



SAR Evaluation Report

IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC OET BULLETIN 65 SUPPLEMENT C

FOR

HANDHELD SCANNER

MODEL: FALCON 4410 & 4420

FCC ID: O9NRSW802BT

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Prepared for

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Revision History

Rev.	Issued date	Revisions	Revised By
--	February 5, 2007	Initial issue	HS

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)**DATES OF TEST:** February 1 and 2, 2007

APPLICANT:	PSC Scanning Inc
ADDRESS:	959 Terry Street Eugene, Oregon 97402 USA
FCC ID:	O9NRSW802BT
MODEL:	Falcon 4410 & 4420 Note: Falcon 4410 does not include a handle while Falcon 4420 does.
DEVICE CATEGORY:	Portable Device
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure

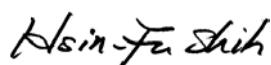
Handheld Scanner Falcon 4420 is used for SAR measurements which includes a WLAN module FCC ID: NKRDRCB and Bluetooth module FCC ID: QOQWT12.

Test Sample is a:	Production unit		
Modulation type:	Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11g Frequency Hopping Spread Spectrum (FHSS) for Bluetooth module		
Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]	Collocation SAR Values [1g_mW/g]
FCC 15.247	2412 - 2462	0.033	0.030

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in FCC OET 65 Supplement C (Edition 01-01).

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

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1 EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Handheld Scanner Falcon 4420 is used for SAR measurements which includes a WLAN module FCC ID: NKRDRCB and Bluetooth module FCC ID: QOQWT12.	
Normal operation:	Worn on body
Accessory:	Holster 1, P/N 4-3660 Holster 2, P/N: 4-4135
Earphone/Headset Jack:	N/A
Power supply:	3.7V, 2000mAh Li-Ion

2 FACILITIES AND ACCREDITATION

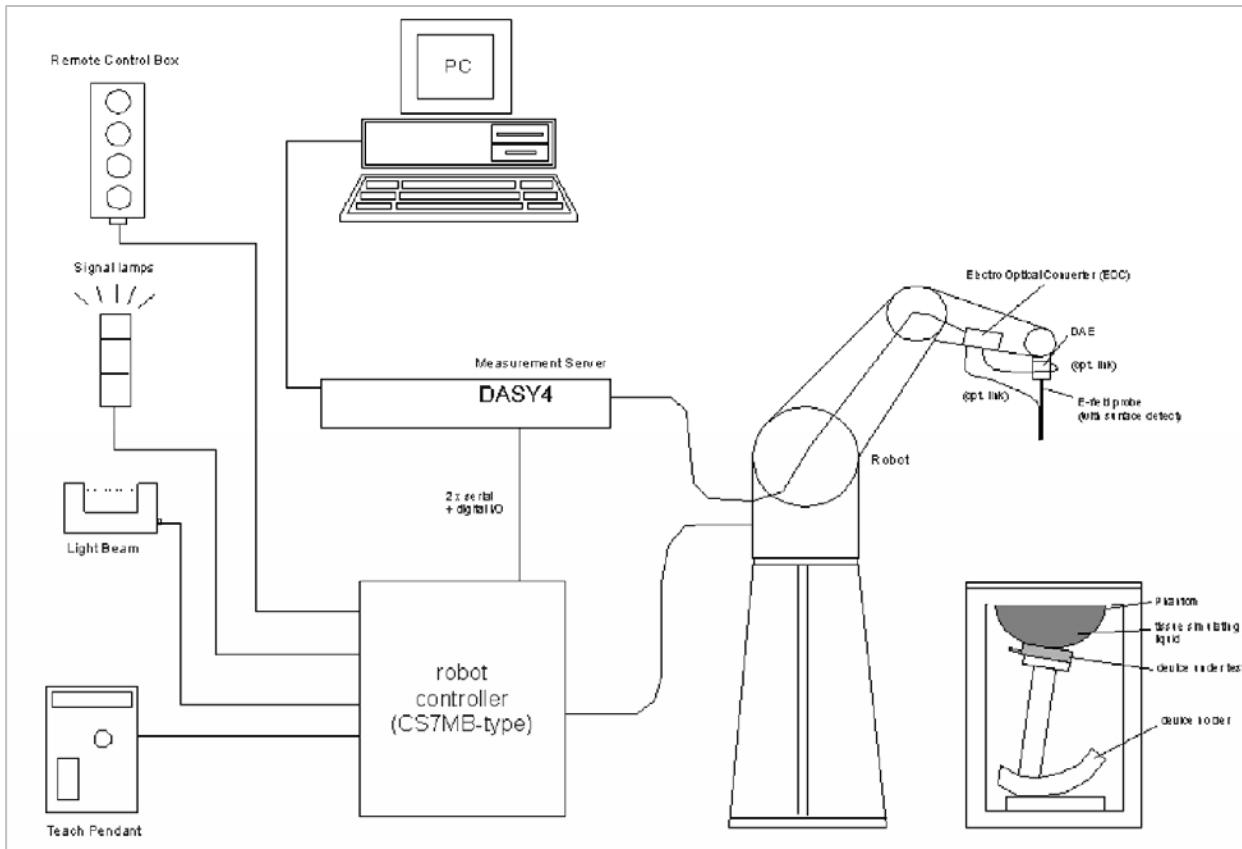
The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, CA 94538 USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

