronic (DAE) System

Cell Controller

Processor：	Intel Pentium 4
Clock Speed：	2.4GHz
Operating System：	Windows 2000 Professional

Data Converter

Features：	Signal Amplifier, multiplexer, A/D converter, and control logic
Software：	DASY5 v 5.0 (Build 125) & SEMCAD v 13.4 (Build 125)
Connecting Lines：	Optical downlink for data and status info
	Optical uplink for commands and clock

6.3 Robot

Positioner：	Stäubli Unimation Corp. Robot Model: RX90L
Repeatability：	±0.025 mm
No. of Axis：	6

6.4 Measurement Server

Processor：	PC/104 with a 166MHz low-power Pentium
I/O-board：	Link to DAE3 or DEA 4
	16-bit A/D converter for surface detection system
	Digital I/O interface
	Serial link to robot
	Direct emergency stop output for robot

6.5 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 9. Device Holder

6.6 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.

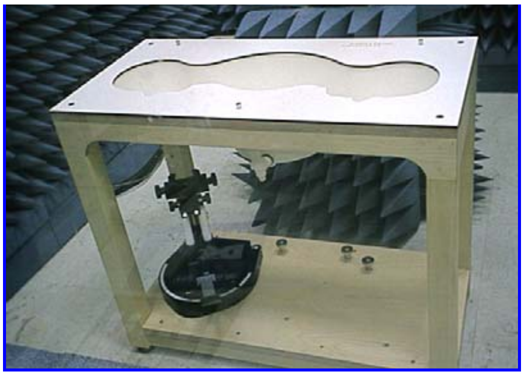


Figure 10.SAM Twin Phantom

Shell Thickness	2 ±0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	810×1000×500 mm (H×L×W)

Table 1. Specification of SAM v4.0

6.7 Data Storage and Evaluation

6.7.1 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 postprocessing 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.

6.7.2 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	dcpi
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)

μ 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/cm^3

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

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/cm^2

E_{tot} = total electric field strength in V/m

H_{tot} = total magnetic field strength in A/m

7. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Dosimetric E-Field Probe	ES3DV3	3150	Jan. 20, 2009	Jan. 20, 2010
SPEAG	450MHz System Validation Kit	D450V2	1021	Feb. 02, 2009	Feb. 02, 2010
SPEAG	Data Acquisition Electronics	DAE3	393	Aug. 24, 2009	Aug. 24, 2010
SPEAG	Device Holder	N/A	N/A	NCR	NCR
SPEAG	Phantom	SAM V4.0	1009	NCR	NCR
SPEAG	Robot	Staubli RX90L	F00/589B1/A/01	NCR	NCR
SPEAG	Software	DASY5 V5.0 Build 125	N/A	NCR	NCR
SPEAG	Software	SEMCAD V13.4 Build 125	N/A	NCR	NCR
SPEAG	Measurement Server	SE UMS 001 BA	1021	NCR	NCR
R & S	Wireless Communication Test Set	CMU200	109369	Jul. 29, 2009	Jul. 29, 2010
Agilent	Wireless Communication Test Set	E5515C	MY47511156	Sep. 17, 2009	Sep. 17, 2010
Agilent	ENA Series Network Analyzer	E5071B	MY42402996	Nov. 04, 2009	Nov. 04, 2010
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

Table 2. Test Equipment List

8. Tissue Simulating Liquids

The Head and body mixtures consist of a viscous gel using hydroxethylcellullouse (HEC) gelling agent and saline solution. Preservation with a bactericide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. 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

8.1 Ingredients

The following ingredients are used:

- Water: deionized water (pure H_20), resistivity ≥ 16 M Ω -as basis for the liquid
- Sugar: refied 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-monobuthyl ether (DGBE), Fluka Chemie GmbH, CAS # 112-34-5 -to reduce relative permittivity

8.2 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 ℃) must be achieved within a tolerance of ±5% for ε and ±5% for σ .

Liquid type	HSL 450 - A	
Ingredient	Weight (g)	Weight (%)
Water	522.94	38.91
Sugar	765.09	56.93
Cellulose	3.39	0.25
Salt	50.94	3.79
Preventol	1.63	0.12
Total amount	1’343.99	99.99
Goal dielectric parameters		
Frequency [MHz]	450	
Relative Permittivity	43.5	
Conductivity [S/m]	0.87	

Liquid type	HSL 450 - B	
Ingredient	Weight (g)	Weight (%)
Water	590.62	46.21
Sugar	654.00	51.17
Cellulose	2.36	0.18
Salt	29.96	2.34
Preventol	1.06	0.08
Total amount	1'278.00	99.98
Goal dielectric parameters		
Frequency [MHz]	450	
Relative Permittivity	56.7	
Conductivity [S/m]	0.94	

8.3 Liquid Confirmation

8.3.1 Parameters

Liquid Verify

Ambient Temperature： 22±3 ℃ ；Relative Humidity：40-70 ％

Liquid Type	Freq.	Temp (℃)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)	Measured Date
450MHz Head	450MHz	22.0	**εr**	43.5	**42.9**	**-1.38**	± 5	Dec. 16, 2009
			σ	0.87	**0.87**	**0.00**	± 5	
450MHz Body	450MHz	22.0	**εr**	56.7	**55.4**	**-2.29**	± 5	Dec. 16, 2009
			σ	0.94	**0.937**	**-0.32**	± 5	

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

8.3.2 Liquid Depth

The liquid level was during measurement 15cm ±0.5cm.

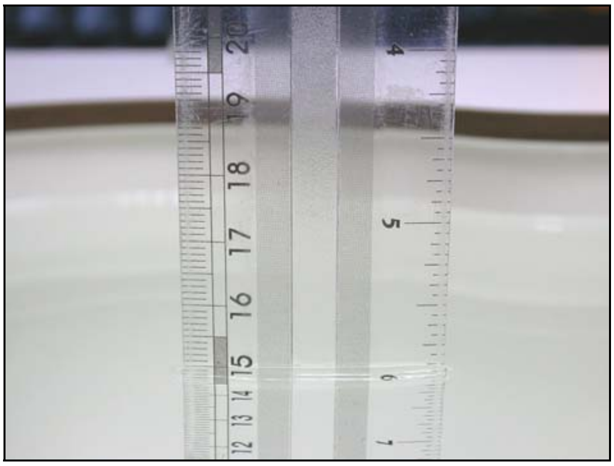


Figure 11. Head-Tissue-Simulating-Liquid

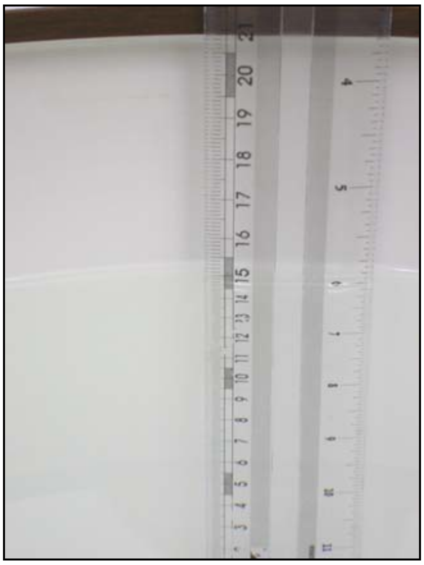


Figure 12. Body-Tissue-Simulating-Liquid

9. Measurement Process

9.1 Device and Test Conditions

The Test Device was provided by Giant Electronics Limited for this evaluation. The spatial peak SAR values were assessed for the middle channels defined by FRS (Ch11 = 467.6375MHz,) and GMRS (Ch4 = 462.6375MHz) systems. Battery and accessories shall be those specified by the manufacturer. The battery shall be fully charged before each measurement and there shall be no external connections.

