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LD/SEMC/BGGI/NM *Hamid Kami Shirazi*

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic*

Checked

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Company Internal  
REPORT

No.

*BGGIN05:363*

Date

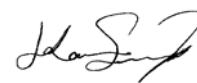
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**Report issued by Accredited SAR Laboratory****For***PY7A1022031***Date of test:** *05 to 12, Dec., 2005***Laboratory:** Sony Ericsson SAR Test Laboratory  
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Phone number**Testing Approval** *Ramadan Plicanic*  
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*+46 46 19 38 62***Statement of Compliance**

Sony Ericsson Mobile Communications AB declares under its sole responsibility that the product

***Sony Ericsson Type AAB-1022031-BV; FCC ID: PY7A1022031; IC:4170B-A1022031***

to which this declaration relates, is in conformity with the appropriate RF exposure standards recommendations and guidelines. It also declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

(None)

This laboratory is accredited to ISO/IEC 17025 (SWEDAC accreditation no. 1847).



Laboratories are accredited by the Swedish Board for Accreditation and Conformity Assessment (SWEDAC) under the terms of Swedish legislation. The accredited laboratory activities meet the requirements in SS-EN ISO/IEC 17025 (2000). This report may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

The results and statements contained herein relate only to the items tested. The names of individuals involved may be mentioned only in connection with the statements or results from this report.

Sony Ericsson encourages all feedback, both positive and negative, on this report.

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## 2 Introduction

In this test report, compliance of the Sony Ericsson PY7A1022031 (Z530i) portable telephone with RF safety guidelines is demonstrated. The applicable RF safety guidelines and the SAR measurement specifications used for the test are described in the *SAR Measurement Specifications of Wireless Handsets* [1].

## 3 Device under Test

### 3.1 Antenna Description

|                      |                            |      |
|----------------------|----------------------------|------|
| <b>Type</b>          | Internal antenna           |      |
| <b>Location</b>      | Inside back, at the bottom |      |
| <b>Dimensions</b>    | Max length                 | 38mm |
|                      | Max width                  | 16mm |
| <b>Configuration</b> | PIFA                       |      |

### 3.2 Device description

|   |                                   |                  |
|---|-----------------------------------|------------------|
| <b>Device model</b>                       | AAB-1022031-BV (Z530i)            |                  |
| <b>Serial number</b>                      | CB5018R2X0                        |                  |
| <b>Mode</b>                               | GSM1900                           | GSM1900(GPRS2TX) |
| <b>Multiple Access Scheme</b>             | TDMA                              | TDMA             |
| <b>Maximum Output Power Setting</b>       | 30dBm                             | 30dBm            |
| <b>Factory Tolerance in Power Setting</b> | ±0.5dB                            | ±0.5dB           |
| <b>Maximum Peak Output Power</b>          | 30.5dBm                           | 30.5dBm          |
| <b>Crest Factor</b>                       | 8                                 | 4                |
| <b>Transmitting Frequency Range(MHz)</b>  | 1850.2 – 1909.8                   |                  |
| <b>Prototype or Production Unit</b>       | Preproduction                     |                  |
| <b>Device Category</b>                    | Portable                          |                  |
| <b>RF exposure environment</b>            | General population / uncontrolled |                  |



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## 4 Test equipment

### 4.1 Dosimetric system

SAR measurements were made using the DASY3 professional system (software version 3.1c) with SAM twin phantom, manufactured by Schmid & Partner Engineering AG (SPEAG). The list of calibrated equipment is given below.

| <b>Description</b>             | <b>Serial Number</b> | <b>Due Date</b> |
|--------------------------------|----------------------|-----------------|
| DASY3 DAE V1                   | 419                  | March 2006      |
| E-field probe ETDV6            | 1585                 | March 2006      |
| Dipole Validation Kit, D1900V2 | 5d002                | March 2007      |

