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SAR Test Report

Report Number: M040827 - TAIT ELECTRONICS - TPAB1A

Test Sample:	Handheld Transceiver
Model Number:	TPAB1A
Tested For:	Tait Electronics
FCC ID:	CASTPAB1A
Date of Issue:	22nd September 2004

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SAR EVALUATION
Tait Electronics Handheld Transceiver
Model: TPAB1A
Report Number: M040827 - TAIT ELECTRONICS - TPAB1A
FCC ID: CASTPAB1A

1.0 GENERAL INFORMATION

Test Sample:	Handheld Transceiver
Device Category:	Portable
Test Device:	Production Unit
Model Number:	TPAB1A
FCC ID:	CASTPAB1A
RF exposure Category:	General Population/Uncontrolled
Manufacturer:	Tait Electronics Ltd
Address:	555 Wairakei Road, Christchurch New Zealand
Test Standard/s:	Evaluating Compliance with FCC Guidelines For Human Exposure to Radiofrequency Electromagnetic Fields Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01)
Statement Of Compliance:	The Tait Electronics Handheld Transceiver model TPAB1A Complied with the FCC Occupational/Controlled RF exposure limits of 8.0mW/g.
Test Dates:	7th to 9th September 2004
Tested for:	Tait Electronics
Address:	555 Wairakei Road, Christchurch, New Zealand
Contact:	Bruce Jensen
Test Officer:	**Peter Jakubiec**
Authorised Signature:	**Aaron Sargent** **B. Elec Eng**

SAR EVALUATION
Tait Electronics Handheld Transceiver
Model: TPAB1A
Report Number: M040827 - TAIT ELECTRONICS - TPAB1A

2.0 DESCRIPTION OF DEVICE

2.1 Description of Test Sample

The device tested was a Tait Electronics Handheld Transceiver operating in the 136 to 174MHz frequency bands. It has an integral antenna and was tested in the Face and Belt-Clip configurations of the phantom.

Operating Mode during Testing	: Continuous Wave 100% duty cycle
Operating Mode production sample	: 50% duty cycle
Modulation Scheme	: Direct Frequency Modulation
Device Power Rating for test sample and identical production unit	: 4 Watts
Antenna type	: Helical
Applicable Head Configurations	: None
Applicable Body Worn-Configurations	: Belt-Clip and Face Position
Battery Options	: None

2.2 Test sample Accessories

2.2.1 Battery Types

A NiMh battery is used to power the Tait Electronics Handheld Transceiver Model: TPAB1A. The maximum rated power is 4W in the 136-174 MHz frequency band. SAR measurements were performed with a standard battery.

2.2.2 Belt Clip

One type of metallic belt clip is sold with the device. The belt clip is fixed to the back of the device and provides a spacing of 15 mm between the device and flat phantom. This metallic belt-clip was attached to the device during testing in the Belt-Clip position.

2.2.3 Pouch

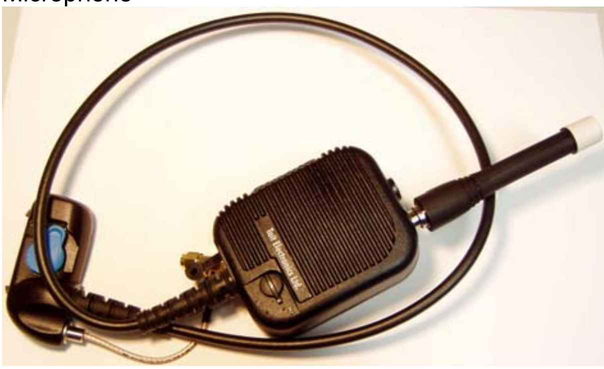
A leather pouch is supplied with the device. The pouch provides a spacing of 40 mm between the device and flat phantom. The speaker microphone cable was connected during testing in the Belt-Clip with pouch position.

2.2.4 Headset Output

The device has a headset output to which a supplied Hands free speaker/microphone was connected to the device during all testing in the belt-clip position. See following photograph.

