

 Celltech Testing and Engineering Services Ltd.	Date(s) of Evaluation	Test Report Serial No.	Test Report Revision No.	 ILAC-MRA ACCREDITED
	June 14, 2010	052810MQO-T1029-S15W	Rev. 1.1 (2nd Release)	
Test Report Issue Date	June 16, 2010	Description of Test(s)	RF Exposure Category	Test Lab Certificate No. 2470.01
		Specific Absorption Rate	Gen. Pop. / Uncontrolled	

SAR TEST REPORT (FCC/IC)

RF EXPOSURE EVALUATION		SPECIFIC ABSORPTION RATE		
MANUFACTURER / APPLICANT	VOCOLLECT INC.			
DEVICE UNDER TEST (DUT)	PORTABLE WIRELESS DATA TERMINAL WITH 802.11B/G WLAN			
DEVICE MODEL(S)	NAME	H1	NO.	TT-100-1-1
DEVICE IDENTIFIER(S)	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011
TRANSMIT FREQUENCY RANGE	2412 - 2462 MHz (ISM Band)			
APPLICATION TYPE	FCC/IC Certification			
STANDARD(S) APPLIED	FCC 47 CFR §2.1093			
	Health Canada Safety Code 6			
PROCEDURE(S) APPLIED	FCC KDB 447498 D01v04			
	FCC KDB 248227 D01v01r02			
	FCC OET Bulletin 65, Supplement C (01-01)			
	Industry Canada RSS-102 Issue 4			
	IEEE 1528-2003			
	IEC 62209-2 (Draft)			
FCC DEVICE CLASSIFICATION	Digital Transmission System (DTS) - §15C			
IC DEVICE CLASSIFICATION	Low Power License-Exempt Radiocommunication Device (RSS-210)			
RF EXPOSURE CATEGORY	General Population / Uncontrolled			
RF EXPOSURE EVALUATION	Body-worn			
DATE(S) OF EVALUATION(S)	June 14, 2010			
TEST REPORT SERIAL NO.	052810MQO-T1029-S15W			
TEST REPORT REVISION NO.	Revision 1.1		(See Page 4)	June 16, 2010
	Revision 1.0		Initial Release	June 15, 2010
TEST REPORT SIGNATORIES	Testing Performed By		Test Report Prepared By	
	Sean Johnston - Celltech Labs		Jon Hughes - Celltech Labs	
TEST LAB AND LOCATION	Celltech Compliance Testing & Engineering Laboratory			
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TEST LAB ACCREDITATION(S)	 ILAC-MRA ACCREDITED			Test Lab Certificate No. 2470.01

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	 Vocollect
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Testing and Engineering Services Ltd.	Date(s) of Evaluation	Test Report Serial No.	Test Report Revision No.	 ILAC-MRA
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				Test Lab Certificate No. 2470.01

DECLARATION OF COMPLIANCE SAR RF EXPOSURE EVALUATION

Test Lab Information	Name	CELLTECH LABS INC.	Address	21-364 Lougheed Road, Kelowna B.C. V1X 7R8 Canada							
Applicant Information	Name	VOCOLLECT INC.	Address	703 Rodi Road, Pittsburgh PA 15235 United States							
Standard(s) Applied	FCC	47 CFR §2.1093									
	IC	Health Canada Safety Code 6									
Procedure(s) Applied	FCC	KDB 447498 D01v04									
	FCC	KDB 248227 D01v01r02									
	FCC	OET Bulletin 65, Supplement C (Edition 01-01)									
	IC	RSS-102 Issue 4									
	IEEE	1528-2003									
	IEC	62209-2 (Draft)									
Device Classification(s)	FCC	Digital Transmission System (FCC Part 15 Subpart C)									
	IC	Low Power License-Exempt Radiocommunication Device (RSS-210)									
Device Identifier(s)	FCC	MQO-TT-100-1-1									
	IC	2570A-TT10011									
Device Description	Portable Voice-Controlled Wireless Data Terminal with 802.11b/g WLAN										
Device Model(s)	Name	H1		Number	TT-100-1-1						
Test Sample Serial No.(s)	207010101 (Identical Prototype)										
Modulation Type(s)	802.11b	DBPSK (1 Mbps), DQPSK (2 Mbps), CCK (5.5, 11 Mbps)									
	802.11g	OFDM (6, 9, 12, 24, 36, 48, 54 Mbps)									
Transmit Frequency Range(s)	2412 - 2462 MHz (ISM Band)										
No. of Channels:	11										
RF Output Power Levels Tested	Transmit Mode	Freq. (MHz)	Channel	Data Rate (Mbps)	Average Conducted Power						
	802.11b	2437	6	2	14.5 dBm	28.2 mW					
		2462	11	1	14.1 dBm	25.7 mW					
	802.11g	2462	11	6	14.0 dBm	25.1 mW					
Antenna Type(s) Tested	Internal										
Battery Type(s) Tested	Lithium-ion		3.7 V	2000 mAh	Model: 1000956 Rev. 02						
Body-worn Accessories Tested	Belt-Holster		P/N: AC-110-01	1.5 cm thickness	Contains metal components						
Audio Accessories Tested	Headset-Microphone		P/N: HE-100-01								
Max. SAR Level(s) Evaluated	BODY	802.11b	0.382 W/kg	1g average	FCC/IC SAR Limit	1.6 W/kg					
						1g average					
Celltech Labs Inc. declares under its sole responsibility that this wireless device is compliant with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6 for the General Population / Uncontrolled Exposure environment. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 4, IEEE 1528-2003 and IEC 62209-2 (Draft). 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.											
This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc.											
The results and statements contained in this report pertain only to the device(s) evaluated.											
Test Report Approved By			Sean Johnston	Lab Manager	Celltech Labs Inc.						

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACCREDITED
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Test Lab Certificate No. 2470.01

TABLE OF CONTENTS

1.0 INTRODUCTION	5
2.0 SAR MEASUREMENT SYSTEM	5
3.0 CONDUCTED OUTPUT POWER MEASUREMENTS	5
4.0 SAR MEASUREMENT SUMMARY	6
5.0 DETAILS OF SAR EVALUATION	7
6.0 SAR EVALUATION PROCEDURES	7
7.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES	8
8.0 SYSTEM PERFORMANCE CHECK	8
9.0 SIMULATED EQUIVALENT TISSUES	9
10.0 SAR SAFETY LIMITS	9
11.0 ROBOT SYSTEM SPECIFICATIONS	10
12.0 PROBE SPECIFICATION (EX3DV4)	11
13.0 SAM TWIN PHANTOM V4.0C	11
14.0 DEVICE HOLDER	11
15.0 TEST EQUIPMENT LIST	12
16.0 MEASUREMENT UNCERTAINTIES	13
17.0 REFERENCES	14
APPENDIX A - SAR MEASUREMENT DATA	15
APPENDIX B - SYSTEM PERFORMANCE CHECK DATA	22
APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS	25
APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS	27
APPENDIX E - DIPOLE CALIBRATION	34
APPENDIX F - PROBE CALIBRATION	35
APPENDIX G - SAM PHANTOM CERTIFICATE OF CONFORMITY	36

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

REVISION HISTORY

REVISION NO.	DESCRIPTION	IMPLEMENTED BY	RELEASE DATE
1.0	Initial Release	Jon Hughes	June 15, 2010
1.1	Corrected IC Certification No.	Jon Hughes	June 16, 2010

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011						
Model Name: H1	Model No.: TT-100-1-1	DUt:	Portable Wireless Data Terminal with 802.11b/g WLAN								
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1.0 INTRODUCTION

This measurement report demonstrates that the VOCOLLECT INC. Model: TT-100-1-1 Portable Voice-Controlled Wireless Data Terminal with 802.11b/g WLAN complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada's 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]), Industry Canada RSS-102 Issue 4 (see reference [4]), IEEE 1528-2003 (see reference [5]) and IEC 62209-2 (Draft - see reference [6]) 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 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 utilizes a controller with built in VME-bus computer.

3.0 CONDUCTED OUTPUT POWER MEASUREMENTS

Radio Serial Number		0017230151C9		G data rates	CH 1 6 Mbs	13.7	22.0
		Average	Peak		CH 1 9 Mbs	13.6	22.0
B data rates	CH 1 1 Mbs	14.0	17.0		CH 1 12 Mbs	13.4	21.5
	CH 6 1 Mbs	14.0	17.5		Ch 1 18 Mbs	13.1	21.6
	CH 11 1 Mbs	14.1	17.7		CH 1 24 Mbs	12.6	22.5
	CH 1 2 Mbs	14.1	17.7		CH 1 36 Mbs	12.0	21.9
	CH 6 2 Mbs	14.5	17.7		CH 1 48 Mbs	11.3	22.1
	CH 11 2 Mbs	14.0	17.7		CH 1 54 Mbs	10.6	21.8
	CH 1 5.5 Mbs	13.7	17.4		CH 1 6 Mbs	13.9	22.4
	CH 6 5.5 Mbs	13.5	17.4		CH 6 6Mbs	14.0	22.2
	CH 11 5.5 Mbs	13.7	17.0		CH 11 6 Mbs	14.0	22.2
	CH 1 11 Mbs	13.4	17.7		CH 1 24 Mbs	12.8	22.5
	CH 6 11 Mbs	13.2	17.7		CH 6 24 Mbs	12.7	22.6
	CH 11 11 Mbs	13.4	17.7		CH 11 24 Mbs	12.7	22.6
	CH 1 54Mbs				CH 1 54Mbs	10.6	21.7
	CH 6 54Mbs				CH 6 54Mbs	10.7	21.9
	CH 11 54Mbs				CH 11 54Mbs	10.8	22.8

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech <small>Testing and Engineering Services Ltd.</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ilac-MRA  ACREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

4.0 SAR MEASUREMENT SUMMARY

BODY SAR EVALUATION RESULTS

Transm it Mode	Test Mode	Freq.	Chan.	Data Rate	Battery Type	Accessory Type(s)			DUT Position To Planar Phantom	Cond. Power Before Test	SAR Drift During Test	Measured SAR 1g
		MHz		Mbps		Body-worn	Spacing	Audio		dBm	dB	W/kg
802.11b	DSSS	2462	11	1	Li-ion	None	0.0 cm	Headset	LED Side	14.1	0.183	0.382
802.11b	DSSS	2462	11	1	Li-ion	None	0.0 cm	Headset	Battery Side	14.1	0.159	0.270
802.11b	DSSS	2462	11	1	Li-ion	Belt-Holster	1.5 cm	Headset	LED Side	14.1	-0.034	0.122
802.11b	DSSS	2437	6	2	Li-ion	None	0.0 cm	Headset	LED Side	14.5	-0.138	0.380
802.11g	OFDM	2462	11	6	Li-ion	None	0.0 cm	Headset	LED Side	14.0	0.238	0.371

SAR LIMIT(S)			BODY	SPATIAL PEAK		RF EXPOSURE CATEGORY		
FCC 47 CFR 2.1093	Health Canada Safety Code 6		1.6 W/kg	averaged over 1 gram		General Population / Uncontrolled		
Measurement Date(s)	June 14, 2010			Relative Humidity		35	%	
Measured Fluid Type	2450 MHz Body			Atmospheric Pressure		101.1	kPa	
Dielectric Constant ϵ	2450 Target		Freq.	Meas.	Dev.	Ambient Temperature	23.0	°C
	52.7	±5%	2437	51.9	-1.5%	Fluid Temperature	24.0	°C
			2462	51.6	-2.1%	Fluid Depth	≥ 15	cm
	2450 Target		Freq.	Meas.	Dev.	ρ (Kg/m ³)	1000	
Conductivity σ (mho/m)	1.95	±5%	2437	1.90	-2.6%			
			2462	1.94	-0.5%			

Note(s)	1.	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.
	2.	The frequencies/channels and data rates evaluated for SAR were selected based on the maximum output power levels measured prior to the SAR evaluations in accordance with the requirements specified in FCC OET "SAR Measurement Procedures for 802.11a/b/g Transmitters" - see reference [8]).
	3.	If the SAR levels measured at the maximum output channel were ≥ 3 dB below the SAR limit, SAR evaluation for the remaining selected channels was optional (per FCC OET "SAR Measurement Procedures for 802.11a/b/g Transmitters" - see reference [8]).
	4.	The power drift of the DUT measured by the DASY4 system during the SAR evaluations was <5% from the start power.
	5.	The DUT battery was fully charged prior to the SAR evaluations.
	6.	The fluid temperature was measured prior to and after the SAR evaluations to ensure the temperature remained within $+\text{-}2^{\circ}\text{C}$ of the fluid temperature reported during the dielectric parameter measurements.
	7.	The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).
	8.	The SAR evaluations were performed within 24 hours of the system performance check.