Usage				Operates with a built-in test mode by client		
Distance between antenna axis at the joint and the liquid surface:				For Body, EUT front to phantom, 15mm separation. EUT back to phantom, 15mm separation.		
Simulating human Head/Body				Head / Body		
EUT Battery				Fully-charged with Alkaline battery.		
Output Power (ERP)	**Channel**			**Frequency MHz**	**Before**	**After**
					dBm	**dBm**
	FRS	**Middle**	**- 11**	467.6375	**22.80**	**22.79**
	GMRS	**Middle**	**- 04**	462.6375	**22.60**	**22.59**

9.2 System Performance Check

9.2.1 Symmetric Dipoles for System Validation

Construction	Symmetrical dipole with l/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	450MHz
Return Loss	> 20 dB at specified validation position
Power Capability	> 100 W (f < 1GHz); > 40 W (f > 1GHz)
Options	Dipoles for other frequencies or solutions and other calibration conditions are available upon request
Dimensions	D450V2：dipole length 270 mm; overall height 330 mm

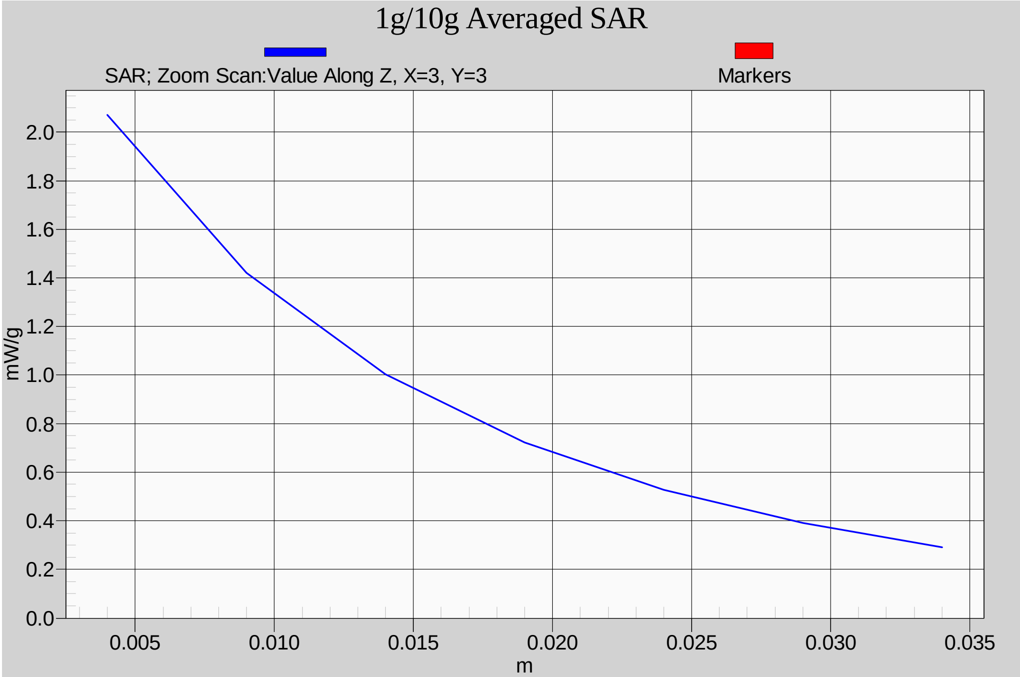
Figure 13. Validation Kit

9.2.2 Validation

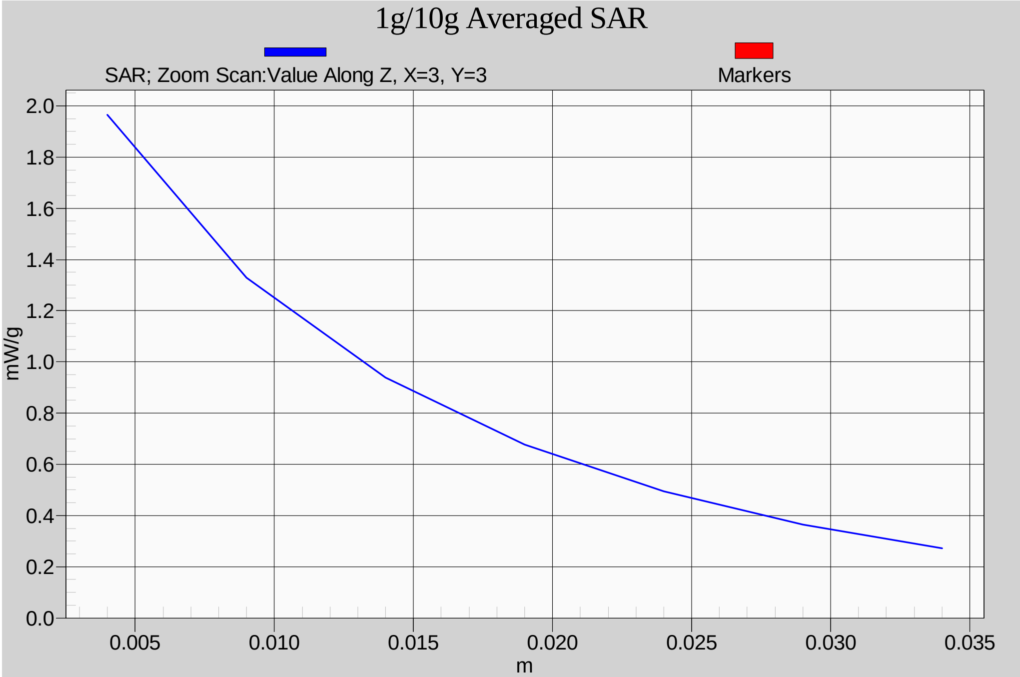
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ± 10%. The validation was performed at 450 MHz.