Photos of Accessories

Microphone



Pouch and Belt loop

Antennas and Belt -Clip

Pouch and Belt loop

Two types of antennas are used with the TPAB1A both Whip and Mini-Helical. A tuned antenna is used for each of the frequency ranges 136, 150 and 176MHz. For SAR measurements all antennas were tested for all test positions.

Table 1: Antenna Label Designation

Frequency	Antenna Type	Designator
136MHz	Whip	Ant Low
150MHz	Whip	Ant Mid
176MHz	Whip	Ant High
136MHz	Mini-Helical	Ant Mini Low
150MHz	Mini-Helical	Ant Mini Mid
176MHz	Mini-Helical	Ant Mini High

2.3 Test Signal, Frequency and Output Power

The Handheld Transceiver operates within the 136 to 174MHz frequency band.

The fixed frequency channels used in the testing are shown in Table 1. Excluding the speaker/microphone and other device accessories there were no wires or other connections to the Handheld Transceiver during the SAR measurements.

At the beginning and completion of the SAR tests the EUT was modified to accept a standard RF connector at the RF output of the device. The conducted power of the device was subsequently measured with a calibrated Power Meter. The results of this measurement taken after batteries were fitted are listed in table 2.

Table 2: Frequency and Output Power

Channel	Channel Frequency MHz	Maximum Conducted Output Power Measured
1	136	37.01
2	155	37.15
3	174	37.05

2.4 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 field at a defined position inside the phantom before the commencement of each test and again after the completion of the test. Conducted power measurements were performed at the beginning and end of each scan at the antenna port. The uncertainty associated with the power drift was less than 12% and was factored into the final SAR results.

2.5 DETAILS OF TEST LABORATORY

2.5.1 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

2.5.2 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 EMR standards:

AS/NZS 2772.2:	RF and microwave radiation hazard measurement
ARPANSA:	Radiation Protection Standard, maximum exposure to RF fields.
ACA:	Electromagnetic Radiation (Human Exposure) Standard :2003
FCC:	Guidelines for Human Exposure to RF Electromagnetic Field
CENELEC:	EN50361:2003
IEEE:	1528:2003

The scope of the NATA accreditation does not cover the SAR measurements in this report.

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

2.5.3 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 in the range 42% to 44%. The liquid parameters were measured daily prior to the commencement of each test. 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 V4.2 Build 37** 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 300 MHz with the SPEAG D300V2 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 @ 300MHz

The following table lists the dielectric properties of the tissue simulating liquid measured prior to each SAR validation. The results of the validation for each day are listed in columns 4 and 5. The forward power into the reference dipole for each SAR validation was adjusted to 100mW.

Table 3: Validation Results (Dipole: SPEAG D300V2 SN: 1005)

1. Validation Date	2. $\in$r (measured)	3. σ (mho/m) (measured)	4. Measured SAR 1g (mW/g)	5. Measured SAR 10g (mW/g)
7th Sept 2004	45.3	0.87	0.779	0.514
8th Sept 2004	44.9	0.85	0.702	0.458
9th Sept 2004	45.1	0.85	0.764	0.499

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 300MHz. 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 (D300V2) during calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in table 4 below.

Table 4: Deviation from reference validation values

Frequency and Date	Measured SAR 1g (mW/g)	Measured SAR 1g (Normalized to 1W)	SPEAG Calibration reference SAR Value 1g (mW/g)	Deviation From SPEAG (1g)	IEEE Std 1528 reference SAR value 1g (mW/g)	Deviation From IEEE (1g)
300MHz 7th Sept 2004	0.779	3.12	2.94	6.1	3.0	4.0
300MHz 8th Sept 2004	0.702	2.81	2.94	-4.4	3.0	-6.3
300MHz 9th Sept 2004	0.764	3.06	2.94	4.1	3.0	2.0

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 a least 15cm with a tolerance of ±0.2cm.

3.5 Phantom Properties (Size, Shape, Shell Thickness)

The phantom used during the validations was the “Flat Phantom” model: PO1A V4.4e from SPEAG. It is a strictly validation phantom with a single thickness of 6mm and was filled with the required tissue simulating liquid. The flat phantom support structures were all non-metallic and spaced more than one device width away in transverse directions.

