SPECIFIC ABSORPTION RATE (SAR) TEST REPORT

Telian Corporation
2505 Bath Road
Elgin, IL 60123

Product: FTD8500
FCC ID: NPQFTD8500

Tested to the SAR Criteria in
FCC OET Bulletin 65, Supplement C (Edition 01-01)

Date: September 15, 2003
Project: 3047586

Prepared By:______________________________Date:____9/15/2003________

Bryan C. Taylor, Team Leader - Engineering

Approved By:______________________________Date:____ 10/15/2003_________

David Chernomordik, Ph.D., EMC Technical Manager

The results contained in this report were derived from measurements performed on the identified test samples. Any implied performance of other samples based on this report is dependent on the representative adequacy of the samples tested.

Intertek Testing Services NA, Inc.
731 Enterprise Drive, Lexington, KY 40510
Telephone: 859-226-1000 Fax: 859-226-1040 Web: www.etlsemko.com

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1.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 /3047586	BCT	9/15/2003	Original document

2.0 References

1] ANSI, *ANSI/IEEE C95.1-1991: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz*, The Institute of electrical and Electronics Engineers, Inc., New York, NY 10017, 1992

[2] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", OET Bulletin 65, FCC, Washington, D.C. 20554, 1997

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, "Automated E-field scanning system for dosimetric assessments", *IEEE Transaction on Microwave Theory and Techniques*, vol. 44, pp. 105-113, Jan. 1996.

[4] Niels Kuster, Ralph Kastle, and Thomas Schmid, "Dosimetic evaluation of mobile communications equipment with know precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp.645-652, May 1997.

5] NIS81, NAMAS, "The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddinton, Middlesex, England, 1994.

6] Barry N. Tayor and Chris E. Kuyatt, "Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994.

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3.0 Introduction

The FTD8500 Cell phone was evaluated for SAR in accordance with the requirements for RF Exposure compliance testing defined in FCC OET Bulletin 65, Supplement C (Edition 01-01). Testing was performed at the Intertek facility in Lexington, Kentucky.

For the evaluation, the dosimetric assessment system DASY3 was used. The phantom employed was the "SAM Twin Phantom". The total uncertainty for the evaluation of the spatial peak SAR values averaged over a cube of 1g tissue mass had been assessed for this system to be ±27.0%.

The device was tested at the maximum output power declared by Telian Corporation.

The maximum spatial peak SAR value for the sample device averaged over 1g was found to be:

Phantom	Position	Worst Case Extrapolated SAR_{1g} mW/g
Head Section (AMPS Mode)	Right Ear, Cheek Touch, 848.87 MHz (High Channel)	0.896
Head Section (TDMA Mode)	Right Ear, Cheek Touch, 836.52 MHz (Mid Channel)	0.370

Based on the worst-case data presented above, the sample tested was found to be in compliance with the requirements defined in OET Bulletin 65, Supplement C (Edition 01-01).

Modifications required for compliance

Intertek implemented no modifications.

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4.0 Test Site Description

The SAR test site located at 731 Enterprise Drive, Lexington KY 40510 is comprised of the SPEAG model DASY 3 automated near-field scanning system, which is a package, optimized for dosimetric evaluation of mobile radios [3]. This system is installed in an ambient-free shielded enclosure with RF absorbing material on the walls and ceiling. The Ambient temperature is controlled to 22.2 $\pm 2^{o}$C. Because the HVAC operates as a closed system, the relative humidity remains constant at 50 $\pm$5%. During the SAR evaluations, the RF ambient conditions are monitored continuously for signals that might interfere with the test results. The tissue simulating liquid is also stored and validated in this area in order to keep it at the same constant ambient temperature as the room.

