



Test Report Serial No.:	020906LEA-T720-S24F	Report Issue No.:	S720-021506-R0
Date(s) of Evaluation:	February 10, 2006	Report Issue Date:	February 15, 2006
Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

RF EXPOSURE EVALUATION

SPECIFIC ABSORPTION RATE

SAR TEST REPORT

FOR

UNICATION CO., LTD.

PORTABLE TWO-WAY PAGING TRANSCEIVER

MODEL: M90

FCC ID: LEAABN25ARA00

IC: 3819A-M90

Test Report Serial Number

020906LEA-T720-S24F

Test Report Issue No.

S720-021506-R0

Test Lab

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Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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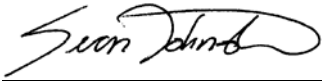

DECLARATION OF COMPLIANCE SAR RF EXPOSURE EVALUATION

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<p>FCC IDENTIFIER: LEAABN25ARA00 IC IDENTIFIER: 3819A-M90 Model(s): M90</p>	
<p>SAR Test Requirement(s): FCC 47 CFR §2.1093; Health Canada Safety Code 6 SAR Test Procedure(s): FCC OET Bulletin 65, Supplement C (Edition 01-01) Industry Canada RSS-102 Issue 2</p> <p>Device Classification: PCS Licensed Transmitter (PCB) Device Description: Portable Two-Way Paging Transceiver Transmission Protocol: ReFLEX™ Modulation Type: CPFSK (Continuous phase-frequency-shift keying)</p>	
<p>Transmit Frequency Range: 901 - 902 MHz Max. RF Output Power Tested: 0.29 Watts (24.6 dBm) ERP (901.5 MHz) Max. Duty Cycle Tested: 22 % (Crest Factor: 1:4.55) Battery Type(s) Tested: 3.6 V Lithium Polymer, 1050 mAh (Model: LP-10) Antenna Type(s) Tested: Internal</p>	
<p>Body-Worn Accessories Tested: Belt-Worn Holster (P/N: 1600-01002)</p>	
<p>Audio Accessories Tested: None (not applicable)</p>	
<p>Max. SAR Level(s) Measured: Body-worn: 1.01 W/kg (1g average)</p>	

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01) and Industry Canada RSS-102 Issue 2 for the General Population / Uncontrolled Exposure environment. All measurements were performed in accordance with the SAR system manufacturer recommendations.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

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<p>Tested By:</p>  <p>Sean Johnston Compliance Technologist Celltech Labs Inc.</p>	<p>Reviewed By:</p>  <p>Spencer Watson Senior Compliance Technologist Celltech Labs Inc.</p>
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Applicant: Unication Co., Ltd.	FCC ID: LEAABN25ARA00	IC ID: 3819A-M90	
Model(s): M90	DUT Type: Portable Two-Way Paging Transceiver	Freq.: 901-902 MHz	
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1.0 INTRODUCTION

This measurement report demonstrates that the UNICATION CO., LTD. Model: M90 Portable Two-Way Paging Transceiver FCC ID: LEAABN25ARA00 complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]) and IC RSS-102 Issue 2 (see reference [4]) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 DESCRIPTION of DEVICE UNDER TEST (DUT)

SAR Test Requirement(s)	FCC 47 CFR §2.1093	Health Canada Safety Code 6		
SAR Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)			
	Industry Canada RSS-102 Issue 2			
FCC Device Classification	PCS Licensed Transmitter (PCB)		§24D	
IC Device Classification	900 MHz Narrowband Personal Communications Services		RSS-134 Issue 1	
Device Description	Portable Two-Way Paging Transceiver			
RF Exposure Category	General Population / Uncontrolled Environment			
FCC IDENTIFIER	LEAABN25ARA00			
IC IDENTIFIER	3819A-M90			
Model(s)	M90			
Test Sample Serial No.	UGBC5Z226R	Identical Prototype		
Transmission Protocol	ReFLEX™			
Modulation Type	CPFSK (Continuous phase frequency-shift keying)			
Transmit Frequency Range	901 - 902 MHz			
Max. RF Output Power Tested	0.29 Watts	24.6 dBm	901.5 MHz	ERP
Max. Duty Cycle Tested	22 %		Crest Factor: 1:4.55	
Battery Type(s) Tested	Lithium Polymer	3.6 V	1050 mAh	Model: LP-10
Antenna Type(s) Tested	Internal			
Body-Worn Accessories Tested	Belt-Worn Holster (Plastic with Metal Screw)		P/N: 1600-01002	
Audio Accessories Tested	None		Not applicable	

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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3.0 SAR MEASUREMENT SYSTEM


Celltech Labs Inc. SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for brain and/or body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server. The DAE4 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the DASY4 measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.



DASY4 Measurement System with SAM Phantom and validation dipole



DASY4 SAR Measurement System with SAM phantom and device holder

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
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4.0 MEASUREMENT SUMMARY

BODY-WORN SAR EVALUATION RESULTS												
Freq. (MHz)	Chan.	Test Mode	Duty Cycle Tested	Battery Type	Antenna Type	DUT Position to Planar Phantom	Body-worn Accessory	Separation Distance to Planar Phantom (cm)	Start Power ERP (Watts)	SAR Drift During Test (dB)	Measured SAR 1g (W/kg)	
901.5	Mid	CW	22%	Lithium Polymer	Internal	Back Side	Belt-Worn Holster	1.2	0.290	-0.166	1.01	
ANSI / IEEE C95.1 1999 - SAFETY LIMIT				BODY: 1.6 W/kg (averaged over 1 gram)				Spatial Peak Uncontrolled Exposure / General Population				
Test Date		February 10, 2006				Atmospheric Pressure		102.1	kPa			
Measured Fluid Type		900 MHz Body				Relative Humidity		30	%			
Dielectric Constant ϵ_r		IEEE Target		Measured	Deviation	Ambient Temperature		22.4	°C			
		55.0	± 5%	53.3	-3.1%	Fluid Temperature		23.0	°C			
Conductivity σ (mho/m)		IEEE Target		Measured	Deviation	Fluid Depth		≥ 15	cm			
		1.05	± 5%	1.04	-1.0%	ρ (Kg/m³)		1000				

Note(s):

- The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
- The transmission band of the DUT is less than 10 MHz, therefore mid channel data only is reported (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
- The DUT battery was fully charged prior to the SAR evaluation.
- The power drift was measured by the DASY4 system for the duration of the SAR evaluation.
- The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures reported were consistent for all measurement periods.
- The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluation using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).
- The SAR evaluation was performed within 24 hours of the system performance check.

