To: Andy Leimer aleimer@fcc.gov
FCC Application Processing Branch

Re: FCC ID AFJIC-M88
Applicant: ICOM Incorporated
Correspondence Reference Number: 24516
731 Confirmation Number: EA861171

1) Updated body worn statement "ALWAYS use Icom authorized accessories (antennas, batteries, belt clips, etc.). Use of unauthorized accessories can cause the FCC RF exposure" could easily be misunderstood to refer to any ICOM accessory. Please refer to the specific accessories tested.

A1) Updated body worn statement.

"The following accessories are authorized for use with this product. Use of accessories other than those specified may result in RF exposure levels exceeding the FCC requirements for wireless RF exposure."

Belt Clip (M/N: MP-79)
Swivel Belt Clip (M/N: MB-68)
Rechargeable Li-Ion Battery Pack(M/N:BP-227)
Alkaline Battery Holder (M/N:BP-226)
Speaker-Microphone (M/N:HM-138)

2) Updated RF safety instruction with additional information about the definition of "occupational". References to occupational use was found in the warning label but no related instructions in the user manual were found.

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

3) Additional information about the SAR measurement system. Please provide manufacturer, general description of, and photographs.

The original system was manufactured by Oscar Garay, 3D-EMC Laboratory in Florida. Since the IEEE 1528 standard has still not been ratified and keep evolving, the system has been improved and modified in order to keep up with the latest requirements and/or recommendations. The description and detail of the system was included at the Exhibit 5. SAR system configuration & test methodology in the report.

4) Strong justification for use of head liquid calibration for body worn measurements. Provide SAR results using probe calibrated in body liquid as appropriate.

A4) The conversion factor calibrated using tested tissue (γ_{muscle}: 7.850, $\zeta_{muscle@cal}$: 0.03602 [W/Kg/mV]) is found to yield similar or lower SAR results than that calibrated using the brain tissue (γ_{brain}: 7.623, $\zeta_{brain@cal}$: 0.03709 [W/Kg/mV]). The percentage difference between the sensitivities in each target tissue is found to be less than 2.88 [%].

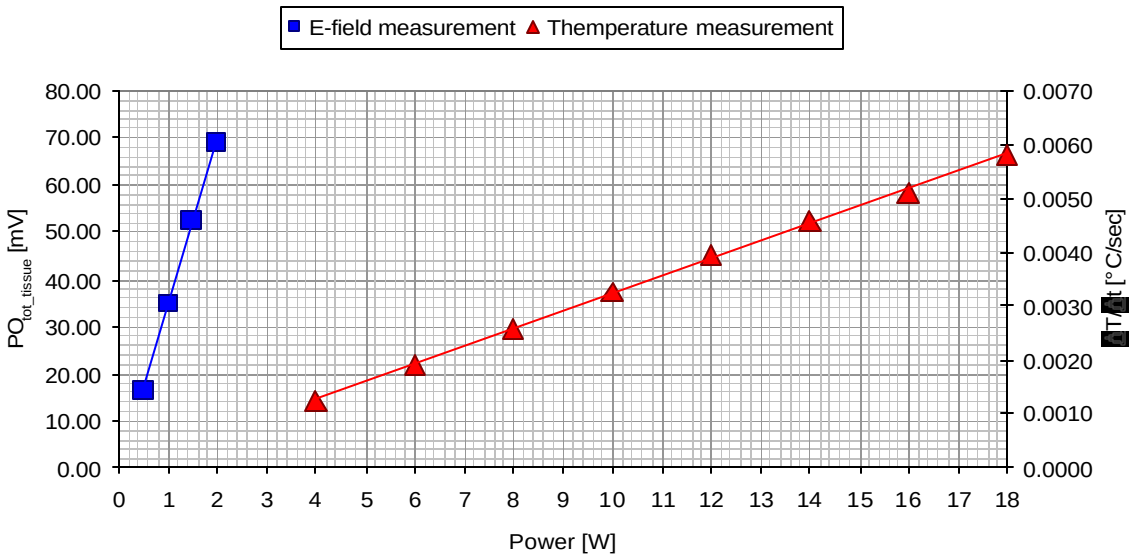
The calibration detail using the tested muscle tissue and the revised SAR data using the new conversion factor is shown below.

