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SAR Test Report

Report Number: M060930

Test Sample: Max Stream XBee-pro ZigBee (802.15.4) Transmitter

Model Number: XBP24-AUI-001
FCC ID: UQM-SMARTSPEED
Tested For: Fusion Sport Pty Ltd

Date of Issue: 18th October 2006

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SAR EVALUATION
Max Stream XBee-pro ZigBee (802.15.4) Transmitter, **Model:** XBP24-AUI-001
Report Number: M060930
FCC ID: UQM-SMARTSPEED

1.0 GENERAL INFORMATION

Test Sample: Max Stream XBee-pro ZigBee (802.15.4) Transmitter with HP PDA
Model Number: XBP24-AUI-001
Manufacturer: Fusion Sport Pty Ltd
FCC ID: UQM-SMARTSPEED

Device Category: Portable Transmitter
Test Device: Production Unit / Prototype Sample
RF exposure Category: General Public/Unaware user

Tested for: Fusion Sport Pty Ltd
Address: 1 Clunies Ross Court, Eight Mile Plains QLD 4113
PO Box 4037, Eight Mile Plains QLD 4113
Contact: Michael Woo
Phone: 07 3853 5323
Fax: 07 3853 5348

Test Standard/s:

1. Evaluating Compliance with FCC Guidelines For Human Exposure to Radiofrequency Electromagnetic Fields
Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01)
2. Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields.
RSS-102 Issue 1 (Provisional) September 25, 1999

Statement Of Compliance: The Max Stream XBee-pro ZigBee (802.15.4) Transmitter, Model: XBP24-AUI-001. Complied with the FCC General public/uncontrolled RF exposure limits of 1.6mW/g per requirements of 47CFR2.1093(d). It also complied with IC RSS-102 requirements.
*. Refer to compliance statement section 9.

Test Dates: 3rd October 2006

Test Officer:

Peter Jakubiec
Assoc Dip Elect Eng

Authorised Signature:

Aaron Sargent B.Eng
EMR Engineer

2.0 DESCRIPTION OF DEVICE

2.1 Description of Test Sample

The device tested was a Max Stream XBee-pro ZigBee (802.15.4) Transmitter, Model: XBP24-AUI-001 operating in 2450 MHz frequency band. It has an external integral fixed length antenna and was tested in Body Worn configuration. The ZigBee Transmitter interfaces with a Personal Digital Assistant PC, which is cradled with the Transmitter Interface Board casing. In this configuration the PDA is used as a User Interface.

Operating Mode during Testing	: Continuous Transmission
Operating Mode production sample	: 1% duty cycle
Modulation Scheme	: DSSS (Direct Sequence Spread Spectrum)
Device Power Rating for test sample and identical production unit	: 18dBm
Antenna type	: External
Applicable Head Configurations	: None
Applicable Body Configurations	: Body Worn Position
Battery Options	: Internal Battery

Cradled PDU details:

Manufacturer:	Hewlett Packard
Model Number:	PE2050A
Serial Number:	TWC4131QC2
FCC ID:	NM8GREATWALL
Battery Type:	Li-ion 3.7V 900mAh
Battery Model Number:	PE2051

2.2 Test Signal, Frequency and Output Power

The Max Stream XBee-pro ZigBee (802.15.4) Transmitter, Model: XBP24-AUI-001 is a 12-channel module that operates in the 2450 MHz frequency band. The frequency range is 2410 MHz to 2465 MHz. The transmitter was configured into a test mode that ensured a continuous RF transmission for the duration of each SAR scan. The device transmission characteristics were also monitored during testing to confirm the device was transmitting continuously. There were no wires or other connections to the Handheld Transceiver during the SAR measurements.

The conducted power of the device was measured with a calibrated Power Meter. The results of this measurement are listed in table below. Note: measurement of conducted power was not possible before and after each SAR test due to lack of an easily accessible RF port.

Table: Frequency and Output Power

Channel	Channel Frequency MHz	Maximum Conducted Output Power dBm
12	2410	17.36
18	2440	16.62
23	2465	18.34

2.3 Battery Status

The device battery was fully charged prior to commencement of measurement. Each SAR test was completed within 30 minutes. The battery condition was monitored by measuring the RF power at a defined position inside the phantom before the commencement of each test and again after the completion of the test.

2.4 DETAILS OF TEST LABORATORY

2.4.1 Location

EMC Technologies Pty Ltd - ACN/ABN: 82057105549
57 Assembly Drive
Tullamarine, (Melbourne) Victoria
Australia 3043

Telephone: +61 3 9335 3333
Facsimile: +61 3 9338 9260
email: melb@emctech.com.au
website: www.emctech.com.au

2.4.2 Accreditations

EMC Technologies Pty. Ltd. is accredited by the National Association of Testing Authorities, Australia (NATA). **NATA Accredited Laboratory Number: 5292**

EMC Technologies Pty Ltd is NATA accredited for the following standards:

ARPANSA Standard AS/NZS 2772.2:	RF and microwave radiation hazard measurement
ACA:	Radio communications (Electromagnetic Radiation - Human Exposure) Standard 2003
FCC:	Guidelines for Human Exposure to RF Electromagnetic Field OET65C 01/01
CENELEC:	ES59005: 1998
EN 50360: 2001	Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)
EN 50361: 2001	Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300MHz – 3GHz)
IEEE 1528: 2003	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques.

Refer to NATA website www.nata.asn.au for the full scope of accreditation.

2.4.3 Environmental Factors

The measurements were performed in a shielded room with no background network signals. The temperature in the laboratory was controlled to within 20 ± 1 °C, the humidity was 44 %. The liquid parameters were measured prior to the commencement of the tests. Tests were performed to check that reflections within the environment did not influence the SAR measurements. The noise floor of the DASY4 SAR measurement system using the SN1377 probe is less than 5µV in both air and liquid mediums.

3.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

3.1 Probe Positioning System

The measurements were performed with the state of the art automated near-field scanning system **DASY4 Version V4.6 Build 23.7** from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision 6-axis robot (working range greater that 1.1m), which positions the SAR measurement probes with a positional repeatability of better than ±0.02 mm. The DASY4 fully complies with the OET65 C (01-01), IEEE 1528 and EN50361 SAR measurement requirements.

3.2 E-Field Probe Type and Performance

The SAR measurements were conducted with the dosimetric probe ET3DV6 Serial: 1377 (manufactured by SPEAG) designed in the classical triangular configuration and optimised for dosimetric evaluation. The probe has been calibrated and found to be accurate to better than ±0.25 dB. The probe is suitable for measurements close to material discontinuity at the surface of the phantom. The sensors of the probe are directly loaded with Schottky diodes and connected via highly resistive lines (length = 300 mm) to the data acquisition unit.

3.3 Data Acquisition Electronics

The data acquisition electronics (DAE3) consists of 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. The input impedance of the DAE3 box is 200 MΩ; the inputs are symmetrical and floating. Common mode rejection is above 80dB.Transmission to the PC-card is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The mechanical probe-mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

3.4 Calibration and Validation Procedures and Data

Prior to the SAR assessment, the system validation kit was used to verify that the DASY4 was operating within its specifications. The validation was performed at 2450 MHz with the SPEAG DV2450V2 calibrated dipole.

The validation dipoles are highly symmetric and matched at the centre frequency for the specified liquid and distance to the phantom. The accurate distance between the liquid surface and the dipole centre is achieved with a distance holder that snaps onto the dipole.

