# SAR Evaluation Report

**FCC ID : A3LRMC30D1 / IC ID:649E-RMC30D1**

**Project Reference No. : NK-10-R-381**

**Product Type : 3 inch Touch Remote control**

**Applicant Name : Samsung Electronics Co.,Ltd.**

**Model : RMC30D1**

**Tested According to : CFR § 2.1093 / OET Bulletin 65 Supplement C**

**Tested Period : November 17, 2010 to January 6, 2011**

Tested by Minchul Shin Jan. 7, 2011 date : January 7, 2011

Verified by Seob Lee Jan. 7. 2011 date : January 7, 2011



Lab Address : Nemko Korea Co., Ltd
300-2, Osan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, Korea
Phone : 82-31-322-2333 Fax : 82-31-322-2332

## Contents of This Report

# 1. General Information

## 1.1 Applicant

| | |
|---|---|
| Company Name: | Samsung Electronics Co.,Ltd |
| Company Address: | 416 Maetan-3 Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 443-742 Korea |
| Phone/e-mail: | 82-31-277-2596 / jaywoo.lee@samsung.com |
| Contact Name: | Mr. Jaywoo Lee |

## 1.2 Manufacturer

| | |
|---|---|
| Company Name: | Samsung Electronics Co.,Ltd |
| Company Address: | 416 Maetan-3 Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 443-742 Korea |
| Phone/e-mail: | 82-31-277-2596 / jaywoo.lee@samsung.com |
| Contact Name: | Mr. Jaywoo Lee |

## 1.3 Description of Device

| | |
|---|---|
| Category: | 3 inch Touch Remote control |
| Model Name: | RMC30D1 |
| Brand Name: | SAMSUNG |
| Frequency of Operation | Tx/Rx : 2412 MHz ~ 2462 MHz |
| Power Output (Conducted-Average) | 802.11 b : 14.78 dBm<br>802.11 g : 13.82 dBm<br>802.11 n : 13.51 dBm |
| Channels | 802.11 b,g,n(HT20): 11 Channels |
| Max. SAR Measurement | 0.131 W/kg 2.4 GHz WLAN Head SAR<br>0.410 W/kg 2.4 GHz WLAN Body SAR |
| Modulation | BPSK,QPSK,16QAM,64QAM |
| Antenna Gain | 3.15 dBi |
| Antenna Type | PCB Pattern Antenna (Internal) |
| Power Supply | 3.7 V Li-ion Bttery,1200 mA |
| Dimensions | 58 mm x 124 mm x 13 mm |
| Weight | Approx. 110 g |
| Remarks: | - |

## 2. General Test Condition

### 2.1 Location

Nemko Korea
300-2, Osan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, Korea
Phone : 82-31-322-2333 , Fax : 82-31-322-2332

### 2.2 Operating Environment

| Parameters | Recording during test | Accepted deviation |
|---|---|---|
| Ambient temperature | (22 ± 2) ℃ | (18 ~ 25) ℃ |
| Relative humidity | (38 ± 15) % | (20 ~ 75) % |

### 2.3 Support Equipment

| Equipment | Manufacturer | Model Name | Serial Number |
|---|---|---|---|
| - | - | - | - |

### 2.4 Test Frequency and Mode Information

| Channel | Test Frequency (MHz) | Remark |
|---|---|---|
| Low | 2412 | 802.11 b,g,n Mode |
| Middle | 2437 | |
| High | 2462 | |

# 3. Description of Test Equipment

## 3.1 SAR Measurement Setup

### Robotic System

Measurements are performed using the DASY4 automated dosimetric assessment system. Which is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Stäubli), robot controller, measurement server, DELL computer, nearfield probe, probe alignment sensor, and the SAM twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Fig. 3.1).

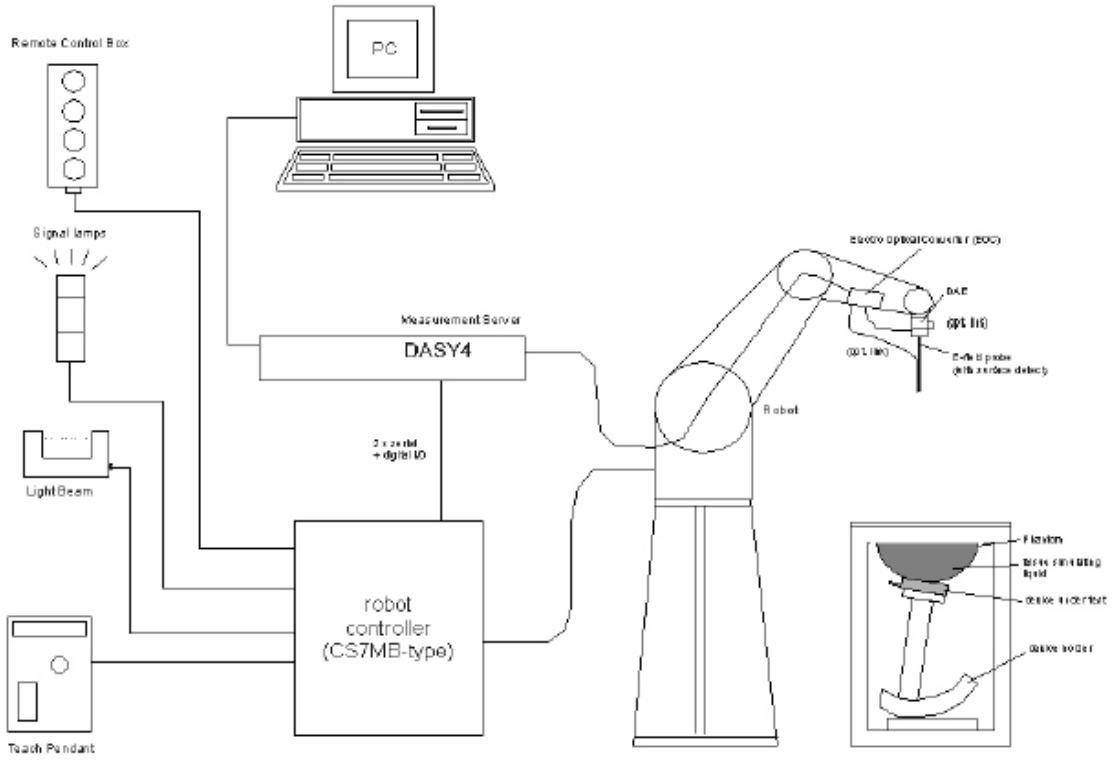



**Figure 3.1 SAR Measurement System Setup**

### System Hardware

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and a remote control is used to drive the robot motors. The PC consists of the DELL computer with Windows XP system and SAR Measurement Software DASY4, LCD monitor, mouse and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot.
A Data Acquisition Electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc.
This is connected to the Electro-Optical Coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the measurement server.

### System Electronics

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with autozeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information 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.

## 3.2 E-field Probe

The SAR measurement were conducted with the dosimetric probe EX3DV4, designed in the classical triangular configuration (see Fig.3.3) 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 (see Fig.3.4). 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 a System 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 DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting (see Fig.3.2). The approach is stopped at reaching the maximum.

**Figure 3.2 DAE System**

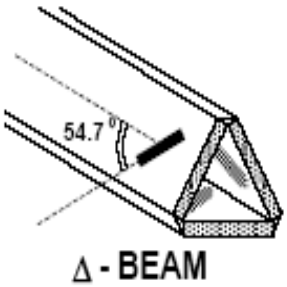



**Figure 3.3 Triangular Probe Configuration**

**Figure 3.4 Probe Thick-Film Technique**

**Probe Specifications**

| | |
|---|---|
| Construction : | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic DGBE) |
| Calibration : | Basic Broad Band Calibration In air from 10 MHz to 6.0 GHz<br>In brain and body simulating tissue at Frequencies of HSL2450,<br>MSL2450 MHz, Calibration certificates please find attached. |
| Frequency : | 10 MHz to > 6 GHz; Linearity: ±0.2 dB (30 MHz to 6 GHz) |
| Directivity | ±0.3 dB in HSL (rotation around probe axis)<br>±0.5 dB in HSL (rotation normal to probe axis) |
| Dynamic Range | 10μW/g to > 100mW/g; Linearity: ±0.2dB |
| Dimensions | Overall length: 337mm (Tip:20mm)<br>Tip diameter: 2.5mm (Body: 12mm)<br>Typical distance from probe to dipole centers : 1.0mm |
| Application | SAR dosimetry testing<br>Compliance tests of mobile phones<br>Fast automatic scanning in arbitrary phantoms |

### 3.3 SAM Phantom

The SAM Twin Phantom V4.0C is constructed of a fiberglass shell Integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users.
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 the 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 in the robot.
(See Figure 3.5)

**Figure 3.5 SAM Twin Phantom**

**Phantom Specification**

Construction : The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528and IEC 62209-1. 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 teaching three points with the robot.

Shell Thickness : 2 ± 0.2 mm
Filling Volume : Approx. 25 liters
Dimensions : Height; 830 mm; Length: 1000 mm; Width: 500 mm

### 3.4 Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device (see Fig. 3.6) enables the rotation of the mounted transmitter in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned
According to IEC, IEEE, FCC or other specifications
The device holder can be locked for positioning at Different phantom sections (Left Head, Right Head, Flat)

## 4. Measurement Procedure

EUT at the maximum power level is placed by a non metallic device holder in the above described positions at a shell phantom of a human being.
The distribution of the electric field strength *E* is measured in the tissue simulating liquid within the shell phantom.
For this miniaturized field probes with high sensitivity and low field disturbance are used.
Afterwards the corresponding SAR values are calculated with the known electrical conductivity σ and the mass density *p* of the tissue in the SEMCAD software.
The software is able to determine the averaged SAR values (averaging region 1g or 10g) for compliance testing.
The measurements are done by two scans: first a coarse scan determines the region of the maximum SAR, afterwards the averaged SAR is measured in a second scan within the sharp of a cube. The measurement times takes about 20 minutes.

The following steps are used for each test position:

**STEP 1**
Establish a call with the maximum output power with a base station simulator.
The connection between the EUT and the base station simulator is established via air interface.

**STEP 2**
Measurement of the local E-Field value at a fixed location (P1).
This value serves as a reference value for calculating a possible power drift.

**STEP 3**
Measurement of the SAR distribution with a grid spacing of 15 mm × 15 mm and a constant distance to the inner surface of the phantom.
Since the sensors can not directly measure at the inner surface of the phantom.
Since the sensors can not directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With this values the area of the maximum SAR is calculated by a interpolation scheme (combination of a least-square fitted function and a weighted average method). Additional peaks within 3dB of the maximum SAR are searched.

**STEP 4**
Around this points, a cube of 30 mm×30 mm×30 mm is assessed by measuring 7×7×7 points. With these data, the peak spatial-average SAR value can be calculated with the SEMCAD software.

**STEP 5**
The used extrapolation and interpolation routines are all based on the modified Quadratic Shepard's method [DASY4].

**STEP 6**
Repetition of the E-Field measurement at the fixed location(P1) and repetition of the whole procedure if the two results differ by more than ±0.223dB.

## 5. Definition of Reference Points

### 5.1 EAR Reference Point

Figure 5.1 shows the front, back and side views of SAM. The point “M” is the reference point For the center of mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERPs are 15 mm posterior to the entrance to ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 5.2.


**Figure 5.1 Front, back and side view of SAM**

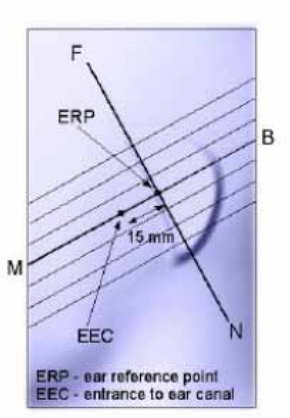



**Figure 5.2 Close up side view**

The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front)perpendicular to the reference plane and passing through the RE(or LE) is called the Reference Pivoting Line (see Figure 5.3).
Line B-M is perpendicular to the N-F line. Both N-F and B-M Lines should be marked on the external phantom shell to Facilitate handset positioning. Posterior to the N-F line, the thickness of the phantom shell with the shape of an ear is a flat surface 6 mm thick at the ERPs.

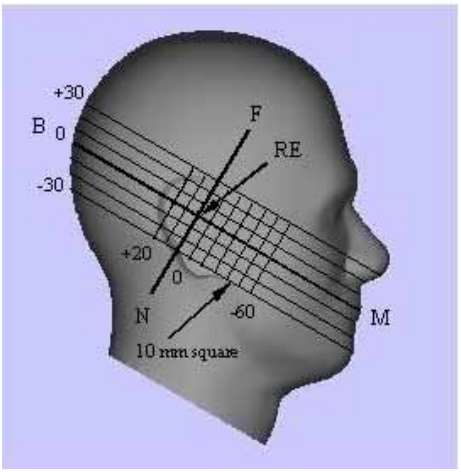



**Figure 5.3 Side view of the phantom showing relevant markings**

### 5.2 Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (see Fig. 5.4).
The “test device reference point” was than located at the same level as the center of the eat reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at it’s tip and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.

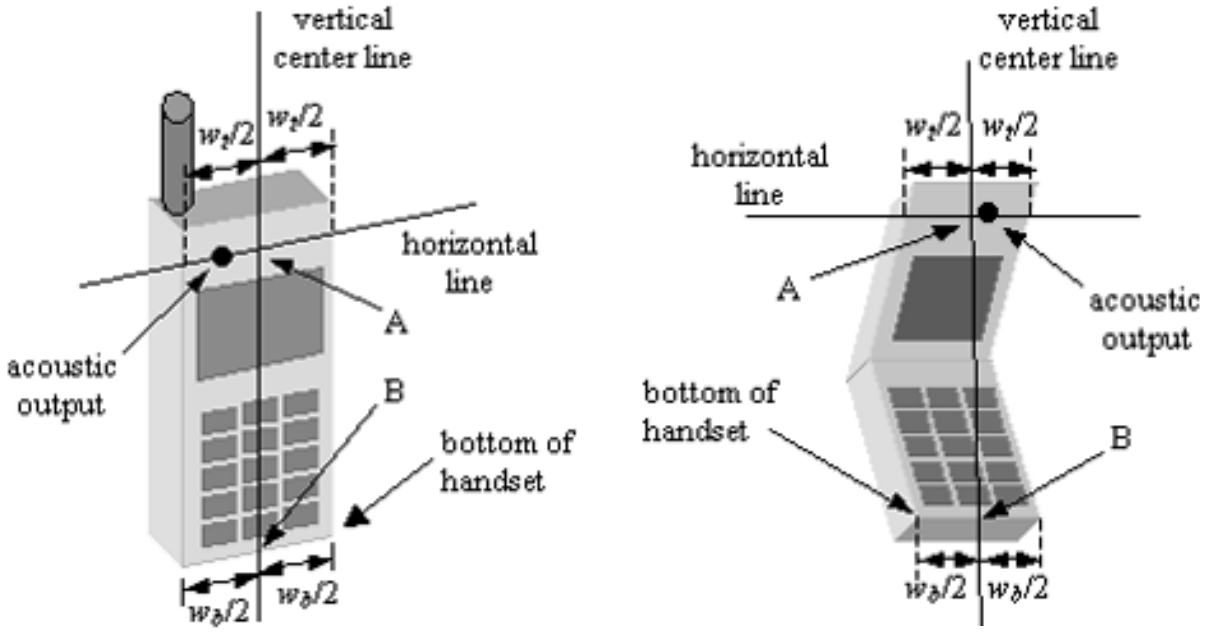



**Figure 5.4 Handset vertical and horizontal reference lines**

# 6. Test Configuration Positions

## 6.1 Cheek/Touch Position

**Step 1**
The test device was positioned with the handset close to the surface of the phantom such that point. A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6.1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

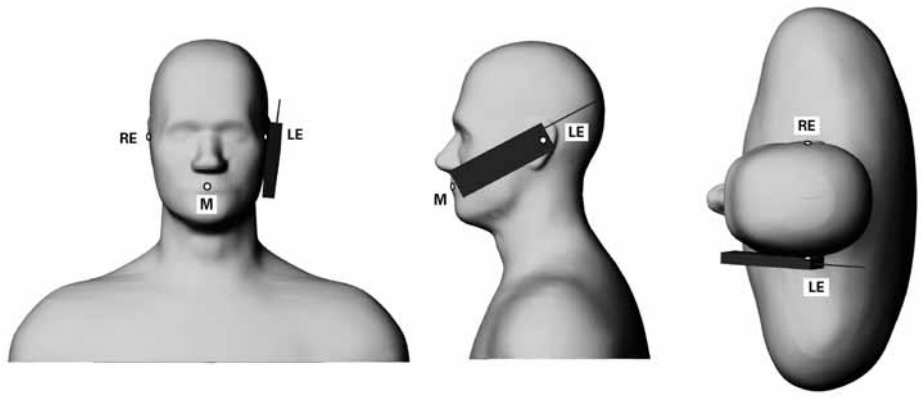



**Figure 6.1 Front Side and Top View of Cheek/Touch Position**

**Step 2**
The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.

**Step 3**
While maintaining the handset in this plane, the handset was rotated around the LE-RE line Until the vertical centerline was in the plane normal to MB-NF including the line MB (reference plane).