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

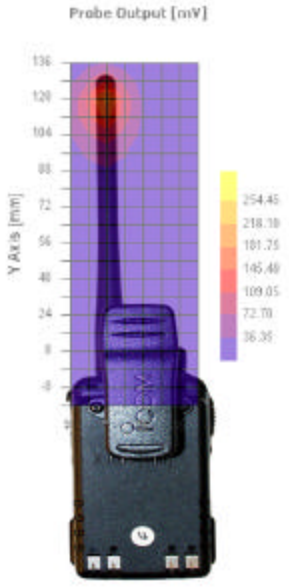
Conversion Factor for muscle tissue

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]
$d(PO_{tot\_tissue})/dP$ [mV/W]	34.48698699
DT/Dt [°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]
$d(DT/Dt)/dP$ [°C/sec/W]	0.0003286310
Conversion Factor (g)	7.850



BODY-WORN (BY STANDER) CONFIGURATION

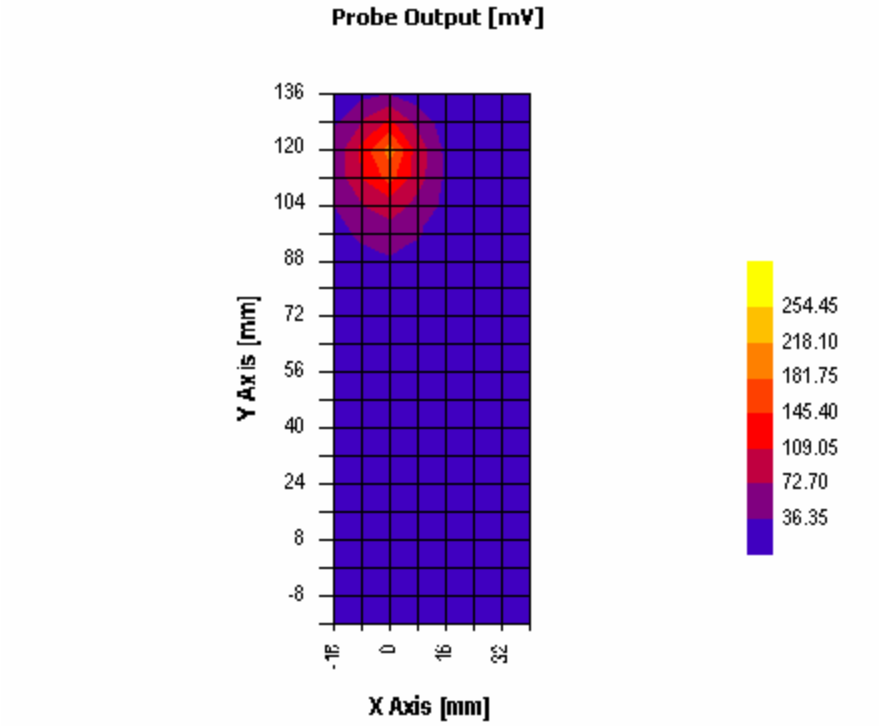
Tip of the antenna in contact

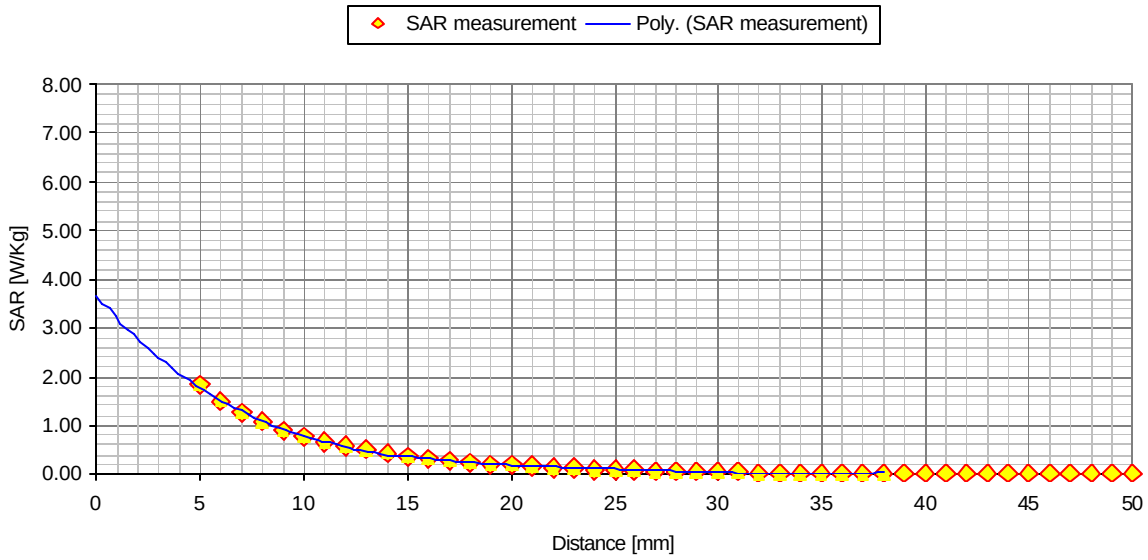


Unless otherwise specified, the reference point (0, 0) in the plots was set to the point at the base of antenna in the projected image of D.U.T. to the phantom surface.