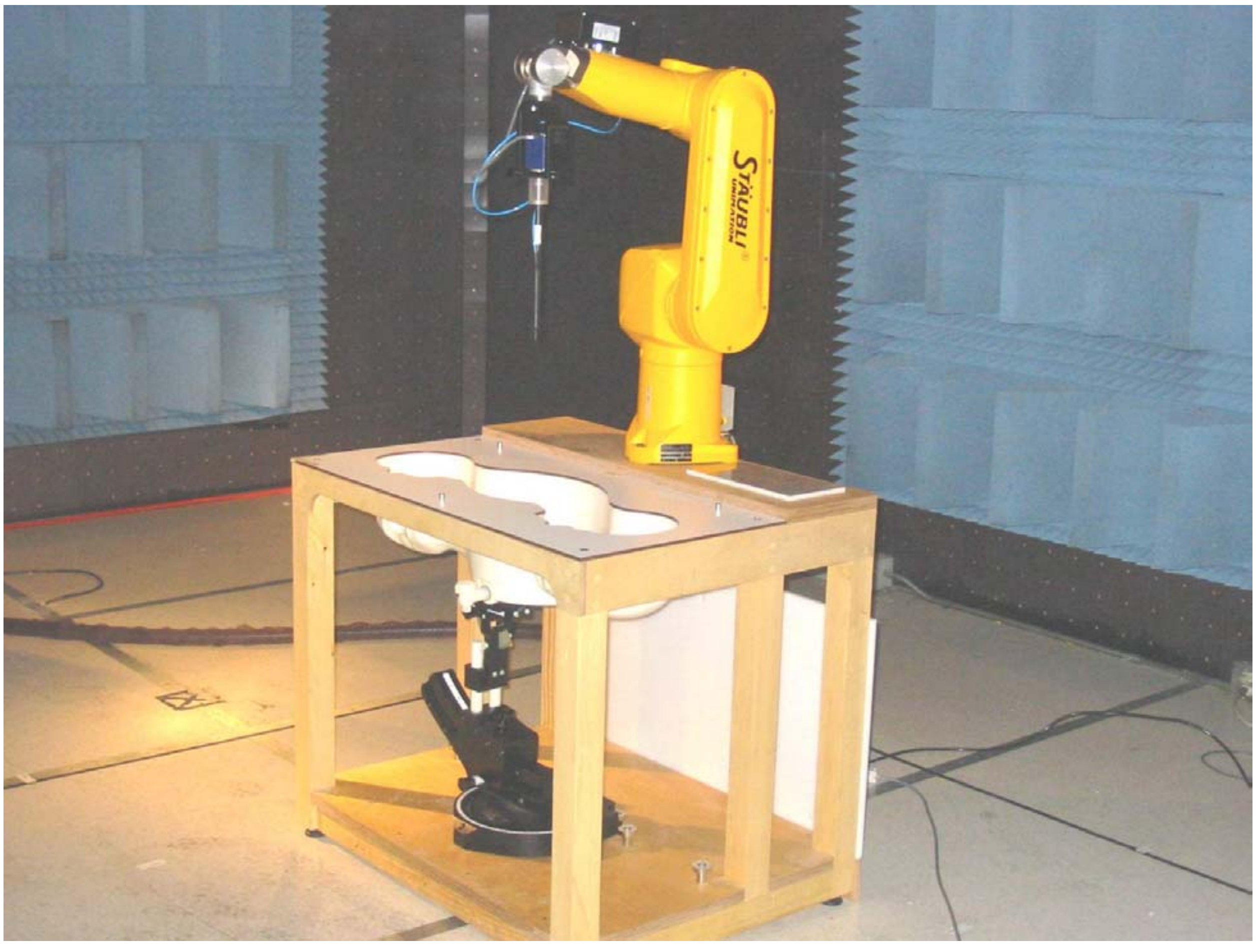

Figure 1 – SAR Test Site

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Measurement Equipment

The following major equipment/components were used for the SAR evaluations:

SAR Measurement System			
EQUIPMENT	**SPECIFICATIONS**	**S/N #**	**Last Cal. Data**
Robot	**Stäubli RX60L**	597412-01	N/A
	Repeatability: ± 0.025mm Accuracy: $0.806x10^{-3}$ degree Number of Axes: 6		
E-Field Probe	**ER3DV6**	1785	07/28/2003
	Dynamic Range: 5 µW/g to >100 mW/g Tip diameter: 6.8 mm Probe Linearity: ± 0.2 dB (30 MHz to 3 GHz) Axial isotropy: ± 0.2 dB Spherical isotropy: ± 0.2 dB Length: 34.5 cm Distance between the probe tip and the dipole center: 2.7 mm Calibration: 450, 835/900, 1800/1900, 2450 MHz for head & body liquid		
Data Acquisition	**DAE3**	317	N/A
	Measurement Range: 1µV to >200mV Input offset Voltage: < 1µV (with auto zero) Input Resistance: 200 M		
Phantom	**SAM Twin V4.0**	TP-1243	QD000P40CA
Complies with IEEE P1528-200x, draft 6.5 (See certificate in App. C)	Type SAM Twin, Homogenous Shell Material: Fiberglass Thickness: 2 ± 0.2 mm Capacity: 20 liter Size of the flat section: approx. 320 x 230 mm		
Device holder	Non-conductive holder supplied with DASY3, dielectric constant less than 5.0	N/A	N/A
Simulated Tissue	**Mixture**	N/A	8/11/03-8/18/03
	Please see Tissue Simulating Liquid Description and Validation on page 13 for details		
Power Meter	**Boonton 5232 RF Power Meter / Voltmeter**	13601	10/08/03
	Power Meter Frequency Range: 10 kHz to 40 GHz Power Meter Measurement Range: -70 dBm to +44 dBm		
Signal Generator	HP 83620 B	3614A00199	8/21/02
	Frequency Range: 10MHz – 20 GHz Amplitude Range: -110 dBm – 25 dBm		

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Measurement Uncertainty

The Table below includes the uncertainty budget suggested by the IEEE Std 1528-200X and determined by SPEAG for the DASY3 measurement System. The extended uncertainty (K=2) was assessed to be 27.0 %

Uncertainty Component	Tolerance (± %)	Probability Distribution	Divisor	c_i	Standard Uncertainty, (± %)	v_i^2 or v_{eff}
Measurement System						
Probe Calibration	4.8	Normal	1	1	4.8	Inf.
Axial Isotropy	4.7	Rectangular	√3	$(1-cp)^{1/2}$	1.9	Inf.
Spherical Isotropy	9.6	Rectangular	√3	$\sqrt{c_p}$	3.9	Inf.
Boundary Effect	5.5	Rectangular	√3	1	3.2	Inf.
Linearity	4.7	Rectangular	√3	1	2.7	Inf.
System Detection Limits	1.0	Rectangular	√3	1	0.6	Inf.
Readout Electronics	1.0	Normal	1	1	1.0	Inf.
Response Time	0.8	Rectangular	√3	1	0.5	Inf.
Integration Time	1.4	Rectangular	√3	1	0.8	Inf.
RF Ambient Conditions	3.0	Rectangular	√3	1	1.7	Inf.
Probe Positioner Mechanical Tolerance	0.4	Rectangular	√3	1	0.2	Inf.
Probe Positioning with respect to Phantom Shell	2.9	Rectangular	√3	1	1.7	Inf.
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	3.9	Rectangular	√3	1	2.3	Inf.
Test sample Related						
Test Sample Positioning	6.0	Normal	0.89	1	6.7	12
Device Holder Uncertainty	5.0	Normal	0.84	1	5.9	8
Output Power Variation - SAR drift measurement	5.0	Rectangular	√3	1	2.9	Inf.
Phantom and Tissue Parameters						
Phantom Uncertainty (shape and thickness tolerances)	4.0	Rectangular	√3	1	2.3	Inf.
Liquid Conductivity Target tolerance	3.0	Rectangular	√3	0.6	1.0	Inf.
Liquid Conductivity - measurement uncertainty	10.0	Rectangular	√3	0.6	3.5	Inf.
Liquid Permittivity Target tolerance	4.0	Rectangular	√3	0.6	1.3	Inf.
Liquid Permittivity - measurement uncertainty	5.0	Rectangular	√3	0.6	1.7	Inf.
Combined Standard Uncertainty					13.5	
Expanded Uncertainty (95% CONFIDENCE INTERVAL)					27.0	

Notes.