### 4.2 Additional equipment

| <b>Description</b>            | <b>Inventory Number</b> | <b>Due Date</b> |
|-------------------------------|-------------------------|-----------------|
| Signal generator ESG-D4000A   | INV 462935              | Nov. 2006       |
| Directional coupler HP778D    | INV 2903                | Jan. 2006       |
| Power meter R&S NRVD          | INV 483920              | Jan. 2006       |
| Power sensor R&S NRV-Z5       | INV 2333                | Jan. 2006       |
| Power sensor R&S NRV-Z5       | INV 2334                | Jan. 2006       |
| Termination 65N50-0-11        | INV 2903                | Jan. 2006       |
| Network analyzer HP8753C      | INV421671               | Nov. 2006       |
| S-parameter test set HP85047A | INV 421670              | Nov. 2006       |
| Dielectric probe kit HP8507D  | INV 200 000 53          | Self calibrated |
| CMU200                        | INV 74510               | Mar. 2006       |



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## 5 Electrical parameters on the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity,  $\epsilon_r$ , and the conductivity,  $\sigma$ , of the tissue simulating liquids were measured with the dielectric probe kit. These values are shown in the table below. The mass density,  $\rho$ , entered into the DASY3 software is also given. Recommended limits for permittivity  $\epsilon_r$ , conductivity  $\sigma$  and mass density  $\rho$  are also shown.

| f (MHz) | Tissue type | Limits / Measured      | Dielectric Parameters |                |                             |
|---------|-------------|------------------------|-----------------------|----------------|-----------------------------|
|         |             |                        | $\epsilon_r$          | $\sigma$ (S/m) | $\rho$ (g/cm <sup>3</sup> ) |
| 1900    | Head        | Measured, 8/Dec./2005  | 38.3                  | 1.46           | 1.00                        |
|         |             | Recommended            | 40.0                  | 1.40           | 1.00                        |
| 1900    | Body        | Measured, 12/Dec./2005 | 51.4                  | 1.55           | 1.00                        |
|         |             | Recommended            | 53.3                  | 1.52           | 1.00                        |

## 6 System accuracy verification

A system accuracy verification of the DASY3 was performed using the dipole validation kit listed in section 3.1. The system verification test was conducted on the same day as the measurement of the DUT. Measurement made in ambient temperature (22-23) °C and humidity (25-30) %. The obtained results are displayed in the table below.

RF noise had been measured in liquid when all RF equipment in lab was set off. Measured value was 0.001mW/g in 1g mass.

| f (MHz) | Tissue type | Measured / Reference   | SAR (W/kg) 1g/10g | Dielectric Parameters |                |                             | Liquid t(°C) |
|---------|-------------|------------------------|-------------------|-----------------------|----------------|-----------------------------|--------------|
|         |             |                        |                   | $\epsilon_r$          | $\sigma$ (S/m) | $\rho$ (g/cm <sup>3</sup> ) |              |
| 1900    | Head        | Measured, 8/Dec./2005  | 39.9/20.4         | 38.3                  | 1.46           | 1.00                        | 22±0.2       |
|         |             | Measured, 9/Dec./2005  | 39.8/20.4         | 38.3                  | 1.46           | 1.00                        | 22±0.2       |
|         |             | Reference              | 39.2/20.6         | 39.6                  | 1.45           | 1.00                        | 22±0.2       |
| 1900    | Body        | Measured, 12/Dec./2005 | 40.5/21.0         | 51.4                  | 1.55           | 1.00                        | 22±0.2       |
|         |             | Reference              | 39.6/20.9         | 51.6                  | 1.58           | 1.00                        | 22±0.2       |



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## 7 SAR measurement uncertainty

