



Date(s) of Evaluation
Nov. 05, 2012

Test Report Serial No.
103012MQO-T1204S

Test Report Revision No.
Rev. 1.0 (1st Release)

Test Report Issue Date
Nov. 07, 2012

Description of Test(s)
Specific Absorption Rate

RF Exposure Category
Gen. Pop. / Uncontrolled



DECLARATION OF COMPLIANCE		SAR RF EXPOSURE EVALUATION			FCC & IC					
Test Lab Information	Name	CELLTECH LABS INC.	Address	21-364 Lougheed Road, Kelowna, BC. V1X 7R8 Canada						
Applicant Information	Name	VOCOLLECT INC.	Address	703 Rodi Road, Pittsburgh PA 15235 United States						
Test Lab Accreditation	A2LA	ISO/IEC 17025:2005 (A2LA Test Lab Certificate No. 2470.01)								
Standard(s) Applied	FCC	47 CFR §2.1093	IC	Health Canada Safety Code 6						
Procedure(s) Applied	FCC	OET Bulletin 65, Supplement C (01-01)								
		KDB 447498 D01v05 - General RF Exposure Procedures								
	IC	RSS-102 Issue 4								
	IEEE	1528-2003	IEC	62209-2:2010						
Device RF Exposure Category	FCC/IC	General Population / Uncontrolled Environment								
Device Classification(s)	FCC	DTS - Digital Transmission System (Part 15 Subpart C)								
		NII - Unlicensed National Information Infrastructure Transmitter (Part 15 Subpart E)								
	IC	Low Power License-Exempt Radio-communication Device (RSS-210)								
Device Identifier(s)	FCC ID:	MQO-TAP700-01		IC:	2570A-TAP70001					
Device Model Name	TAP700-01 Terminal			Device Model No.	TAP700-01					
Test Sample Serial No.	202421002 (Identical Prototype)									
Test Sample Hardware Rev. No.	A		Test Sample Firmware Rev. No.		VVC 3.8.2					
Measurement Date(s)	Nov. 5, 2012		Date of Sample Receipt		Oct. 30, 2012					
Device Description	Portable Body-worn Voice-Controlled Wireless Data Terminal									
Internal Transmitter(s) Type	802.11b/g WLAN Bluetooth									
Transmitter Type Tested	802.11b/g WLAN									
Co-located Transmitter(s)	Bluetooth		0 dBm (+/-0.5 dB)		Simultaneous transmission with WLAN					
	Minimum Antenna-to-Antenna Distance (Bluetooth to 802.11b/g) = 88 mm									
	SAR evaluation for simultaneous transmission not required per FCC KDB 447498 D01v05									
Modulation Type(s)	802.11b	DSS, DBPSK, DQPSK, CCK		802.11g	OFDM					
Data Rates	802.11b	1, 2, 5.5, 11 Mbps		802.11g	6, 9, 12, 24, 36, 48, 54 Mbps					
Transmit Frequency Range(s)	802.11b/g	2412 - 2462 MHz		Bluetooth	2402 - 2480 MHz					
Rated Cond. Output Power	802.11b/g	17.0 dBm		+/-1.0 dBm		Source-Based Time-Averaged				
Antenna Type(s) Tested	Internal (802.11b/g)									
Battery Type(s) Tested	Lithium-ion (3.7V, 17Wh)									
Body-worn Accessories Tested	Belt-Clip & Belt Strap									
Audio Accessories Tested	Headset-Microphone									
Max. SAR Level(s) Evaluated	BODY	802.11b	0.038 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 portable device was 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 procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 4, IEEE Standard 1528-2003 and IEC International Standard 62209-2:2010. 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.										
The results and statements contained in this report pertain only to the device evaluated.										
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Test Report Approved By			Mike Meaker	Engineering Technologist	Celltech Labs Inc.					

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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	<u>Test Report Issue Date</u> Nov. 07, 2012	<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	1st Release	Mike Meaker	Nov. 07, 2012

TEST REPORT SIGN-OFF

DEVICE TESTED BY	REPORT PREPARED BY	QA REVIEW BY	REPORT APPROVED BY
Mike Meaker	Mike Meaker	Mike Meaker	Mike Meaker

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A						
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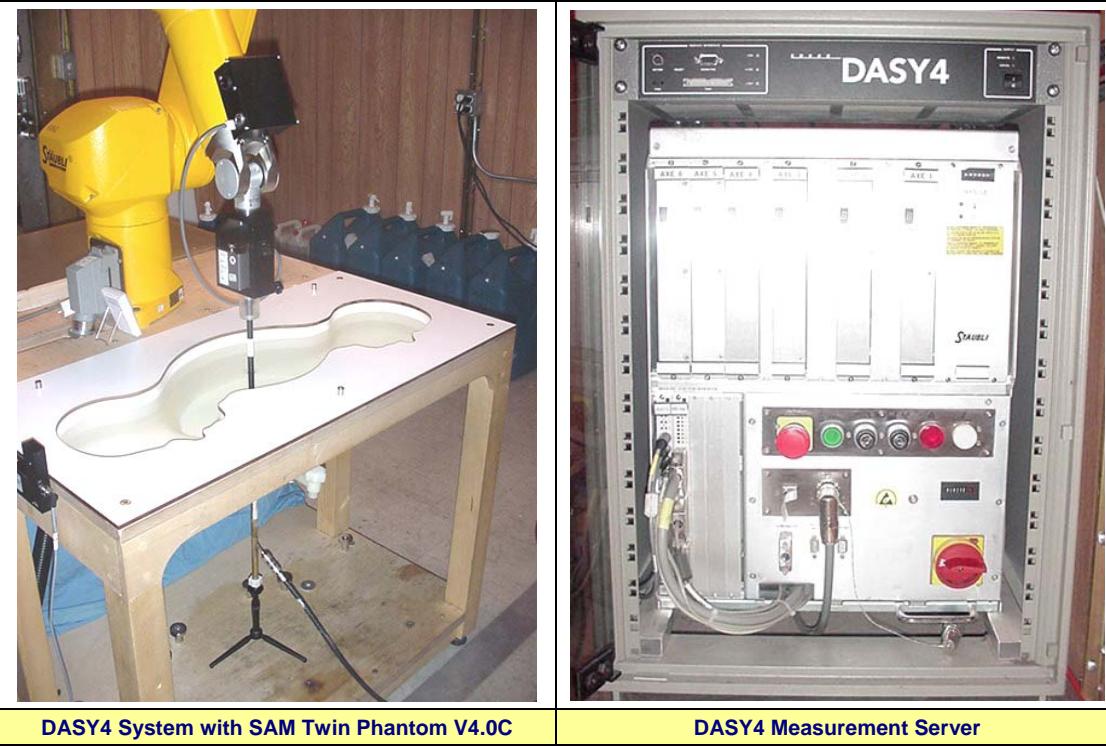
 Celltech <small>Testing and Engineering Services Lab</small>	<u>Date(s) of Evaluation</u> Nov. 05, 2012	<u>Test Report Serial No.</u> 103012MQO-T1204S	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 ILAC-MRA <small>ACCREDITED</small>
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1.0 INTRODUCTION

This measurement report demonstrates that the Vocollect Inc. Model: TAP700-01 Portable Body-worn Voice-Controlled Wireless Data Terminal with 802.11b/g WLAN and Bluetooth 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]), IC RSS-102 Issue 4 (see reference [4]), IEEE Standard 1528-2003 (see reference [5]) and IEC International Standard 62209-2:2010 (see reference [7]) were employed. A description of the product, 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 Head 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.



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3.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES (150MHz-3GHz)

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 [10]).

Probe Calibration Freq.	Device Measurement Freq.	Frequency Interval	<u>+50 MHz \geq 300 MHz</u>
2450 MHz	2437 MHz	13 MHz	< 50 MHz

The probe calibration and measurement frequency interval is < 50 MHz; therefore the additional steps are not required for this evaluation.

4.0 CONDUCTED OUTPUT POWER MEASUREMENTS

MEASURED RF CONDUCTED OUTPUT POWER LEVELS								
Freq. (MHz)	Channel	Average Conducted RF Output Power Levels (dBm)						
802.11b Mode		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps			
2412	1	16.6	16.6	16.6	16.5			
2437	6	16.7	16.5	16.5	16.5			
2462	11	16.6	16.4	16.4	16.5			
802.11g Mode		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps
2412	1	16.6	16.5	16.5	16.5	16.4	16.4	16.5
2437	6	13.1	13.1	13.2	13.2	13.2	13.2	13.2
2462	11	13.1	13.1	13.1	13.1	13	13	13
Notes								
1. The RF conducted average output power levels of the DUT were measured by Celltech prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter at the internal connector in accordance with FCC 47 CFR §2.1046 (see reference [13]) and IC RSS-Gen (see reference [14]).								
2. The RF conducted output power levels measured in 802.11g mode were < 0.25 dB > 802.11b mode; therefore SAR evaluations were not required for 802.11g mode (per FCC KDB 248277 D01v01r02 - see reference [9]).								
3. The RF conducted output power levels measured for the higher data rates were < 0.25 dB > the lowest data rate conducted output power levels; therefore SAR evaluations were not required for the higher data rates (per FCC KDB 248227 D01v01r02 - see reference [9]).								

