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# SAR Test Report

## Report Number: M121040F

**Test Sample:** Simoco Push to Talk Transceiver

**Model Number:** SRP9180 UW

**FCC ID:** STZSRP9170UW

**Tested For:** ComGroup Australia Pty Ltd

**Date of Issue:** 29th November 2012

## CONTENTS

# SAR EVALUATION

Simoco Push to Talk Transceiver, **Model:** SRP9180 UW **Report Number:** M121040F

## 1.0 GENERAL INFORMATION

| | |
|---|---|
| **Test Sample:** | Simoco Push to Talk Transceiver |
| **Model Number:** | SRP9180 UW |
| **Serial Number:** | FT9HX1228DDBK |
| **FCC ID:** | STZSRP9170UW |
| **Hardware Version:** | Revision 7 |
| **Software Version:** | V 2.21 |
| **Manufacturer:** | ComGroup Australia Pty Ltd |
| **Device Category:** | Portable Transmitter |
| **Test Device:** | Production Unit / Prototype Sample |
| **RF exposure Category:** | Occupational/Aware user |
| **Tested for:** | ComGroup Australia Pty Ltd |
| **Address:** | 1270 Ferntree Gully Road Scoresby, VIC 3179, Australia |
| **Contact:** | Bob Stowell |
| **Phone:** | 03 9730 3800 |
| **Fax:** | 03 9730 3968 |
| **Email:** | bstowell@comgroup.net.au |
| **Test Standard/s:** | Evaluating Compliance with FCC Guidelines For Human Exposure to Radiofrequency Electromagnetic Fields<br>Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01)<br>**IEEE 1528: 2003**<br>Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)<br>RSS-102 Issue 4<br>**EN 62209-2:2010**<br>Human exposure to radio frequency fields from hand-held and bodymounted wireless communication devices. Human models, instrumentation, and procedures.<br>**Part 2**: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz) |
| **Statement Of Compliance:** | The Simoco Push to Talk Transceiver, model SRP9180 UW. Complied with the FCC Occupational/Controlled RF exposure limits of 8 mW/g per requirements of 47CFR2.1093(d). It also complied with IC RSS-102 requirements. |
| **Test Dates:** | 12th November 2012 to 13th November 2012 |
| **Test Officer:** | Peter Jakubiec |
| **Authorised Signature:** | Peter Jakubiec |

# 2.0 DESCRIPTION OF DEVICE

## 2.1 Description of Test Sample

The device tested was a Simoco Push to Talk Transceiver, Model: SRP9180 UW operating in 450 MHz frequency band. It will be referred to as the device under test (DUT) throughout this report. The DUT has an external integral fixed length antenna and was tested in the Face Frontal and Belt Clip configurations of the phantom.

| | |
|---|---|
| Operating Mode during Testing | : Continuous Wave 100% duty cycle |
| Operating Mode production sample | : 50% duty cycle |
| Modulation: | : FM |
| Device Power Rating for test sample and identical production unit | : 5 W |
| Device Dimensions (LxWxH) | : 140 x 55 x 40 mm |
| Antenna type | : Quarter wave dipole whip antenna |
| Applicable Head Configurations | : Face Frontal |
| Applicable Body Configurations | : Belt Clip Position |
| Battery Options | : 7.4V 3000mAh Li-ion Battery Pack |

## 2.2 Test sample Accessories

The DUT also allows use of handheld Antenna Speaker-Microphone model: PAR-9180 LMR4 (as an option), and the DUT can also be used with a leather holster Model: PAR-9180CLBC3. Photographs included in appendix A.

### 2.2.1 Battery Types

A 7.4V 3000mAh Li-ion Battery Pack is used to power the DUT. The maximum rated power is 5 W. SAR measurements were performed with a standard 7.4 V battery.

### 2.2.2 Belt Clip

One type of metal-plastic belt clip is sold with the device. The belt clip is fixed to the back of the device and provides a spacing of 12 mm (11mm for SPK-MIC) between the device and flat phantom. This metal-plastic belt-clip was attached to the device during testing in the Belt-Clip position.

