# ENGINEERING TEST REPORT

## Broadcom WLAN MiniPCI card
## Model No.: BCM94309MP

**Tested For**

**Broadcom Corporation**
190 Mathilda Place
Sunnyvale, California 94086
USA

***In Accordance With***

**SAR (Specific Absorption Rate) Requirements**
**using guidelines established in IEEE C95.1-1991,**
**FCC OET Bulletin 65 (Supplement C),**
**Industry Canada RSS-102(Issue 1) and**
**ACA Radiocommunications (Electromagnetic Radiation – Human Exposure)**
**Amendment Standard 2000 (No. 1)**

**UltraTech's File No.: BRQ-002-SAR**

| | |
|---|---|
| This Test report is Issued under the Authority of<br>Tri M. Luu, Professional Engineer,<br>Vice President of Engineering<br>UltraTech Group of Labs<br><br>Date: February 25, 2003 |  |
| Report Prepared by: JaeWook Choi<br><br>Issued Date: February 25, 2003 | Tested by: JaeWook Choi<br><br>Test Dates: February 15, 2003 |

*The results in this Test Report apply only to the sample(s) tested, which has been randomly selected.*


**UltraTech**

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# EXHIBIT 1. INTRODUCTION

The additional assessment has been conducted in order to ensure the RF safety compliance of the D.U.T mounted in different types of the host laptop PC units with different antenna configuration as specified in this report. The evaluation proceeded as based on the factors which was determined through prescans SAR measurements as documented in the original report. The test were performed at 5 mm separation distance since at this distance, the DUT was found be in compliance with the specific limit for general population exposure. All other conditions were set to be the same as on the original test. Refer to the original report for more test details

# EXHIBIT 2. PERFORMANCE ASSESSMENT

## 2.1. CLIENT AND MANUFACTURER INFORMATION

| **APPLICANT**: | |
|---|---|
| **Name:** | Broadcom Corporation |
| **Address:** | 190 Mathilda Place<br>Sunnyvale, California 94086<br>USA |
| **Contact Person:** | Chris McGough<br>Phone #: +1 408 922 5810<br>Fax #: +1 408 543 3399<br>Email Address: cmcgough@broadcom.com |

| **MANUFACTURER:** | |
|---|---|
| **Name:** | Broadcom Corporation |
| **Address:** | 190 Mathilda Place<br>Sunnyvale, California 94086<br>USA |
| **Contact Person:** | Chris McGough<br>Phone #: +1 408 922 5810<br>Fax #: +1 408 543 3399<br>Email Address: cmcgough@broadcom.com |

## 2.2. DEVICE UNDER TEST (D.U.T.) DESCRIPTION

The following is the information provided by the applicant.

| | |
|---|---|
| **Trade Name** | The Broadcom Wireless LAN mini-PCI card |
| **Type/Model Number** | BCM94309MP |
| **Serial Number** | 1388 |
| **Type of Equipment** | Wireless LAN Card |
| **Frequency of Operation** | 2400 ~ 2483.5 MHz , 5150 ~ 5350 MHz |
| **Rated RF Power** | 15 dBm avg power in packet @ 5,180 MHz<br>15 dBm avg power in packet @ 5,260 MHz<br>15 dBm avg power in packet @ 5,320 MHz |
| **Modulation Employed** | DSSS (2GHz band), OFDM(5GHz band) |
| **External Power Supply** | Power supplied through the laptop computer |
| **Primary User Functions of D.U.T.:** | Data Radio Communication Through Air |

## 2.3. ANCILLARY EQUIPMENT

- Laptop #2: Laptop PC (Dell, M/N: PP05L) with the Hitachi Monopole MFJ type antenna (Main – M/N: HFT01-DL01, Aux – M/N: HFT01-DL01)
- Laptop #3: Laptop PC (Dell, M/N: PP02X) with the Hitachi Monopole MFJ type antenna (Main - M/N: HFT04-DL01-Main, Aux – M/N: HFT04-DL01-AUX)
- Laptop #4: Laptop PC (Dell, M/N: PP02X) with the Wistron NeWeb Corp. Triple-band antenna (Main – P/N: 81.CA915.001, Aux – P/N: 81.CA915.002)
- AC Power adaptor (M/N: HP-OQ065B83)

Laptop # 2 has the same housing case as the ancillary laptop used in the original report but has a different set of MAIN and AUX antenna from the different manufacturer.

Laptop #3 & #4 has the same housing case but each laptop has a different set of MAIN and AUX antenna from the different manufacturer.

| | | Laptop #1 | Laptop #2 | Laptop #3 | Laptop #4 |
|---|---|---|---|---|---|
| Laptop Model Number | | PP05L | PP05L | PP02X | PP02X |
| Antenna | | Wistron NeWeb Corp. | Hitachi | Hitachi | Wistron NeWeb Corp. |
| Antenna Model Number | MAIN | 81.CA513.001 | HFT01-DL01 | HFT04-DL01-MAIN | 81.CA915.001 |
| | AUX | 81.CA513.002 | HFT01-DL01 | HFT04-DL01-AUX | 81.CA915.002 |
| Comment | | Tested in the original report | Tested in this report | Tested in this report | Tested in this report |

## 2.4. SPECIFIC OPERATING CONDITIONS

D.U.T. was made to transmit with a 98% duty cycle which is the maximum duty cycle configurable instead of with its actual nominal duty cycle as a worst case consideration, using the exclusive software for SAR test provided by the manufacturer.

# EXHIBIT 3. SUMMARY OF TEST RESULTS

## 3.1. LOCATION OF TESTS

All of the measurements described in this report were performed at UltraTech Group of Labs located at:

3000 Bristol Circle, in the city of Oakville, Province of Ontario, Canada.

All measurements were performed in UltraTech's shielded chamber, 24' x 16' x 8'.

## 3.2. APPLICABILITY & SUMMARY OF SAR RESULTS

The maximum peak spatial - average SAR measured was found to be 1.0998 W/Kg at 5 mm separation distance.

| Exposure Category and SAR Limits | Test Requirements | Compliance (Yes/No) |
|---|---|---|
| **General population/Uncontrolled exposure**<br><br>0.08W/kg whole body average and spatial peak SAR of 1.6W/kg, averaged over 1gram of tissue<br>Hands, wrist, feet and ankles have a peak SAR not to exceed 4 W/kg, averaged over 10 grams of tissue. | Requirements using guidelines established in IEEE C95.1-1991<br><br>FCC OET Bulletin 65 (Supplement C)<br><br>Industry Canada RSS-102 (Issue 1).<br><br>ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2000 (No. 1) | YES |
| **Occupational/Controlled Exposure**<br><br>0.4W/kg whole body average and spatial peak SAR of 8W/kg, averaged over 1gram of tissue Hands, wrist, feet and ankles have a peak SAR not to exceed 20 W/kg, averaged over 10 grams of tissue. | Requirements using guidelines established in IEEE C95.1-1991<br><br>FCC OET Bulletin 65 (Supplement C),<br><br>Industry Canada RSS-102 (Issue 1)<br><br>ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2000 (No. 1) | N/A |

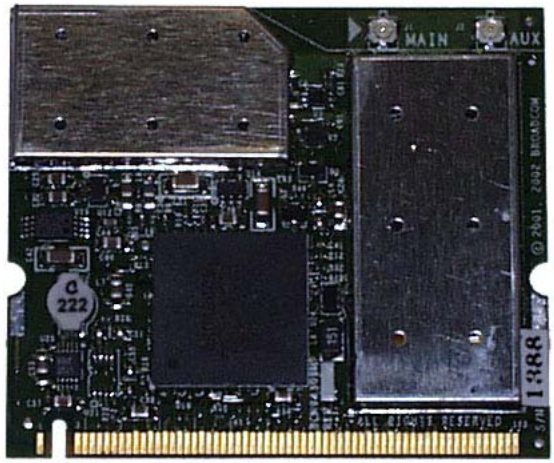
# EXHIBIT 4. MEASUREMENTS, EXAMINATIONS & TEST DATA

## 4.1. TEST SETUP

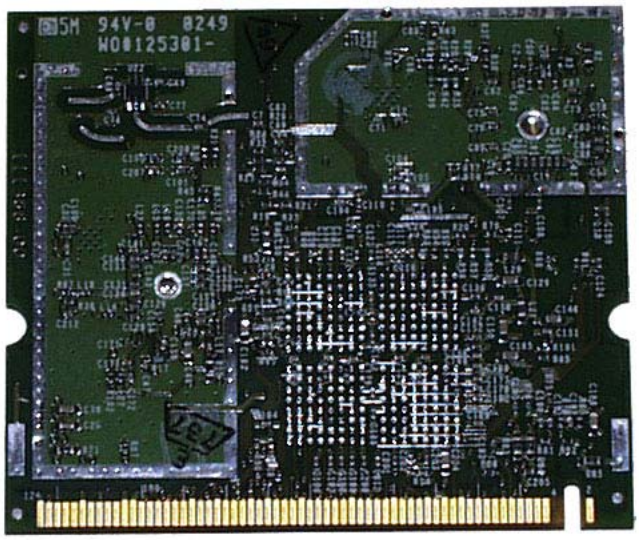
| D.U.T. Information | | Condition | |
|---|---|---|---|
| **Product Name** | Broadcom WLAN MiniPCI card | **Robot Type** | 6 Axis |
| **Model Number** | BCM94309MP | **Scan Type** | SAR - Area/Zoom/Att Vs Depth |
| **Serial Number** | 1388 | **Measured Field** | E |
| **Frequency Band [MHz]** | 5150 ~ 5350 | **Phantom Type** | $2_{mm}$ base Flat Phantom |
| **Frequency Tested [MHz]** | 5180.0, 5260.0, 5320.0 | **Phantom Position** | Waist |
| **Measured Output Power [dBm]** (POP Power) | 22.0 pk @ 5,180 MHz<br>22.0 pk @ 5,260 MHz<br>22.0 pk @ 5,320 MHz | **Room Temperature [°C]** | 21.0 ± 1 |
| **Antenna Type** | Refer to 2.3 | **Room Humidity [%]** | 30 ± 10 |
| **Modulation** | OFDM @ 5GHz band | **Tissue Temperature [°C]** | 21.0 ± 1 |
| **Duty Cycle** | 98 % | | |

| | |
|---|---|
| **Type of Tissue** | Muscle |
| **Test Frequency [MHz]** | 5240 |
| **Measured Dielectric Constant** | 47.3 (-3.5 %) |
| **Measured Conductivity [S/m]** | 5.61 (+4.9 %) |
| **Penetration Depth (Plane Wave Excitation)** [mm] | 6.64 |
| **Probe Model Number** | E-TR |
| **Probe Serial Number** | UT-0200-1 |
| **Probe Orientation** | Isotropic |
| **Probe Offset [mm]** | 2.00 |
| **Probe Tip Diameter [mm]** | 4.00 |
| **Sensor Factor ($\eta_{pd}$) [mV/(mW/cm$^2$)]** | 10.8 |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$) [W/Kg/mV]** | 0.719 |