<table>
<tr><th colspan="2">Validation kit</th><th>Mixture Type</th><th colspan="2">SAR_{1g} [mW/g]</th><th colspan="2">SAR_{10g} [mW/g]</th><th>Date of Calibration</th></tr>
<tr><td colspan="2" rowspan="2">D450V2-SN1021</td><td>Head</td><td colspan="2">4.77</td><td colspan="2">3.19</td><td rowspan="2">Feb. 02, 2009</td></tr>
<tr><td>Body</td><td colspan="2">4.55</td><td colspan="2">3.07</td></tr>
<tr><th rowspan="2">Frequency (MHz)</th><th rowspan="2">Power</th><th rowspan="2">SAR_{1g} (mW/g)</th><th rowspan="2">SAR_{10g} (mW/g)</th><th rowspan="2">Drift (dB)</th><th colspan="2">Difference percentage</th><th rowspan="2">Date</th></tr>
<tr><th>1g</th><th>10g</th></tr>
<tr><td rowspan="2">450 (Head)</td><td>398mW</td><td>1.94</td><td>1.31</td><td rowspan="2">-0.126</td><td rowspan="2">2.2 %</td><td rowspan="2">3.2 %</td><td rowspan="2">Dec. 16, 2009</td></tr>
<tr><td>Normalize to 1 Watt</td><td>4.87</td><td>3.29</td></tr>
<tr><td rowspan="2">450 (Body)</td><td>398mW</td><td>1.84</td><td>1.24</td><td rowspan="2">-0.019</td><td rowspan="2">1.6 %</td><td rowspan="2">1.5 %</td><td rowspan="2">Dec. 16, 2009</td></tr>
<tr><td>Normalize to 1 Watt</td><td>4.62</td><td>3.12</td></tr>
</table>

Z-axis Plot of System Performance Check



Head-Tissue-Simulating-Liquid 450MHz



Body -Tissue-Simulating-Liquid 450MHz

9.3 Dosimetric Assessment Setup

9.3.1 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, a distance of 15 mm was tested to confirm the necessary "minimum SAR separation distance".
(＊Note：This distance includes the 2 mm phantom shell thickness.)

9.3.2 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 × 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 5 x 5 x 7 points in a 32 x 32 x 30 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.

9.4 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 $(32\times32\times30)mm^3$ ($5\times5\times7$ 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].

10. 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 ±27 %〔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 ±2dB 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.

Source of Uncertainty	Uncertainty Value	Probability Distribution	Divisor	c_i	Standard Uncertainty ±1% (1-g)	v_i or V_{eff}
Type-A	0.9 %	Normal	1	1	0.9	9
Measurement System						
Probe Calibration	7 %	Normal	2	1	3.5	∞
Axial Isotropy	0.2dB	Rectangular	$\sqrt{3}$	$\sqrt{0.5}$	1.9	∞
Hemispherical Isotropy	9.6 %	Rectangular	$\sqrt{3}$	$\sqrt{0.5}$	3.9	∞
Spatial Resolution	0 %	Rectangular	$\sqrt{3}$	1	0	∞
Boundary Effect	11.0 %	Rectangular	$\sqrt{3}$	1	6.4	∞
Linearity	0.2dB	Rectangular	$\sqrt{3}$	1	2.7	∞
Detection Limit	1.0 %	Rectangular	$\sqrt{3}$	1	0.6	∞
Readout Electronics	1.0 %	Normal	1	1	1.0	∞
RF Ambient Conditions	3.0 %	Rectangular	$\sqrt{3}$	1	1.73	∞
Probe Positioner Mech. Const.	0.4 %	Rectangular	$\sqrt{3}$	1	0.2	∞
Probe Positioning	0.35 %	Rectangular	$\sqrt{3}$	1	0.2	∞
Extrapolation and Integration	3.9 %	Rectangular	$\sqrt{3}$	1	2.3	∞
Test sample Related						
Test sample Positioning	4.7 %	Normal	1	1	4.7	5
Device Holder Uncertainty	6.1 %	Normal	1	1	6.1	5
Drift of Output Power	5.0 %	Rectangular	$\sqrt{3}$	1	2.9	∞
Phantom and Setup						
Phantom Uncertainty (Including temperature effects)	4.0%	Rectangular	$\sqrt{3}$	1	2.3	∞
Liquid Conductivity (target)	5.0%	Rectangular	$\sqrt{3}$	0.6	1.7	∞
Liquid Conductivity (meas.)	10.0%	Rectangular	$\sqrt{3}$	0.6	3.4	∞
Liquid Permittivity (target)	5.0%	Rectangular	$\sqrt{3}$	0.6	1.7	∞
Liquid Permittivity (meas.)	5.0%	Rectangular	$\sqrt{3}$	0.6	1.7	∞
Combined standard uncertainty		RSS			13.5	88.7
Expanded uncertainty (Coverage factor = 2)		Normal (k=2)			27	

Table 5. Uncertainty Budget of DASY

11. SAR Test Results Summary

11.1 FRS Face SAR _ 15 mm Spacing

Ambient：

Temperature (℃)： **22 ± 2** Relative HUMIDITY (%)： **40-70**

Liquid：

Mixture Type： **HSL450** Liquid Temperature (℃) ： **22**

Depth of liquid (cm)： **15**

Measurement：

Crest Factor： **1** Probe S/N： **3150**

Frequency		Modulation	Battery	Accessory	SAR_{1g}[mW/g] Duty Cycle		Power Drift	Amb. Temp	Remark
MHz	Ch.				100%	50%			
467.6375	11	FM	Alkaline	N/A	0.430	0.215	0.018	21.8	---
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg (mW/g) Averaged over 1 gram				

◆ SAR values are scaled for the power drift

Frequency		Battery	SAR_{1g}[mW/g] Duty Cycle		power drift (dB)	+ power drift 10^(dB/10)	SAR_{1g}[mW/g] (include +power drift) Duty Cycle	
MHz	Ch.		100%	50%			100%	50%
467.6375	11	Alkaline	0.430	0.215	0.018	1.004	0.432	0.216

SAR is basically proportional to average transmit power and duty cycle

(i.e. SAR = P x T where P is the average transmit power and T is the transmit duty cycle).

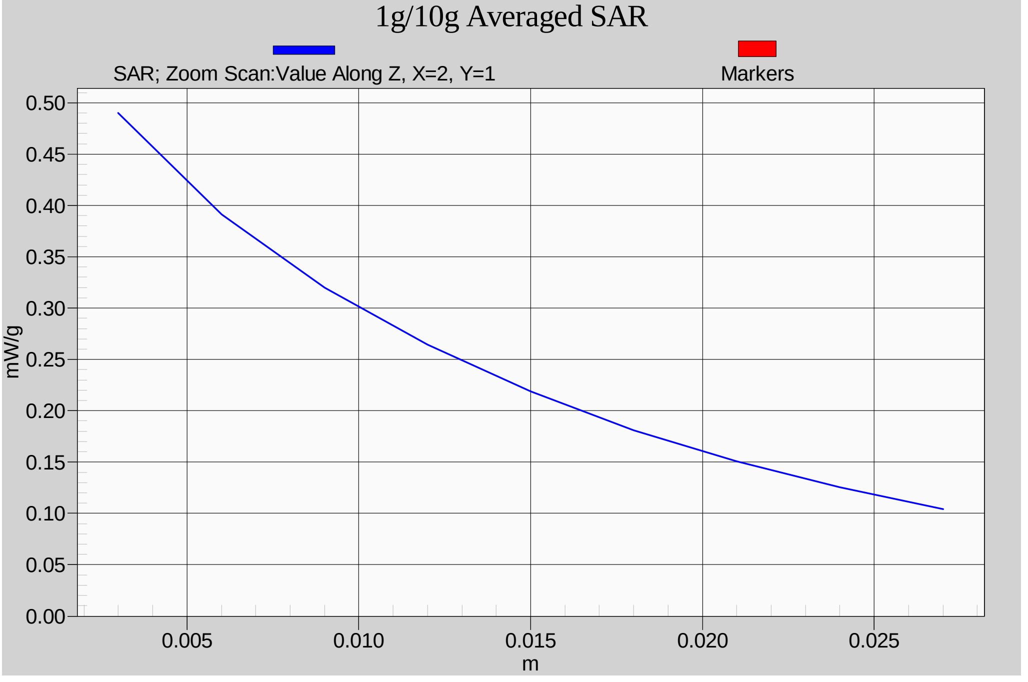
SAR(unknown) = SAR(know) x (PxTx/P(known) T(known))

Where Px is the unknown power (i.e. the power at the highest drift)

Tx is the transmit duty cycle used at that unknown power.