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5.0 DETAILS OF SAR EVALUATION

The UNICATION CO., LTD. Model: M90 Portable Two-Way Paging Transceiver FCC ID: LEAABN25ARA00 was compliant for localized Specific Absorption Rate (Uncontrolled Exposure) based on the test provisions and conditions described below. Detailed test setup photographs are shown in Appendix D.

SAR Test Configurations

1. The DUT was tested in a body-worn configuration placed inside the Belt-Worn Holster accessory (P/N: 1600-01002) with the back side of the DUT facing parallel to the outer surface of the SAM phantom (planar section). The belt-clip section of the Belt-Worn Holster was touching the outer surface of the SAM phantom (planar section) and provided a 1.2 cm spacing between the back of the DUT and the outer surface of the SAM phantom (planar section).

Test Modes & Power Settings

2. The conducted RF output power of the DUT could not be measured for the SAR evaluation due to an internal antenna. The DUT was evaluated for SAR at the maximum conducted RF output power level preset by the manufacturer.
3. The DUT was evaluated for Effective Radiated Power (ERP) by Timco Engineering Inc. prior to the SAR evaluation using the signal substitution method in accordance with ANSI/TIA-603-C-2004 (see reference [7]).
4. The DUT was tested in unmodulated transmit operation with a CW signal at maximum power and 22% duty cycle (Crest Factor 1:4.55) with 200ms on/off duration.
5. The power drift of the DUT was measured by the DASY4 system for the duration of the SAR evaluation.
6. The DUT battery was fully charged prior to the SAR evaluation.

6.0 EVALUATION PROCEDURES


- (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.
- (ii) For body-worn and face-held devices a planar phantom was used.
- b. The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.

An area scan was determined as follows:

- c. Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.
- d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.

A 1g and 10g spatial peak SAR was determined as follows:

- e. Extrapolation is used to find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, 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 1.4 mm (see probe calibration document in Appendix F). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.
- f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).
- g. A zoom scan volume of 32 mm x 32 mm x 30 mm (5 x 5 x 7 points) centered at the peak SAR location determined from the area scan is used for all zoom scans for devices with a transmit frequency < 800 MHz. Zoom scans for frequencies ≥ 800 MHz are determined with a scan volume of 30 mm x 30 mm x 30 mm (7 x 7 x 7) to ensure complete capture of the peak spatial-average SAR.

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7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluation a system check was performed at the planar section of the SAM phantom with a 900MHz dipole (see Appendix E for system validation procedures). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of $\pm 10\%$ (see Appendix B). See Table 1 below for the SAR system manufacturer's reference body SAR values from the DASY4 Operation Manual (see reference [6]).

SYSTEM PERFORMANCE CHECK EVALUATION																
Test Date	900MHz Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant ϵ_r			Conductivity σ (mho/m)			ρ (Kg/m ³)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		IEEE Target	Meas.	Dev.	IEEE Target	Meas.	Dev.	IEEE Target	Meas.	Dev.						
2/10/06	Body	2.78 $\pm 10\%$	2.72	-2.2%	55.0 $\pm 5\%$	53.3	-3.1%	1.05 $\pm 5\%$	1.04	-1.0%	1000	22.4	23.0	≥ 15	30	101.1

Note(s):
 1. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the system performance check. The temperatures listed in the table above were consistent for all measurement periods.

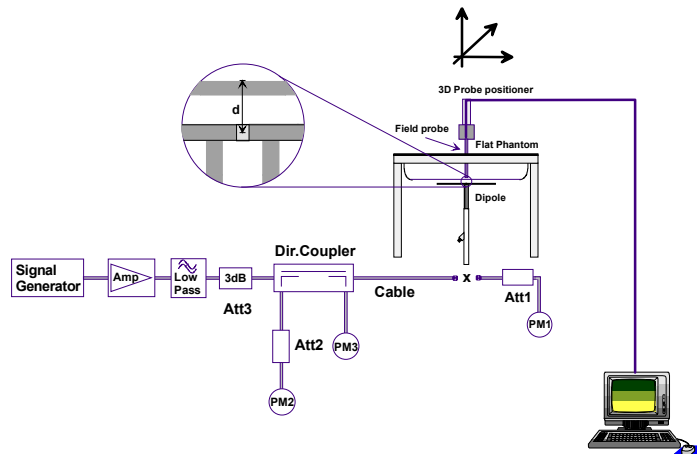


Figure 1. System Performance Check Measurement Setup



900MHz Dipole Setup

Dipole Type	Distance [mm]	Frequency [MHz]	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D300V2	15	300	3.02	2.06	4.36
D450V2	15	450	5.01	3.36	7.22
D835V2	15	835	9.71	6.38	14.1
D900V2	15	900	11.1	7.17	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1500V2	10	1500	30.8	17.1	52.1
D1640V2	10	1640	34.4	18.7	59.4
D1800V2	10	1800	38.5	20.3	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	40.9	21.2	71.5
D2450V2	10	2450	51.2	23.7	97.6
D3000V2	10	3000	61.9	24.8	136.7

Table 32.1: Numerical reference SAR values for SPEAG dipoles and flat phantom filled with body-tissue simulating liquid. Note: All SAR values normalized to 1 W forward power.