## 4.2. PHOTOGRAPH OF D.U.T. AND ALL ACCESSORIES

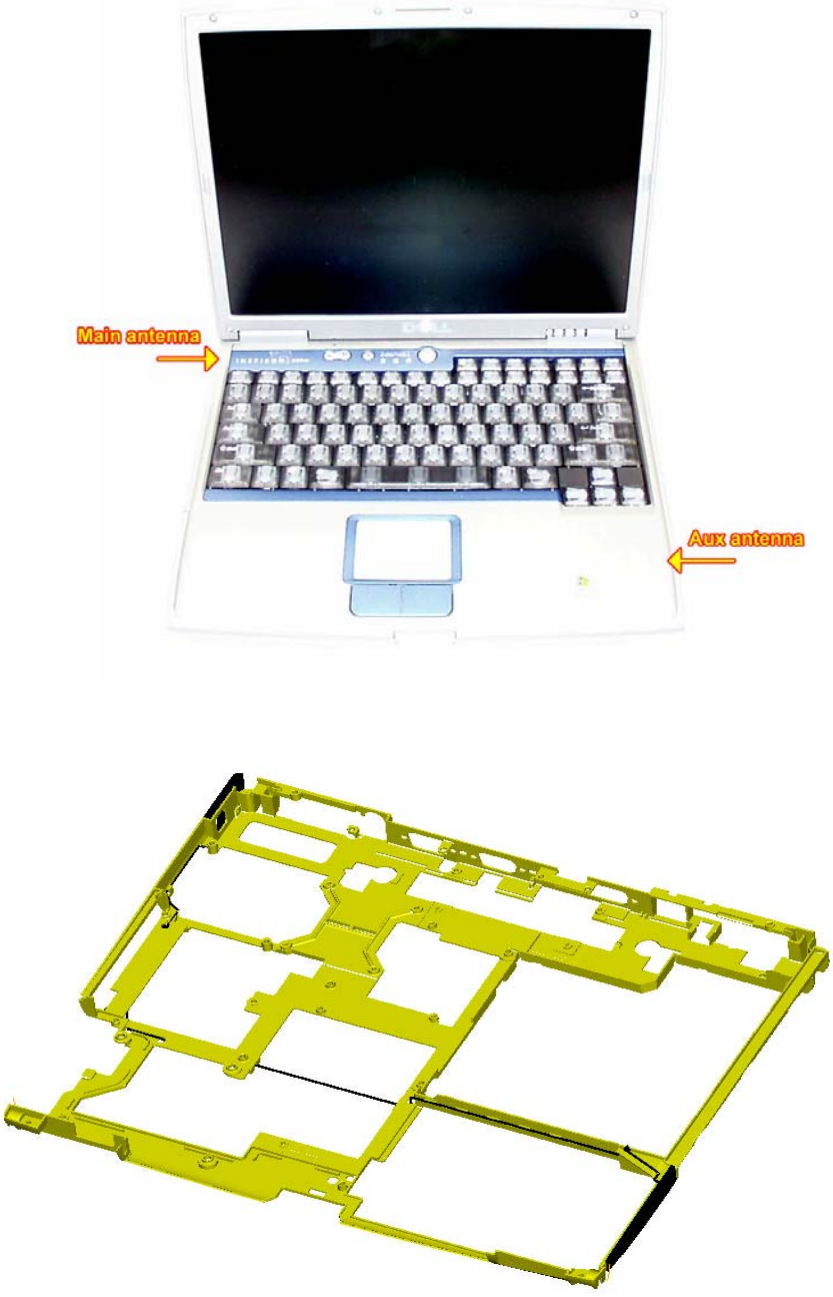



**< BCM94309MP Broadcom WLAN MiniPCI card front view>**




**< BCM94309MP Broadcom WLAN MiniPCI card rear view>**

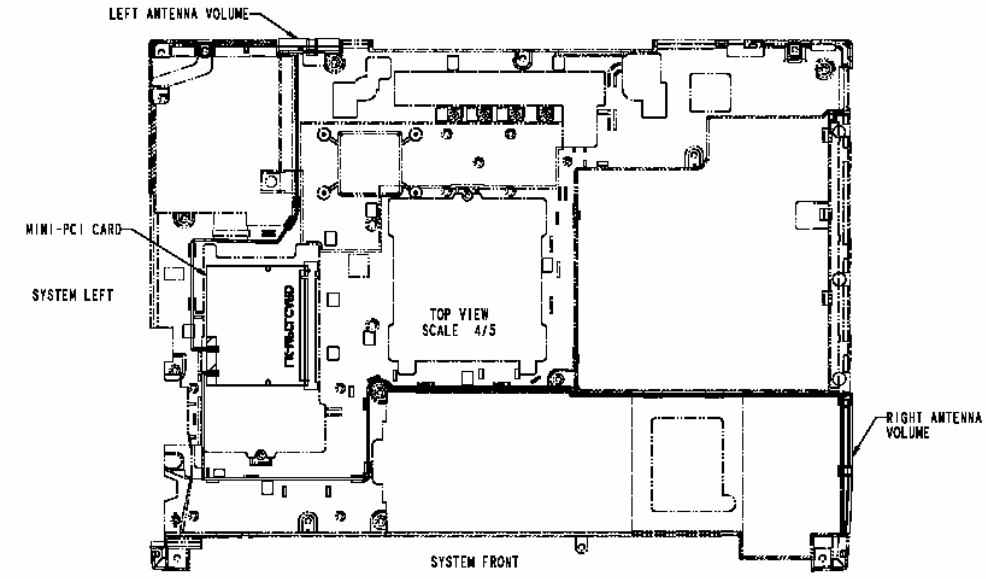
### 4.2.1. Laptop #2 (M/N: PP05L, Hitachi Monopole MFJ type Antenna)