## 2.3 Test Signal, Frequency and Output Power

The DUT operates in the frequency range 440 MHz to 512 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.
FCC guidelines (KDB 643646 D01 SAR Test for PTT Radios v01r01) stipulate that SAR measurements be done at the “highest channel” of the operating band, and if SAR is higher than 3.5 mW/g also at the adjacent channels. Due to the variations in antenna gain in near field and proximity of large body of tissue simulating liquid (coupling) for different channels, determining the worst case SAR channels was done using the prescans. Full SAR measurements were done on the channels that were found to have the highest SAR values using the prescan technique. The DUT is supplied with only one size of antenna.
The device has a speaker/microphone output to which a supplied speaker/microphone was connected during all testing in the belt-clip position. Excluding the speaker/microphone accessory there were no wires or other connections to the Handheld Transceiver during the SAR measurements.

**Table: Test Frequencies**

| Frequency Range | Traffic Channels | Nominal Power (W) |
|---|---|---|
| 440 – 512 MHz | Ch0 – Ch4 | 5 |

## 2.4 Conducted Power Measurements

The conducted power of the DUT was measured in the 440 MHz to 512 MHz frequency range with a calibrated Power Meter. The results of this measurement are listed in table below.

**Table: Frequency and Output Power**

| Channel | Channel Frequency MHz | Battery Type | Maximum Conducted Output Power dBm |
|---|---|---|---|
| Ch0 | 440.075 MHz | Li-ion | 37.13 |
| Ch1 | 458.075 MHz | Li-ion | 36.99 |
| Ch2 | 476.075 MHz | Li-ion | 37.00 |
| Ch3 | 494.075 MHz | Li-ion | 37.10 |
| Ch4 | 511.975 MHz | Li-ion | 37.24 |

## 2.5 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 conducted RF at the antenna port before the commencement of each test and again after the completion of the test.

**Table: Battery Details**

| | | | |
|---|---|---|---|
| **Battery #1:** | 7.4V 3000 mAh Li-ion | **Battery #2:** | 7.4V 3000 mAh Li-ion |
| **Model No.:** | PAR-9180 BATL 3x | **Model No.:** | PAR-9180 BATL 3x |
| **Serial No.:** | 10611 | **Serial No.:** | 51311 |

## 2.6 Details of Test Laboratory

### 2.6.1 Location

EMC Technologies Pty Ltd
176 Harrick Road
Keilor Park, (Melbourne) Victoria
Australia 3042

**Telephone:** +61 3 9365 1000
**Facsimile:** +61 3 9331 7455
**email:** melb@emctech.com.au
**website:** www.emctech.com.au

### 2.6.2 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:

| | |
|---|---|
| **AS/NZS 2772.1:** | 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 62209-1:2006** | Human Exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models instrumentation and procedures. **Part 1:** Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (300 MHz to 3 GHz) |
| **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.

### 2.6.3 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 to 45 %. 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 DASY5 SAR measurement system using the SN1380 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 **DASY5 Version 52** 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 DASY5 fully complies with the OET65 C (01-01), IEEE 1528 and EN50361SAR measurement requirements.

## 3.2 E-Field Probe Type and Performance

The SAR measurements were conducted with the dosimetric probe ET3DV6 Serial: 1380 (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 DASY5 was operating within its specifications. The validation was performed at 450 MHz with the SPEAG D450V3 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 @ 450 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 400mW.

**Table: Validation Results (Dipole: SPEAG** D450V3 **SN: 1074)**

| 1. Validation Date | 2. ∈r (measured) | 3. σ (mho/m) (measured) | 4. Measured SAR 1g (mW/g) | 5. Measured SAR 10g (mW/g) |
|---|---|---|---|---|
| 12th November 2012 | 42.5 | 0.86 | 2.00 | 1.32 |
| 13th November 2012 | 42.9 | 0.87 | 2.00 | 1.32 |

### 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 450 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 (D450V3) 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**

| 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 (%) | IEEE Std 1528 reference SAR value 1g (mW/g) | Deviation From IEEE (%) |
|---|---|---|---|---|---|---|
| 450 MHz 12th November 2012 | 2 | 5.00 | 4.66 | 7.30 | 4.9 | 2.04 |
| 450 MHz 13th November 2012 | 2 | 5.00 | 4.66 | 7.30 | 4.9 | 2.04 |

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.