System validation is performed by feeding a known power level into a reference dipole, set at a know distance from the phantom. The measured SAR is compared to the theoretically derived level.

3.4.1 Validation Results @ 2450 MHz

The following table lists the dielectric properties of the tissue simulating liquid measured prior to SAR validation. The results of the validation are listed in columns 4 and 5. The forward power into the reference dipole for each SAR validation was adjusted to 250mW.

Table: Validation Results (Dipole: SPEAG DV2450V2 SN: 724)

1. Validation Date	2. Frequency (MHz)	3. ϵ_r (measured)	4. σ (mho/m) (measured)	5. Measured SAR 1g	6. Measured SAR 10g
3rd October 2006	2450	39.8	1.81	13.8	6.52

3.4.2 Deviation from reference validation values

The reference SAR values are derived using a reference dipole and flat phantom suitable for a centre frequency of 2450 MHz. These reference SAR values are obtained from the IEEE Std 1528-2003 and are normalized to 1W.

The SPEAG calibration reference SAR value is the SAR validation result obtained in a specific dielectric liquid using the validation dipole (DV2450V2) during calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in table below.

Table: Deviation from reference validation values

Date and Validation Frequency (MHz)	Measured SAR 1g (mW/g)	Measured SAR 1g (Normalized to 1W)	SPEAG Calibration reference SAR Value 1g (mW/g)	Deviation From SPEAG (%)	IEEE Std 1528 reference SAR value 1g (mW/g)	Deviation From IEEE (%)
3rd Oct. 06 2450 MHz	13.8	55.2	56.4	-2.13	52.4	5.34

NOTE: All reference validation values are referenced to 1W input power.

3.4.3 Liquid Depth 15cm

During the SAR measurement process the liquid level was maintained to a level of 15cm with a tolerance of ±0.5cm. The following photo shows the depth of the liquid maintained during the testing.

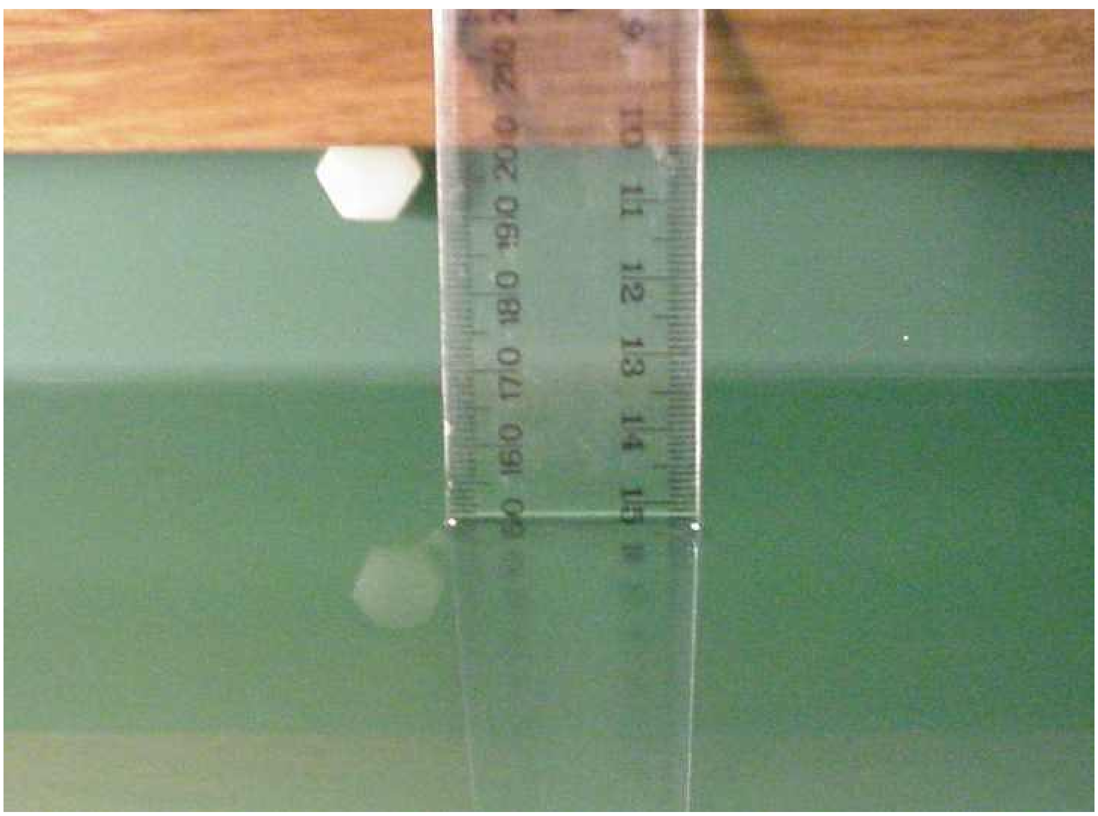


Photo of liquid Depth in Flat Phantom

3.5 Phantom Properties (Size, Shape, Shell Thickness)

The phantom used during the SAR testing in Touch, Tilted positions and the validation was the “SAM” phantom from SPEAG. The phantom thickness is 2.0mm+/-0.2 mm and was filled with the required tissue simulating liquid.

For SAR testing in the Belt Clip positions an AndreT Flat Phantom V10.1 was used. The phantom thickness is 2.0mm +/-0.2 mm and the phantom was filled with the required tissue simulating liquid. Following table provides a summary of the measured phantom properties

Table: Phantom Properties (300MHz-2500MHz)

Phantom Properties	Requirement for specific EUT	Measured
Thickness of flat section	2.0mm +/-0.2mm (flat section)	2.08 – 2.20mm
Dielectric Constant	<5.0	4.603 @ 300MHz (worst-case frequency)
Loss Tangent	<0.05	0.0379 @ 2500MHz (worst-case frequency)

Photo 1: Flat_Phantom V10.1 2mm

3.6 Tissue Material Properties

The dielectric parameters of the tissue simulating liquid were measured prior to SAR assessment using the HP85070A dielectric probe kit and HP8714B Network Analyser. The actual dielectric parameters are shown in the following table.

Table: Measured Body Simulating Liquid Dielectric Values

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
2410	51.5	52.7 ±5% (50.1 to 55.3)	1.90	1.95 ±5% (1.85 to 2.05)	1000
2440	51.4	52.7 ±5% (50.1 to 55.3)	1.95	1.95 ±5% (1.85 to 2.05)	1000
2465	51.2	52.7 ±5% (50.1 to 55.3)	1.99	1.95 ±5% (1.85 to 2.05)	1000

NOTE: The brain and muscle liquid parameters were within the required tolerances of ±5%.

3.6.1 Liquid Temperature and Humidity

The humidity and dielectric/ambient temperatures are recorded during the assessment of the tissue material dielectric parameters. The difference between the ambient temperature of the liquid during the dielectric measurement and the temperature during tests was less than |2|°C.

Table: Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
3rd October 2006	20.3	20.0	44

3.7 Simulated Tissue Composition Used for SAR Test

The tissue simulating liquids are created prior to the SAR evaluation and often require slight modification each day to obtain the correct dielectric parameters.