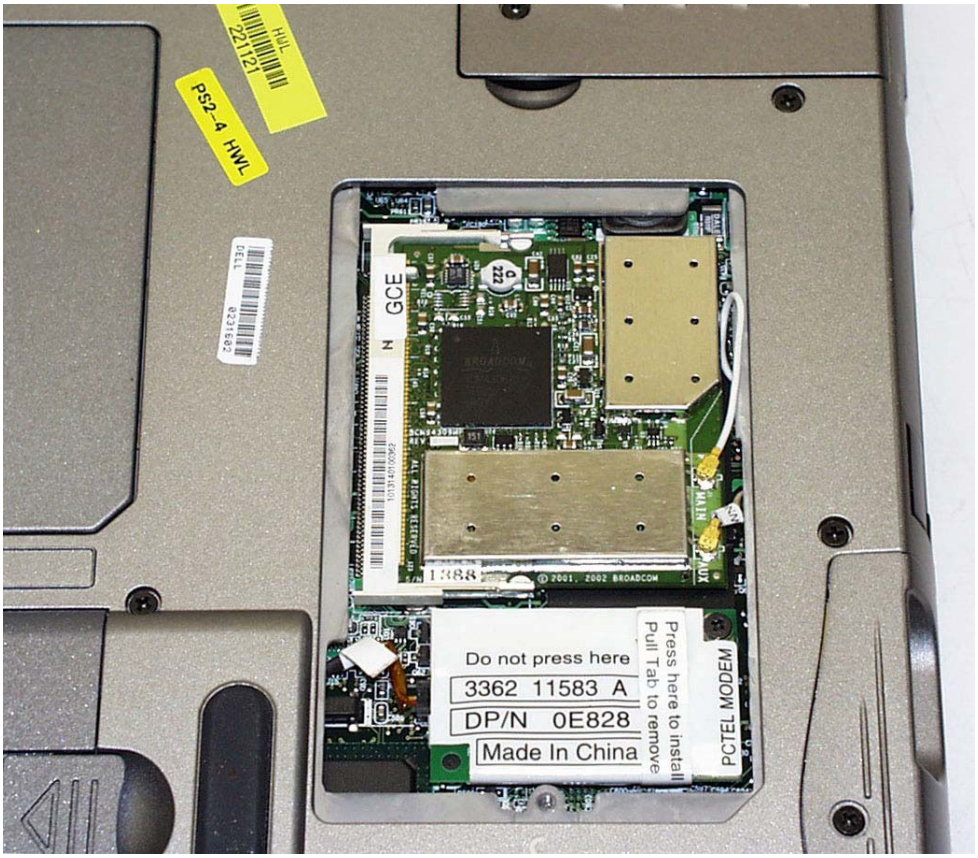

**< Dell Latitude Laptop PC (M/N: PP05L) – MAIN and AUX antenna location and cable routing >**


**< D.U.T. installed in miniPCI slot >**

### 4.2.2. Laptop #3 & #4 (M/N: PP02X, Hitachi Monopole MFJ type Antenna or Wistron NeWeb Corp. Triple-band Antenna)


**< Dell Inspiron (M/N: PP02X) – MAIN and AUX antenna location and cable routing >**

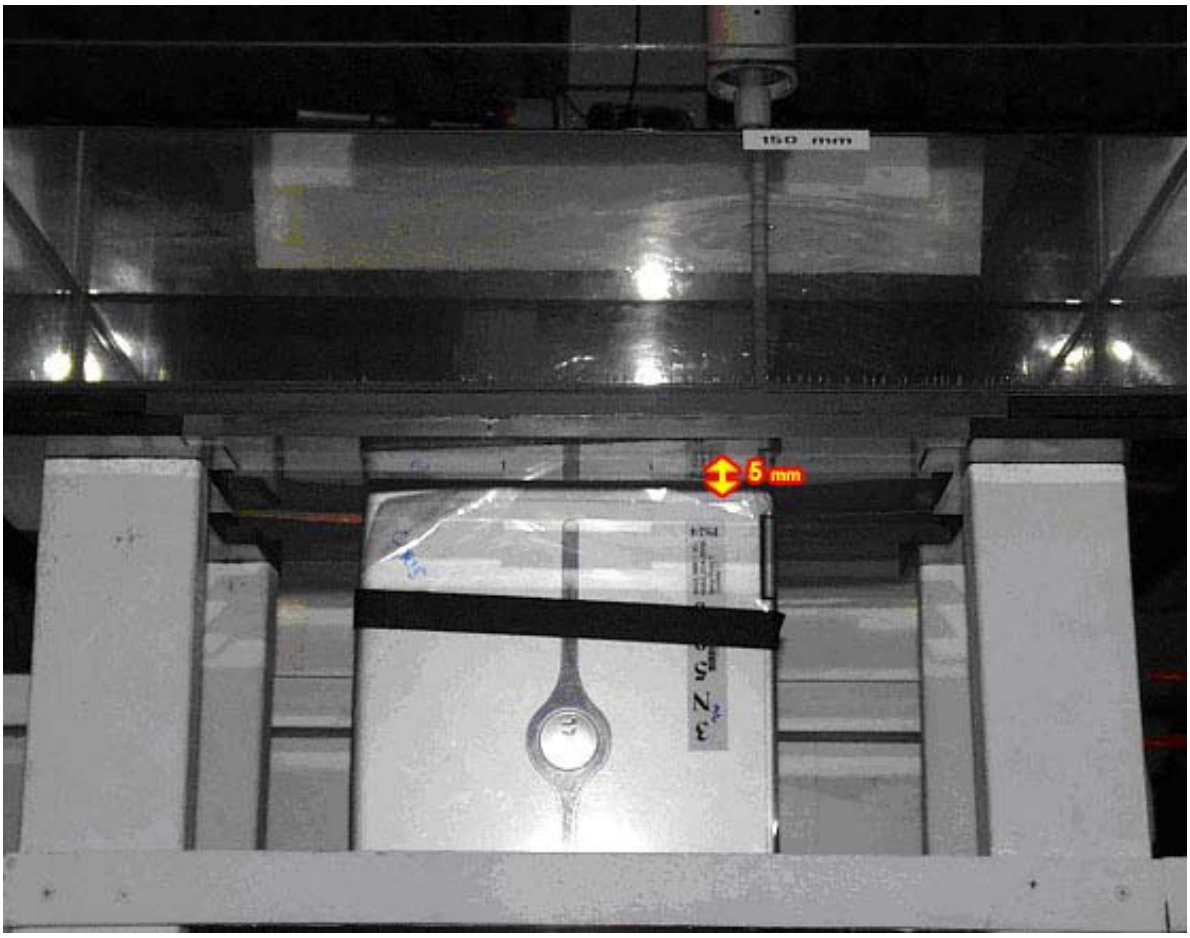



**< D.U.T. installed in miniPCI slot >**

## 4.3. PHOTOGRAPH OF D.U.T. POSITION

### 4.3.1. Laptop #2 (M/N: PP05L, Hitachi Monopole MFJ type Antenna)

#### *4.3.1.1. Left side of the host PC toward the phantom and 5 mm separation distance (Main antenna)*

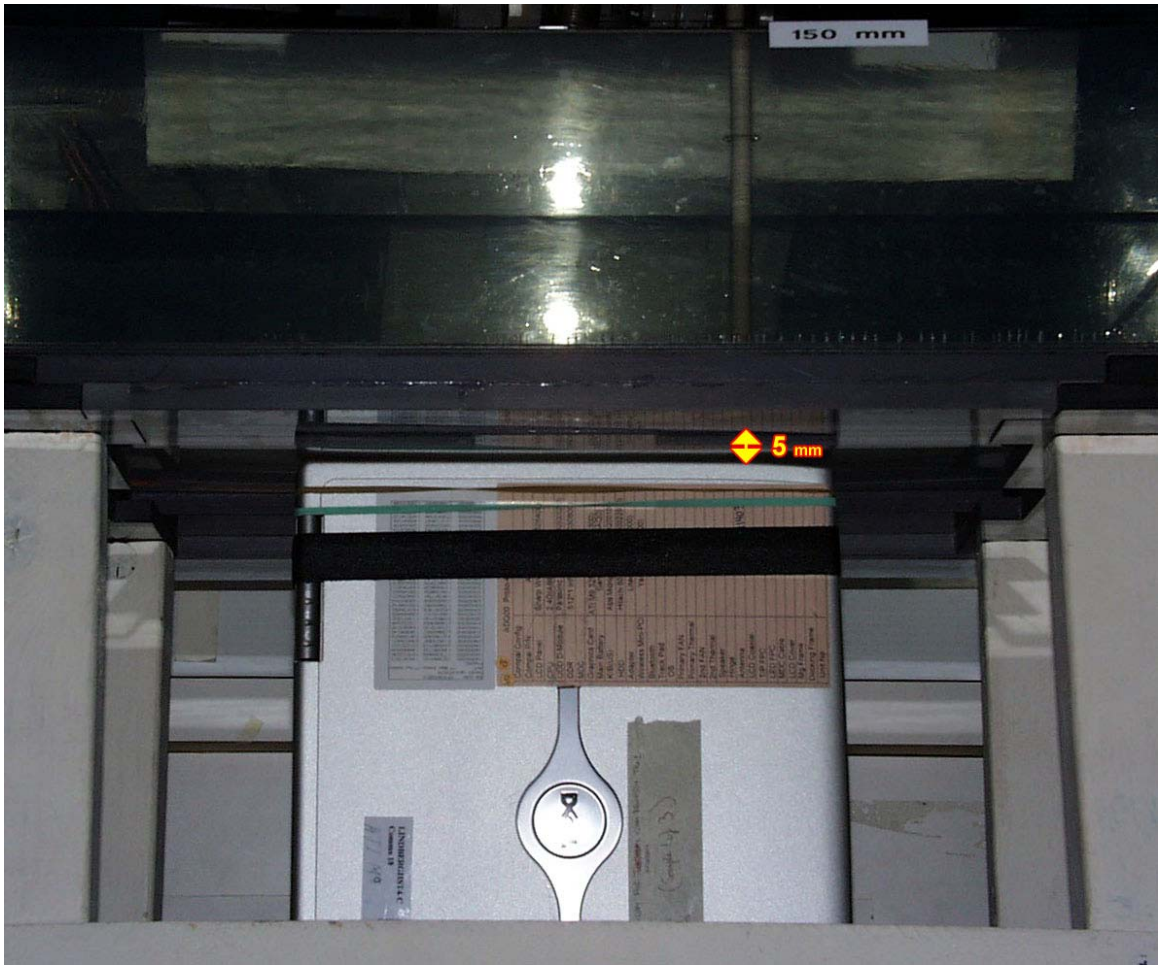


***4.3.1.2. Right side of the host PC toward the phantom and 5 mm separation distance (Aux antenna)***

## 4.3.2. Laptop #3 & #4 (M/N: PP02X, Hitachi Monopole MFJ type Antenna or Wistron NeWeb Corp. Triple-band Antenna)

### *4.3.2.1. Back side of the host PC toward the phantom and 5 mm separation distance (Main antenna)*

***4.3.2.2. Right side of the host PC toward the phantom and 5 mm separation distance (Aux antenna)***



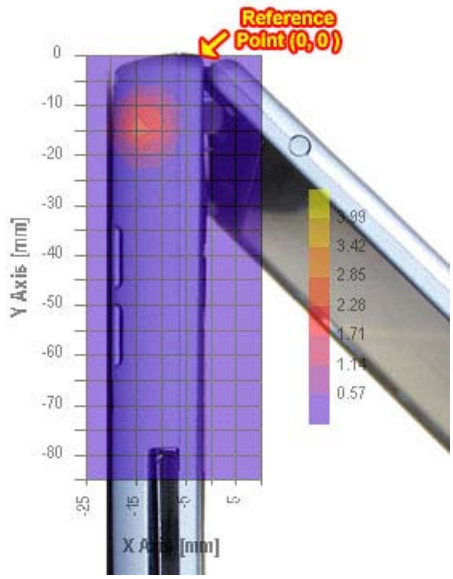
## 4.4. MAXIMUM PEAK SPATIAL-AVERAGE SAR

### 4.4.1. Laptop #2 (M/N: PP05L, Hitachi Monopole MFJ type Antenna)

#### *4.4.1.1. Maximum peak spatial-average SAR data*

| # | Configuration | Device Test Positions | Antenna Position | Freq. [MHz] | Channel | MAX. SAR [W/Kg] |
|---|---|---|---|---|---|---|
| 02 | Left side of the host PC toward the phantom<br>5 mm separation distance<br>6 MBPS data rate | Body-worn (By Stander) | Main antenna (left side) - Fixed | 5260 | CH52 | 0.7884 |

#### *4.4.1.2. Maximum peak spatial-average SAR location*

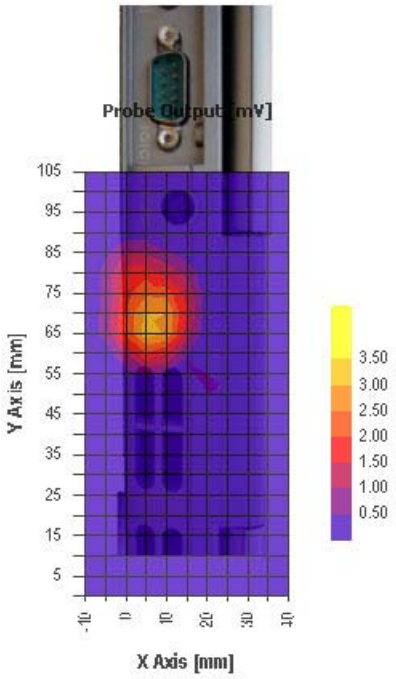


## 4.4.2. Laptop #3 (M/N: PP02X, Hitachi Monopole MFJ type Antenna) & #4 (M/N: PP02X, Wistron NeWeb Corp. Triple-band Antenna)

### *4.4.2.1. Maximum peak spatial-average SAR data*

| # | Configuration | Device Test Positions | Antenna Position | Freq. [MHz] | Channel | MAX. SAR [W/Kg] |
|---|---|---|---|---|---|---|
| 13 | Back side of the host PC toward the phantom<br>5 mm separation distance<br>6 MBPS data rate | Body-worn (By Stander) | Main antenna (back side) - Fixed | 5180 | CH36 | 1.0998 |

### *4.4.2.2. Maximum peak spatial-average SAR location*



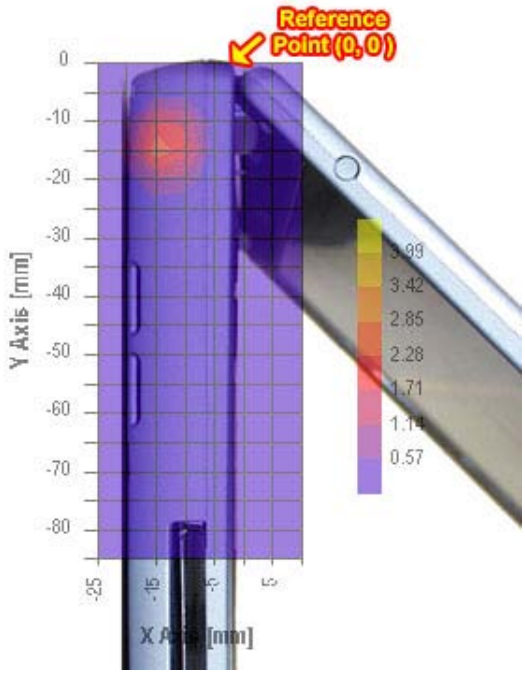
## 4.5. SAR MEASUREMENT

### 4.5.1. Body-worn (By Stander) Configuration

#### *4.5.1.1. Laptop #2 (M/N: PP05L, Hitachi Monopole MFJ type Antenna)*

##### *4.5.1.1.1. Main antenna (left side)*

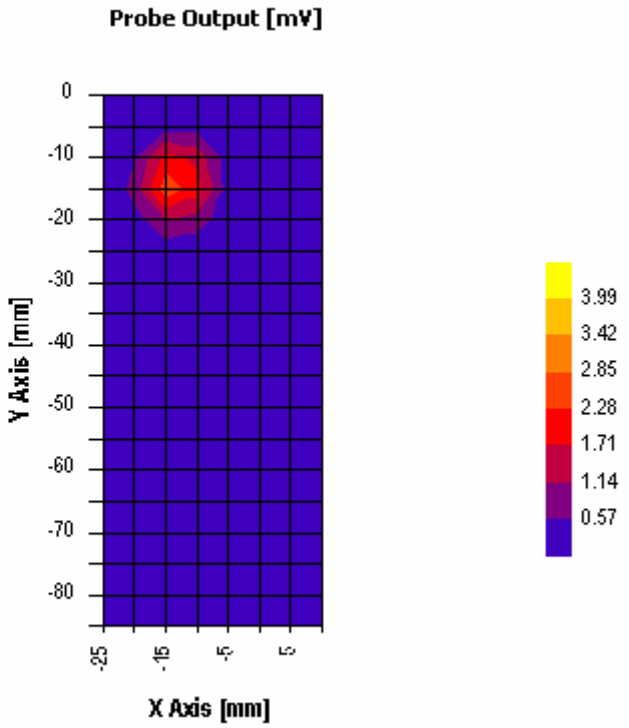
| # | Configuration | Device Test Positions | Antenna Position | Freq. [MHz] | Channel | Power reference before [dBm] | Power reference after [dBm] | MAX SAR [W/Kg] |
|---|---|---|---|---|---|---|---|---|
| 01 | Left side of the host PC toward the phantom<br>6 MBPS data rate | 5 mm separation | Main antenna (left side) – Fixed | 5180 | CH36 | | | *note) |
| 02 | | | | 5260 | CH52 | 21.9 pk | 21.8 pk | 0.7884 |
| 03 | | | | 5320 | CH64 | | | *note) |