**Step 4**
Rotate the handset around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.

**Step 5**
While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, the handset was rotated about the line NF until any point on the handset made contact with a phantom point below the ear cheek.(See Figure 5.2)

### 6.2 EAR/Tilt 15° Position

With the test device aligned in the “Cheek/Touch Position”:

**Step 1**
Repeat steps 1 to 5 of 5.2 to place the device in the “Cheek/Touch Position”

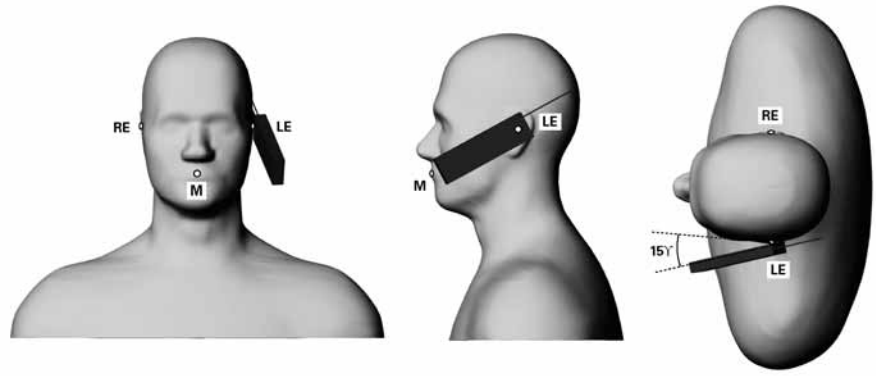



**Figure 6.2 Front, side and Top View of Ear/Tilt 15° Position**

**Step 2**
While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degree.

**Step 3**
The phone was then rotated around the horizontal line by 15 degree.

**Step 4**
While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the phone touches the head.
(In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced.
The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head. (See Figure 6.2)

## 6.3 Body-worn and Other Configurations

### 6.3.1 Phantom Requirement

For body-worn and other configurations a flat phantom shall be used which is comprised of material with electrical properties similar to the corresponding tissues.

### 6.3.2 Test Position

The body-worn configurations shall be tested with the supplied accessories (belt-clips, holsters, etc.) attached to the device in normal use configuration. Devices with a headset output shall be tested with a connected headset. Since the Supplement C to OET Bulletin 65 was mainly issued for mobile phones it is only a guideline and therefore some requirements are not usable or practical for devices other than mobile phones.

### 6.3.3 Test to be Performed

For purpose of determining test requirements, accessories may be divided into two categories: those that do not contain metallic components and those that do. For multiple accessories that do not contain metallic components, the device may be tested only with that accessory which provides the closet spacing to the body.
For multiple accessories that contain metallic components, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component, only the accessory that provides the closet spacing to the body must be tested.
If the manufacturer provides none body accessories, a separation distance of 0 cm between the back of the device and the flat phantom is recommended to cover the worst-case usage scenarios. Other separation distances may be used, but they shall not exceed 2.5cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.
For devices with retractable antenna, the SAR test shall be performed with the antenna fully extended and fully retracted. Other factors that may affect the exposure shall also be tested. For example, optional antennas or optional battery packs which may significantly change the volume, lengths, flip open/closed, etc. of the device or any other accessories which might have the potential to considerably increase the peak spatial-average SAR value.
The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at the middle channel for each test configuration is at least 3.0dB lower than the SAR limit, testing at the high and low channel is optional.

## 7. Tissue dielectric parameters for Head and Body Phantoms.

The head and muscle mixture consist of a viscous gel using hydroxethyl-cellullose (HEC) gelling agent and saline solution (see Table 7.1). Preservation with a bacteriacide is added and visual inspection is made to make sure air Bubbles are not trapped during the mixing process.
The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 have been incorporated in the following table.

**Table 7.1 Composition of the Head & Muscle Tissue Equivalent Matter**

| Ingredient (% by weight) | Frequency (MHz) | |
|---|---|---|
| | 2450 | |
| Tissue Type | Head | Body |
| Water | 45.00 | 69.83 |
| DGBE | 55.00 | 30.17 |
| Dielectric Constant | 39.2 ± 5% | 52.7 ± 5% |
| Conductivity (S/m) | 1.80 ± 5% | 1.95 ± 5% |

## 8. Limits for Specific Absorption Rate (SAR)

| HUMAN EXPOSURE | SAR (W/kg) | |
|---|---|---|
| | General Population / Uncontrolled Exposure Environment | Occupational / Controlled Exposure Environment |
| Spatial Peak SAR (Brain) | 1.6 | 8.0 |
| Spatial Average SAR (Whole Body) | 0.08 | 0.4 |
| Spatial Peak SAR (Hands, Wrists, Feet and Ankles ) | 4.0 | 20 |

1. This limits accord to SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6
2. The Spatial Peak value of the SAR averaged over any 1g of tissue and over the appropriate averaging time.
3. The Spatial average value of the SAR averaged over the whole body.
4. The Spatial Peak value of the SAR averaged over any 10g of tissue and over the appropriate averaging time.

## 9. Transmitter Conducted Output Power

### 9.1 IEEE 802.11b Conducted Average Powers

| Frequency (MHz) | Channel | Power setting Value | Data rate (Mbps) | Average power (dBm) |
|---|---|---|---|---|
| 2412 | 1 | 13 | 1 | 14.57 |
| | | | 2 | 14.53 |
| | | | 5.5 | 14.01 |
| | | | 11 | 14.21 |
| 2437 | 6 | 13 | 1 | **14.78** |
| | | | 2 | 14.73 |
| | | | 5.5 | 14.23 |
| | | | 11 | 14.41 |
| 2462 | 11 | 13 | 1 | 13.92 |
| | | | 2 | 13.89 |
| | | | 5.5 | 13.36 |
| | | | 11 | 13.55 |

### 9.2 IEEE 802.11g Conducted Average Powers

| Frequency (MHz) | Channel | Power setting Value | Data rate (Mbps) | Average power (dBm) |
|---|---|---|---|---|
| 2412 | 1 | 11 | 6 | 13.63 |
| | | | 9 | 13.61 |
| | | | 12 | 13.57 |
| | | | 18 | 13.46 |
| | | | 24 | 13.43 |
| | | | 36 | 13.21 |
| | | | 48 | 13.08 |
| | | | 54 | 12.94 |
| 2437 | 6 | 11 | 6 | **13.82** |
| | | | 9 | 13.79 |
| | | | 12 | 13.77 |
| | | | 18 | 13.22 |
| | | | 24 | 13.67 |
| | | | 36 | 13.29 |
| | | | 48 | 13.18 |
| | | | 54 | 13.11 |
| 2462 | 11 | 11 | 6 | 13.43 |
| | | | 9 | 13.45 |
| | | | 12 | 13.42 |
| | | | 18 | 13.33 |
| | | | 24 | 13.72 |
| | | | 36 | 13.41 |
| | | | 48 | 13.22 |
| | | | 54 | 13.17 |

### 9.3 IEEE 802.11n Conducted Average Powers

| Frequency (MHz) | Channel | Power setting Value | Data rate | Average power (dBm) |
|---|---|---|---|---|
| 2412 | 1 | 11 | MCS0 | 13.35 |
| | | | MCS1 | 13.27 |
| | | | MSC2 | 13.12 |
| | | | MCS3 | 11.65 |
| | | | MCS4 | 10.87 |
| | | | MCS5 | 8.69 |
| | | | MCS6 | 7.48 |
| | | | MCS7 | 6.35 |
| 2437 | 6 | 11 | MCS0 | **13.51** |
| | | | MCS1 | 13.38 |
| | | | MSC2 | 13.27 |
| | | | MCS3 | 11.79 |
| | | | MCS4 | 10.99 |
| | | | MCS5 | 8.74 |
| | | | MCS6 | 7.58 |
| | | | MCS7 | 6.04 |
| 2462 | 11 | 11 | MCS0 | 13.27 |
| | | | MCS1 | 13.28 |
| | | | MSC2 | 13.09 |
| | | | MCS3 | 11.11 |
| | | | MCS4 | 10.28 |
| | | | MCS5 | 8.11 |
| | | | MCS6 | 7.05 |
| | | | MCS7 | 5.71 |

## 10. Measurement Uncertainty

| Uncertainty Component | Tolerance (±%) | Prob. Dist. | Divisor | (Ci) | | Standard Uncertainty (±%) | | (Vi) |
|---|---|---|---|---|---|---|---|---|
| | | | | (1g) | (10g) | (1g) | (10g) | |
| **Measurement System** | | | | | | | | |
| Probe Calibration | 5.5 | Normal | 1 | 1 | 1 | 5.5 | 5.5 | ∞ |
| Axial Isotropy | 4.7 | Rectangular | 1.73 | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| Hemispherical Isotropy | 9.6 | Rectangular | 1.73 | 0.7 | 0.7 | 3.9 | 3.9 | ∞ |
| Hboundary Effects | 1.0 | Rectangular | 1.73 | 1 | 1 | 0.6 | 0.6 | ∞ |
| Linearity | 4.7 | Rectangular | 1.73 | 1 | 1 | 2.7 | 2.7 | ∞ |
| System Detection Limits | 1.0 | Rectangular | 1.73 | 1 | 1 | 0.6 | 0.6 | ∞ |
| Readout Electronics | 0.3 | Normal | 1 | 1 | 1 | 0.3 | 0.3 | ∞ |
| Response Time | 0.8 | Rectangular | 1.73 | 1 | 1 | 0.5 | 0.5 | ∞ |
| Intergration Time | 2.6 | Rectangular | 1.73 | 1 | 1 | 1.5 | 1.5 | ∞ |
| RF Ambient Conditions | 3.0 | Rectangular | 1.73 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | Rectangular | 1.73 | 1 | 1 | 0.2 | 0.2 | ∞ |
| Probe Positioning | 2.9 | Rectangular | 1.73 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Max. SAR Eval. | 1.0 | Rectangular | 1.73 | 1 | 1 | 0.6 | 0.6 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | 1 | 2.9 | 2.9 | 145 |
| Device Holder | 3.6 | Normal | 1 | 1 | 1 | 3.6 | 3.6 | 5 |
| Power Drift | 5.0 | Rectangular | 1.73 | 1 | 1 | 2.9 | 2.9 | ∞ |
| **Phantom and Setup** | | | | | | | | |
| Phantom Uncertainty | 4.0 | Rectangular | 1.73 | 1 | 1 | 2.3 | 2.3 | ∞ |
| Liquid Conductivity(target) | 5.0 | Rectangular | 1.73 | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| Liquid Conductivity(Meas.) | 3.2 | Normal | 1 | 0.64 | 0.43 | 2.0 | 1.4 | 5 |
| Liquid Permittivity(target) | 5.0 | Rectangular | 1.73 | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |
| Liquid Permittivity(meas.) | 4.0 | Normal | 1 | 0.6 | 0.49 | 2.4 | 2.0 | 5 |
| Combined Std. Uncertainty | | RSS | | | | **10.8** | **10.5** | |
| Expanded STD Uncertainty | | *k* = 2 | | | | **21.7** | **21.0** | |

Note: The above measurement uncertainties are according to IEEE Std. 1528-2003

## 11. System Verification

### 11.1 Tissue Verification

For the measurement of the following parameters the HP 85070E dielectric probe kit is used, representing the open-ended slim form probe measurement procedure. The measured values should be within ±5% of the recommended values given by the IEEE 1528-2003 / OET Bulletin 65 Supplement C.

**Table 11.1.1 Measured Tissue Parameters (Head)**

| Liquid Temperature (°C) | | 21.2 | |
|---|---|---|---|
| Test date | | November.18.2010 | |
| Frequency (MHz) | Liquid Parameter | Target | Measured |
| 2412 | Dielectric Constant ( $\varepsilon_r$ ) | 39.27 | 38.90 |
| 2437 | | 39.22 | 38.70 |
| 2450 | | 39.20 | 38.60 |
| 2462 | | 39.18 | 38.60 |
| 2412 | Conductivity . ( $\sigma$ ) | 1.77 | 1.80 |
| 2437 | | 1.79 | 1.83 |
| 2450 | | 1.80 | 1.84 |
| 2462 | | 1.81 | 1.86 |
| tolerance in tissue parameters | | f = 2450MHz<br>$\varepsilon_r$ = 39.2 ± 5%<br>$\sigma$ = 1.8 ± 5% | |

**Table 11.1.2 Measured Tissue Parameters (Body)**

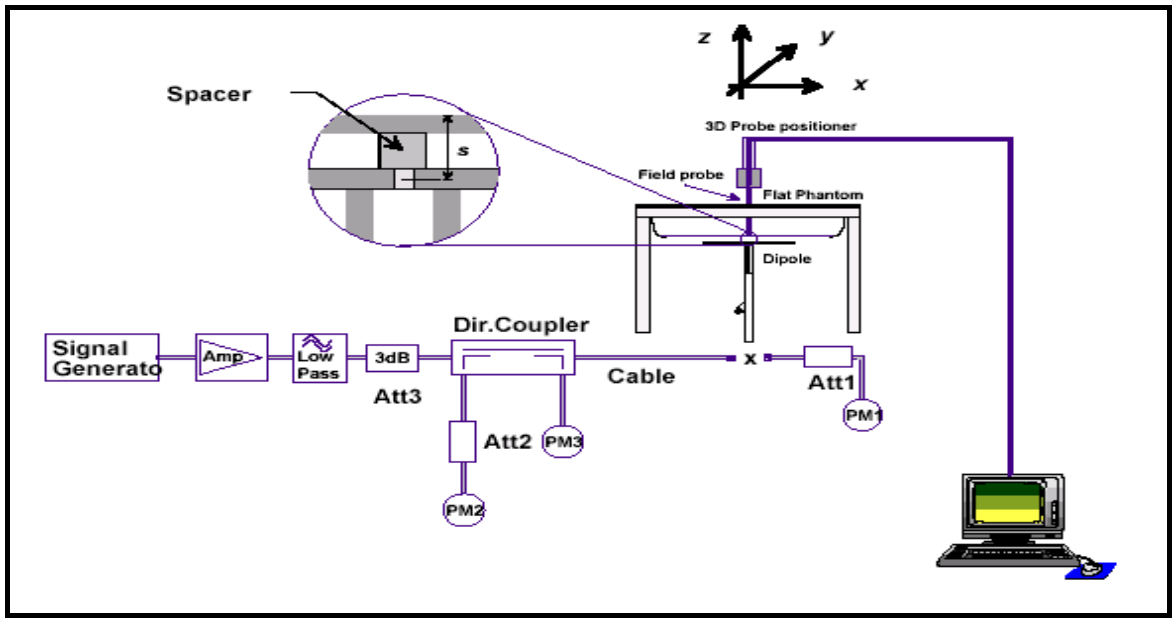
| Liquid Temperature (°C) | | 22.2 | |
|---|---|---|---|
| Test date | | January 6, 2011 | |
| Frequency (MHz) | Liquid Parameter | Target | Measured |
| 2412 | Dielectric Constant ( $\varepsilon_r$ ) | 52.75 | 52.80 |
| 2437 | | 52.72 | 52.80 |
| 2450 | | 52.70 | 52.70 |
| 2462 | | 52.69 | 52.60 |
| 2412 | Conductivity . ( $\sigma$ ) | 1.91 | 1.97 |
| 2437 | | 1.94 | 2.00 |
| 2450 | | 1.95 | 2.01 |
| 2462 | | 1.97 | 2.03 |
| tolerance in tissue parameters | | f = 2450MHz<br>$\varepsilon_r$ = 52.70 ± 5%<br>$\sigma$ = 1.95 ± 5% | |

### 11.2 Test System Validation

The simplified performance check was realized using the dipole validation kits.
The input power of the dipole antenna was 250 mW and it was placed under the flat Part of the SAM phantoms.
The target and measured results are listed in the table 11.2.1

**Table 11.2.1 System Validation Results**

| Liquid | Date | Ambi Temp. (°C) | Liquid Temp. (°C) | Frequency (MHz) | Targeted SAR ( mW/g ) | Measured SAR ( mW/g ) | Deviation (%) |
|---|---|---|---|---|---|---|---|
| | | | | | 1g | 1g | |
| Head | November 19, 2010 | 22.8 | 21.2 | 2450 | 13.03 | **13.2** | **1.30** |
| Body | January 6, 2011 | 23.4 | 21.4 | 2450 | 13.48 | **13.9** | **3.12** |




