Q1) SAR setup figure 4.3.1.1 seems to show 25mm from antenna to flat phantom - what is distance from the front of device body to flat phantom? Please submit closeup photo of setup and spacing. Suppl C ~pg 44 has 25mm as distance from front of device not antenna.

A1) We will use 25mm separation distance between the front of device and the phantom for future filings. In this case, SAR using 15mm separation distance will yield higher SAR than 25mm since SAR is known to be increasing as the separation distance decreased. ($SAR_{surface}$ is inversely proportional to the square of the separation distance according to the references listed in IEEE 1528)
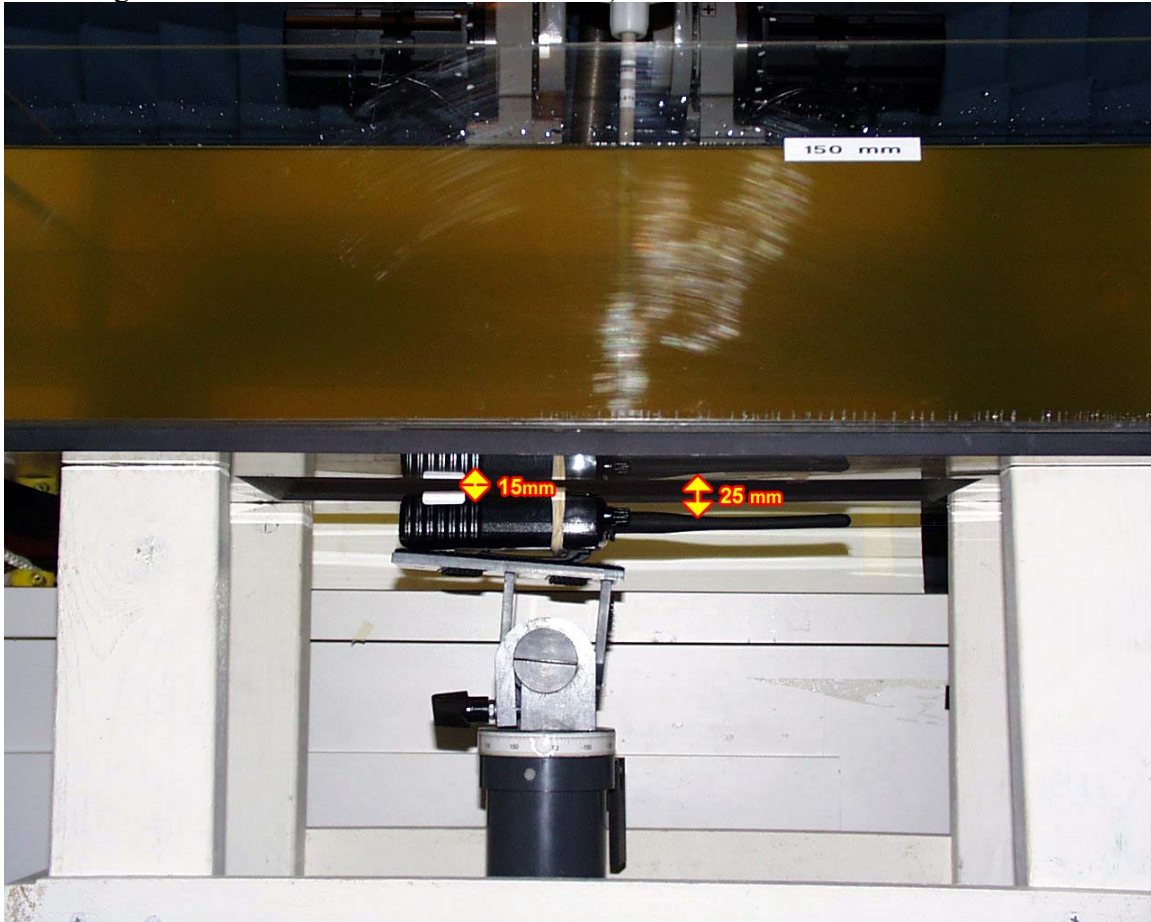
Q2) Depending on response to 1), more justification may be needed to use occupational SAR limits, which apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

A2) Refer to user manual folder for the revised version of the manual.