If transmitter duty cycle is the same then it should be a relationship of Px/Pknown)

Z-axis Plot of SAR Measurement



FRS Face SAR -15 mm Spacing _ CH11 _ Alkaline

11.2 GMRS Face SAR _ 15mm Spacing

Ambient：

Temperature (℃)：	**22 ± 2**	Relative HUMIDITY (%)：	**40-70**

Liquid：

Mixture Type：	**HSL450**	Liquid Temperature (℃)：	**22**
		Depth of liquid (cm)：	**15**

Measurement：

Crest Factor：	**1**	Probe S/N：	**3150**

Frequency		**Modulation**	**Battery**	**Accessory**	**SAR_{1g}[mW/g]**		**Power Drift**	**Amb. Temp**	**Remark**
					Duty Cycle				
MHz	**Ch.**				**100%**	**50%**			
462.6375	4	FM	Alkaline	N/A	0.351	0.176	0.020	21.0	---
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					**1.6 W/kg (mW/g) Averaged over 1 gram**				

◆ SAR values are scaled for the power drift

Frequency		**Battery**	**SAR_{1g}[mW/g]**		**power drift (dB)**	**+ power drift 10^(dB/10)**	**SAR_{1g}[mW/g] (include +power drift)**	
			Duty Cycle				**Duty Cycle**	
MHz	**Ch.**		**100%**	**50%**			**100%**	**50%**
462.6375	4	Alkaline	0.351	0.176	0.020	1.005	0.353	0.176

SAR is basically proportional to average transmit power and duty cycle

(i.e. SAR = P x T where P is the average transmit power and T is the transmit duty cycle).

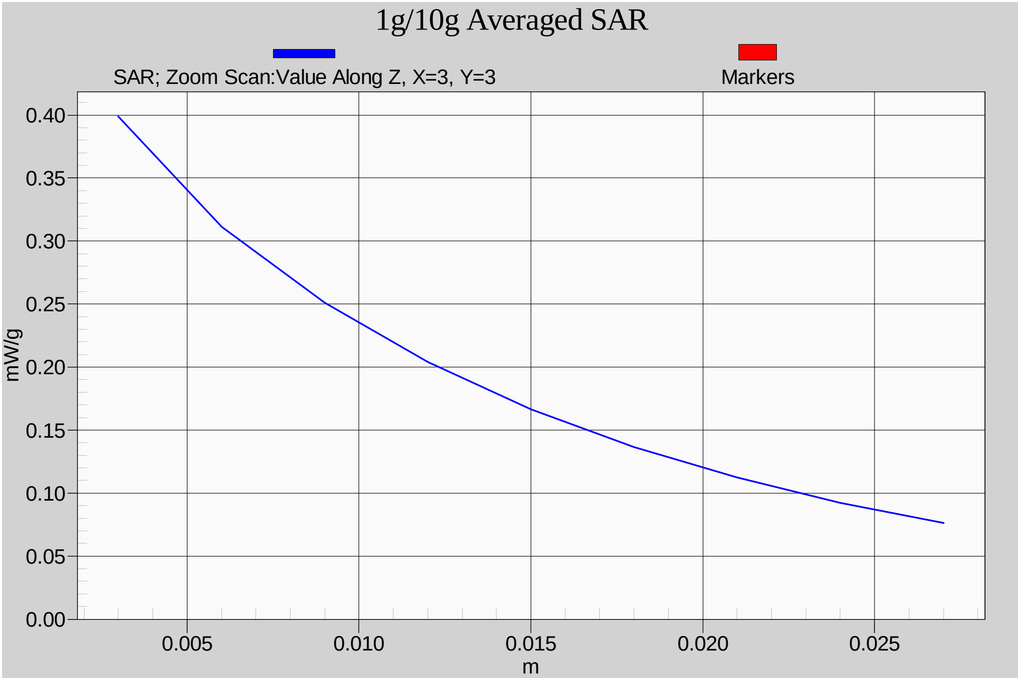
SAR(unknown) = SAR(know) x (PxTx/P(known) T(known))

Where Px is the unknown power (i.e. the power at the highest drift)

Tx is the transmit duty cycle used at that unknown power.

If transmitter duty cycle is the same then it should be a relationship of Px/Pknown)

Z-axis Plot of SAR Measurement



GMRS Face SAR - 15 mm Spacing _ CH4_ Alkaline

11.3 FRS Body SAR _ 15 mm Spacing

Ambient：

Temperature (℃)： **22 ± 2** Relative HUMIDITY (%)： **40-70**

Liquid：

Mixture Type： **MSL450** Liquid Temperature (℃)： **22**

Depth of liquid (cm)： **15**

Measurement：

Crest Factor： **1** Probe S/N： **3150**

Frequency		Modulation	Battery	Accessory	SAR_{1g}[mW/g] Duty Cycle		Power Drift	Amb. Temp	Remark
MHz	Ch.				100%	50%			
467.6375	11	FM	Alkaline	NA	0.406	0.203	-0.069	22.1	---
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg (mW/g) Averaged over 1 gram				

◆ SAR values are scaled for the power drift

Frequency		Battery	SAR_{1g}[mW/g] Duty Cycle		power drift (dB)	+ power drift 10^(dB/10)	SAR_{1g}[mW/g] (include +power drift) Duty Cycle	
MHz	Ch.		100%	50%			100%	50%
467.6375	11	Alkaline	0.406	0.203	-0.069	1.016	0.413	0.206

SAR is basically proportional to average transmit power and duty cycle

(i.e. SAR = P x T where P is the average transmit power and T is the transmit duty cycle).