**Dipole Validation Test Setup**

### 11.3 Measurement Result of Test Data (Head Validation)

Date/Time: 2010-11-19 AM 11:21:37

Test Laboratory: Nemko Korea File Name: RMC30D1 System validation.da4

**DUT: Dipole 2450 MHz Type: D2450V2 Serial: D2450V2 - SN:774 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: CW Frequency: 2450 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2450 MHz; $\sigma$ = 1.84 mho/m; $\varepsilon_r$ = 38.6; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**RMC30D1 System Validation (Head)/Area Scan (7x7x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

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

**RMC30D1 System Validation (Head)/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

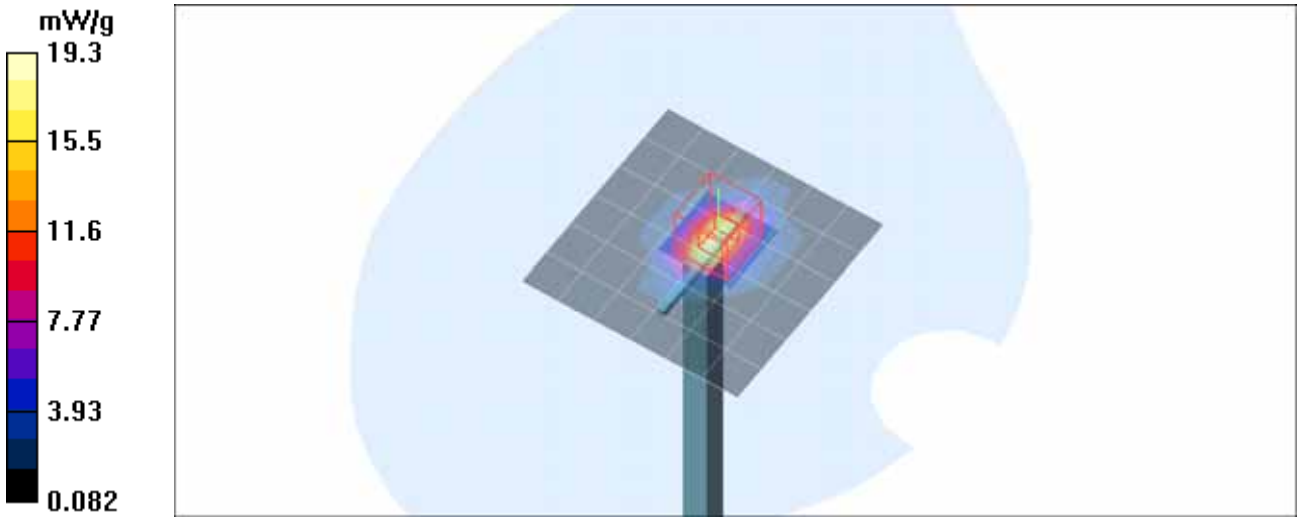
Reference Value = 95.0 V/m; Power Drift = 0.066 dB

Peak SAR (extrapolated) = 29.3 W/kg

**SAR(1 g) = 13.2 mW/g; SAR(10 g) = 5.87 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 19.3 mW/g



### 11.4 Measurement Result of Test Data (Body Validation)

Date/Time: 2011-01-06 PM 2:38:22

Test Laboratory: Nemko Korea File Name: RMC30D1 System validation(Body).da4

**DUT: Dipole 2450 MHz Type: D2450V2 Serial: D2450V2 - SN:774 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: CW Frequency: 2450 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2450 MHz; $\sigma$ = 2.01 mho/m; $\varepsilon_r$ = 52.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.49, 7.49, 7.49); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**RMC30D1 System Validation (Body)/Area Scan (7x7x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 19.2 mW/g

**RMC30D1 System Validation (Body)/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

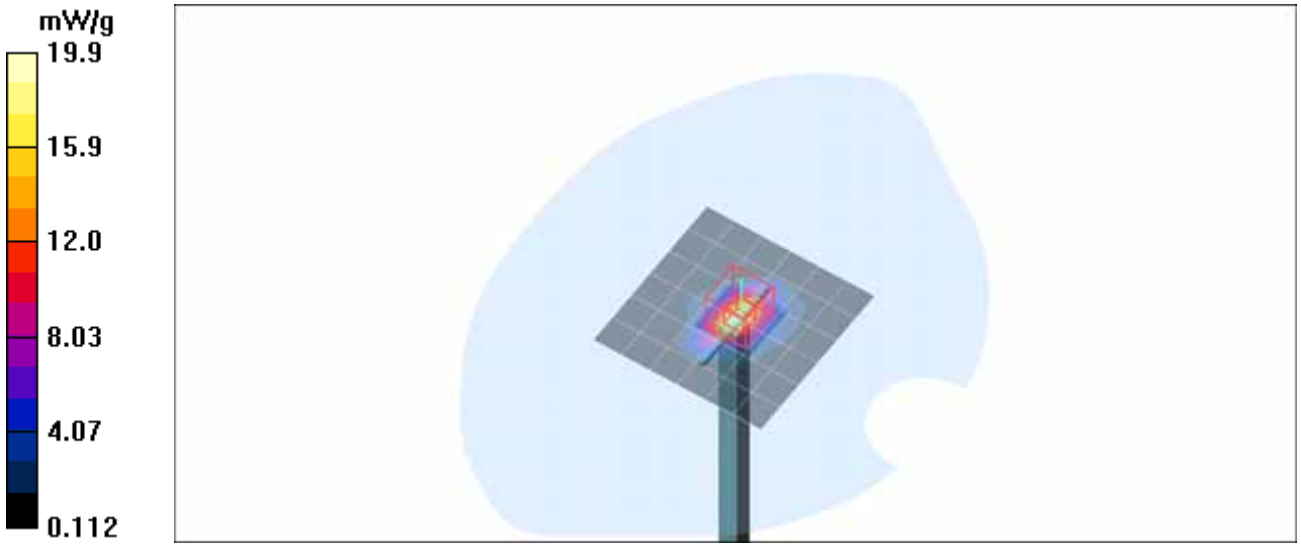
Reference Value = 98.5 V/m; Power Drift = -0.051 dB

Peak SAR (extrapolated) = 29.6 W/kg

**SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.35 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 19.9 mW/g



## 12. SAR Measurement Results

### 12.1 Test Results (Head)

Date of Test : November 19. 2010
Mixture Type: 2450 MHz Head
Tissue Depth: 15.1 Cm

| Frequency | | Mode | Data Rate | Side | Ambi Temp. (°C) | Liquid Temp. (°C) | Position | Power drift (dB) | 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|
| MHz | Ch. | | | | | | | | |
| 2437 | 6 | 802.11 b | 1 Mbps | Left | 23.4 | 21.6 | Touch | **0.004** | **0.097** |
| | | | | | 22.9 | 21.4 | Tilt | **-0.023** | **0.032** |
| | | | | Right | 23.2 | 21.5 | Touch | **0.049** | **0.080** |
| | | | | | 23.5 | 21.6 | Tilt | **0.103** | **0.019** |
| | | 802.11 g | 6 Mbps | Left | 23.1 | 21.5 | Touch | **0.208** | **0.044** |
| | | | | | 22.9 | 21.4 | Tilt | **-0.080** | **0.014** |
| | | | | Right | 23.5 | 21.6 | Touch | **0.212** | **0.033** |
| | | | | | 23.3 | 21.5 | Tilt | **-0.138** | **0.008** |
| | | 802.11 n | MCS0 | Left | 23.1 | 21.5 | Touch | **-0.116** | **0.071** |
| | | | | | 22.9 | 21.4 | Tilt | **0.004** | **0.022** |
| | | | | Right | 23.4 | 21.6 | Touch | **0.202** | **0.054** |
| | | | | | 23.5 | 21.6 | Tilt | **-0.073** | **0.012** |
| **2412** | 1 | 802.11 b | 1 Mbps | Left | 22.8 | 21.4 | Touch | **0.192** | **0.131** |
| **2462** | 11 | 802.11 b | 1 Mbps | Left | 22.8 | 21.4 | Touch | **-0.173** | **0.087** |

**Notes:**

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration.
2. All modes of operation were investigated, and worst-case results are reported.
3. Tissue parameters are listed on the SAR plots.
4. In this testing, the limit for General Population Spatial Peak averaged over 1g, 1.6 W/kg, is Applied
5. Test procedures used were according to FCC/OET Bulletin 65, Supplement C(June 2001).
6. Other IEEE 802.11 modes data rate were not investigated as per FCC KDB 248227 and FCC KDB 438498, since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the IEEE 802.11b mode 1 Mbps.

Date/Time: 2010-11-19 PM 5:02:38

Test Laboratory: Nemko Korea File Name: RMC30D1 Left Head Touch Position CH6 b mode 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Left Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Left Head Touch Position CH6 b mode 1Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.101 mW/g

## RMC30D1 Left Head Touch Position CH6 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

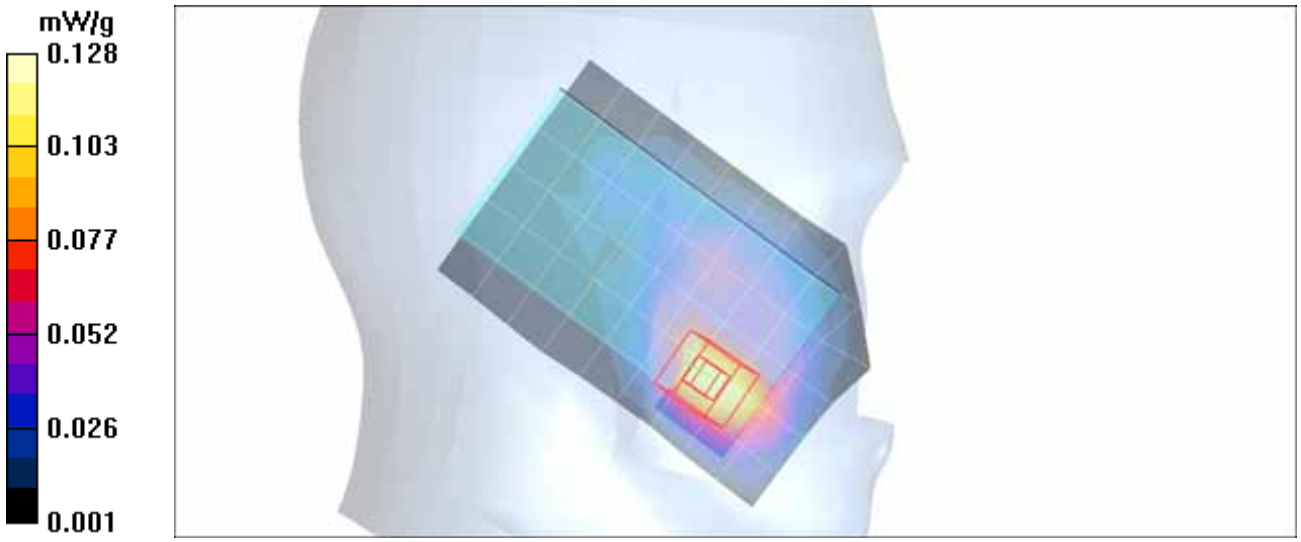
Reference Value = 2.64 V/m; Power Drift = 0.004 dB

Peak SAR (extrapolated) = 0.180 W/kg

**SAR(1 g) = 0.097 mW/g; SAR(10 g) = 0.051 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.128 mW/g



Date/Time: 2010-11-19 PM 7:14:02

Test Laboratory: Nemko Korea File Name: RMC30D1 Left Head Tilt Position CH6 b mode 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Left Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Left Head Tilt Position CH6 b mode 1Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.042 mW/g

## RMC30D1 Left Head Tilt Position CH6 b mode 1Mbps/Zoom Scan (7x7x7)/Cube

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

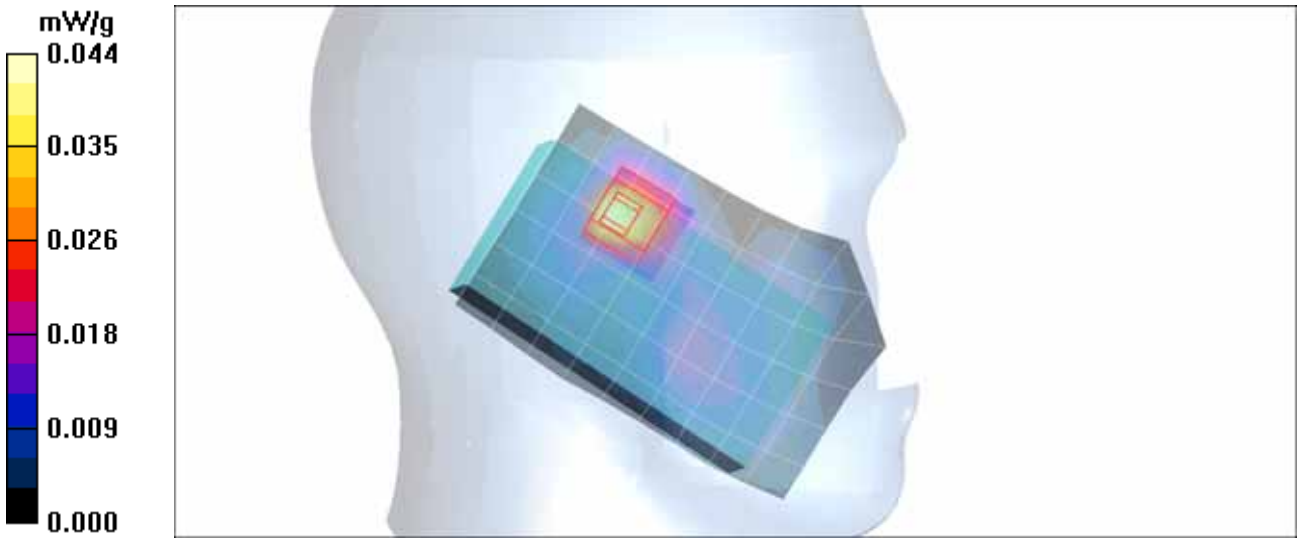
Reference Value = 2.84 V/m; Power Drift = -0.023 dB

Peak SAR (extrapolated) = 0.063 W/kg

**SAR(1 g) = 0.032 mW/g; SAR(10 g) = 0.016 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.044 mW/g



Date/Time: 2010-11-19 PM 1:35:41

Test Laboratory: Nemko Korea File Name: RMC30D1 Right Head Touch Position CH6 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Right Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Right Head Touch Position CH6 b mode 1Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.100 mW/g

## RMC30D1 Right Head Touch Position CH6 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

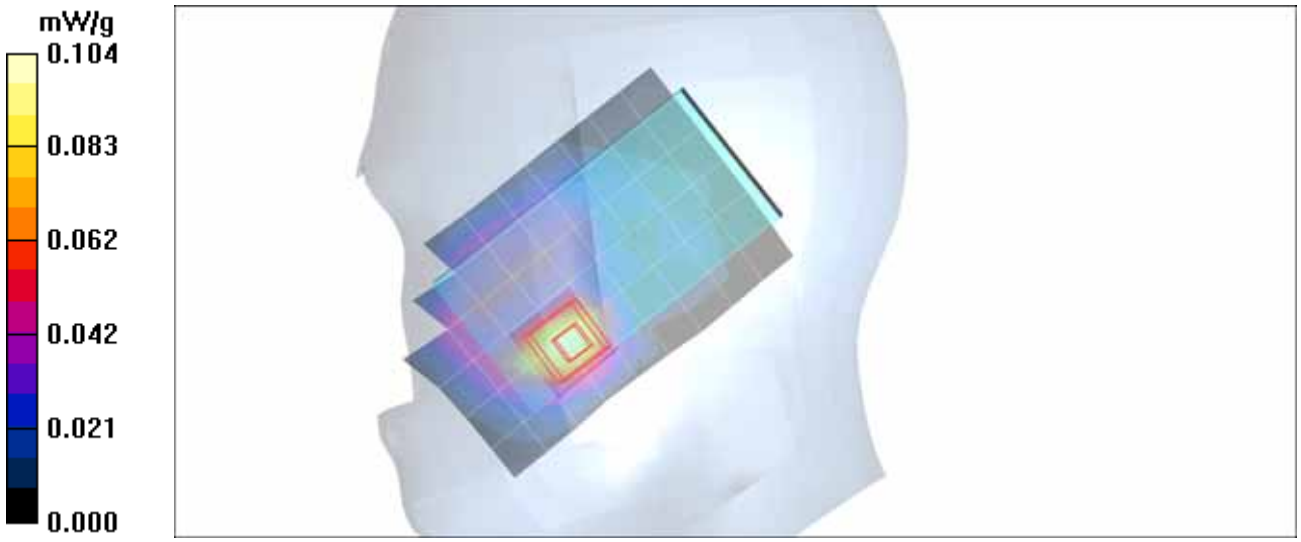
Reference Value = 2.96 V/m; Power Drift = 0.049 dB