Q3) Please explain how power drift of SAR report 4.5.3 was used to obtain
final SAR numbers.

A3) Since the power drift was found to be higher than 5% for 30 minutes continuous
exposure at the maximum power level, the test was paused and the battery was replaced
at least twice in order to make sure the SAR was evaluated at the maximum power level.
During the area scan for finding the maximum exposure location, AA batteries and Ni-
MH battery pack were replaced once. During area scans and zoom scans the batteries was
replaced again prior to the volume scan for both types of battery to find the peak spatial-
average 1-gram SAR. The position of the EUT was maintained to be as close as possible
before and after the battery replacement. The volume scan for calculating actual 1-gram
SAR took approximately 7-8 minutes for each scan. In either case, the Ni-MH battery
was found to provide the higher SAR value and provided very little drop.

Q4) FYI in future filings it may be useful to consider small gap to antenna
tip (e.g., 5mm) rather than contact with phantom, to reduce possible
antenna de-tuning effects.

Q5) Please explain why probe conversion factor is 7.623 for both head and
body liquid.

A4) The conversion factor calibrated using tested tissue (γ_{muscle}: 7.850, $\zeta_{muscle@cal}$:
0.03646 [W/Kg/mV]) is found to yield similar or lower SAR results than that calibrated
using the brain tissue (γ_{brain}: 7.623, $\zeta_{brain@cal}$: 0.03755 [W/Kg/mV]). The percentage
difference between the sensitivities in each target tissue is found to be less than 2.99 [%].

The calibration detail using the tested muscle tissue and the revised SAR data using the
new conversion factor is shown below.

Simulated tissue for muscle

Tissue calibration type	HP Dielectric Strength Probe System
Tissue calibration date [MM/DD/YYYY]	09/20/2002
Tissue calibrated by	JaeWook Choi
Room temperature [°C]	24
Room humidity [%]	50
Simulated tissue temperature [°C]	24
Tissue calibration frequency [MHz]	150
Tissue Type	Muscle
Target conductivity [S/m]	0.80
Target dielectric constant	61.9
Specific Heat Capacity [J/Kg/°C]	3,046
Mass Density [Kg/m3]	1,241
Measured conductivity [S/m]	0.81 (+0.3 %)

Measured dielectric constant	62.5 (+1.5 %)
Penetration depth (plane wave excitation) [mm]	61.9