Table: Tissue Type: Brain @ 2450MHz
Volume of Liquid: 60 Litres

Approximate Composition	% By Weight
Distilled Water	62.7
Salt	0.5
Triton X-100	36.8

Table: Tissue Type: Muscle @ 2450MHz
Volume of Liquid: 60 Litres

Approximate Composition	% By Weight
Distilled Water	73.2
Salt	0.04
DGBE	26.7

3.8 Device Holder for DASY4

The DASY4 device holder supplied by SPEAG is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The rotation centres for both scales is the ear opening. Thus the device needs no repositioning when changing the angles.

The DASY4 device holder is made of low-loss material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, to reduce the influence on the clamp on the test results.

Refer to Appendix A2-A3 for photographs of device positioning

4.0 SAR MEASUREMENT PROCEDURE USING DASY4

The SAR evaluation was performed with the SPEAG DASY4 system. 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 side of the head *or* the flat section of the flat phantom is measured at a distance of 3.9 mm from the inner surface of the shell. The area covers the entire dimension of the head and the horizontal grid spacing is 15 mm x 15 mm. The actual Area Scan has dimensions of typically 181 mm x 81 mm for body configuration, surrounding the test device hot spot location. Based on this data, the area of the maximum absorption is determined by Spline interpolation. A pre-scan is performed for each phantom configuration to ensure that entire hot spot is identified.

c) Around this point, a volume of 30 mm x 30 mm x 30 mm is assessed by measuring 7 x 7 x 7 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 2.7 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

5.0 MEASUREMENT UNCERTAINTY

The uncertainty analysis is based on the template listed in the IEEE Std 1528-2003 for both Handset SAR tests and Validation uncertainty. The measurement uncertainty of a specific device is evaluated independently and the total uncertainty for both evaluations (95% confidence level) must be less than 30%.

Table: Uncertainty Budget for DASY4 Version V4.6 Build 23.7 – EUT SAR test

a	b	c	d	e= f(d,k)	f	g	h=cxf/e	i=cxg/e	k
Uncertainty Component	Sec.	Tol. (%)	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i (%)	10g u_i (%)	v_i
Measurement System									
Probe Calibration (k=1) (standard calibration)	7.2.1	4.8	N	1	1	1	4.8	4.8	∞
Axial Isotropy	7.2.1	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	7.2.1	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	7.2.1	1	R	1.73	1	1	0.6	0.6	∞
Linearity	7.2.1	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	7.2.1	1	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	7.2.1	1	N	1	1	1	1.0	1.0	∞
Response Time	7.2.1	0.8	R	1.73	1	1	0.5	0.5	∞
Integration Time	7.2.1	2.6	R	1.73	1	1	1.5	1.5	∞
RF Ambient Conditions	7.2.3	0.05	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	7.2.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	7.2.2	2.9	R	1.73	1	1	1.7	1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	7.2.4	1	R	1.73	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	7.2.2	1.61	N	1	1	1	1.6	1.6	11
Device Holder Uncertainty									
Output Power Variation – SAR Drift Measurement	7.2.3	11	R	1.73	1	1	6.4	6.4	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	7.2.2	4	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity – Deviation from target values	7.2.3	5	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity – Measurement uncertainty	7.2.3	4.3	N	1	0.64	0.43	2.8	1.8	5
Liquid Permittivity – Deviation from target values	7.2.3	5	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – Measurement uncertainty	7.2.3	4.3	N	1	0.6	0.49	2.6	2.1	5
Combined standard Uncertainty			RSS				11.2	10.8	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				22.4	21.58	

Estimated total measurement uncertainty for the DASY4 measurement system was ± 11.2. The extended uncertainty (K = 2) was assessed to be ± 22.4 based on 95% confidence level. The uncertainty is not added to the measurement result.

Table: Uncertainty Budget for DASY4 Version V4.6 Build 23.7 - Validation

a	b	c	d	e= f(d,k)	f	g	h=cxf/e	i=cxg/e	k
Uncertainty Component	Sec.	Tol. (6%)	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i (6%)	10g u_i (6%)	v_i
Measurement System									
Probe Calibration (k=1) (standard calibration)	E.2.1	4.8	N	1	1	1	4.8	4.8	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Hemispherical Isotropy	E.2.2	0	R	1.73	1	1	0.0	0.0	∞
Boundary Effect	E.2.3	1	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	1	N	1	1	1	1.0	1.0	∞
Response Time	E.2.7	0	R	1.73	1	1	0.0	0.0	∞
Integration Time	E.2.8	0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions	E.6.1	0.05	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	E.6.3	2.9	R	1.73	1	1	1.7	1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E.5	1	R	1.73	1	1	0.6	0.6	∞
Test Sample Related									
Dipole Axis to Liquid Surface		2	R	1.73	1	1	1.2	1.2	∞
Power Drift		4.7	R	1.73	1	1	2.7	2.7	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1	4	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity – Deviation from target values	E.3.2	5	R	1.73	0.6	0.43	1.7	1.2	∞
Liquid Conductivity – Measurement uncertainty	E.3.3	2.5	N	1.73	0.6	0.43	0.9	0.6	5
Liquid Permittivity – Deviation from target values	E.3.2	5	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – Measurement uncertainty	E.3.3	2.5	N	1.73	0.6	0.49	0.9	0.7	5
Combined standard Uncertainty			RSS				8.0	7.8	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				16.0	15.63	

Estimated total measurement uncertainty for the DASY4 measurement system was ±8.0%. The extended uncertainty (K = 2) was assessed to be ±16.0% based on 95% confidence level. The uncertainty is not added to the Validation measurement result.

6.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table: SPEAG DASY4 Version V4.6 Build 23.7

Equipment Type	Manufacturer	Model Number	Serial Number	Calibration Due	Used For this Test?
Robot - Six Axes	Staubli	RX90BL	N/A	Not applicable	Yes
Robot Remote Control	SPEAG	CS7MB	RX90B	Not applicable	Yes
SAM Phantom	SPEAG	N/A	1260	Not applicable	Yes
SAM Phantom	SPEAG	N/A	1060	Not applicable	No
Flat Phantom	AndreT	10.1	P 10.1	Not Applicable	Yes
Flat Phantom	AndreT	9.1	P 9.1	Not Applicable	No
Flat Phantom	SPEAG	PO1A 6mm	1003	Not Applicable	No
Data Acquisition Electronics	SPEAG	DAE3 V1	359	12-July-2007	Yes
Data Acquisition Electronics	SPEAG	DAE3 V1	442	08-Dec-2006	No
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	No
Probe E-Field	SPEAG	ET3DV6	1380	14-Dec-2006	No
Probe E-Field	SPEAG	ET3DV6	1377	14-July-2007	Yes
Probe E-Field	SPEAG	ES3DV6	3029	Non Compliance	No
Probe E-Field	SPEAG	EX3DV4	3563	14-July-2007	No
Antenna Dipole 300 MHz	SPEAG	D300V2	1005	26-Oct-2007	No
Antenna Dipole 450 MHz	SPEAG	D450V2	1009	15-Dec-2006	No
Antenna Dipole 900 MHz	SPEAG	D900V2	047	6-July-2008	No
Antenna Dipole 1640 MHz	SPEAG	D1640V2	314	30-June-2008	No
Antenna Dipole 1800 MHz	SPEAG	D1800V2	242	3-July-2008	No
Antenna Dipole 2450 MHz	SPEAG	D2450V2	724	2-Nov-2006	Yes
Antenna Dipole 3500 MHz	SPEAG	D3500V2	1002	1-July-2007	No
Antenna Dipole 5600 MHz	SPEAG	D5GHzV2	1008	27-Oct-2007	No
RF Amplifier	EIN	603L	N/A	In test	No
RF Amplifier	Mini-Circuits	ZHL-42	N/A	In test	Yes
RF Amplifier	Mini-Circuits	ZVE-8G	N/A	In test	No
Synthesized signal generator	Hewlett Packard	ESG-D3000A	GB37420238	*Not Required	Yes
RF Power Meter Dual	Hewlett Packard	437B	3125012786	30-May-2007	Yes
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	30-May-2007	Yes
RF Power Meter Dual	Gigatronics	8542B	1830125	18-April-2007	Yes
RF Power Sensor	Gigatronics	80301A	1828805	18-April-2007	Yes
RF Power Meter Dual	Hewlett Packard	435A	1733A05847	*Not Required	Yes
RF Power Sensor	Hewlett Packard	8482A	2349A10114	*Not Required	Yes
Network Analyser	Hewlett Packard	8714B	GB3510035	31-Aug-2007	Yes
Network Analyser	Hewlett Packard	8753ES	JP39240130	30-Sept-2007	No
Dual Directional Coupler	Hewlett Packard	778D	1144 04700	In test	No
Dual Directional Coupler	NARDA	3022	75453	In test	Yes