Peak SAR (extrapolated) = 0.149 W/kg

**SAR(1 g) = 0.080 mW/g; SAR(10 g) = 0.041 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.104 mW/g



Date/Time: 2010-11-19 PM 2:00:32

Test Laboratory: Nemko Korea File Name: RMC30D1 Right Head Tilt Position CH6 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Right Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Right Head Tilt Position CH6 b mode 1Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

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

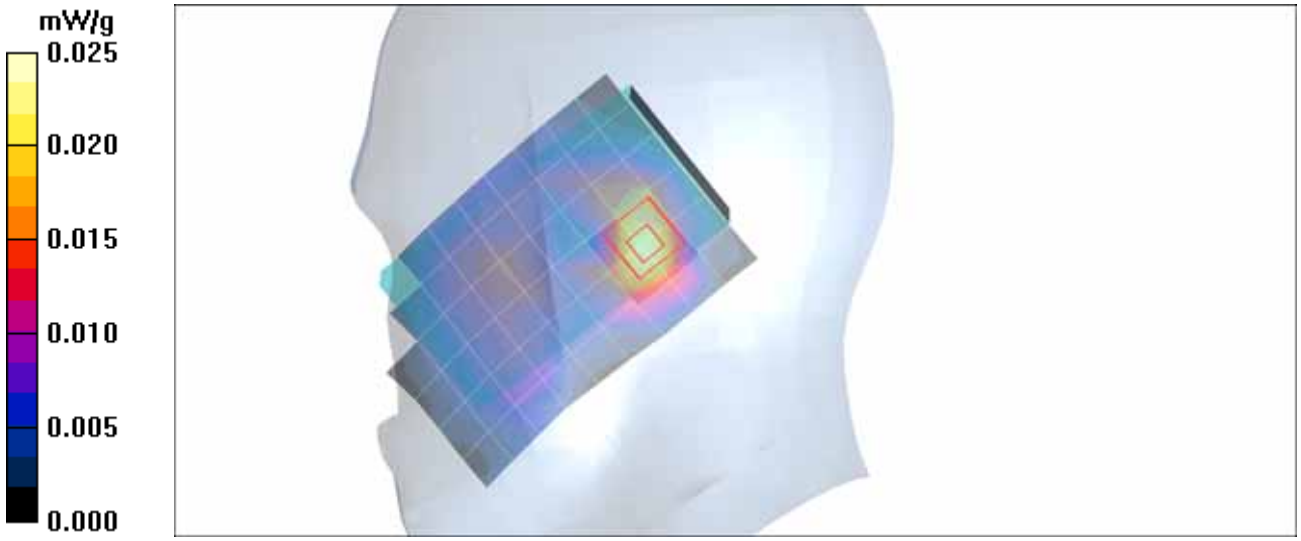
## RMC30D1 Right Head Tilt Position CH6 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.33 V/m; Power Drift = 0.103 dB

Peak SAR (extrapolated) = 0.033 W/kg

**SAR(1 g) = 0.019 mW/g; SAR(10 g) = 0.00955 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.



Date/Time: 2010-11-19 PM 5:26:41

Test Laboratory: Nemko Korea File Name: RMC30D1 Left Head Touch Position CH6 g mode 6Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Left Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Left Head Touch Position CH6 g mode 6Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.050 mW/g

## RMC30D1 Left Head Touch Position CH6 g mode 6Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

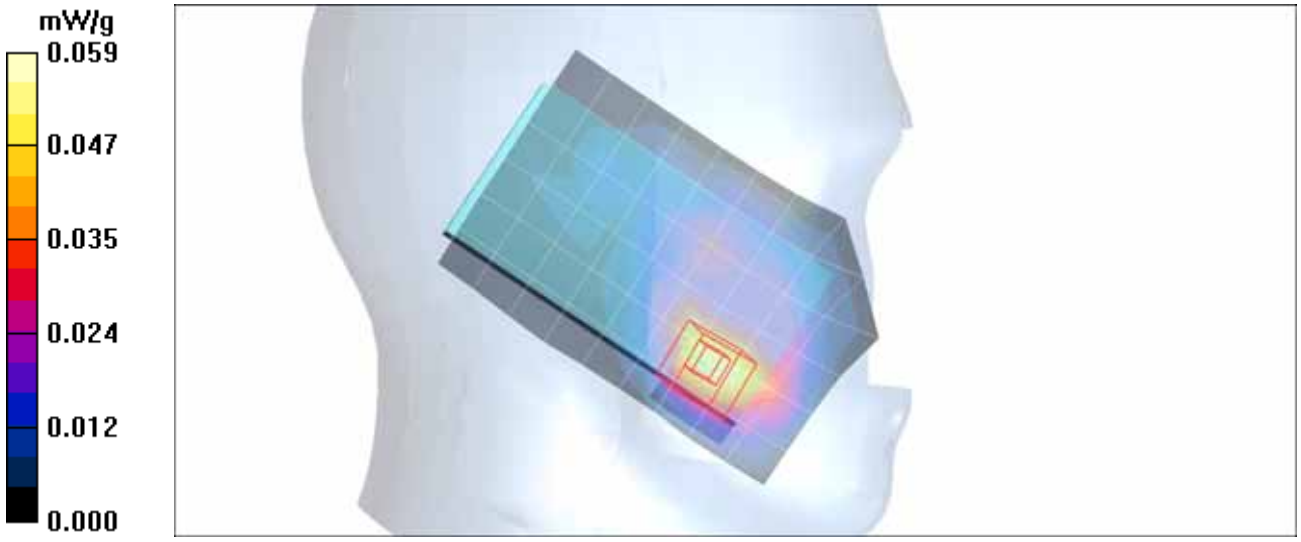
Reference Value = 1.91 V/m; Power Drift = 0.208 dB

Peak SAR (extrapolated) = 0.082 W/kg

**SAR(1 g) = 0.044 mW/g; SAR(10 g) = 0.022 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.059 mW/g



Date/Time: 2010-11-19 PM 6:35:40

Test Laboratory: Nemko Korea File Name: RMC30D1 Left Head Tilt Position CH6 g mode 6Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Left Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Left Head Tilt Position CH6 g mode 6Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.017 mW/g

## RMC30D1 Left Head Tilt Position CH6 g mode 6Mbps/Zoom Scan (7x7x7)/Cube 0:

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

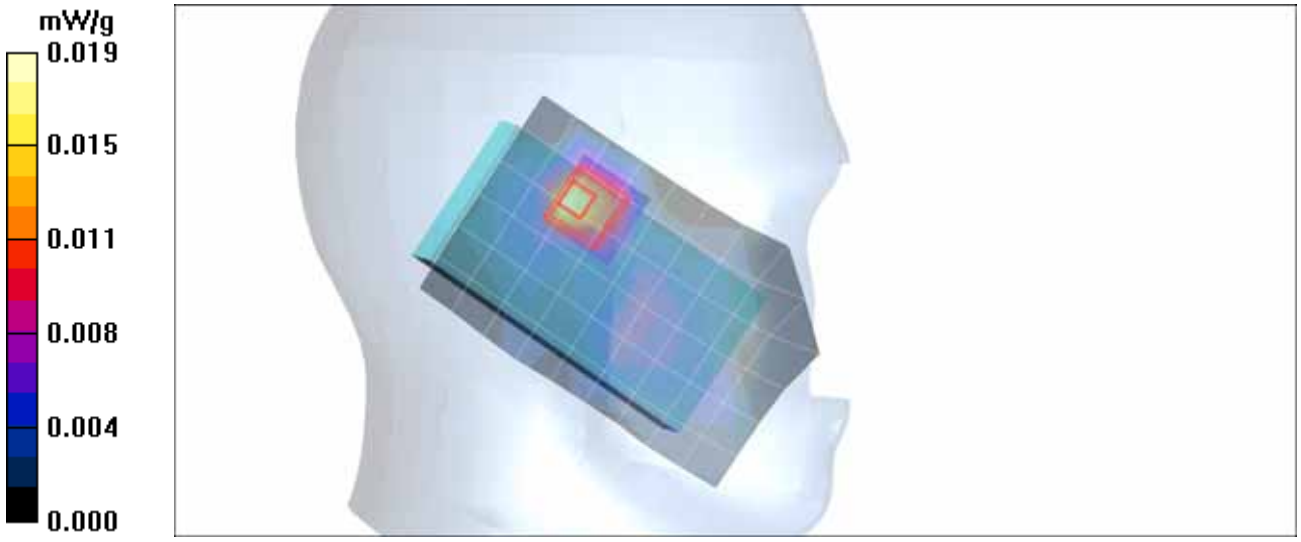
Reference Value = 1.98 V/m; Power Drift = -0.080 dB

Peak SAR (extrapolated) = 0.033 W/kg

**SAR(1 g) = 0.014 mW/g; SAR(10 g) = 0.00646 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.019 mW/g



Date/Time: 2010-11-19 PM 3:19:22

Test Laboratory: Nemko Korea File Name: RMC30D1 Right Head Touch Position CH6 6Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Right Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Right Head Touch Position CH6 g mode 6Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.040 mW/g

## RMC30D1 Right Head Touch Position CH6 g mode 6Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

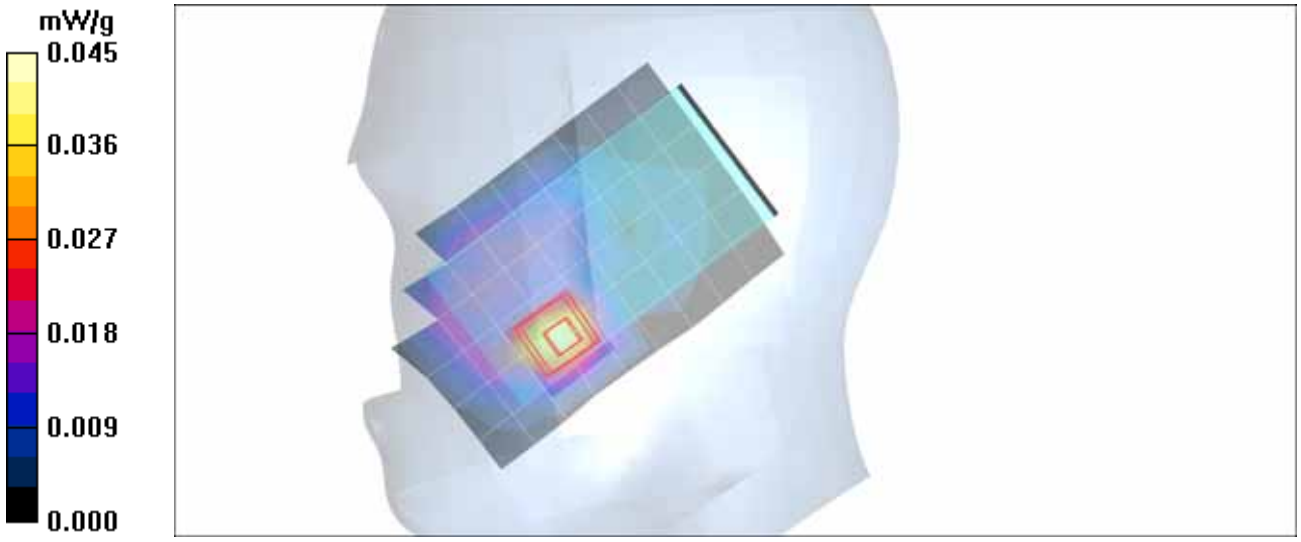
Reference Value = 2.08 V/m; Power Drift = 0.212 dB

Peak SAR (extrapolated) = 0.068 W/kg

**SAR(1 g) = 0.033 mW/g; SAR(10 g) = 0.017 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.045 mW/g



Date/Time: 2010-11-19 PM 2:48:26

Test Laboratory: Nemko Korea File Name: RMC30D1 Right Head Tilt Position CH6 6Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Right Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Right Head Tilt Position CH6 g mode 6Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.009 mW/g

## RMC30D1 Right Head Tilt Position CH6 g mode 6Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

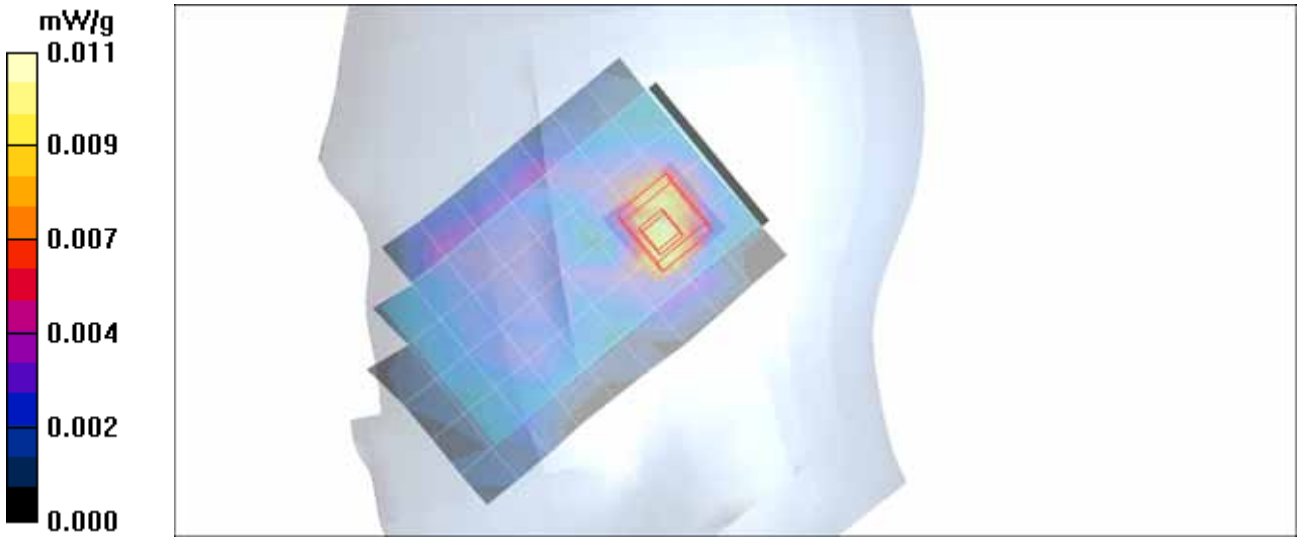
Reference Value = 2.36 V/m; Power Drift = -0.138 dB

Peak SAR (extrapolated) = 0.034 W/kg

**SAR(1 g) = 0.00773 mW/g; SAR(10 g) = 0.00316 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.011 mW/g



Date/Time: 2010-11-19 PM 5:47:03

Test Laboratory: Nemko Korea File Name: RMC30D1 Left Head Touch Position CH6 n mode MCS0.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Left Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Left Head Touch Position CH6 n mode MCS0/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.083 mW/g

## RMC30D1 Left Head Touch Position CH6 n mode MCS0/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

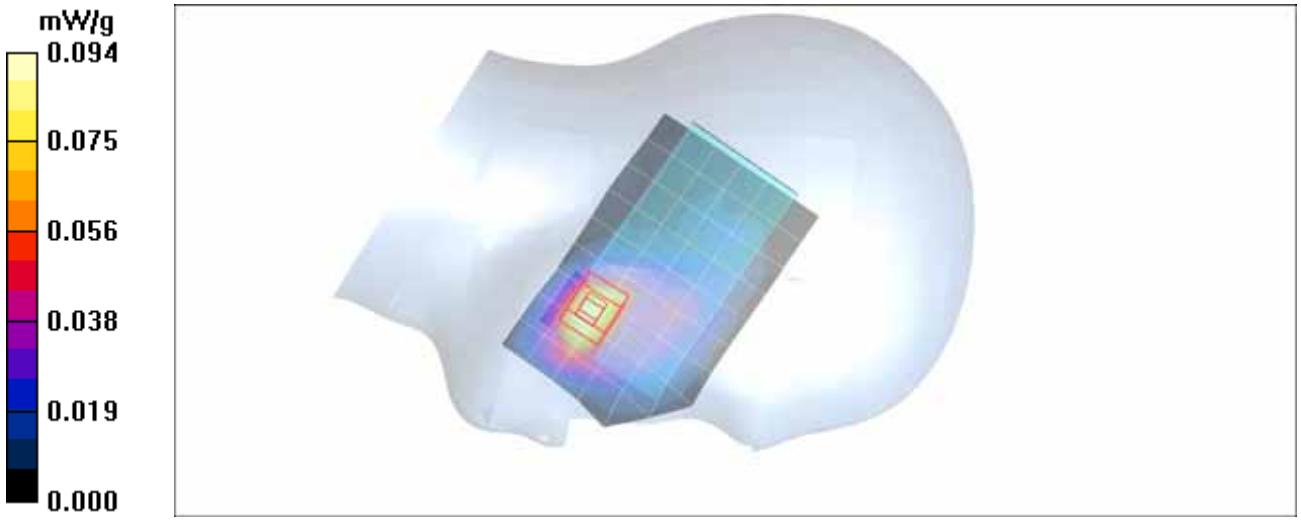
Reference Value = 2.43 V/m; Power Drift = -0.116 dB