3 SYSTEM DESCRIPTION



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

3.1 COMPOSITION OF INGREDIENTS FOR TISSUE SIMULATING LIQUIDS

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16 MΩ+ resistivity

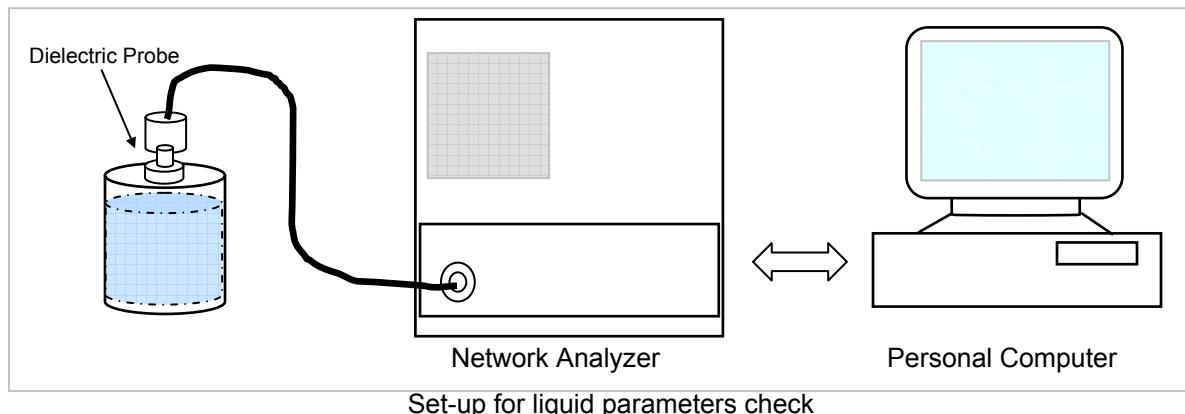
HEC: Hydroxyethyl Cellulose

DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

4 SIMULATING LIQUID PARAMETERS CHECK

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values. The relative permittivity and conductivity of the tissue material should be within $\pm 5\%$ of the values given in the table below.



Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 150 – 3000 MHz and 5800 MHz)

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE Standard 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Standard 1528.

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(ϵ_r = relative permittivity, σ = conductivity and $\rho = 1000 \text{ kg/m}^3$)

4.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 22°C; Relative humidity = 40% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	e'	e" (σ):				
2450	21	15	e' 52.2277	Relative Permittivity (ϵ_r): 52.2277	52.2277	52.7	-0.90	± 5
			e" 14.7192	Conductivity (σ): 2.00618	2.00618	1.95	2.88	± 5

Liquid Check

Ambient temperature: 22.0 deg. C; Liquid temperature: 21.0 deg C

February 01, 2007 11:21 AM

Frequency	e'	e"
2400000000.	52.4135	14.5045
2405000000.	52.3951	14.5340
2410000000.	52.3813	14.5427
2415000000.	52.3639	14.5902
2420000000.	52.3479	14.5906
2425000000.	52.3324	14.6058
2430000000.	52.3139	14.6364
2435000000.	52.2929	14.6588
2440000000.	52.2906	14.6805
2445000000.	52.2632	14.7002
2450000000.	52.2277	14.7192
2455000000.	52.2039	14.7499
2460000000.	52.1988	14.7682
2465000000.	52.1894	14.7769
2470000000.	52.1484	14.7963
2475000000.	52.1272	14.8130
2480000000.	52.1113	14.8423
2485000000.	52.1031	14.8655
2490000000.	52.0760	14.8944
2495000000.	52.0689	14.9089
2500000000.	52.0436	14.9474