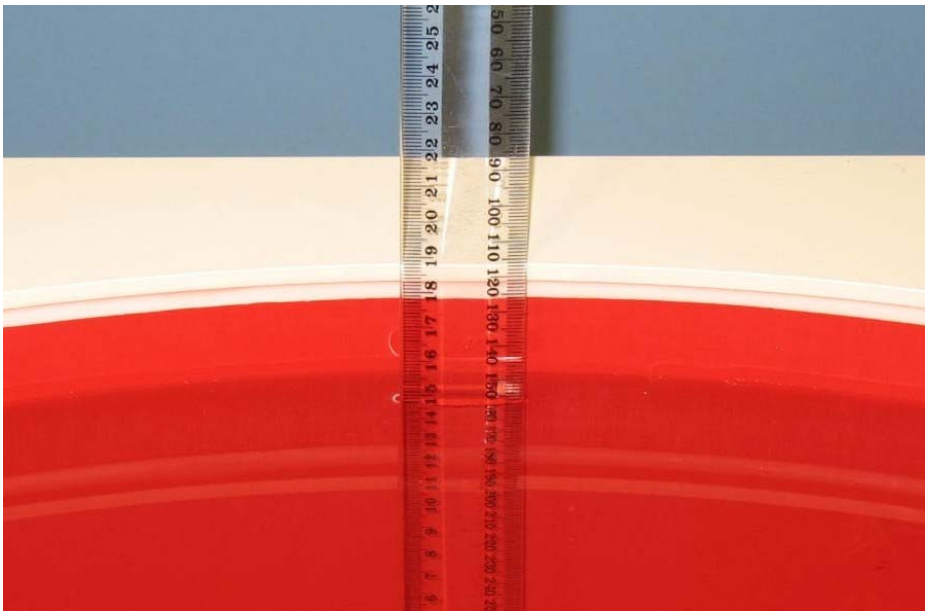

Photo of liquid Depth in Flat Phantom

## 3.5 Phantom Properties (Size, Shape, Shell Thickness)

For SAR testing in the Face Frontal and Belt Clip positions (also for the System Check) an SPEAG Flat Phantom ELI 4.0 was used. The phantom thickness is 2.0mm +/-0.2 mm and the phantom was filled with the required tissue simulating liquid. Table below provides a summary of the measured phantom properties

**Photo 1: Flat_Phantom ELI 4.0 2mm**

## 3.6 Tissue Material Properties

The dielectric parameters of the 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 Brain Simulating Liquid Dielectric Values**

| Frequency Band | ∈r (measured range) | ∈r (target) | σ (mho/m) (measured range) | σ (target) | ρ kg/m$^3$ |
|---|---|---|---|---|---|
| 440 MHz | 42.7 | 43.5 ±5% (41.3 – 45.7) | 0.85 | 0.87 ±5% (0.82 – 0.91) | 1000 |
| 458 MHz | 42.3 | 43.5 ±5% (41.3 – 45.7) | 0.86 | 0.87 ±5% (0.82 – 0.91) | 1000 |
| 476 MHz | 41.9 | 43.5 ±5% (41.3 – 45.7) | 0.88 | 0.87 ±5% (0.82 – 0.91) | 1000 |
| 494 MHz | 41.7 | 43.5 ±5% (41.3 – 45.7) | 0.89 | 0.87 ±5% (0.82 – 0.91) | 1000 |
| 512 MHz | 41.4 | 43.5 ±5% (41.3 – 45.7) | 0.91 | 0.87 ±5% (0.82 – 0.91) | 1000 |