For SAR testing in the body worn positions an AndreT phantom was used. The phantom thickness is 2.0mm+/-0.2 mm and the phantom was filled with the required tissue simulating liquid. Table 5 provides a summary of the measured phantom properties. *Refer to Appendix D Part 4, for details of SAM phantom thickness tolerance, corresponding dielectric properties, and loss tangent*.

Table 5: Phantom Properties (300MHz-2500MHz)

Phantom Properties	Requirement for specific EUT	Measured
Depth of Phantom		200mm
Width of flat section		320mm
Length of flat section		870mm
Thickness of flat section	2.0mm 60.2mm (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: AndreT 2mm Flat Phantom

Photo 2: AndreT 2mm Flat Phantom

3.6 Tissue Material Properties

The dielectric parameters of the brain 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 6: Measured Brain Simulating Liquid Dielectric Values

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
300MHz	44.9-45.3	43.5 ±5% (41.3 to 45.6)	0.85-0.87	0.87 ±5% (0.83 to 0.91)	1000

Table 7: Measured Brain Simulating Liquid Dielectric Values

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
136MHz	52.4	53.5 ±5% (50.8 to 56.2)	0.75	0.74 ±5% (0.70 to 0.78)	1000
150MHz	51.2	52.3 ±5% (49.7 to 54.9)	0.77	0.76 ±5% (0.72 to 0.80)	1000
176MHz	50.4	50.9 ±5% (48.4 to 53.9)	0.78	0.78 ±5% (0.74 to 0.82)	1000

Table 8: Measured Body Simulating Liquid Dielectric Values

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
136MHz	62.0-62.1	63.0 ±5% (59.9 to 66.2)	0.76-0.77	0.77 ±5% (0.73 to 0.81)	1000
150MHz	61.4	61.9 ±5% (58.8 to 65.0)	0.78	0.80 ±5% (0.76 to 0.84)	1000
176MHz	60.8-60.9	61.0 ±5% (58.0 to 64.0)	0.79	0.82 ±5% (0.78 to 0.86)	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 9: Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
7th Sept 2004	21.0	20.5	42
8th Sept 2004	20.4	19.8	44
9th Sept 2004	20.4	19.7	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 10: Tissue Type: Brain @ 150MHz
Volume of Liquid: 60 Litres

Approximate Composition	% By Weight
Distilled Water	38.56
Salt	3.95
Sugar	56.32
HEC	0.98
Bactericide	0.19

Table 11: Tissue Type: Muscle @ 150MHz
Volume of Liquid: 60 Litres

Approximate Composition	% By Weight
Distilled Water	51.16
Salt	1.49
Sugar	46.78
HEC	0.52
Bactericide	0.05

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.

A foam spacer is used to raise the device above the clamp of the device holder to minimise any affect on the radiation characteristics of the device. In cases where foam is not used the device is mounted so that the antenna is unobstructed.

Refer to Appendix A2 for photograph 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 20 mm x 20 mm. The actual Area Scan has dimensions of 81mm x 181mm surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation.

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 12: Uncertainty Budget for DASY4 Version V4.2 Build 37 – 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) (numerical calibration)	E.2.1	4.8	N	1	1	1	4.8	4.8	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
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	0.8	R	1.73	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1	1	1.5	1.5	∞
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									
Test Sample Positioning	E.4.2	1.61	N	1	1	1	1.6	1.6	11
Device Holder Uncertainty	E.4.1	3.34	N	1	1	1	3.3	3.3	7
Output Power Variation – SAR Drift Measurement	6.6.2	12	R	1.73	1	1	6.9	6.9	∞
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	0.64	0.43	1.8	1.2	∞
Liquid Conductivity – Measurement uncertainty	E.3.3	4.3	N	1	0.64	0.43	2.8	1.8	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	4.3	N	1	0.6	0.49	2.6	2.1	5
Combined standard Uncertainty			RSS				12.0	11.6	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.0	23.3	

Estimated total measurement uncertainty for the DASY4 measurement system was ±12%. The extended uncertainty (K = 2) was assessed to be ±24% based on 95% confidence level. The uncertainty is not added to the measurement result.