7.0 SAR TEST METHOD

7.1 Description of the Test Positions

SAR measurements were performed in a Body Worn position, measured in the flat section of the AndreT 10.1 phantom.
See Appendix A for photos of test positions.

7.1.1 "Body Worn" Position

The device was tested in the (2.00 mm) flat section of the AndreT phantom for the "Body Worn" position. The back of the transceiver was placed at the flat section of the phantom and suspended until the edges of the device touched the phantom. *Refer to Appendix A2 for photos of measurement position.*

7.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes)

The device has a fixed antenna. The SAR was measured at three test channels with the test sample operating at maximum power, as specified in section 2.3.

7.3 FCC and RSS-102 SAR Exposure Limits for Occupational/ Controlled Exposure

Spatial Peak SAR Limits For:	
Partial-Body:	8.0 mW/g (averaged over any 1g cube of tissue)
Hands, Wrists, Feet and Ankles:	20.0 mW/g (averaged over 10g cube of tissue)

7.4 FCC and RSS-102 SAR Exposure Limits for Un-controlled/Non–occupational

Spatial Peak SAR Limits For:	
Partial-Body:	1.6 mW/g (averaged over any 1g cube of tissue)
Hands, Wrists, Feet and Ankles:	4.0 mW/g (averaged over 10g cube of tissue)

8.0 SAR MEASUREMENT RESULTS

The SAR values averaged over 1 g and 10 g tissue masses were determined for the sample device for a Body Worn configuration.

The plots with the corresponding SAR distributions, which reveal information about the location of the maximum SAR with respect to the device, are contained in Appendix B of this report.

Table: SAR MEASUREMENT RESULTS

1. Test Position	2. Plot No.	3. Test Channel	4. Test Freq (MHz)	5. Measured 1g SAR Results (mW/g)	6. Measured Drift (dB)
Body Worn	1	12	2410	0.00315	0.393
	2	18	2440	0.00408	0.299
	3	23	2465	0.00897	-0.238

Note: The uncertainty of the system (± 22.4 %) has not been added to the results.

The highest SAR level recorded was 0.00897 mW/g for a 1g cube. This value was measured in the “Body Worn” position at a frequency of 2465 MHz (Channel 23).

The FCC and RSS-102 SAR limit for Non-occupational exposure is 1.6 m W/g measurement in a 1g cube of tissue.

9.0 COMPLIANCE STATEMENT

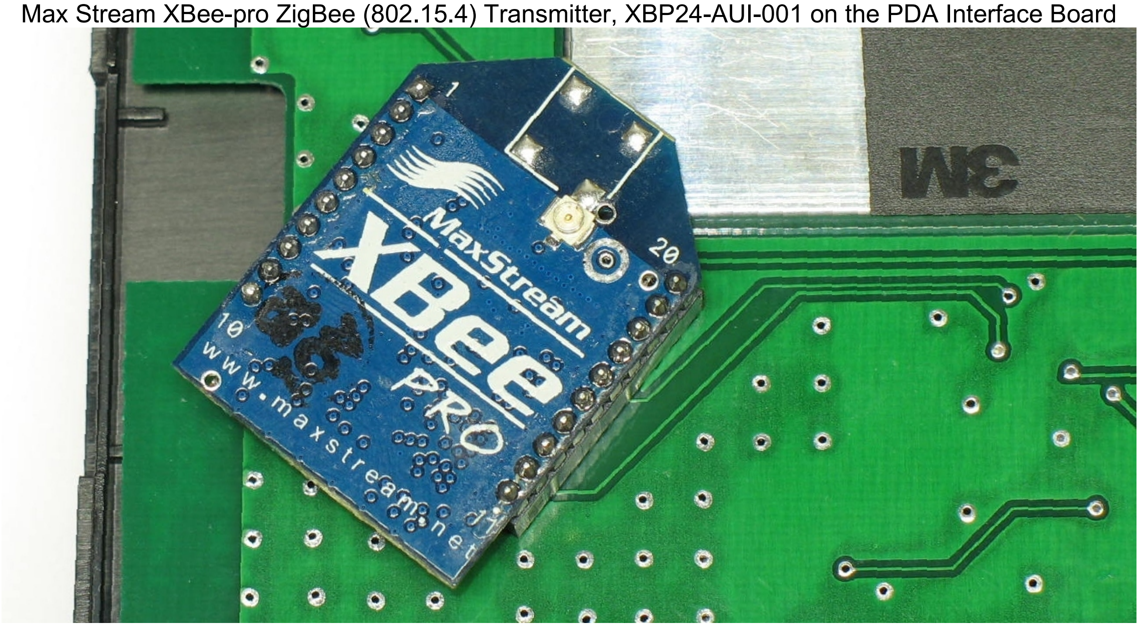
The Max Stream XBee-pro ZigBee (802.15.4) Transmitter model XBP24-AUI-001 was tested on behalf of Fusion Sport Pty Ltd. It complied with the FCC and RSS-102 SAR requirements.

The highest SAR level recorded was 0.00897 mW/g for a 1g cube. This value was measured in the “Body Worn” position, and was below the uncontrolled limit of 1.6 mW/g, even taking into account the measurement uncertainty of 22.4 %.