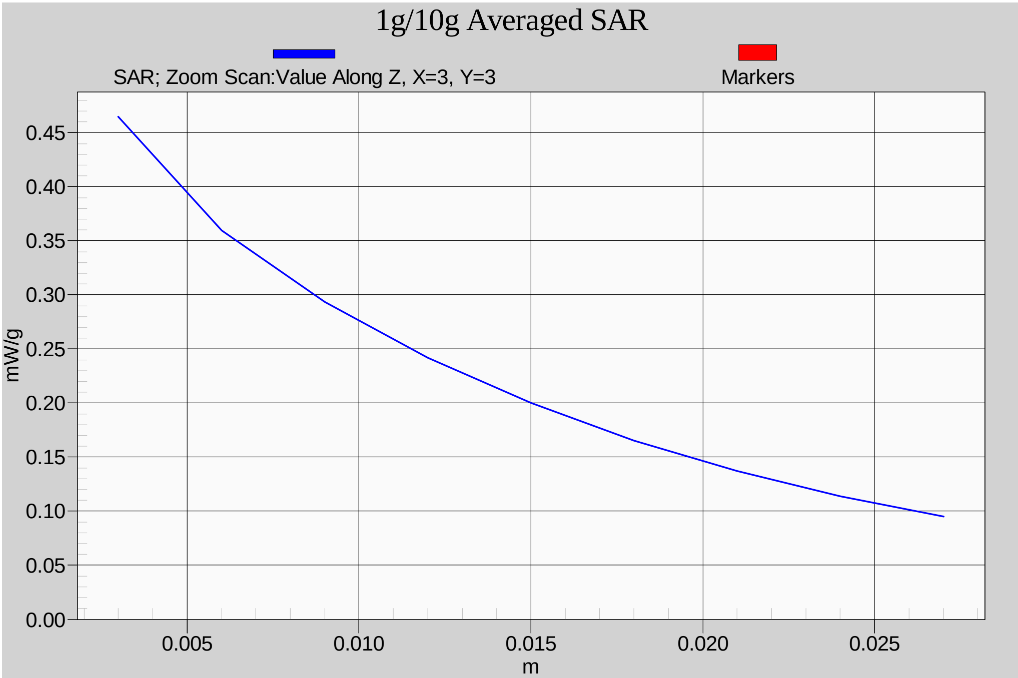
SAR(unknown) = SAR(know) x (PxTx/P(known) T(known))

Where Px is the unknown power (i.e. the power at the highest drift)

Tx is the transmit duty cycle used at that unknown power.

If transmitter duty cycle is the same then it should be a relationship of Px/Pknown)

Z-axis Plot of SAR Measurement



FRS Body SAR - 15 mm Spacing _ CH11_ Alkaline

11.4 GMRS Body SAR _15 mm Spacing

Ambient：

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

Liquid：

Mixture Type：	MSL450	Liquid Temperature (℃)：	22
		Depth of liquid (cm)：	15

Measurement：

Crest Factor：	1	Probe S/N：	3150

Frequency		Modulation	Battery	Accessory	SAR$_{1g}$[mW/g] Duty Cycle		Power Drift	Amb. Temp	Remark
MHz	Ch.				100%	50%			
462.6375	4	FM	Alkaline	NA	0.304	0.152	-0.040	22.1	---
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg (mW/g) Averaged over 1 gram				

◆ SAR values are scaled for the power drift

Frequency		Battery	SAR$_{1g}$[mW/g] Duty Cycle		power drift (dB)	+ power drift 10^(dB/10)	SAR$_{1g}$[mW/g] (include +power drift) Duty Cycle	
MHz	Ch.		100%	50%			100%	50%
462.6375	4	Alkaline	0.304	0.152	-0.040	1.009	0.307	0.153

SAR is basically proportional to average transmit power and duty cycle

(i.e. SAR = P x T where P is the average transmit power and T is the transmit duty cycle).

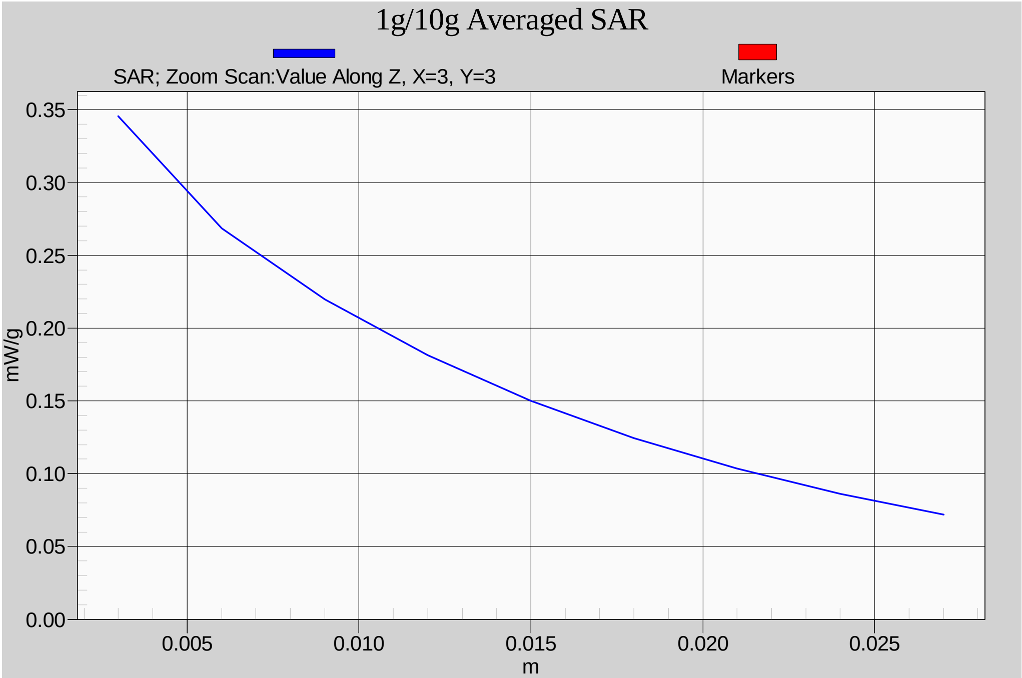
SAR(unknown) = SAR(know) x (PxTx/P(known) T(known))

Where Px is the unknown power (i.e. the power at the highest drift)

Tx is the transmit duty cycle used at that unknown power.

If transmitter duty cycle is the same then it should be a relationship of Px/Pknown)