High Power Mode, CH 16, 156.800 MHz

Test date [MM/DD/YYYY]	10/17/2002
Test by	JaeWook Choi
Room temperature [°C]	22
Room humidity [%]	40
Simulated tissue temperature [°C]	22
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 (h_{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]	0.81 (+1.3 %)
Measured dielectric constant	62.9 (+1.6 %)
Conversion Factor (g)	7.850
Sensitivity (z) [W/Kg/mV]	0.03602
Power [mW]	5,100 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]	1.406





Muscle Tissue Dielectric Properties : σ = 0.81 [S/m], εr= 62.9

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

$$z_b[W/Kg/mV] = \frac{s_{@meas}}{h_{E2} \times 1{,}000[Kg/m^3] \times g_{brain}} = \frac{0.81}{10.8/3{,}770 \times 1{,}000 \times 7.623} = 3.709\text{E-}2$$

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

$$z_m[W/Kg/mV] = \frac{s_{@meas}}{h_{E2} \times 1{,}000[Kg/m^3] \times g_{muscle}} = \frac{0.81}{10.8/3{,}770 \times 1{,}000 \times 7.850} = 3.602\text{E-}2$$

Body worn configuration SAR_{1g} using ζ_b (γ_{brain}) : 1.448 [W/Kg]

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

$$SAR_{1g} = \frac{1.448[W/Kg]}{z_b[W/Kg/mV]} \times z_m[W/Kg/mV] = \frac{1.448}{0.03709} \times 0.03602 = 1.406[W/Kg]$$

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

5) Additional information of 150 MHZ dipole. Please include drawings/photographs.

A5) The 150MHz dipole was not intended to be used for the system verification but ONLY for the thermal transfer calibration (The return loss when it interfaced with the test tissue was better than 20 dB). Per discussion between Kwok Chan of FCC lab and Victor Kee of Ultratech, the system verification at 300 MHz was provided because of there being no validation parameters for 150 MHz and no verification phantom/dipole currently available for the frequency band. The system verification at 150 MHz was provided just for your information.

6) Clarification of procedure used to measure liquid parameters. Pages

30-32 mention two different procedures. It is not clear which was used.

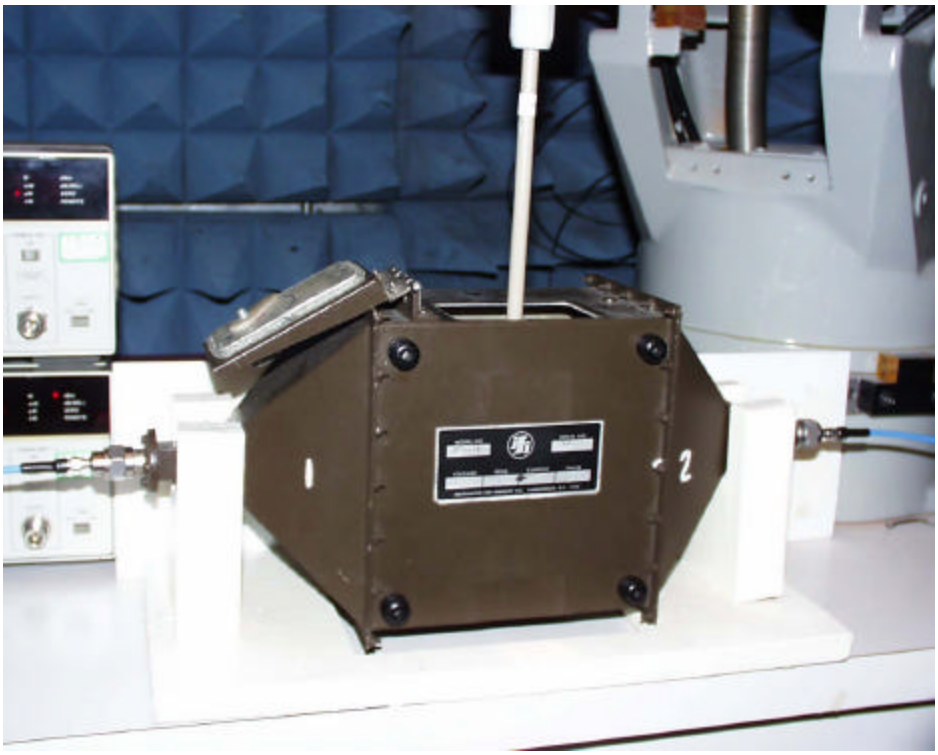
A6) The dielectric properties shown in the report were measured using the HP dielectric strength probe system (open-ended coaxial transmission-line probe).
The slotted coaxial waveguide method was initially used for the tissue calibration when the tissue was mixed, then the dielectric strength probe system was used for the verification of the dielectric properties of the tissue on a project basis.