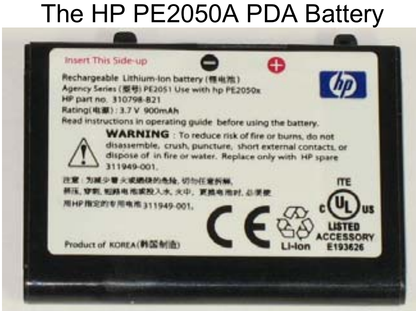
APPENDIX A1 Test Sample Photographs

Max Stream XBee-pro ZigBee (802.15.4) Transmitter, XBP24-AUI-001

Max Stream XBee-pro ZigBee (802.15.4) Transmitter, XBP24-AUI-001 on the PDA Interface Board



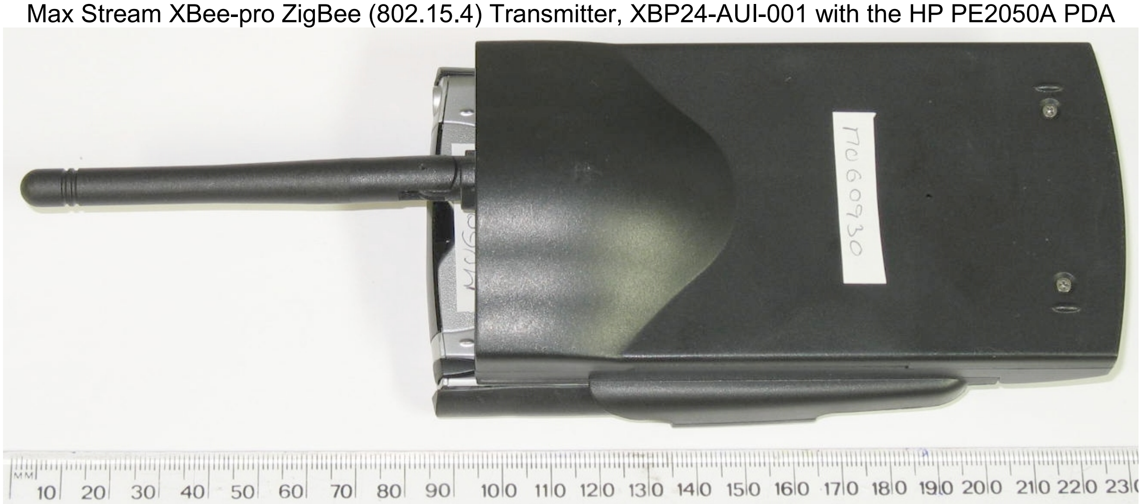
The HP PE2050A PDA Battery



APPENDIX A2 Test Sample Photographs

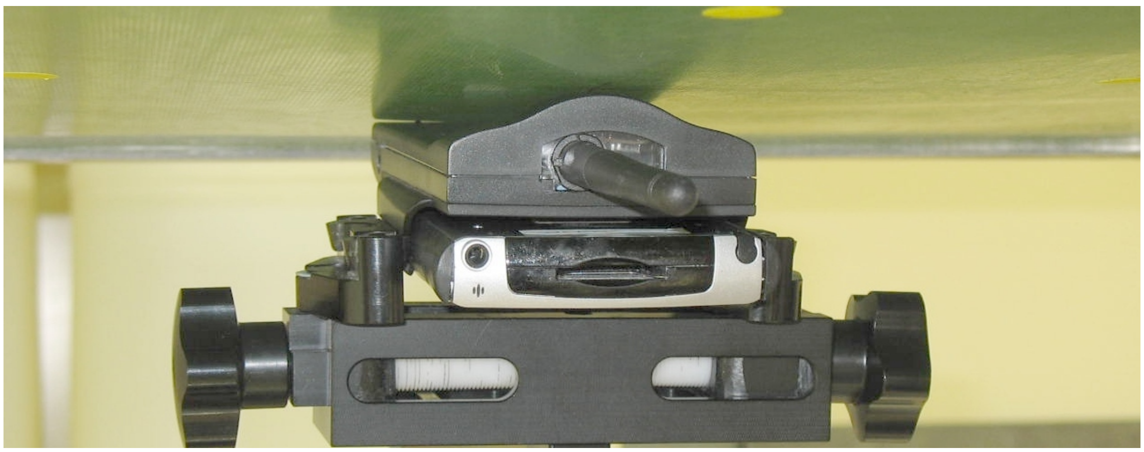
Max Stream XBee-pro ZigBee (802.15.4) Transmitter, XBP24-AUI-001 with the HP PE2050A PDA

Max Stream XBee-pro ZigBee (802.15.4) Transmitter, XBP24-AUI-001 with the HP PE2050A PDA



APPENDIX A3 Test Setup Photographs

Body Worn Position



APPENDIX B Plots Of The SAR Measurements

Plots of the measured SAR distributions inside the phantom are given in this Appendix for all tested configurations. The spatial peak SAR values were assessed with the procedure described in this report.

Table: 2450MHz Band SAR Measurement Plot Numbers

Test Position	Plot Number	Test Channel
Body Worn	1	12
	2	18
	3	23

Table: 2450MHz Validation Plot Numbers

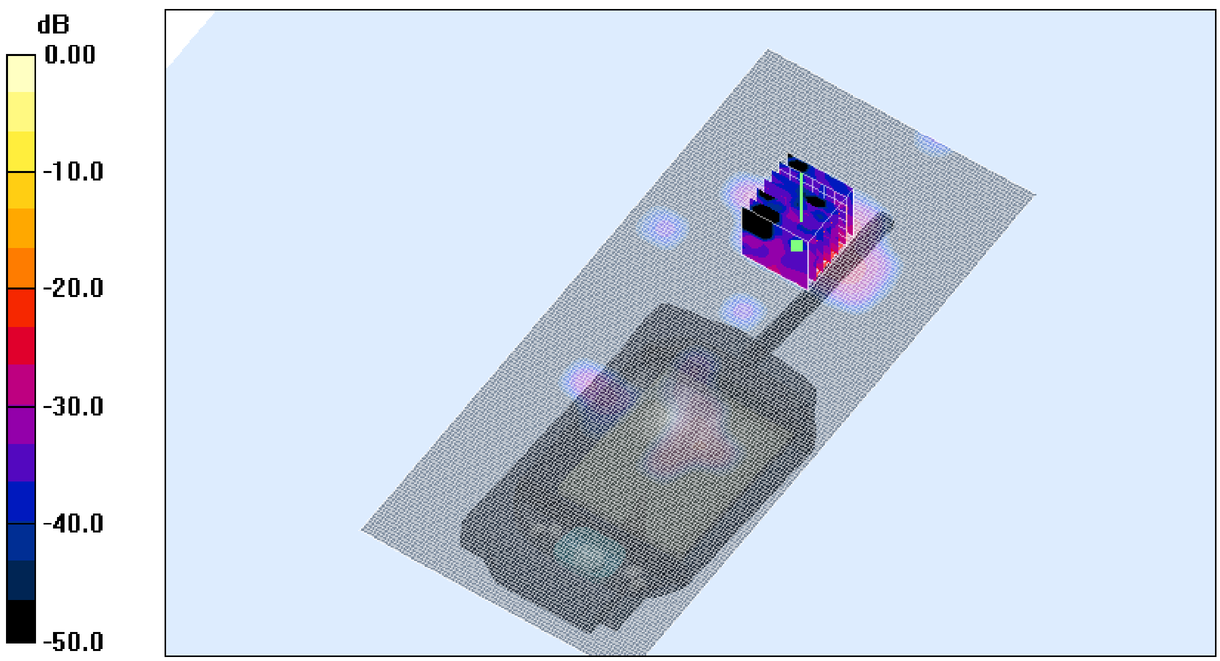
Date	Plot Number	Frequency
Validation 3rd October 2006	4	2450 MHz

Test Date: 03 October 2006
File Name: Body Worn 2450 MHz DSSS 2.45 GHz (DAE 359 Probe 1377) 03-10-06.da4
DUT: Fusion Sport Zigbee Transmitter with HP PDA; Type: PDA - PE2050A; Serial: PDA - TWC4131QC2

* Communication System: 2450 MHz DSSS Zigbee ; Frequency: 2410 MHz; Duty Cycle: 1:1
* Medium parameters used: $\sigma = 1.90394$ mho/m, $\varepsilon_r = 51.5288$; $\rho = 1000$ kg/m^3
- Electronics: DAE3 Sn359; Probe: ET3DV6 - SN1377; ConvF(4.2, 4.2, 4.2)
- Phantom: Flat Phantom 10.1; Serial: P 10.1; Phantom section: Flat 2.2 Section