Peak SAR (extrapolated) = 0.130 W/kg

**SAR(1 g) = 0.071 mW/g; SAR(10 g) = 0.037 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.094 mW/g



Date/Time: 2010-11-19 PM 6:10:05

Test Laboratory: Nemko Korea File Name: RMC30D1 Left Head Tilt Position CH6 n mode MCS0.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Left Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Left Head Tilt Position CH6 n mode MCS0/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.029 mW/g

## RMC30D1 Left Head Tilt Position CH6 n mode MCS0/Zoom Scan (7x7x7)/Cube 0:

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

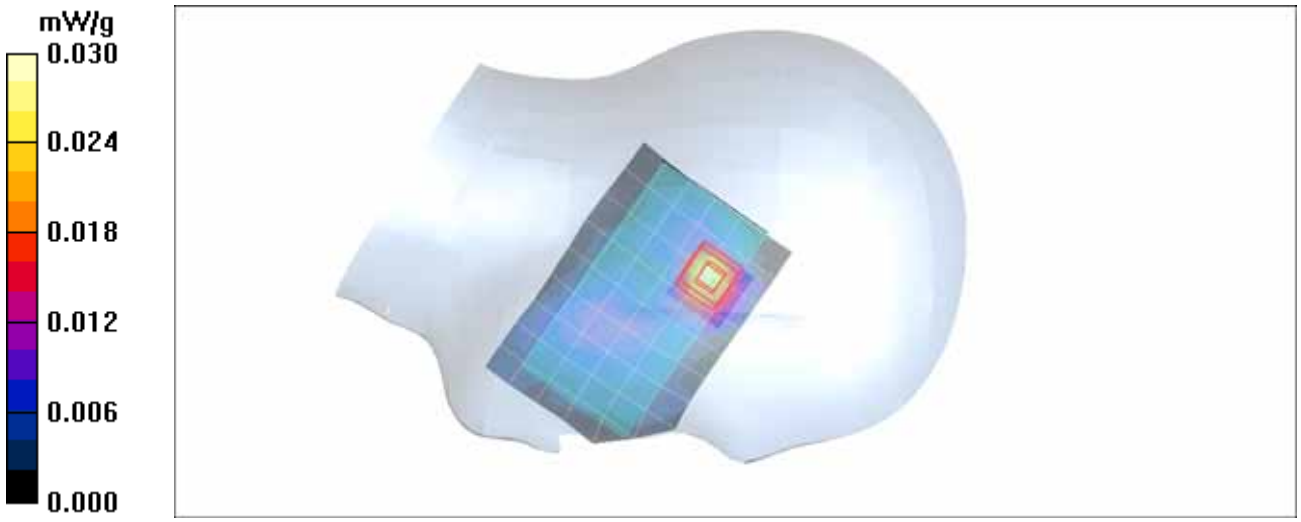
Reference Value = 2.72 V/m; Power Drift = 0.004 dB

Peak SAR (extrapolated) = 0.044 W/kg

**SAR(1 g) = 0.022 mW/g; SAR(10 g) = 0.011 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.030 mW/g



Date/Time: 2010-11-19 PM 3:56:08

Test Laboratory: Nemko Korea File Name: RMC30D1 Right Head Touch Position CH6 n mode MCS0.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Right Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Right Head Touch Position CH6 n mode MCS0/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.068 mW/g

## RMC30D1 Right Head Touch Position CH6 n mode MCS0/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

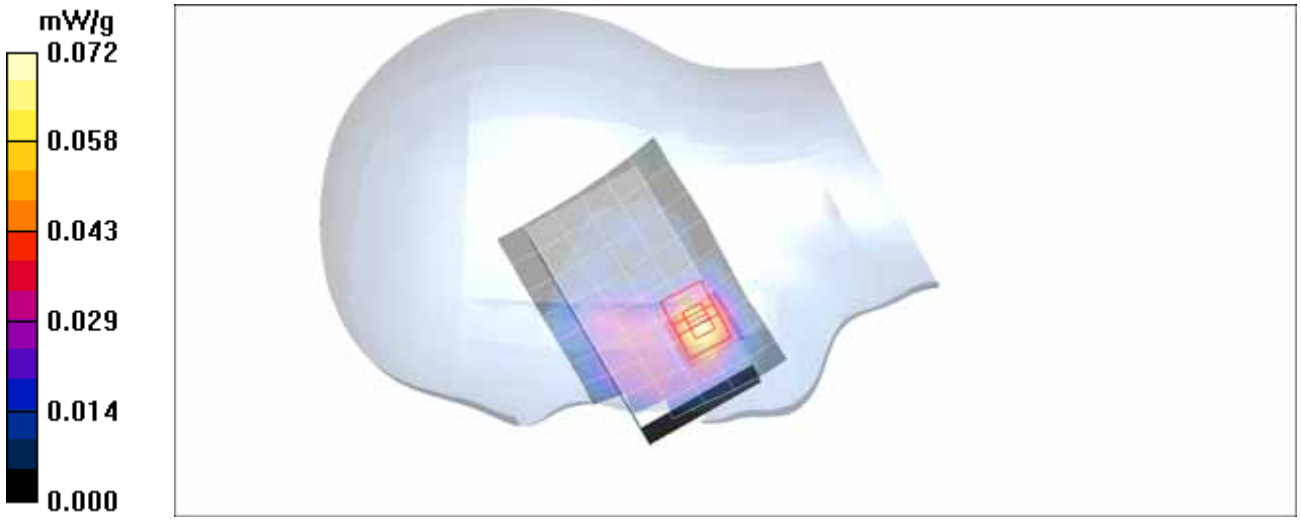
Reference Value = 2.45 V/m; Power Drift = 0.202 dB

Peak SAR (extrapolated) = 0.104 W/kg

**SAR(1 g) = 0.054 mW/g; SAR(10 g) = 0.028 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.072 mW/g



Date/Time: 2010-11-19 PM 4:16:46

Test Laboratory: Nemko Korea File Name: RMC30D1 Right Head Tilt Position CH6 n mode MCS0.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Right Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.83 mho/m; $\varepsilon_r$ = 38.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Right Head Tilt Position CH6 n mode MCS0/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.018 mW/g

## RMC30D1 Right Head Tilt Position CH6 n mode MCS0/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

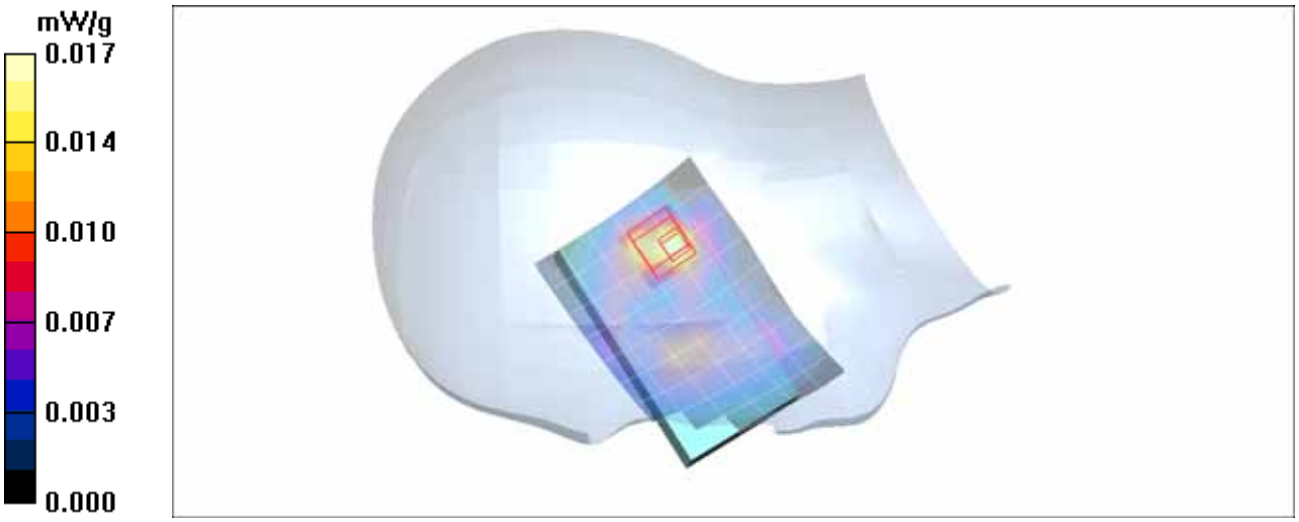
Reference Value = 2.90 V/m; Power Drift = -0.073 dB

Peak SAR (extrapolated) = 0.032 W/kg

**SAR(1 g) = 0.012 mW/g; SAR(10 g) = 0.00606 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.017 mW/g



Date/Time: 2010-11-19 PM 7:35:27

Test Laboratory: Nemko Korea File Name: RMC30D1 Left Head Touch Position CH1 b mode 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2412 MHz

Duty Cycle: 1:1 Phantom section: Left Section

Medium parameters used: f = 2412.15 MHz; $\sigma$ = 1.8 mho/m; $\varepsilon_r$ = 38.9; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Left Head Touch Position CH1 b mode 1Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

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

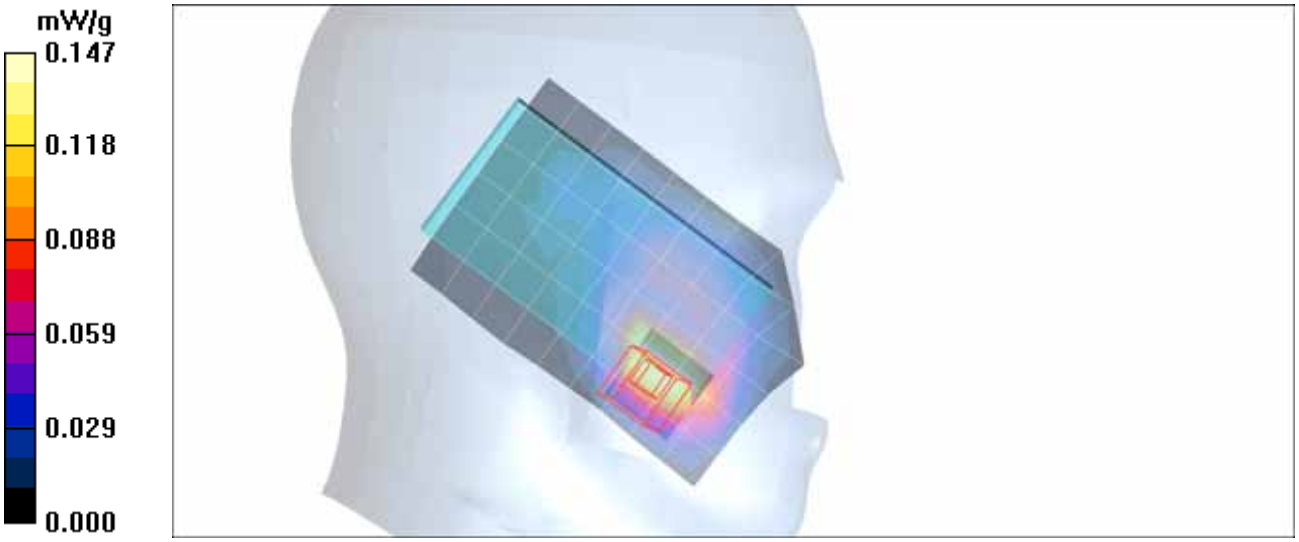
## RMC30D1 Left Head Touch Position CH1 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.66 V/m; Power Drift = 0.192 dB

Peak SAR (extrapolated) = 0.440 W/kg

**SAR(1 g) = 0.131 mW/g; SAR(10 g) = 0.051 mW/g**

Maximum value of SAR (measured) = 0.147 mW/g



Date/Time: 2010-11-19 PM 7:35:27

Test Laboratory: Nemko Korea File Name: RMC30D1 Left Head Touch Position CH1 b mode 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2412 MHz

Duty Cycle: 1:1 Phantom section: Left Section

Medium parameters used: f = 2412.15 MHz; $\sigma$ = 1.8 mho/m; $\varepsilon_r$ = 38.9; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Left Head Touch Position CH1 b mode 1Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

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

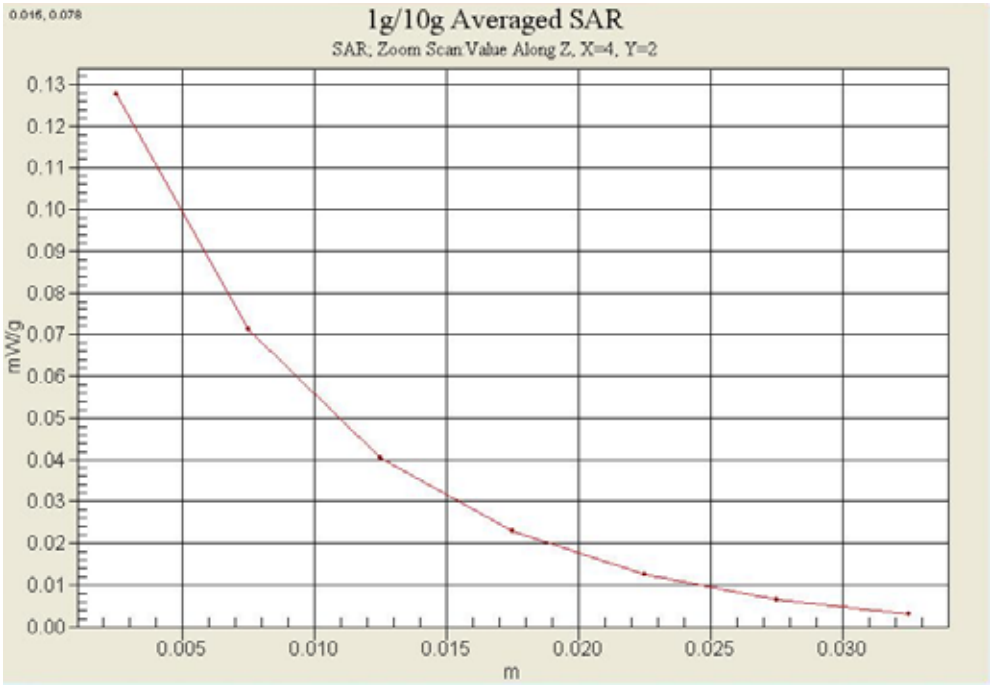
## RMC30D1 Left Head Touch Position CH1 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.66 V/m; Power Drift = 0.192 dB

Peak SAR (extrapolated) = 0.440 W/kg

**SAR(1 g) = 0.131 mW/g; SAR(10 g) = 0.051 mW/g**

Maximum value of SAR (measured) = 0.147 mW/g



Date/Time: 2010-11-19 PM 7:57:41

Test Laboratory: Nemko Korea File Name: RMC30D1 Left Head Touch Position CH11 b mode 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2462 MHz

Duty Cycle: 1:1 Phantom section: Left Section

Medium parameters used: f = 2462.1 MHz; $\sigma$ = 1.86 mho/m; $\varepsilon_r$ = 38.6; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.25, 7.25, 7.25); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Left Head Touch Position CH11 b mode 1Mbps/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.103 mW/g