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 e'' = 2 \pi f \epsilon_0 e''$$

where $f = \text{target } f * 10^6$

$$\epsilon_0 = 8.854 * 10^{-12}$$

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 22°C; Relative humidity = 30%

Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	e'	Relative Permittivity (ϵ_r):				
2450	21	15	e'	53.2479	53.2479	52.7	1.04	± 5
			e''	14.7799	Conductivity (σ):	2.01445	1.95	3.31

Liquid Check

Ambient temperature: 22.0 deg. C; Liquid temperature: 21.0 deg C

February 02, 2007 09:16 AM

Frequency	e'	e''
2400000000.	53.4319	14.5765
2405000000.	53.3977	14.6051
2410000000.	53.4022	14.6421
2415000000.	53.3721	14.6582
2420000000.	53.3678	14.6757
2425000000.	53.3316	14.6924
2430000000.	53.3187	14.7177
2435000000.	53.3147	14.7433
2440000000.	53.3062	14.7475
2445000000.	53.2815	14.7539
2450000000.	53.2479	14.7799
2455000000.	53.2331	14.7931
2460000000.	53.2283	14.8167
2465000000.	53.1918	14.8042
2470000000.	53.1612	14.8077
2475000000.	53.1402	14.8299
2480000000.	53.1209	14.8501
2485000000.	53.1023	14.8735
2490000000.	53.0905	14.8958
2495000000.	53.0904	14.9263
2500000000.	53.0800	14.9432

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 e'' = 2 \pi f \epsilon_0 e''$$

where $f = \text{target } f * 10^6$

$$\epsilon_0 = 8.854 * 10^{-12}$$

5 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of $\pm 10\%$.

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3-SN: 3531 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 5 x 5 x 7 fine cube was chosen for cube integration($dx=dy=7.5\text{mm}$; $dz=5\text{mm}$).
For 5 GHz band - Special 8x8x8 fine cube was chosen for cube integration($dx=dy=4.3\text{mm}$; $dz=3\text{mm}$)
- Distance between probe sensors and phantom surface was set to 4 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.0mm
- The dipole input power (forward power) was $250\text{ mW}\pm 3\%$.
- The results are normalized to 1 W input power.

Reference SAR Values for body-tissue

In the table below, the numerical reference SAR values of a SPEAG validation dipoles placed below the flat phantom filled with body-tissue simulating liquid are given. The reference SAR values were calculated using the finite-difference time-domain method and the geometry parameters.

Dipole Type	Distance (mm)	Frequency (MHz)	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D450V2	15	450	5.01	3.36	7.22
D835V2	15	835	9.71	6.38	14.1
D900V2	15	900	11.1	7.17	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1800V2	10	1800	38.5	20.3	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	40.9	21.2	71.5
D2450V2	10	2450	51.2	23.7	97.6

Note: All SAR values normalized to 1 W forward power.

5.1 SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D2450V2 SN: 706

Date: February 1, 2007

Room Ambient Temperature = 22°C; Relative humidity = 40% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	1g	12.60	50.4	51.2	-1.56	± 10
2450	21	15	1g	12.60	50.4	51.2	-1.56	± 10
			10g	5.78	23.12	23.7	-2.45	± 10

Date: February 2, 2007

Room Ambient Temperature = 22°C; Relative humidity = 30% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	1g	12.90	51.6	51.2	0.78	± 10
2450	21	15	1g	12.90	51.6	51.2	0.78	± 10
			10g	5.85	23.4	23.7	-1.27	± 10

6 SAR MEASURMENT PROCEDURE

A summary of the procedure follows:

- a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the EUT. The SAR at this point is measured at the start of the test, and then again at the end of the test.
- b) The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 4 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 15 mm x 15 mm. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

For 5 GHz band - The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 2.0 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 10 mm x 10 mm. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

- c) Around this point, a volume of X=Y= 30 and Z=21 mm is assessed by measuring 5 x 5 x 7 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

For 5 GHz band - Around this point, a volume of X=Y=24 and Z=20 mm is assessed by measuring 7 x 7 x 9 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

- (i) The data at the surface are extrapolated, since the centre of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.
- (ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the "Not a knot"- condition (in x, y and z-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.
- (iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.
- (iv) The SAR value at the same location as in Step (a) is again measured to evaluate the actual power drift.