Conversion Factor for muscle tissue

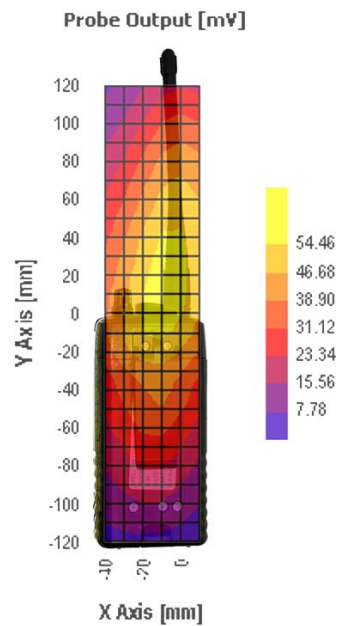|	
Calibration Date [MM/DD/YYYY]	09/22/2002
Calibration by	JaeWook Choi
Calibration Frequency [MHz]	150
Room Temperature [°C]	24
Room Humidity [%]	50
Simulated Tissue Temperature [°C]	24
PO_{tot_tissue} [mV]	15.987 @ 0.50 [W] 34.696 @ 1.01 [W] 52.834 @ 1.48 [W] 68.711 @ 2.01 [W]
$\delta(PO_{tot\_tissue})/\delta P$ [mV/W]	34.48698699
$\Delta T/\Delta t$ [°C/ sec]	0.00122 @ 4.0 [W] 0.00191 @ 6.0 [W] 0.00258 @ 8.0 [W] 0.00328 @ 10.0 [W] 0.00397 @ 12.0 [W] 0.00456 @ 14.0 [W] 0.00513 @ 16.0 [W] 0.00581 @ 18.0 [W]
$\delta(\Delta T/\Delta t)/\delta P$ [°C/sec/W]	0.0003286310
Conversion Factor (γ)	7.850
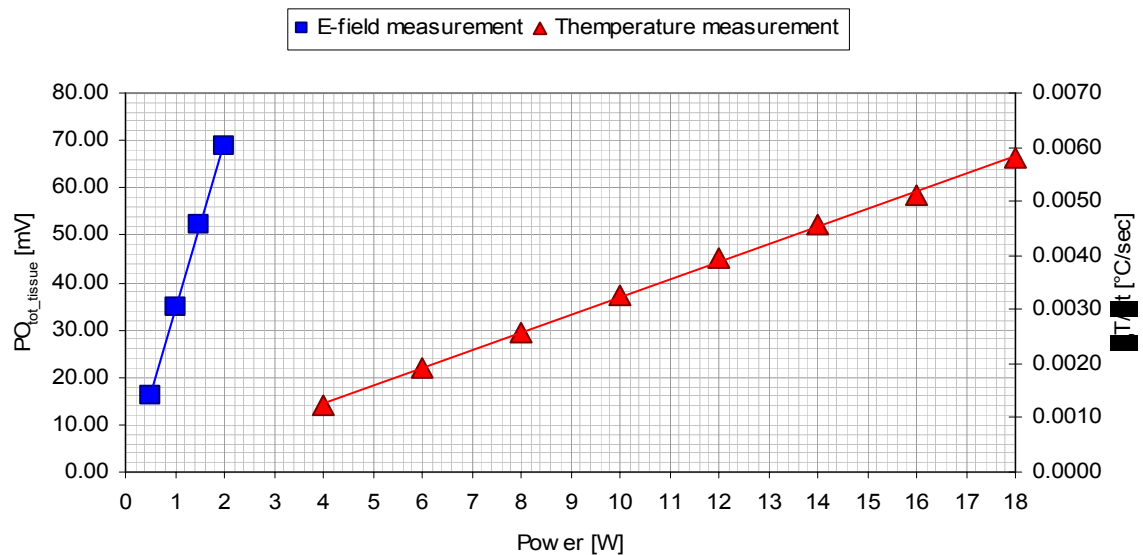
BODY-WORN (BY STANDER) CONFIGURATION

DUT parallel to the phantom

#	Configuration	Device Test Positions	Antenna Position	Freq. [MHz]	Channel	MAX SAR [W/Kg]
03	High Power (36.51 dBm conducted)	DUT parallel to the phantom	Fixed	156.800	CH16	0.829 (1.658)
04	Medium Power (30.25 dBm conducted)		Fixed	156.800	CH16	0.129 (0.257)