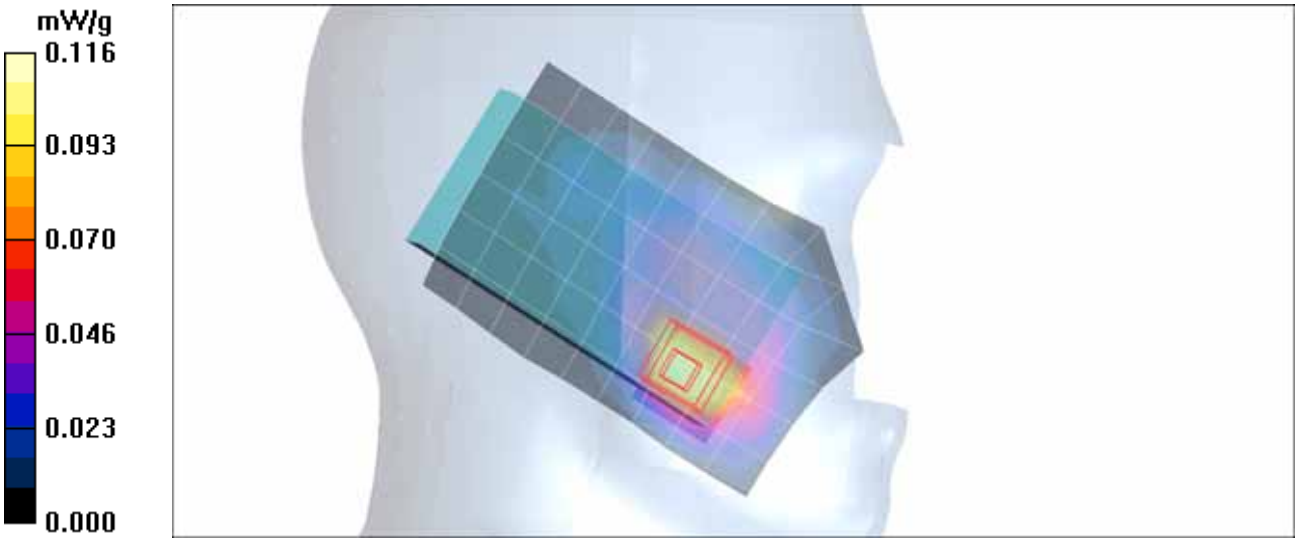
## RMC30D1 Left Head Touch Position CH11 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.54 V/m; Power Drift = -0.173 dB

Peak SAR (extrapolated) = 0.162 W/kg

**SAR(1 g) = 0.087 mW/g; SAR(10 g) = 0.045 mW/g**

Maximum value of SAR (measured) = 0.116 mW/g



### 12.2 Test Results (Body)

Date of Test : January 6, 2011
Mixture Type: 2450 MHz Body
Tissue Depth: 15.0 Cm

| Frequency | | Mode | Data Rate | Side | Spacing (mm) | Ambi Temp. (°C) | Liquid Temp. (°C) | Power drift (dB) | 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|
| MHz | Ch. | | | | | | | | |
| **2437** | 6 | 802.11 b | 1 Mbps | Front | 0 | 23.8 | 21.7 | **0.150** | **0.338** |
| | | | | Rear | | 23.5 | 21.4 | **0.186** | **0.352** |
| | | 802.11 g | 6 Mbps | Rear | | 23.8 | 21.7 | **0.161** | **0.268** |
| | | 802.11 n | MCS0 | Rear | | 23.8 | 21.7 | **0.014** | **0.260** |
| **2412** | 1 | 802.11 b | 1 Mbps | Rear | | 23.6 | 21.4 | **0.117** | **0.410** |
| **2462** | 11 | 802.11 b | 1 Mbps | Rear | | 23.6 | 21.5 | **0.162** | **0.279** |

**Notes:**

1. The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration.
2. All modes of operation were investigated, and worst-case results are reported.
3. Tissue parameters are listed on the SAR plots.
4. In this testing, the limit for General Population Spatial Peak averaged over 1g, 1.6 W/kg, is applied
5. Test procedures used were according to FCC/OET Bulletin 65, Supplement C(June 2001).
6. Other IEEE 802.11 modes data rate were not investigated as per FCC KDB 248227 and FCC KDB 438498, since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the IEEE 802.11b mode 1 Mbps.

Date/Time: 2011-01-06 PM 7:27:43

Test Laboratory: Nemko Korea File Name: RMC30D1 Flat phantom 0mm distance LCD Front Side CH6 b mode 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 2 mho/m; $\varepsilon_r$ = 52.8; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.49, 7.49, 7.49); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Flat phantom 0mm distance LCD Front Side CH6 b mode 1Mbps/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.361 mW/g

## RMC30D1 Flat phantom 0mm distance LCD Front Side CH6 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

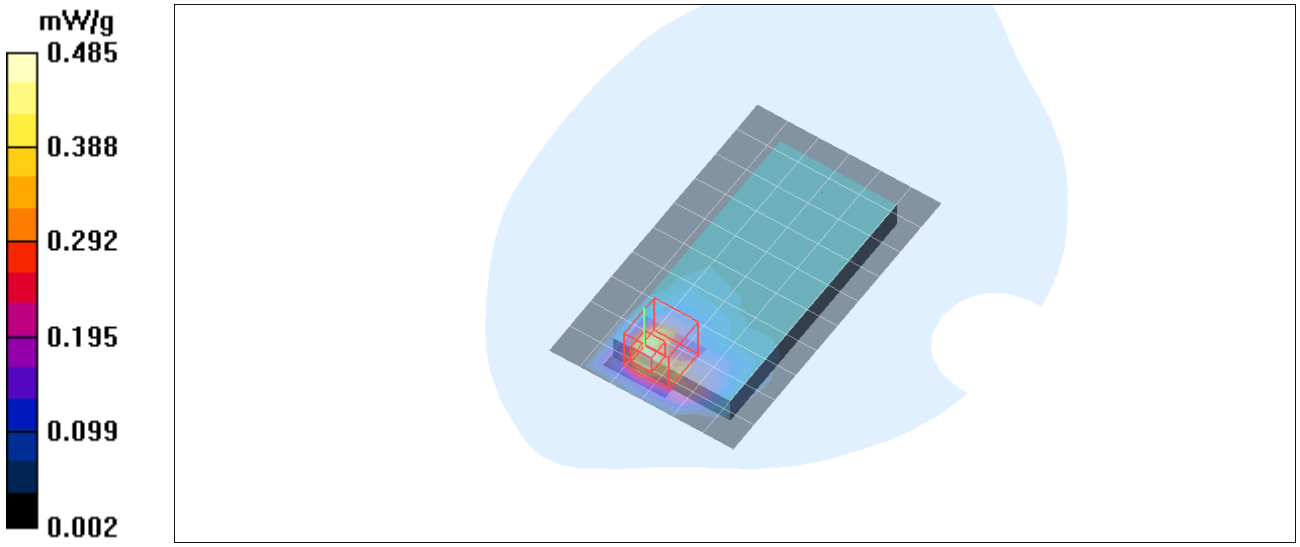
Reference Value = 2.66 V/m; Power Drift = 0.150 dB

Peak SAR (extrapolated) = 0.870 W/kg

**SAR(1 g) = 0.338 mW/g; SAR(10 g) = 0.153 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.485 mW/g



Date/Time: 2011-01-06 PM 4:25:52

Test Laboratory: Nemko Korea File Name: RMC30D1 Flat phantom 0mm distance LCD Rear Side CH1 b mode 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2412 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2412.15 MHz; $\sigma$ = 1.97 mho/m; $\varepsilon_r$ = 52.8; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.49, 7.49, 7.49); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH1 b mode 1Mbps/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.440 mW/g

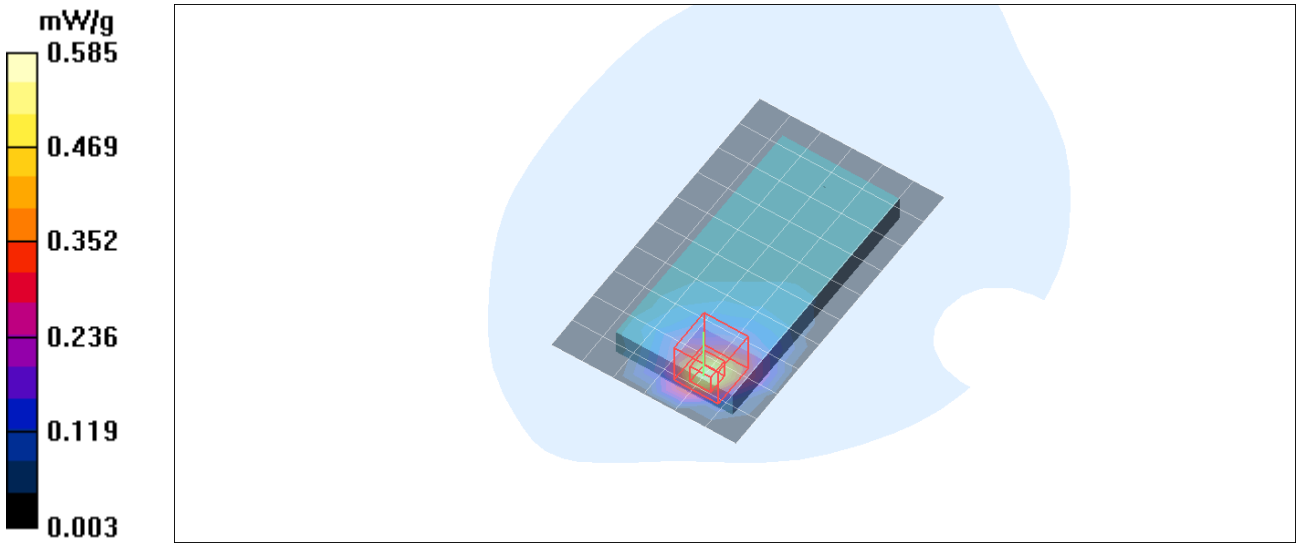
## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH1 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.46 V/m; Power Drift = 0.117 dB

Peak SAR (extrapolated) = 0.892 W/kg

**SAR(1 g) = 0.410 mW/g; SAR(10 g) = 0.190 mW/g**

Maximum value of SAR (measured) = 0.585 mW/g



Date/Time: 2011-01-06 PM 6:18:57

Test Laboratory: Nemko Korea File Name: RMC30D1 Flat phantom 0mm distance LCD Rear Side CH6 g mode 6Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 2 mho/m; $\varepsilon_r$ = 52.8; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.49, 7.49, 7.49); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH6 g mode 6Mbps/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.328 mW/g

## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH6 g mode 6Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

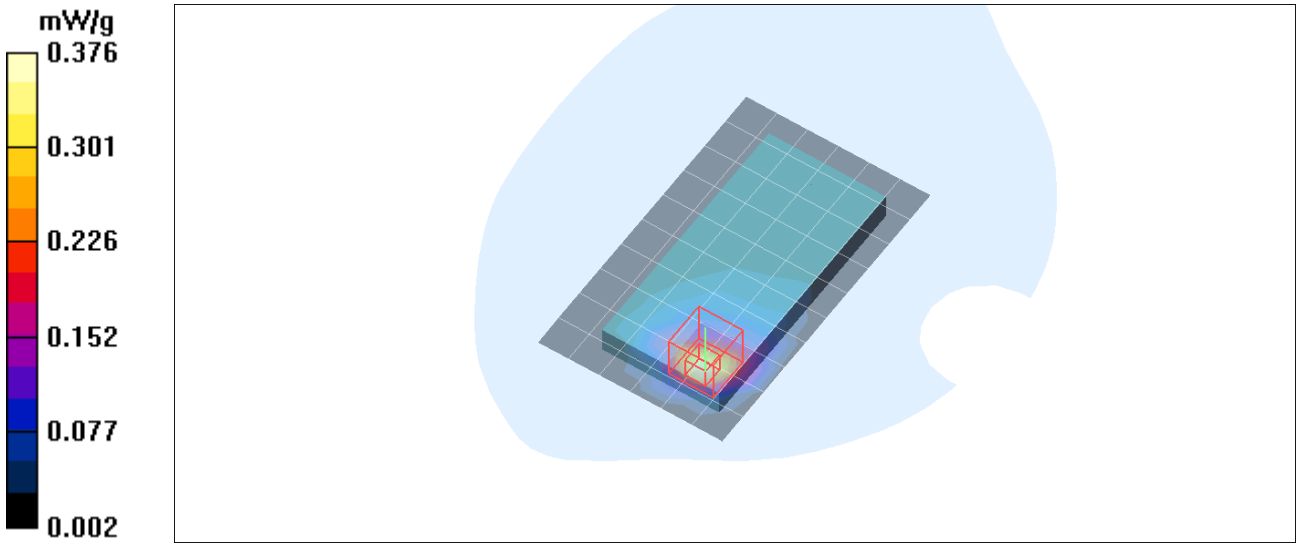
Reference Value = 2.73 V/m; Power Drift = 0.161 dB

Peak SAR (extrapolated) = 0.580 W/kg

**SAR(1 g) = 0.268 mW/g; SAR(10 g) = 0.124 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.376 mW/g



Date/Time: 2011-01-06 PM 7:04:44

Test Laboratory: Nemko Korea File Name: RMC30D1 Flat phantom 0mm distance LCD Rear Side CH6 n mode 6.5Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 2 mho/m; $\varepsilon_r$ = 52.8; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.49, 7.49, 7.49); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH6 n mode 6.5Mbps/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.320 mW/g

## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH6 n mode 6.5Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

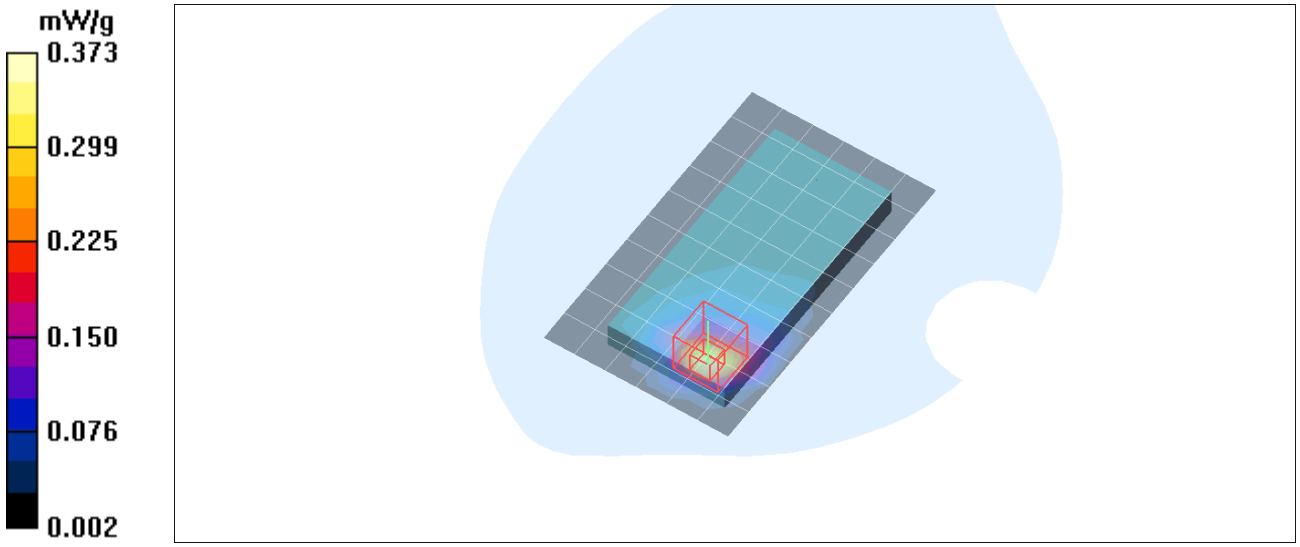
Reference Value = 2.50 V/m; Power Drift = 0.014 dB

Peak SAR (extrapolated) = 0.563 W/kg

**SAR(1 g) = 0.260 mW/g; SAR(10 g) = 0.120 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.373 mW/g



Date/Time: 2011-01-06 PM 4:25:52

Test Laboratory: Nemko Korea File Name: RMC30D1 Flat phantom 0mm distance LCD Rear Side CH1 b mode 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2412 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2412.15 MHz; $\sigma$ = 1.97 mho/m; $\varepsilon_r$ = 52.8; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.49, 7.49, 7.49); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH1 b mode 1Mbps/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.440 mW/g

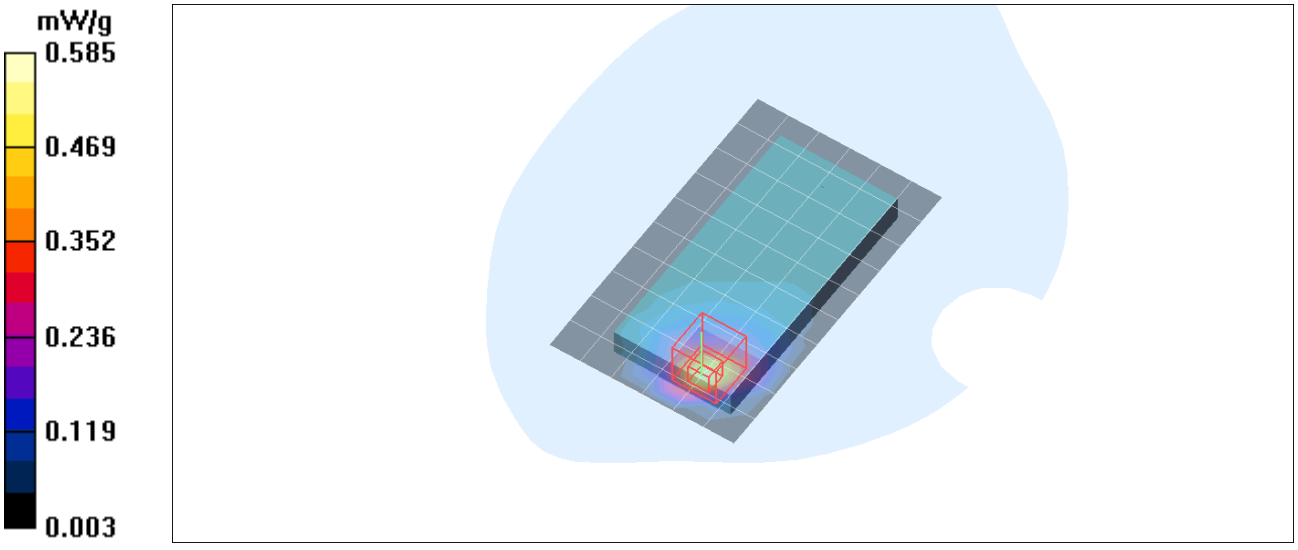
## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH1 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.46 V/m; Power Drift = 0.117 dB