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	 Vocollect <small>Intelligence at Work</small>
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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5.0 MANUFACTURER'S DISCLOSED ACCESSORY LISTING

Accessory ID # for Test Report	ACCESSORY CATEGORY: BATTERY		
	Part Number	Description	SAR Evaluation
a	BT-700	Lithium-ion (3.7V, 17Wh)	Yes
Accessory ID # for Test Report	ACCESSORY CATEGORY: BODY-WORN		
	Part Number	Description	SAR Evaluation
1	BL-601-107	Belt-strap & Belt-clip (Does NOT contain metal)	Yes
Accessory ID # for Test Report	ACCESSORY CATEGORY: AUDIO		
	Part Number	Description	SAR Evaluation
1	SR-20	Headset-Microphone	Yes

Manufacturer's disclosed accessory listing information provided by Vocollect Inc.

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6.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS						
Date: 11/06/2012		Frequency: 2450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2.350	51.29	1.84	52.7	1.95	-2.68%	-5.64%
2.360	51.07	1.83	52.7	1.95	-3.09%	-6.15%
2.370	51.1	1.86	52.7	1.95	-3.04%	-4.62%
2.380	51.13	1.85	52.7	1.95	-2.98%	-5.13%
2.390	51.12	1.88	52.7	1.95	-3.00%	-3.59%
2.400	50.96	1.88	52.7	1.95	-3.30%	-3.59%
2.410	50.99	1.91	52.7	1.95	-3.24%	-2.05%
2.420	51.05	1.92	52.7	1.95	-3.13%	-1.54%
2.430	50.92	1.96	52.7	1.95	-3.38%	0.51%
2.437*	51	1.97	52.7	1.95	-3.23%	1.03%
2.440	50.97	1.97	52.7	1.95	-3.28%	1.03%
2.450	50.96	1.97	52.7	1.95	-3.30%	1.03%
2.460	50.76	1.96	52.7	1.95	-3.68%	0.51%
2.470	50.81	2	52.7	1.95	-3.59%	2.56%
2.480	50.84	2	52.7	1.95	-3.53%	2.56%
2.490	50.64	2.02	52.7	1.95	-3.91%	3.59%
2.500	50.58	2.04	52.7	1.95	-4.02%	4.62%
2.510	50.73	2.03	52.7	1.95	-3.74%	4.10%
2.520	50.63	2.07	52.7	1.95	-3.93%	6.15%
2.530	50.5	2.09	52.7	1.95	-4.17%	7.18%
2.540	50.61	2.1	52.7	1.95	-3.97%	7.69%
2.550	50.56	2.11	52.7	1.95	-4.06%	8.21%

*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m ³)
Nov 6	2450 Body	22.0°C	23.1 °C	≥ 15 cm	101.1 kPa	35%	1000

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7.0 SAR MEASUREMENT SUMMARY

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	
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8.0 SAR SCALING FOR TUNE-UP TOLERANCE

SCALED SAR							
Test Config.	Freq. (MHz)	Test Ch.	Data Rate	Measured Conducted Power (dBm)	Maximum Rated Conducted Power (dBm)	Measured SAR Level 1g (W/kg)	Scaled SAR 1g (W/kg)
Body-worn	2437	6	1 Mbps	16.7	18.0	0.028	0.038

Notes:

1. The scaled SAR levels are below the FCC/IC SAR Limit of 1.6 W/kg.

9.0 SIMULTANEOUS TRANSMISSION ASSESSMENT

Simultaneous transmission assessment is in accordance with FCC KDB 447498 D01v05 Section 4.3.2 (reference [8]).

Simultaneous Transmission: 802.11b/g + Bluetooth
 Antenna-to-antenna distance: 88mm
 Bluetooth Rated Output Power: 0 dBm +/-0.5dB

Standalone SAR is not required for Bluetooth based on the SAR exclusion threshold from KDB 447498 Section 4.3.1 1)

$$(1.12\text{mW} / 5\text{mm}) * (\text{sqrt } 2.44\text{GHz}) \leq 3.0 \\ 0.35 \leq 3.0$$

Therefore the standalone SAR for Bluetooth must be estimated according to KDB 447498 section 4.3.2 2)

$$(1.12\text{mW} / 5\text{mm}) * (\text{sqrt } 2.44\text{GHz}) / 7.5 = 0.047 \text{ W/kg}$$

The sum of the measured 802.11b/g SAR and the estimated Bluetooth SAR is below the SAR limit of 1.6 W/kg.

$$0.038 \text{ W/kg} + 0.047 \text{ W/kg} = 0.085 \text{ W/kg}$$

Therefore simultaneous transmission SAR test exclusion applies.

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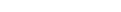
10.0 DETAILS OF SAR EVALUATION

1. The DUT was evaluated for body-worn SAR with the plastic belt-clip and belt-strap accessory attached to the DUT. The back side (belt-clip side) of the DUT was placed parallel and touching the outer surface of the planar phantom.
2. The headset-microphone audio accessory was connected to the DUT for the duration of the body-worn evaluation.
3. The DUT was placed into test mode using a terminal program on a PC with a serial cable connected to the DUT. Instructions for setting the WLAN channel and data rate were provided by the customer and used to set the device in the correct mode. The serial cable was removed from the DUT prior to SAR evaluations.
4. The DUT was tested with a modulated DSSS signal in 802.11b mode.

11.0 SAR EVALUATION PROCEDURES

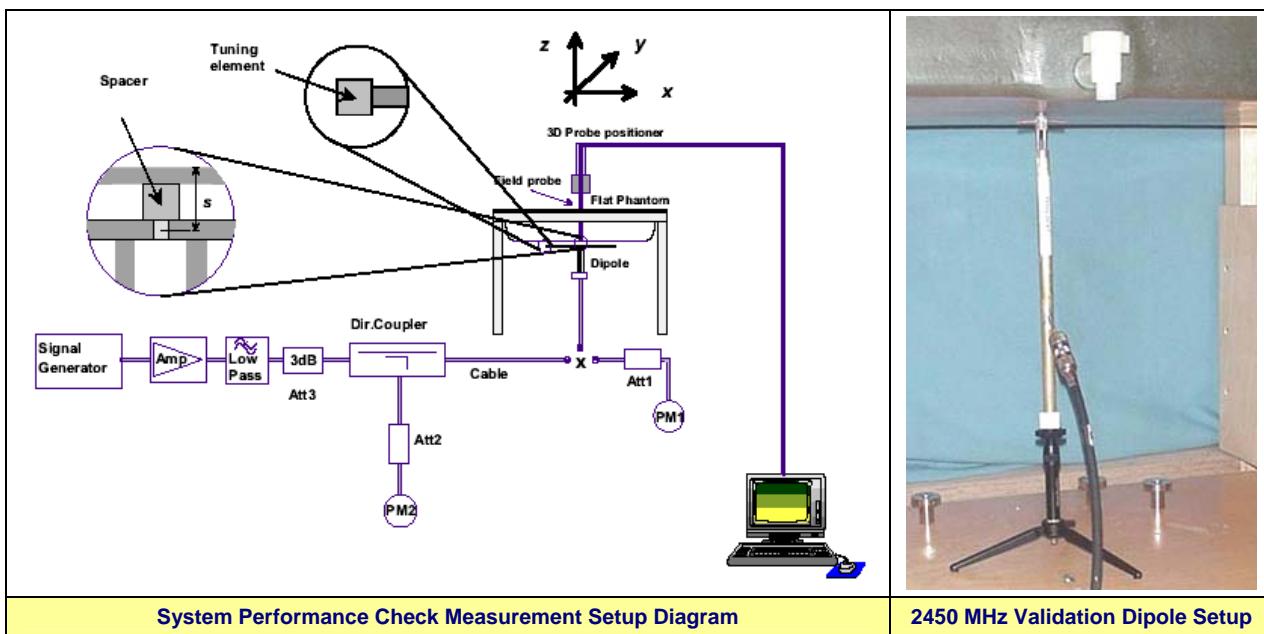
- (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.
 (ii) For body-worn and face-held devices a planar phantom 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 10mm x 10mm.
 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 1mm grid (42875 interpolated points).
- g. A zoom scan volume of 30 mm x 30 mm x 30 mm (5x5x7 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 (7x7x7 points) to ensure complete capture of the peak spatial-average SAR.

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12.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations, a system check was performed at the planar section of the SAM phantom with a 2450MHz SPEAG validation dipole (see Appendix B for system performance check test plot) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]) and IEC 62209-2:2010 (see reference [7]). 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 value (see Appendix E for system manufacturer's dipole calibration procedures).



Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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 Celltech <small>Testing and Engineering Services Lab</small>	<u>Date(s) of Evaluation</u> Nov. 05, 2012	<u>Test Report Serial No.</u> 103012MQO-T1204S	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 ILAC-MRA <small>ACCREDITED</small>
	<u>Test Report Issue Date</u> Nov. 07, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

13.0 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 [11]). The ingredient percentage may have been adjusted minimally in order to achieve the appropriate target dielectric parameters within the specified tolerance.

2450 MHz SIMULATED TISSUE MIXTURES	
INGREDIENT	2450 MHz Body
Water	69%
Glycol Monobutyl	31%

14.0 SAR 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 1 g of tissue)		1.6 W/kg	8.0 W/kg
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)		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.			

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	 Vocollect <small>Intelligence of Location</small>
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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Test Lab Certificate No. 2470.01

15.0 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>	
<u>Cell Controller</u>	
Processor	AMD Athlon XP 2400+
Clock Speed	2.0 GHz
Operating System	Windows XP Professional
<u>Data Converter</u>	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY4, V4.7 Build 80
	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

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A						
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT								
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16.0 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: 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%.



EX3DV4 E-Field Probe

17.0 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).



SAM Twin Phantom V4.0C

18.0 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 pairs of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. For evaluations of larger devices a Plexiglas platform is attached to the device holder.



Device Holder



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Test Lab Certificate No. 2470.01

19.0 TEST EQUIPMENT LIST

TEST EQUIPMENT	ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
DESCRIPTION				
Schmid & Partner DASY4 System	-	-	-	-
-DASY4 Measurement Server	00158	1078	CNR	CNR
-Robot	00046	599396-01	CNR	CNR
-DAE4	00019	353	19-Apr-12	Biennial
-EX3DV4 E-Field Probe	00213	3600	27-Apr-12	Annual
-D2450V2 Validation Dipole	00219	825	25-Apr-12	Triennial
-SAM Twin Phantom V4.0C	00154	1033	CNR	CNR
HP 85070C Dielectric Probe Kit	00033	None	CNR	CNR
Gigatronics 8652A Power Meter	00007	1835272	03-May-12	Biennial
Gigatronics 80701A Power Sensor	00014	1833542	03-May-12	Biennial
Gigatronics 80334A Power Sensor	-	1837001	03-May-12	Biennial
HP 8753ET Network Analyzer	00134	US39170292	26-Apr-12	Biennial
Rohde & Schwarz SMR20 Signal Generator	00006	100104	CNR	CNR
Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
CNR = Calibration Not Required				

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A						
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT								
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20.0 MEASUREMENT UNCERTAINTIES

Uncertainty Budget for Device Evaluation (IEC 62209-2:2010)									
Source of Uncertainty	IEC 62209-2 Section	Tolerance / Uncertainty ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Standard Uncertainty ±% (1g)	Standard Uncertainty ±% (10g)	V_i or V_{eff}
Measurement System									
Probe Calibration (450 MHz)	7.2.2.1	6.0	Normal	1	1	1	6.0	6.0	∞
Isotropy	7.2.2.2	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
Boundary Effect	7.2.2.6	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Linearity	7.2.2.3	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
Detection Limits	7.2.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Readout Electronics	7.2.2.7	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	7.2.2.8	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time	7.2.2.9	2.6	Rectangular	1.732050808	1	1	1.5	1.5	∞
RF Ambient Conditions	7.2.4.5	3	Rectangular	1.732050808	1	1	1.7	1.7	∞
Probe Positioner Mechanical Restrictions	7.2.3.1	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell	7.2.3.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Post-processing	7.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	7.2.3.4.3	2.9	Normal	1	1	1	2.9	2.9	12
Device Holder Uncertainty	7.2.3.4.2	3.6	Normal	1	1	1	3.6	3.6	8
Drift of Output Power (meas. SAR drift)	7.2.2.10	5	Rectangular	1.732050808	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	7.2.3.2	4	Rectangular	1.732050808	1	1	2.3	2.3	∞
SAR Correction Algorithm for deviations in permittivity and conductivity	7.2.4.3	1.9	Normal	1	1	0.81	1.9	1.54	∞
Liquid Conductivity (measured)	7.2.4.3	1.03	Normal	1	0.78	0.71	0.8	0.7	∞
Liquid Permittivity (measured)	7.2.4.3	3.23	Normal	1	0.23	0.26	0.7	0.8	∞
Liquid Permittivity - temp. uncertainty	7.2.4.4	1.23	Rectangular	1.732050808	0.78	0.71	0.6	0.5	∞
Liquid Conductivity - temp. uncertainty	7.2.4.4	0.93	Rectangular	1.732050808	0.23	0.26	0.1	0.1	∞
Combined Standard Uncertainty	7.3.1		RSS				10.02	9.95	
Expanded Uncertainty (95% Confidence Interval)	7.3.2		k=2				20.03	19.91	

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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21.0 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 Exposure Compliance of Radio Communication 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 62209-1:2005 - "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures."
- [7] International Standard IEC 62209-2 Edition 1.0 2010-03 - "Human exposure to radio frequency fields from hand-held & body-mounted wireless communication devices - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)".
- [8] Federal Communications Commission, Office of Engineering and Technology - "Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies", KDB 447498 D01 v05: October 2012.
- [9] Federal Communications Commission, Office of Engineering and Technology - "SAR Measurement Procedures for 802.11a/b/g Transmitters"; KDB 248227 D01 v01r02: May 2007.
- [10] 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.
- [11] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 17 Application Note, Body Tissue Recipe: Sept. 2005.
- [12] International Standard ISO/IEC 17025:2005 - "General requirements for the competence of testing and calibration laboratories".
- [13] Federal Communications Commission - "Measurements Required: RF Power Output"; Rule Part 47 CFR §2.1046.
- [14] Industry Canada - "General Requirements and Information for the Certification of Radiocommunication Equipment", Radio Standards Specification RSS-Gen Issue 2: June 2007.

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A		
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT				
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APPENDIX A - SAR MEASUREMENT PLOTS

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	 Vocollect A Division of L-3 Communications
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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Test Date: 11/05/2012

Body-worn - 802.11b - Ch. 6 - 2437 MHz - 1Mbps

DUT: Vocollect TAP700-01; Type: Waist-Worn Terminal; Serial: 202421002

Program Notes: Ambient Temp: 22C; Fluid Temp: 23.1C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Procedure Notes:

Communication System: WLAN

Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: M2450 Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.97$ mho/m; $\epsilon_r = 51$; $\rho = 1000$ kg/m³

- Probe: EX3DV4 - SN3600; ConvF(6.34, 6.34, 6.34); Calibrated: 27/04/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Belt Strap Side - 2437 - 802.11b/Area Scan (10x19x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.034 mW/g

Belt Strap Side - 2437 - 802.11b/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.65 V/m; Power Drift = 0.538 dB

Peak SAR (extrapolated) = 0.055 W/kg

SAR(1 g) = 0.028 mW/g; SAR(10 g) = 0.016 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.032 mW/g

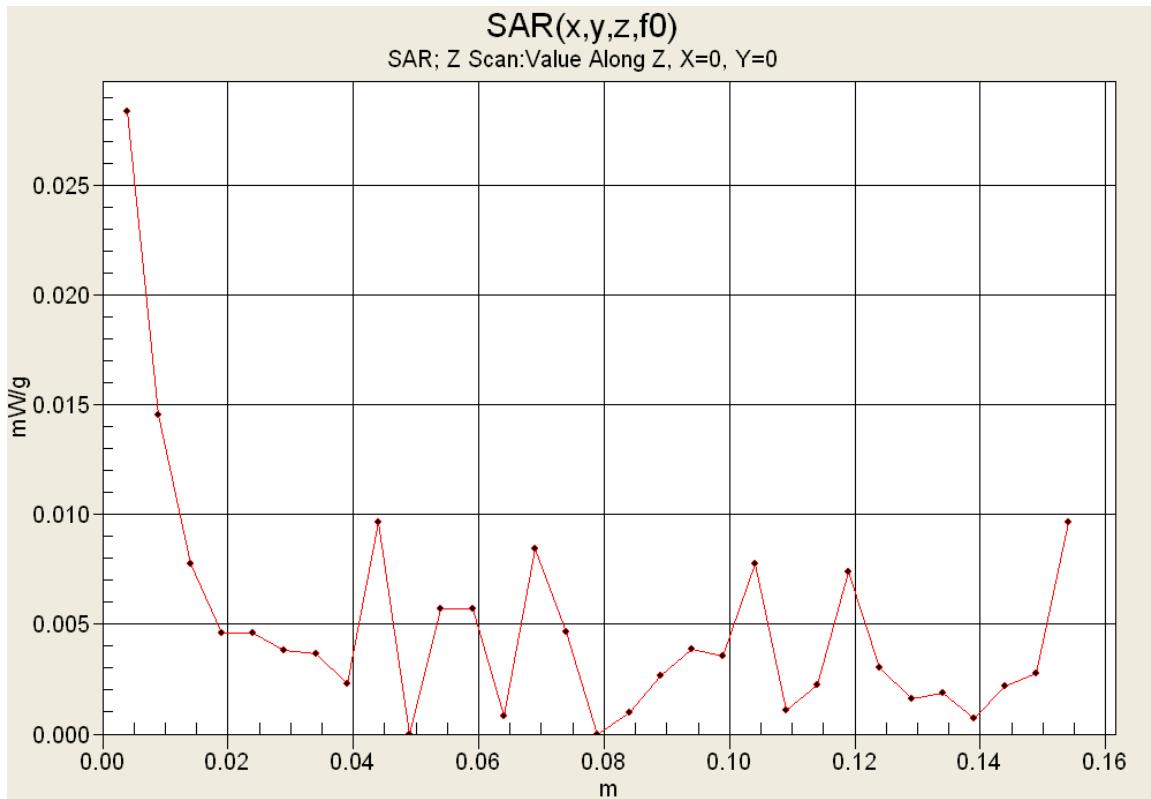


DUT orientation under planar phantom: Headset connector is left

Applicant:	Vocollect Inc.		FCC ID:	MQO	IC:	2570A	 Vocollect <small>Intelligence of Movement</small>
Model:	TAP700-01 Terminal		DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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Z-axis Scan