1. The Divisor is a function of the probability distribution and degrees of freedom (ν_i and ν_{eff}). See NIST Technical Note TN1297, NIS 81 and NIS 3003.
2. c_i is the sensitivity coefficient that should be applied to convert the variability of the uncertainty component into a variability of SAR.

Measurement Tractability

All measurements described in this report are traceable to National Institute of Standards and Technology (NIST) standards or appropriate national standards.

5.0 Job Description

The FTD8500 Cell phone has been tested to the requirements defined in OET Bulletin 65, Supplement C (Edition 01-01) at the request of:

Manufacturer of the EUT:	Telian Corporation 5th Floor Namjeun Building 53-3 Haan-Dong, Kwangmyung, Kyunggi-DO Korea
Name of contact:	Mr. Pedro Park
Telephone:	011 82 9256482683
Fax:	011 82 9256482684
Manufacturer of the radio:	Telian Corporation
Model Number of the radio:	FTD8500
Serial Number of the radio:	Not Marked
Manufacturer of the battery:	BYD
Model Number of the battery:	Not Marked
EUT receive date:	September 4, 2003
EUT received condition:	Good working condition production unit
Test start date:	September 4, 2003
Test end date:	September 8, 2003

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Test Sample Description

The EUT was an AMPS / TDMA "clam shell" type Cell Phone.

Test sample		
Model	FTD8500	
FCC ID of Phone	NPQFTD8500	
Device Category	Portable	
RF Exposure Category	General Population/Uncontrolled Environment	
Frequency Band	824.04 – 848.97 MHz	
Mode(s) of Operation	AMPS	TDMA
Crest Factor	1	3
Maximum output power	26.7 dBm	26.8 dBm

Test sample Antenna	
Type	¼ wave whip antenna
Configuration	Fixed
Location	Right side of phone

Test sample Accessories	
Battery type	3.7V Li-Ion Battery Manufactured by BYD
Earpiece	A specific earpiece was supplied with the EUT

Test Signal Mode	
Test Commands	X
Base Station Simulator	

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Test Sample Photographs

Figure 2 – Phone In Holster

Figure 3 – Phone Out of Holster

Figure 4 – Phone with Earpiece Attached

6.0 System Verification

Dipole System Validation

Prior to the assessment, the system was verified to be within ±10% of the specifications by using the system validation kit. The validation was performed at 900 MHz using head tissue.

Reference Dipole Validation								
Frequency Measure (MHz)	Dipole Type	Dipole Serial Number	Fluid Type	Dipole Power Input	Cal. Lab SAR (1g)	Measured SAR (1g)	% Error SAR (1g)	Date
900	D900V2	13	900 MHz Head	250 mW	2.66	2.78	4.51	9/4/2003

Dipole dimensions: L=150.2 mm, D=3.6 mm

The following information, regarding the impedance of the D900V2, S/N #: 013 dipole was supplied by SPEAG:

Feed-point impedance at 900 MHz: Re{Z} = 50.3 Ohm; Im{Z} = 0.7 Ohm
Return Loss at 900 MHz -41.9 dB

For the SAR Dipole Validation plots see page 22.

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Tissue Simulating Liquid Description and Validation

Simulation Liquid; Frequency: 900 MHz		
Ingredient	**Head**	**Body**
Water	41.45 %	52.4 %
Sugar	56.0 %	45.0 %
Salt	1.45 %	1.4 %
Bactericide	0.1 %	0.1 %
HEC	1.0 %	1.0 %

Note: The amounts of each ingredient specified in the tables are not the exact amounts of the final test solution. The final test solution was adjusted by adding small amounts of water, sugar, and/or salt to calibrate the solution to meet the proper dielectric parameters.