**Table: Measured Body Simulating Liquid Dielectric Values**

| Frequency Band | ∈r (measured range) | ∈r (target) | σ (mho/m) (measured range) | σ (target) | ρ kg/m$^3$ |
|---|---|---|---|---|---|
| 440 MHz | 56.8 | 56.7 ±5% (53.9 – 59.5) | 0.92 | 0.94 ±5% (0.89 – 0.99) | 1000 |
| 458 MHz | 56.3 | 56.7 ±5% (53.9 – 59.5) | 0.94 | 0.94 ±5% (0.89 – 0.99) | 1000 |
| 476 MHz | 56.1 | 56.7 ±5% (53.9 – 59.5) | 0.96 | 0.94 ±5% (0.89 – 0.99) | 1000 |
| 494 MHz | 55.7 | 56.7 ±5% (53.9 – 59.5) | 0.97 | 0.94 ±5% (0.89 – 0.99) | 1000 |
| 512 MHz | 55.4 | 56.7 ±5% (53.9 – 59.5) | 0.99 | 0.94 ±5% (0.89 – 0.99) | 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 (%) |
|---|---|---|---|
| 12th November 2012 | 19.8 | 19.4 | 45 |
| 13th November 2012 | 20.1 | 19.8 | 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 @ 450MHz**
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: Tissue Type: Muscle @ 450MHz**
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 DASY5

The DASY5 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 DASY5 device holder is made of low-loss material having the following dielectric parameters: relative permittivity $\varepsilon$=3 and loss tangent $\delta$=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 DASY5

The SAR evaluation was performed with the SPEAG DASY5 system. A summary of the procedure follows:

a) A measurement of the conducted power value at the antenna port is used as a reference value for assessing the power drop of the DUT. Also a measurement of the SAR value at a fixed location is used. The power 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 120 mm x 345 mm 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 4 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 DASY5 Version 52– DUT SAR test**

| Error Description | Uncert. Value | Prob. Dist. | Div. | $C_i$ (1g) | $C_i$ (10g) | 1g $u_i$ | 10g $u_i$ | $v_i$ |
|---|---|---|---|---|---|---|---|---|
| Measurement System | | | | | | | | |
| Probe Calibration | 6.7 | N | 1.00 | 1 | 1 | 6.70 | 6.70 | ∞ |