### *SAR measurement uncertainty evaluation for Sony Ericsson Z530i phone*

| Uncertainty Component                            | Uncer. (%) | Prob Dist. | Div. | C <sub>i</sub> | GSM1900 Head | GSM1900 Body |
|--|------------|------------|------|----------------|--------------|--------------|
| <b>Measurement System</b>                        |            |            |      |                |              |              |
| Probe Calibration                                | ±4.8       | N          | 1    | 1              | ±4.8         | ±4.8         |
| Axial Isotropy                                   | ±4.7       | R          | √3   | 0.7            | ±1.9         | ±1.9         |
| Spherical Isotropy                               | ±9.6       | R          | √3   | 0.7            | ±3.9         | ±3.9         |
| Boundary effect                                  | ±1.0       | R          | √3   | 1              | ±1.0         | ±1.0         |
| Probe linearity                                  | ±4.7       | R          | √3   | 1              | ±2.7         | ±2.7         |
| Detection limit                                  | ±1.0       | R          | √3   | 1              | ±0.6         | ±0.6         |
| Readout electronics                              | ±1.0       | N          | 1    | 1              | ±1.0         | ±1.0         |
| Response time                                    | ±0.8       | R          | √3   | 1              | ±0.5         | ±0.5         |
| Integration time                                 | ±1.4       | R          | √3   | 1              | ±0.8         | ±0.8         |
| RF Ambient Conditions                            | ±3.0       | R          | √3   | 1              | ±1.7         | ±1.7         |
| Mech. Constraints of robot                       | ±0.4       | R          | √3   | 1              | ±0.2         | ±0.2         |
| Probe positioning                                | ±2.9       | R          | √3   | 1              | ±1.7         | ±1.7         |
| Extrap, interpolation and integration            | ±3.9       | R          | √3   | 1              | ±2.3         | ±2.3         |
| <b>Measurement System Uncertainty</b>            |            |            |      |                | <b>±8.0</b>  | <b>±8.0</b>  |
| <b>Test Sample Related</b>                       |            |            |      |                |              |              |
| Device positioning                               | ±3.2       | N          | 1    | 1              | ±3.2         | ±3.2         |
| Device holder uncertainty                        | ±3.0       | N          | 1    | 1              | ±3.0         | ±3.0         |
| Power drift                                      | -1.9/-0.7  | R          | √3   | 1              | -1.10        | -0.4         |
| <b>Test Sample Related Uncertainty</b>           |            |            |      |                | <b>±4.5</b>  | <b>±4.4</b>  |
| <b>Phantom and Tissue Parameters</b>             |            |            |      |                |              |              |
| Phantom uncertainty                              | ±4.0       | R          | √3   | 1              | ±2.3         | ±2.3         |
| Liquid conductivity (meas)                       | +4.3/+2.0  | R          | 1    | 0.64           | +2.8         | +1.3         |
| Liquid conductivity (target)                     | ±5.0       | R          | √3   | 0.64           | ±1.8         | ±1.8         |
| Liquid Permittivity (meas)                       | -4.3/-3.6  | R          | 1    | 0.6            | -2.6         | -2.2         |
| Liquid Permittivity (target)                     | ±5.0       | R          | √3   | 0.6            | ±1.7         | ±1.7         |
| <b>Phantom and Tissue Parameters Uncertainty</b> |            |            |      |                | <b>±5.1</b>  | <b>±4.2</b>  |
| <b>Combined standard uncertainty</b>             |            |            |      |                | <b>±10.5</b> | <b>±10.0</b> |
| <b>Extended standard uncertainty (k=2)</b>       |            |            |      |                | <b>±21.0</b> | <b>±20.0</b> |



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## 8 Test results

The measured 1-gram and averaged SAR values of the device against the head are provided in Tables 1 and body are provided in Tables 2. The ambient humidity and temperature of test facility were 25%-30% and 22°C–23°C respectively. The depth of the head and body tissue simulating liquid were 15.5cm and 15cm respectively. A base station simulator was used to control the device during the SAR measurement. The phone was supplied with full-charged battery for each measurement.

For head measurement, the device was tested on the right-hand phantom (corresponding to the right side of the head) and the left-hand phantom in two phone position, cheek (touch) and tilt (cheek + 15deg).