Applicant:	Vocollect Inc.		FCC ID:	MQO	IC:	2570A	 Vocollect	
Model:	TAP700-01 Terminal		DUT Type:	Body-worn Data Terminal with 802.11b/g & BT				
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APPENDIX B - SYSTEM PERFORMANCE CHECK PLOTS

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	 Vocollect A Division of Emerson
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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Test Date: 11/05/2012

System Performance Check - 2450 MHz Dipole - Body

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 825; Calibrated: 25/04/2012

Program Notes: Ambient Temp: 22C; Fluid Temp: 23.1C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Procedure Notes:

Communication System: CW

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: M2450 Medium parameters used: $f = 2450$ MHz; $\sigma = 1.97$ mho/m; $\epsilon_r = 51$; $\rho = 1000$ kg/m³

- Probe: EX3DV4 - SN3600; ConvF(6.34, 6.34, 6.34); Calibrated: 27/04/2012
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

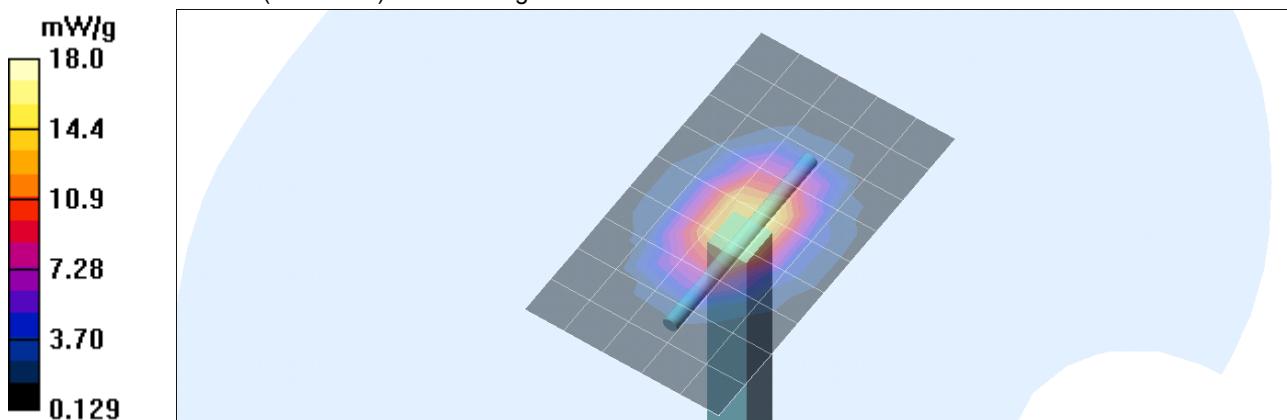
2450 MHz Dipole d=10mm P=250mW/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
 Maximum value of SAR (measured) = 15.1 mW/g

2450 MHz Dipole d=10mm P=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 95.3 V/m; Power Drift = 0.104 dB

Peak SAR (extrapolated) = 27.6 W/kg

SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.35 mW/g

Maximum value of SAR (measured) = 18.0 mW/g



Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A						
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT								
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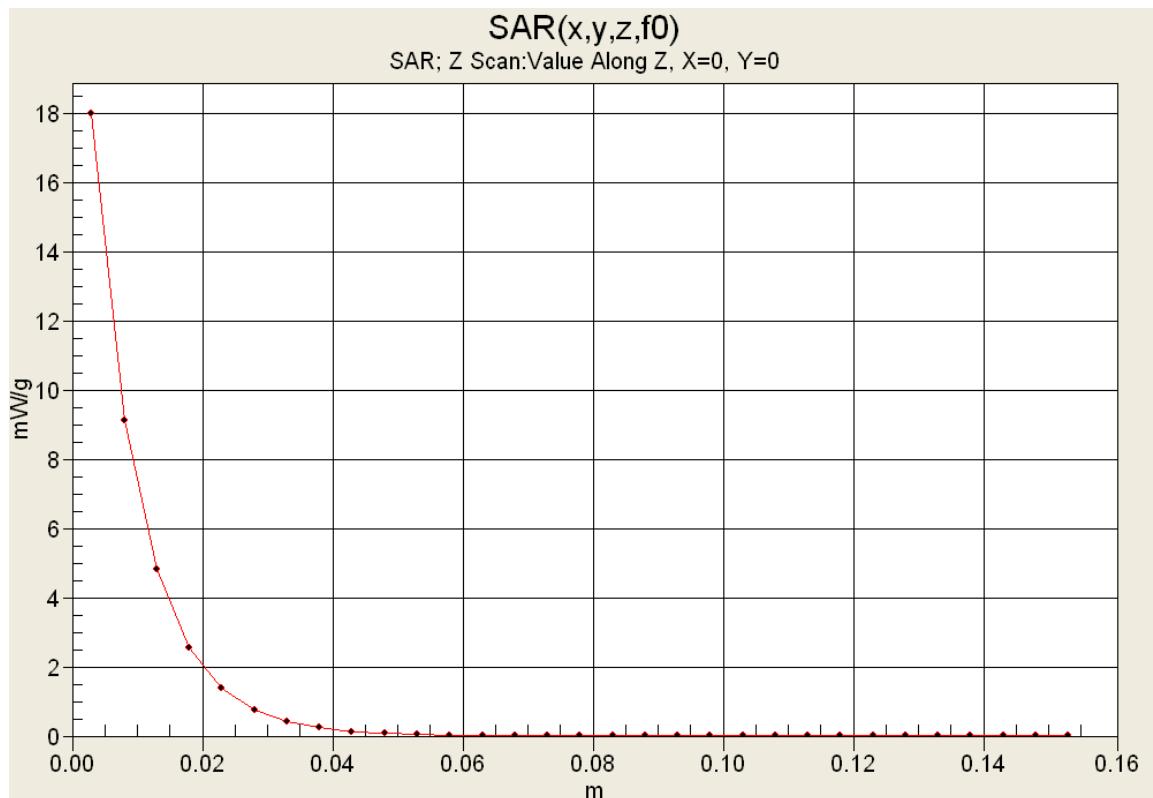
Description of Test(s)
Specific Absorption Rate

RF Exposure Category
Gen. Pop. / Uncontrolled



Test Lab Certificate No. 2470.01

Z-axis Scan



Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A						
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT								
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APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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	<u>Test Report Issue Date</u> Nov. 07, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

2450 MHz Body

Celltech Labs Inc.

Test Result for UIM Dielectric Parameter

05/Nov/2012

Freq Frequency(GHz)

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	51.29	1.84
2.3600	52.82	1.86	51.07	1.83
2.3700	52.81	1.87	51.10	1.86
2.3800	52.79	1.88	51.13	1.85
2.3900	52.78	1.89	51.12	1.88
2.4000	52.77	1.90	50.96	1.88
2.4100	52.75	1.91	50.99	1.91
2.4200	52.74	1.92	51.05	1.92
2.4300	52.73	1.93	50.92	1.96
2.4400	52.71	1.94	50.97	1.97
2.4500	52.70	1.95	50.96	1.97
2.4600	52.69	1.96	50.76	1.96
2.4700	52.67	1.98	50.81	2.00
2.4800	52.66	1.99	50.84	2.00
2.4900	52.65	2.01	50.64	2.02
2.5000	52.64	2.02	50.58	2.04
2.5100	52.62	2.04	50.73	2.03
2.5200	52.61	2.05	50.63	2.07
2.5300	52.60	2.06	50.50	2.09
2.5400	52.59	2.08	50.61	2.10
2.5500	52.57	2.09	50.56	2.11

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	 Vocollect <small>Intelligence of Movement</small>
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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 Celltech Testing and Engineering Services Lab	<u>Date(s) of Evaluation</u> Nov. 05, 2012	<u>Test Report Serial No.</u> 103012MQO-T1204S	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 ILAC-MRA ACCREDITED
	<u>Test Report Issue Date</u> Nov. 07, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	 Vocollect A Division of Emerson
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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Date(s) of Evaluation
Nov. 05, 2012