* The SAR Measurement inside the parenthesis indicates the reading before 50 % duty factor is applied for the half-duplex type PTT
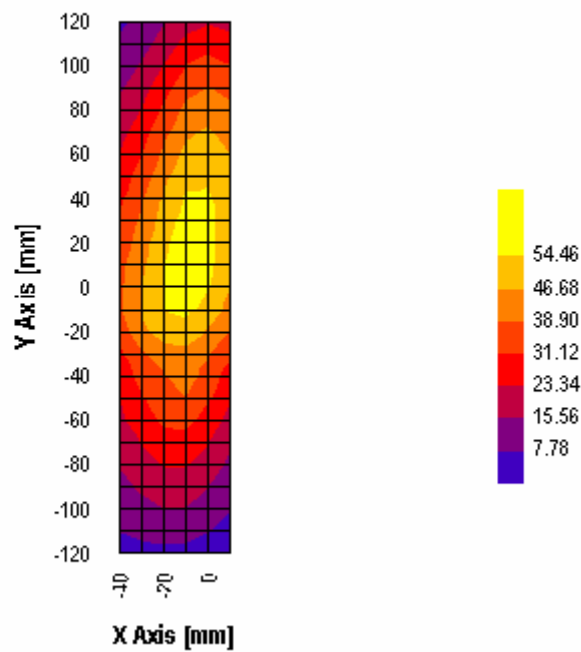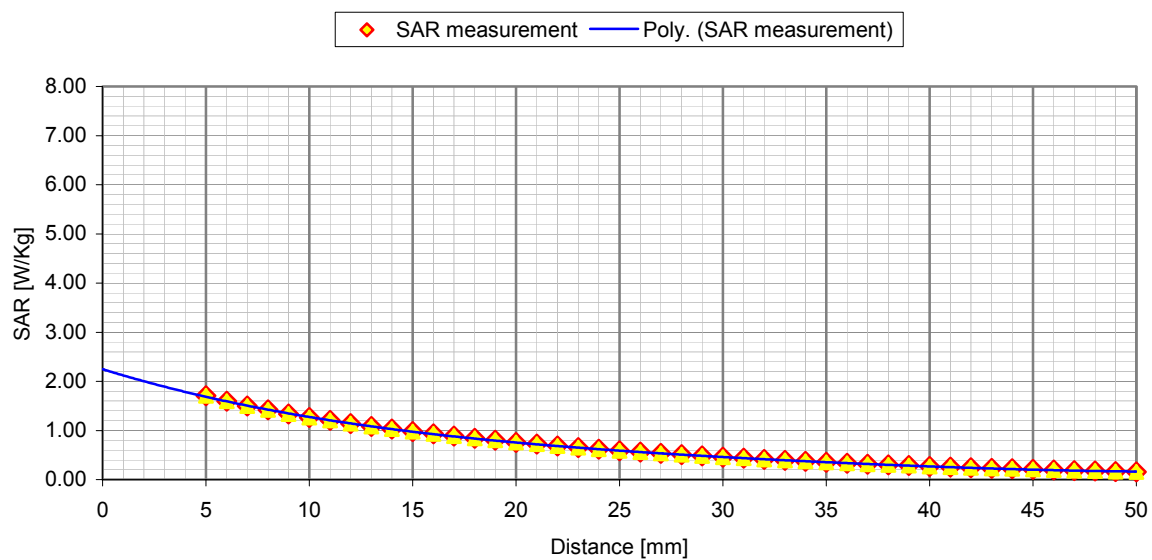

Unless otherwise specified, the reference point (0, 0) in the plots was set to the point at the base of antenna in the projected image of D.U.T. to the phantom surface.

High Power Mode, CH16, 156.800 MHz

|	
Test date [MM/DD/YYYY]	10/02/2002
Test by	JaeWook Choi
Room temperature [°C]	24
Room humidity [%]	45
Simulated tissue temperature [°C]	24
Separation distance, d [mm]	0
Test frequency [MHz]	156.800
E-field Probe	M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm
Sensor Factor (η_{Pd}) [mV/(mW/cm^2)]	10.8
Amplifier Settings (AS$_1$, AS$_2$, AS$_3$)	0.01158954, 0.01040087, 0.01319890
Tissue Type	Muscle
Measured conductivity [S/m]	0.82 (+2.7 %)
Measured dielectric constant	62.8 (+1.4 %)
Conversion Factor (γ)	7.850
Sensitivity (ζ) [W/Kg/mV]	0.03646
Power [mW]	4,477 conducted
Measurement Volume Specification (X × Y × Z)	5 pts × 5 pts × 7 pts, 20 mm × 20 mm × 30 mm; Resolution: 5 mm × 5 mm × 5 mm
SAR$_{1g}$ [W/Kg]	

Probe Output [mV]

Medium Power Mode, CH16, 156.800 MHz

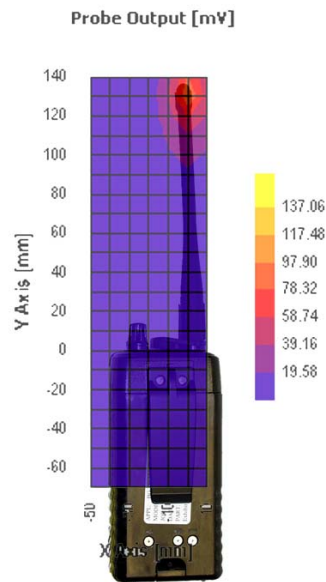|	
Test date [MM/DD/YYYY]	10/02/2002
Test by	JaeWook Choi
Room temperature [°C]	24
Room humidity [%]	45
Simulated tissue temperature [°C]	24
Separation distance, d [mm]	0
Test frequency [MHz]	156.800
E-field Probe	M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm
Sensor Factor (η_{Pd}) [mV/(mW/cm^2)]	10.8
Amplifier Settings (AS$_1$, AS$_2$, AS$_3$)	0.01158954, 0.01040087, 0.01319890
Tissue Type	Muscle
Measured conductivity [S/m]	0.82 (+2.7 %)
Measured dielectric constant	62.8 (+1.4 %)
Conversion Factor (γ)	7.850
Sensitivity (ζ) [W/Kg/mV]	0.03646
Power [mW]	1,059 conducted
Measurement Volume Specification (X × Y × Z)	5 pts × 5 pts × 7 pts, 20 mm × 20 mm × 30 mm; Resolution: 5 mm × 5 mm × 5 mm
SAR$_{1g}$ [W/Kg]	

