# SAR EVALUATION REPORT

## Report No. : 24DE0125-HO-5

| | | |
|---|---|---|
| **Applicant** | : | **DENSO WAVE INCORPORATED** |
| **Type of Equipment** | : | **Wireless LAN adapter** |
| **Model No.** | : | **KCS** |
| **FCC ID** | : | **PZWKCS** |
| **Test standard** | : | **FCC47CFR 2.1093**<br>**FCC OET Bulletin 65, Supplement C** |
| **Test Result** | : | **Complied** |
| **Max SAR Measured** | : | **0.266W/kg( Body, 2412MHz )** |

1. This test report shall not be reproduced except full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the SAR profile.
4. The test results in this test report are traceable to the national or international standards.

**Date of test** : November 28, 2003

**Tested by** : M. Ikuta

Miyo Ikuta
Head Office EMC Lab.

**Approved by** : T. Maeno

Tetsuo Maeno
Site Manager of Head Office EMC Lab.

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## SECTION 1 : Client information

| | | |
|---|---|---|
| Company Name | : | DENSO WAVE INCORPORATED |
| Brand Name | : | DENSO |
| Address | : | 1-1, Showa-cho, Kariya-shi, Aichi-ken 448-8661, Japan |
| Telephone Number | : | 81-566-61-3858 |
| Facsimile Number | : | 81-566-25-4741 |
| Contact Person | : | Noritaka Hirao |

## SECTION 2 : Equipment under test (Wireless LAN adapter)

### 2.1 Identification of Wireless LAN adapter

| | | |
|---|---|---|
| APPLICANT | : | DENSO WAVE INCORPORATED |
| Type of Equipment | : | Wireless LAN adapter |
| Model No. | : | KCS |
| Serial No. | : | K03633100001C01 |
| Country of Manufacture | : | Taiwan |
| Receipt Date of Sample | : | November 20,2003 |
| Condition of EUT | : | Production model |
| Category Identified | : | Portable device |

### 2.2 Product description of Wireless LAN adapter

| | | |
|---|---|---|
| Tx Frequency | : | 2412MHz~2462MHz |
| Modulation | : | DSSS |
| Rating | : | DC3.3 - 3.5V |
| Max.Output Power Tested | : | 15.75 dBm Peak Conducted |
| Antenna Type | : | Chip Antenna:YOKOWO YCE-5208DN |

## SECTION 3 : Requirements for compliance testing defined by the FCC

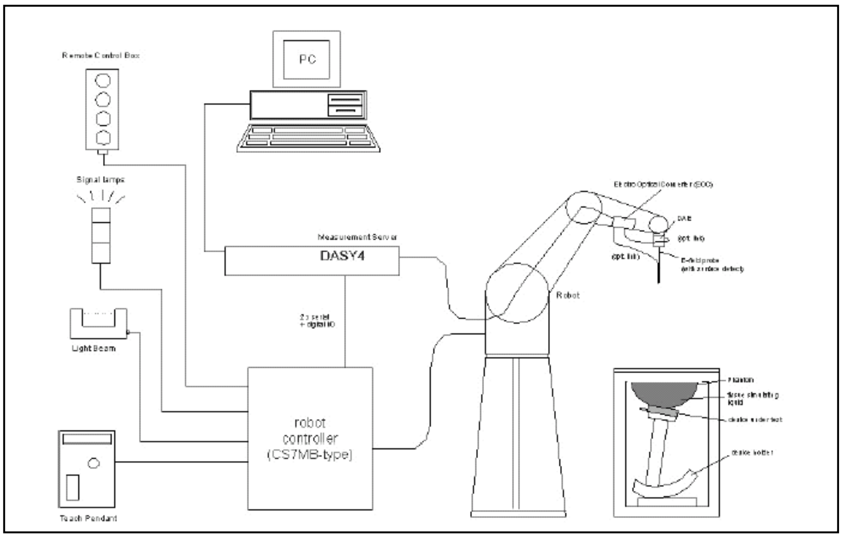
The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

**1** Specific Absorption Rate (SAR) is a measure of the rate of energy absorption due to exposure to an RF transmitting source (wireless portable device).
**2** IEEE/ANSI Std. C95.1-1992 limits are used to determine compliance with FCC ET Docket 93-62.

## SECTION 4 : Dosimetry assessment setup

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than +/- 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetry probe ET3DV6, SN: 1685 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [2] with accuracy of better than +/-10%. The spherical isotropy was evaluated with the procedure described in [3] and found to be better than +/-0.25 dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEE P1528 and CENELEC EN50361.

## 4.1 Configuration and peripherals




The DASY4 system for performing compliance tests consist of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
   An arm extension for accommodating the data acquisition electronics (DAE).

2. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

3. A data acquisition electronic (DAE), which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

4. The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection.
   The EOC is connected to the measurement server.

5. The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.

6. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.

7. A computer operating Windows 2000.

8. DASY4 software.

9. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

10. The SAM twin phantom enabling testing left-hand and right-hand usage.

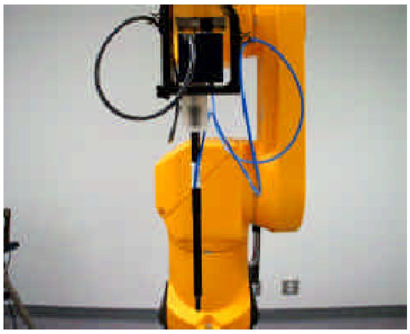
11. The device holder for handheld mobile phones.

12. Tissue simulating liquid mixed according to the given recipes.

13. Validation dipole kits allowing to validate the proper functioning of the system.

## 4.2 System components

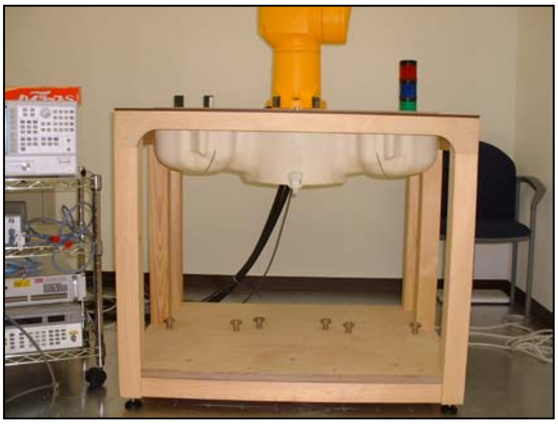
### 4.2.1 ET3DV6 Probe Specification



**Construction:**
Symmetrical design with triangular core
Built-in optical fiber for surface detection System
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)
**Calibration:**
Basic Broad Band calibration in air from 10 MHz to 2.5 GHz
In brain and muscle simulating tissue at
Frequencies of 450 MHz, 900 MHz, 1.8 GHz and 2.45GHz (accuracy +/-8%)
**Frequency:**
10 MHz to 3GHz; Linearity: +/-0.2 dB
(30 MHz to 3 GHz)
**Directivity:**
+/-0.2 dB in brain tissue (rotation around probe axis)
+/-0.4 dB in brain tissue (rotation normal probe axis)
**Dynamic Range:**
5 mW/g to > 100 mW/g;Linearity: +/-0.2 dB
**Optical Surface Detection:**
+/-0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces.
**Dimensions:**
Overall length: 330 mm (Tip: 16 mm)
Tip length: 16 mm
Body diameter: 12 mm (Body: 12 mm)
Tip diameter: 6.8 mm
Distance from probe tip to dipole centers: 2.7 mm
**Application:**
General dosimetric up to 3 GHz
Compliance tests of mobile phones
Fast automatic scanning in arbitrary phantoms

**Inside view of ET3DV6 E-field Probe**

### 4.2.2 SAM Phantom



SAM Phantom

**Construction:**
The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209.
It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.
**Shell Thickness:**
2 +/-0.2 mm
**Filling Volume:**
Approx. 25 liters
**Dimensions:**
(H x L x W): 810 x 1000 x 500 mm

### 4.2.3 Device Holder for Transmitters

Device Holder

In combination with the SAM Twin Phantom V4.0, the Mounting Device enables the rotation of the mounted transmitter
in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head,flat phantom).
* Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations.
To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Device holder couldn't be used at this SAR measurement.