Z-axis Plot of SAR Measurement



GMRS Body SAR - 15 mm Spacing _ CH4_ Alkaline

11.5 Setup Photo

Face Position

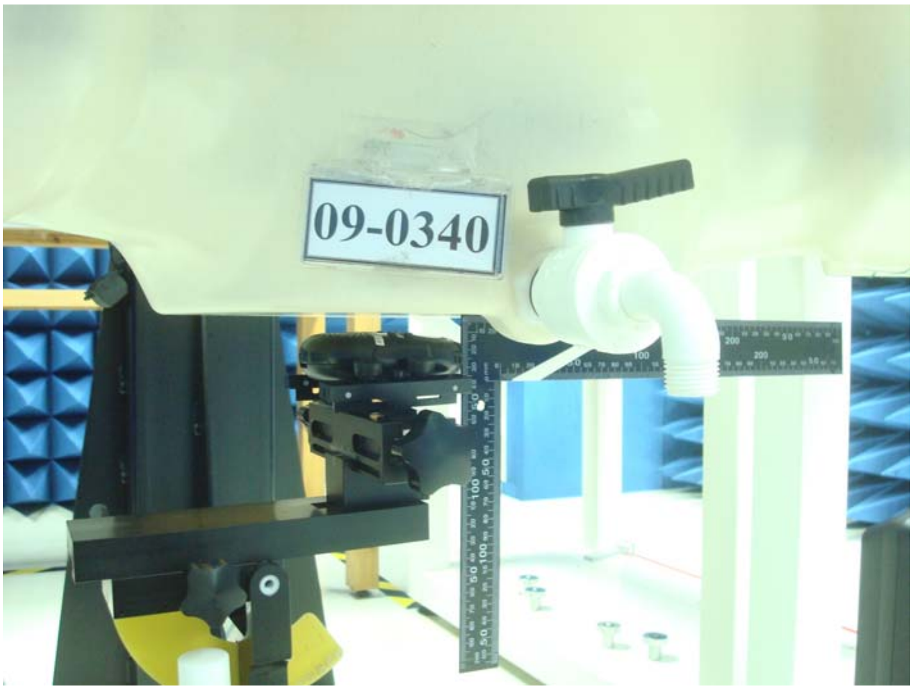
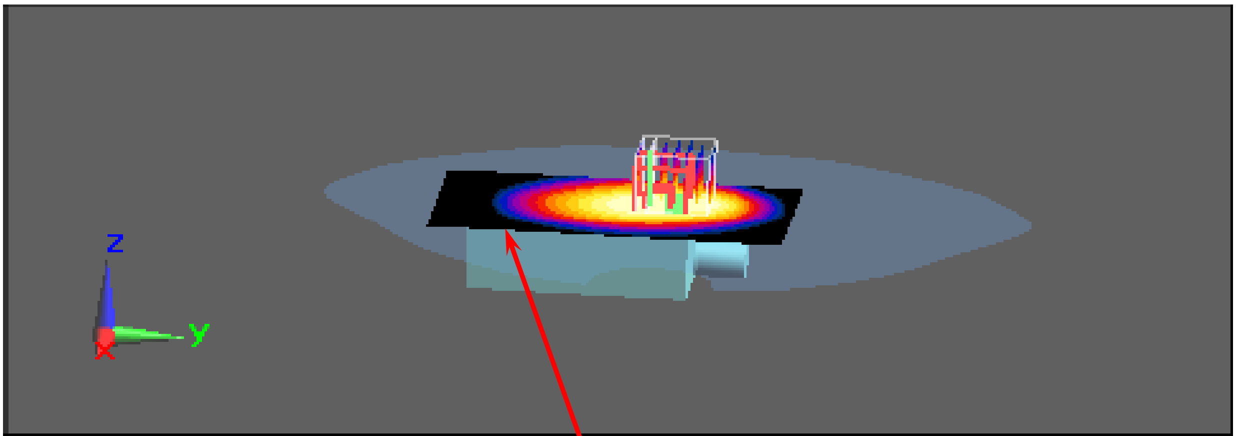


Figure 14. EUT Face to Phantom 15 mm spacing

1 

EUT Front side

Body Position

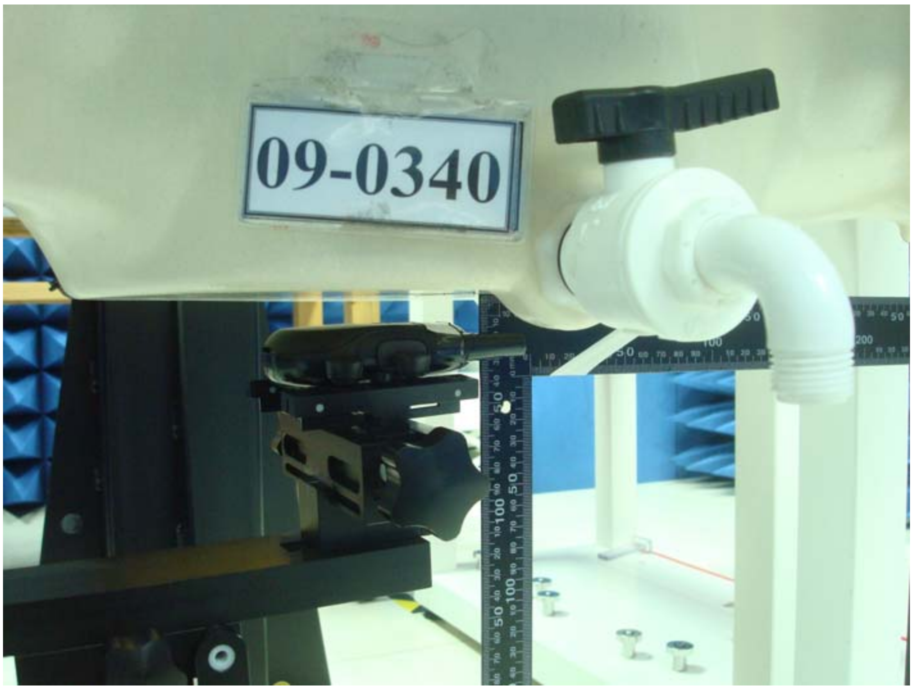
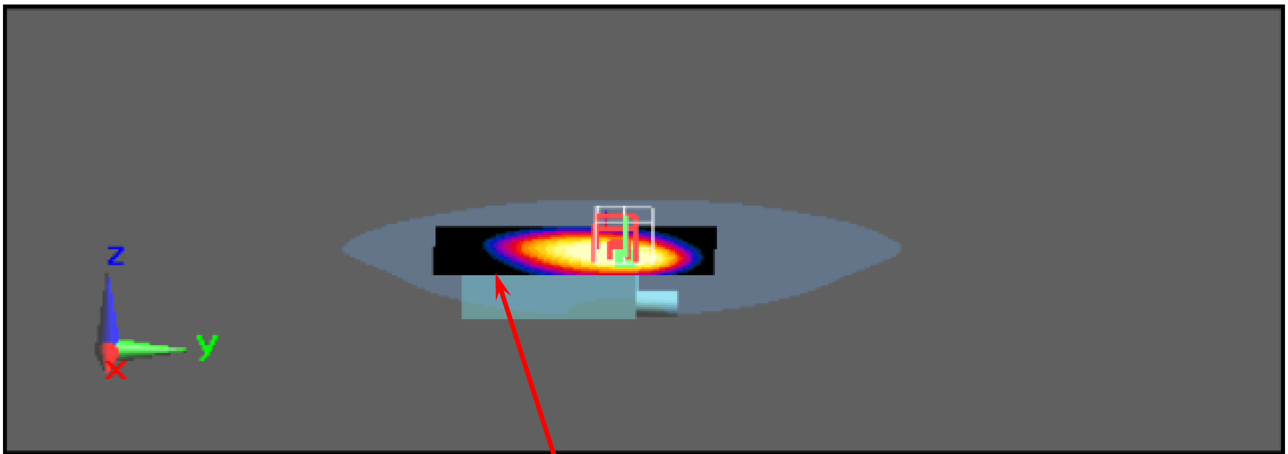


Figure 15. EUT to Phantom 15 mm spacing



EUT Back side

11.6 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).

12. Conclusion

The SAR test values found for the portable mobile phone **Giant Electronics Limited Trade Mark：Motorola Model(s)：MA120** are below the maximum recommended level of 1.6 W/kg (mW/g).

13. References

[1] Std. C95.1-2005, "*American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300KHz to 100GHz",* New York.

[2] NCRP, National Council on Radiation Protection and Measurements, "*Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields"*, NCRP report NO. 86, 1986.