Peak SAR (extrapolated) = 0.892 W/kg

**SAR(1 g) = 0.410 mW/g; SAR(10 g) = 0.190 mW/g**

Maximum value of SAR (measured) = 0.585 mW/g



Date/Time: 2011-01-06 PM 4:25:52

Test Laboratory: Nemko Korea File Name: RMC30D1 Flat phantom 0mm distance LCD Rear Side CH1 b mode 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2412 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2412.15 MHz; $\sigma$ = 1.97 mho/m; $\varepsilon_r$ = 52.8; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.49, 7.49, 7.49); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH1 b mode 1Mbps/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.440 mW/g

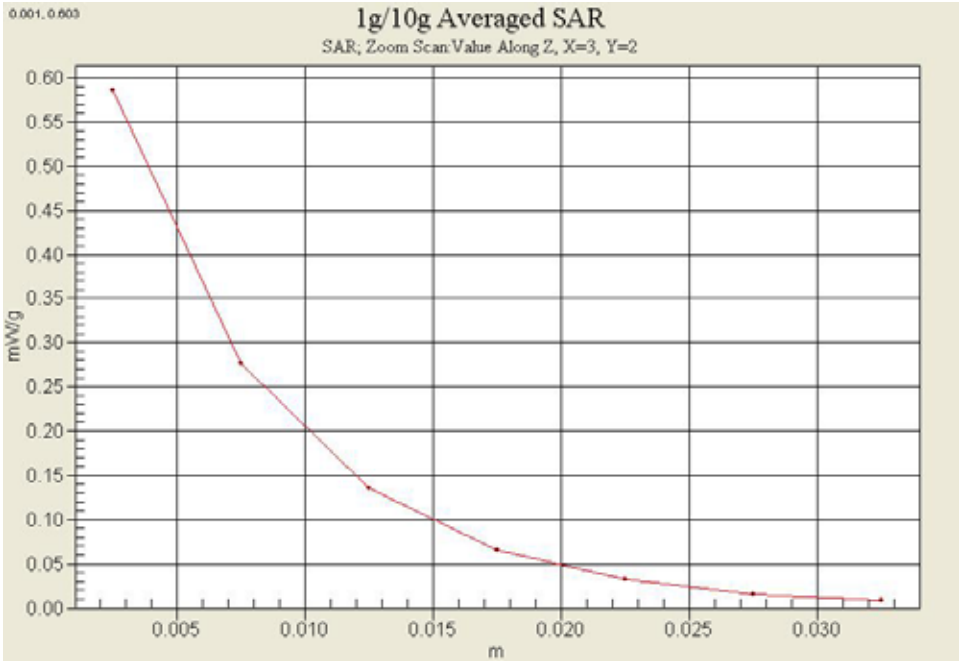
## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH1 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.46 V/m; Power Drift = 0.117 dB

Peak SAR (extrapolated) = 0.892 W/kg

**SAR(1 g) = 0.410 mW/g; SAR(10 g) = 0.190 mW/g**

Maximum value of SAR (measured) = 0.585 mW/g



Date/Time: 2011-01-06 PM 5:11:30

Test Laboratory: Nemko Korea File Name: RMC30D1 Flat phantom 0mm distance LCD Rear Side CH11 b mode 1Mbps.da4

**DUT: RMC30D1 Type: Bar type Serial: 20101025 Applicant Name: Samsung Electronics.Co.,Ltd**

Communication System: Wireless LAN Frequency: 2462 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2462.1 MHz; $\sigma$ = 2.03 mho/m; $\varepsilon_r$ = 52.6; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

Probe: EX3DV4 - SN3682; ConvF(7.49, 7.49, 7.49); Calibrated: 2010-05-26

Sensor-Surface: 2.5mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2010-02-18

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH11 b mode 1Mbps/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.266 mW/g

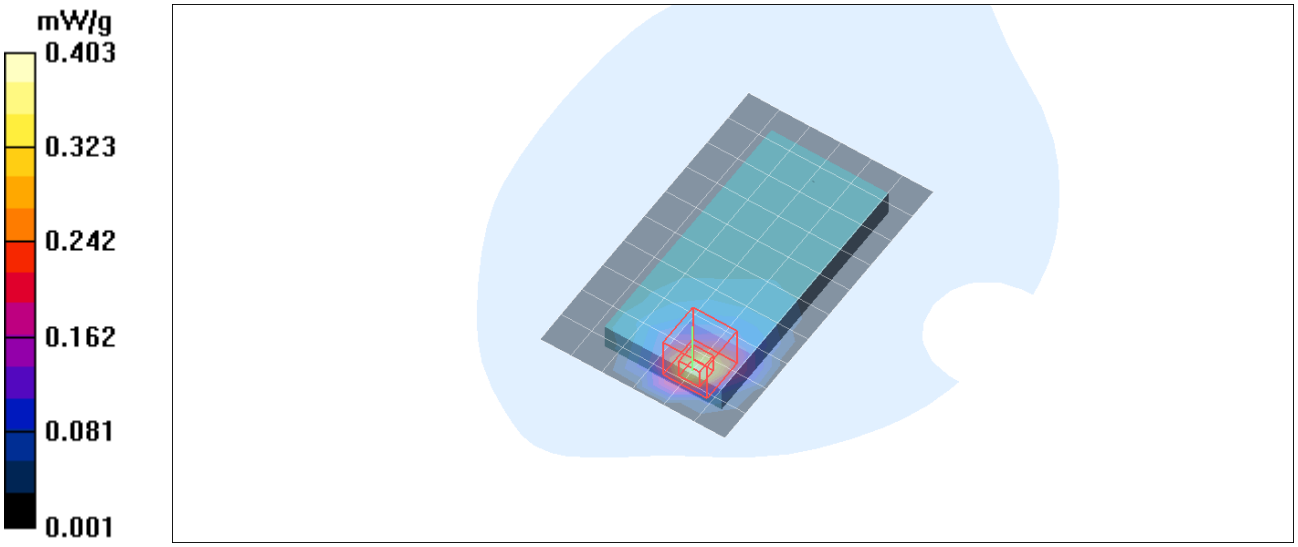
## RMC30D1 Flat phantom 0mm distance LCD Rear Side CH11 b mode 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.67 V/m; Power Drift = 0.162 dB

Peak SAR (extrapolated) = 0.621 W/kg

**SAR(1 g) = 0.279 mW/g; SAR(10 g) = 0.127 mW/g**

Maximum value of SAR (measured) = 0.403 mW/g



## 13. Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Industry Canada, with respect to all parameters subject to this test. The results and statements relate only to the item(s) tested.

## 14. SAR Test Equipment

**Table 14.1 Test Equipment Calibration**

| Description | Model | Serial No. | Calibration Date | Calibration Interval |
|---|---|---|---|---|
| Staubli Robot Unit | RX60L | F05/51E1A1/A/01 | N/A | N/A |
| Data Acquisition Electronics | DAE4 | 672 | Feb.18. 2010 | 1 year |
| E-Field Probe | EX3DV4 | 3682 | May.26. 2010 | 1 year |
| Electro-Optical Converter | EOC3 | 398 | N/A | N/A |
| SAM Twin Phantom V4.0C | TP-1358 | SM 00 T02 DA | N/A | N/A |
| Validation Dipole Antenna | D2450V2 | 774 | May.27. 2010 | 2 year |
| Dual Directional Coupler | 11692D | 1212A02175 | Oct.12.2010 | 1 year |
| PSA Series Spectrum Analyzer | E4440A | MY44303257 | Jul.20.2010 | 1 year |
| PSA Series Spectrum Analyzer | E4440A | MY44022567 | Jun.03.2010 | 1 year |
| Dielectric Probe Kit | 85070E | MY44300121 | N/A | N/A |
| Network Analyzer | 8753ES | US39171172 | Feb.03. 2010 | 1 year |
| Power Amplifier | 5303075 | 509/0743 | Nov.11.2010 | 1 year |
| Power Meter | 437B | 2912U01687 | Nov.11.2010 | 1 year |
| Power Sensor | 8481A | 3318A83210 | Jul.20.2010 | 1 year |
| Power Meter | ML2437A | 97310060 | Feb.10. 2010 | 1 year |
| Power Sensor | MA2474A | 3455 | Feb.10. 2010 | 1 year |
| Series Signal Generator | E4438C | US45092564 | Feb.03. 2010 | 1 year |
| Series Signal Generator | E4436B | US39260598 | May.10. 2010 | 1 year |

Note:

*The E-field probe was calibrated by SPEAG, by waveguide technique procedure. Dipole Validation Measurement is performed by Nemkokorea Lab. before each test. The brain and body simulating material were calibrated by Nemkokorea using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain and body equivalent material.*

## 15. References

[1] IEEE 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques, December 2003

[2] IEC 62209-1, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz), Feb. 2005.

[3] IEC 62209 - 1, “Specific Absorption Rate (SAR) in the frequency range of 300 MHz to 3 GHz

[4] FCC Application Note for SAR Probe Calibration and System Verification Consideration for Measurement at 150MHz ~3GHz, KDB 450824

[5] OET Bulletin 65, Supplement C, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, Edition 01-01

[6] ANSI-PC63.19-2001, Draft 3.6, “American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids”, April 2005

[7] SAR Measurement procedures for IEEE802.11 A/B/G/ KDB 248227

[8] Industry Canada RSS-102 Radio Frequecy Exposure compliance of Radiocommunication Apparature (All Frequency Bands) Issue 4, March 2010.

## Appendix A

### SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (*dU*) absorbed by (dissipated in ) an incremental mass (*dm*) contained in a volume element (*dV*) of a given density (*p*). It is also defined as the rate of RF energy absorption pet unit mass at a point in an absorbing body (see Fig. A.1).

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{pdv}\right)$$

**Figure A.1 SAR Mathematical Equation**

**SAR is expressed in units of Watts per Kilogram (W/kg).**

$$SAR = \sigma E^2 / p$$

**Where :**

σ = conductivity of the tissue-simulant material (S/m)
*p* = mass density of the tissue-simulant material (kg/m3)
*E* = Total RMS electric field strength (V/m)

Note:
The primary factors that control rate or 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.

## Appendix B : Probe Calibration

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
**Zeughausstrasse 43, 8004 Zurich, Switzerland**

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

Accreditation No.: **SCS 108**

Client **Nemko (Dymstec)** Certificate No: **EX3-3682_May10**

# CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3682

Calibration procedure(s): QA CAL-01.v6, QA CAL-23.v3 and QA CAL-25.v2
Calibration procedure for dosimetric E-field probes

Calibration date: May 26, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 1-Apr-10 (No. 217-01136) | Apr-11 |
| Power sensor E4412A | MY41495277 | 1-Apr-10 (No. 217-01136) | Apr-11 |
| Power sensor E4412A | MY41498087 | 1-Apr-10 (No. 217-01136) | Apr-11 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 30-Mar-10 (No. 217-01159) | Mar-11 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 30-Mar-10 (No. 217-01161) | Mar-11 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 30-Mar-10 (No. 217-01160) | Mar-11 |
| Reference Probe ES3DV2 | SN: 3013 | 30-Dec-09 (No. ES3-3013_Dec09) | Dec-10 |
| DAE4 | SN: 660 | 20-Apr-10 (No. DAE4-660_Apr10) | Apr-11 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (in house check Oct-09) | In house check: Oct-11 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (in house check Oct-09) | In house check: Oct10 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Claudio Leubler | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: May 26, 2010

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

Certificate No: EX3-3682_May10 Page 1 of 11

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Accreditation No.: SCS 108

## Glossary:

| | |
|---|---|
| TSL | tissue simulating liquid |
| NORMx,y,z | sensitivity in free space |
| ConvF | sensitivity in TSL / NORMx,y,z |
| DCP | diode compression point |
| CF | crest factor (1/duty_cycle) of the RF signal |
| A, B, C | modulation dependent linearization parameters |
| Polarization φ | φ rotation around probe axis |
| Polarization ϑ | ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis |

## Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

## Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the $E^2$-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

# Probe EX3DV4

## SN:3682

| | |
|---|---|
| Manufactured: | September 24, 2008 |
| Last calibrated: | September 30, 2008 |
| Recalibrated: | May 26, 2010 |

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

EX3DV4 SN:3682 May 26, 2010

# DASY/EASY - Parameters of Probe: EX3DV4 SN:3682

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|---|---|---|---|
| Norm ($\mu$V/(V/m)$^2$)[A] | 0.49 | 0.49 | 0.64 | ± 10.1% |
| DCP (mV)[B] | 100.5 | 86.8 | 89.5 | |

## Modulation Calibration Parameters

| UID | Communication System Name | PAR | | A dB | B dBuV | C | VR mV | Unc[E] (k=2) |
|---|---|---|---|---|---|---|---|---|
| 10000 | CW | 0.00 | X | 0.00 | 0.00 | 1.00 | 300 | ± 1.5% |
| | | | Y | 0.00 | 0.00 | 1.00 | 300 | |
| | | | Z | 0.00 | 0.00 | 1.00 | 300 | |

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

[A] The uncertainties of NormX,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Pages 5 and 6).

[B] Numerical linearization parameter: uncertainty not required.

[E] Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

EX3DV4 SN:3682 May 26, 2010

# DASY/EASY - Parameters of Probe: EX3DV4 SN:3682

## Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz] | Validity [MHz][C] | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---|---|---|---|---|---|---|---|---|
| 835 | ± 50 / ± 100 | 41.5 ± 5% | 0.90 ± 5% | 9.47 | 9.47 | 9.47 | 0.72 | 0.65 ± 11.0% |
| 1750 | ± 50 / ± 100 | 40.1 ± 5% | 1.37 ± 5% | 8.36 | 8.36 | 8.36 | 0.71 | 0.61 ± 11.0% |
| 1900 | ± 50 / ± 100 | 40.0 ± 5% | 1.40 ± 5% | 8.14 | 8.14 | 8.14 | 0.59 | 0.68 ± 11.0% |
| 2450 | ± 50 / ± 100 | 39.2 ± 5% | 1.80 ± 5% | 7.25 | 7.25 | 7.25 | 0.48 | 0.74 ± 11.0% |

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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EX3DV4 SN:3682 May 26, 2010

# DASY/EASY - Parameters of Probe: EX3DV4 SN:3682

## Calibration Parameter Determined in Body Tissue Simulating Media

| f [MHz] | Validity [MHz][C] | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth | Unc (k=2) |
|---|---|---|---|---|---|---|---|---|---|
| 835 | ± 50 / ± 100 | 55.2 ± 5% | 0.97 ± 5% | 9.61 | 9.61 | 9.61 | 0.61 | 0.68 | ± 11.0% |
| 1750 | ± 50 / ± 100 | 53.4 ± 5% | 1.49 ± 5% | 7.95 | 7.95 | 7.95 | 0.71 | 0.62 | ± 11.0% |
| 1900 | ± 50 / ± 100 | 53.3 ± 5% | 1.52 ± 5% | 7.65 | 7.65 | 7.65 | 0.61 | 0.67 | ± 11.0% |
| 2450 | ± 50 / ± 100 | 52.7 ± 5% | 1.95 ± 5% | 7.49 | 7.49 | 7.49 | 0.58 | 0.65 | ± 11.0% |
| 2600 | ± 50 / ± 100 | 52.5 ± 5% | 2.16 ± 5% | 7.48 | 7.48 | 7.48 | 0.42 | 0.79 | ± 11.0% |