## SECTION 5 : Test system specifications

**Robot RX60L**

| | | |
|---|---|---|
| **Number of Axes** | : | 6 |
| **Payload** | : | 1.6 kg |
| **Reach** | : | 800mm |
| **Repeatability** | : | +/-0.025mm |
| **Control Unit** | : | CS7M |
| **Programming Language** | : | V+ |
| **Manuafacture** | : | Stäubli Unimation Corp. Robot Model: RX60 |

**DASY4 Measurement sever**

| | | |
|---|---|---|
| **Features** | : | 166MHz low power Pentium MMX<br>32MB chipdisk and 64MB RAM Serial link to DAE (with watchdog supervision)<br>16 Bit A/D converter for surface detection system<br>Two serial links to robot (one for real-time communication which is supervised by watchdog)<br>Ethernet link to PC (with watchdog supervision)<br>Emergency stop relay for robot safety chainTwo expansion slots for future applications |
| **Manufacture** | : | Schimid & Partner Engineering AG |

**Data Acquisition Electronic (DAE)**

| | | |
|---|---|---|
| **Features** | : | Signal amplifier, multiplexer, A/D converter and control logic<br>Serial optical link for communication with DASY4 embedded system (fully remote controlled) 2 step probe touch detector for mechanical surface detection and emergency robot stop (not in -R version) |
| **Measurement Range** | : | 1 μV to > 200 mV (16 bit resolution and two range settings: 4mV, 400mV) |
| **Input Offset voltage** | : | < 1 μV (with auto zero) |
| **Input Resistance** | : | 200 MΩ |
| **Battery Power** | : | > 10 h of operation (with two 9 V accus) |
| **Dimension** | : | 60 x 60 x 68 mm |
| **Manufacture** | : | Schimid & Partner Engineering AG |

**Software**

| | | |
|---|---|---|
| **Item** | : | Dosimetric Assesment System DASY4 |
| **Type No.** | : | SD 000 401A, SD 000 402A |
| **Software version No.** | : | 4.1 |
| **Manufacture / Origin** | : | Schimid & Partner Engineering AG |

**E-Field Probe**

| | | |
|---|---|---|
| **Model** | : | ET3DV6 |
| **Serial No.** | : | 1685 |
| **Construction** | : | Triangular core fiber optic detection system |
| **Frequency** | : | 10 MHz to 6 GHz |
| **Linearity** | : | +/-0.2 dB (30 MHz to 3 GHz) |
| **Manufacture** | : | Schimid & Partner Engineering AG |

**Phantom**

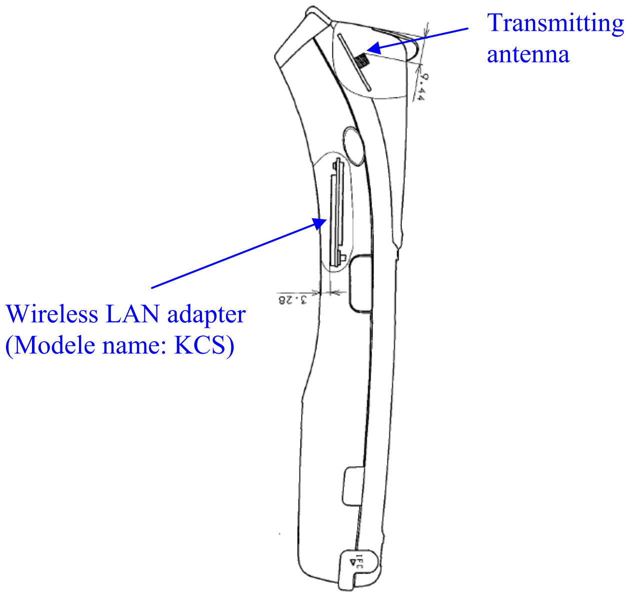
| | | |
|---|---|---|
| **Type** | : | SAM Twin Phantom V4.0 |
| **Shell Material** | : | Fiberglass |
| **Thickness** | : | 2.0 +/-0.2 mm |
| **Volume** | : | Approx. 20 liters |
| **Manufacture** | : | Schimid & Partner Engineering AG |

## SECTION 6 : Measurement outline

This EUT was manufactured by DENSO and will be inserted into only Bar-code Handy Terminal which was manufactured by DENSO.
The detail of host device that we used for SAR testing is shown in the following.

### 6.1 Information of PC

| | | |
|---|---|---|
| Type of Equipment | : | Bar-code Handy Terminal |
| Model No. | : | BHT-7500W |
| Serial No. | : | None |
| Manufacture | : | DENSO CORPORATION |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## SECTION 7 : Test setup of EUT

### 7.1 Photographs of test setup

We tested the Bar-code Handy Terminal (Model No.: BHT-7500W) with which this EUT was inserted.
When users operate or carry the Bar-code Handy Terminal, it could be considered to touch or get close to their bodies. In order to assume this situation, we performed the test at the following positions. Please refer to "APPENDIX 1" for more details.

1.Front : The test was performed in touch with front surface of Bar-code Handy Terminal to the flat phantom.

2.Back : The test was performed in touch with back surface of Bar-code Handy Terminal to the flat phantom.

3.Right Side : The test was performed in touch with right side of Bar-code Handy Terminal to the flat phantom.

4.Left Side : The test was performed in touch with left side of Bar-code Handy Terminal to the flat phantom.

5.Top : The test was performed in touch and distanced 5mm ,10mm and 15mm with top of Bar-code Handy Terminal to the flat phantom.