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Model Name: H1	Model No.: TT-100-1-1	DUt:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech Testing and Engineering Services Ltd.	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA ACCREDITED
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Test Lab Certificate No. 2470.01

5.0 DETAILS OF SAR EVALUATION

The VOCOLLECT INC. Model: TT-100-1-1 Portable Voice-Controlled Wireless Data Terminal with 802.11b/g WLAN was compliant for localized Specific Absorption Rate (Uncontrolled Exposure) based on the test provisions and conditions described below. The SAR test setup photographs are shown in Appendix D.

Test Configuration(s)

1. The DUT was tested for body-worn SAR with the LED side placed parallel to, and touching, the outer surface of the SAM phantom (planar section). The headset-microphone audio accessory was connected to the DUT for the duration of the tests.
2. The DUT was tested for body-worn SAR with the battery side placed parallel to, and touching, the outer surface of the SAM phantom (planar section). The headset-microphone audio accessory was connected to the DUT for the duration of the test.
3. The DUT was evaluated for body-worn SAR with the belt-holster accessory. The back side of the DUT (LCD side) was placed parallel to the outer surface of the SAM phantom (planar section). The belt-holster accessory provided a 1.5 cm spacing from the back of the DUT to the outer surface of the SAM phantom (planar section). The headset-microphone audio accessory was connected to the DUT for the duration of the test.

Test Mode(s) & Power Setting(s)

4. The DUT was placed into test mode using an executable program provided by the customer and controlled via PC with serial cable connected to the DUT. Once the DUT was placed in test mode at maximum RF output power and channel setting the serial cable was then removed from the DUT prior to the SAR evaluation.
5. The DUT was tested in continuous transmit operation at 100% duty cycle with a modulated DSSS signal in 802.11b mode and a modulated OFDM signal in 802.11g mode.
6. The average conducted output power levels of the DUT were measured prior to the SAR evaluations.

6.0 SAR 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 determine the values between the dipole center of the probe and the surface of the phantom. This data cannot be measured because the center of the dipole sensors is 1.0 mm away from the probe tip and the distance between the probe and the boundary must be larger than 25% of the probe diameter. The probe diameter is 2.4 mm. In the DASY4 software, the distance between the sensor center and phantom surface is set to 2.0 mm. This provides a distance of 1.0 mm between the probe tip and the surface. The extrapolation of the values between the dipole center and the surface of the phantom 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 1 mm grid (42875 interpolated points).
 - g. A zoom scan volume of 24 mm x 24 mm x 20 mm (7x7x9 points) centered at the peak SAR location determined from the area scan was used and a zoom scan resolution of 4 mm x 4 mm x 2.5 mm was used.

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7.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES

The following procedures are recommended for measurements at 150 MHz - 3 GHz to minimize probe calibration and tissue dielectric parameter discrepancies. In general, SAR measurements below 300 MHz should be within ± 50 MHz of the probe calibration frequency. At 300 MHz to 3 GHz, measurements should be within ± 100 MHz of the probe calibration frequency. Measurements exceeding 50% of these intervals, ± 25 MHz $<$ 300 MHz and ± 50 MHz \geq 300 MHz, require additional steps (per FCC KDB 450824 D01 v01r01, SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz - see reference [9]).

Probe Calibration Freq.	Device Measurement Freq.	Frequency Interval	± 50 MHz \geq 300 MHz
2450 MHz	2437 MHz	13 MHz	< 50 MHz
	2462 MHz	12 MHz	< 50 MHz

The probe calibration and measurement frequency interval is < 50 MHz; therefore the additional steps were not required.

8.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations a daily system check was performed at the planar section of the SAM phantom with a 2450MHz SPEAG dipole (see Appendix B for system performance check evaluation plot) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]). The dielectric parameters of the simulated tissue mixtures were measured prior to the system performance checks using an HP 85070C 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 $\pm 10\%$ from the system manufacturer's dipole calibration target SAR values (see Appendix E for system manufacturer's dipole calibration procedures).

SYSTEM PERFORMANCE CHECK EVALUATION

Test Date	Fluid Freq.	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)
	Body (MHz)	SPEAG Target	Meas.	Dev.	SPEAG Target	Meas.	Dev.	SPEAG Target	Meas.	Dev.						
Jun-14	2450	12.9 $\pm 10\%$	13.2	+2.3%	52.7 $\pm 5\%$	51.9	-1.5%	1.95 $\pm 5\%$	1.91	-2.1%	1000	23.0	24.0	≥ 15	35	101.1
Notes																
1. The target SAR values are the measured values from the dipole calibration performed by SPEAG (see Appendix E).																
2. The target dielectric parameters are the nominal values from the dipole calibration performed by SPEAG (see Appendix E).																
3. The fluid temperature was measured prior to and after the system performance check to ensure the temperature remained within +/- 2°C of the fluid temperature reported during the dielectric parameter measurements.																
4. The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).																

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 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACCREDITED
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Test Lab Certificate No. 2470.01

9.0 SIMULATED EQUIVALENT TISSUES

The simulated equivalent tissue recipe listed in the table below is derived from the SAR system manufacturer's suggested recipe in the DASY4 manual (see reference [10]) in accordance with the procedures and requirements specified in IEEE Standard 1528-2003 (see reference [5]). The ingredient percentage may have been adjusted minimally in order to achieve the appropriate target dielectric parameters within the specified tolerance.

2450 MHz TISSUE MIXTURES	
INGREDIENT	2450 MHz BODY
Water	69.98 %
Glycol Monobutyl	30.00 %
Salt	0.02 %

10.0 SAR SAFETY LIMITS

SAR RF EXPOSURE LIMITS			
FCC 47 CFR 2.1093	Health Canada Safety Code 6	(General Population / Uncontrolled Exposure)	(Occupational / Controlled Exposure)
Spatial Average (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak (averaged over any 1g of tissue)		1.6 W/kg	8.0 W/kg
Spatial Peak (hands/wrists/feet/ankles averaged over 10g)		4.0 W/kg	20.0 W/kg
The Spatial Average value of the SAR averaged over the whole body.			
The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.			
The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.			
Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.			
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.			

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUt:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech Testing and Engineering Services Ltd.	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

11.0 ROBOT SYSTEM SPECIFICATIONS

<u>Specifications</u>	
Positioner	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability	0.02 mm
No. of axis	6
<u>Data Acquisition Electronic (DAE) System</u>	
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	Measurement Software: DASY4, V4.7 Build 44 Postprocessing Software: SEMCAD, V1.8 Build 171
Connecting Lines	Optical downlink for data and status info.; Optical uplink for commands and clock
<u>DASY4 Measurement Server</u>	
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
<u>E-Field Probe</u>	
Model	EX3DV4
Serial No.	3600
Construction	Symmetrical design with triangular core
Frequency	10 MHz to 6 GHz
Linearity	± 0.2 dB (30 MHz to 3 GHz)
<u>Phantom(s)</u>	
Type	SAM V4.0C
Shell Material	Fiberglass
Thickness	2.0 ± 0.1 mm
Volume	Approx. 25 liters

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUt:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech <small>Testing and Engineering Services Ltd.</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

12.0 PROBE SPECIFICATION (EX3DV4)

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. DGBE)	
Calibration:	Basic Broadband Calibration in air: 10-3000 MHz Conversion Factors (CF) for HSL 900 and HSL 1750	
Frequency:	10 MHz to >6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)	
Directivity:	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range:	10 μ W/g to >100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)	
Dimensions:	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm)	
Application:	Typical distance from probe tip to dipole centers: 1.0 mm High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better than 30%.	

13.0 SAM TWIN PHANTOM V4.0C

The SAM Twin 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 G for specifications of the SAM Twin Phantom V4.0C).

14.0 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. For evaluation of devices with a larger footprint (e.g. Laptop PC, Tablet PC), or to avoid perturbation due to device holder clamps for devices with a smaller footprint, a Plexiglas platform is attached to the device holder.

 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

15.0 TEST EQUIPMENT LIST

TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
USED	DESCRIPTION				
x	Schmid & Partner DASY4 System	-	-	-	-
x	-DASY4 Measurement Server	00158	1078	CNR	CNR
x	-Robot	00046	599396-01	CNR	CNR
x	-DAE4	00019	353	27Apr10	Annual
x	-EX3DV4 E-Field Probe	00213	3600	29Apr10	Annual
x	-D2450V2 Validation Dipole	00219	825	17Apr09	Biennial
x	-SAM Twin Phantom V4.0C	00154	1033	CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
x	Gigatronics 8652A Power Meter	00007	1835272	04May10	Biennial
x	Gigatronics 80701A Power Sensor	00014	1833699	04May10	Biennial
x	HP 8753ET Network Analyzer	00134	US39170292	04May10	Biennial
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required; N/A = Not Applicable				

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

16.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION									
Uncertainty Component	IEEE 1528 Section	Uncertainty Value ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value ±% (1g)	Uncertainty Value ±% (10g)	Vi or V _{eff}
Measurement System									
Probe Calibration (2450 MHz)	E.2.1	5.5	Normal	1	1	1	5.5	5.5	∞
Axial Isotropy	E.2.2	4.7	Rectangular	1.732050808	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	Rectangular	1.732050808	0.7	0.7	3.9	3.9	∞
Boundary Effect	E.2.3	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	Rectangular	1.732050808	1	1	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3	Rectangular	1.732050808	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Extrapolation, interpolation & integration algorithms for max. SAR evaluation	E.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	2.9	Normal	1	1	1	2.9	2.9	12
Device Holder Uncertainty	E.4.1	3.6	Normal	1	1	1	3.6	3.6	8
SAR Drift Measurement	6.6.2	5	Rectangular	1.732050808	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4	Rectangular	1.732050808	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5	Rectangular	1.732050808	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measured)	E.3.3	2.6	Normal	1	0.64	0.43	1.7	1.1	∞
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measured)	E.3.3	2.1	Normal	1	0.6	0.49	1.3	1.0	∞
Combined Standard Uncertainty				RSS			10.56	10.32	
Expanded Uncertainty (95% Confidence Interval)				k=2			21.12	20.65	
Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003									

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DU _T :	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech <small>Testing and Engineering Services Ltd.</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

17.0 REFERENCES

- [1] Federal Communications Commission - "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093.
- [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 (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)", Radio Standards Specification RSS-102 Issue 4: March 2010.
- [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] International Standard IEC 62209-2 Draft (106-62209-2-CDV_090323) - "Human exposure to radio frequency fields from hand-held & body-mounted wireless comm. devices - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (30 MHz to 6 GHz)".
- [7] Federal Communications Commission, Office of Engineering and Technology - "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies"; KDB 447498 D01v04: November 2009.
- [8] Federal Communications Commission, Office of Engineering and Technology - "SAR Measurement Procedures for 802.11a/b/g Transmitters"; KDB 248227 D01v01r02: May 2007.
- [9] Federal Communications Commission, Office of Engineering and Technology - "Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz"; KDB 450824 D01 v01r01: January 2007.
- [10] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 17 Application Note, Body Tissue Recipe: Sept. 2005.
- [11] ISO/IEC 17025 - "General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)."