[3] T. Schmid, O. Egger, and N. Kuster, "*Automatic E-field scanning system for dosimetric assessments*", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp, 105-113, Jan. 1996.

[4] K. Pokovic, T. Schmid, and N. Kuster, "*Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequency*", in ICECOM'97, Dubrovnik, October 15-17, 1997, pp.120-124.

[5] K. Pokovic, T. Schmid, and N. Kuster, "*E-field probe with improved isotropy in brain simulating liquids*", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp.172-175.

[6] N. Kuster, and Q. Balzano, "*Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz"*, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[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.

[8] N. Kuster, R. Kastle, T. Schmid, *Dosimetric evaluation of mobile communications equipment with known precision*, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[9] Std. C95.3-1991, "*IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave,* New York: IEEE, Aug. 1992.

[10] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), *Human Exposure to Electromagnetic Fields High-frequency*: 10KHz-300GHz, Jan. 1995.

Appendix A - System Performance Check

See following Attached Pages for System Performance Check.

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 12/16/2009 9:14:25 AM

System Performance Check at 450 MHz_20091216_Head

DUT: Dipole 450MHz; Type: D450V2; Serial: D450V2 SN:1021

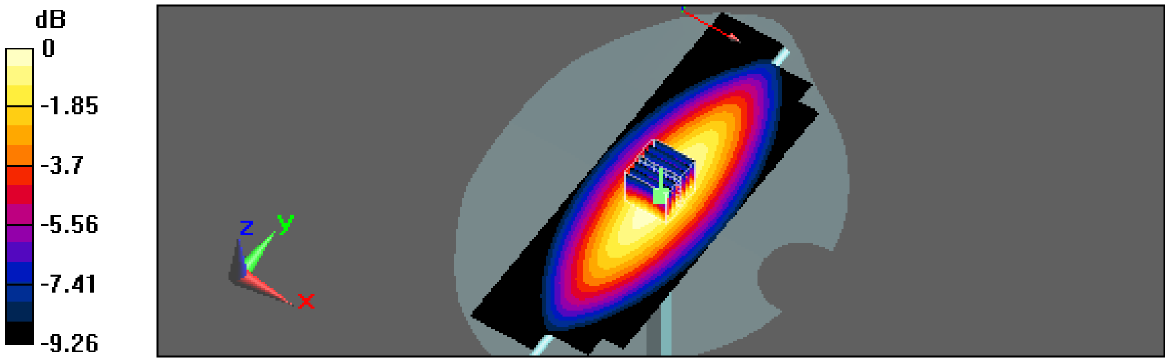
Communication System: CW; Frequency: 450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 450 MHz; σ = 0.87 mho/m; ε_r = 42.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6.25, 6.25, 6.25); Calibrated: 1/20/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 8/24/2009
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

System Performance Check at 450 MHz/Area Scan (61x201x1):
Measurement grid:
dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.09 mW/g

System Performance Check at 450 MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement
grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 49.8 V/m; Power Drift = -0.126 dB
Peak SAR (extrapolated) = 2.85 W/kg
SAR(1 g) = 1.94 mW/g; SAR(10 g) = 1.31 mW/g
Maximum value of SAR (measured) = 2.07 mW/g



0 dB = 2.07mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 12/16/2009 11:01:39 AM

System Performance Check at 450 MHz_20091216_Body

DUT: Dipole 450MHz; Type: D450V2; Serial: D450V2 SN:1021

Communication System: CW; Frequency: 450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 450 MHz; σ = 0.937 mho/m; ε_r = 55.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

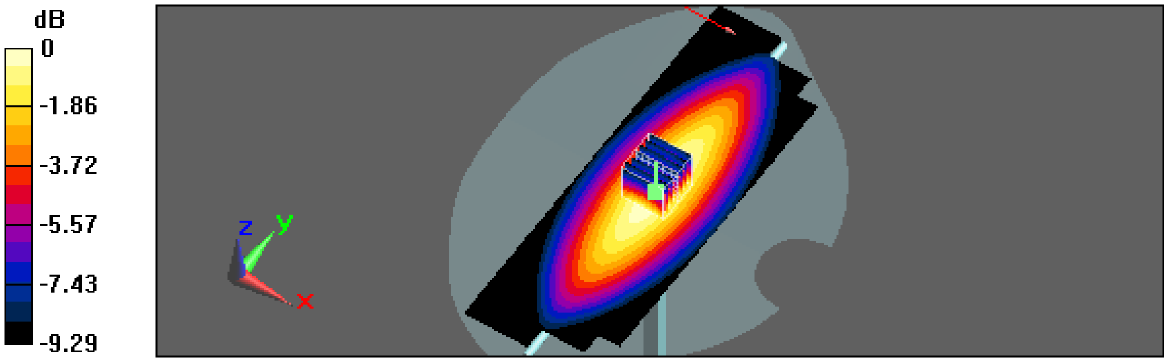
- Probe: ES3DV3 - SN3150; ConvF(6.75, 6.75, 6.75); Calibrated: 1/20/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 8/24/2009
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

System Performance Check at 450 MHz/Area Scan (61x201x1):

Measurement grid:
dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.98 mW/g

System Performance Check at 450 MHz/Zoom Scan (7x7x7)/Cube 0:

Measurement
grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 46.1 V/m; Power Drift = -0.019 dB
Peak SAR (extrapolated) = 2.78 W/kg
SAR(1 g) = 1.84 mW/g; SAR(10 g) = 1.24 mW/g
Maximum value of SAR (measured) = 1.96 mW/g



0 dB = 1.96mW/g

Appendix B - SAR Measurement Data

See following Attached Pages for SAR Measurement Data.

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 12/16/2009 2:05:10 PMDate/Time: 12/16/2009 2:12:51 PM

Flat_FRS CH11_Brain_Alkaline_15mm to phantom

DUT: MA120; Type: Two Way Radio with GMRS ,FRS; FCC ID: K7GMAABJ

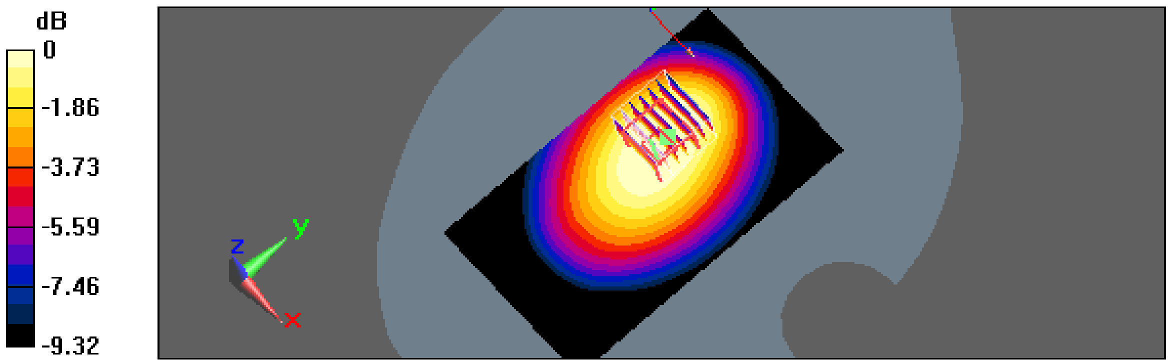
Communication System: FRS; Frequency: 467.63750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 467.63750 MHz; σ = 0.881 mho/m; ε_r = 42.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6.25, 6.25, 6.25); Calibrated: 1/20/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 8/24/2009
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.545 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 23.9 V/m; Power Drift = 0.018 dB
Peak SAR (extrapolated) = 0.657 W/kg
SAR(1 g) = 0.430 mW/g; SAR(10 g) = 0.299 mW/g
Maximum value of SAR (measured) = 0.490 mW/g