**1. Front**


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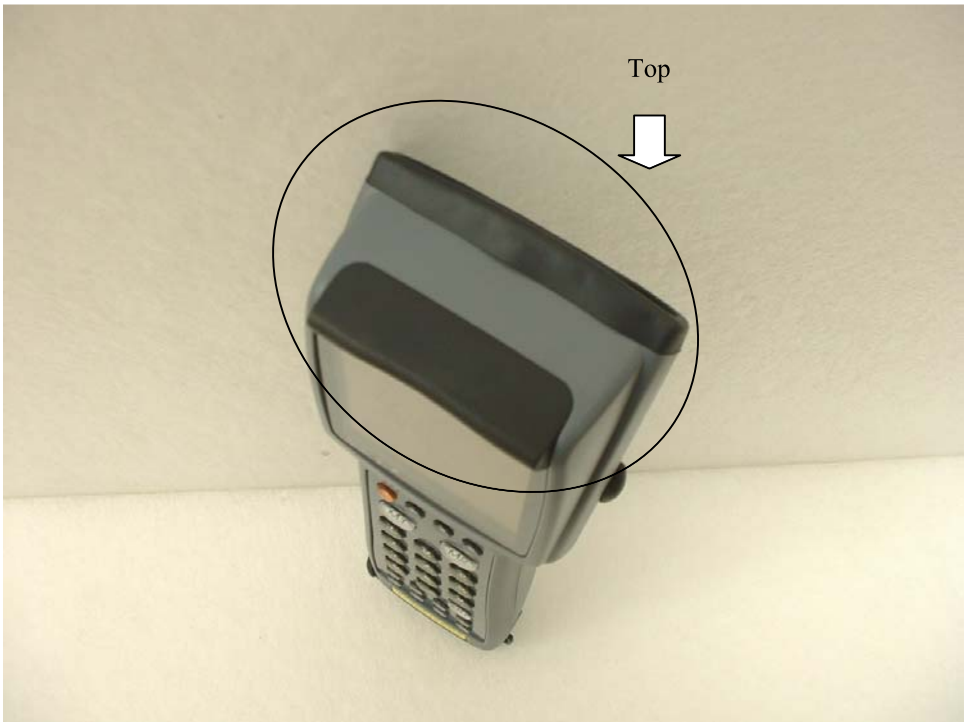
**2. Back**


**3. Right Side**

4. **Left Side**


5. **Top**



## 7.2 EUT Tune-up procedure

We determined following conditions ;

Transmitter was continuous mode.
Crest Factor = 1
Frequency channel were low , middle and high (2412MHz ,2437MHz and 2462MHz)

## 7.3 Distance between Bar-code Handy Terminal and Phantom

The position for the highest SAR value of this EUT was at ”Top” position.
The measurement was performed with the distance, 5mm, 10mm, and 15mm to check if the distance 0mm may not have the worst value. As a result, the distance 0mm had the worst value.

## SECTION 8: Measurement uncertainty

The uncertainty budget has been determined for the DASY4 measurement system according to the NIS81 [13] and the NIST1297 [6] documents and is given in the following Table.

| Error Description | Uncertainty value ± % | Probability distribution | divisor | (ci)1 1g | Standard Uncertainty (1g) | vi or veff |
|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | |
| Probe calibration | ±4.8 | Normal | 1 | 1 | ±4.8 | ∞ |
| Axial isotropy of the probe | ±4.7 | Rectangular | √3 | $(1-c_p)^{1/2}$ | ±1.9 | ∞ |
| Spherical isotropy of the probe | ±9.6 | Rectangular | √3 | $(c_p)^{1/2}$ | ±3.9 | ∞ |
| Boundary effects | ±1.0 | Rectangular | √3 | 1 | ±0.6 | ∞ |
| Probe linearity | ±4.7 | Rectangular | √3 | 1 | ±2.7 | ∞ |
| Detection limit | ±1.0 | Rectangular | √3 | 1 | ±0.6 | ∞ |
| Readout electronics | ±1.0 | Normal | 1 | 1 | ±1.0 | ∞ |
| Response time | ±0.8 | Rectangular | √3 | 1 | ±0.5 | ∞ |
| Integration time | ±2.6 | Rectangular | √3 | 1 | ±1.5 | ∞ |
| RF ambient conditions | ±3.0 | Rectangular | √3 | 1 | ±1.7 | ∞ |
| Mech. constraints of robot | ±0.4 | Rectangular | √3 | 1 | ±0.2 | ∞ |
| Probe positioning | ±2.9 | Rectangular | √3 | 1 | ±1.7 | ∞ |
| Extrap. and integration | ±1.0 | Rectangular | √3 | 1 | ±0.6 | ∞ |
| **Test Sample Related** | | | | | | |
| Device positioning | ±2.9 | Rectangular | √3 | 1 | ±2.9 | 6 |
| Device holder uncertainty | ±3.6 | Rectangular | √3 | 1 | ±3.6 | 4 |
| Power drift | ±5.0 | Rectangular | √3 | 1 | ±2.9 | ∞ |
| **Phantom and Setup** | | | | | | |
| Phantom uncertainty | ±4.0 | Rectangular | √3 | 1 | ±2.3 | ∞ |
| Liquid conductivity (target) | ±5.0 | Rectangular | √3 | 0.64 | ±1.8 | ∞ |
| Liquid conductivity (meas.) | ±5.0 | Rectangular | √3 | 0.64 | ±3.7 | ∞ |
| Liquid permittivity (target) | ±10.0 | Rectangular | √3 | 0.6 | ±3.5 | ∞ |
| Liquid permittivity (meas.) | ±10.0 | Rectangular | √3 | 0.6 | ±1.7 | ∞ |
| | | | | | | |
| **Combined Standard Uncertainty** | | | | | **±11.26** | |
| **Expanded Uncertainty (k=2)** | | | | | **±22.5** | |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# SECTION 9 : Simulated tissue liquid parameter

## 8.1 Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement are reported in each correspondent section.

### 8.1.1 Head 2450MHz

Type of liquid : **Head 2450 MHz**
Ambient temperature (deg.c.) : **24.5**
Relative Humidity (%) : **48**
Lquid depth (cm) : **15.9**

Date : November 28,2003
Measured By : Miyo Ikuta

| DIELECTRIC PARAMETERS MEASUREMENT RESULTS | | | | | | |
|---|---|---|---|---|---|---|
| Liquid Temp [deg.c] | | Parameters | Target Value | Measured | Deviation [%] | Limit [%] |
| Before | After | | | | | |
| 23.2 | 23.2 | Relative Permittivity εr | 39.2 | 35.9 | -8.4 | +/-10 |
| | | Coductivity σ [mho/m] | 1.80 | 1.87 | 3.9 | +/-5 |

### 8.1.2 Muscle 2450MHz

Type of liquid : **Muscle 2450 MHz**
Ambient temperature (deg.c.) : **24.5**
Relative Humidity (%) : **41**
Liquid depth (cm) : **15.6**

Date : November 28,2003
Measured By : Miyo Ikuta

| DIELECTRIC PARAMETERS MEASUREMENT RESULTS | | | | | | |
|---|---|---|---|---|---|---|
| Liquid Temp [deg.c] | | Parameters | Target Value | Measured | Deviation [%] | Limit [%] |
| Before | After | | | | | |
| 23.0 | 23.0 | Relative Permittivity εr | 52.7 | 50.2 | -4.7 | +/-10 |
| | | Coductivity σ [mho/m] | 1.95 | 1.93 | -1.0 | +/-5 |

## 8.2 Simulated Tissues

| Ingredient | MiXTURE(%) | |
|---|---|---|
| | Head 2450MHz | Muscle 2450MHz |
| Water | 45.0 | 69.83 |
| DGMBE | 55.0 | 30.17 |

Note:DGMBE(Diethylenglycol-monobuthyl ether)