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011						
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN								
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 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX A - SAR MEASUREMENT DATA

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011		
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN				
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	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/14/2010

Body-worn SAR - 802.11b - 1 Mbps - 2462 MHz - Channel 11 - LED Side of DUT (Touch Position)

DUT: Vocollect TT-100-1-1; Type: Wireless Data Terminal with 802.11b/g WLAN; Serial: 207010101

Body-worn Accessory: None; Audio Accessory: Headset-Microphone (P/N: HE-100-01)

Ambient Temp: 23.0°C; Fluid Temp: 24.0°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: DSSS WLAN

Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: M2450 Medium parameters used: $f = 2462$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 51.6$; $\rho = 1000$ kg/m³

- Probe: EX3DV4 - SN3600; ConvF(6.24, 6.24, 6.24); Calibrated: 29/04/2010
- Sensor-Surface: 3 mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - LED Side of DUT Touching Planar Phantom Section

Area Scan (9x13x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.449 mW/g

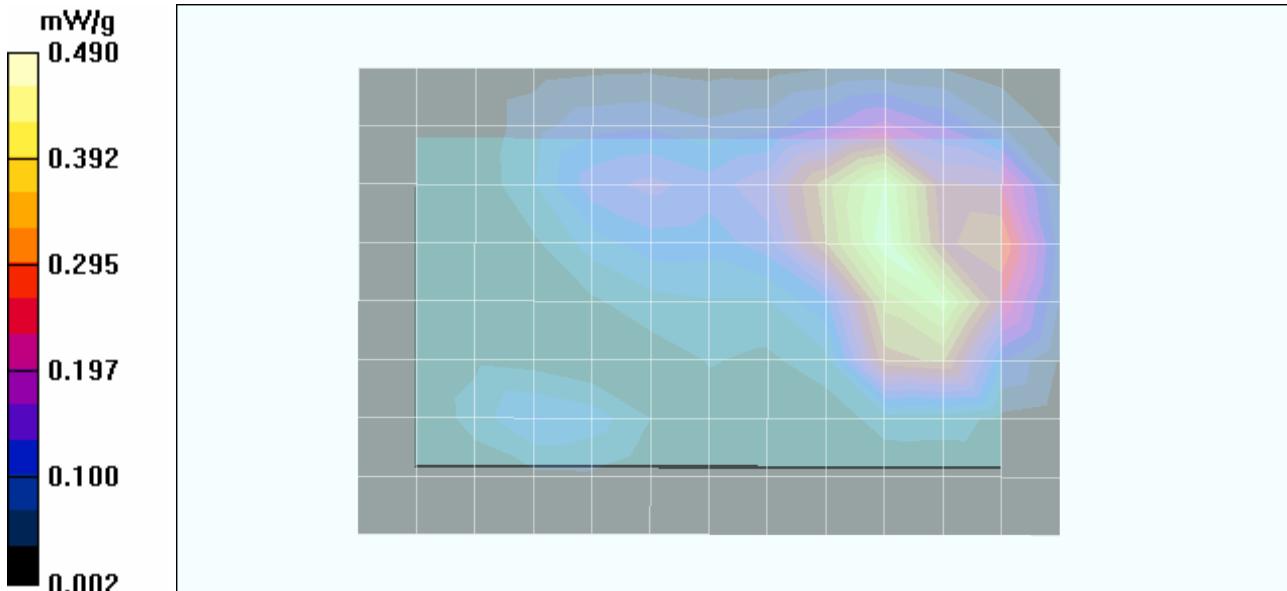
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.66 V/m; Power Drift = 0.183 dB

Peak SAR (extrapolated) = 0.718 W/kg

SAR(1 g) = 0.382 mW/g; SAR(10 g) = 0.190 mW/g

Maximum value of SAR (measured) = 0.490 mW/g

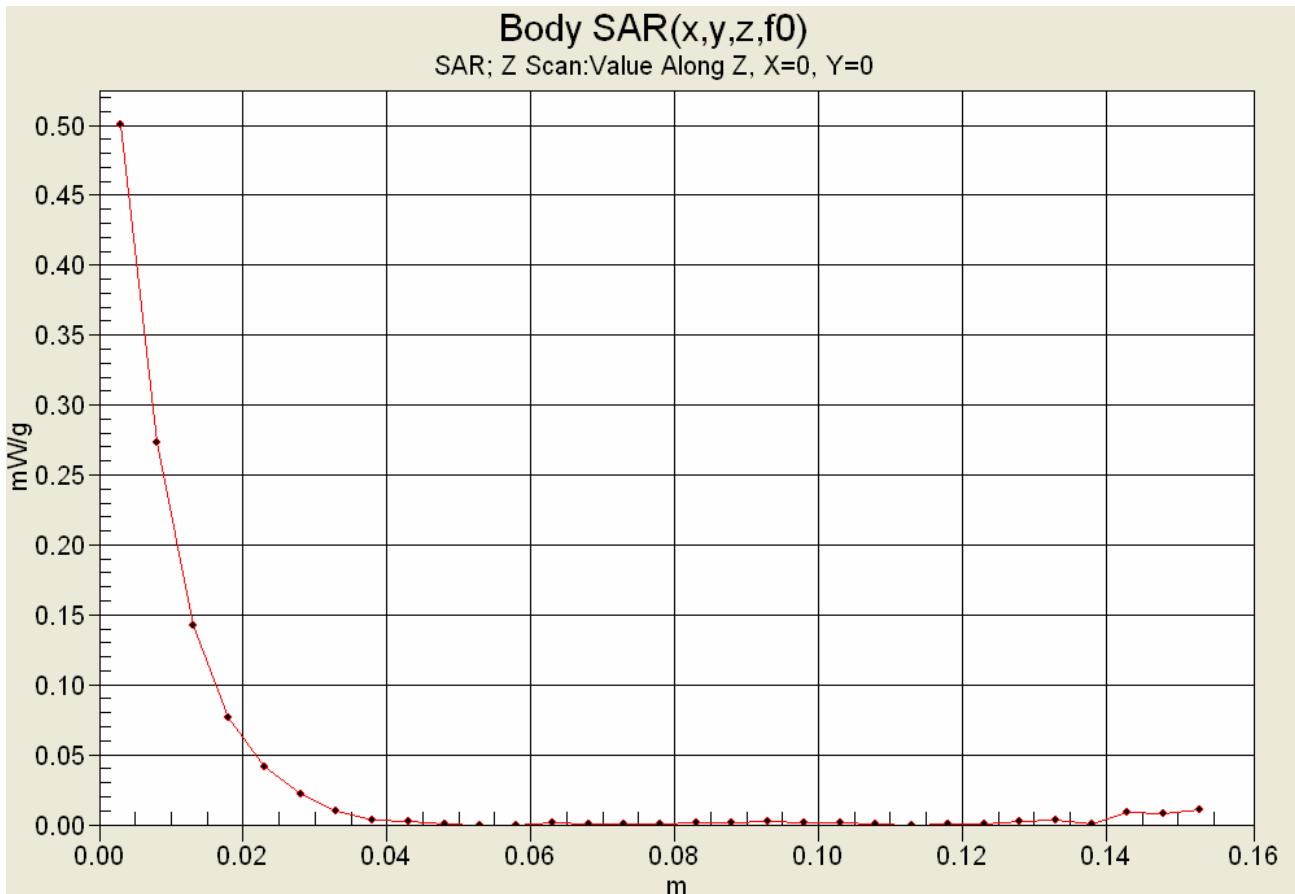


Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech Testing and Engineering Services Ltd.	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

Z-Axis Scan



Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011						
Model Name: H1	Model No.: TT-100-1-1	DUt:	Portable Wireless Data Terminal with 802.11b/g WLAN								
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	Page 17 of 36										

 Testing and Engineering Services Ltd.	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/14/2010

Body-worn SAR - 802.11b - 1 Mbps - 2462 MHz - Channel 11 - Battery Side of DUT (Touch Position)

DUT: Vocollect TT-100-1-1; Type: Wireless Data Terminal with 802.11b/g WLAN; Serial: 207010101

Body-worn Accessory: None; Audio Accessory: Headset-Microphone (P/N: HE-100-01)

Ambient Temp: 23.0°C; Fluid Temp: 24.0°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: DSSS WLAN

Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: M2450 Medium parameters used: $f = 2462$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 51.6$; $\rho = 1000$ kg/m³

- Probe: EX3DV4 - SN3600; ConvF(6.24, 6.24, 6.24); Calibrated: 29/04/2010
- Sensor-Surface: 3 mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - Battery Side of DUT Touching Planar Phantom Section

Area Scan (9x13x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.375 mW/g

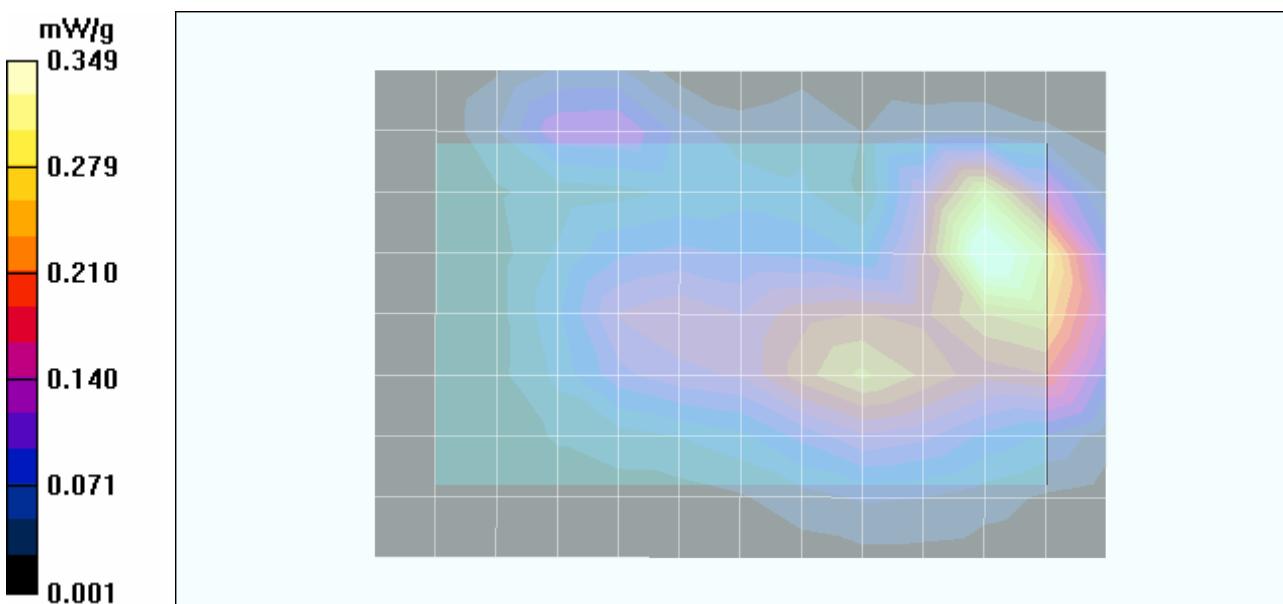
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.75 V/m; Power Drift = 0.159 dB

Peak SAR (extrapolated) = 0.584 W/kg

SAR(1 g) = 0.270 mW/g; SAR(10 g) = 0.130 mW/g

Maximum value of SAR (measured) = 0.349 mW/g



Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011					
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN							
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	Page 18 of 36									

 Celltech <small>Testing and Engineering Services Ltd.</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/14/2010