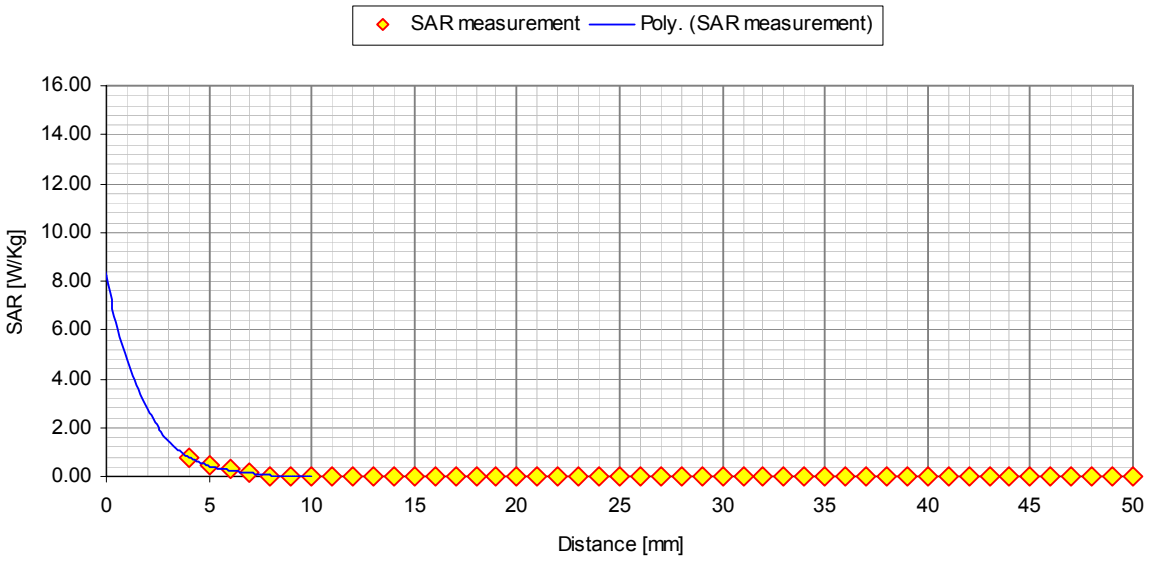



* If the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

### *4.5.1.1.1.1. CH 52, 5260 MHz*

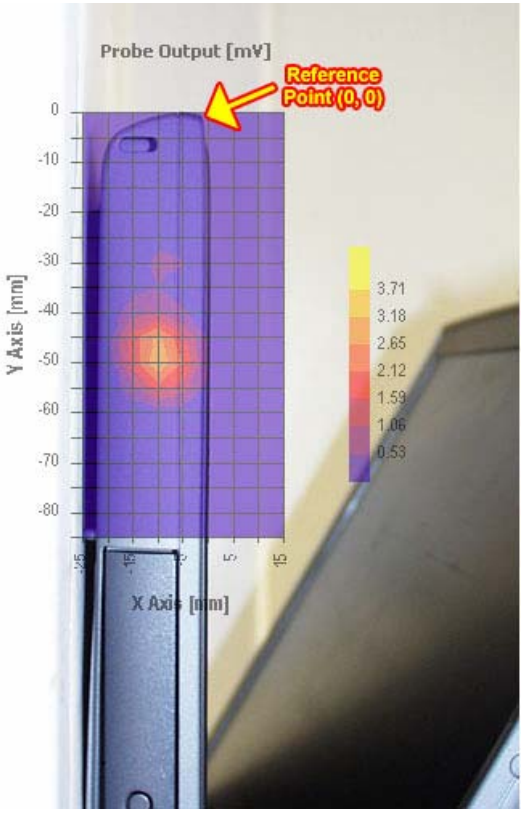
| | |
|---|---|
| **Test date** [MM/DD/YYYY] | 02/20/2003 |
| **Test by** | JaeWook Choi |
| **Room temperature** [°C] | 21 |
| **Room humidity** [%] | 30 |
| **Simulated tissue temperature** [°C] | 21 |
| **Separation distance, d** [mm] | 5 |
| **Test frequency** [MHz] | 5260 |
| **E-field Probe** | M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm |
| **Sensor Factor ($\eta_{Pd}$)** [mV/(mW/cm$^2$)] | 10.8 |
| **Amplifier Settings ($AS_1$, $AS_2$, $AS_3$)** | 0.00596768, 0.00563160, 0.00779221 |
| **Tissue Type** | Muscle |
| **Measured conductivity** [S/m] | 5.61 (+4.9 %) |
| **Measured dielectric constant** | 47.3 (-3.5 %) |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$)** [W/Kg/mV] | 0.719 |
| **Power** [dBm] | 21.9 peak conducted |
| **Measurement Volume Specification (X × Y × Z)** | 5 pts × 5 pts × 13 pts, 12 mm × 12 mm × 12 mm; Resolution: 3 mm × 3 mm × 1 mm |
| **$SAR_{1g}$** [W/Kg] | 0.7884 |




SAR measurement
Poly. (SAR measurement)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
SAR [W/Kg]
0
5
10
15
20
25
30
35
40
45
50
Distance [mm]

### *4.5.1.1.2. Aux antenna (right side)*

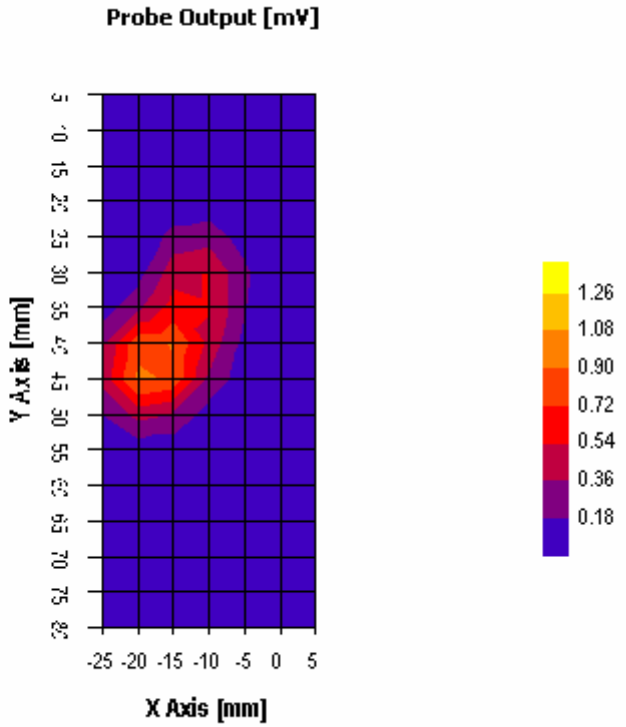
| # | Configuration | Device Test Positions | Antenna Position | Freq. [MHz] | Channel | Power reference before [dBm] | Power reference after [dBm] | MAX SAR [W/Kg] |
|---|---|---|---|---|---|---|---|---|
| 04 | Right side of the host PC toward the phantom<br>6 MBPS data rate | 5 mm separation | Aux antenna (right side) - Fixed | 5180 | CH36 | | | *note) |
| 05 | | | | 5260 | CH52 | 21.9 pk | 21.8 pk | 0.0774 |
| 06 | | | | 5320 | CH64 | | | *note) |

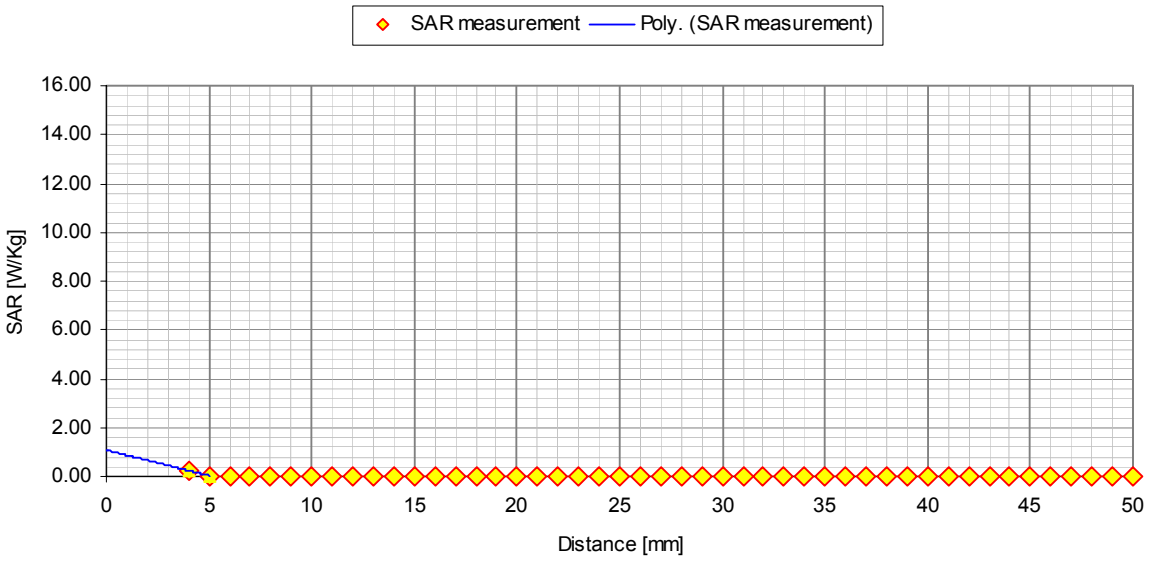



* If the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

### *4.5.1.1.2.1. CH 52, 5260 MHz*

| | |
|---|---|
| **Test date** [MM/DD/YYYY] | 02/20/2003 |
| **Test by** | JaeWook Choi |
| **Room temperature** [°C] | 21 |
| **Room humidity** [%] | 30 |
| **Simulated tissue temperature** [°C] | 21 |
| **Separation distance, d** [mm] | 5 |
| **Test frequency** [MHz] | 5260 |
| **E-field Probe** | M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm |
| **Sensor Factor ($\eta_{Pd}$)** [mV/(mW/cm$^2$)] | 10.8 |
| **Amplifier Settings ($AS_1$, $AS_2$, $AS_3$)** | 0.00596768, 0.00563160, 0.00779221 |
| **Tissue Type** | Muscle |
| **Measured conductivity** [S/m] | 5.61 (+4.9 %) |
| **Measured dielectric constant** | 47.3 (-3.5 %) |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$)** [W/Kg/mV] | 0.719 |
| **Power** [dBm] | 21.9 peak conducted |
| **Measurement Volume Specification (X × Y × Z)** | 5 pts × 5 pts × 13 pts, 12 mm × 12 mm × 12 mm; Resolution: 3 mm × 3 mm × 1 mm |
| **$SAR_{1g}$** [W/Kg] | 0.0774 |

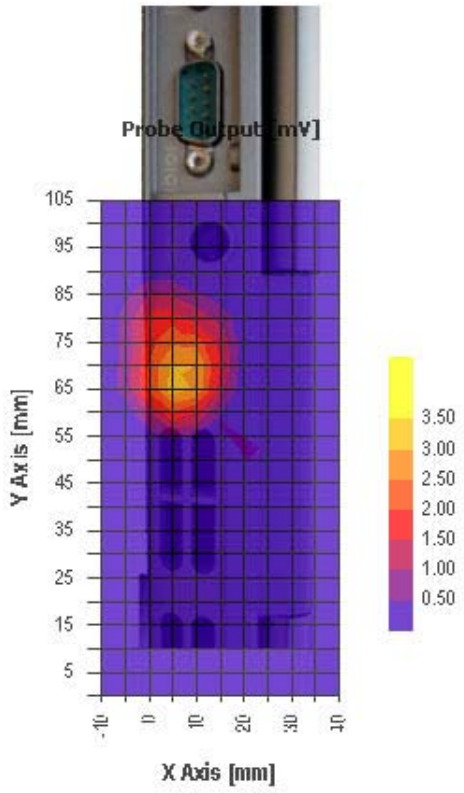



SAR measurement
Poly. (SAR measurement)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
SAR [W/Kg]
0
5
10
15
20
25
30
35
40
45
50
Distance [mm]