Test Report Serial No.
103012MQO-T1204S

Test Report Revision No.
Rev. 1.0 (1st Release)

Test Report Issue Date
Nov. 07, 2012

Description of Test(s)
Specific Absorption Rate

RF Exposure Category
Gen. Pop. / Uncontrolled



SAR TEST SETUP PHOTOGRAPHS



Body-worn Test setup - Belt-clip & Belt-strap Body-worn accessory with Headset-Microphone Audio Accessory

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A				
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT						
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Test Report Issue Date
Nov. 07, 2012

Description of Test(s)
Specific Absorption Rate

RF Exposure Category
Gen. Pop. / Uncontrolled



SAR TEST SETUP PHOTOGRAPHS



Body-worn Test setup close-up - Belt-clip & Belt-strap Body-worn accessory with Headset-Microphone Audio Accessory

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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DUT PHOTOGRAPHS



Button Side of DUT



Opposite Side of DUT



Battery Side of DUT (Front Side)



Belt-clip Side of DUT (Back Side)



Audio Connector end of DUT



Opposite end of DUT

Applicant:	Vocollect Inc.		FCC ID:	MQO	IC:	2570A		
Model:	TAP700-01 Terminal		DUT Type:	Body-worn Data Terminal with 802.11b/g & BT				
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Date(s) of Evaluation
Nov. 05, 2012

Test Report Serial No.
103012MQO-T1204S

Test Report Revision No.
Rev. 1.0 (1st Release)

Test Report Issue Date
Nov. 07, 2012

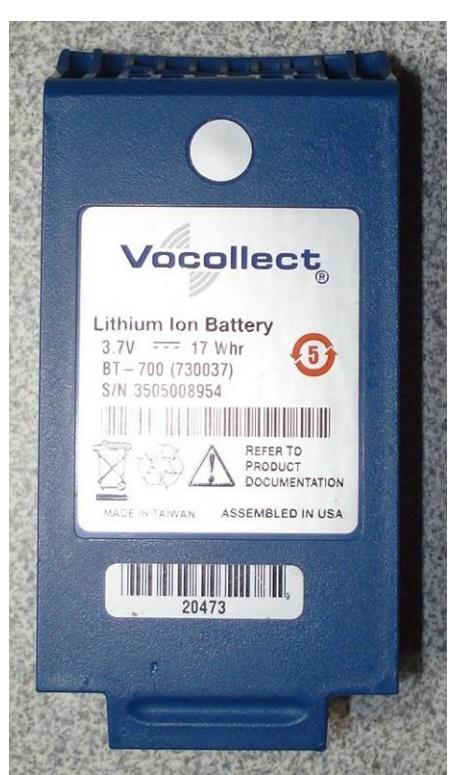
Description of Test(s)
Specific Absorption Rate

RF Exposure Category
Gen. Pop. / Uncontrolled



Test Lab Certificate No. 2470.01

DUT PHOTOGRAPHS

		
DUT with Battery Removed	Top Side of Battery	Bottom Side of Battery
		
Connection End of Battery		Opposite End of Battery

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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Date(s) of Evaluation
Nov. 05, 2012

Test Report Serial No.
103012MQO-T1204S

Test Report Revision No.
Rev. 1.0 (1st Release)

Test Report Issue Date
Nov. 07, 2012

Description of Test(s)
Specific Absorption Rate

RF Exposure Category
Gen. Pop. / Uncontrolled



Test Lab Certificate No. 2470.01

DUT PHOTOGRAPHS



Belt-clip and Belt-strap



Front of Belt-clip



Back of Belt-clip

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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Date(s) of Evaluation
Nov. 05, 2012

Test Report Serial No.
103012MQO-T1204S

Test Report Revision No.
Rev. 1.0 (1st Release)

Test Report Issue Date
Nov. 07, 2012

Description of Test(s)
Specific Absorption Rate

RF Exposure Category
Gen. Pop. / Uncontrolled



Test Lab Certificate No. 2470.01

DUT PHOTOGRAPHS



Headset Audio Accessory



DUT with Headset and Belt-clip/Belt strap accessories

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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 Celltech Testing and Engineering Services Lab	<u>Date(s) of Evaluation</u> Nov. 05, 2012	<u>Test Report Serial No.</u> 103012MQO-T1204S	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 ILAC-MRA ACCREDITED
	<u>Test Report Issue Date</u> Nov. 07, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

APPENDIX E - DIPOLE CALIBRATION

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	 Vocollect A Division of Emerson
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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Accreditation No.: **SCS 108**

Client **Celltech**

Certificate No: **D2450V2-825_Apr12**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 825**

Calibration procedure(s) **QA CAL-05.v8**
 Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **April 25, 2012**

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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

Calibrated by: **Jeton Kastrati** **Laboratory Technician**

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

Issued: April 25, 2012

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Accreditation No.: SCS 108

Glossary:

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

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
- 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:

- 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 TSL:* 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 TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 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 ± 0.2) °C	39.6 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.7 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	50.8 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.90 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	23.6 mW / g ± 16.5 % (k=2)

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	52.4 ± 6 %	1.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	50.4 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.91 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	23.5 mW / g ± 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$53.0 \Omega + 5.5 j\Omega$
Return Loss	- 24.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$50.4 \Omega + 6.1 j\Omega$
Return Loss	- 24.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.159 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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: 25.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.81$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

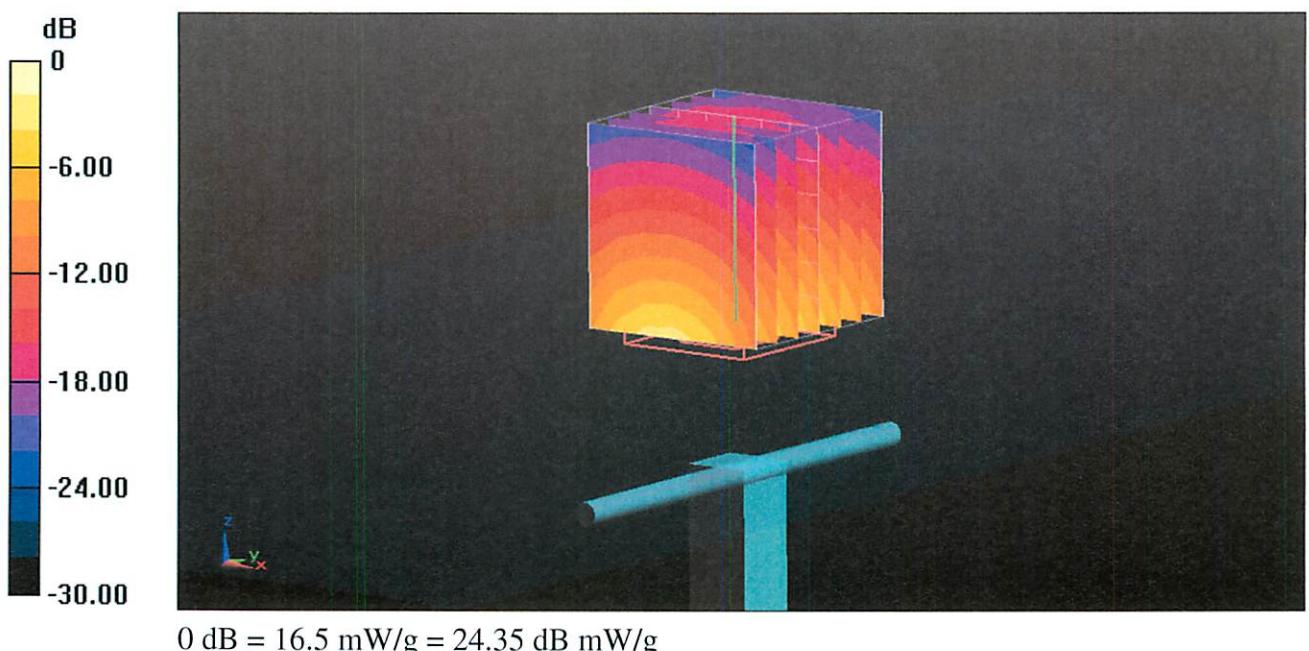
Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 99.271 V/m; Power Drift = 0.05 dB