Body-worn SAR - 802.11b - 1 Mbps - 2462 MHz - Channel 11 - DUT inside Holster Accessory

DUT: Vocollect TT-100-1-1; Type: Wireless Data Terminal with 802.11b/g WLAN; Serial: 207010101

Body-worn Accessory: Belt-Holster P/N: AC-110-01; Audio Accessory: Headset-Microphone (P/N: HE-100-01)

Ambient Temp: 23.0°C; Fluid Temp: 24.0°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: DSSS WLAN
Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: M2450 Medium parameters used: $f = 2462 \text{ MHz}$; $\sigma = 1.94 \text{ mho/m}$; $\epsilon_r = 51.6$; $\rho = 1000 \text{ kg/m}^3$

- Probe: EX3DV4 - SN3600; ConvF(6.24, 6.24, 6.24); Calibrated: 29/04/2010
- Sensor-Surface: 3 mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 1.5 cm Belt-Holster Accessory Spacing between LED Side of DUT and Planar Phantom Section

Area Scan (9x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.167 mW/g

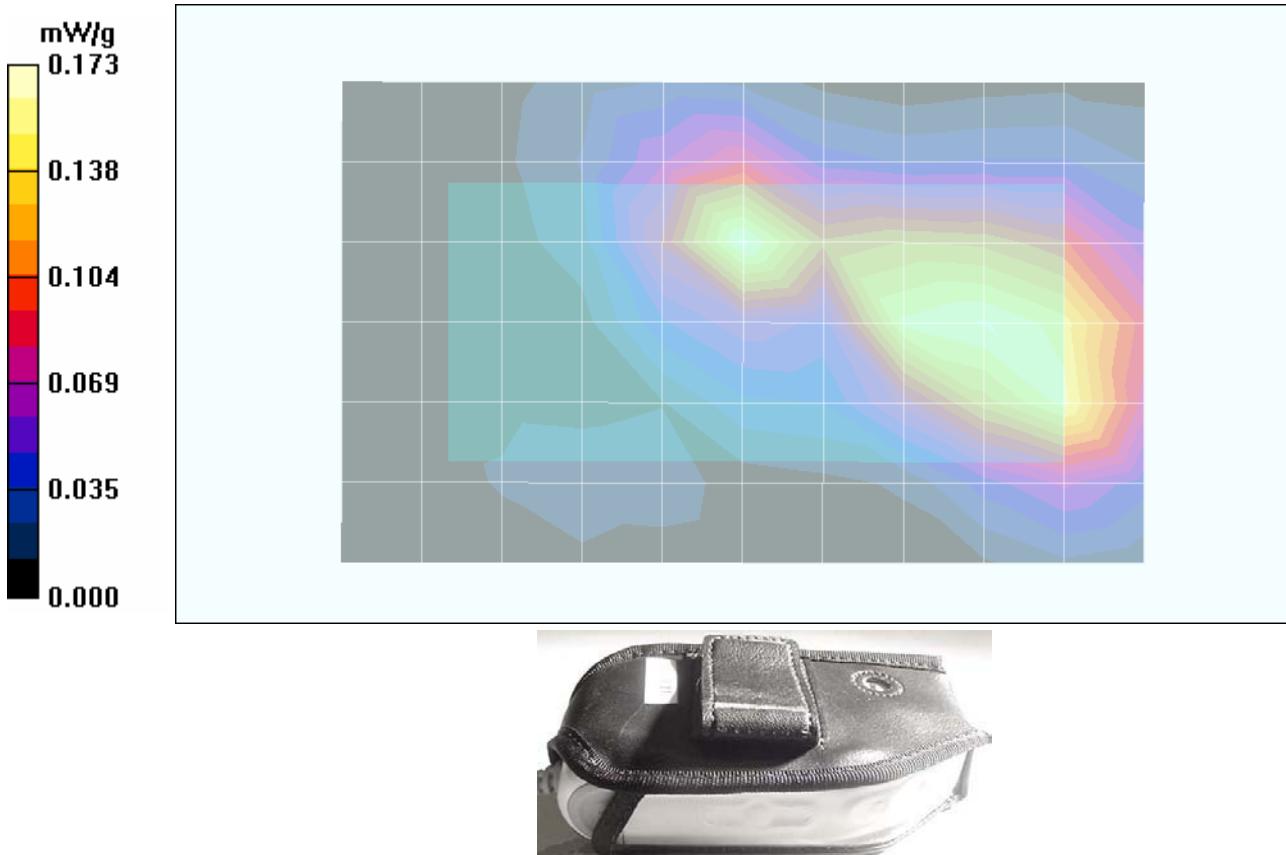
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.94 V/m; Power Drift = -0.034 dB

Peak SAR (extrapolated) = 0.229 W/kg

SAR(1 g) = 0.122 mW/g; SAR(10 g) = 0.068 mW/g

Maximum value of SAR (measured) = 0.173 mW/g



Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Testing and Engineering Services Ltd.	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/14/2010

Body-worn SAR - 802.11b - 2 Mbps - 2437 MHz - Channel 6 - LED Side of DUT (Touch Position)

DUT: Vocollect TT-100-1-1; Type: Wireless Data Terminal with 802.11b/g WLAN; Serial: 207010101

Body-worn Accessory: None; Audio Accessory: Headset-Microphone (P/N: HE-100-01)

Ambient Temp: 23.0°C; Fluid Temp: 24.0°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: DSSS WLAN

Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: M2450 Medium parameters used: $f = 2437$ MHz; $\sigma = 1.9$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

- Probe: EX3DV4 - SN3600; ConvF(6.24, 6.24, 6.24); Calibrated: 29/04/2010
- Sensor-Surface: 3 mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - LED Side of DUT Touching Planar Phantom Section

Area Scan (9x13x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.443 mW/g

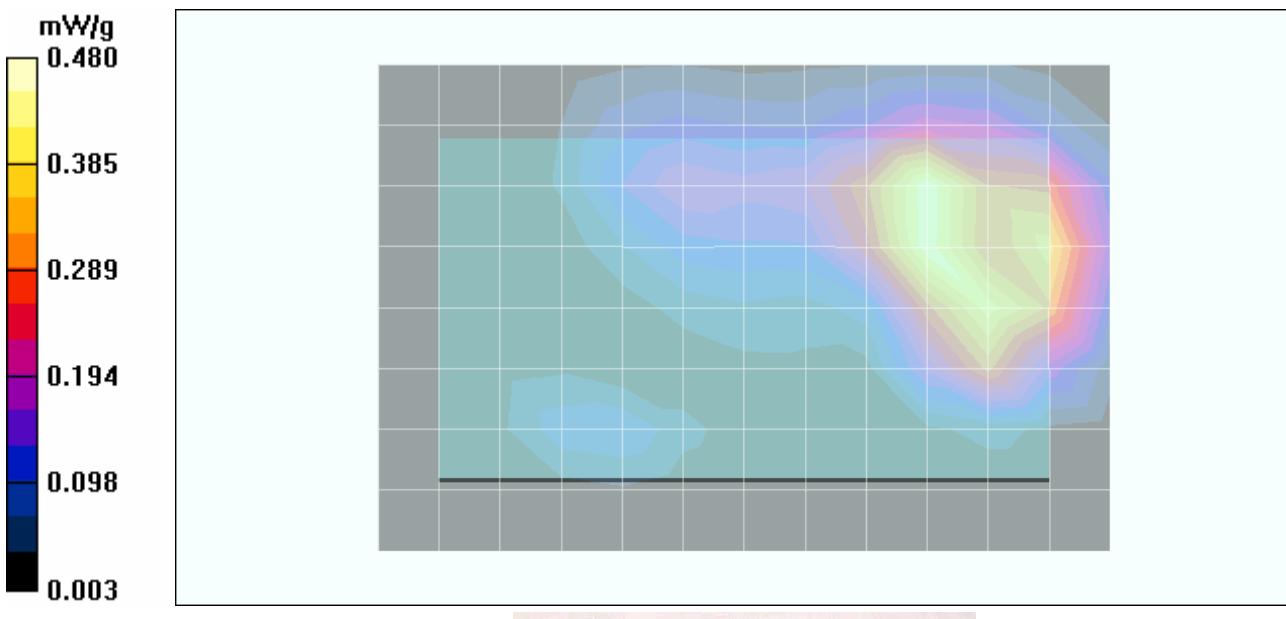
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.09 V/m; Power Drift = 0.138 dB

Peak SAR (extrapolated) = 0.694 W/kg

SAR(1 g) = 0.380 mW/g; SAR(10 g) = 0.187 mW/g

Maximum value of SAR (measured) = 0.480 mW/g



Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech <small>Testing and Engineering Services Lab</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/14/2010

Body-worn SAR - 802.11g - 6 Mbps - 2462 MHz - Channel 11 - LED Side of DUT (Touch Position)

DUT: Vocollect TT-100-1-1; Type: Wireless Data Terminal with 802.11b/g WLAN; Serial: 207010101

Body-worn Accessory: None; Audio Accessory: Headset-Microphone (P/N: HE-100-01)

Ambient Temp: 23.0°C; Fluid Temp: 24.0°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: OFDM WLAN

Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: M2450 Medium parameters used: $f = 2462$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 51.6$; $\rho = 1000$ kg/m³

- Probe: EX3DV4 - SN3600; ConvF(6.24, 6.24, 6.24); Calibrated: 29/04/2010
- Sensor-Surface: 3 mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - LED Side of DUT Touching Planar Phantom Section

Area Scan (9x13x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.167 mW/g

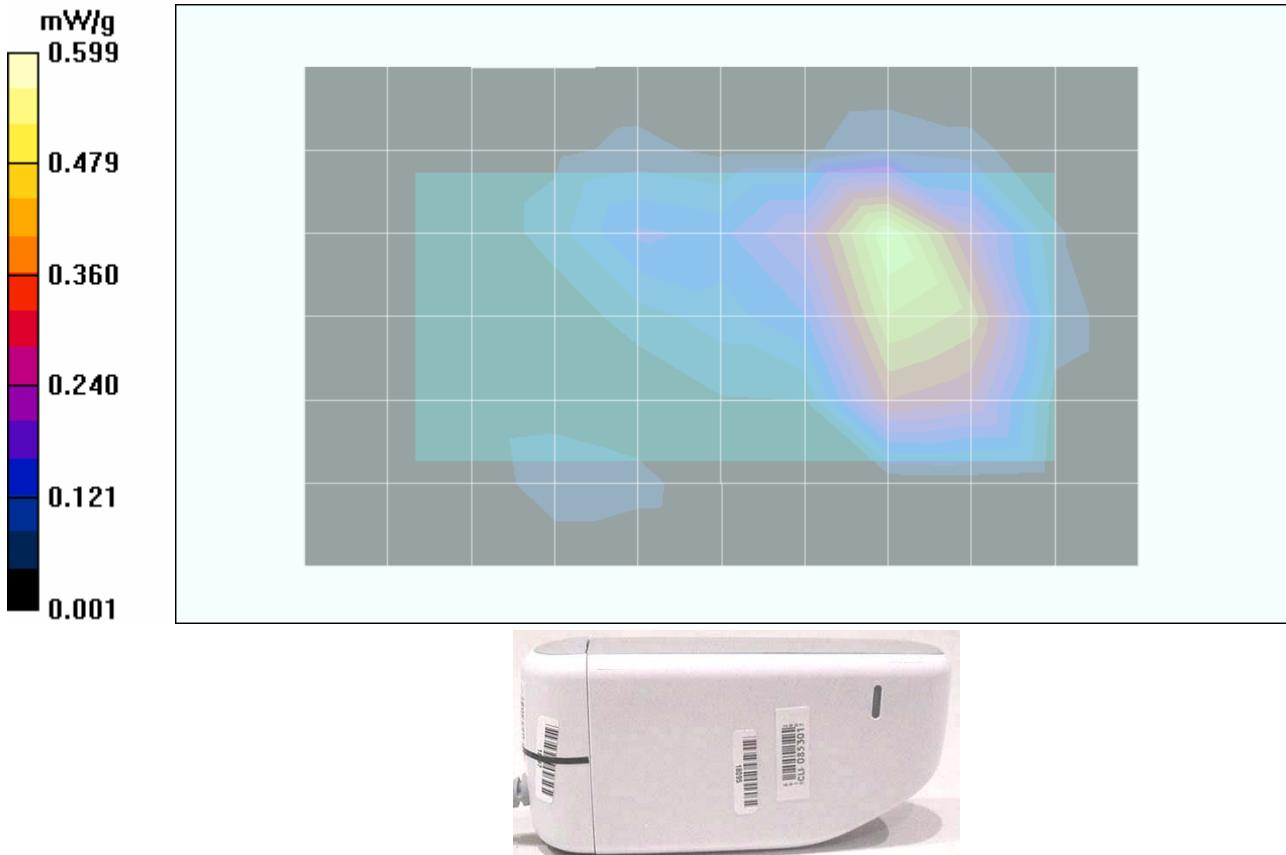
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.54 V/m; Power Drift = 0.238 dB