| Axial Isotropy | 4.7 | R | 1.73 | 0.7 | 0.7 | 1.90 | 1.90 | ∞ |
| Hemispherical Isotropy | 9.6 | R | 1.73 | 0.7 | 0.7 | 3.88 | 3.88 | ∞ |
| Boundary Effects | 1 | R | 1.73 | 1 | 1 | 0.58 | 0.58 | ∞ |
| Linearity | 4.7 | R | 1.73 | 1 | 1 | 2.71 | 2.71 | ∞ |
| System Detection Limits | 1 | R | 1.73 | 1 | 1 | 0.58 | 0.58 | ∞ |
| Readout Electronics | 0.3 | N | 1.00 | 1 | 1 | 0.30 | 0.30 | ∞ |
| Response Time | 0.8 | R | 1.73 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Integration Time | 2.6 | R | 1.73 | 1 | 1 | 1.50 | 1.50 | ∞ |
| RF Ambient Noise | 3 | R | 1.73 | 1 | 1 | 1.73 | 1.73 | ∞ |
| RF Ambient Reflections | 3 | R | 1.73 | 1 | 1 | 1.73 | 1.73 | ∞ |
| Probe Positioner | 0.4 | R | 1.73 | 1 | 1 | 0.23 | 0.23 | ∞ |
| Probe Positioning | 2.9 | R | 1.73 | 1 | 1 | 1.67 | 1.67 | ∞ |
| Max. SAR Eval. | 1 | R | 1.73 | 1 | 1 | 0.58 | 0.58 | ∞ |
| Post Processing | 2 | R | 1.73 | 1 | 1 | 1.15 | 1.15 | ∞ |
| Test Sample Related | | | | | | | | |
| Power Scaling | 0 | R | 1.73 | 1 | 1 | 0.00 | 0.00 | ∞ |
| Test Sample Positioning | 2.9 | N | 1.00 | 1 | 1 | 2.90 | 2.90 | 145 |
| Device Holder Uncertainty | 3.6 | N | 1.00 | 1 | 1 | 3.60 | 3.60 | 5 |
| Output Power Variation – SAR Drift Measurement | 4.06 | R | 1.73 | 1 | 1 | 2.34 | 2.34 | ∞ |
| Phantom and Setup | | | | | | | | |
| Phantom Uncertainty | 7.5 | R | 1.73 | 1 | 1 | 4.33 | 4.33 | ∞ |
| Liquid Conductivity – Deviation from target values | 5 | R | 1.73 | 0.64 | 0.43 | 1.85 | 1.24 | ∞ |
| Liquid Permittivity – Deviation from target values | 5 | R | 1.73 | 0.6 | 0.49 | 1.73 | 1.41 | ∞ |
| Liquid Conductivity – Measurement uncertainty | 2.5 | N | 1.00 | 0.64 | 0.71 | 1.60 | 1.78 | ∞ |
| Liquid Permittivity – Measurement uncertainty | 2.5 | N | 1.00 | 0.6 | 0.26 | 1.50 | 0.65 | ∞ |
| Temp.unc. - Conductivity | 1.7 | R | 1.73 | 0.78 | 0.71 | 0.77 | 0.70 | ∞ |
| Temp. unc. - Permittivity | 0.3 | R | 1.73 | 0.23 | 0.26 | 0.04 | 0.05 | ∞ |
| Combined standard Uncertainty ($u_c$) | | | | | | 11.9 | 11.7 | |
| Expanded Uncertainty (95% CONFIDENCE LEVEL) | | | k= 2 | | | 23.8 | 23.5 | |