Table 13: Uncertainty Budget for DASY4 Version V4.2 Build 37 - 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	4.4	N	1	1	1	4.4	4.4	∞
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	8.3	R	1.73	1	1	4.8	4.8	∞
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	3.9	R	1.73	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning		1	R	1.73	1	1	0.6	0.6	∞
Device Holder Uncertainty		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	10	N	1.73	0.6	0.43	3.5	2.5	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	5	N	1.73	0.6	0.49	1.7	1.4	5
Combined standard Uncertainty			RSS				10.0	9.5	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				20.0	19.10	

Estimated total measurement uncertainty for the DASY4 measurement system was ±10.0%. The extended uncertainty (K = 2) was assessed to be ±20.0% based on 95% confidence level. The uncertainty is not added to the Validation measurement result.

6.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table 14: SPEAG DASY4 Version 4.2 Build 37

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	No
SAM Phantom	SPEAG	N/A	1060	Not applicable	No
Flat Phantom	SPEAG	PO1A V4.4e - 6mm	1003	Not Applicable	Yes
Data Acquisition Electronics	SPEAG	DAE3 V1	359	16-July-2004	No
Data Acquisition Electronics	SPEAG	DAE3 V1	442	09-Sept - 04	Yes
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	No
Probe E-Field	SPEAG	ET3DV6	1380	18-July-2004	No
Probe E-Field	SPEAG	ET3DV6	1377	19-Sept - 04	Yes
Antenna Dipole 300 MHz	SPEAG	D300V2	1005	27- Nov-2005	Yes
Antenna Dipole 450 MHz	SPEAG	D450V2	1009	24-Jan-05	No
Antenna Dipole 900 MHz	SPEAG	D900V2	047	12-July-06	No
Antenna Dipole 1800 MHz	SPEAG	D1800V2	242	13-July-06	No
Antenna Dipole 2450 MHz	SPEAG	D2450V2	724	9-Nov-2004	No
RF Amplifier	Mini-Circuits	ZHL-42	N/A	Not applicable	Yes
RF Amplifier	Mini-Circuits	ZVE-8G	N/A	In test	No
Synthesized signal generator	Hewlett Packard	ESG-D3000A	GB37420238	In test	Yes
RF Power Meter Dual	Hewlett Packard	437B	3125012786	26-May-05	Yes
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	27-May-05	Yes
RF Power Meter Dual	Gigatronics	8542B	1830125	15-Jan-05	Yes
RF Power Sensor	Gigatronics	80301A	1828805	15-Jan-05	Yes
Network Analyser	Hewlett Packard	8714B	GB3510035	06-Sept-04	Yes
Dual Directional Coupler	Hewlett Packard	778D	1144 04700	In test	No

7.0 OET BULLETIN 65 – SUPPLEMENT C TEST METHOD

7.1 Description of the Test Positions (Belt Clip and In front of face)

The accessories used with the EUT have the potential to change the SAR distribution. In order to characterise these accessories a number of test positions were devised.

SAR measurements were performed in the following positions:
1. Belt-Clip Position
2. Belt-Clip Position with Pouch
3. Belt-Clip Position with Speaker Microphone
4. Face Position
5. Face Position with Speaker Microphone

Six individual tuned antennas are used with theTPAB1A. SAR measurements were performed on each antenna and in each test position.

All test positions were measured in the flat section of the AndreT (PL870) phantom.
See Appendix A for photos of test positions.

7.1.1 "Belt Clip Position"
The device was tested in the 2.00mm flat section of the AndreT phantom for the "Belt Clip" position. A belt clip maintained a distance of approximately 15mm between the back of the device and the flat phantom. The Transceiver was placed at the flat section of the phantom and suspended until the Belt Clip touched the phantom. The belt clip was made of plastic and metallic parts and the device was connected with the hands free earpiece/microphone.