6.1 DASY4 SAR MEASURMENT PROCEDURE

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 1.2 mm for an EX3DV3 probe type).

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures 5 x 5 x 7 points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

For 5 GHz band – Same as above except the Zoom Scan measures 7 x 7 x 9 points.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation, the extrapolated distance should not be larger than the step size in Z-direction.

7 PROCEDURE USED TO ESTABLISH TEST SIGNAL

The following procedures had been used to prepare the EUT for the SAR test.

The client provided a special driver and program, sdcfcc, which enables a user to control the frequency and output power of the module.

The cable assembly insertion loss of 20.33dB (including 19.83 dB attenuator and 0.5dB connectors and cable) was entered as an offset in the power meter to allow for direct reading of power.

b mode

Channel	Frequency (MHz)	Peak Power (dBm)
Low	2412	18.3
Middle	2437	18.0
High	2462	18.1

g mode

Channel	Frequency (MHz)	Peak Power (dBm)
Low	2412	19.3
Middle	2437	19.0
High	2462	19.1

8 SAR MEASURMENT RESULTS

8.1 ANTENNA 1

8.1.1 HOLSTER 1 – WORN ON RIGHT SIDE



802.11b (1Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.033	0.000	0.033
11	2462			
6 ⁴⁾	2462	0.029	-0.172	0.030

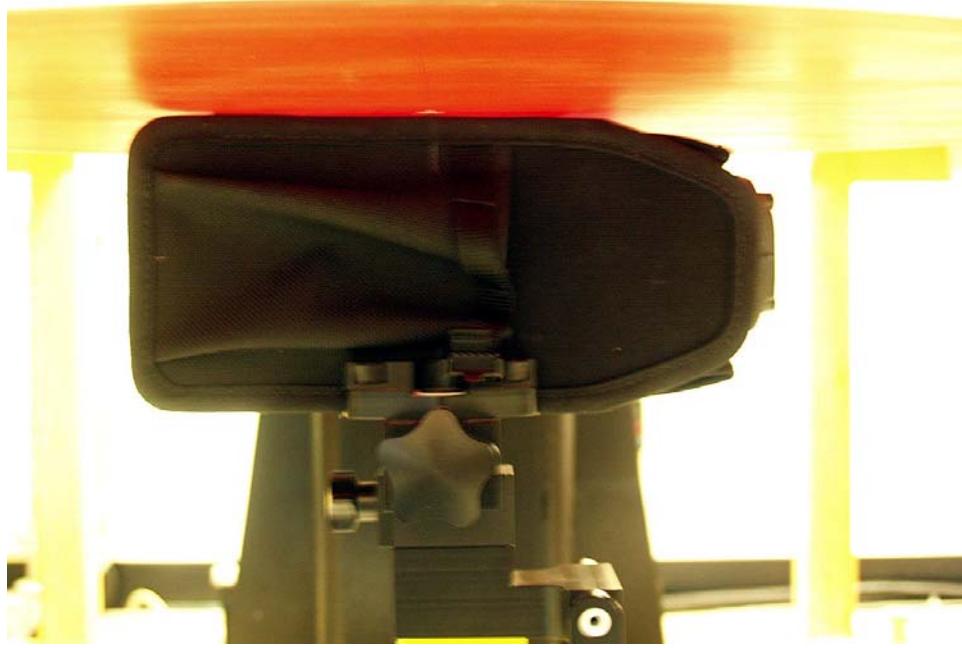
802.11g (6 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437			
11	2462	0.015	-0.159	0.015

Notes:

- 1) The exact method of extrapolation is Measured SAR x $10^{(-\text{drift}/10)}$. The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
- 2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
- 3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
- 4) Collocation with Bluetooth module.

8.1.2 HOLSTER 1 – WORN ON LEFT SIDE

**802.11b (1Mbps)**

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.005	-0.136	0.005
11	2462			

802.11g (6 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.005	0.000	0.005
11	2462			

Notes:

- 1) The exact method of extrapolation is Measured SAR $\times 10^{(-\text{drift}/10)}$. The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
- 2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
- 3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.3 HOLSTER 2 – WORN ON RIGHT SIDE

**802.11b (1Mbps)**

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437			
11	2462	0.026	0.000	0.026

802.11g (6 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437			
11	2462	0.017	0.000	0.017

Notes:

- 1) The exact method of extrapolation is Measured SAR $\times 10^{(-\text{drift}/10)}$. The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
- 2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
- 3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.4 HOLSTER 2 – WORN ON LEFT SIDE

This position is skipped since SAR Values are too low for this position.