#### *4.5.1.2. Laptop #3 (M/N: PP02X, Hitachi Monopole MFJ type Antenna)*

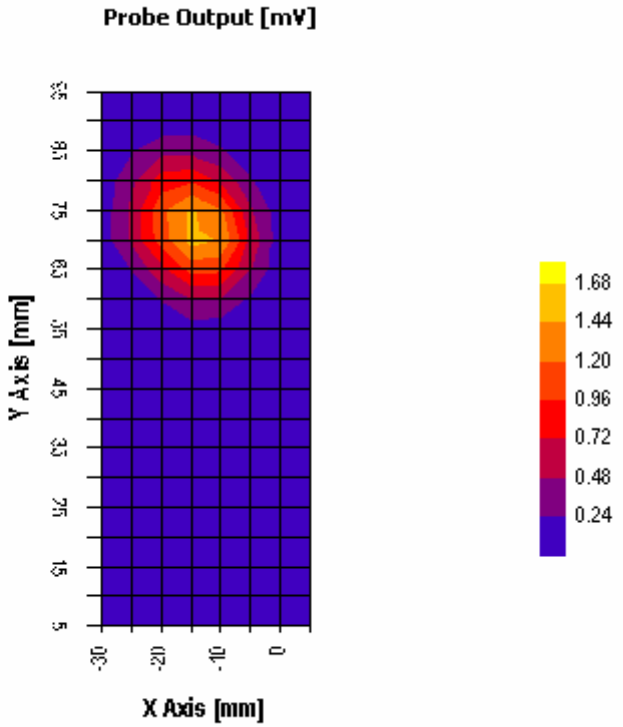
##### *4.5.1.2.1. Main antenna (back side)*

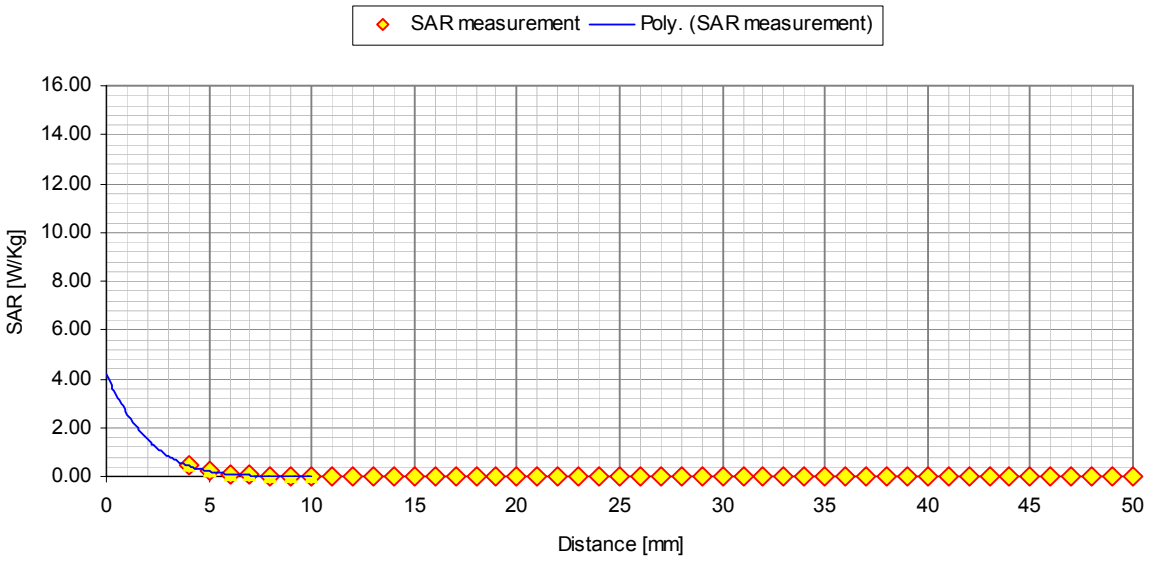
| # | Configuration | Device Test Positions | Antenna Position | Freq. [MHz] | Channel | Power reference before [dBm] | Power reference after [dBm] | MAX SAR [W/Kg] |
|---|---|---|---|---|---|---|---|---|
| 07 | Back side of the host PC toward the phantom<br>6 MBPS data rate | 5 mm separation | Main antenna (back side) – Fixed | 5180 | CH36 | 21.9 pk | 21.8 pk | 0.3030 |
| 08 | | | | 5260 | CH52 | 21.9 pk | 21.8 pk | 0.9710 |
| 09 | | | | 5320 | CH64 | 21.9 pk | 21.8 pk | 0.3518 |



### *4.5.1.2.1.1. CH 36, 5180 MHz*

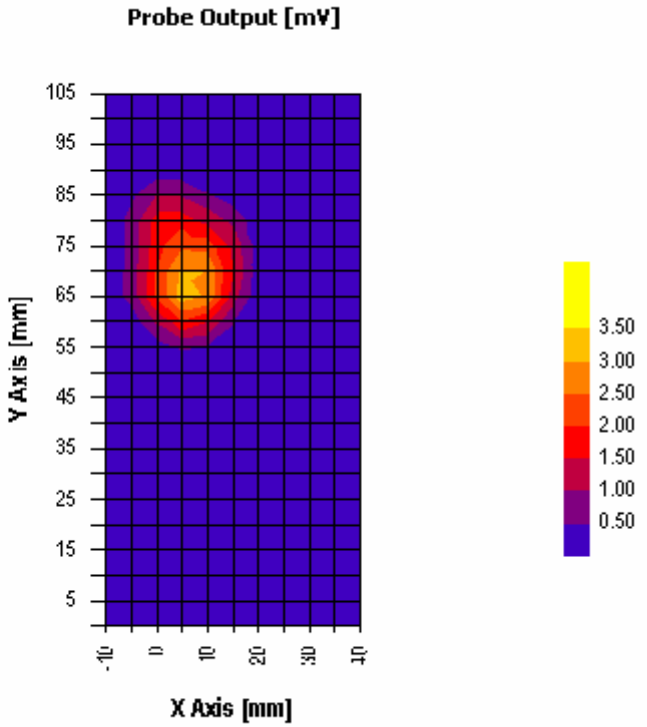
| | |
|---|---|
| **Test date** [MM/DD/YYYY] | 02/18/2003 |
| **Test by** | JaeWook Choi |
| **Room temperature** [°C] | 21 |
| **Room humidity** [%] | 30 |
| **Simulated tissue temperature** [°C] | 21 |
| **Separation distance, d** [mm] | 5 |
| **Test frequency** [MHz] | 5180 |
| **E-field Probe** | M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm |
| **Sensor Factor ($\eta_{Pd}$)** [mV/(mW/cm$^2$)] | 10.8 |
| **Amplifier Settings ($AS_1$, $AS_2$, $AS_3$)** | 0.00596768, 0.00563160, 0.00779221 |
| **Tissue Type** | Muscle |
| **Measured conductivity** [S/m] | 5.61 (+4.9 %) |
| **Measured dielectric constant** | 47.3 (-3.5 %) |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$)** [W/Kg/mV] | 0.719 |
| **Power** [dBm] | 21.9 peak conducted |
| **Measurement Volume Specification (X × Y × Z)** | 5 pts × 5 pts × 13 pts, 12 mm × 12 mm × 12 mm; Resolution: 3 mm × 3 mm × 1 mm |
| **$SAR_{1g}$** [W/Kg] | 0.3030 |

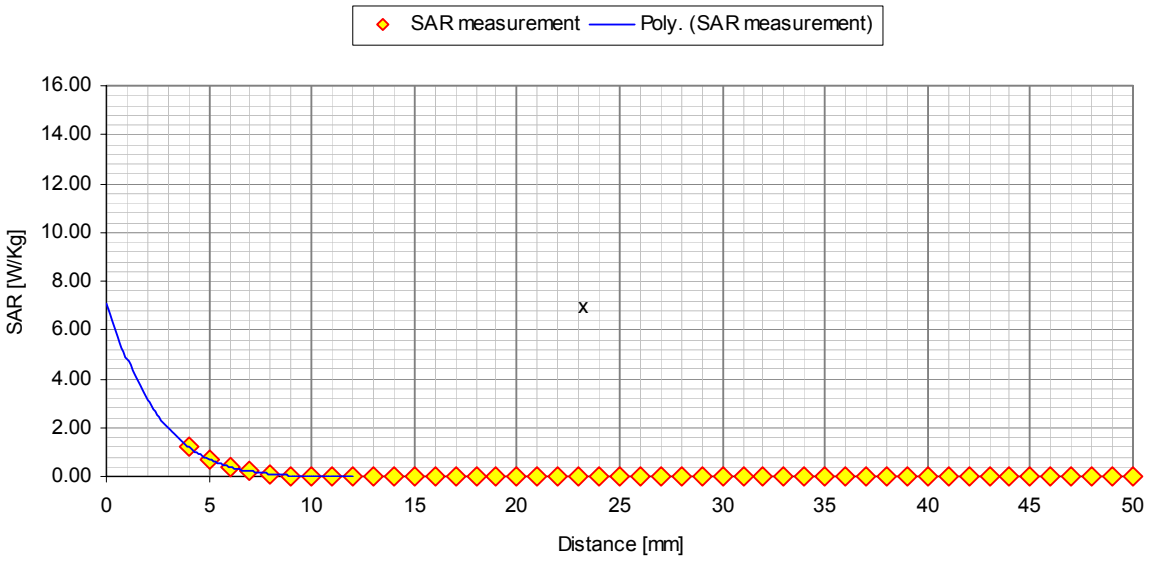



SAR measurement
Poly. (SAR measurement)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
SAR [W/Kg]
0
5
10
15
20
25
30
35
40
45
50
Distance [mm]

### *4.5.1.2.1.2. CH 52, 5260 MHz*

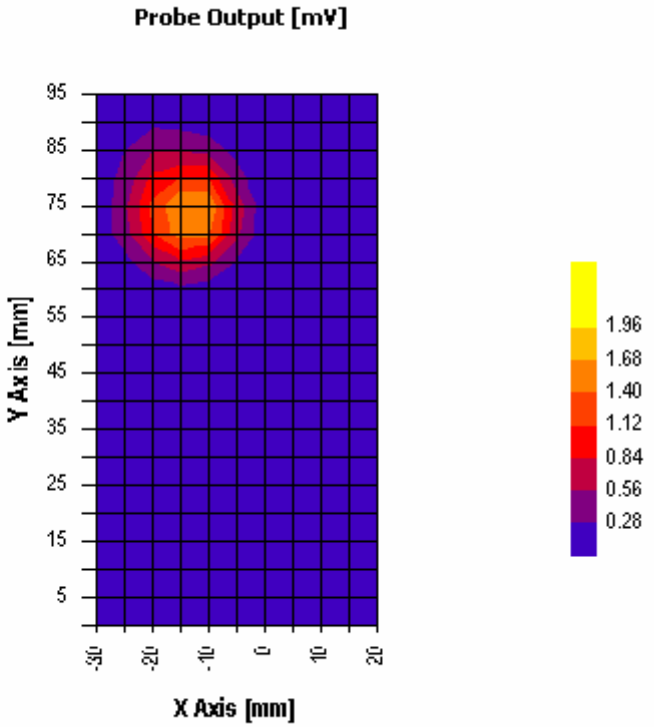
| | |
|---|---|
| **Test date** [MM/DD/YYYY] | 02/18/2003 |
| **Test by** | JaeWook Choi |
| **Room temperature** [°C] | 21 |
| **Room humidity** [%] | 30 |
| **Simulated tissue temperature** [°C] | 21 |
| **Separation distance, d** [mm] | 5 |
| **Test frequency** [MHz] | 5260 |
| **E-field Probe** | M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm |
| **Sensor Factor ($\eta_{Pd}$)** [mV/(mW/cm$^2$)] | 10.8 |
| **Amplifier Settings ($AS_1$, $AS_2$, $AS_3$)** | 0.00596768, 0.00563160, 0.00779221 |
| **Tissue Type** | Muscle |
| **Measured conductivity** [S/m] | 5.61 (+4.9 %) |
| **Measured dielectric constant** | 47.3 (-3.5 %) |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$)** [W/Kg/mV] | 0.719 |
| **Power** [dBm] | 21.9 peak conducted |
| **Measurement Volume Specification (X × Y × Z)** | 5 pts × 5 pts × 13 pts, 12 mm × 12 mm × 12 mm; Resolution: 3 mm × 3 mm × 1 mm |
| **$SAR_{1g}$** [W/Kg] | 0.9710 |