7.1.2 "Belt Clip Position with Pouch"
The device was tested in the 2.00mm flat section of the AndreT phantom for the "Belt Clip with Pouch" position. A leather Pouch and Belt loop maintained a distance of approximately 40mm between the back of the device and the flat phantom. The Transceiver was placed at the flat section of the phantom and suspended until the Belt Clip touched the phantom. The belt loop was made of leather with metallic studs.

7.1.3 "Belt Clip Position with Speaker Microphone"
The device was tested in the 2.00mm flat section of the AndreT phantom for the "Belt Clip" position. A belt clip maintained a distance of approximately 15mm between the back of the device and the flat phantom. The Transceiver was placed at the flat section of the phantom and suspended until the Belt Clip touched the phantom. The belt clip was made of plastic and metallic parts and the device was connected with the hands free earpiece/microphone.

7.1.4 "Face Position"
The SAR evaluation was performed in the flat section of the AndreT phantom. The device was placed 25mm from the phantom, this position is equivalent to the device placed in front of the nose. The supporting hand was not used.

7.1.5 "Face Position with Speaker Microphone"
The SAR evaluation was performed in the flat section of the AndreT phantom. The device was placed 25mm from the phantom with the speaker microphone connected. This position is equivalent to the device placed in front of the nose.

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 RF 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 RF 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 the Face and Belt-Clip configurations of the phantom.

Table 15: SAR MEASUREMENT RESULTS–Belt-Clip positions

1. Test Position	2. Plot No.	3. Test Channel	4. Test Freq (MHz)	5. Measured 1g SAR Results (mW/g)	6. Measured 1g SAR Results (mW/g) Extrapolated to 50% Duty Cycle	7. Conducted Power measured Before Test	8. Conducted Power measured After Test	9. Measured Drift (dB)
	1	1	136	3.15	1.58	36.89	36.66	-0.23
Belt-Clip	2	2	150	2.61	1.31	37.61	36.35	-0.26
	3	3	174	1.69	0.85	36.71	36.31	-0.40
	4	1	136	2.16	1.08	36.86	36.67	-0.19
Belt-Clip	5	2	150	1.75	0.88	37.05	36.72	-0.33
	6	3	174	1.40	0.70	36.61	36.35	-0.26
Belt-Clip with	7	1	136	1.02	0.51	36.88	36.67	-0.21
Pouch	8	2	150	1.84	0.92	36.99	36.61	-0.38
	9	3	174	1.13	0.57	36.69	36.27	-0.42
Belt-Clip with	10	1	136	0.817	0.41	36.85	36.69	-0.16
Pouch	11	2	150	0.562	0.28	37.01	36.55	-0.46
	12	3	174	0.885	0.44	36.69	36.35	-0.34
Belt-Clip with	13	1	136	8.21	4.11	36.65	36.37	-0.28
Speaker Mic	14	2	150	4.48	2.24	36.43	36.10	-0.33
	15	3	174	2.63	1.32	36.34	35.89	-0.45
Belt-Clip with	16	1	136	7.92	3.96	36.58	36.38	-0.20
Speaker Mic	17	2	150	1.98	0.99	36.41	36.14	-0.27
	18	3	174	2.51	1.26	36.21	35.89	-0.32

*NOTE: The measurement uncertainty has not been added to the result.

Table 16: SAR MEASUREMENT RESULTS– Face positions

1. Test Position	2. Plot No.	3. Test Channel	4. Test Freq (MHz)	5. Measured 1g SAR Results (mW/g)	6. Measured 1g SAR Results (mW/g) Extrapolated to 50% Duty Cycle	7. Conducted Power measured Before Test	8. Conducted Power measured After Test	9. Measured Drift (dB)
	19	1	136	1.68	0.84	37.01	36.69	-0.32
Face Position	20	2	150	2.79	1.40	37.17	36.85	-0.32
	21	3	174	1.48	0.74	36.63	36.22	-0.41
	22	1	136	1.33	0.67	37.00	36.73	-0.27
Face Position	23	2	150	0.894	0.45	37.14	36.73	-0.41
	24	3	174	1.15	0.58	36.62	36.33	-0.29
Belt-Clip with	25	1	136	0.497	0.25	36.61	36.30	-0.31
Pouch	26	2	150	2.14	1.07	36.41	36.20	-0.21
	27	3	174	2.64	1.32	36.38	35.99	-0.39
Belt-Clip with	28	1	136	0.429	0.21	36.73	36.32	-0.41
Pouch	29	2	150	1.73	0.87	36.43	36.16	-0.27
	30	3	174	1.89	0.95	36.24	35.97	-0.27

*NOTE: The measurement uncertainty has not been added to the result.