Estimated total measurement uncertainty for the DASY5 measurement system was ±11.9%. The extended uncertainty (K = 2) was assessed to be ±23.8% based on 95% confidence level. The uncertainty is not added to the measurement result.

**Table: Uncertainty Budget for DASY5 Version 52- Validation**

| Error Description | Uncert. Value | Prob. Dist. | Div. | $C_i$ (1g) | $C_i$ (10g) | 1g $u_i$ | 10g $u_i$ | $v_i$ |
|---|---|---|---|---|---|---|---|---|
| Measurement System | | | | | | | | |
| Probe Calibration | 6.7 | N | 1.00 | 1 | 1 | 6.70 | 6.70 | ∞ |
| Axial Isotropy | 4.7 | R | 1.73 | 1 | 1 | 2.71 | 2.71 | ∞ |
| Hemispherical Isotropy | 9.6 | R | 1.73 | 0 | 0 | 0.00 | 0.00 | ∞ |
| Boundary Effects | 1 | R | 1.73 | 1 | 1 | 0.58 | 0.58 | ∞ |
| Linearity | 4.7 | R | 1.73 | 1 | 1 | 2.71 | 2.71 | ∞ |
| System Detection Limits | 1 | R | 1.73 | 1 | 1 | 0.58 | 0.58 | ∞ |
| Readout Electronics | 0.3 | N | 1.00 | 1 | 1 | 0.30 | 0.30 | ∞ |
| Response Time | 0 | R | 1.73 | 1 | 1 | 0.00 | 0.00 | ∞ |
| Integration Time | 0 | R | 1.73 | 1 | 1 | 0.00 | 0.00 | ∞ |
| RF Ambient Noise | 1 | R | 1.73 | 1 | 1 | 0.58 | 0.58 | ∞ |
| RF Ambient Reflections | 1 | R | 1.73 | 1 | 1 | 0.58 | 0.58 | ∞ |
| Probe Positioner | 0.8 | R | 1.73 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Probe Positioning | 6.7 | R | 1.73 | 1 | 1 | 3.87 | 3.87 | ∞ |
| Max. SAR Eval. | 2 | R | 1.73 | 1 | 1 | 1.15 | 1.15 | ∞ |
| Post Processing | 2 | R | 1.73 | 1 | 1 | 1.15 | 1.15 | ∞ |
| Dipole Related | | | | | | | | |
| | | | | | | | | |
| Deviation of exp. dipole | 5.5 | R | 1.73 | 1 | 1 | 3.18 | 3.18 | ∞ |
| Dipole Axis to Liquid Dist. | 2 | R | 1.73 | 1 | 1 | 1.15 | 1.15 | ∞ |
| Input power & SAR drift | 5.00 | R | 1.73 | 1 | 1 | 2.89 | 2.89 | ∞ |
| Phantom and Setup | | | | | | | | |
| Phantom Uncertainty | 4 | R | 1.73 | 1 | 1 | 2.31 | 2.31 | ∞ |
| Liquid Conductivity – Deviation from target values | 5 | R | 1.73 | 0.64 | 0.43 | 1.85 | 1.24 | ∞ |
| Liquid Permittivity – Deviation from target values | 5 | R | 1.73 | 0.6 | 0.49 | 1.73 | 1.41 | ∞ |
| Liquid Conductivity – Measurement uncertainty | 2.5 | N | 1.00 | 0.78 | 0.71 | 1.95 | 1.78 | ∞ |
| Liquid Permittivity – Measurement uncertainty | 2.5 | N | 1.00 | 0.26 | 0.26 | 0.65 | 0.65 | ∞ |
| Temp.unc. - Conductivity | 1.7 | R | 1.73 | 0.78 | 0.71 | 0.77 | 0.70 | ∞ |
| Temp. unc. - Permittivity | 0.3 | R | 1.73 | 0.23 | 0.26 | 0.04 | 0.05 | ∞ |
| Combined standard Uncertainty ($u_c$) | | | | | | 10.7 | 10.6 | |
| Expanded Uncertainty (95% CONFIDENCE LEVEL) | | | k= 2 | | | 21.5 | 21.1 | |

Estimated total measurement uncertainty for the DASY5 measurement system was ±10.7%. The extended uncertainty (K = 2) was assessed to be ±21.5% based on 95% confidence level. The uncertainty is not added to the Validation measurement result.