Probe Output [mV]
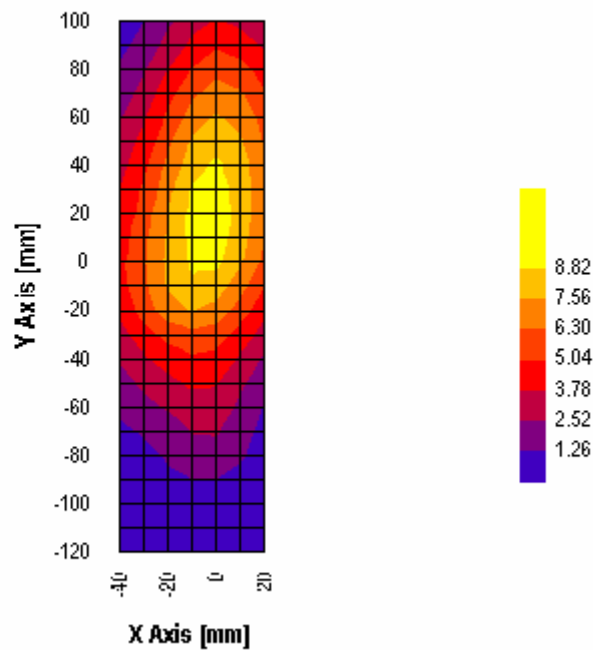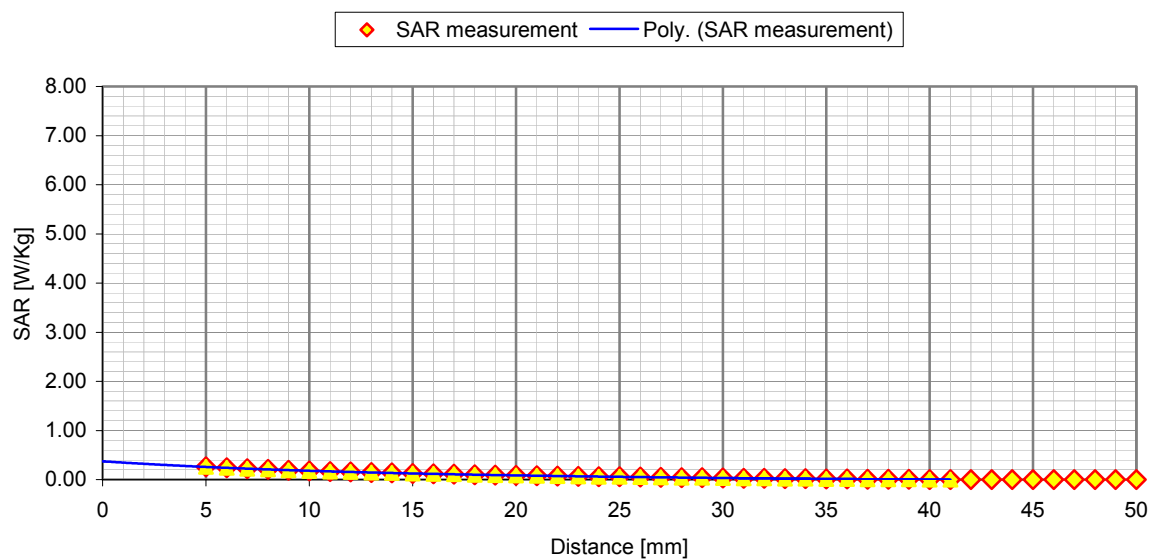
Tip of the antenna in contact