## SECTION 10 : System validation data

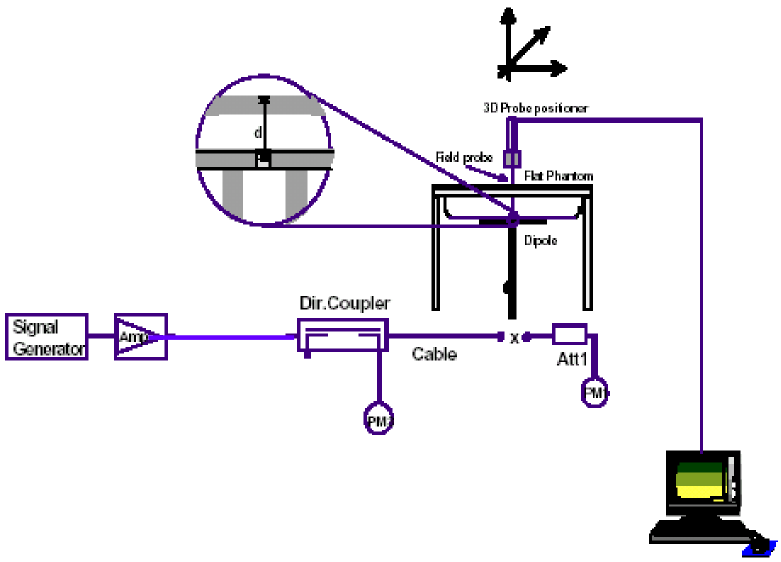
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are tabulated below. Please refer to APPENDIX 3.

| | | |
|---|---|---|
| Type of liquid | : | **HEAD 2450MHz** |
| Frequency | : | **2450MHz** |
| Liquid depth (cm) | : | **15.9** |
| Ambient temperature (deg.c.) | : | **24.5** |
| Relative Humidity (%) | : | **48** |
| Dipole | : | **D2450V2 SN:713** |
| Power | : | **250mW** |

Date : November 28,2003
Measured By : Miyo Ikuta

| SYSTEM PERFORMANCE CHECK | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Liquid (HEAD 2450MHz) | | | | | | System dipole validation target & measured | | | |
| Liquid Temp [deg.c.] | | Relative Permittivity εr | | Conductivity σ [mho/m] | | SAR 1g [W/kg] | | Deviation [%] | Limit [%] |
| Before | After | Target | Measured | Target | Measured | Target | Measured | | |
| 23.2 | 23.2 | 39.2 | 35.9 | 1.80 | 1.87 | 13.1 | 13.5 | 3.1 | +/-10 |

Note: Please refer to Attachment for the result representation in plot format




**2450MHz System performance check setup**

**Test system for the system performance check setup diagram**

## SECTION 11 : Evaluation procedure

**The evaluation was performed with the following procedure:**

**Step 1:** Measurement of the SAR value at a fixed location above the ear point or central position of flat phantom was used as a reference value for assessing the power drop.

**Step 2:** The SAR distribution at the exposed side of head or body position was measured at a distance of each device from the inner surface of the shell. The area covered the entire dimension of the EUT(180 x 260) and the horizontal grid spacing was 20 mm x 20 mm. Based on these data, the area of the maximum absorption was determined by spline interpolation.

**Step 3:** Around this point found in the Step 2 (area scan) , a volume of 32 mm x 32 mm x 30 mm was assessed by measuring 5 x5 x 7 points. And for any secondary peaks found in the Step2 which are within 2dB of maximum peak and not with this Step3 (Zoom scan) is repeated. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm [4]. A polynomial of the fourth order was calculated through the points in z-axes.
This polynomial was then used to evaluate the points between the surface and the probe tip.

2. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot"-condition (in x, y and z-directions) [4], [5]. The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

3. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

**Step 4**: Re-measurement of the SAR value at the same location as in Step 1. It is measured SAR-drift( the difference between the SAR measured in Step 4 and Step 1)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## SECTION 12 : Exposure limit

(A) Limits for Occupational/Controlled Exposure (W/kg)

| Spatial Average (averaged over the whole body) | Spatial Peak (averaged over any 1g of tissue) | Spatial Peak (hands/wrists/feet/ankles averaged over 10g) |
|---|---|---|
| 0.4 | 8.0 | 20.0 |

(B) Limits for General population/Uncontrolled Exposure (W/kg)

| Spatial Average (averaged over the whole body | Spatial Peak (averaged over any 1g of tissue) | Spatial Peak (hands/wrists/feet/ankles averaged over 10g) |
|---|---|---|
| 0.08 | 1.6 | 4.0 |

**Occupational/Controlled Environments:** are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

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

**NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE**
**SPATIAL PEAK(averaged over any 1g of tissue) LIMIT**
**1.6 W/kg**

## SECTION 13 : SAR Measurement results

### 12.1 Conducted power measurement results

Date : November 28,2003
Measured By : Miyo Ikuta

| CONDUCTED POWER MEASUREMENT RESULTS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Before | | | | | After | | | | | Deviation [%] | Limit [%] |
| | Reading [dBm] | Att. [dB] | Cable loss [dB] | Result [dBm] | Convert [mW] | Reading [dBm] | Att. [dB] | Cable loss [dB] | Result [dBm] | Convert [mW] | | |
| 2412 | 3.8 | 10 | 1.95 | 15.75 | 37.6 | 3.7 | 10 | 1.95 | 15.65 | 36.7 | -2.3 | +/-5 |
| 2437 | 3.4 | 10 | 1.95 | 15.35 | 34.3 | 3.2 | 10 | 1.95 | 15.15 | 32.7 | -4.5 | +/-5 |
| 2462 | 3.2 | 10 | 1.95 | 15.15 | 32.7 | 3.2 | 10 | 1.95 | 15.15 | 32.7 | 0.0 | +/-5 |

### 12.2 Body 2450MHz SAR

| | | | |
|---|---|---|---|
| Liquid Depth (cm) | : **15.6** | Model | : **KCS** |
| Parameters | : $\varepsilon_r$ =**50.2**, $\sigma$ =**1.93** | Serial No. | : **K03633100001C01** |
| Ambient Temperature[deg.c.] | : **24.5** | Modulation | : **DSSS** |
| Relative Humidity (%) | : **41** | Crest factor | : **1** |

Date : November 28,2003
Measured By : Miyo Ikuta

| BODY SAR MEASUREMENT RESULTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency | | Phantom Section | EUT Set-up Conditions | | | Liquid Temp.[deg.c] | | SAR(1g) [W/kg] |
| Channel | [MHz] | | Antenna | Position | Separation [mm] | Before | After | Maximum value of multi-peak) |
| Mid | 2437 | Flat | Fixed | Front | 0 | 22.7 | 22.7 | **0.0526** |
| Mid | 2437 | Flat | Fixed | Back | 0 | 22.6 | 22.6 | **0.145** |
| Mid | 2437 | Flat | Fixed | Right Side | 0 | 22.6 | 22.6 | **0.0586** |
| Mid | 2437 | Flat | Fixed | Left Side | 0 | 22.6 | 22.6 | **0.0714** |
| Mid | 2437 | Flat | Fixed | Top | 0 | 22.7 | 22.6 | **0.21** |
| Low | 2412 | Flat | Fixed | Top | 0 | 22.6 | 22.6 | **0.266** |
| High | 2462 | Flat | Fixed | Top | 0 | 22.9 | 22.9 | **0.19** |
| Low | 2412 | Flat | Fixed | Top | 5 | 22.6 | 22.6 | **0.216** |
| Low | 2412 | Flat | Fixed | Top | 10 | 22.6 | 22.6 | **0.118** |
| Low | 2412 | Flat | Fixed | Top | 15 | 22.6 | 22.6 | **0.0635** |
| **ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population** | | | | | | **Body SAR: 1.6 W/kg (averaged over 1 gram)** | | |

* The position of EUT of the highest SAR value is touch to the flat phantom at Top position and 2412MHz.