## 6.0 EQUIPMENT LIST AND CALIBRATION DETAILS

**Table: SPEAG DASY5 Version 52**

| Equipment Type | Manufacturer | Model Number | Serial Number | Calibration Due | Used For this Test? |
|---|---|---|---|---|---|
| Robot - Six Axes | Staubli | RX90BL | N/A | Not applicable | ✓ |
| Robot Remote Control | SPEAG | CS7MB | RX90B | Not applicable | ✓ |
| SAM Phantom | SPEAG | N/A | 1260 | Not applicable | |
| SAM Phantom | SPEAG | N/A | 1060 | Not applicable | |
| Flat Phantom | AndreT | 10.1 | P 10.1 | Not Applicable | |
| Flat Phantom | AndreT | 9.1 | P 9.1 | Not Applicable | |
| Flat Phantom | SPEAG | ELI 4.0 | 1101 | Not Applicable | ✓ |
| Data Acquisition Electronics | SPEAG | DAE3 V1 | 359 | 21-June- | |
| Data Acquisition Electronics | SPEAG | DAE3 V1 | 442 | 05-Dec-2012 | ✓ |
| Probe E-Field - Dummy | SPEAG | DP1 | N/A | Not applicable | |
| Probe E-Field | SPEAG | ET3DV6 | 1380 | 12-Dec-2012 | ✓ |
| Probe E-Field | SPEAG | ET3DV6 | 1377 | 20-June- | |
| Probe E-Field | SPEAG | ES3DV6 | 3029 | Not Used | |
| Probe E-Field | SPEAG | EX3DV4 | 3563 | 21-June- | |
| Probe E-Field | SPEAG | EX3DV4 | 3657 | 14-Dec-2012 | |
| Antenna Dipole 300 MHz | SPEAG | D300V3 | 1012 | 30-Nov-2012 | |
| Antenna Dipole 450 MHz | SPEAG | D450V3 | 1074 | 30-Nov-2012 | ✓ |
| Antenna Dipole 750 MHz | SPEAG | D750V2 | 1051 | 9-Jan-2014 | |
| Antenna Dipole 900 MHz | SPEAG | D900V2 | 047 | 22-Jun-2014 | |
| Antenna Dipole 1640 MHz | SPEAG | D1640V2 | 314 | 20-Jun-2014 | |
| Antenna Dipole 1800 MHz | SPEAG | D1800V2 | 242 | 20-Jun-2014 | |
| Antenna Dipole 1950 MHz | SPEAG | D1950V3 | 1113 | 10-Dec -2012 | |
| Antenna Dipole 2450 MHz | SPEAG | D2450V2 | 724 | 09-Dec-2012 | |
| Antenna Dipole 2600 MHz | SPEAG | D2600V2 | 1044 | 10-Jan-2014 | |
| Antenna Dipole 3500 MHz | SPEAG | D3500V2 | 1002 | 13-July-2013 | |
| Antenna Dipole 5600 MHz | SPEAG | D5GHzV2 | 1008 | 14-Dec-2013 | |
| RF Amplifier | EIN | 603L | N/A | *In test | |
| RF Amplifier | Mini-Circuits | ZHL-42 | N/A | *In test | ✓ |
| RF Amplifier | Mini-Circuits | ZVE-8G | N/A | *In test | |
| Synthesized signal generator | Hewlett Packard | ESG-D3000A | GB37420238 | *In test | ✓ |
| RF Power Meter | Hewlett Packard | 437B | 3125012786 | 30-Aug-2013 | ✓ |
| RF Power Sensor 0.01 - 18 | Hewlett Packard | 8481H | 1545A01634 | 03-Sept-2013 | ✓ |
| RF Power Meter | Rohde & Schwarz | NRP | 101415 | 18-Aug-2012 | |
| RF Power Sensor | Rohde & Schwarz | NRP - Z81 | 100174 | 21-Sept-2012 | |
| RF Power Meter Dual | Hewlett Packard | 435A | 1733A05847 | *In test | ✓ |
| RF Power Sensor | Hewlett Packard | 8482A | 2349A10114 | *In test | ✓ |
| Network Analyser | Hewlett Packard | 8714B | GB3510035 | 27-Sept-2013 | ✓ |
| Network Analyser | Hewlett Packard | 8753ES | JP39240130 | 7-Nov-2012 | |
| Dual Directional Coupler | Hewlett Packard | 778D | 1144 04700 | *In test | |
| Dual Directional Coupler | NARDA | 3022 | 75453 | *In test | ✓ |

* Calibrated during the test for the relevant parameters.

# 7.0 SAR TEST METHOD

## 7.1 Description of the Test Positions (Face Frontal and Belt Clip)

SAR measurements were performed in the "Face Frontal" and "Belt Clip" positions. Both the "Face Frontal" and "Belt Clip" positions were measured in the flat section of the SPEAG ELI 4.0 phantom.
See Appendix A for photos of test positions.

### 7.1.1 "Face Frontal Position"

The SAR evaluation was performed in the flat section of the SPEAG 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.

### 7.1.2 "Belt Clip" Position

The device was tested in the (2.00 mm) flat section of the SPEAG phantom for the "Belt Clip" position. A belt clip maintained a distance of approximately 12 mm (11mm for SPK-MIC) 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 metal and plastic and the device was connected with the speaker/microphone.

## 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 tissue mass were determined for the sample device for the Face Frontal and Belt Clip configurations of the phantom.