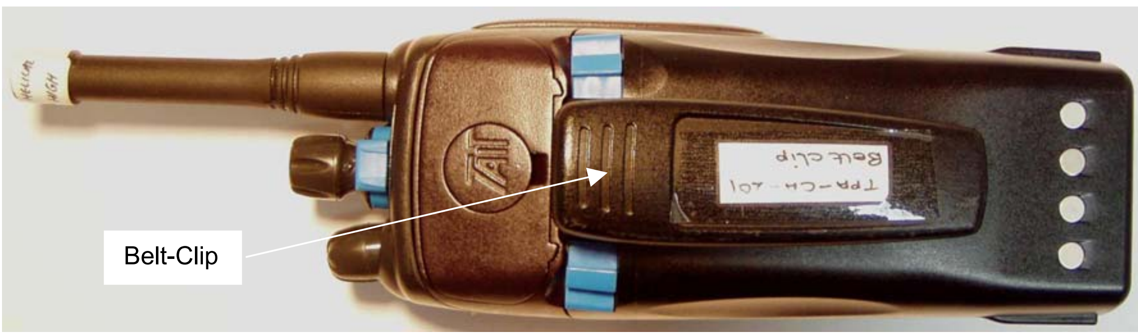
9.0 COMPLIANCE STATEMENT

The Tait Electronics Model TPAB1A FCC ID: CASTPAB1A 136 to 176MHz band Handheld Transceiver was found to comply with the FCC SAR requirements.

After extrapolating to a 50% PTT duty cycle, the highest SAR level recorded was 4.11 mW/g for a 1g cube. This value was measured in channel 1 in the “Belt-Clip with Speaker Microphone”. This level was below the Occupational/Controlled limit of 8.0 mW/g, even taking into account the measurement uncertainty of 24%.