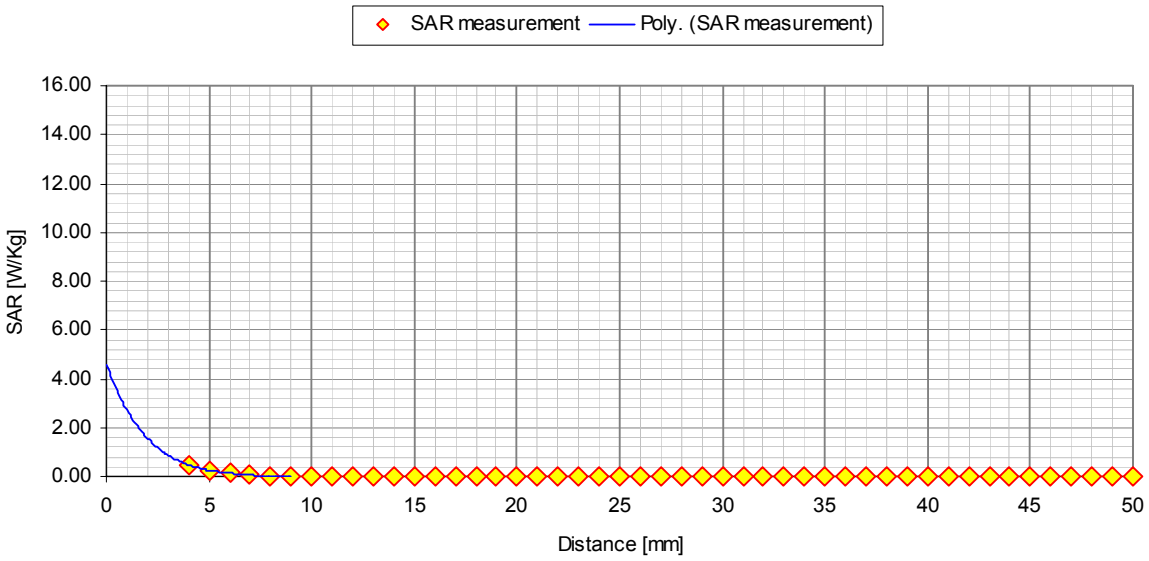



SAR measurement
Poly. (SAR measurement)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
SAR [W/Kg]
0
5
10
15
20
25
30
35
40
45
50
Distance [mm]

### *4.5.1.2.1.3. CH 64, 5320 MHz*

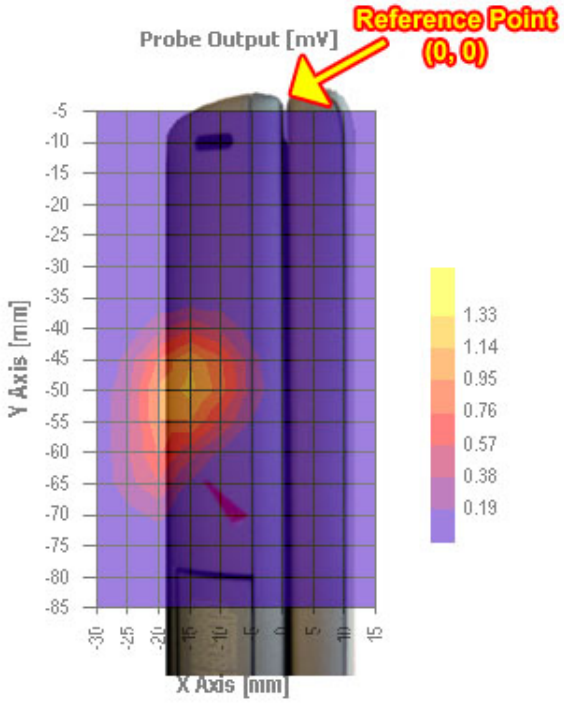
| | |
|---|---|
| **Test date** [MM/DD/YYYY] | 02/18/2003 |
| **Test by** | JaeWook Choi |
| **Room temperature** [°C] | 21 |
| **Room humidity** [%] | 30 |
| **Simulated tissue temperature** [°C] | 21 |
| **Separation distance, d** [mm] | 5 |
| **Test frequency** [MHz] | 5320 |
| **E-field Probe** | M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm |
| **Sensor Factor ($\eta_{Pd}$)** [mV/(mW/cm$^2$)] | 10.8 |
| **Amplifier Settings ($AS_1$, $AS_2$, $AS_3$)** | 0.00596768, 0.00563160, 0.00779221 |
| **Tissue Type** | Muscle |
| **Measured conductivity** [S/m] | 5.61 (+4.9 %) |
| **Measured dielectric constant** | 47.3 (-3.5 %) |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$)** [W/Kg/mV] | 0.719 |
| **Power** [dBm] | 21.9 peak conducted |
| **Measurement Volume Specification (X × Y × Z)** | 5 pts × 5 pts × 13 pts, 12 mm × 12 mm × 12 mm; Resolution: 3 mm × 3 mm × 1 mm |
| **$SAR_{1g}$** [W/Kg] | 0.3518 |




SAR measurement
Poly. (SAR measurement)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
SAR [W/Kg]
0
5
10
15
20
25
30
35
40
45
50
Distance [mm]

### *4.5.1.2.2. Aux antenna (right side)*

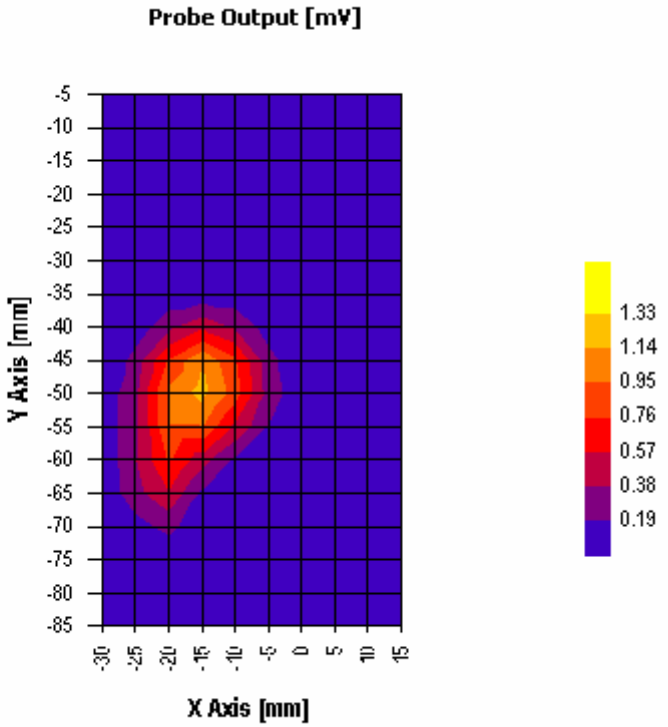
| # | Configuration | Device Test Positions | Antenna Position | Freq. [MHz] | Channel | Power reference before [dBm] | Power reference after [dBm] | MAX SAR [W/Kg] |
|---|---|---|---|---|---|---|---|---|
| 10 | Right side of the host PC toward the phantom<br>6 MBPS data rate | 5 mm separation | Aux antenna (right side) – Fixed | 5180 | CH36 | | | *note) |
| 11 | | | | 5260 | CH52 | 21.9 pk | 21.8 pk | 0.1596 |
| 12 | | | | 5320 | CH64 | | | *note) |

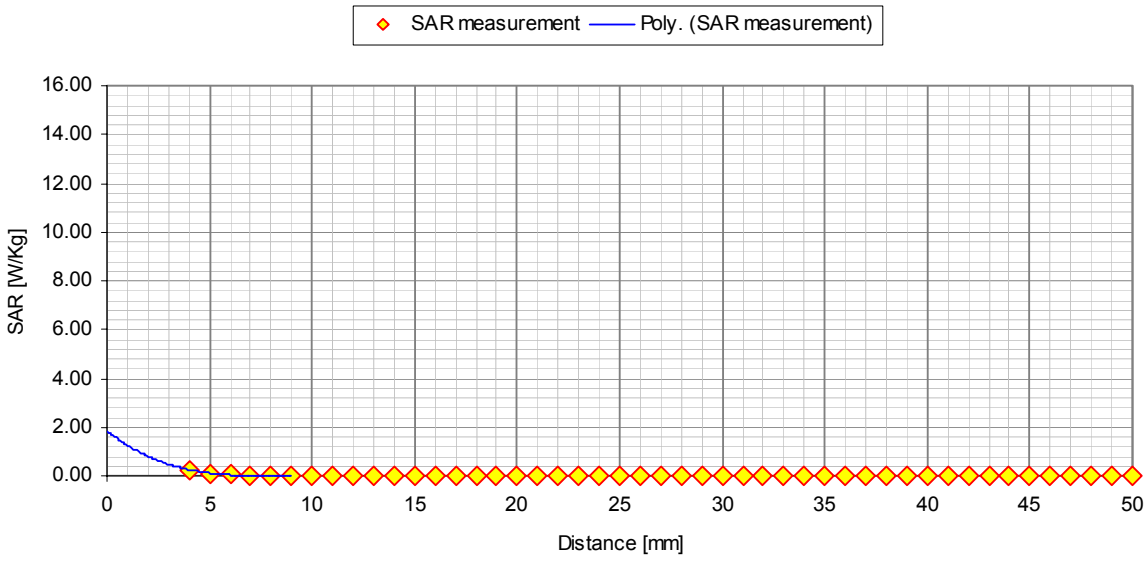



* If the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

### *4.5.1.2.2.1. CH 52, 5260 MHz*

| | |
|---|---|
| **Test date** [MM/DD/YYYY] | 02/18/2003 |
| **Test by** | JaeWook Choi |
| **Room temperature** [°C] | 21 |
| **Room humidity** [%] | 30 |
| **Simulated tissue temperature** [°C] | 21 |
| **Separation distance, d** [mm] | 5 |
| **Test frequency** [MHz] | 5260 |
| **E-field Probe** | M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm |
| **Sensor Factor ($\eta_{Pd}$)** [mV/(mW/cm$^2$)] | 10.8 |
| **Amplifier Settings ($AS_1$, $AS_2$, $AS_3$)** | 0.00596768, 0.00563160, 0.00779221 |
| **Tissue Type** | Muscle |
| **Measured conductivity** [S/m] | 5.61 (+4.9 %) |
| **Measured dielectric constant** | 47.3 (-3.5 %) |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$)** [W/Kg/mV] | 0.719 |
| **Power** [dBm] | 21.9 peak conducted |
| **Measurement Volume Specification (X × Y × Z)** | 5 pts × 5 pts × 13 pts, 12 mm × 12 mm × 12 mm; Resolution: 3 mm × 3 mm × 1 mm |
| **$SAR_{1g}$** [W/Kg] | 0.1596 |

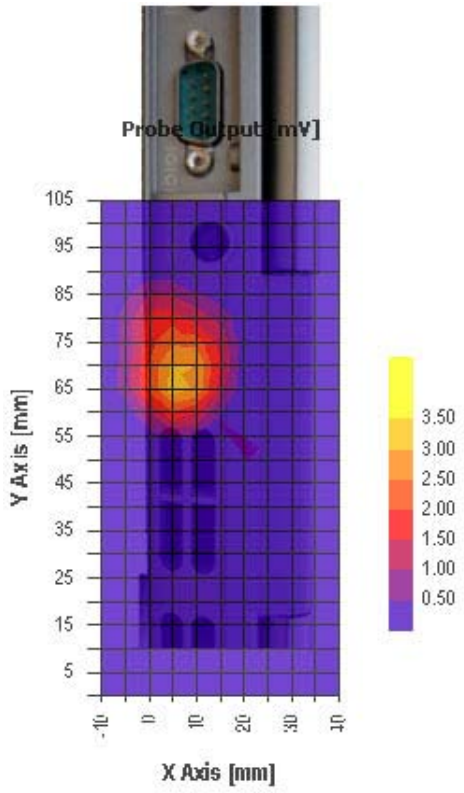



SAR measurement
Poly. (SAR measurement)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
SAR [W/Kg]
0
5
10
15
20
25
30
35
40
45
50
Distance [mm]