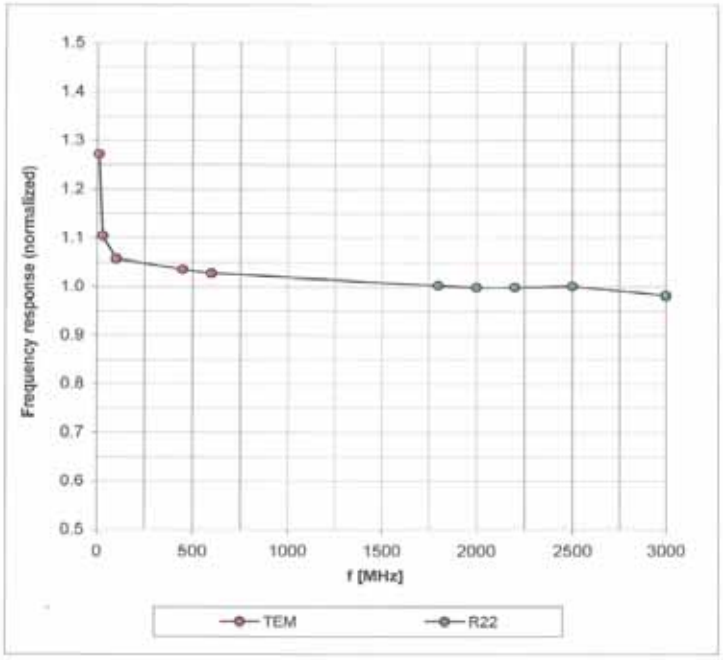
[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Certificate No: EX3-3682_May10 Page 6 of 11

EX3DV4 SN:3682 May 26, 2010

## Frequency Response of E-Field

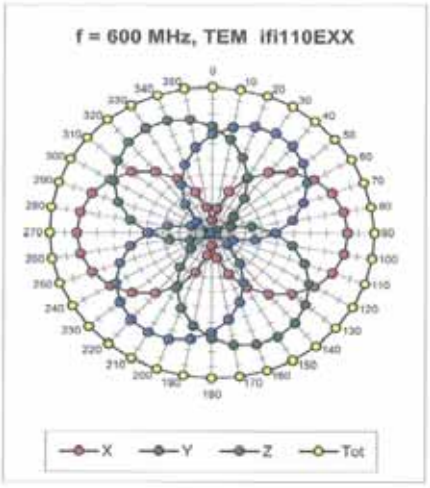
(TEM-Cell:ifi110 EXX, Waveguide: R22)

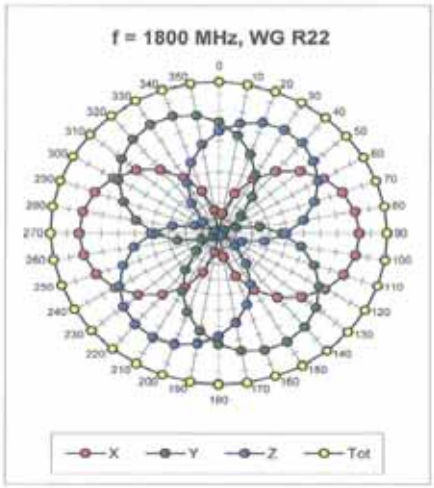


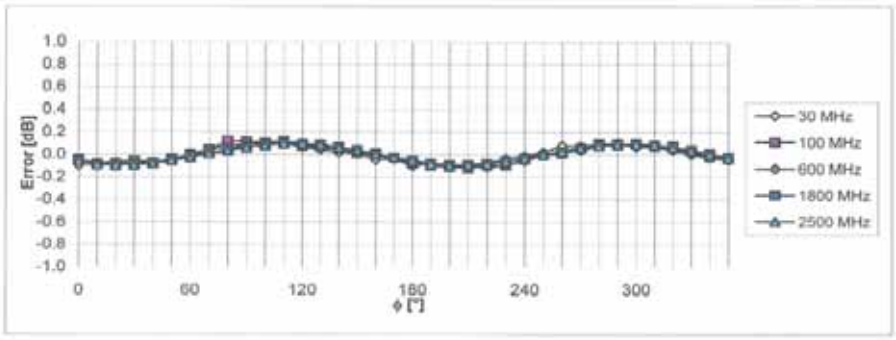

Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

EX3DV4 SN:3682 May 26, 2010

## Receiving Pattern ($\phi$), $\vartheta$ = 0°




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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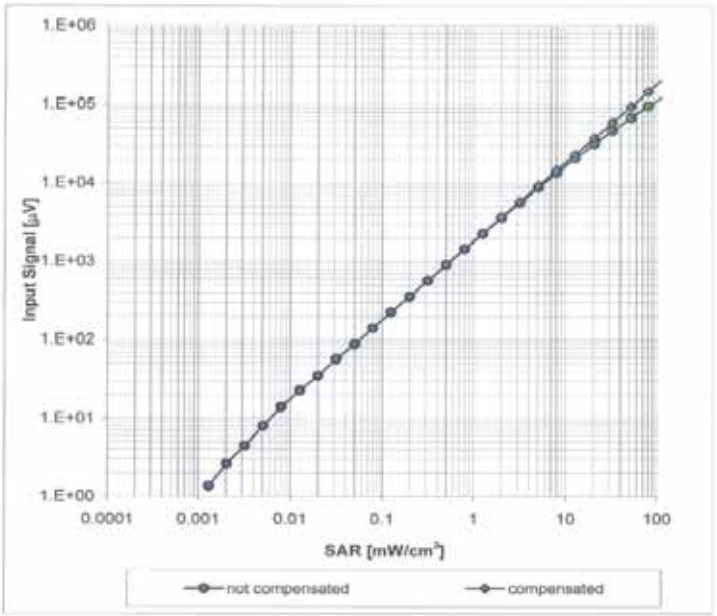
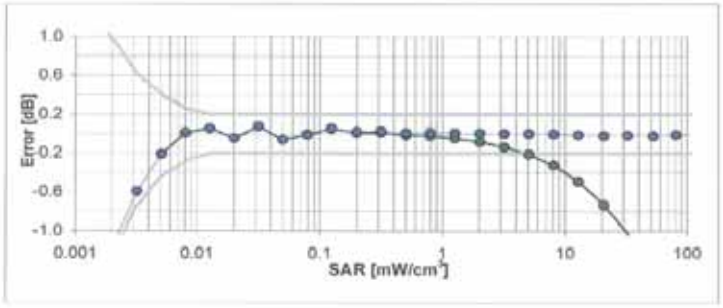
EX3DV4 SN:3682 May 26, 2010

## Dynamic Range f($SAR_{head}$)

(Waveguide R22, f = 1800 MHz)




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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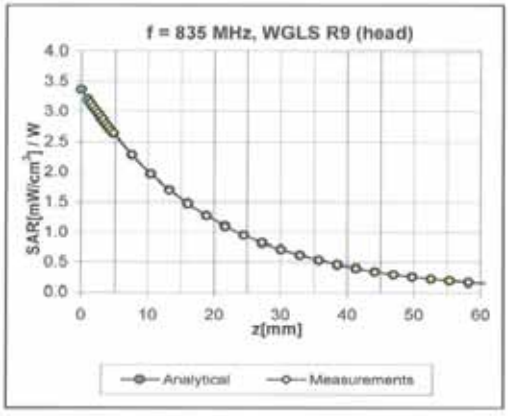
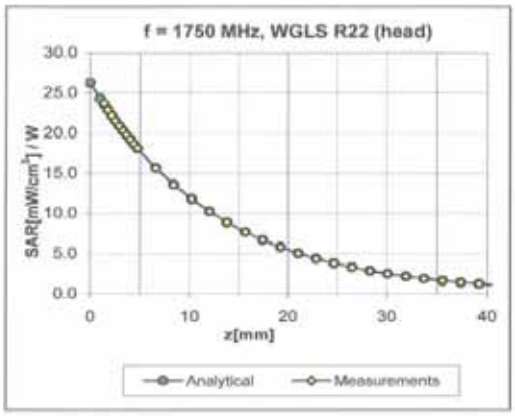
EX3DV4 SN:3682 May 26, 2010

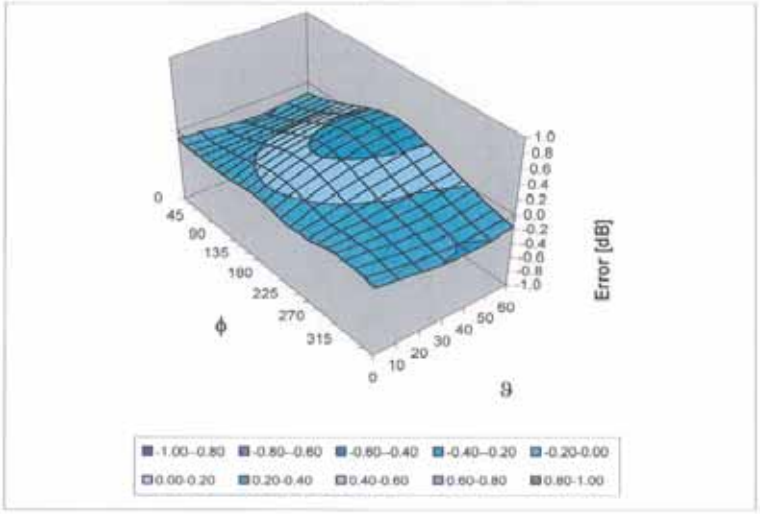
## Conversion Factor Assessment




## Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz




Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

EX3DV4 SN:3682 May 26, 2010

## Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | Not applicable |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 9 mm |
| Tip Diameter | 2.5 mm |
| Probe Tip to Sensor X Calibration Point | 1 mm |
| Probe Tip to Sensor Y Calibration Point | 1 mm |
| Probe Tip to Sensor Z Calibration Point | 1 mm |
| Recommended Measurement Distance from Surface | 2 mm |

Certificate No: EX3-3682_May10 Page 11 of 11

## Appendix C : Dipole Calibrations

Calibration Laboratory of
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Accreditation No.: SCS 108

Client: Nemko (Dymstec)

Certificate No: D2450V2-774_May10

# CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 774

Calibration procedure(s): QA CAL-05.v7
Calibration procedure for dipole validation kits

Calibration date: May 27, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 06-Oct-09 (No. 217-01086) | Oct-10 |
| Power sensor HP 8481A | US37292783 | 06-Oct-09 (No. 217-01086) | Oct-10 |
| Reference 20 dB Attenuator | SN: 5086 (20g) | 30-Mar-10 (No. 217-01158) | Mar-11 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 30-Mar-10 (No. 217-01162) | Mar-11 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Apr-10 (No. ES3-3205_Apr10) | Apr-11 |
| DAE4 | SN: 601 | 02-Mar-10 (No. DAE4-601_Mar10) | Mar-11 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (in house check Oct-09) | In house check: Oct-11 |
| RF generator R&S SMT-06 | 100005 | 4-Aug-99 (in house check Oct-09) | In house check: Oct-11 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-09) | In house check: Oct-10 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Dimce Iliev | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: May 27, 2010

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Certificate No: D2450V2-774_May10 Page 1 of 9

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Accreditation No.: SCS 108

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V5.2 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom V4.9 | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 2450 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 39.2 | 1.80 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 39.0 ± 6 % | 1.76 mho/m ± 6 % |
| **Head TSL temperature during test** | (21.5 ± 0.2) °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 12.9 mW / g |
| SAR normalized | normalized to 1W | 51.6 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **52.1 mW /g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.07 mW / g |
| SAR normalized | normalized to 1W | 24.3 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.3 mW /g ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 52.7 | 1.95 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 53.6 ± 6 % | 1.97 mho/m ± 6 % |
| **Body TSL temperature during test** | (21.7 ± 0.2) °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.5 mW / g |
| SAR normalized | normalized to 1W | 54.0 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **53.9 mW / g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.36 mW / g |
| SAR normalized | normalized to 1W | 25.4 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **25.4 mW / g ± 16.5 % (k=2)** |

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 54.9 Ω + 2.8 jΩ |
| Return Loss | - 25.4 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 50.7 Ω + 4.0 jΩ |
| Return Loss | - 28.0 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.152 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | January 20, 2005 |

**DASY5 Validation Report for Head TSL**

Date/Time: 25.05.2010 15:15:23

Test Laboratory: SPEAG, Zurich, Switzerland

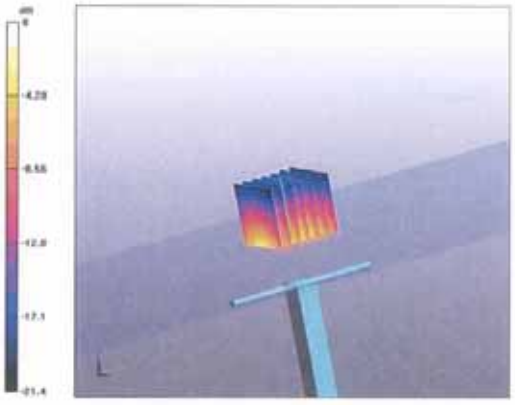
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:774**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.76 mho/m; $\varepsilon_r$ = 39; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

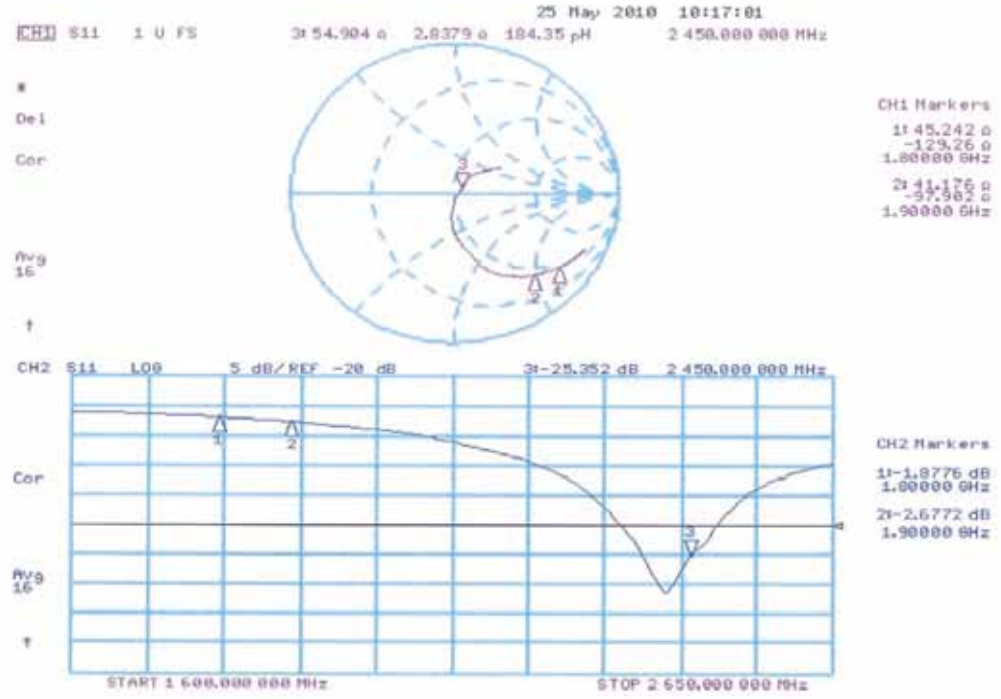
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

**Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.6 V/m; Power Drift = 0.039 dB
Peak SAR (extrapolated) = 26.4 W/kg
**SAR(1 g) = 12.9 mW/g; SAR(10 g) = 6.07 mW/g**
Maximum value of SAR (measured) = 16.9 mW/g



0 dB = 16.9mW/g

## Impedance Measurement Plot for Head TSL



**DASY5 Validation Report for Body**

Date/Time: 27.05.2010 10:33:49

Test Laboratory: SPEAG, Zurich, Switzerland

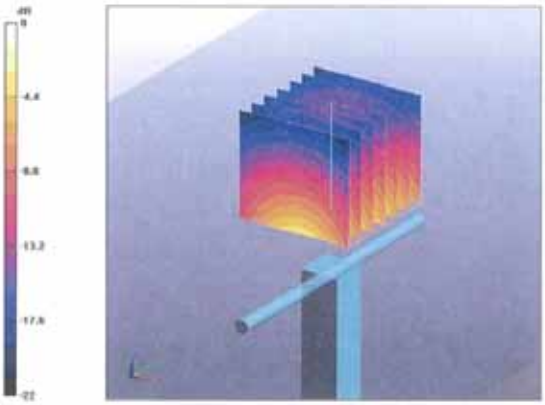
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:774**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U11 BB
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.97 mho/m; $\varepsilon_r$ = 53.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

**Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97 V/m; Power Drift = -0.031 dB
Peak SAR (extrapolated) = 27.5 W/kg
**SAR(1 g) = 13.5 mW/g; SAR(10 g) = 6.36 mW/g**
Maximum value of SAR (measured) = 17.5 mW/g



0 dB = 17.5mW/g

**Impedance Measurement Plot for Body TSL**