APPENDIX A1
TEST SAMPLE PHOTOGRAPHS

Tait Electronics
Model: TPAB1A



Antennas and Belt-Clip

Speaker Microphone

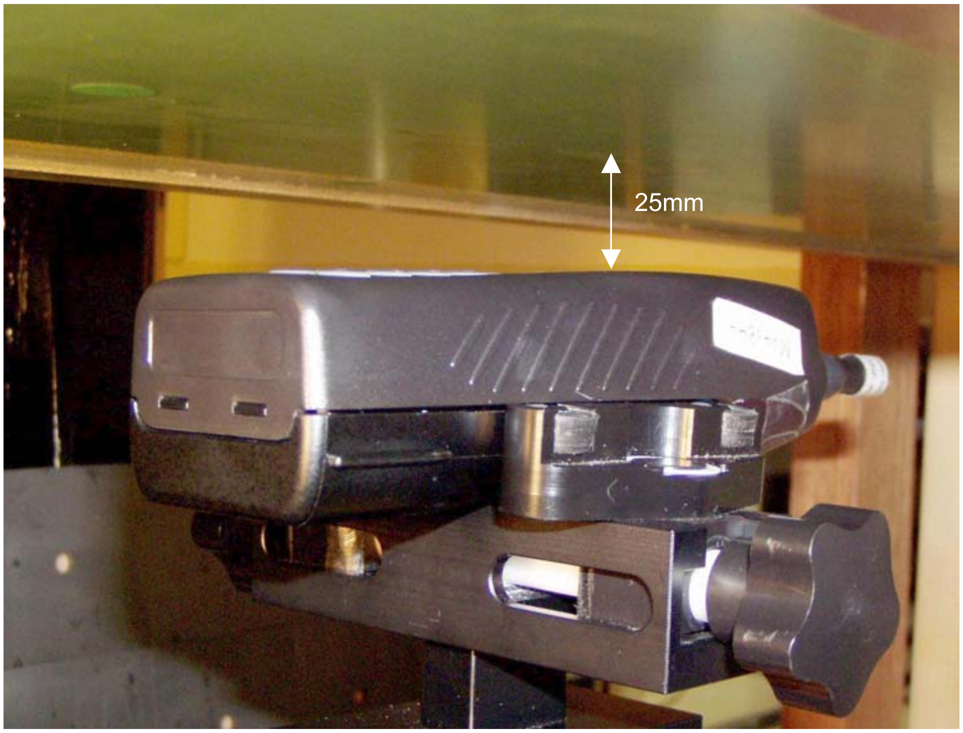
Speaker Microphone

Battery

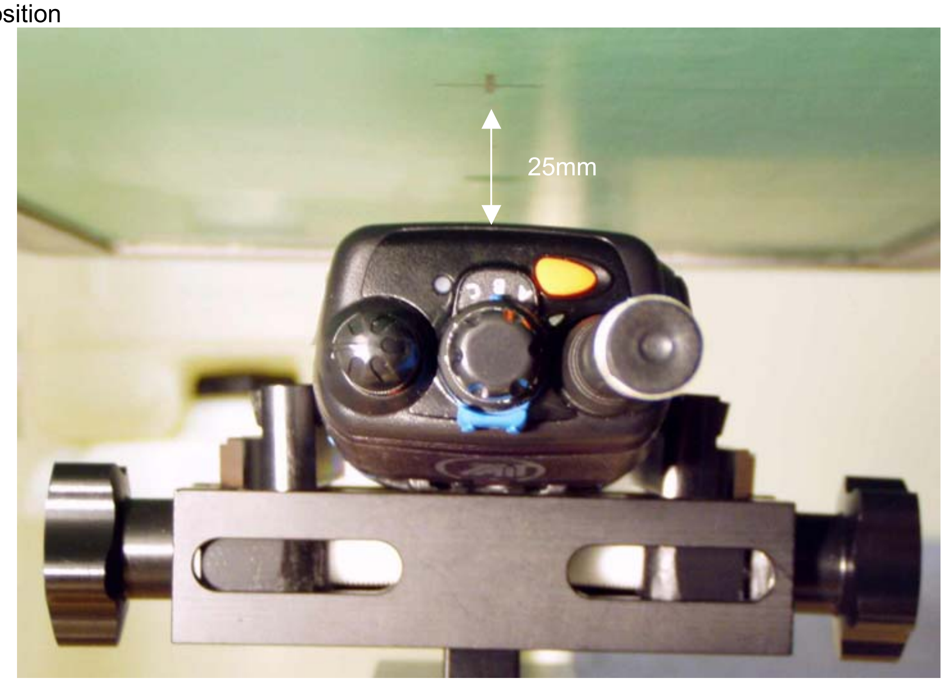
Battery

APPENDIX A2
TEST SETUP PHOTOGRAPHS

Face Position