Table 1. SAR system manufacturer's reference body SAR values

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8.0 SIMULATED EQUIVALENT TISSUES

The 900MHz simulated tissue mixture consisted of a viscous gel using saline solution. Preservation with a bactericide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. The fluid was prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).


SIMULATED TISSUE MIXTURES		
INGREDIENT	900 MHz Body	900 MHz Body
	System Performance Check	DUT Evaluation
Water	53.79 %	53.79 %
Sugar	45.13 %	45.13 %
Salt	0.98 %	0.98 %
Bactericide	0.10 %	0.10 %

9.0 SAR SAFETY LIMITS

EXPOSURE LIMITS	SAR (W/Kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

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10.0 ROBOT SYSTEM SPECIFICATIONS

Specifications

POSITIONER: Stäubli Unimation Corp. Robot Model: RX60L
Repeatability: 0.02 mm
No. of axis: 6

Data Acquisition Electronic (DAE) System

Cell Controller

Processor: AMD Athlon XP 2400+
Clock Speed: 2.0 GHz
Operating System: Windows XP Professional

Data Converter

Features: Signal Amplifier, multiplexer, A/D converter, and control logic
Software: DASY4 software
Connecting Lines: Optical downlink for data and status info.
 Optical uplink for commands and clock

DASY4 Measurement Server

Function: Real-time data evaluation for field measurements and surface detection
Hardware: PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections: COM1, COM2, DAE, Robot, Ethernet, Service Interface

E-Field Probe

Model: ET3DV6
Serial No.: 1590
Construction: Triangular core fiber optic detection system
Frequency: 10 MHz to 6 GHz
Linearity: ±0.2 dB (30 MHz to 3 GHz)

Phantom(s)

Type: SAM V4.0C
Shell Material: Fiberglass
Thickness: 2.0 ±0.1 mm
Volume: Approx. 25 liters

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11.0 PROBE SPECIFICATION (ET3DV6)

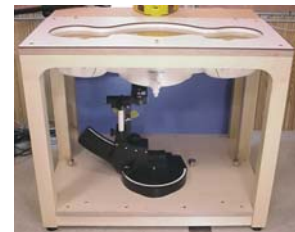
Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy $\pm 8\%$)
Frequency:	10 MHz to >6 GHz; 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 to probe axis)
Dynamic Range:	5 μ W/g to >100 mW/g; Linearity: ± 0.2 dB
Surface Detection:	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 3 GHz Compliance tests of portable devices



ET3DV6
E-Field Probe

12.0 SAM PHANTOM V4.0C

The SAM phantom V4.0C is a fiberglass shell phantom with a 2.0 mm (+/-0.2 mm) shell thickness for left and right head and flat planar area integrated in a wooden table. The shape of the fiberglass shell corresponds to the phantom defined by SCC34-SC2. The device holder positions are adjusted to the standard measurement positions in the three sections (see Appendix F for specifications of the SAM phantom V4.0C).




SAM Phantom

13.0 DEVICE HOLDER

The DASY4 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.




Device Holder

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14.0 TEST EQUIPMENT LIST

TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED		CALIBRATION DUE DATE
USED	DESCRIPTION					
x	Schmid & Partner DASY4 System	-	-	-	-	-
x	-DASY4 Measurement Server	00158	1078	N/A	N/A	N/A
x	-Robot	00046	599396-01	N/A	N/A	N/A
x	-DAE4	00019	353	15Jun05		15Jun06
	-ET3DV6 E-Field Probe	00016	1387	18Mar05		18Mar06
x	-ET3DV6 E-Field Probe	00017	1590	20May05		20May06
	-300MHz Validation Dipole	00023	135	25Oct05		25Oct06
	-450MHz Validation Dipole	00024	136	25Oct05		25Oct06
	-835MHz Validation Dipole	00022	411	Brain	30Mar05	30Mar06
				Body	12Apr05	12Apr06
	-900MHz Validation Dipole	00020	054	Brain	10Jun05	10Jun06
x				Body	10Jun05	10Jun06
	-1800MHz Validation Dipole	00021	247	Brain	14Jun05	14Jun06
				Body	14Jun05	14Jun06
	-1900MHz Validation Dipole	00032	151	Brain	17Jun05	17Jun06
				Body	22Apr05	22Apr06
	-2450MHz Validation Dipole	00025	150	Brain	20Sep05	20Sep06
				Body	22Apr05	22Apr06
x	-SAM Phantom V4.0C	00154	1033	N/A		N/A
	-Barski Planar Phantom	00155	03-01	N/A		N/A
	-Plexiglas Side Planar Phantom	00156	161	N/A		N/A
	-Plexiglas Validation Planar Phantom	00157	137	N/A		N/A
	HP 85070C Dielectric Probe Kit	00033	N/A	N/A		N/A
x	ALS-PR-DIEL Dielectric Probe Kit	00160	260-00953	N/A		N/A
x	Gigatronics 8652A Power Meter	00110	1835801	16Apr05		16Apr06
x	Gigatronics 80701A Power Sensor	00012	1834350	12Sep05		12Sep06
x	Gigatronics 80701A Power Sensor	00014	1833699	07Sep05		07Sep06
	Gigatronics 80701A Power Sensor	00109	1834366	16Apr05		16Apr06
x	HP 8753ET Network Analyzer	00134	US39170292	04May05		04May06
x	HP 8648D Signal Generator	00005	3847A00611	29Apr05		29Apr06
	Rohde & Schwarz SMR40 Signal Generator	00006	100104	12Apr05		12Apr06
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	N/A		N/A


Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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	Test Report Serial No.:	020906LEA-T720-S24F	Report Issue No.:	S720-021506-R0
	Date(s) of Evaluation:	February 10, 2006	Report Issue Date:	February 15, 2006
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

15.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION						
Error Description	Uncertainty Value ±%	Probability Distribution	Divisor	ci 1g	Uncertainty Value ±% (1g)	V _i or V _{eff}
Measurement System						
Probe calibration	5.5	Normal	1	1	5.5	∞
Axial isotropy of the probe	4.7	Rectangular	1.732050808	0.7	1.9	∞
Spherical isotropy of the probe	9.6	Rectangular	1.732050808	0.7	3.9	∞
Spatial resolution	0	Rectangular	1.732050808	1	0.0	∞
Boundary effects	1	Rectangular	1.732050808	1	0.6	∞
Probe linearity	4.7	Rectangular	1.732050808	1	2.7	∞
Detection limit	1	Rectangular	1.732050808	1	0.6	∞
Readout electronics	0.3	Normal	1	1	0.3	∞
Response time	0.8	Rectangular	1.732050808	1	0.5	∞
Integration time	2.6	Rectangular	1.732050808	1	1.5	∞
RF ambient conditions	3	Rectangular	1.732050808	1	1.7	∞
Mech. constraints of robot	0.4	Rectangular	1.732050808	1	0.2	∞
Probe positioning	2.9	Rectangular	1.732050808	1	1.7	∞
Extrapolation & integration	1	Rectangular	1.732050808	1	0.6	∞
Test Sample Related						
Device positioning	2.9	Normal	1	1	2.9	12
Device holder uncertainty	3.6	Normal	1	1	3.6	8
Power drift	5	Rectangular	1.732050808	1	2.9	∞
Phantom and Setup						
Phantom uncertainty	4	Rectangular	1.732050808	1	2.3	∞
Liquid conductivity (target)	5	Rectangular	1.732050808	0.64	1.8	∞
Liquid conductivity (measured)	2.5	Normal	1	0.64	1.6	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	2.5	Normal	1	0.6	1.5	∞
Combined Standard Uncertainty					10.58	
Expanded Uncertainty (k=2)					21.16	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])


Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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	Test Report Serial No.:	020906LEA-T720-S24F	Report Issue No.:	S720-021506-R0
	Date(s) of Evaluation:	February 10, 2006	Report Issue Date:	February 15, 2006
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION						
Error Description	Uncertainty Value ±%	Probability Distribution	Divisor	ci 1g	Uncertainty Value ±% (1g)	V _i or V _{eff}
Measurement System						
Probe calibration	5.5	Normal	1	1	5.5	∞
Axial isotropy of the probe	4.7	Rectangular	1.732050808	1	2.7	∞
Spherical isotropy of the probe	0	Rectangular	1.732050808	1	0.0	∞
Spatial resolution	0	Rectangular	1.732050808	1	0.0	∞
Boundary effects	1	Rectangular	1.732050808	1	0.6	∞
Probe linearity	4.7	Rectangular	1.732050808	1	2.7	∞
Detection limit	1	Rectangular	1.732050808	1	0.6	∞
Readout electronics	0.3	Normal	1	1	0.3	∞
Response time	0	Rectangular	1.732050808	1	0.0	∞
Integration time	0	Rectangular	1.732050808	1	0.0	∞
RF ambient conditions	3	Rectangular	1.732050808	1	1.7	∞
Mech. constraints of robot	0.4	Rectangular	1.732050808	1	0.2	∞
Probe positioning	2.9	Rectangular	1.732050808	1	1.7	∞
Extrapolation & integration	1	Rectangular	1.732050808	1	0.6	∞
Dipole						
Dipole Positioning	2	Normal	1.732050808	1	1.2	∞
Power & Power Drift	4.7	Normal	1.732050808	1	2.7	∞
Phantom and Setup						
Phantom uncertainty	4	Rectangular	1.732050808	1	2.3	∞
Liquid conductivity (target)	5	Rectangular	1.732050808	0.64	1.8	∞
Liquid conductivity (measured)	2.5	Normal	1	0.64	1.6	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	2.5	Normal	1	0.6	1.5	∞
Combined Standard Uncertainty					8.79	
Expanded Uncertainty (k=2)					17.57	


Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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	Test Report Serial No.:	020906LEA-T720-S24F	Report Issue No.:	S720-021506-R0
	Date(s) of Evaluation:	February 10, 2006	Report Issue Date:	February 15, 2006
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2


16.0 REFERENCES

- [1] Federal Communications Commission, "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093: 1999.
- [2] Health Canada, "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz", Safety Code 6: 1999.
- [3] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.
- [4] Industry Canada, "Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)", Radio Standards Specification RSS-102 Issue 2: November 2005.
- [5] IEEE Standard 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques": December 2003.
- [6] Schmid & Partner Engineering AG, "DASY4 Manual", V4.5: March 2005.
- [7] ANSI/TIA-603-C, "Land Mobile FM or PM Communications Equipment - Measurement and Performance Standards": December 2004.