Peak SAR (extrapolated) = 0.891 W/kg

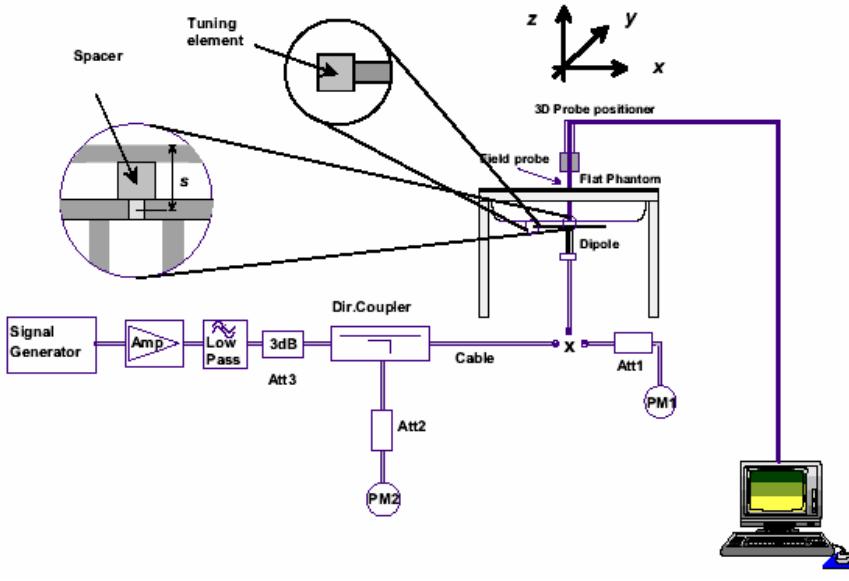
SAR(1 g) = 0.371 mW/g; SAR(10 g) = 0.182 mW/g

Maximum value of SAR (measured) = 0.599 mW/g



Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DU ^T :	Portable Wireless Data Terminal with 802.11b/g WLAN			
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APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

 <p>System Performance Check Measurement Setup (IEEE Standard 1528-2003)</p>	 <p>2450 MHz Validation Dipole Setup</p>
--	---

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011					
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN							
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	Page 22 of 36									

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	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/14/2010

System Performance Check - 2450 MHz Dipole - Body

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 825; Calibrated: 17/04/2009

Ambient Temp: 23.0°C; Fluid Temp: 24.0°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW

Forward Conducted Power: 250 mW

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: M2450 Medium parameters used: $f = 2450$ MHz; $\sigma = 1.91$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

- Probe: EX3DV4 - SN3600; ConvF(6.24, 6.24, 6.24); Calibrated: 29/04/2010
- Sensor-Surface: 3 mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

2450 MHz System Performance Check

Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 17.0 mW/g

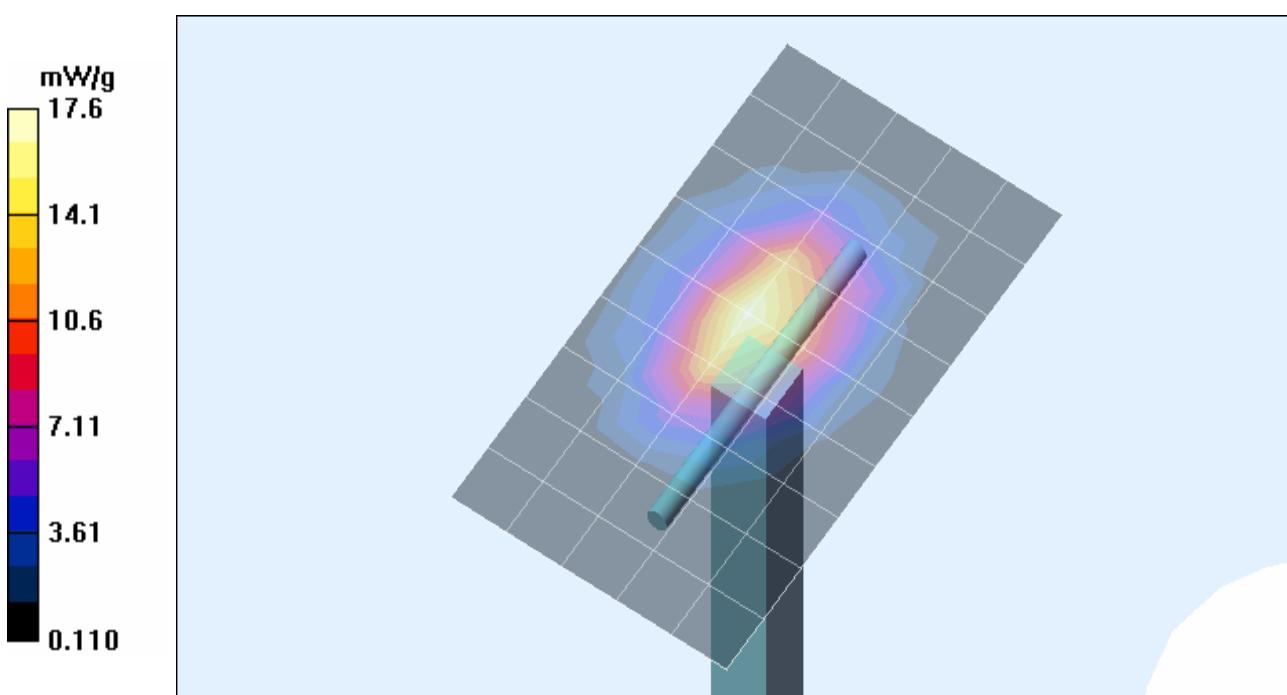
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.2 V/m; Power Drift = -0.046 dB

Peak SAR (extrapolated) = 27.3 W/kg

SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.1 mW/g

Maximum value of SAR (measured) = 17.6 mW/g

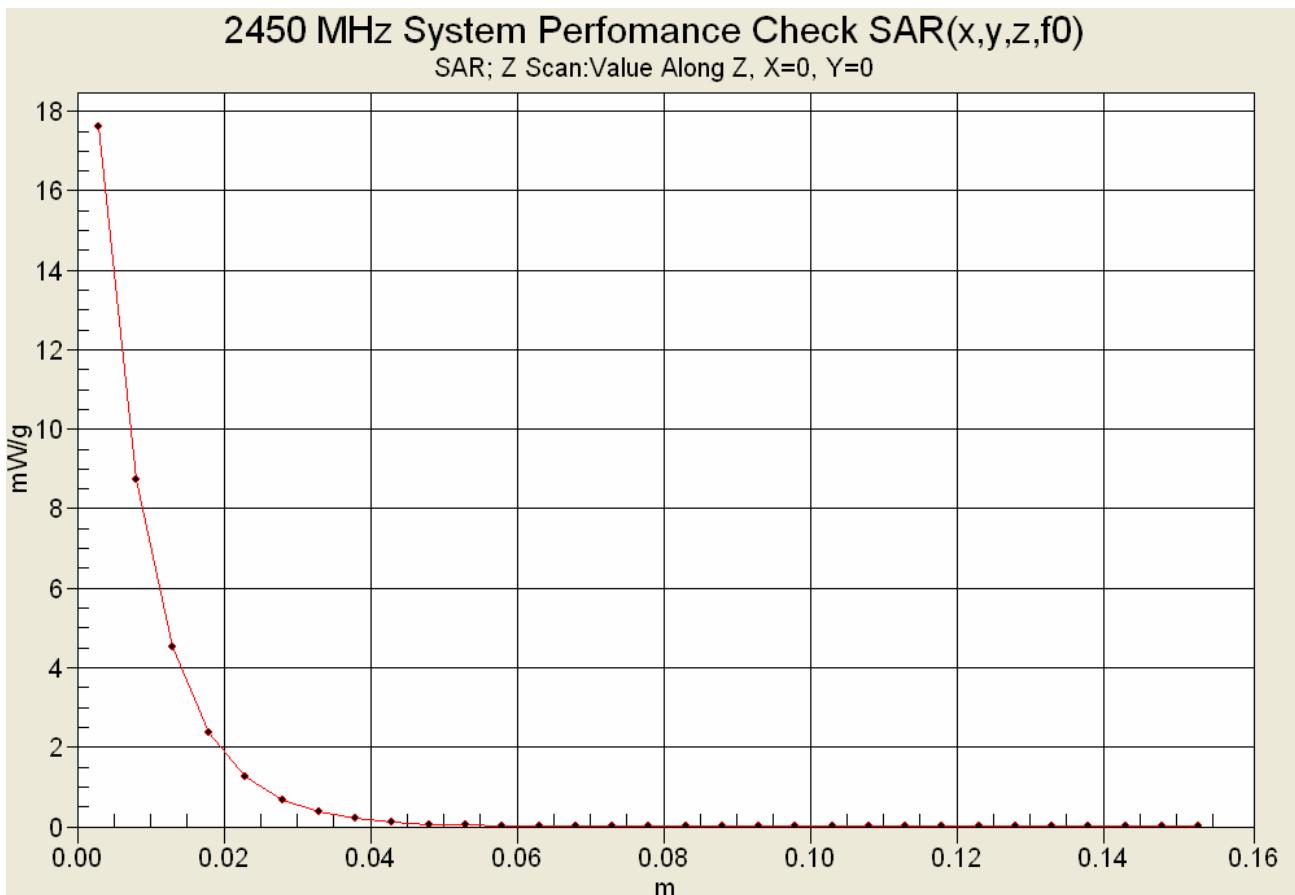


Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011						
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN								
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	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

Z-Axis Scan



Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011						
Model Name: H1	Model No.: TT-100-1-1	DUt:	Portable Wireless Data Terminal with 802.11b/g WLAN								
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 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011		
Model Name: H1	Model No.: TT-100-1-1	DUt:	Portable Wireless Data Terminal with 802.11b/g WLAN				
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 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC MRA  ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

2450 MHz System Performance Check & 2437/2462 MHz DUT Evaluation (Body)

Celltech Labs Inc.