The dielectric parameters were verified prior to assessment using the HP 85070A dielectric probe kit and the HP 8753C Network Analyzer. The dielectric parameters (ε_r, σ) on each day of testing were as follows:

Head Tissue Parameters								
Frequency Measure (MHz)	**Dielectric Constant Target**	**Dielectric Constant Measure**	**Dielectric % Deviation**	**Imaginary Part**	**Conductivity Target**	**Conductivity Measure**	**Conductivity % Deviation**	**Date**
835	41.5	41.4	0.24	18.8	0.9	0.87	3.03	9/4/2003
900	41.5	40.9	1.45	18.7	0.97	0.94	3.54	9/4/2003
915	41.5	40.7	1.93	18.7	0.98	0.95	2.93	9/4/2003

Maximum mass density $\rho = 1$ g/cm^3
Maximum deviation of the dielectric parameters from the recommended values was 3.54%.
During the measurements, the liquid level was maintained to a level of 15 cm with a tolerance of ±0.2 cm.

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7.0 Evaluation Procedures

Prior to any testing, the appropriate fluid was used to fill the phantom to a depth of 15 cm ±0.2cm. The fluid parameters were verified and the dipole validation was performed as described in the previous sections.

Test Positions:

The Device was positioned against the SAM and flat phantoms using the exact procedure described in Supplement C Edition 01 – 01 of Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", OET Bulletin 65, FCC, Washington, D.C. 20554, 1997.

Reference Power Measurement:

The measurement probe was positioned at a fixed location above the reference point. A power measurement was made with the probe above this reference position so it could be used for the assessing the power drift later in the test procedure.

Coarse Scan:

A coarse area scan with a horizontal grid spacing of 20 x 20 mm was performed in order to find the approximate location of the peak SAR value. This scan was performed with the measurement probe at a constant height in the simulating fluid. A two dimensional spline interpolation algorithm was then used to determine the peaks and gradients within the scanned area.

Zoom Scan:

A zoom scan was performed around the approximate location of the peak SAR as determined from the coarse scan. The zoom scan was comprised of a measurement volume of 32 x 32 x 34 mm based on 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

Data Extrapolation:

Since the center of the dipoles in the measurement probe are 2.7 mm away from the tip of the probe, and the distance between the surface and the lowest measurement point is 1.6 mm the data at the surface was extrapolated. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in the Z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

The maximum interpolated value was searched with a straightforward sorting algorithm. Around this maximum, the SAR values averaged over the spatial volumes (1g or 10g) were computed using a 3-D spline interpolation algorithm. The 3-D spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y and z directions). The volume was integrated with a trapezoidal algorithm. 1000 points (10 x 10 x 10) were interpolated to calculate the average.

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

Reference Power Measurement:

The probe was positioned at precisely the same reference point and the reference power measurement was repeated. The difference between the initial reference power and the final one is referred to as the power drift. If the power drift exceeded 5% of the final peak SAR value, the measurement was repeated.

RF Ambient Activity:

During the entire SAR evaluation, the RF ambient activity was monitored using a spectrum analyzer with an antenna connected to it. The spectrum analyzer was tuned to the frequency of measurement and with one trace set to max hold mode. In this way, it was possible to determine if at any point during the SAR measurement there were interfering ambient signals. If an ambient signal was detected, then the SAR measurement was repeated.