#	Configuration	Device Test Positions	Antenna Position	Freq. [MHz]	Channel	MAX SAR [W/Kg]
05	High Power (36.51 dBm conducted)	Tip of the antenna in contact	Fixed	156.800	CH16	0.313 (0.644)

* The SAR Measurement inside the parenthesis indicates the reading before 50 % duty factor is applied for the half-duplex type PTT
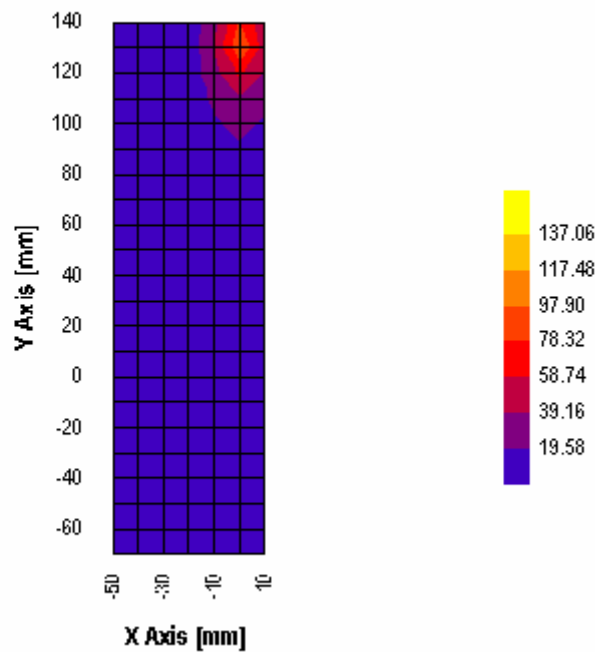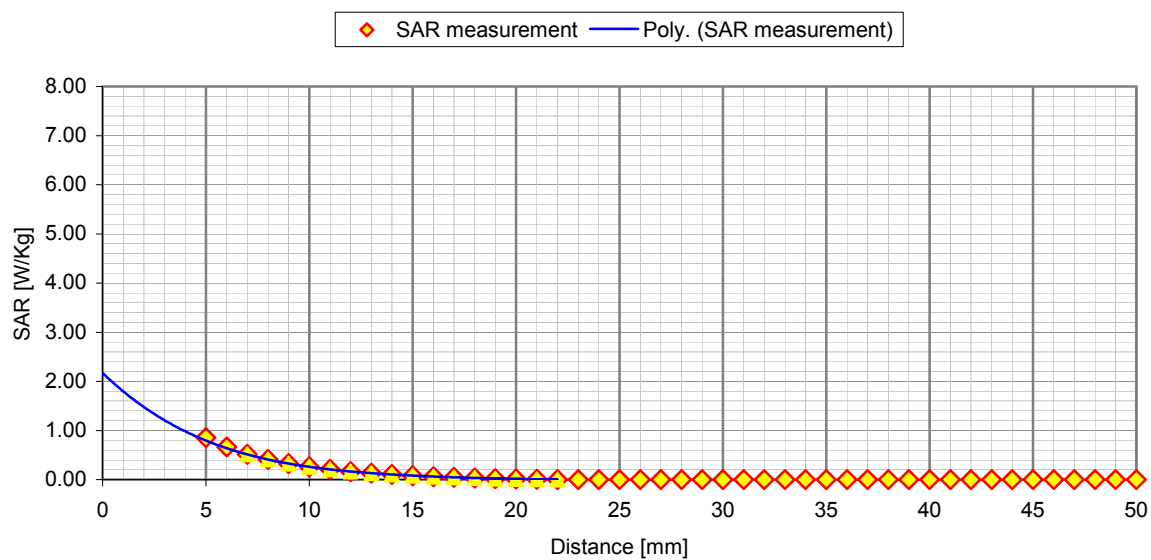

Unless otherwise specified, the reference point (0, 0) in the plots was set to the point at the base of antenna in the projected image of D.U.T. to the phantom surface.