Test Result for UIM Dielectric Parameter

14/June/2010

Frequency (GHz)

FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
 FCC_sH FCC 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
2.3500	52.83	1.85	51.86	1.79
2.3600	52.82	1.86	51.96	1.81
2.3700	52.81	1.87	51.75	1.80
2.3800	52.79	1.88	51.85	1.81
2.3900	52.78	1.89	51.85	1.85
2.4000	52.77	1.90	51.73	1.84
2.4100	52.75	1.91	51.72	1.85
2.4200	52.74	1.92	51.83	1.89
2.4300	52.73	1.93	51.54	1.87
2.4400	52.71	1.94	51.85	1.90
2.4500	52.70	1.95	51.92	1.91
2.4600	52.69	1.96	51.55	1.94
2.4700	52.67	1.98	51.66	1.93
2.4800	52.66	1.99	51.72	1.95
2.4900	52.65	2.01	51.59	1.98
2.5000	52.64	2.02	51.53	1.98
2.5100	52.62	2.04	51.45	2.00
2.5200	52.61	2.05	51.54	2.01
2.5300	52.60	2.06	51.44	2.01
2.5400	52.59	2.08	51.48	2.03
2.5500	52.57	2.09	51.53	2.08

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

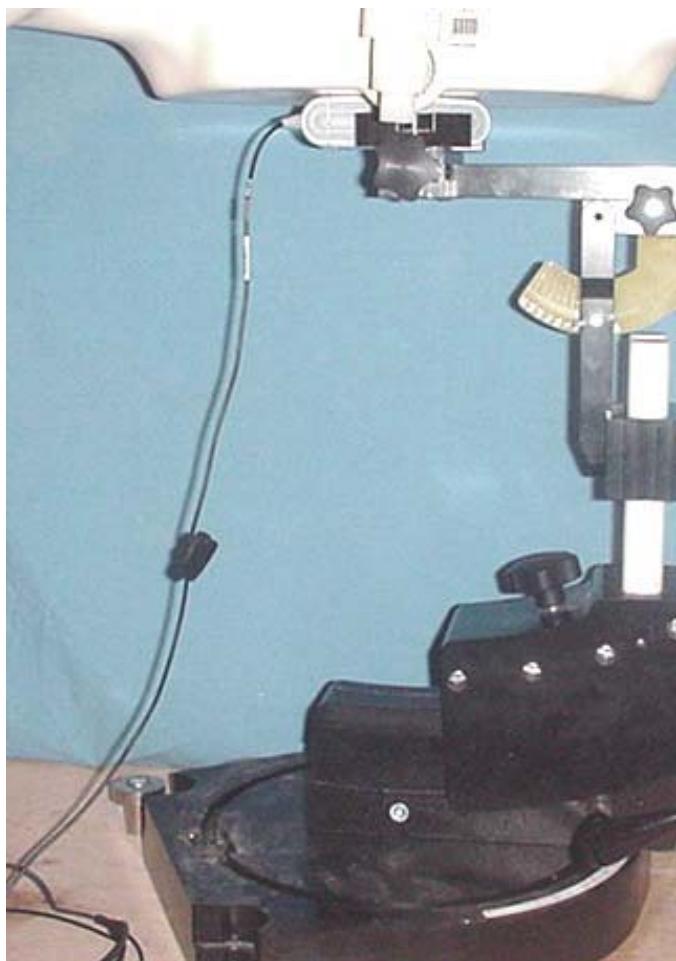
APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011		
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN				
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 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

BODY SAR TEST SETUP PHOTOGRAPHS
LED Side of DUT Touching Planar Section of SAM Phantom
DUT with Headset-Microphone Audio Accessory



Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011						
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN								
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 Celltech <small>Testing and Engineering Services Ltd.</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

BODY SAR TEST SETUP PHOTOGRAPHS

Battery Side of DUT Touching Planar Section of SAM Phantom DUT with Headset-Microphone Audio Accessory



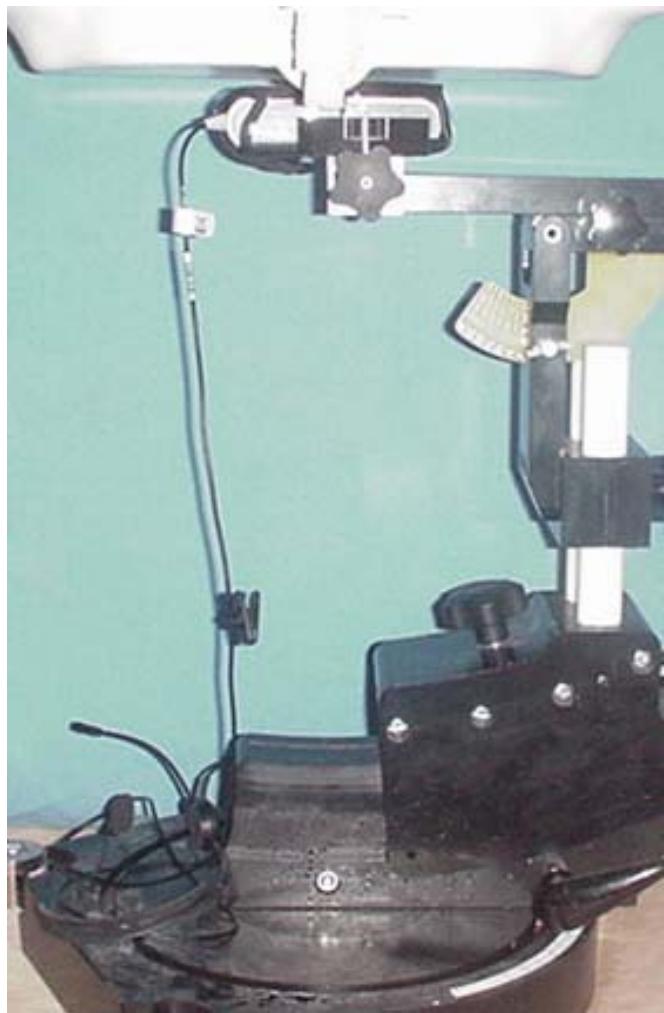
Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Testing and Engineering Services Ltd.	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

BODY SAR TEST SETUP PHOTOGRAPHS

1.5 cm Belt-Holster Spacing from LED Side of DUT to Planar Section of SAM Phantom
 DUT with Headset-Microphone Audio Accessory



Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			

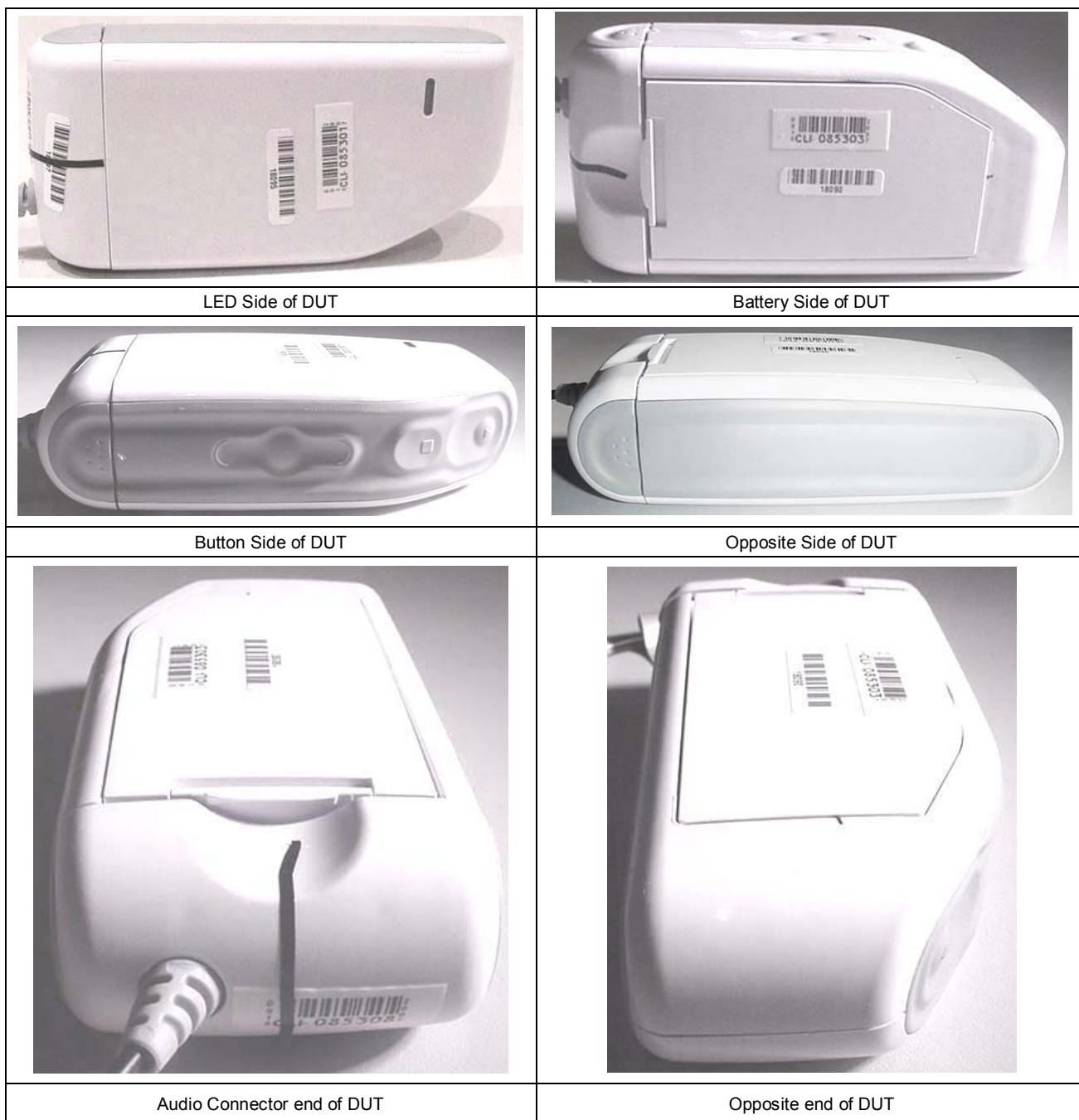
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Page 30 of 36

 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

DUT PHOTOGRAPHS



Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech <small>Testing and Engineering Services Ltd.</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ilac-MRA  ACREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

DUT PHOTOGRAPHS



DUT audio connector

Headset-Microphone and connector (P/N: HE-100-01)



DUT with Headset-Microphone audio accessory (P/N: HE-100-01)

DUT with Headset-Microphone & Belt-Holster (P/N: AC-110-01)



DUT Battery Compartment

DUT Battery (Lithium-ion Model: 1000956 Rev. 02)

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUt:	Portable Wireless Data Terminal with 802.11b/g WLAN			
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 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

DUT PHOTOGRAPHS



Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011	
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN			

 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX E - DIPOLE CALIBRATION

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011		
Model Name: H1	Model No.: TT-100-1-1	DUt:	Portable Wireless Data Terminal with 802.11b/g WLAN				
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Accredited by the Swiss Accreditation Service (SAS)
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client

Celltech

Certificate No.: **D2450V2-825_Apr09**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 825**

Calibration procedure(s) **QA CAL-05.v7**
Calibration procedure for dipole validation kits

Calibration date: **April 17, 2009**

Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV2	SN: 3025	28-Apr-08 (No. ES3-3025_Apr08)	Apr-09
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

Calibrated by: Name **Claudio Leubler** Function **Laboratory Technician**

Signature

Approved by: Name **Katja Pokovic** Function **Technical Manager**

Issued: April 22, 2009

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TS	tissue simulating liquid
ConvF	sensitivity in TS / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TS:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TS parameters:* The measured TS parameters are used to calculate the nominal SAR result.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	38.0 \pm 6 %	1.82 mho/m \pm 6 %
Head TSL temperature during test	(22.0 \pm 0.2) °C	—	—

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.6 mW / g
SAR normalized	normalized to 1W	54.4 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	53.7 mW /g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.29 mW / g
SAR normalized	normalized to 1W	25.2 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	25.0 mW /g \pm 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.4 ± 6 %	1.98 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	—	—

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 mW / g
SAR normalized	normalized to 1W	51.6 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	51.6 mW /g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.05 mW / g
SAR normalized	normalized to 1W	24.2 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	24.2 mW /g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$54.5 \Omega + 4.7 \text{ j}\Omega$
Return Loss	- 24.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$49.2 \Omega + 5.6 \text{ j}\Omega$
Return Loss	- 24.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.160 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 11, 2008