For body measurement phone was tested on the antenna (back) to the phantom and Front to the phantom in both speech and GPRS 2 TX mode and with 15mm distance against flat section of phantom. For all modes, the device was tested at the lowest, middle and highest frequencies in the transmit band. For Hand free measurement phone was pared with Sony Ericsson HBH-60 Blue Tooth and Sony Ericsson head set (HPM-70) and measured on worst case speech mode.

| Mode          | Channel | Power (dB) | Phone Position | Liquid t (°C) | SAR (W/kg)         |                   |
|---------------|---------|------------|----------------|---------------|--------------------|-------------------|
|               |         |            |                |               | Right-hand 1g mass | Left-hand 1g mass |
| 1900 GSM Head | 512     | 30.5       | Cheek          | 22±0.2        | 0.95               | 0.94              |
|               |         |            | Tilt           | 22±0.2        | 0.47               | 0.39              |
|               | 661     | 30.5       | Cheek          | 22±0.2        | 0.92               | 0.99              |
|               |         |            | Tilt           | 22±0.2        | 0.48               | 0.44              |
|               | 810     | 30.4       | Cheek          | 22±0.2        | <b>1.02</b>        | <b>1.02</b>       |
|               |         |            | Tilt           | 22±0.2        | 0.43               | 0.42              |

Table1: SAR measurement result for Sony Ericsson PY7A1022031 (Z530i) telephone at highest possible output power. The phone has measured against the head.

| Mode          | Channel | Power (dBm) | Phone Position                   | Liquid t (°C) | SAR (W/kg) in 1 g mass |
|---------------|---------|-------------|----------------------------------|---------------|------------------------|
| GSM 1900 Body | 512     | 30.5        | Front to phantom                 | 22±0.2        | 0.08                   |
|               |         |             | Antenna to phantom               | 22±0.2        | 0.12                   |
|               |         |             | Antenna to phantom hand free     | 22±0.2        | <b>0.13</b>            |
|               |         |             | Antenna to phantom Blue tooth    | 22±0.2        | <b>0.13</b>            |
|               | 661     | 30.5        | Antenna to phantom, GPRS 2 Slots | 22±0.2        | <b>0.36</b>            |
|               |         |             | Front to phantom                 | 22±0.2        | 0.07                   |
|               |         |             | Antenna to phantom               | 22±0.2        | 0.12                   |
|               |         |             | Antenna to phantom, GPRS 2 Slots | 22±0.2        | <b>0.36</b>            |
|               | 810     | 30.4        | Front to phantom                 | 22±0.2        | 0.07                   |
|               |         |             | Antenna to phantom               | 22±0.2        | <b>0.13</b>            |
|               |         |             | Antenna to phantom, GPRS 2 Slots | 22±0.2        | 0.34                   |

Table2: SAR measurement result for Sony Ericsson PY7A1022031 (Z530i) telephone at highest possible output power. The phone has measured against the Body.



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## 9 References

[1] R.Plicanic, "SAR Measurement Specification of Wireless Handsets", Sony Ericsson SAR Test Laboratory internal document GUG/N 03:141

[2] Basic standard for the Measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300MHz-3GHz), European Standard EN 50361, July 2001

[3] FCC, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radio Frequency Emissions," Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97- 01).

[4] IEEE, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques," Std. 1528-2003, June, 2003.





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## 10 Appendix

### 10.1 Photographs of the device under test



Close state



Open state

#### Front & Back sides



Down Connector



Sides



Back side with battery



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## 10.2 Device position on SAM Twins Phantom



Device position against the head: Cheek (touch) phone position



Device position against the head: Tilt (cheek+15deg) phone position



Device position against the body: phone with 15mm distance against flat section of the Phantom



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### 10.3 Attachment

- Probe & Dipole Calibration
- Measurement plots and system validation
- Annex