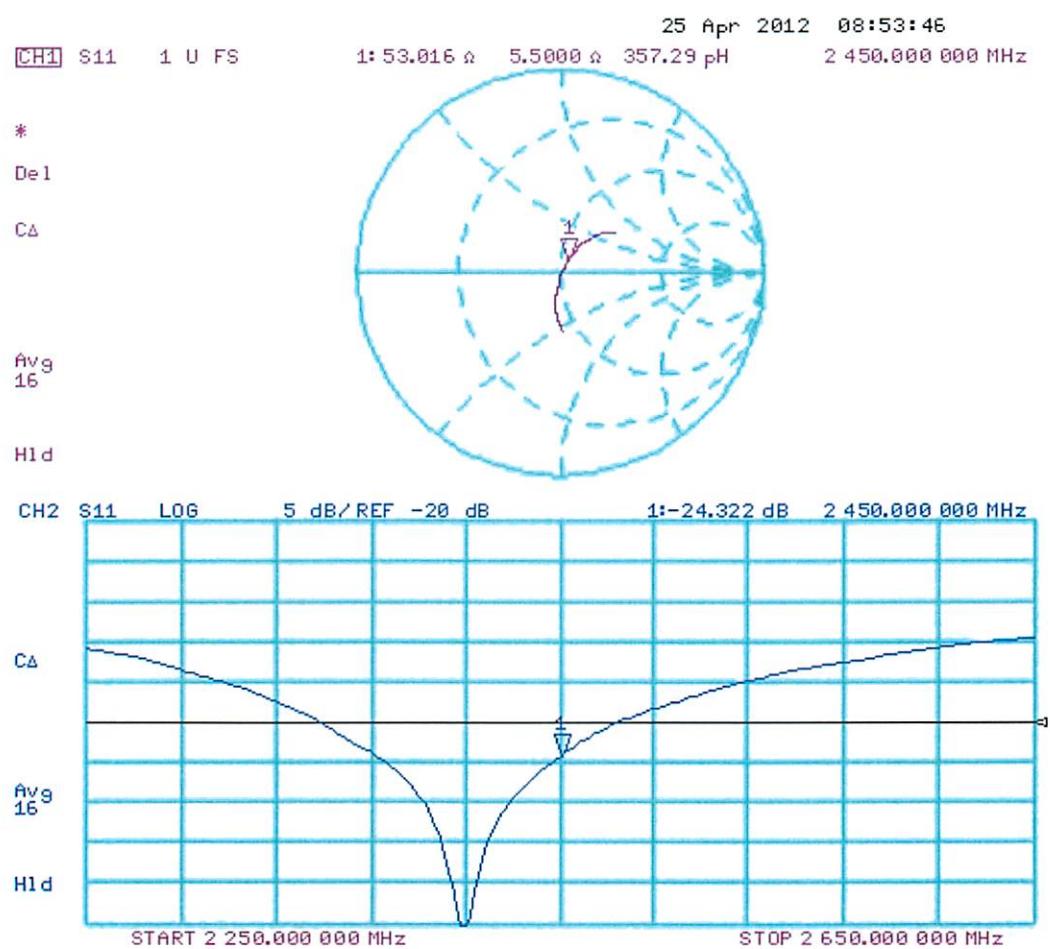
Peak SAR (extrapolated) = 26.216 mW/g

SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.9 mW/g

Maximum value of SAR (measured) = 16.5 mW/g



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 25.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.98$ mho/m; $\epsilon_r = 52.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

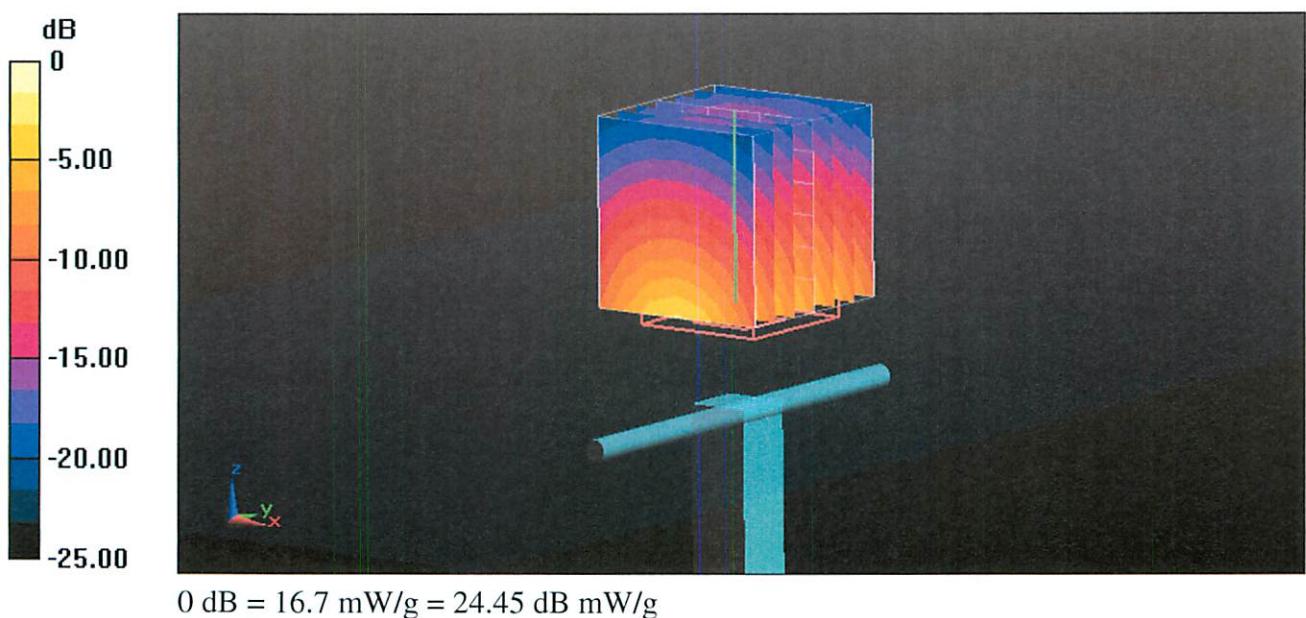
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.157 V/m; Power Drift = -0.00 dB

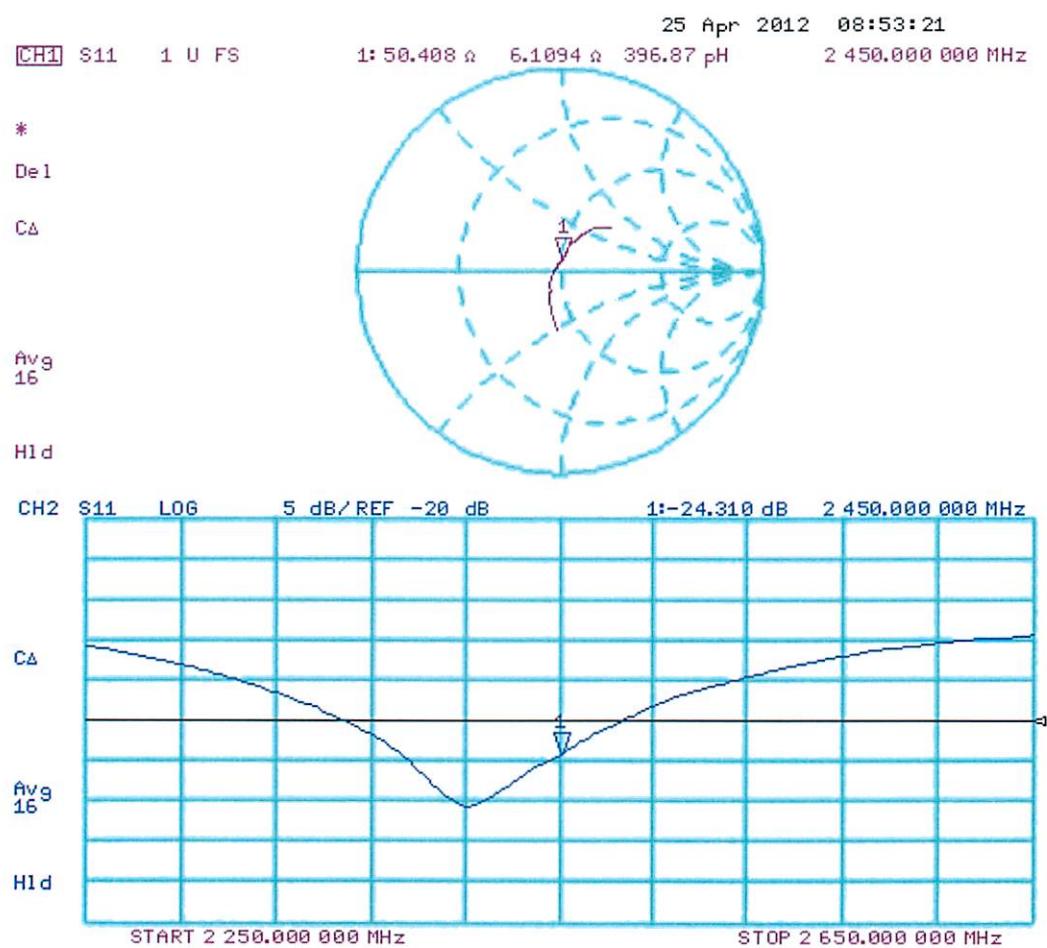
Peak SAR (extrapolated) = 25.807 mW/g

SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.91 mW/g

Maximum value of SAR (measured) = 16.7 mW/g



Impedance Measurement Plot for Body TSL



 Celltech Testing and Engineering Services Lab	<u>Date(s) of Evaluation</u> Nov. 05, 2012	<u>Test Report Serial No.</u> 103012MQO-T1204S	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 ILAC-MRA ACCREDITED
	<u>Test Report Issue Date</u> Nov. 07, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX F - PROBE CALIBRATION