DASY5 Validation Report for Head TSL

Date/Time: 17.04.2009 12:17:23

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN825

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.82$ mho/m; $\epsilon_r = 38$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.4, 4.4, 4.4); Calibrated: 28.04.2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

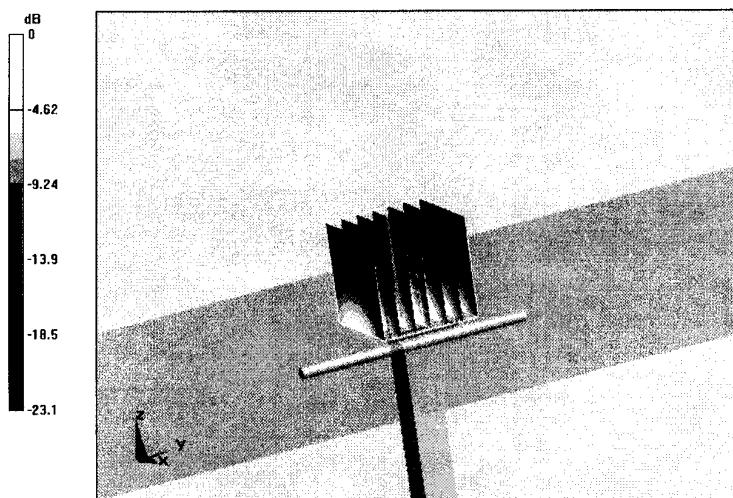
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.1 V/m; Power Drift = 0.026 dB

Peak SAR (extrapolated) = 28.4 W/kg

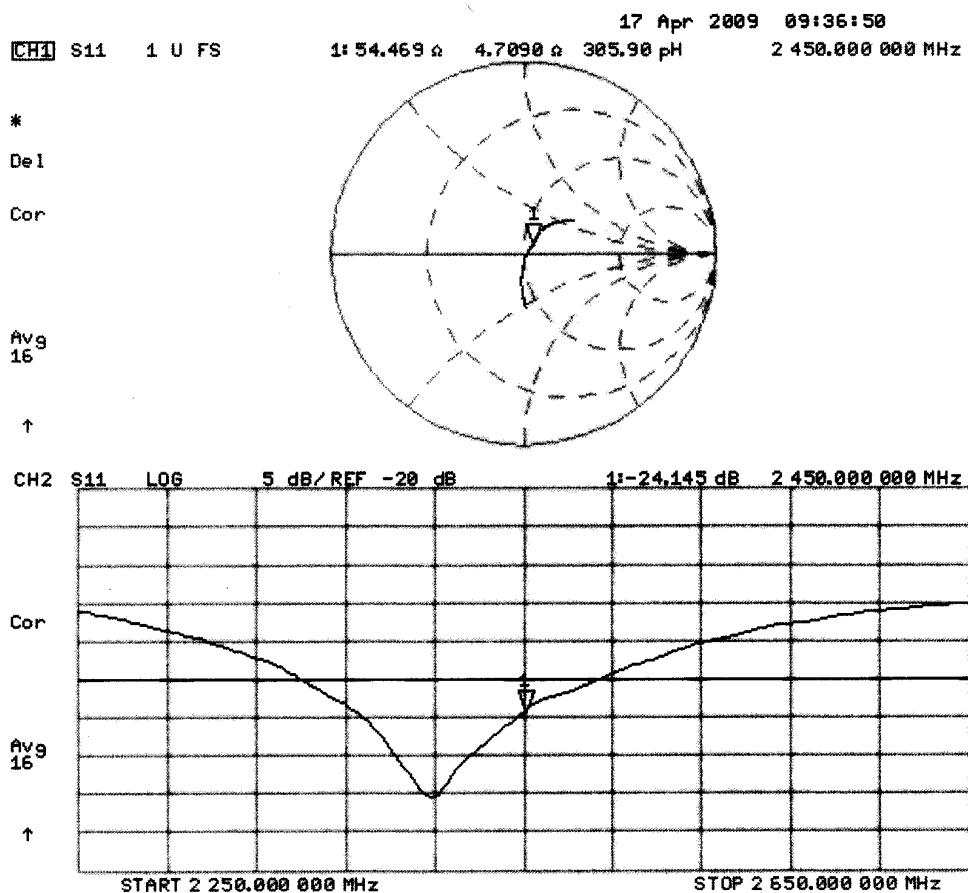
SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.29 mW/g

Maximum value of SAR (measured) = 17.7 mW/g



0 dB = 17.7mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 17.04.2009 14:54:34

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:825

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.98$ mho/m; $\epsilon_r = 54.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.07, 4.07, 4.07); Calibrated: 28.04.2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

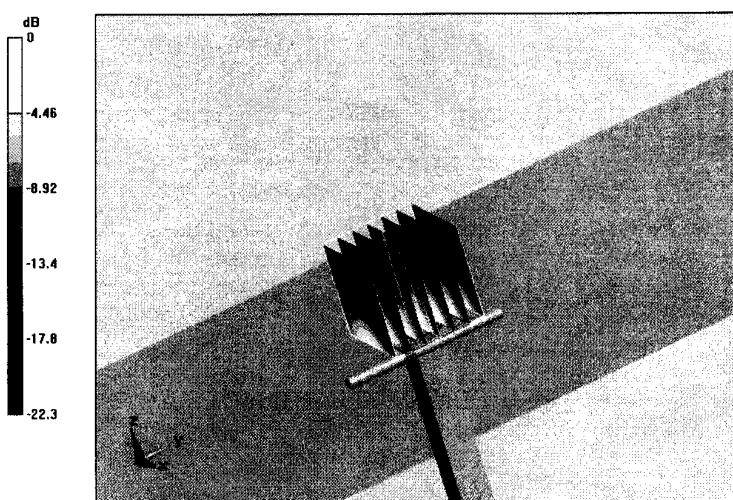
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 91.6 V/m; Power Drift = 0.046 dB

Peak SAR (extrapolated) = 26.1 W/kg

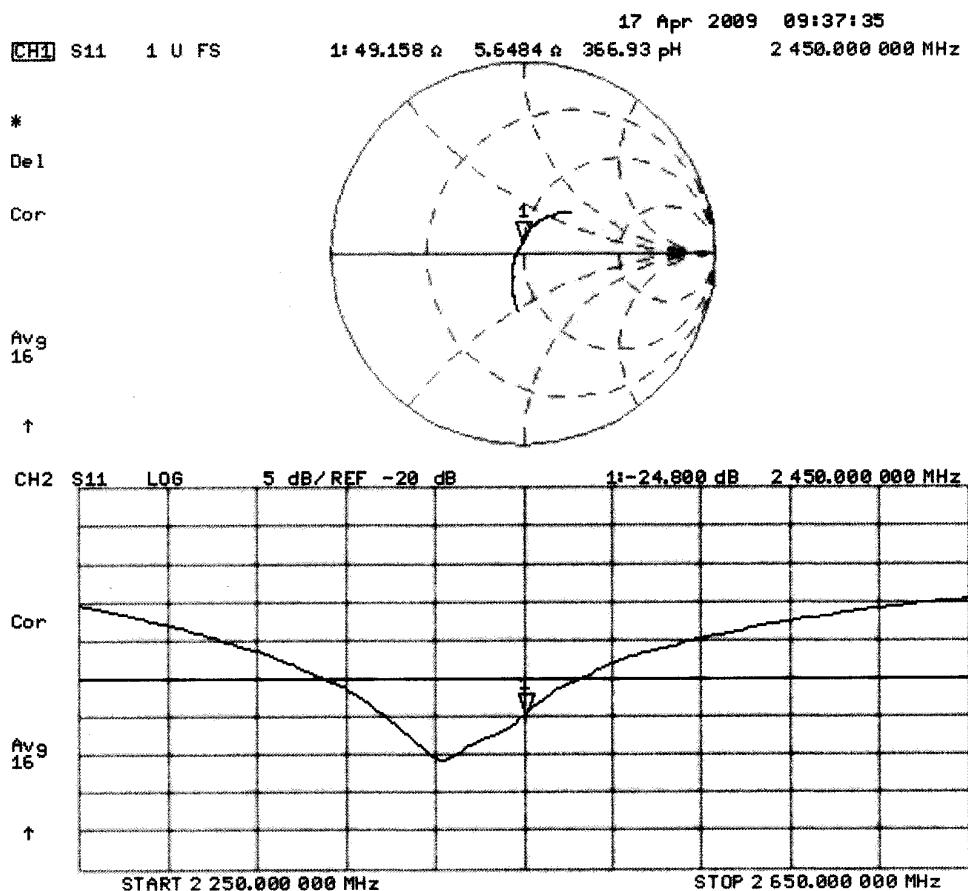
SAR(1 g) = 12.9 mW/g; SAR(10 g) = 6.05 mW/g

Maximum value of SAR (measured) = 16.6 mW/g



0 dB = 16.6mW/g

Impedance Measurement Plot for Body TSL



 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 ILAC-MRA  ACCREDITED
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX F - PROBE CALIBRATION

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011		
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN				
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Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
C Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Client **Celltech**

Certificate No: **EX3-3600_Apr10**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3600**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2**
Calibration procedure for dosimetric E-field probes

Calibration date: **April 29, 2010**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN. 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

Calibrated by: **Katja Pokovic** **Name** **Function** **Signature**
Technical Manager

Approved by: **Niels Kuster** **Name** **Function** **Signature**
Quality Manager

Issued: April 29, 2010

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM x,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORM x,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- $NORM $x,y,z$$: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). $NORM $x,y,z$$ are only intermediate values, i.e., the uncertainties of $NORM $x,y,z$$ does not effect the E^2 -field uncertainty inside TSL (see below $ConvF$).
- $NORM(f)x,y,z = NORM x,y,z * frequency_response$ (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of $ConvF$.
- $DCPx,y,z$: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- $Ax,y,z; Bx,y,z; Cx,y,z; VRx,y,z$: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters*: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to $NORM x,y,z * $ConvF$ whereby the uncertainty corresponds to that given for $ConvF$. A frequency dependent $ConvF$ is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.$
- Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3600

Manufactured: January 10, 2007
Last calibrated: April 28, 2009
Recalibrated: April 29, 2010

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: EX3DV4 SN:3600

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.51	0.51	0.40	$\pm 10.1\%$
DCP (mV) ^B	90.5	88.5	85.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc ^E (k=2)
10000	CW	0.00	X Y Z	0.00 0.00 0.00	0.00 0.00 0.00	1.00 1.00 1.00	300 300 300	$\pm 1.5\%$

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^C Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY - Parameters of Probe: EX3DV4 SN:3600**Calibration Parameter Determined in Head Tissue Simulating Media**

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	7.79	7.79	7.79	0.74	0.61 ± 11.0%
1810	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	6.79	6.79	6.79	0.59	0.70 ± 11.0%
1950	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	6.46	6.46	6.46	0.57	0.72 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	6.15	6.15	6.15	0.34	0.89 ± 11.0%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