## SECTION 14 : Equipment & calibration information

| Name of Equipment | Manufacture | Model number | Serial number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Cal | due date |
| Power Meter | Agilent | E4417A | GB41290639 | 2003/11/12 | 2004/11/11 |
| Power Sensor | Agilent | E9327A | US40440544 | 2003/02/21 | 2004/02/20 |
| Power Sensor | Agilent | E9327A | US40440545 | 2003/03/18 | 2004/03/17 |
| S-Parameter Network Analyzer | Agilent | E8358A | US41080381 | 2003/08/13 | 2004/08/12 |
| Signal Generator | Rohde&Schwarz | SML03 | 100331 | 2003/09/11 | 2004/09/10 |
| RF Amplifier | OPHIR | 5056F | 1005 | 2003/02/06 | 2004/02/05 |
| Dosimetric E-Field Probe | Schmid&Partner Engineering AG | ET3DV6 | 1685 | 2003/10/10 | 2004/10/09 |
| Data Acquisition Electronics | Schmid&Partner Engineering AG | DAE3 V1 | 509 | 2003/04/10 | 2004/04/09 |
| Robot,SAM Phantom | Schmid&Partner Engineering AG | DASY4 | I021834 | N/A | N/A |
| Attenuator | HIROSE ELECTRIC CO.,LTD. | AT-120 | 901247 | 2003/02/03 | 2004/02/02 |
| Attenuator | Orient Microwave | BX10-0476-00 | - | 2003/03/31 | 2004/03/30 |
| Microwave Cable | Storm | - | 90-011-080/03-04-001 | 2003/04/30 | 2004/04/29 |
| 2450MHz System Validation Dipole | Schmid&Partner Engineering AG | D2450V2 | 713 | 2002/11/15 | 2004/11/14 |
| Dual Directional Coupler | N/A | Narda | 03702 | N/A | N/A |
| Head 2450MHz | N/A | N/A | N/A | N/A | N/A |
| Body 2450MHz | N/A | N/A | N/A | N/A | N/A |

## SECTION 15 : References

[1]ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
[2] Katja Pokovic, Thomas Schmid, and Niels Kuster, “Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies”, in ICECOM ‘97, Dubrovnik, October 15-17, 1997, pp. 120-124.
[3] Katja Pokovic, Thomas Schmid, and Niels Kuster, “E-_field probe with improved isotropy in brain simulating liquids”, in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp.172-175.
[4] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
[5] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.
[6] Barry N. Taylor and Christ E. Kuyatt, “Guidelines for evaluating and expressing the uncertainty of NIST measurement results”, Tech. Rep., National Institute of Standards and Technology,1994.

# APPENDIX 1 : Photographs of test setup


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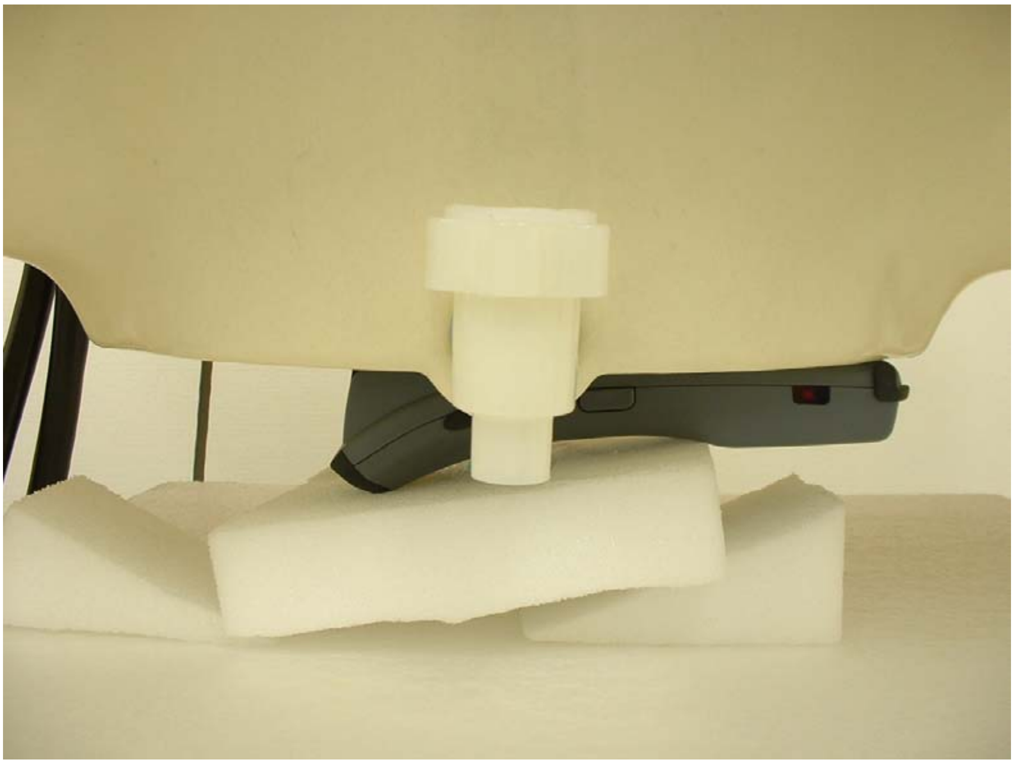
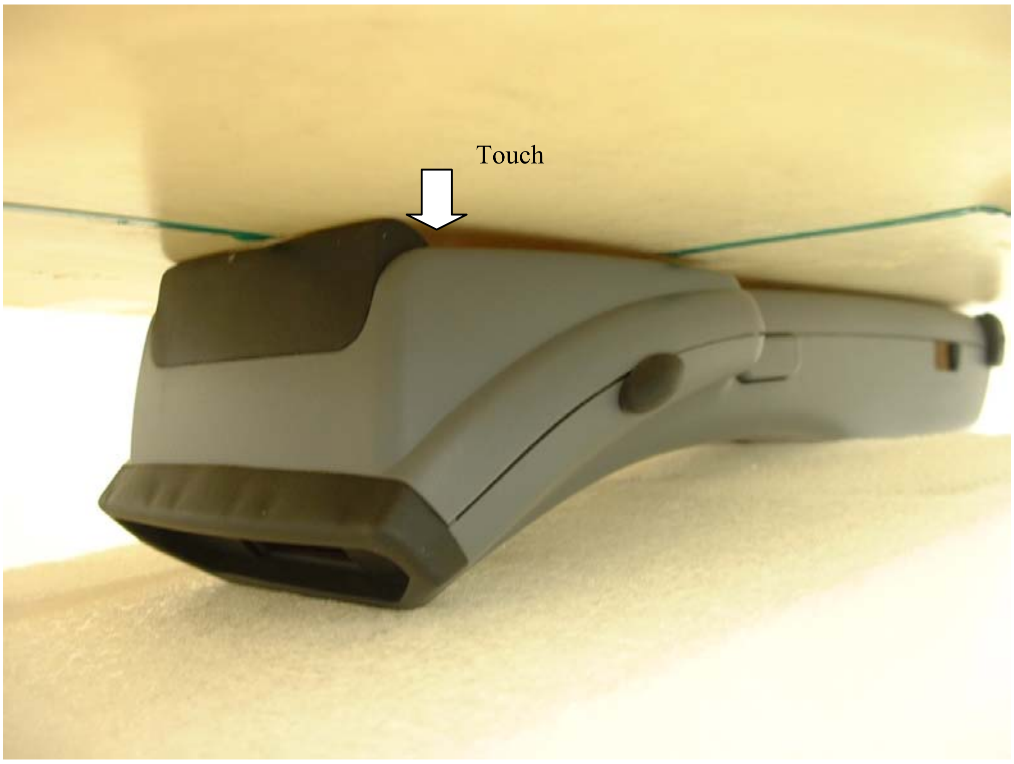
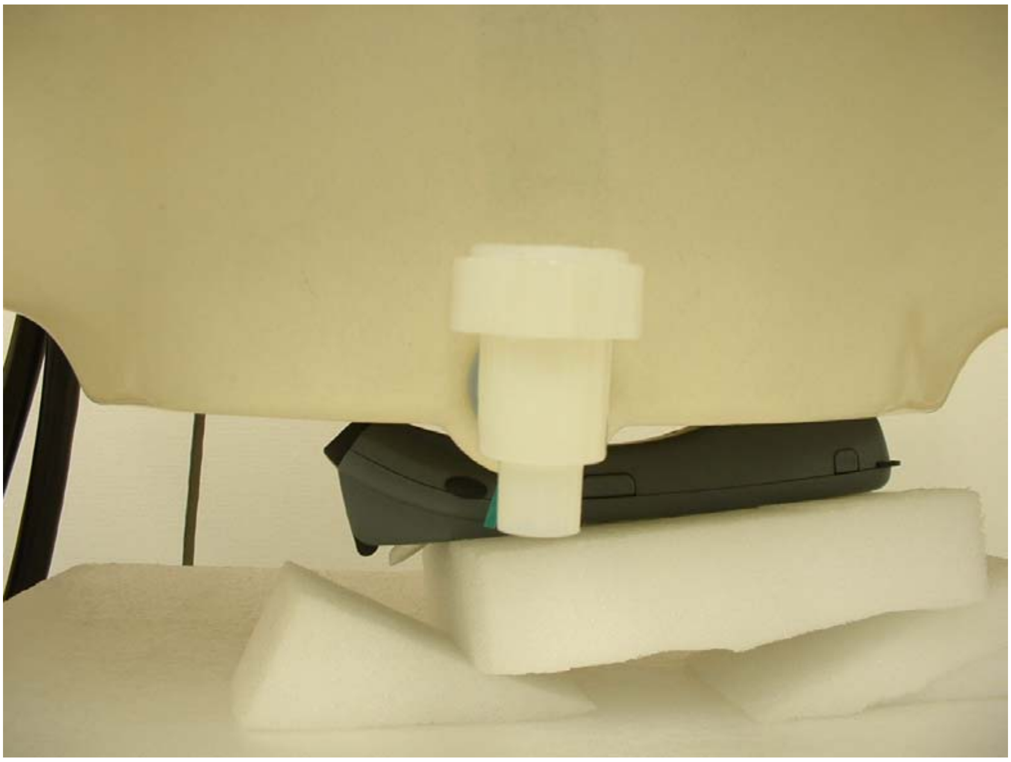
*Telephone: +81 596 24 8116*
*Facsimile: +81 596 24 8124*