#### *4.5.1.3. Laptop #4 (M/N: PP02X, Wistron NeWeb Corp. Triple-band Antenna)*

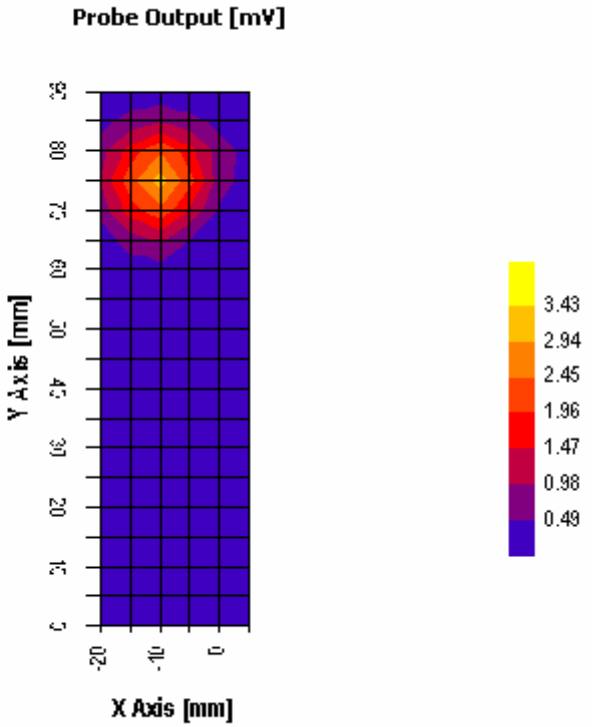
##### *4.5.1.3.1. Main antenna (back side)*

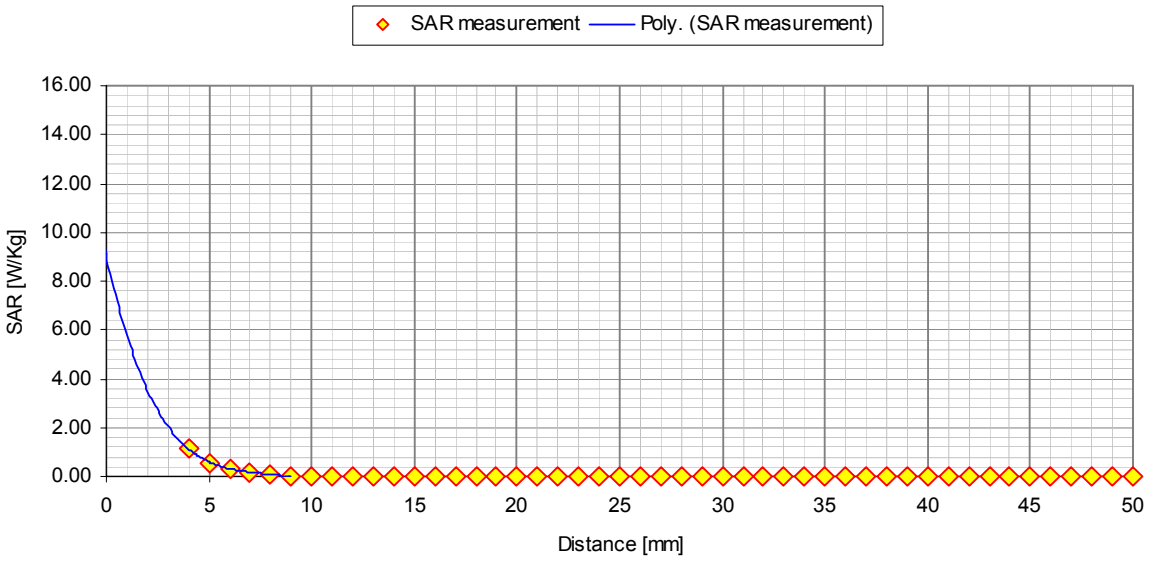
| # | Configuration | Device Test Positions | Antenna Position | Freq. [MHz] | Channel | Power reference before [dBm] | Power reference after [dBm] | MAX SAR [W/Kg] |
|---|---|---|---|---|---|---|---|---|
| 13 | Back side of the host PC toward the phantom<br>6 MBPS data rate | 5 mm separation | Main antenna (back side) – Fixed | 5180 | CH36 | 21.9 pk | 21.8 pk | 1.0998 |
| 14 | | | | 5260 | CH52 | 21.9 pk | 21.8 pk | 0.5997 |
| 15 | | | | 5320 | CH64 | 21.9 pk | 21.8 pk | 0.2789 |



### *4.5.1.3.1.1. CH 36, 5180 MHz*

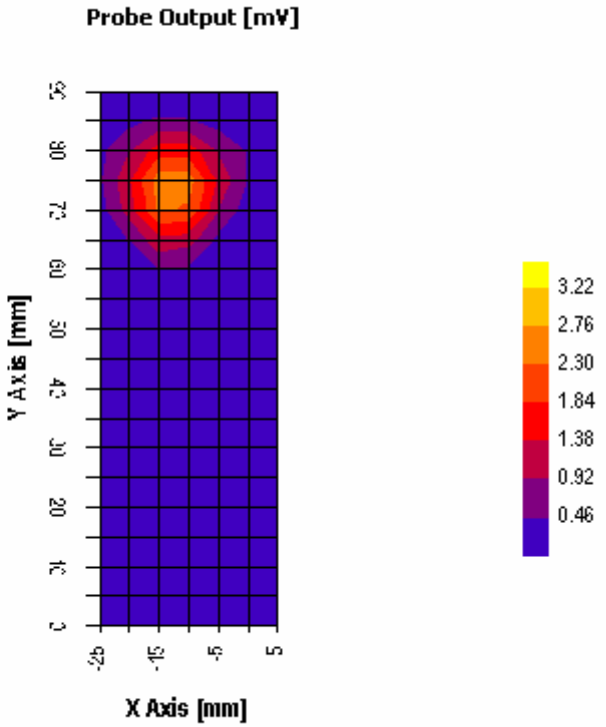
| | |
|---|---|
| **Test date** [MM/DD/YYYY] | 02/19/2003 |
| **Test by** | JaeWook Choi |
| **Room temperature** [°C] | 21 |
| **Room humidity** [%] | 30 |
| **Simulated tissue temperature** [°C] | 21 |
| **Separation distance, d** [mm] | 5 |
| **Test frequency** [MHz] | 5180 |
| **E-field Probe** | M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm |
| **Sensor Factor ($\eta_{Pd}$)** [mV/(mW/cm$^2$)] | 10.8 |
| **Amplifier Settings ($AS_1$, $AS_2$, $AS_3$)** | 0.00596768, 0.00563160, 0.00779221 |
| **Tissue Type** | Muscle |
| **Measured conductivity** [S/m] | 5.61 (+4.9 %) |
| **Measured dielectric constant** | 47.3 (-3.5 %) |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$)** [W/Kg/mV] | 0.719 |
| **Power** [dBm] | 21.9 peak conducted |
| **Measurement Volume Specification (X × Y × Z)** | 5 pts × 5 pts × 13 pts, 12 mm × 12 mm × 12 mm; Resolution: 3 mm × 3 mm × 1 mm |
| **$SAR_{1g}$** [W/Kg] | 1.0998 |

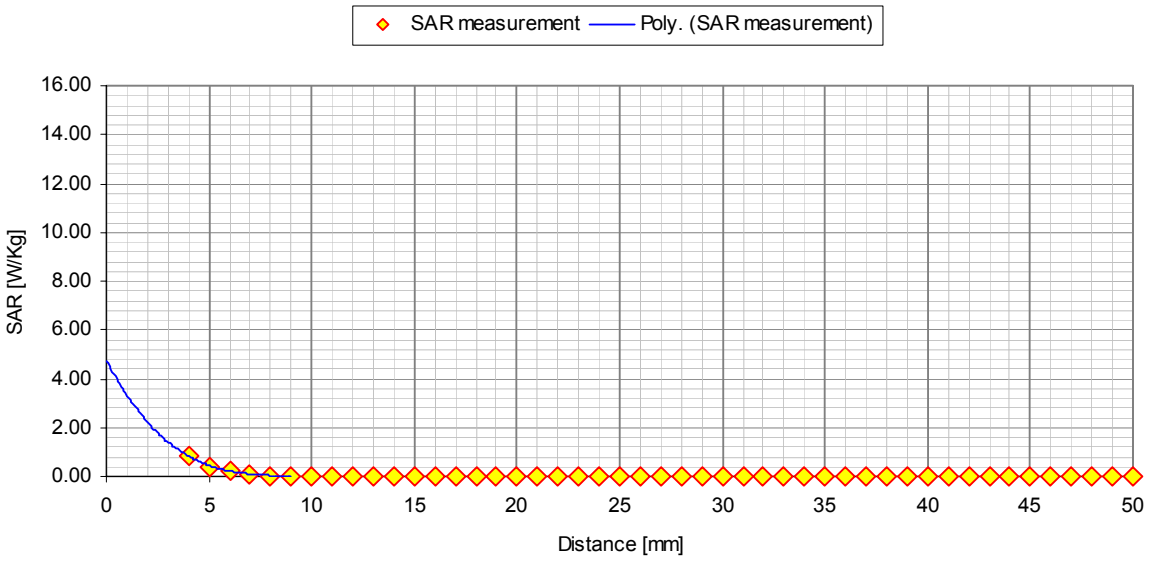



SAR measurement
Poly. (SAR measurement)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
SAR [W/Kg]
0
5
10
15
20
25
30
35
40
45
50
Distance [mm]

### *4.5.1.3.1.2. CH 52, 5260 MHz*

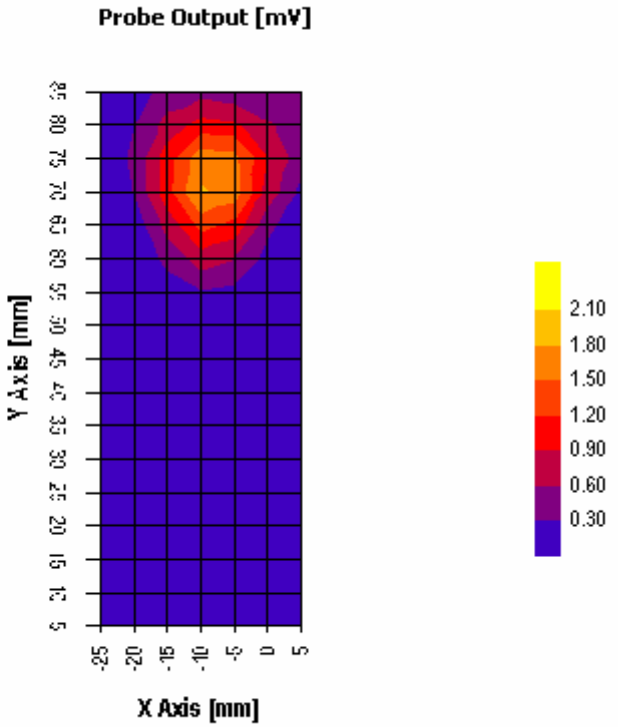
| | |
|---|---|
| **Test date** [MM/DD/YYYY] | 02/19/2003 |
| **Test by** | JaeWook Choi |
| **Room temperature** [°C] | 21 |
| **Room humidity** [%] | 30 |
| **Simulated tissue temperature** [°C] | 21 |
| **Separation distance, d** [mm] | 5 |
| **Test frequency** [MHz] | 5260 |
| **E-field Probe** | M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm |
| **Sensor Factor ($\eta_{Pd}$)** [mV/(mW/cm$^2$)] | 10.8 |
| **Amplifier Settings ($AS_1$, $AS_2$, $AS_3$)** | 0.00596768, 0.00563160, 0.00779221 |
| **Tissue Type** | Muscle |
| **Measured conductivity** [S/m] | 5.61 (+4.9 %) |
| **Measured dielectric constant** | 47.3 (-3.5 %) |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$)** [W/Kg/mV] | 0.719 |
| **Power** [dBm] | 21.9 peak conducted |
| **Measurement Volume Specification (X × Y × Z)** | 5 pts × 5 pts × 13 pts, 12 mm × 12 mm × 12 mm; Resolution: 3 mm × 3 mm × 1 mm |
| **$SAR_{1g}$** [W/Kg] | 0.5997 |