DASY - Parameters of Probe: EX3DV4 SN:3600

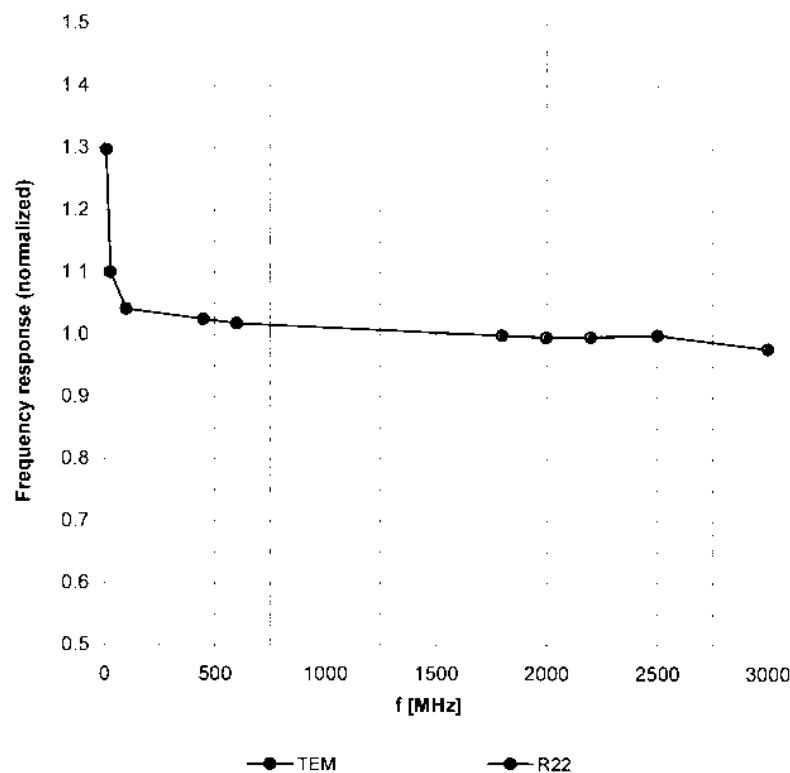
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	7.92	7.92	7.92	0.50	0.77 ± 11.0%
1810	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	6.47	6.47	6.47	0.70	0.64 ± 11.0%
1950	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	6.53	6.53	6.53	0.64	0.67 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	6.24	6.24	6.24	0.43	0.87 ± 11.0%
5200	± 50 / ± 100	49.0 ± 5%	5.30 ± 5%	3.73	3.73	3.73	0.52	1.95 ± 13.1%
5500	± 50 / ± 100	48.6 ± 5%	5.65 ± 5%	3.30	3.30	3.30	0.58	1.95 ± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	3.44	3.44	3.44	0.63	1.95 ± 13.1%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Frequency Response of E-Field

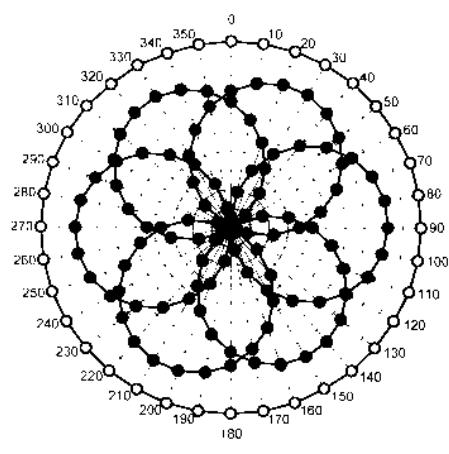
(TEM-Cell:ifi110 EXX, Waveguide: R22)



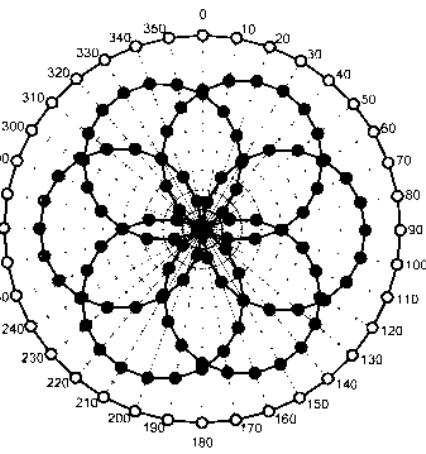
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$

$f = 600 \text{ MHz, TEM ifi110EXX}$

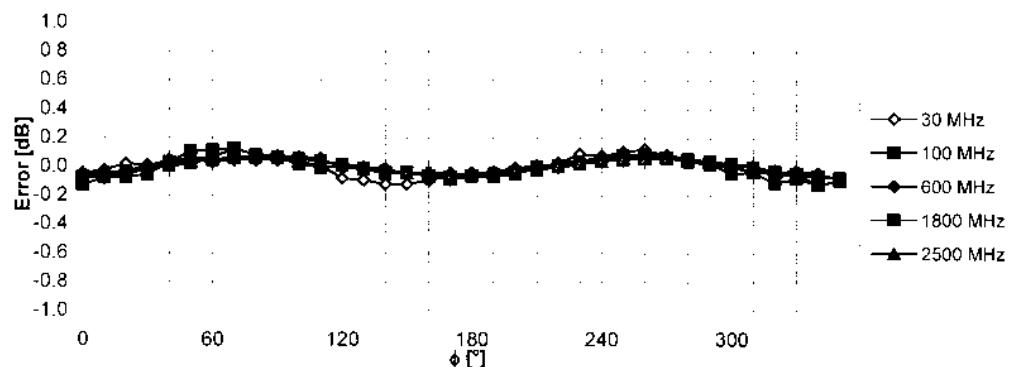


$f = 1800 \text{ MHz, WG R22}$



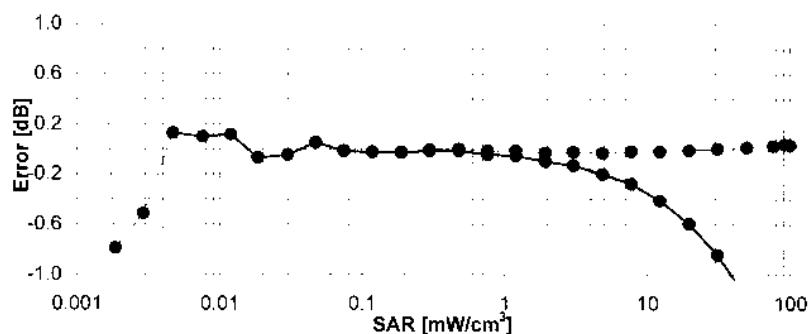
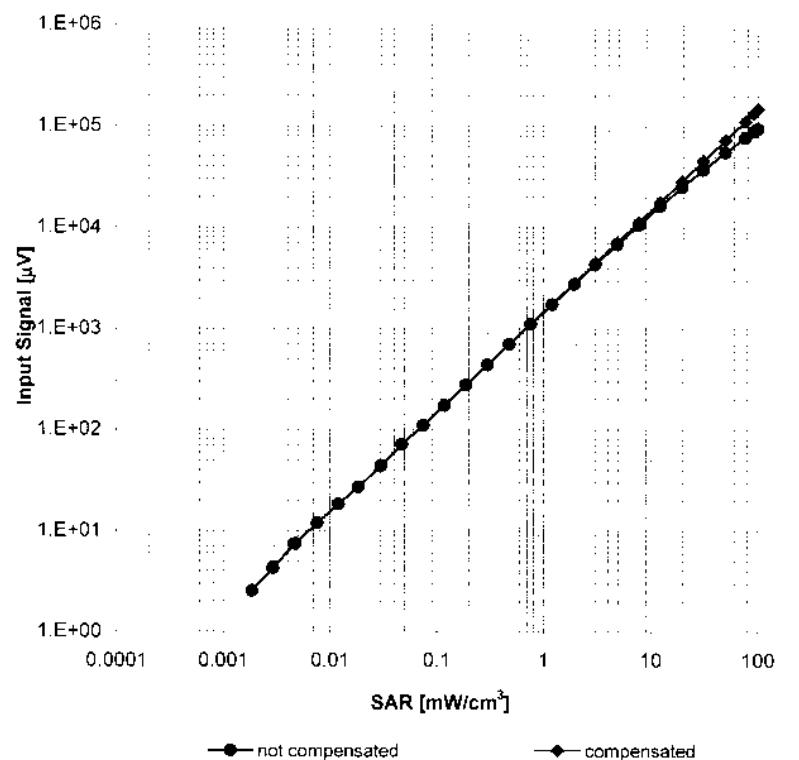
—●— X —●— Y —●— Z —○— Tot

—●— X —●— Y —●— Z —○— Tot



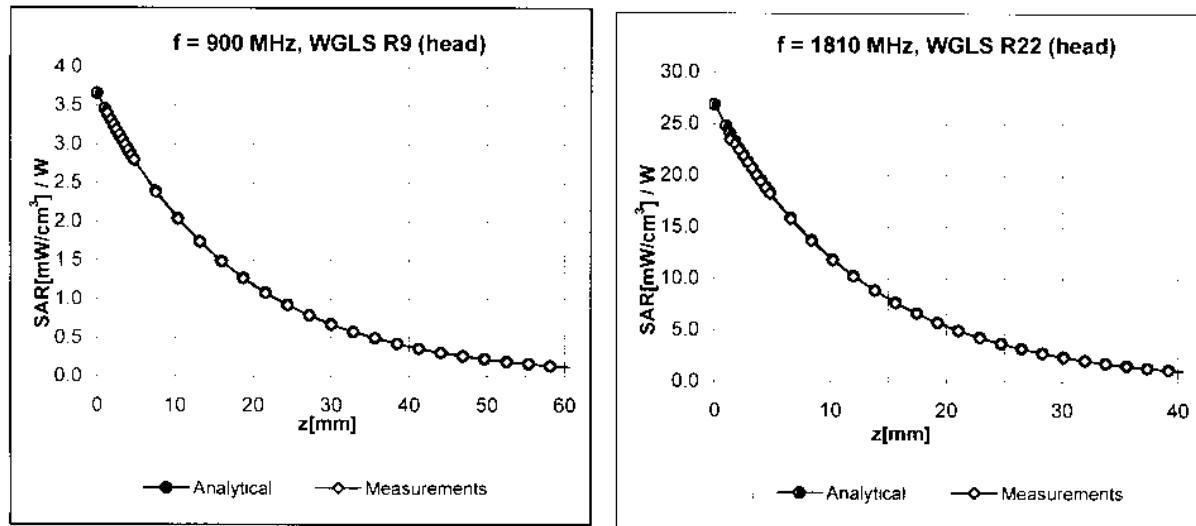
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head}) (Waveguide R22, f = 1800 MHz)

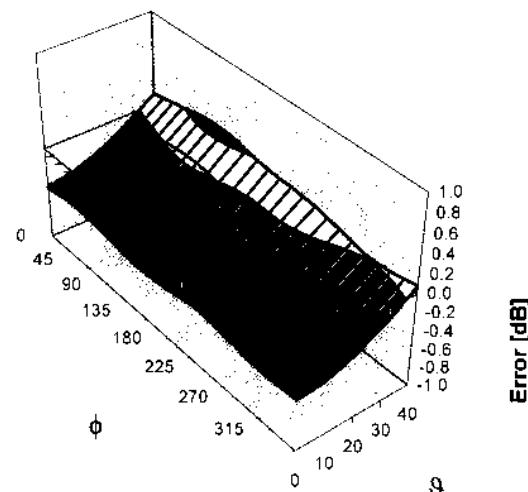


Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ, θ) , $f = 900 \text{ MHz}$ 

■ -1.00--0.80	■ -0.80--0.60	■ -0.60--0.40	■ -0.40--0.20	■ -0.20--0.00
□ 0.00--0.20	■ 0.20--0.40	□ 0.40--0.60	■ 0.60--0.80	■ 0.80--1.00

Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

 Celltech <small>Testing and Engineering Services Ltd</small>	<u>Date(s) of Evaluation</u> June 14, 2010	<u>Test Report Serial No.</u> 052810MQO-T1029-S15W	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> June 16, 2010	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX G - SAM PHANTOM CERTIFICATE OF CONFORMITY

Company Name:	VOCOLLECT INC.	FCC ID:	MQO-TT-100-1-1	IC ID:	2570A-TT10011		
Model Name: H1	Model No.: TT-100-1-1	DUT:	Portable Wireless Data Terminal with 802.11b/g WLAN				
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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

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