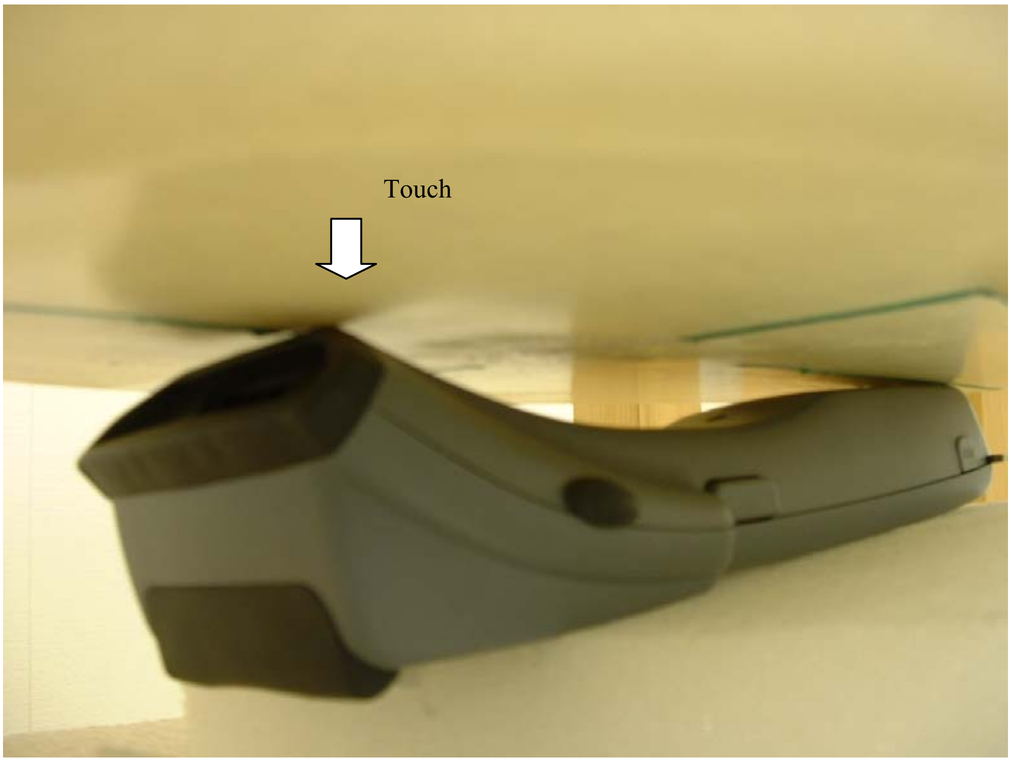
**Front**



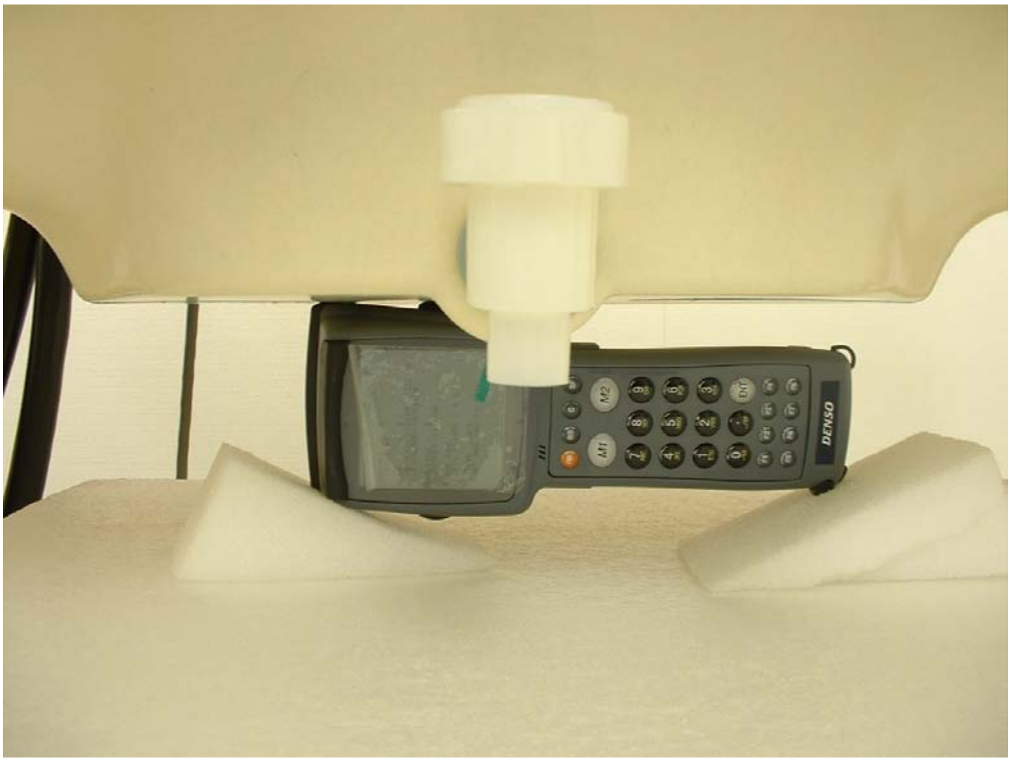


**Back**

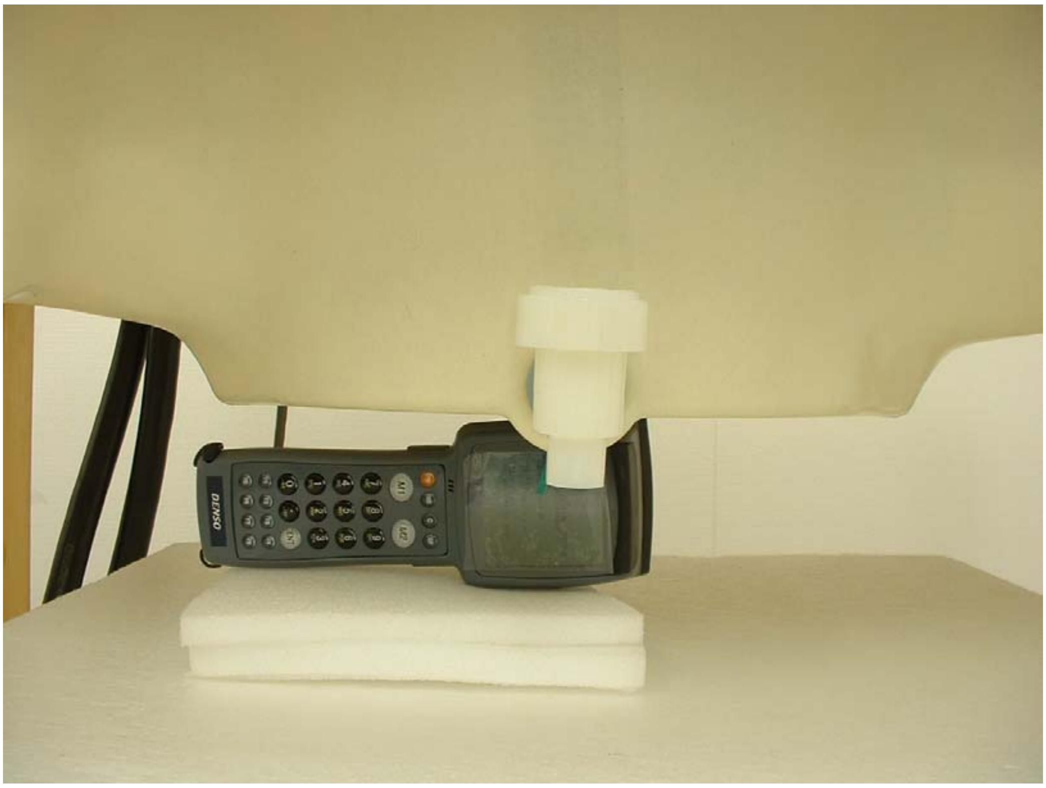