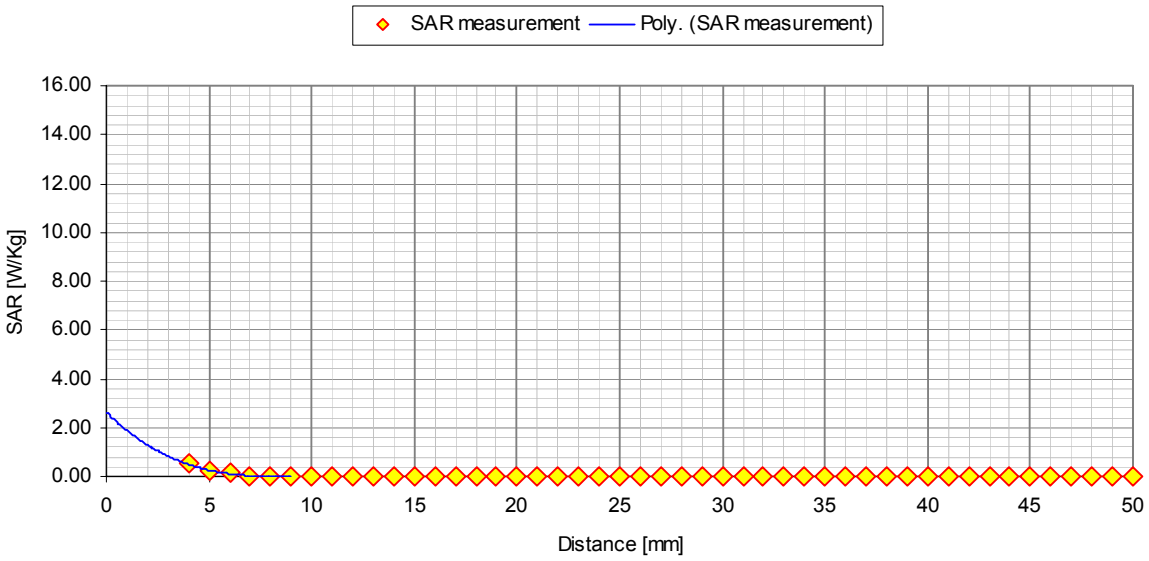



SAR measurement
Poly. (SAR measurement)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
SAR [W/Kg]
0
5
10
15
20
25
30
35
40
45
50
Distance [mm]

### *4.5.1.3.1.3. CH 64, 5320 MHz*

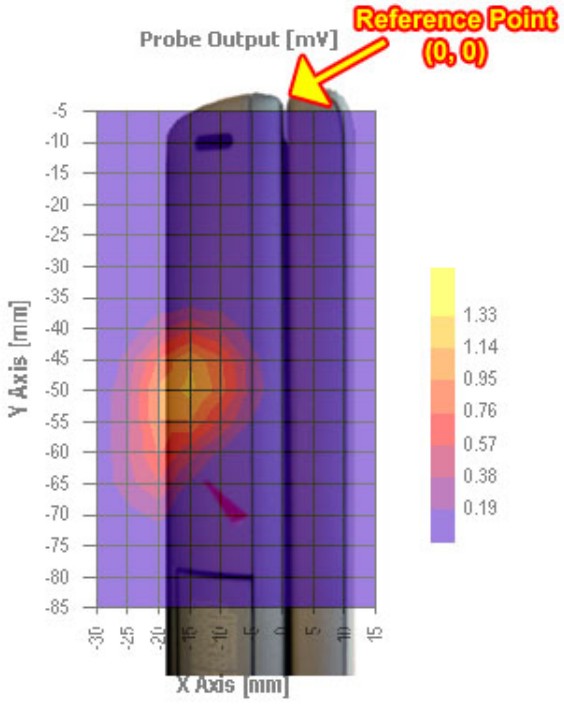
| | |
|---|---|
| **Test date** [MM/DD/YYYY] | 02/19/2003 |
| **Test by** | JaeWook Choi |
| **Room temperature** [°C] | 21 |
| **Room humidity** [%] | 30 |
| **Simulated tissue temperature** [°C] | 21 |
| **Separation distance, d** [mm] | 5 |
| **Test frequency** [MHz] | 5320 |
| **E-field Probe** | M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm |
| **Sensor Factor ($\eta_{Pd}$)** [mV/(mW/cm$^2$)] | 10.8 |
| **Amplifier Settings ($AS_1$, $AS_2$, $AS_3$)** | 0.00596768, 0.00563160, 0.00779221 |
| **Tissue Type** | Muscle |
| **Measured conductivity** [S/m] | 5.61 (+4.9 %) |
| **Measured dielectric constant** | 47.3 (-3.5 %) |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$)** [W/Kg/mV] | 0.719 |
| **Power** [dBm] | 21.9 peak conducted |
| **Measurement Volume Specification (X × Y × Z)** | 5 pts × 5 pts × 13 pts, 12 mm × 12 mm × 12 mm; Resolution: 3 mm × 3 mm × 1 mm |
| **$SAR_{1g}$** [W/Kg] | 0.2789 |




SAR measurement
Poly. (SAR measurement)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
SAR [W/Kg]
0
5
10
15
20
25
30
35
40
45
50
Distance [mm]

### *4.5.1.3.2. Aux antenna (right side)*

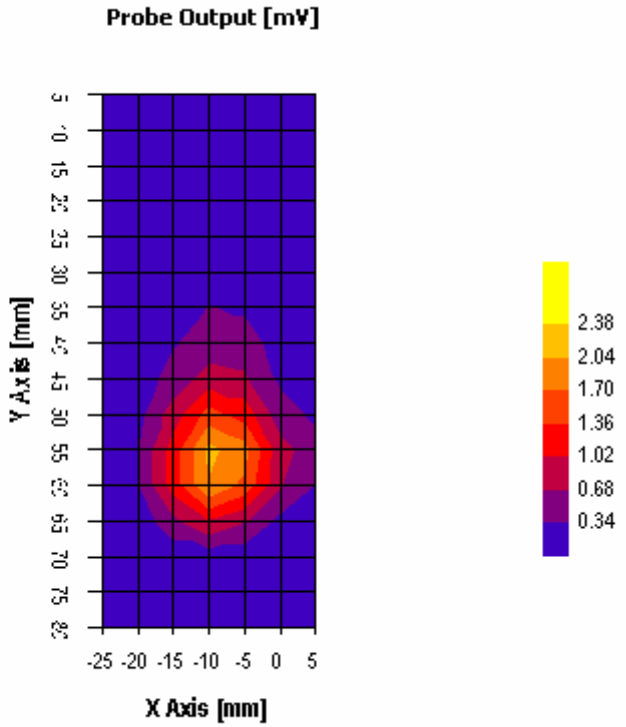
| # | Configuration | Device Test Positions | Antenna Position | Freq. [MHz] | Channel | Power reference before [dBm] | Power reference after [dBm] | MAX SAR [W/Kg] |
|---|---|---|---|---|---|---|---|---|
| 16 | Right side of the host PC toward the phantom<br>6 MBPS data rate | 5 mm separation | Aux antenna (right side) – Fixed | 5180 | CH36 | | | *note) |
| 17 | | | | 5260 | CH52 | 21.9 pk | 21.8 pk | 0.4211 |
| 18 | | | | 5320 | CH64 | | | *note) |

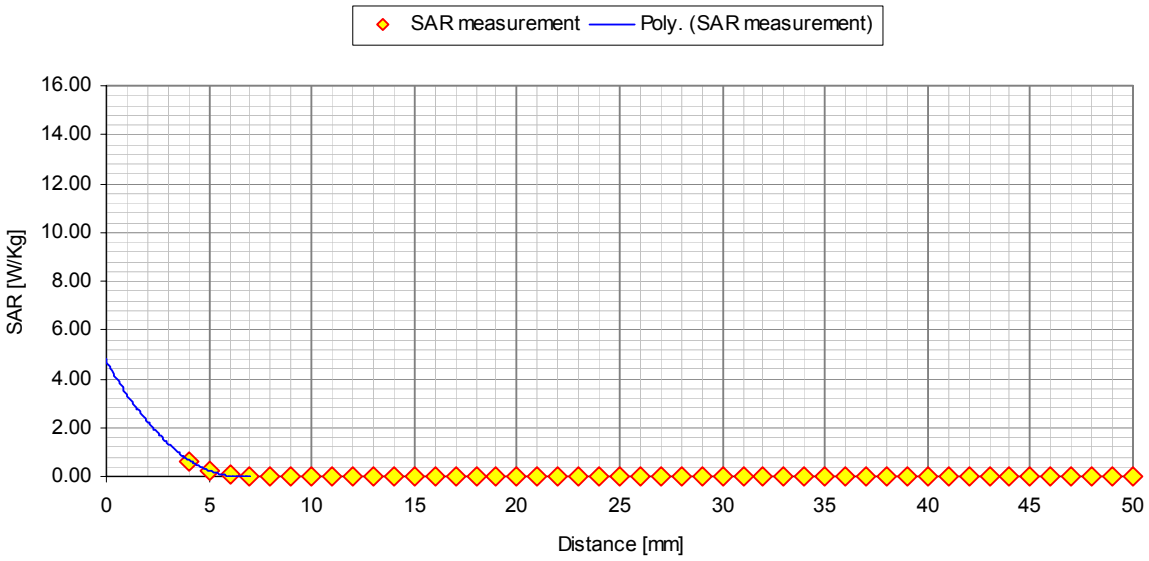



* If the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

### *4.5.1.3.2.1. CH 52, 5260 MHz*

| | |
|---|---|
| **Test date** [MM/DD/YYYY] | 02/19/2003 |
| **Test by** | JaeWook Choi |
| **Room temperature** [°C] | 21 |
| **Room humidity** [%] | 30 |
| **Simulated tissue temperature** [°C] | 21 |
| **Separation distance, d** [mm] | 5 |
| **Test frequency** [MHz] | 5260 |
| **E-field Probe** | M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm |
| **Sensor Factor ($\eta_{Pd}$)** [mV/(mW/cm$^2$)] | 10.8 |
| **Amplifier Settings ($AS_1$, $AS_2$, $AS_3$)** | 0.00596768, 0.00563160, 0.00779221 |
| **Tissue Type** | Muscle |
| **Measured conductivity** [S/m] | 5.61 (+4.9 %) |
| **Measured dielectric constant** | 47.3 (-3.5 %) |
| **Conversion Factor ($\gamma$)** | 2.721 |
| **Sensitivity ($\zeta$)** [W/Kg/mV] | 0.719 |
| **Power** [dBm] | 21.9 peak conducted |
| **Measurement Volume Specification (X × Y × Z)** | 5 pts × 5 pts × 13 pts, 12 mm × 12 mm × 12 mm; Resolution: 3 mm × 3 mm × 1 mm |
| **$SAR_{1g}$** [W/Kg] | 0.4211 |




SAR measurement
Poly. (SAR measurement)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
SAR [W/Kg]
0
5
10
15
20
25
30
35
40
45
50
Distance [mm]