		
<p>Notes:</p> <ul style="list-style-type: none">1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.		

8.2 ANTENNA 2

8.2.1 HOLSTER 1 – WORN ON RIGHT SIDE



802.11b (1Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.012	-0.186	0.013
11	2462			

802.11g (6 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.014	-0.109	0.014
11	2462			

Notes:

- 1) The exact method of extrapolation is Measured SAR $\times 10^{(-\text{drift}/10)}$. The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
- 2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
- 3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.2 HOLSTER 1 – WORN ON LEFT SIDE

**802.11b (1Mbps)**

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.019	-0.113	0.019
11	2462			

802.11g (6 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.004	0.000	0.004
11	2462			

Notes:

- 1) The exact method of extrapolation is Measured SAR $\times 10^{(-\text{drift}/10)}$. The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
- 2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
- 3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.3 HOLSTER 2 – WORN ON RIGHT SIDE

**802.11b (1Mbps)**

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.015	0.000	0.015
11	2462			

802.11g (6 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.017	0.000	0.017
11	2462			

Notes:

- 1) The exact method of extrapolation is Measured SAR $\times 10^{(-\text{drift}/10)}$. The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
- 2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
- 3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.4 HOLSTER 2 – WORN ON LEFT SIDE

**802.11b (1Mbps)**

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.025	-0.135	0.025
11	2462			

802.11g (6 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1	2412			
6	2437	0.011	-0.116	0.011
11	2462			

Notes:

- 1) The exact method of extrapolation is Measured SAR $\times 10^{(-\text{drift}/10)}$. The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
- 2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
- 3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

9 MEASURMENT UNCERTAINTY

9.1 MEASURMENT UNCERTAINTY FOR 300 MHz – 3000 MHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	1.59	R	1.732	1	1	0.92	0.92
RF Ambient Conditions - Reflections	0.00	R	1.732	1	1	0.00	0.00
Probe Positioner Mechanical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.44	10.49
Expanded Uncertainty (95% Confidence Interval)	K=2					22.87	20.98

Notes for table

1. Tol. - tolerance in influence quality
2. N - Nominal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is the sensitivity coefficient

10 EQUIPMENT LIST AND CALIBRATION

Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date		
				MM	DD	Year
Robot - Six Axes	Stäubli	RX90BL	N/A			N/A
Robot Remote Control	Stäubli	CS7MB	3403-91535			N/A
DASY4 Measurement Server	SPEAG	SEUMS001BA	1041			N/A
Probe Alignment Unit	SPEAG	LB (V2)	261			N/A
SAM Phantom (SAM1)	SPEAG	TP-1185	QD000P40CA			N/A
SAM Phantom (SAM2)	SPEAG	TP-1015	N/A			N/A
Electronic Probe kit	HP	85070C	N/A			N/A
S-Parameter Network Analyzer	Agilent	8753ES-6	US39173569	2	9	2007
E-Field Probe	SPEAG	EX3DV4	3552	5	30	2007
Data Acquisition Electronics	SPEAG	DAE3 V1	427	11	16	2007
System Validation Dipole	SPEAG	D2450V2	706	4	27	2008
Power Meter	Agilent	E4416A	GB41291160	12	2	2007
Amplifier	Mini-Circuits	ZHL-42W	D072701-5			N/A
Radio Communication Tester	R & S	CMU 200	838114/032	3	21	2007
Simulating Liquid	CCS	H450	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M2450	N/A	Within 24 hrs of first test		