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



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

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Accreditation No.: SCS 108

Client Celltech

Certificate No: EX3-3600_Apr12

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3600

Calibration procedure(s) QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: April 27, 2012

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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	10-Jan-12 (No. DAE4-660_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

Calibrated by:	Name	Function	Signature
	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 28, 2012

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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., $\theta = 0$ 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:

- $NORMx,y,z$: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). $NORMx,y,z$ are only intermediate values, i.e., the uncertainties of $NORMx,y,z$ does not affect the E²-field uncertainty inside TSL (see below ConvF).
- $NORM(f)x,y,z = NORMx,y,z * frequency_response$ (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.
- PAR : PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- $Ax,y,z; Bx,y,z; Cx,y,z; VRx,y,z$: 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 $NORMx,y,z * ConvF$ 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
Calibrated: April 27, 2012

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - 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	0.50	0.52	0.38	$\pm 10.1 \%$
DCP (mV) ^B	100.3	99.1	99.9	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
0	CW	0.00	X	0.00	0.00	1.00	111.1	$\pm 2.5 \%$
			Y	0.00	0.00	1.00	118.1	
			Z	0.00	0.00	1.00	123.5	

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 E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3600

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
1810	40.0	1.40	7.12	7.12	7.12	0.14	1.52	± 12.0 %
1950	40.0	1.40	6.83	6.83	6.83	0.13	1.69	± 12.0 %
2450	39.2	1.80	6.35	6.35	6.35	0.24	1.29	± 12.0 %

^c Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^f At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3600

Calibration Parameter Determined in Body Tissue Simulating Media

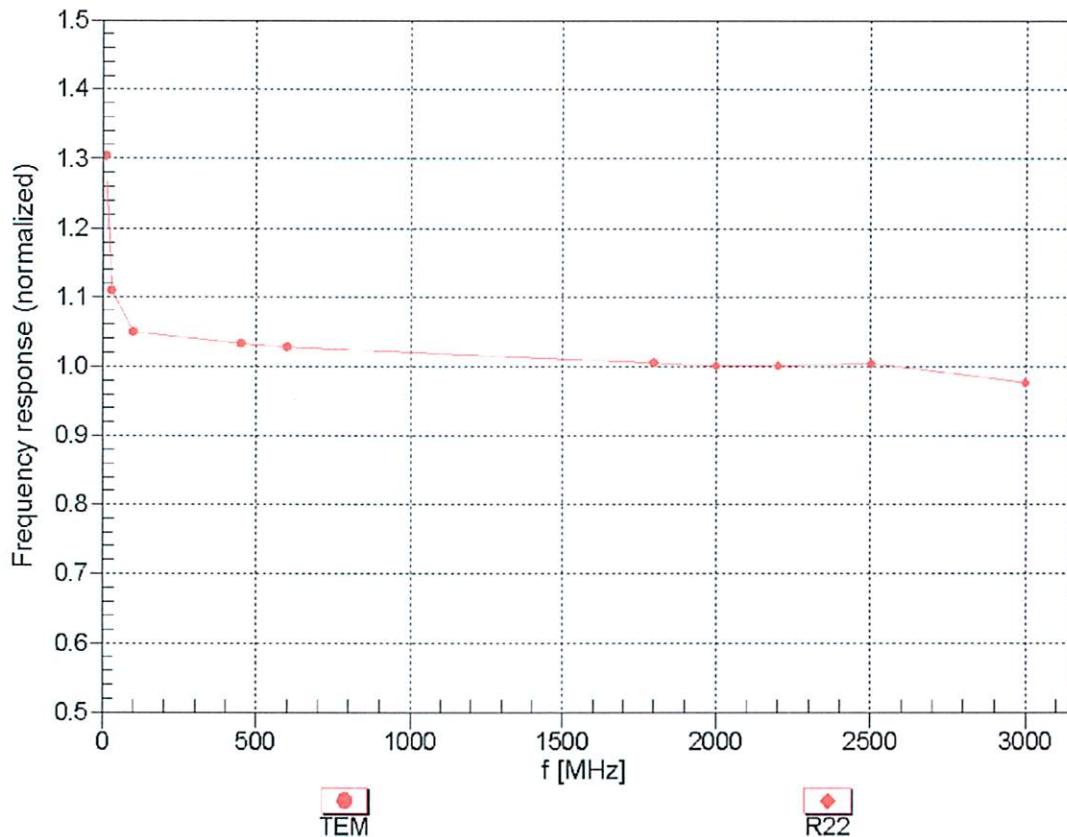
f (MHz) ^c	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
1810	53.3	1.52	6.80	6.80	6.80	0.11	3.00	± 12.0 %
1950	53.3	1.52	6.72	6.72	6.72	0.16	1.10	± 12.0 %
2450	52.7	1.95	6.34	6.34	6.34	0.79	0.50	± 12.0 %
5200	49.0	5.30	3.78	3.78	3.78	0.55	1.90	± 13.1 %
5500	48.6	5.65	3.29	3.29	3.29	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.39	3.39	3.39	0.60	1.90	± 13.1 %

^c Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^f At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

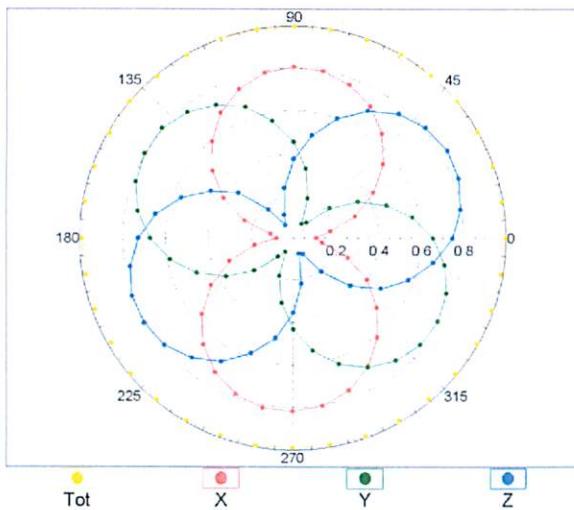
(TEM-Cell:ifi110 EXX, Waveguide: R22)



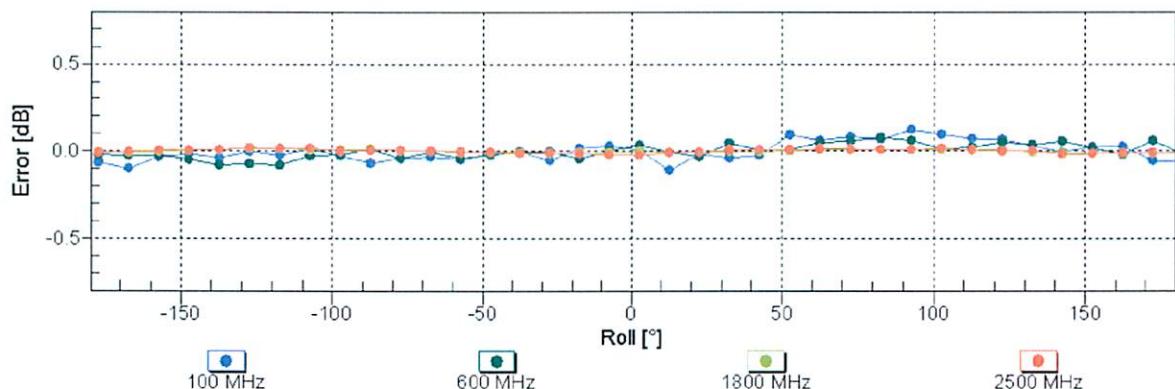
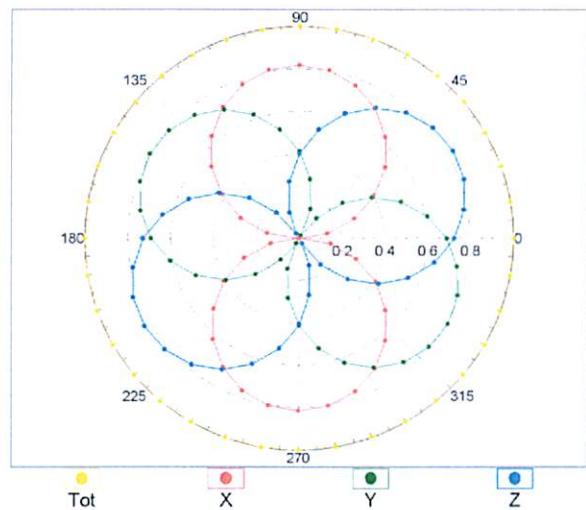
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz, TEM