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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	Description of Test(s):	RF Exposure	SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

APPENDIX A - SAR MEASUREMENT DATA

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

Date Tested: 02/10/2006

Body-Worn SAR - Back Side of DUT with Holster - Mid Channel - 901.5 MHz

DUT: Unication Model: M90; Type: Portable Two-Way Paging Transceiver; Serial No.: UGBC5Z226R

Body-Worn Accessory: Belt-Worn Holster (P/N: 1600-01002); Audio Accessory: None (not applicable)

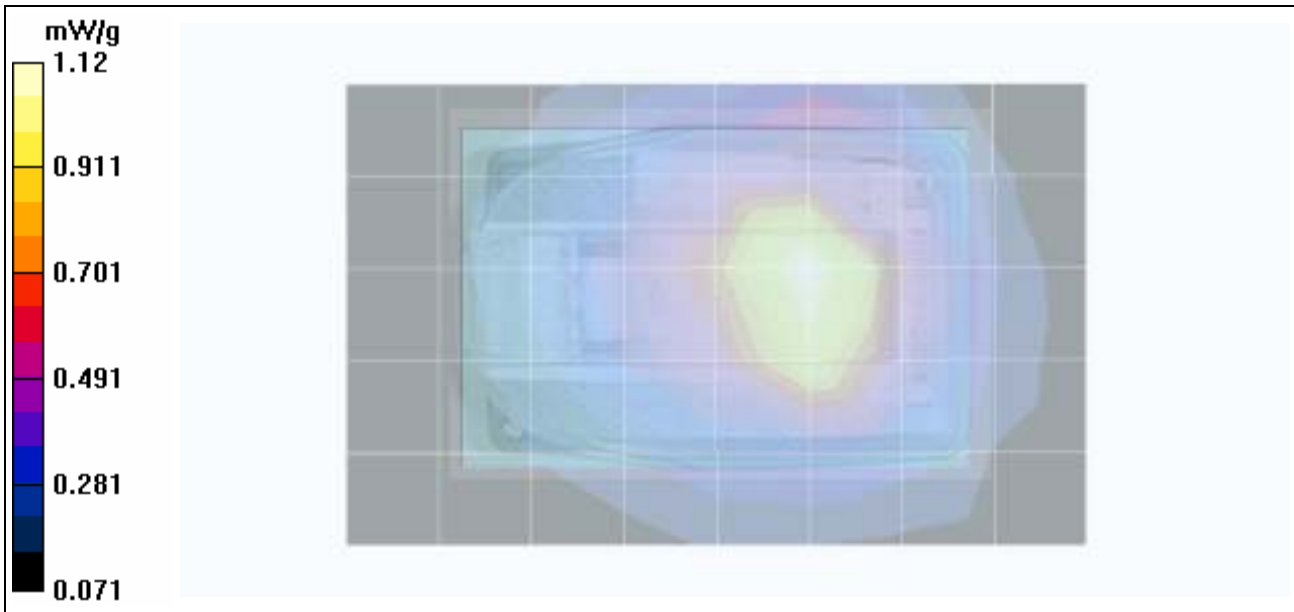
Ambient Temp: 22.4 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 102.1 kPa; Humidity: 30%


Communication System: CW
 RF Output Power: 0.29 Watts (ERP)
 Frequency: 901.5 MHz; Duty Cycle: 1:4.55
 3.6V 1050mAh Lithium Polymer Battery (Model: LP-10)
 Medium: M900 ($\sigma = 1.04 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$)

- Probe: ET3DV6 - SN1590; ConvF(6.47, 6.47, 6.47); Calibrated: 20/05/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

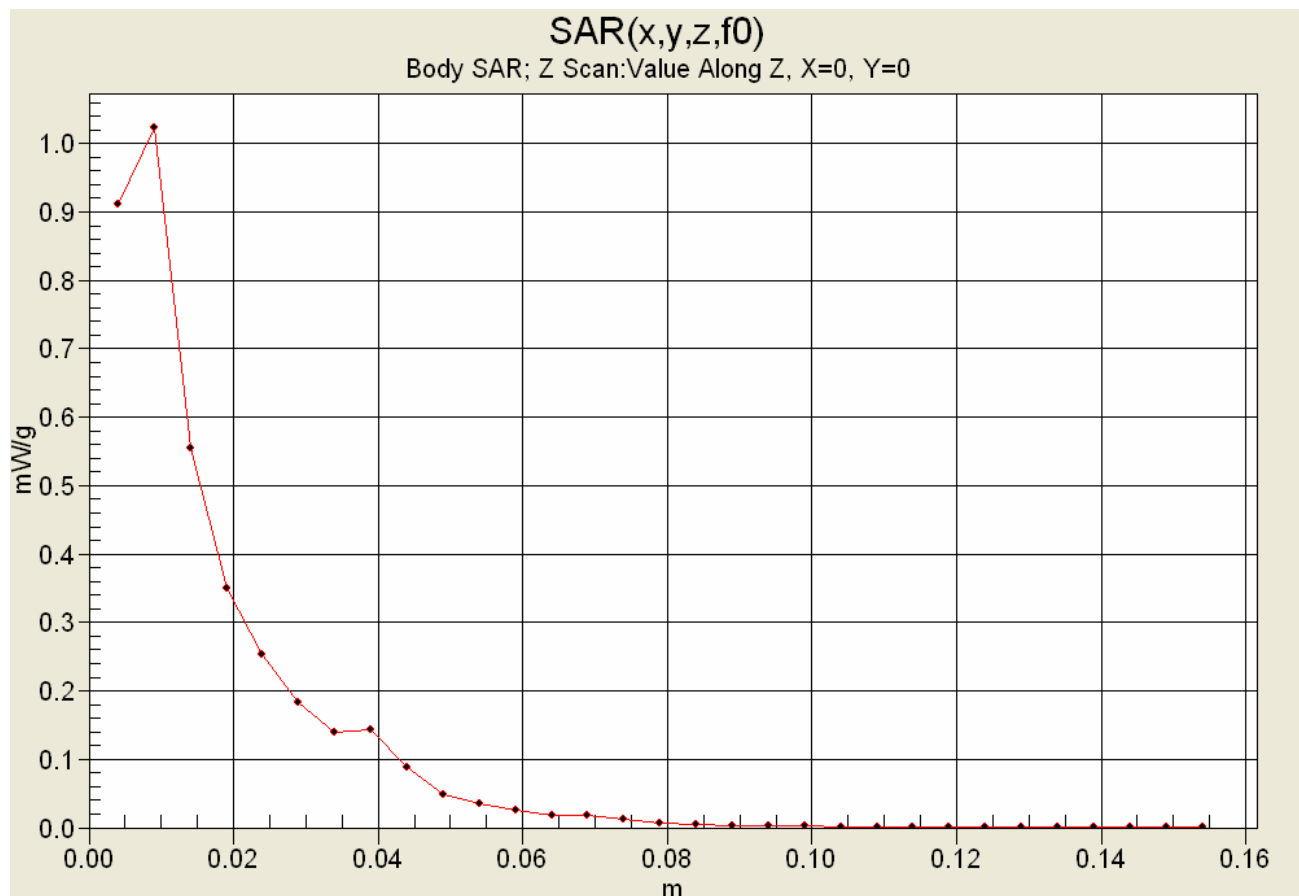
Body-Worn SAR - 1.2 cm Holster Separation Distance from Back of DUT - Mid Channel Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm

Body-Worn SAR - 1.2 cm Holster Separation Distance from Back of DUT - Mid Channel Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 34.7 V/m; Power Drift = -0.166 dB
 Peak SAR (extrapolated) = 1.46 W/kg
SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.680 mW/g




Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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Z-Axis Scan



	Test Report Serial No.:	020906LEA-T720-S24F		Report Issue No.:	S720-021506-R0
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	Description of Test(s):	RF Exposure	SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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Date Tested: 02/10/2006

System Performance Check (Body) - 900 MHz Dipole

DUT: Dipole 900 MHz; Model: D900V2; Type: System Performance Check; Serial: 054; Calibrated: 06/10/2005

Ambient Temp: 22.4 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 30%

Communication System: CW
 Forward Conducted Power: 250 mW
 Frequency: 900 MHz; Duty Cycle: 1:1
 Medium: M900 ($\sigma = 1.04 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$)

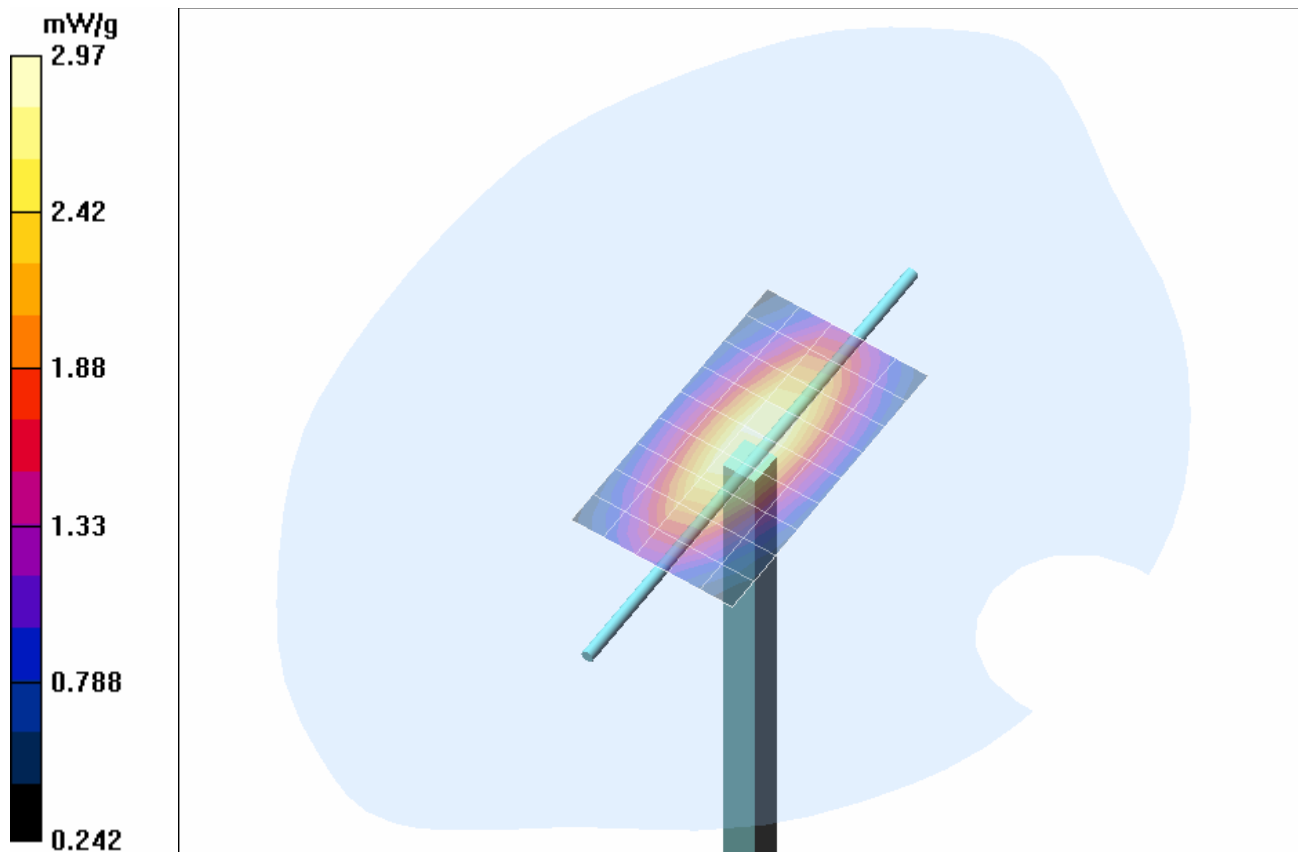
- Probe: ET3DV6 - SN1590; ConvF(6.47, 6.47, 6.47); Calibrated: 20/05/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