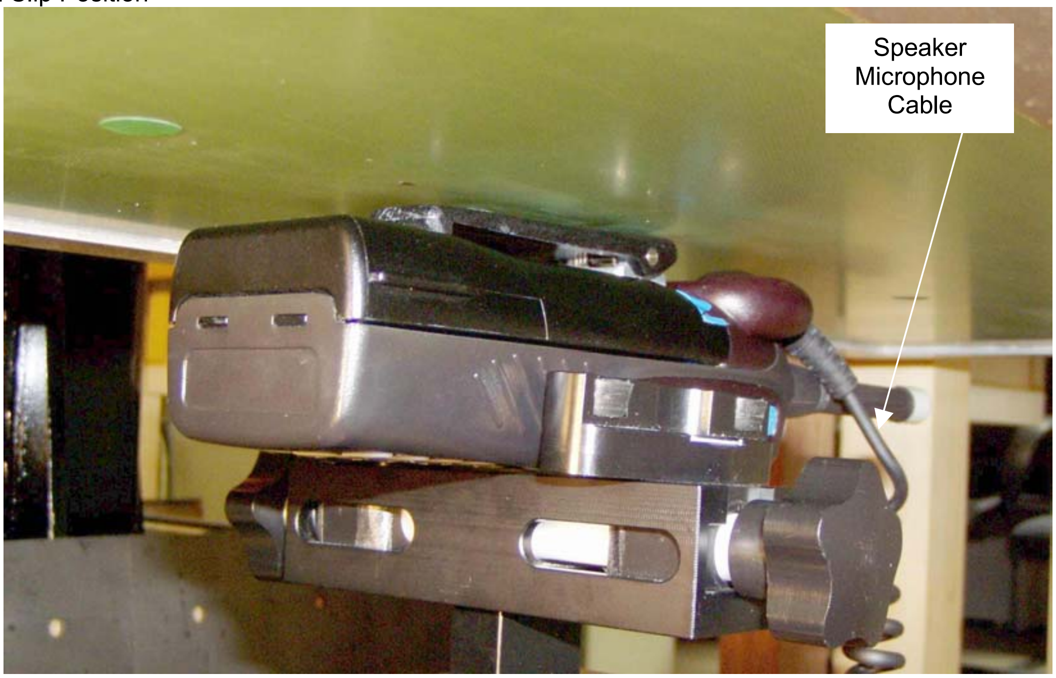


Face Position



APPENDIX A3
TEST SET UP PHOTOGRAPHS

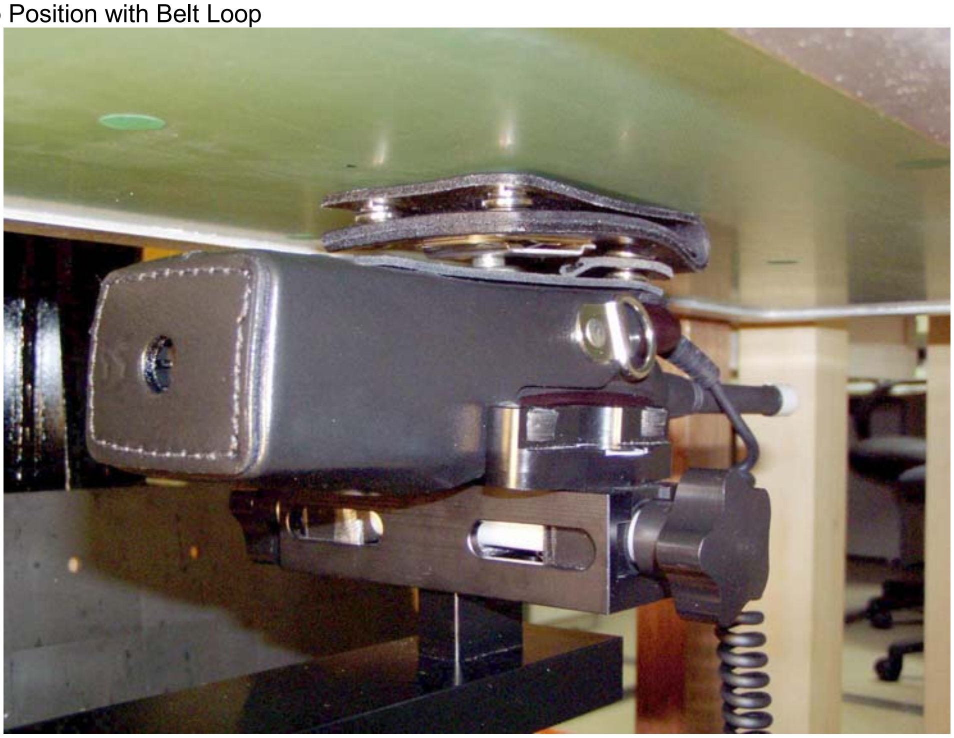
Belt Clip Position



Belt Clip Position

APPENDIX A4
TEST SET UP PHOTOGRAPHS

Belt Clip Position with Belt Loop



Belt Clip Position with DC power supply