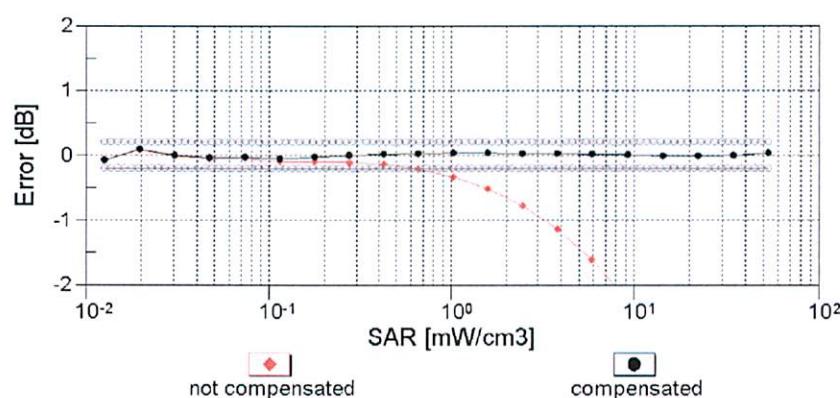
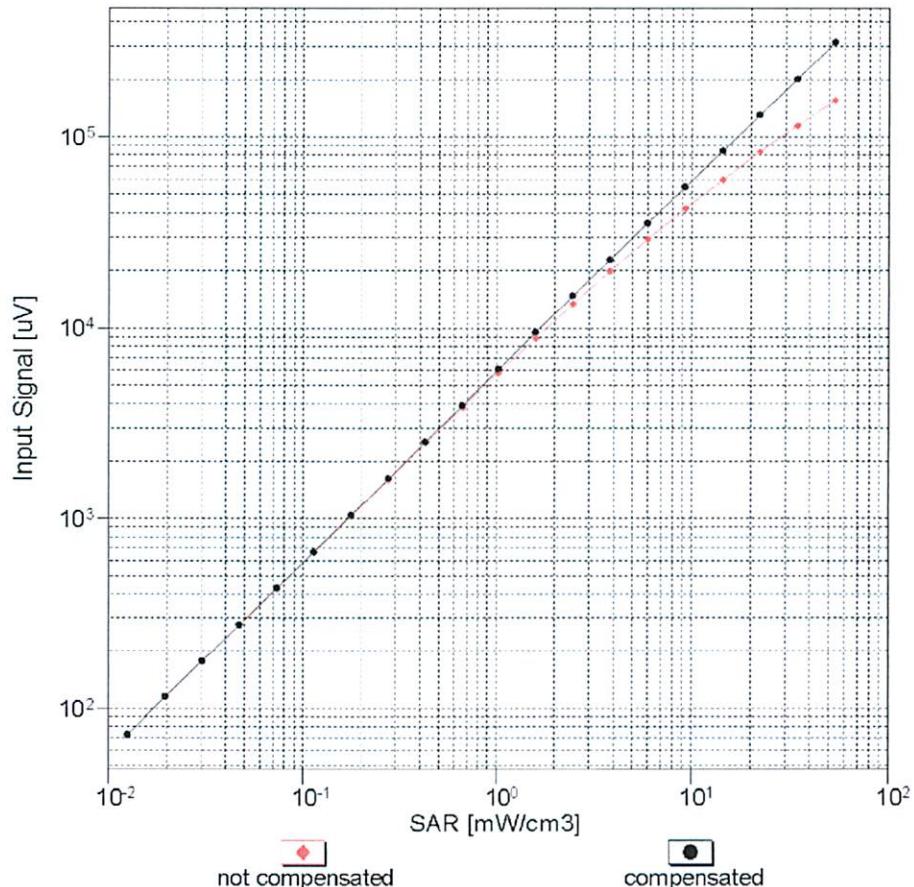


f=1800 MHz, R22



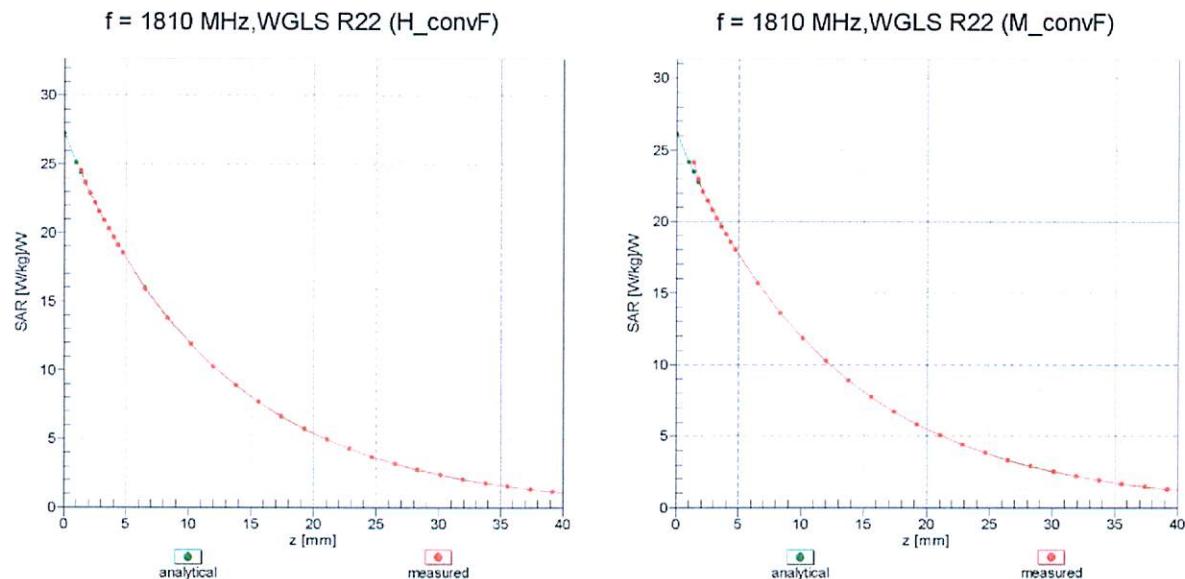
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f = 900 \text{ MHz}$)



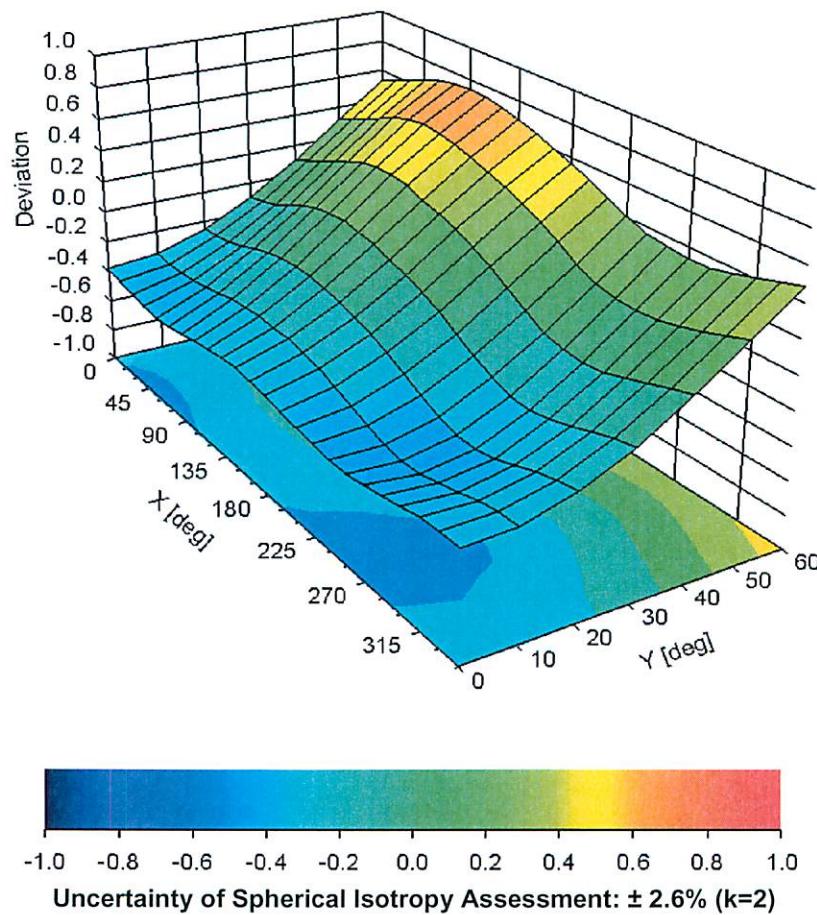
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: EX3DV4 - SN:3600

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	32.6
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 Testing and Engineering Services Lab	<u>Date(s) of Evaluation</u> Nov. 05, 2012	<u>Test Report Serial No.</u> 103012MQO-T1204S	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 ILAC-MRA ACCREDITED
	<u>Test Report Issue Date</u> Nov. 07, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX G - SAM PHANTOM CERTIFICATE OF CONFORMITY

Applicant:	Vocollect Inc.	FCC ID:	MQO	IC:	2570A	 Vocollect A Division of Emerson
Model:	TAP700-01 Terminal	DUT Type:	Body-worn Data Terminal with 802.11b/g & BT			
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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


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