900 MHz Dipole - System Performance Check/Area Scan (6x10x1):

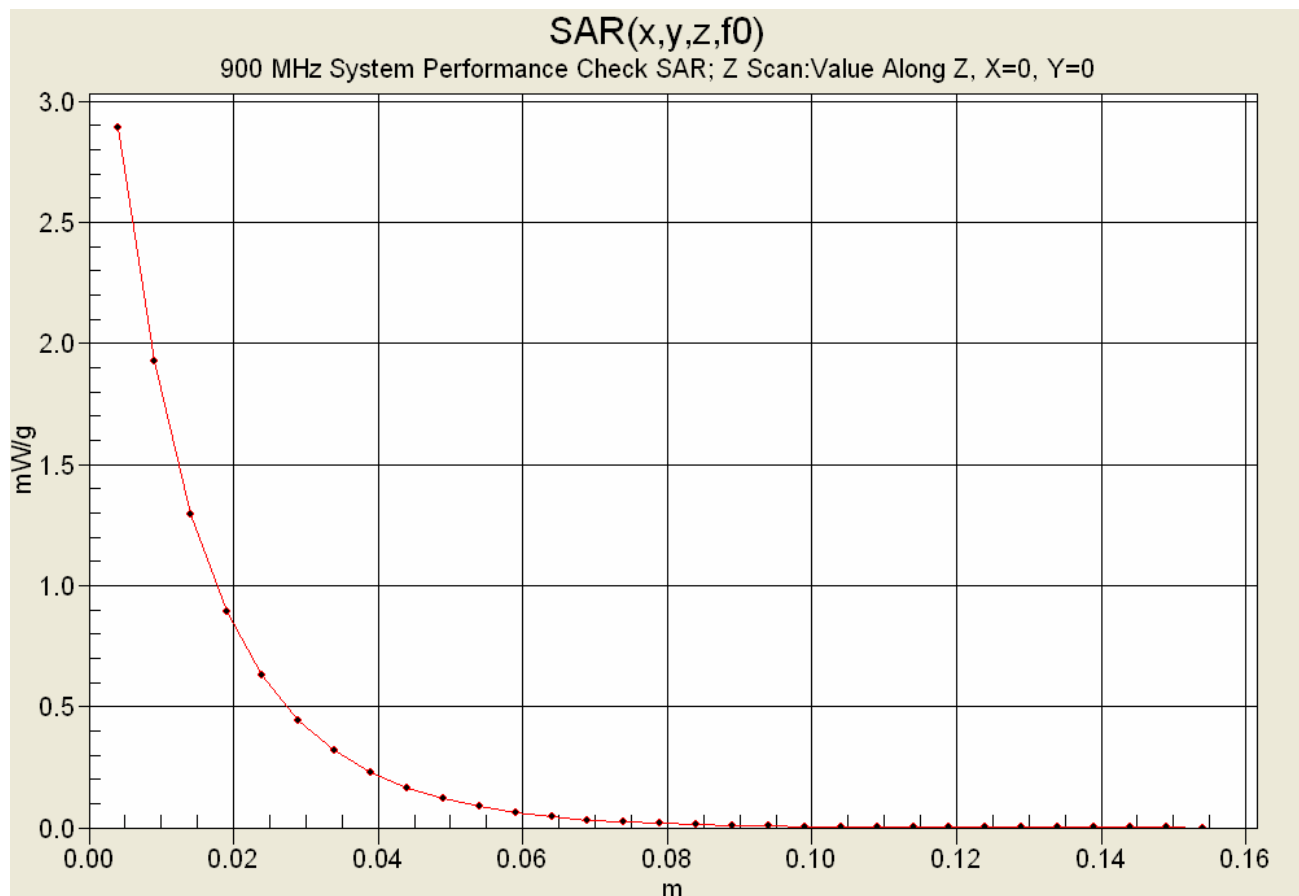
Measurement grid: dx=10mm, dy=10mm

900 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 55.3 V/m; Power Drift = -0.112 dB
 Peak SAR (extrapolated) = 4.07 W/kg
SAR(1 g) = 2.72 mW/g; SAR(10 g) = 1.74 mW/g




Z-Axis Scan



	Test Report Serial No.:	020906LEA-T720-S24F	Report Issue No.:	S720-021506-R0
	Date(s) of Evaluation:	February 10, 2006	Report Issue Date:	February 15, 2006
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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Date(s) of Evaluation:	February 10, 2006	Report Issue Date:	February 15, 2006
Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

900 MHz System Performance Check & DUT Evaluation (Body)

Celltech Labs Inc.
 Test Result for UIM Dielectric Parameter
 Fri 10/Feb/2006
 Frequency(GHz)


FCC_eHFCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
 FCC_sHFCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
 FCC_eB FCC Limits for Body Epsilon
 FCC_sB FCC Limits for Body Sigma
 Test_e Epsilon of UIM
 Test_s Sigma of UIM

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.8000	55.34	0.97	53.80	0.94
0.8100	55.30	0.97	53.83	0.95
0.8200	55.26	0.97	53.73	0.96
0.8300	55.22	0.97	53.87	0.97
0.8400	55.18	0.98	53.78	0.97
0.8500	55.15	0.99	53.70	0.98
0.8600	55.12	1.00	53.59	0.99
0.8700	55.09	1.01	53.60	1.00
0.8800	55.06	1.03	53.45	1.01
0.8900	55.03	1.04	53.26	1.03
0.9000	55.00	1.05	53.28	1.04
0.9100	55.00	1.06	53.21	1.04
0.9200	54.99	1.06	53.24	1.06
0.9300	54.97	1.07	53.21	1.07
0.9400	54.95	1.07	53.19	1.08
0.9500	54.93	1.08	53.10	1.09
0.9600	54.92	1.08	53.14	1.09
0.9700	54.90	1.08	53.18	1.11
0.9800	54.88	1.09	53.01	1.12
0.9900	54.86	1.09	52.86	1.13
1.0000	54.84	1.10	52.80	1.14