Channel 12 Test/Area Scan (181x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.01 mW/g

Channel 12 Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.26 V/m; Power Drift = 0.393 dB
Peak SAR (extrapolated) = 0.013 W/kg
SAR(1 g) = 0.00315 mW/g; SAR(10 g) = 0.00152 mW/g
Maximum value of SAR (measured) = 0.00 mW/g



0 dB = 0.00mW/g

SAR MEASUREMENT PLOT 1

Ambient Temperature	**20.3 Degrees Celsius**
Liquid Temperature	**20.0 Degrees Celsius**
Humidity	**44.0 %**

Test Date: 03 October 2006

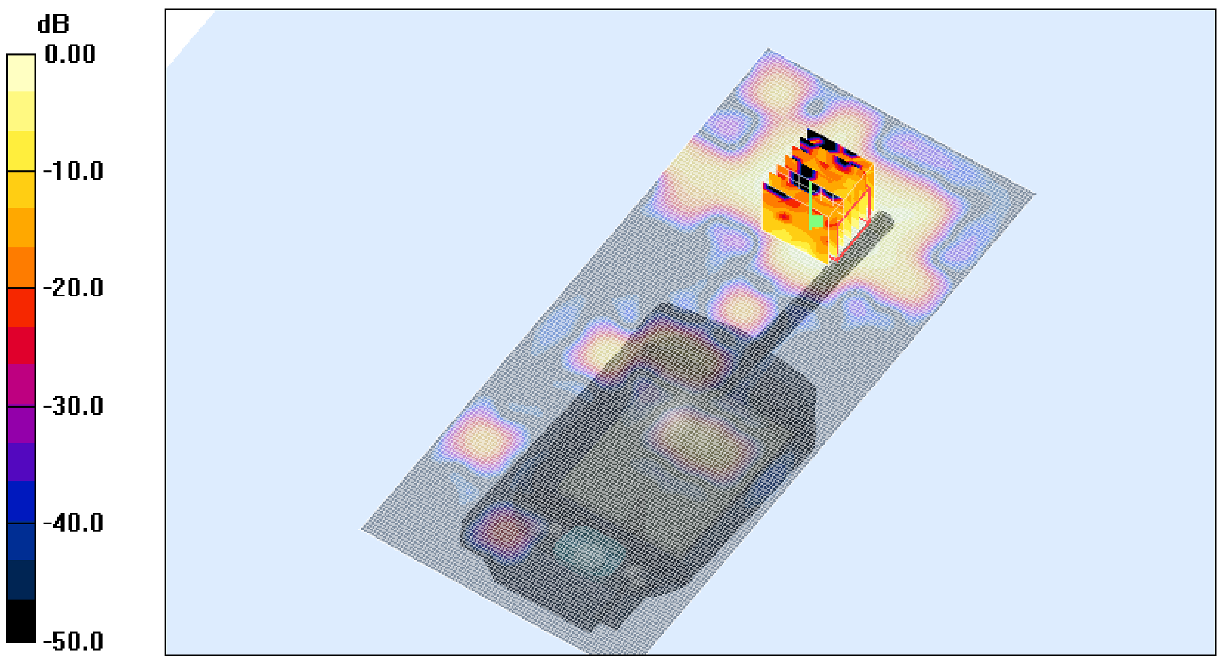
File Name: Body Worn 2450 MHz DSSS 2.45 GHz (DAE 359 Probe 1377) 03-10-06.da4
DUT: Fusion Sport Zigbee Transmitter with HP PDA; Type: PDA - PE2050A; Serial: PDA - TWC4131QC2

* Communication System: 2450 MHz DSSS Zigbee ; Frequency: 2440 MHz; Duty Cycle: 1:1
* Medium parameters used: σ = 1.94892 mho/m, ε_r = 51.3789; ρ = 1000 kg/m^3

- Electronics: DAE3 Sn359; Probe: ET3DV6 - SN1377; ConvF(4.2, 4.2, 4.2)
- Phantom: Flat Phantom 10.1; Serial: P 10.1; Phantom section: Flat 2.2 Section

Channel 18 Test/Area Scan (181x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.01 mW/g

Channel 18 Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.897 V/m; Power Drift = 0.299 dB
Peak SAR (extrapolated) = 0.01 W/kg
SAR(1 g) = 0.00408 mW/g; SAR(10 g) = 0.00198 mW/g
Maximum value of SAR (measured) = 0.01 mW/g



0 dB = 0.010mW/g

SAR MEASUREMENT PLOT 2

Ambient Temperature	**20.3 Degrees Celsius**
Liquid Temperature	**20.0 Degrees Celsius**
Humidity	**44.0 %**

Test Date: 03 October 2006

File Name: Body Worn 2450 MHz DSSS 2.45 GHz (DAE 359 Probe 1377) 03-10-06.da4

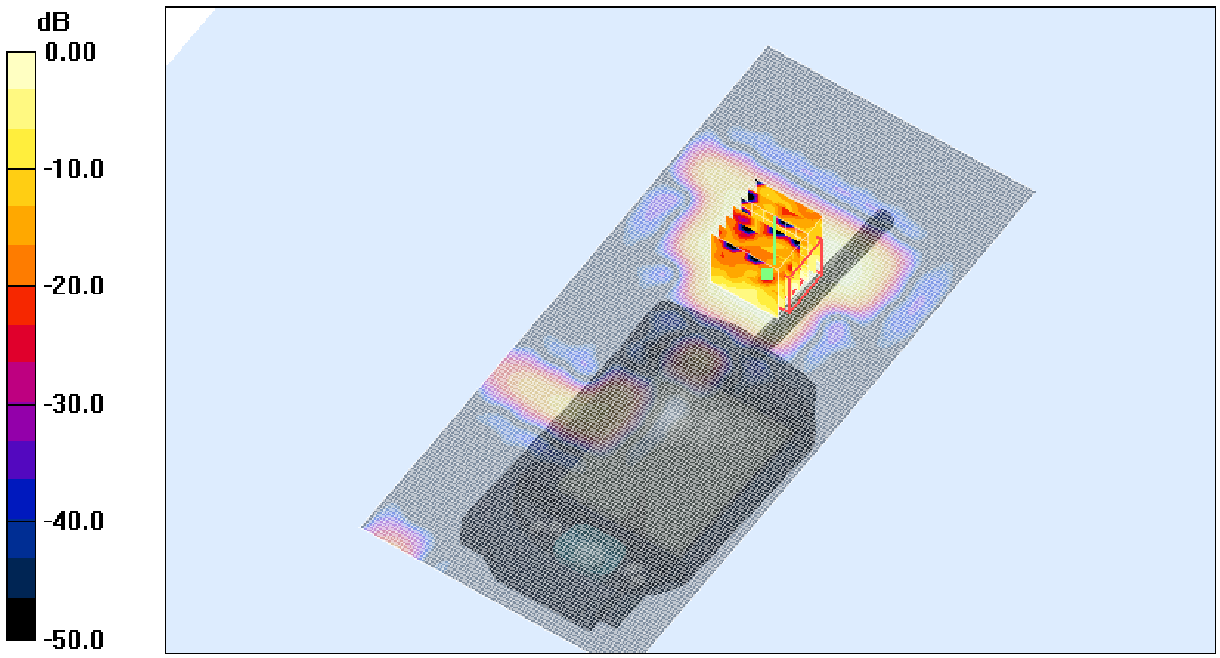
DUT: Fusion Sport Zigbee Transmitter with HP PDA; Type: PDA - PE2050A; Serial: PDA - TWC4131QC2