7) SAR data for low and high channel frequencies. It appears that data for only one frequency was taken.

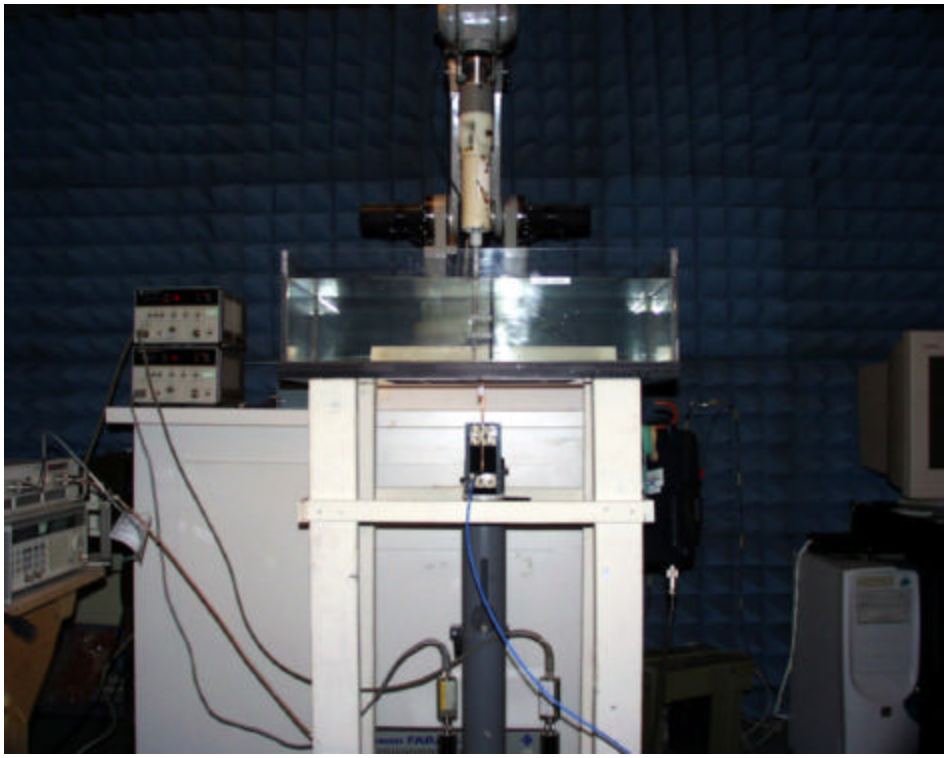
A7) SAR readings were at least 3.0 dB lower than the SAR limit (8.0 W/Kg, occupational/controlled exposure category) thus the test at low and high channel were considered to be optional as per the latest revised OET 65 Supplement C.
"If SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and lower channel is optional for such test configuration(s)", FCC Public Notice (DA 02-1438, June 19, 2002)

8) Additional calibration information justifying compliance with P1528 procedures. Please include photographs of each critical stage i.e. wave guide, temperature transfer etc. P1528 recommends waveguide calibration above 800 MHZ. It appears that TEM and temperature transfer was used. Please justify procedure.

A8) This frequency band is 150MHz which is not addressed well in the IEEE 1528 standard. As far as we know, the temperature transfer calibration is known to be the most proper calibration method at this frequency among the known methods. Key step of the system calibration procedure was included and explained in detail at section 5.6 System Calibration in the report. The system calibration procedure was designed as recommend in IEEE 1528 and well compliant with the standards as well.



< General system configuration - Free space calibration >



< General system configuration - set-up for the thermal transfer calibration and system verification >

9) Details of how the power droop with the AA batteries was handled. How long were the SAR scans associated with the AA battery configuration. Please

take appropriate steps to assure that results are conservative.

A9) 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 Li-Ion 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. In either case, the Li-Ion battery was found to provide the higher SAR value and provided very little drop.

10) Please provide before and after power measurements for each scan.

Head Front Configuration Result

Push-To-Talk

#	Configuration	Device Test Positions	Antenna Position	Freq. [MHz]	Channel	Conducted Power Before [dBm]	Conducted Power After [dBm]	MAX SAR [W/Kg]
01	High Power (37.08 dBm conducted)	25 mm separation (Push-To-Talk)	Fixed	156.800	CH16	37.08	36.88	1.196 (2.391)

Body-Worn (By stander) Configuration Result

Tip of the antenna in contact

#	Configuration	Device Test Positions	Antenna Position	Freq. [MHz]	Channel	Conducted Power Before [dBm]	Conducted Power After [dBm]	MAX SAR [W/Kg]
02	High Power (37.08 dBm conducted)	Tip of the antenna in contact	Fixed	156.800	CH16	37.08	36.88	0.724 (1.448)

Please feel free to contact us if you have any questions

Best Regards
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