0 dB = 0.490mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 12/16/2009 4:23:05 PMDate/Time: 12/16/2009 4:30:45 PM

Flat_FRS CH11_muscle_Alkaline_15mm to phantom

DUT: MA120; Type: Two Way Radio with GMRS ,FRS; FCC ID: K7GMAABJ

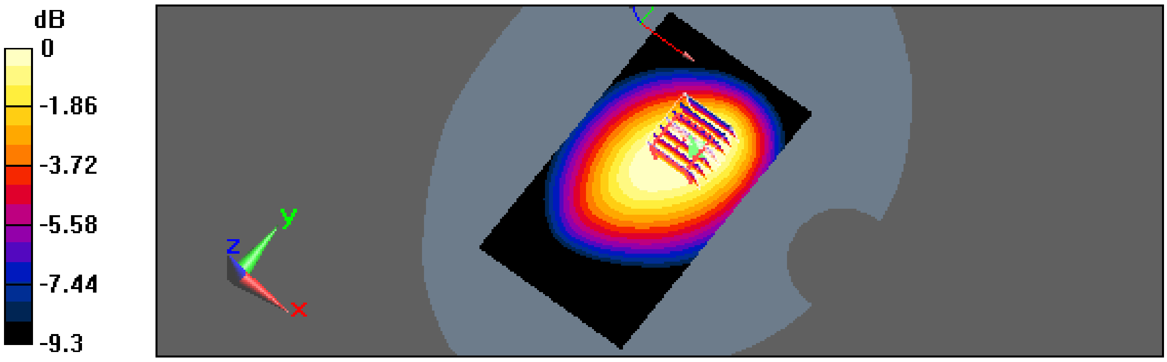
Communication System: FRS; Frequency: 467.63750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 467.63750 MHz; σ = 0.954 mho/m; ε_r = 55.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6.75, 6.75, 6.75); Calibrated: 1/20/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 8/24/2009
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.540 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 24.1 V/m; Power Drift = -0.069 dB
Peak SAR (extrapolated) = 0.694 W/kg
SAR(1 g) = 0.406 mW/g; SAR(10 g) = 0.283 mW/g
Maximum value of SAR (measured) = 0.465 mW/g



0 dB = 0.465mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 12/16/2009 2:45:11 PMDate/Time: 12/16/2009 2:52:52 PM

Flat_GMRS CH4_Brain_Alkaline_15mm to phantom

DUT: MA120; Type: Two Way Radio with GMRS ,FRS; FCC ID: K7GMAABJ

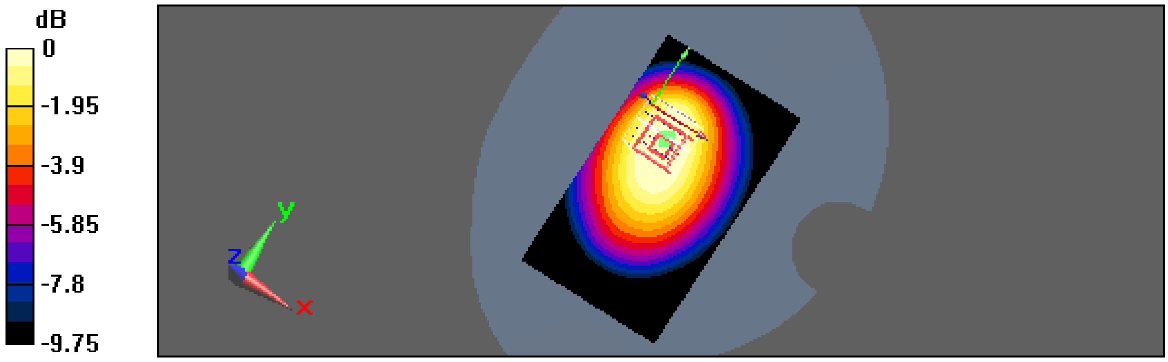
Communication System: GMRS; Frequency: 462.63750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 462.63750 MHz; σ = 0.878 mho/m; ε_r = 42.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6.25, 6.25, 6.25); Calibrated: 1/20/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 8/24/2009
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.453 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 21.4 V/m; Power Drift = 0.020 dB
Peak SAR (extrapolated) = 0.572 W/kg
SAR(1 g) = 0.351 mW/g; SAR(10 g) = 0.243 mW/g
Maximum value of SAR (measured) = 0.399 mW/g



0 dB = 0.399mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 12/16/2009 3:48:09 PMDate/Time: 12/16/2009 3:55:48 PM

Flat_GMRS CH4_muscle_Alkaline_15mm to phantom

DUT: MA120; Type: Two Way Radio with GMRS ,FRS; FCC ID: K7GMAABJ

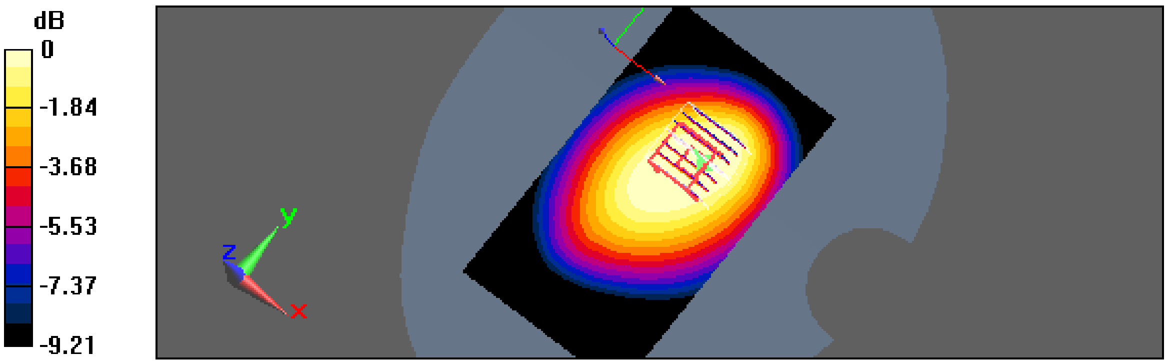
Communication System: GMRS; Frequency: 462.63750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 462.63750 MHz; σ = 0.949 mho/m; ε_r= 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6.75, 6.75, 6.75); Calibrated: 1/20/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 8/24/2009
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.403 mW/g

Flat/Zoom Scan (7x7x9)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 20.8 V/m; Power Drift = -0.040 dB
Peak SAR (extrapolated) = 0.505 W/kg
SAR(1 g) = 0.304 mW/g; SAR(10 g) = 0.213 mW/g
Maximum value of SAR (measured) = 0.345 mW/g



0 dB = 0.345mW/g