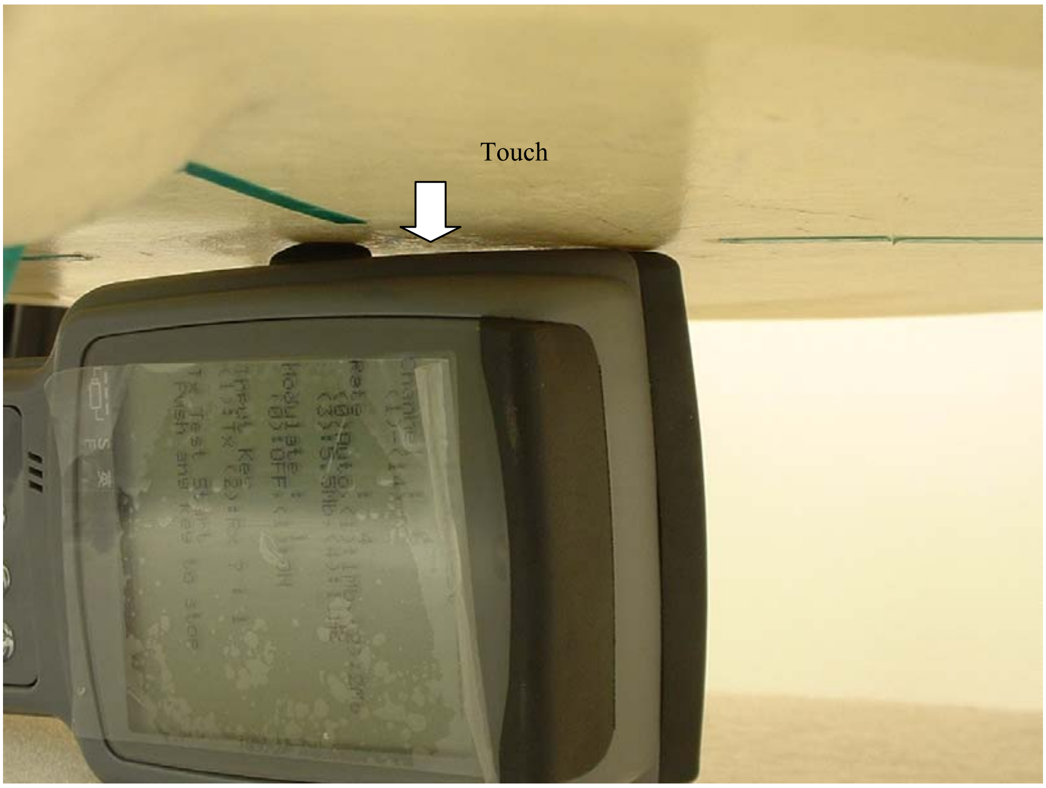


## Right Side

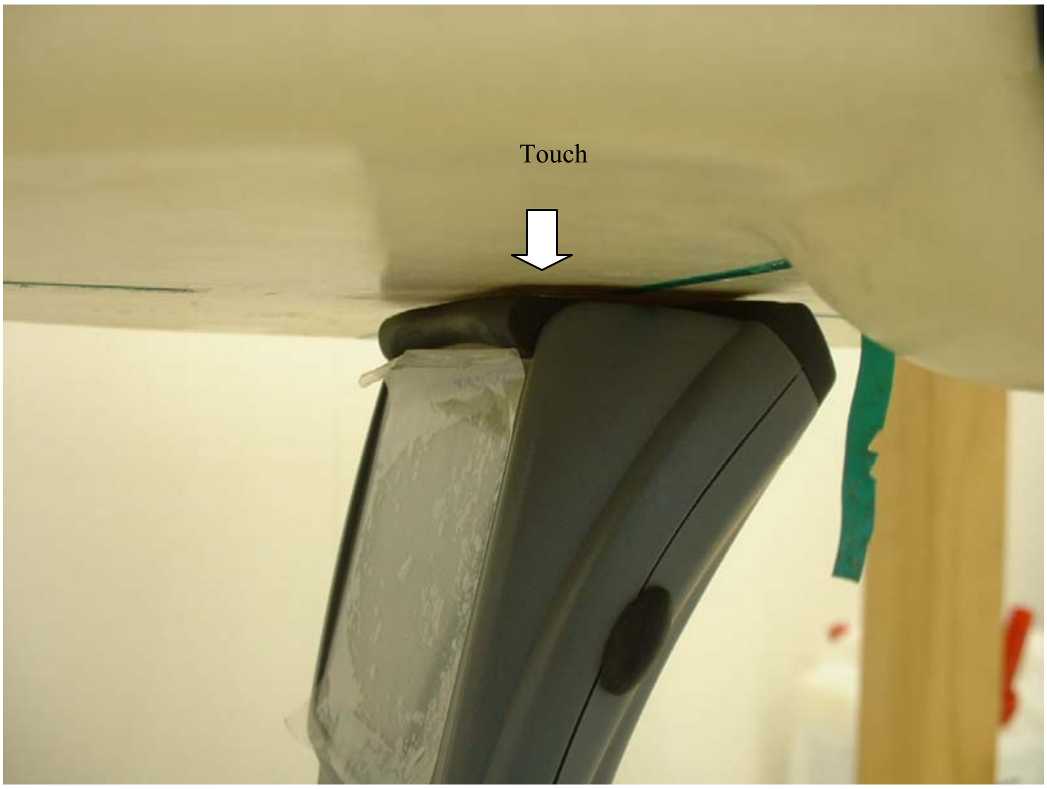