11 PHOTOS

Handheld Scanner
Falcon 4420



Handheld Scanner
Falcon 4420



Falcon 4410



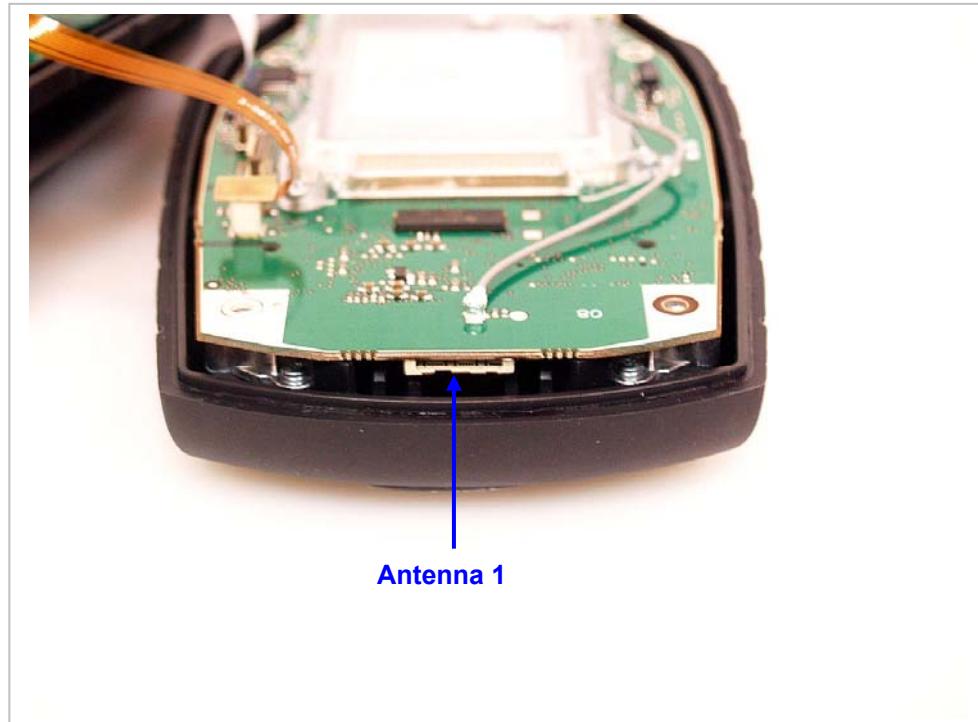
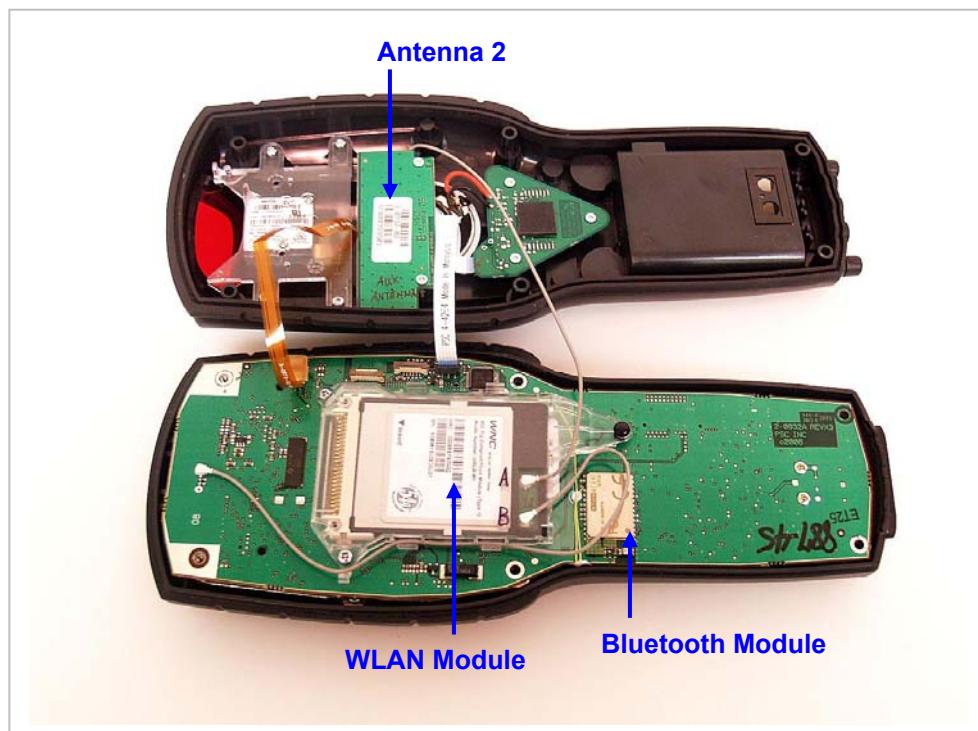
Handheld Scanner with Holster 1 (P/N: 4-4135)



Handheld Scanner with Holster 2 (P/N: 4-4135)



WLAN & Antennas Location



WLAN Module
Model #: DRCB-M1



12 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	4
2	SAR Test Plots	14
3	Certificate of E-Field Probe - EXDV4SN3552	9
4	Certificate of System Validation Dipole - D2450 SN:706	9

END OF REPORT