High Power Mode, CH 16, 156.800 MHz

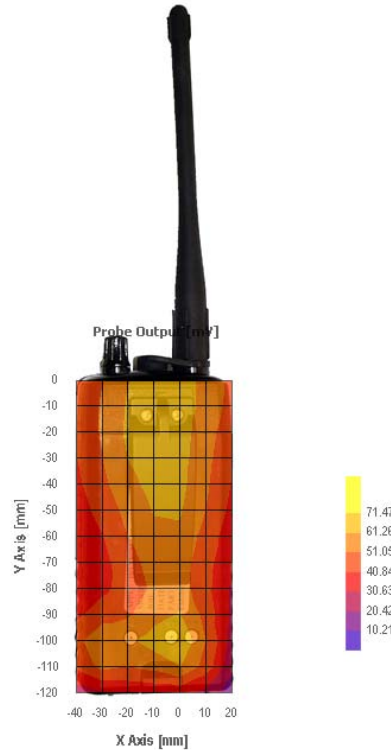|	
Test date [MM/DD/YYYY]	10/03/2002
Test by	JaeWook Choi
Room temperature [°C]	24
Room humidity [%]	45
Simulated tissue temperature [°C]	24
Separation distance, d [mm]	0
Test frequency [MHz]	156.800
E-field Probe	M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm
Sensor Factor (η_{Pd}) [mV/(mW/cm^2)]	10.8
Amplifier Settings (AS$_1$, AS$_2$, AS$_3$)	0.01158954, 0.01040087, 0.01319890
Tissue Type	Muscle
Measured conductivity [S/m]	0.82 (+2.7 %)
Measured dielectric constant	62.8 (+1.4 %)
Conversion Factor (γ)	7.850
Sensitivity (ζ) [W/Kg/mV]	0.03646
Power [mW]	4,477 conducted
Measurement Volume Specification (X × Y × Z)	5 pts × 5 pts × 7 pts, 20 mm × 20 mm × 30 mm; Resolution: 5 mm × 5 mm × 5 mm
SAR$_{1g}$ [W/Kg]	

Probe Output [mV]

Bottom edge of the DUT in contact

#	Configuration	Device Test Positions	Antenna Position	Freq. [MHz]	Channel	MAX SAR [W/Kg]
06	High Power (36.51 dBm conducted)	Bottom edge of the DUT in contact	Fixed	156.800	CH16	0.710 (1.419)

* The SAR Measurement inside the parenthesis indicates the reading before 50 % duty factor is applied for the half-duplex type PTT
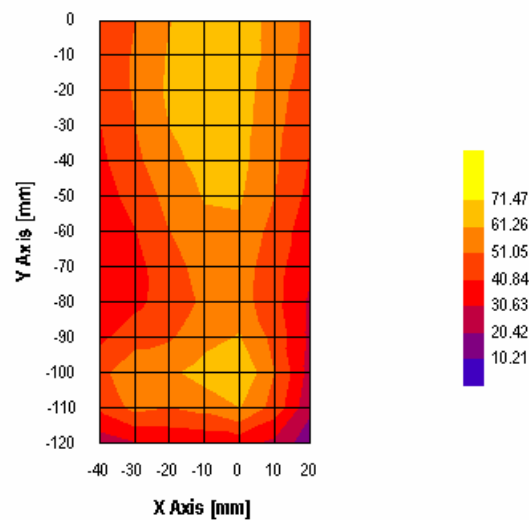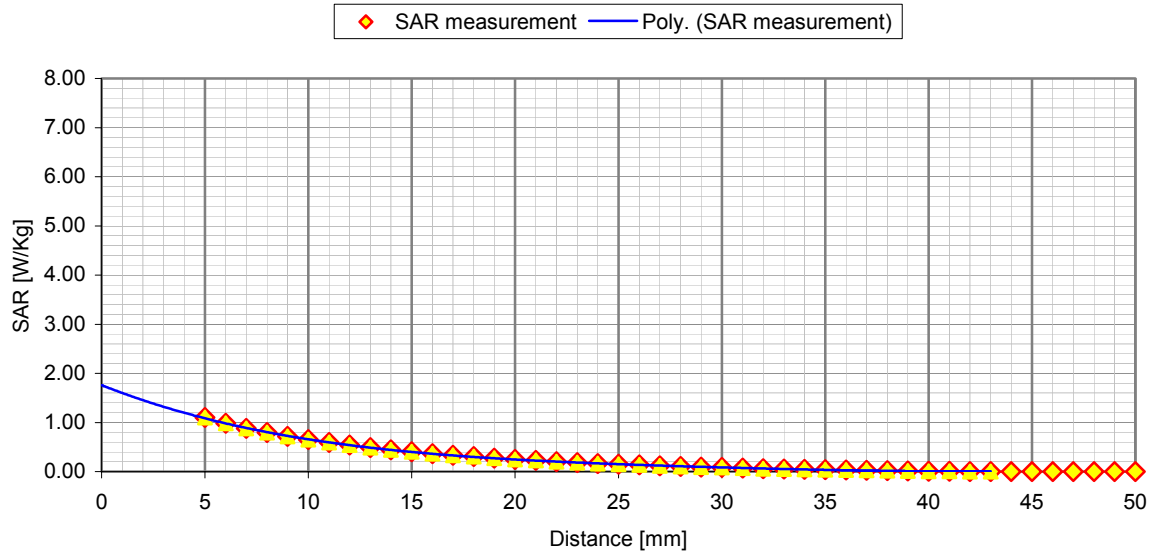