## Left Side

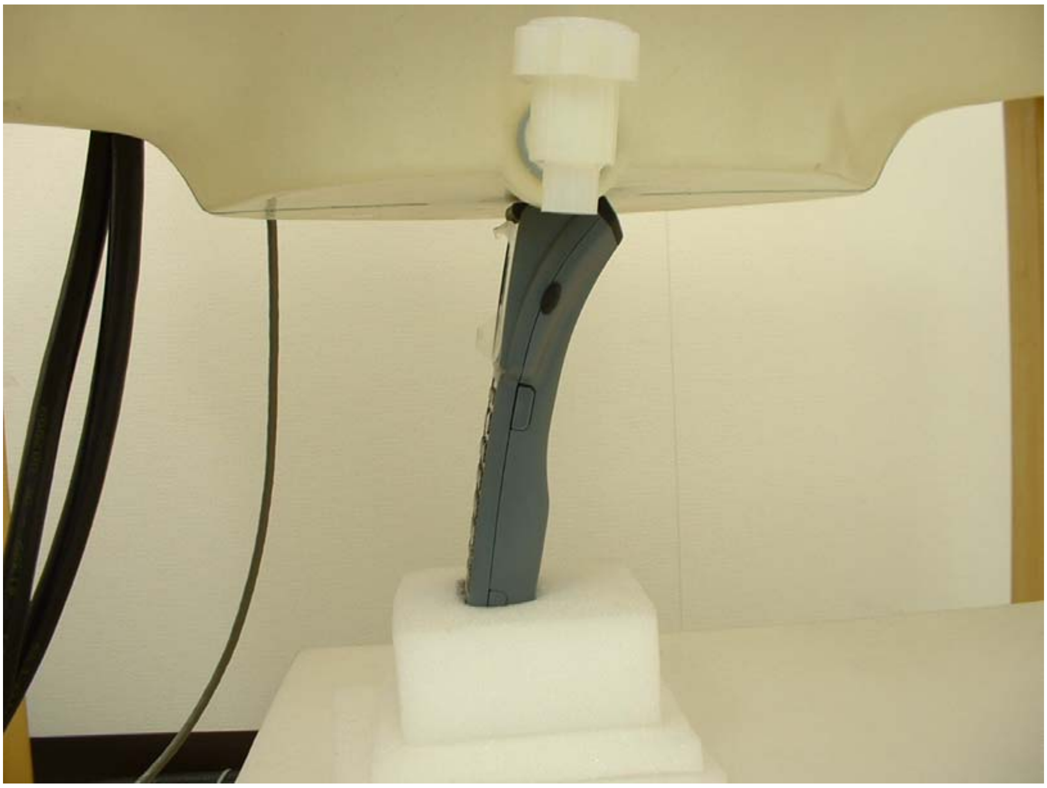


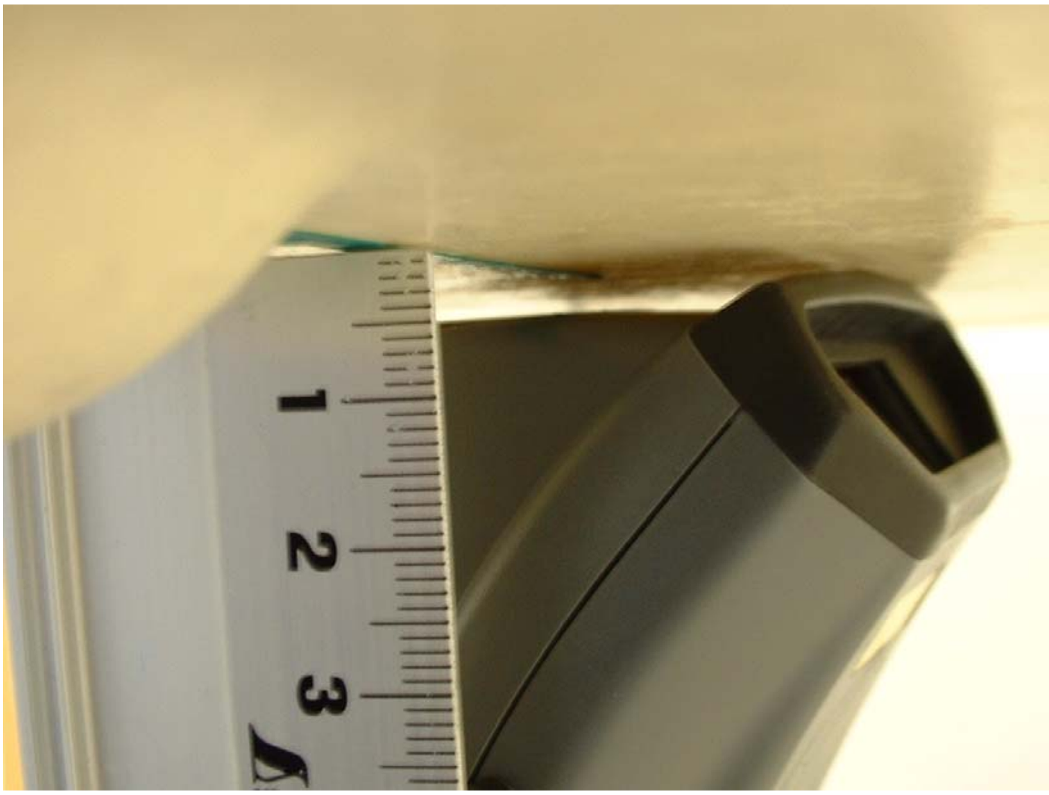



**Top 0mm**



**Top 5mm**





## Top 10mm