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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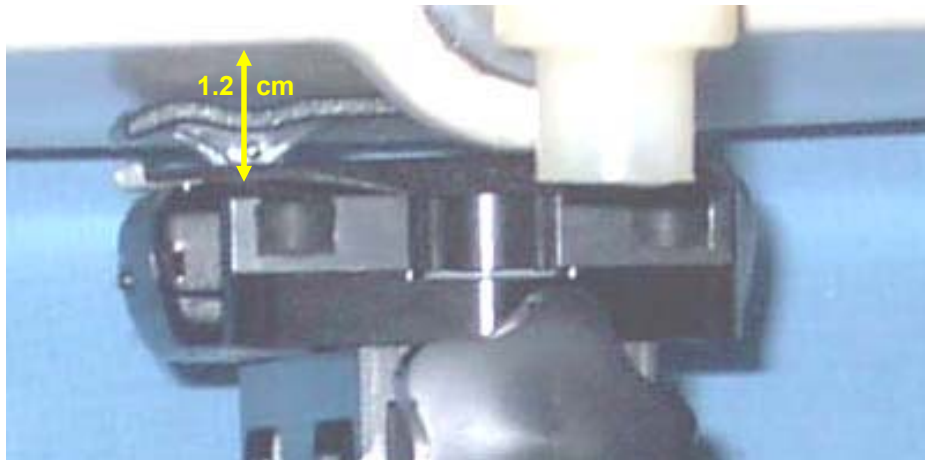
	Test Report Serial No.:	020906LEA-T720-S24F		Report Issue No.:	S720-021506-R0
	Date(s) of Evaluation:	February 10, 2006		Report Issue Date:	February 15, 2006
	Description of Test(s):	RF Exposure	SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2


APPENDIX D - SAR TEST SETUP PHOTOGRAPHS

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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SAR TEST SETUP PHOTOGRAPHS
1.2 cm Holster Separation Distance from Back Side of DUT to Planar Phantom



Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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DUT PHOTOGRAPHS



	Test Report Serial No.:	020906LEA-T720-S24F	Report Issue No.:	S720-021506-R0
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	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

DUT PHOTOGRAPHS



Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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DUT PHOTOGRAPHS



**Belt-Worn Holster Accessory
(P/N: 1600-01002)**



Front of Belt-Worn Holster with DUT



Back of Belt-Worn Holster with DUT



Bottom end of Belt-Worn Holster with DUT




Top end of Belt-Worn Holster with DUT



Left Side of Belt-Worn Holster with DUT (plastic with metal screw)



Right Side of Belt-Worn Holster with DUT (plastic with metal screw)

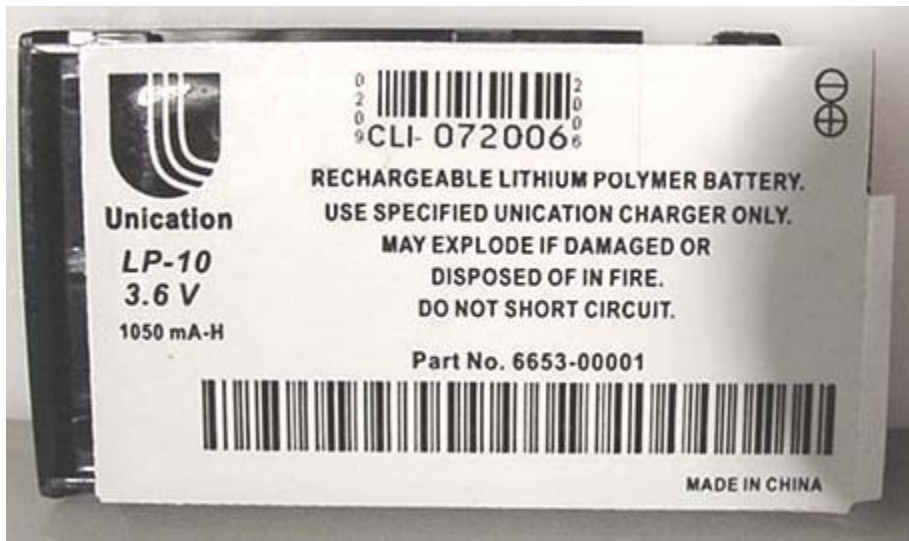
Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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	Test Report Serial No.:	020906LEA-T720-S24F	Report Issue No.:	S720-021506-R0
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	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2


DUT PHOTOGRAPHS



DUT Battery Compartment




Lithium Polymer Battery (Model No: LP-10)

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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	Date(s) of Evaluation:	February 10, 2006		Report Issue Date:	February 15, 2006
	Description of Test(s):	RF Exposure	SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

APPENDIX G - SAM PHANTOM CERTIFICATE OF CONFORMITY

Applicant:	Unication Co., Ltd.	FCC ID:	LEAABN25ARA00	IC ID:	3819A-M90	
Model(s):	M90	DUT Type:	Portable Two-Way Paging Transceiver	Freq.:	901-902 MHz	
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Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles. Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz - 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

- [1] CENELEC EN 50361
- [2] IEEE P1528-200x draft 6.5
- [3] IEC PT 62209 draft 0.9

(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 18.11.2001

Signature / Stamp

**Schmid & Partner
Engineering AG**

Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79