8.0 Configuration / Test Photographs

Figure 5 – Left Ear Tilt Position

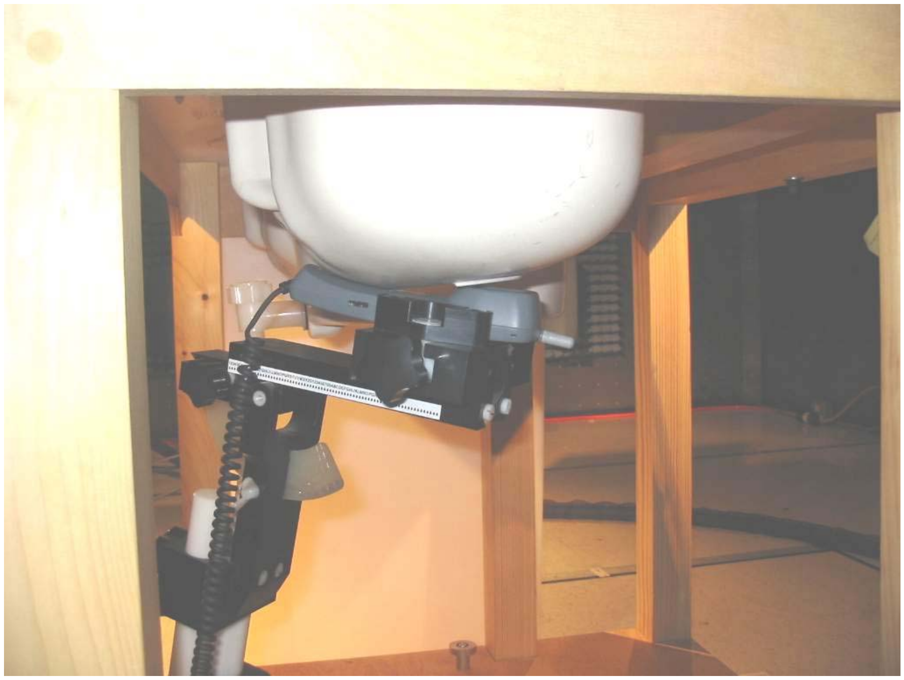

Figure 6 – Left Ear Touch Position

Figure 7 – Right Ear Tilt Position

Figure 8 – Right Ear Touch Position

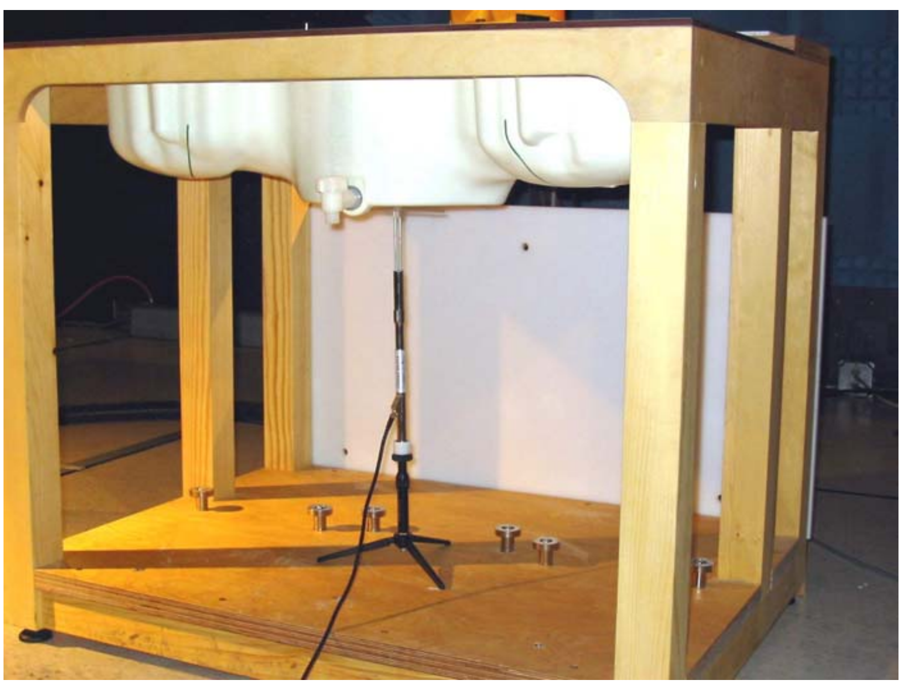

Figure 9 - System Verification with 900 MHz Dipole

9.0 Criteria

The following FCC limits for SAR apply to devices operating in General Population/Uncontrolled Exposure environment:

Exposure (General Population/Uncontrolled Exposure environment)	**SAR (W/kg)**
Average over the whole body	0.08
Spatial Peak (1g)	1.60
Spatial Peak for hands, wrists, feet and ankles (10g)	4.00

10.0 Engineering Judgments

Per Supplement C (01-01), if the SAR at the middle channel is at least 3.0 dB lower than the SAR limit (i.e. 0.8 mW/g), testing at the high and low channels is optional. Therefore, SAR was measured at the middle channel for each configuration (left and right sides) and found that the measured 1-gram SAR is less than 0.8 mW/g. Additional tests were performed at the highest channel because the output power at highest channel is slightly higher than at the middle channel.