* Communication System: 2450 MHz DSSS Zigbee ; Frequency: 2465 MHz; Duty Cycle: 1:1
* Medium parameters used: σ = 1.98627 mho/m, ε_r = 51.2074; ρ = 1000 kg/m^3

- Electronics: DAE3 Sn359; Probe: ET3DV6 - SN1377; ConvF(4.2, 4.2, 4.2)
- Phantom: Flat Phantom 10.1; Serial: P 10.1; Phantom section: Flat 2.2 Section

Channel 23 Test/Area Scan (181x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.01 mW/g

Channel 23 Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.12 V/m; Power Drift = -0.238 dB
Peak SAR (extrapolated) = 0.025 W/kg
SAR(1 g) = 0.00897 mW/g; SAR(10 g) = 0.00411 mW/g
Maximum value of SAR (measured) = 0.011 mW/g



0 dB = 0.011mW/g

SAR MEASUREMENT PLOT 3

Ambient Temperature	**20.3 Degrees Celsius**
Liquid Temperature	**20.0 Degrees Celsius**
Humidity	**44.0 %**

Test Date: 03 October 2006

File Name: Validation 2450 MHz (DAE359 Probe1377) 30-10-06.da4

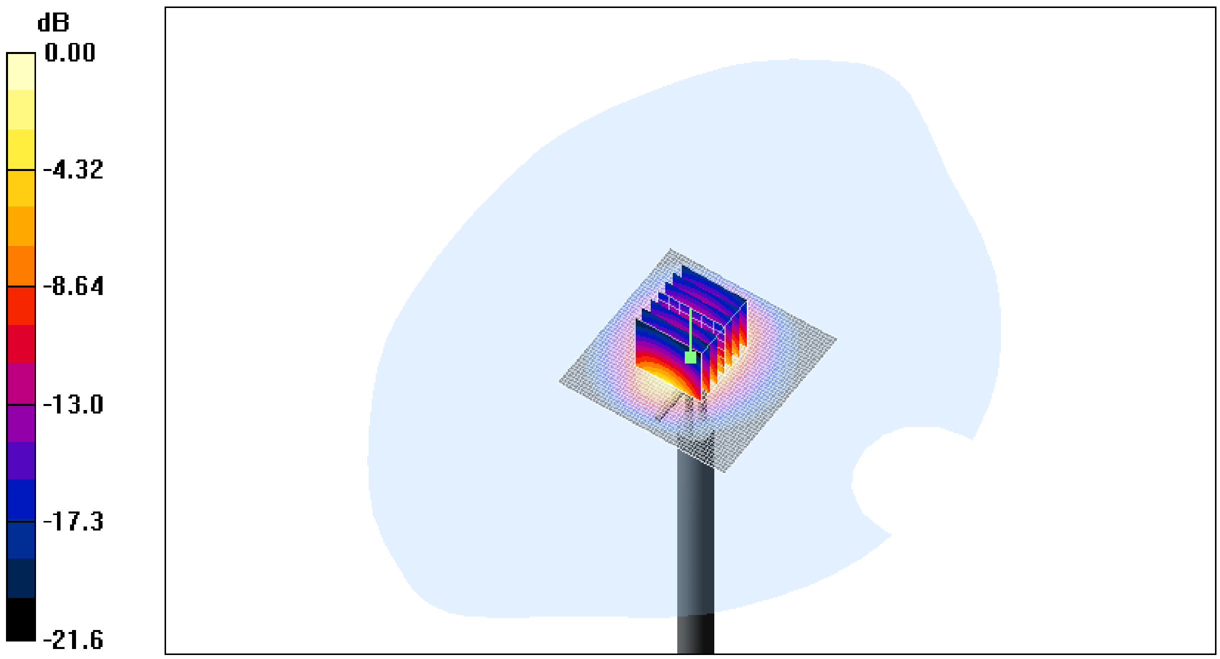
DUT: Dipole 2450 MHz; Type: DV2450V2; Serial: 724

* Communication System: CW 2450 MHz; Frequency: 2450 MHz; Duty Cycle: 1:1
* Medium parameters used: σ = 1.812 mho/m, ε_r = 39.7501; ρ = 1000 kg/m^3

- Electronics: DAE3 Sn359; Probe: ET3DV6 - SN1377; ConvF(4.49, 4.49, 4.49)
- Phantom: SAM 22; Serial: 1260; Phantom section: Flat Section

Channel 1 Test/Area Scan (51x51x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 18.2 mW/g

Channel 1 Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.5 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 29.9 W/kg
SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.52 mW/g
Maximum value of SAR (measured) = 15.2 mW/g