**Table: SAR MEASUREMENT RESULTS– Face Frontal and Belt Clip positions**

| 1. Test Position | 2. Plot No. | 4. Test Freq (MHz) | 5. Measured 1g SAR Results (mW/g) | 5.1 Measured 1g SAR Results 50% Duty Cycle (mW/g) | 6. Measured Drift (dB) | 7. Antenna | 8. Measured RF Power (dBm) |
|---|---|---|---|---|---|---|---|
| Belt Clip | 1 | 440.075 | 8.27 | 4.14 | -0.12 | Quarter wave | 37.02 |
| | 2 | 458.075 | **9.09** | **4.55** | -0.15 | | 36.91 |
| | 3 | 476.075 | 6.97 | 3.49 | -0.06 | | 36.95 |
| Belt Clip with Holster | 4 | 440.075 | 8.37 | 4.19 | -0.16 | | 37.00 |
| | 5 | 458.075 | 8.85 | 4.43 | -0.11 | | 36.95 |
| | 6 | 476.075 | 7.22 | 3.61 | -0.16 | | 36.93 |
| | | | | | | | |
| Face Frontal | 7 | 458.075 | 6.11 | 3.06 | -0.11 | Quarter wave | 36.89 |
| | | | | | | | |
| Belt Clip SPK-MIC | 8 | 458.075 | 8.30 | 4.15 | -0.06 | Quarter wave | 34.87 |
| | 9 | 476.075 | 8.01 | 4.01 | -0.14 | | 34.76 |
| | 10 | 494.075 | 8.09 | 4.05 | -0.10 | | 34.77 |
| | | | | | | | |
| Face Frontal SPK-MIC | 11 | 458.075 | 3.14 | 1.57 | -0.18 | Quarter wave | 35.42 |

Note: The uncertainty of the system (± 23.8 %) has not been added to the results.

**Table: PRESCANS RESULTS**

| 1. Test Position | 2. Plot No. | 3. Test Ch | 4. Test Freq (MHz) | 5. Measured 1g SAR Results (mW/g) | 6. Antenna |
|---|---|---|---|---|---|
| Face Frontal | 12 | 0 | 440.075 MHz | 5.77 | Quarter wave dipole whip antenna |
| | | 1 | 458.075 MHz | 6.35 | |
| | | 2 | 476.075 MHz | 4.63 | |
| | | 3 | 494.075 MHz | 3.12 | |
| | | 4 | 511.975 MHz | 2.37 | |
| Face Frontal SPK-MIC | 13 | 0 | 440.075 MHz | 3.00 | |
| | | 1 | 458.075 MHz | 3.32 | |
| | | 2 | 476.075 MHz | 2.86 | |
| | | 3 | 494.075 MHz | 2.17 | |
| | | 4 | 511.975 MHz | 2.50 | |
| Body Worn Back Belt Clip | 14 | 0 | 440.075 MHz | 8.22 | |
| | | 1 | 458.075 MHz | 8.87 | |
| | | 2 | 476.075 MHz | 6.64 | |
| | | 3 | 494.075 MHz | 4.94 | |
| | | 4 | 511.975 MHz | 3.71 | |
| Body Worn Back Belt Clip SPK-MIK | 15 | 0 | 440.075 MHz | 7.33 | |
| | | 1 | 458.075 MHz | 8.25 | |
| | | 2 | 476.075 MHz | 8.48 | |
| | | 3 | 494.075 MHz | 7.84 | |
| | | 4 | 511.975 MHz | 7.95 | |

The FCC SAR limit for occupational exposure is 8.0 m W/g measurement in a 1g cube of tissue.

## 9.0 COMPLIANCE STATEMENT

The Simoco Push to Talk Transceiver model SRP9180 UW was tested on behalf of ComGroup Australia Pty Ltd. It complied with the FCC SAR requirements. It also complied with IC RSS-102 requirements.

The highest SAR level recorded was 9.09 mW/g for a 1g cube. After extrapolating to a 50% duty cycle the highest SAR level recorded was 4.55 mW/g for a 1g cube. This value was measured in the "Belt Clip" position, and was below the controlled limit of 8.0mW/g, even taking into account the measurement uncertainty of 23.8 %.