Unless otherwise specified, the reference point (0, 0) in the plots was set to the point at the base of antenna in the projected image of D.U.T. to the phantom surface.

High Power Mode, CH 16, 156.800 MHz

Test date [MM/DD/YYYY]	10/03/2002
Test by	JaeWook Choi
Room temperature [°C]	24
Room humidity [%]	45
Simulated tissue temperature [°C]	24
Separation distance, d [mm]	0
Test frequency [MHz]	156.800
E-field Probe	M/N: E-TR, S/N: UT-0200-1, Sensor Offset: 2.0 mm
Sensor Factor (η_{Pd}) [mV/(mW/cm^2)]	10.8
Amplifier Settings (AS$_1$, AS$_2$, AS$_3$)	0.01158954, 0.01040087, 0.01319890
Tissue Type	Muscle
Measured conductivity [S/m]	0.82 (+2.7 %)
Measured dielectric constant	62.8 (+1.4 %)
Conversion Factor (γ)	7.850
Sensitivity (ζ) [W/Kg/mV]	0.03646
Power [mW]	4,477 conducted
Measurement Volume Specification (X × Y × Z)	5 pts × 5 pts × 7 pts, 20 mm × 20 mm × 30 mm; Resolution: 5 mm × 5 mm × 5 mm
SAR$_{1g}$ [W/Kg]	

Probe Output [mV]

SAR measurement ◇   —— Poly. (SAR measurement)

SAR [W/Kg]

8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00

0   5   10   15   20   25   30   35   40   45   50

Distance [mm]

Muscle Tissue Dielectric Properties : $\sigma = 0.82$ [S/m], $\varepsilon_r = 62.8$

Brain Tissue Conversion Factor (γ_{brain}) : 7.623
Sensitivity(ζ_b) in the muscle tissue using brain tissue Conversion Factor

$$\zeta_b[W/Kg/mV] = \frac{\sigma_{@\,meas}}{\eta_{E2} \times 1{,}000[Kg/m^3] \times \gamma_{brain}} = \frac{0.82}{10.8/3{,}770 \times 1{,}000 \times 7.623} = 3.755\text{E-2}$$

Muscle Tissue Conversion Factor (γ_{muscle}) : 7.850
Sensitivity(ζ_m) in the muscle tissue using muscle tissue Conversion Factor

$$\zeta_m[W/Kg/mV] = \frac{\sigma_{@\,meas}}{\eta_{E2} \times 1{,}000[Kg/m^3] \times \gamma_{muscle}} = \frac{0.82}{10.8/3{,}770 \times 1{,}000 \times 7.850} = 3.646\text{E-2}$$

For example,
Body worn configuration SAR_{1g} using ζ_b (γ_{brain}) : 1.708 [W/Kg]

Body-worn configuration SAR_{1g} using ζ_m (γ_{muscle}):

$$SAR_{1g} = \frac{1.708[W/Kg]}{\zeta_b[W/Kg/mV]} \times \zeta_m[W/Kg/mV] = \frac{1.708}{0.03755} \times 0.03646 = 1.658[W/Kg]$$

(Refer to EXHIBIT 11. SAR Calculation Summary in the report)

Please feel free to contact us if you have any questions

Best Regards
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