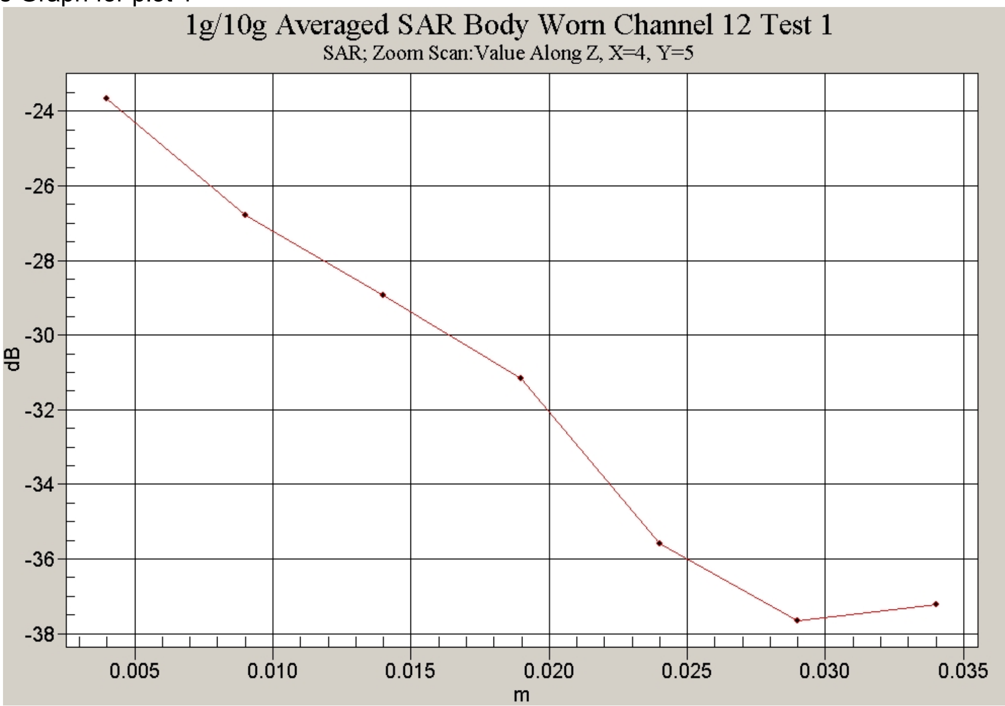


0 dB = 15.2mW/g

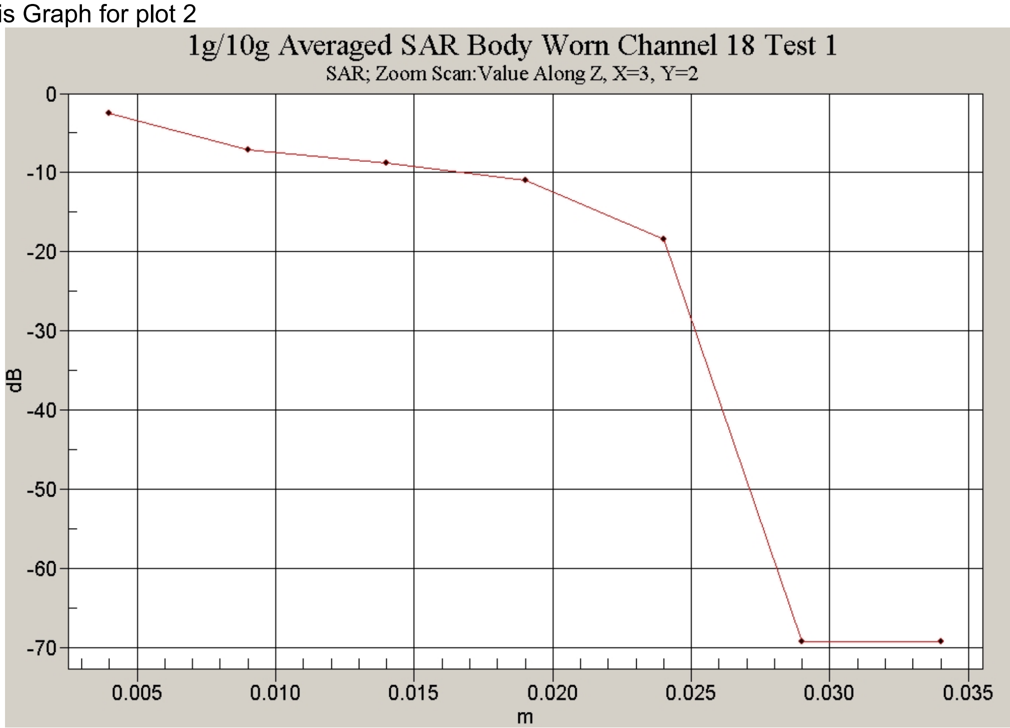
SAR MEASUREMENT PLOT 4

Ambient Temperature	**20.3 Degrees Celsius**
Liquid Temperature	**20.0 Degrees Celsius**
Humidity	**44.0 %**

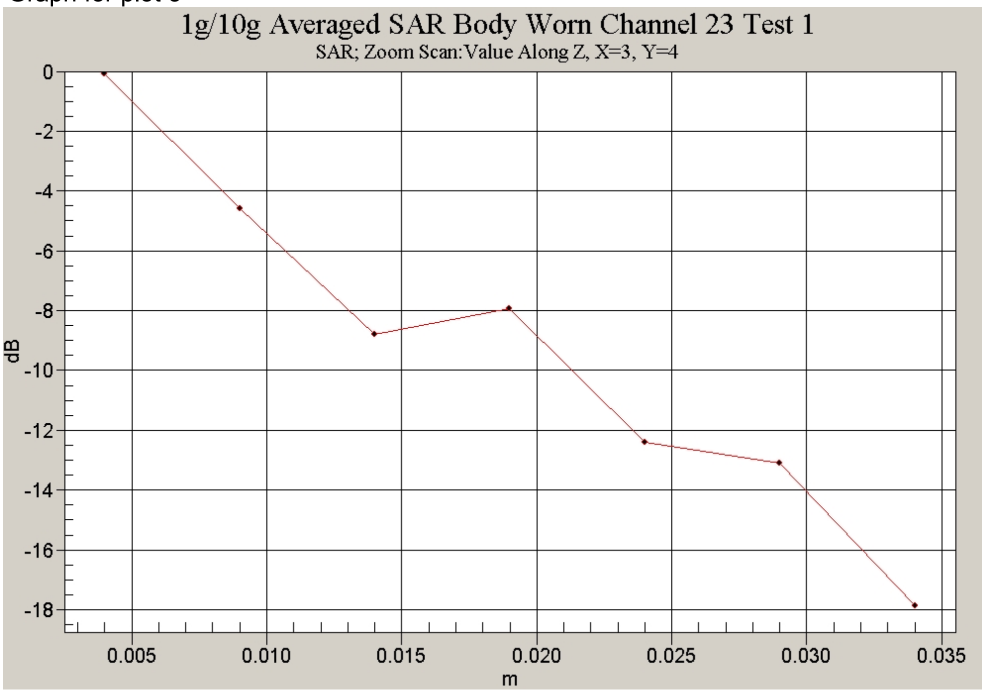
Z-Axis Graph for plot 1



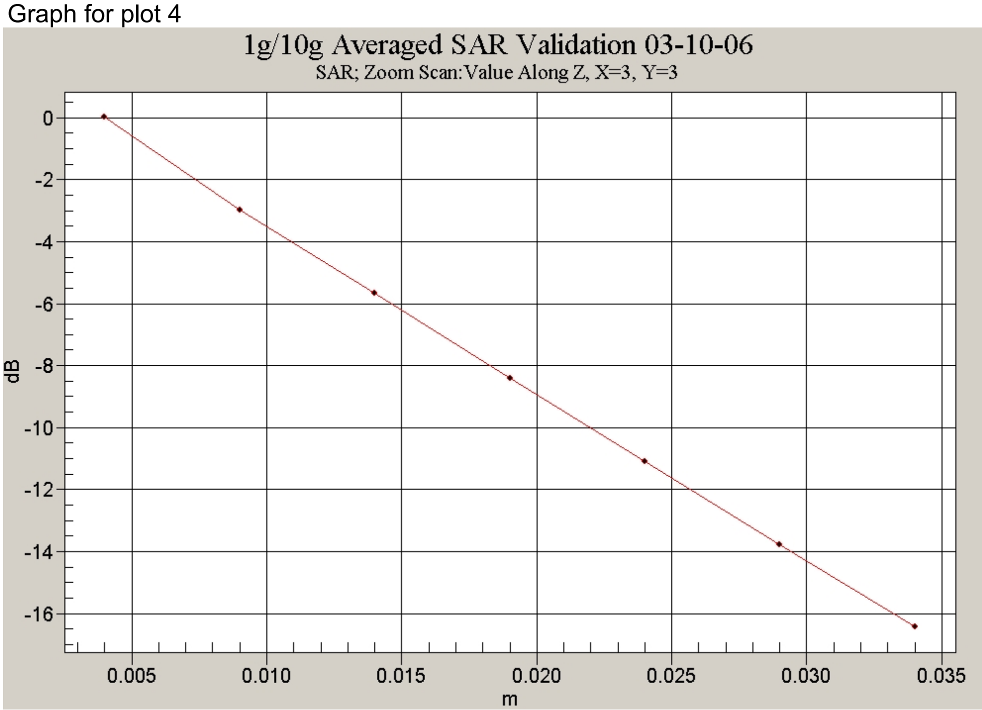
Z-Axis Graph for plot 2



Z-Axis Graph for plot 3



Z-Axis Graph for plot 4



APPENDIX C - SAR EQUIPMENT CALIBRATION CERTIFICATES

E-Field Probe SN1377 Calibration	8 Pages
2450MHz Dipole Calibration	5 Pages