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11.0 Tabular Test Results

The results on the following page(s) were obtained when the device was tested in the condition described. Detail measurement data and plots, which reveal information about the location of the maximum SAR with respect to the device, are reported in Appendix A.

Conducted Power Measurements

The following conducted power measurements were taken using a cable supplied by Telian Corporation. The cable, which had an insertion loss of 0.5 dB, was inserted into the measurement port of the phone. The other end of the cable was attached to the input of a power meter. The phone was made to transmit at the low, mid, and high channels in both AMPS and TDMA modes. The power meter reading was added to the cable loss to yield the conducted power measurements below.

Frequency (MHz)	Conducted Power in AMPS Mode (dBm)	Conducted Power in TDMA Mode (dBm)
824.04	26.5	26.4
836.52	26.6	26.8
848.97	26.7	26.8

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Phone Mode Tabular Test Results

Please note that the duty cycle factor is included in the measured SAR data and that the uncertainty of the system is not included

Cheek Touch and Tilt; AMPS Mode With Crest Factor of 1									
Channel	**Freq. (MHz)**	**Ant. Pos.**	**Battery**	**Test Position**	**Carry Case**	**Other Attatchments**	**Power Drift (dB)**	**Measured 1-g SAR (mW/g)**	**Scaled 1-g SAR (mW/g)**
High	848.9700	NA	AC Power	Right Ear Cheek Touch	None	None	-0.210	0.854	0.896
	848.9700	NA	AC Power	Right Ear 15 Deg. Tilt	None	None	-0.130	0.765	-
	848.9700	NA	AC Power	Left Ear Cheek Touch	None	None	-0.010	0.668	-
	848.9700	NA	AC Power	Left Ear 15 Deg. Tilt	None	None	0.570	0.718	0.819
Mid	836.5200	NA	AC Power	Right Ear Cheek Touch	None	None	-0.200	0.254	-
	836.5200	NA	AC Power	Right Ear 15 Deg. Tilt	None	None	0.070	0.752	-
	836.5200	NA	AC Power	Left Ear Cheek Touch	None	None	0.000	0.203	-
	836.5200	NA	AC Power	Left Ear 15 Deg. Tilt	None	None	0.560	0.669	0.761

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Cheek Touch and Tilt; TDMA Mode With Crest Factor of 3									
Channel	**Freq. (MHz)**	**Ant. Pos.**	**Battery**	**Test Position**	**Carry Case**	**Other Attatchments**	**Power Drift (dB)**	**Measured 1-g SAR (mW/g)**	**Scaled 1-g SAR (mW/g)**
High	848.9700	NA	AC Power	Right Ear Cheek Touch	None	None	-0.070	0.226	-
	848.9700	NA	AC Power	Right Ear 15 Deg. Tilt	None	None	-0.270	0.176	-
	848.9700	NA	AC Power	Left Ear Cheek Touch	None	None	-0.340	0.134	-
	848.9700	NA	AC Power	Left Ear 15 Deg. Tilt	None	None	0.000	0.128	-
Mid	836.5200	NA	AC Power	Right Ear Cheek Touch	None	None	-0.180	0.355	0.370
	836.5200	NA	AC Power	Right Ear 15 Deg. Tilt	None	None	-0.150	0.263	-
	836.5200	NA	AC Power	Left Ear Cheek Touch	None	None	0.310	0.337	0.362
	836.5200	NA	AC Power	Left Ear 15 Deg. Tilt	None	None	0.270	0.221	-

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12.0 Graphical Test Results

Please note that the graphical visualization of the phone position onto the SAR distribution gives only limited information on the current distribution of the device, since the curvature of the head results in graphical distortion. Full information can only be obtained either by H-field scans in free space or SAR evaluation with a flat phantom.

SAR Plots for System verification