



Company Internal REPORT

Prepared (also subject responsible if other)

LD/SEMC/BGGI/NM Hamid Kami Shirazi

No.

BGGIN05:030

Approved

Checked

Date

Rev

Reference

LD/SEMC/BGGI/NM Ramadan Plicanic

050201

050128

A

File

Report issued by Accredited SAR Laboratory

for

PY7A102101B

Date of test: 24 and 27 January , 2005

Laboratory: Sony Ericsson SAR Test Laboratory
Sonyericsson Mobile Communications AB
Nya Vattentorget
SE-221 82 LUND, Sweden

Testing Engineer: Hamid Kami Shirazi
kami.shirazi@sonyericsson.com
+4646232644

[Handwritten signature]

Testing Approval Ramadan Plicanic
Ramadan.Plicanic@sonyericsson.com
+46 46 19 38 62

[Handwritten signature]

Statement of Compliance

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

Sony Ericsson AAB-101012-BV; FCC ID:PY7A 102101B

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.
© Sony Ericsson Mobile Communication AB, 2004



Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File

1 Table of contents

2 INTRODUCTION 3

3 DEVICE UNDER TEST 3

3.1 ANTENNA DESCRIPTION 3

3.2 DEVICE DESCRIPTION 3

4 TEST EQUIPMENT..... 4

4.1 DOSIMETRIC SYSTEM 4

4.2 ADDITIONAL EQUIPMENT 4

5 ELECTRICAL PARAMETERS ON THE TISSUE SIMULATING LIQUID 5

6 SYSTEM ACCURACY VERIFICATION 5

7 SAR MEASUREMENT UNCERTAINTY 6

8 TEST RESULTS 7

9 REFERENCES 8

10 APPENDIX..... 9

10.1 SAR DISTRIBUTION COMPARISON FOR SYSTEM ACCURACY VERIFICATION 9

10.2 SAR DISTRIBUTION PLOT 12

10.3 PHOTOGRAPHS OF THE DEVICE UNDER TEST..... 15

10.4 DEVICE POSITION ON SAM TWINS PHANTOM..... 17

10.5 PROBE CALIBRATION PARAMETERS..... 21



Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File

2 Introduction

In this test report, compliance of the Sony Ericsson PY7A102101B 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

| | | |
|----------------------|----------------|-------|
| Type | Built In | |
| Location | Up on the back | |
| Dimensions | Max length | 33 mm |
| | Max width | 22 mm |
| Configuration | PIFA | |

3.2 Device description

| | |
|---|-----------------------------------|
| Device model | PY7A102101B |
| Serial number | T26000YUB6 |
| Mode | GSM1900 |
| Multiple Access Scheme | TDMA |
| Maximum Output Power Setting | 28.5 |
| Factory Tolerance in Power Setting | 0.5 |
| Maximum Peak Output Power | 29 |
| Crest Factor | 8 |
| Transmitting Frequency Range(MHz) | 1850 – 1910 |
| Prototype or Production Unit | Preproduction |
| Device Category | Portable |
| RF exposure environment | General population / uncontrolled |



Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File

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.

| Description | Serial Number | Due Date |
|--------------------------------|----------------------|-----------------|
| DASY3 DAE V1 | 419 | 042005 |
| E-field probe ETDV6 | 1585 | 032005 |
| Dipole Validation Kit, D900V2 | 111 | 052005 |
| Dipole Validation Kit, D1800V2 | 297 | 042005 |
| Dipole Validation Kit, D1900V2 | 5d002 | 042005 |

4.2 Additional equipment

| Description | Inventory Number | Due Date |
|-------------------------------|-------------------------|-----------------|
| Signal generator ESG-D4000A | INV 462935 | 092005 |
| Directional coupler HP778D | INV 39656 | 012006 |
| Power meter R&S NRVD | INV 483920 | 012006 |
| Power sensor R&S NRV-Z5 | INV 2333 | 012006 |
| Power sensor R&S NRV-Z5 | INV 2334 | 012006 |
| Termination 65N50-0-11 | INV 2903 | 072005 |
| Network analyzer HP8753C | INV421671 | 092005 |
| S-parameter test set HP85047A | INV 421670 | 082005 |
| Dielectric probe kit HP8507D | INV 2000053 | 042005 |
| Communication Test Set | INV20001078 | 092005 |



Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File

5 Electrical parameters on the tissue simulating liquid

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

| f (MHz) | Tissue type | Limits / Measured | Dielectric Parameters | | |
|---------|-------------|----------------------|-----------------------|----------------|-----------------------------|
| | | | ϵ_r | σ (S/m) | ρ (g/cm ³) |
| 1900 | Head | Measured, 24/01/2005 | 39.3 | 1.47 | 1.00 |
| | | Recommended | 40.0 | 1.40 | 1.00 |
| 1900 | Body | Measured, 27/01/2005 | 52.7 | 1.58 | 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 °C and humidity 39%. 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) |
|---------|-------------|----------------------|-------------------|-----------------------|----------------|-----------------------------|--------------|
| | | | | ϵ_r | σ (S/m) | ρ (g/cm ³) | |
| 1900 | Head | Measured, 24/01/2005 | 42.5/21.5 | 39.3 | 1.47 | 1.00 | 21 |
| | | Reference | 41.6/21.5 | 38.8 | 1.44 | 1.00 | - |
| 1900 | Body | Measured, 27/01/2005 | 43.7/22.5 | 52.7 | 1.58 | 1.00 | 21 |
| | | Reference | 43.2/22.4 | 51.2 | 1.59 | 1.00 | - |



Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File

7 SAR measurement uncertainty

SAR measurement uncertainty evaluation for Sonyericsson Txxx phone

| Uncertainty Component | Uncer. (%) | Prob Dist. | Div. | C _i | GSM 1900 Head | GSM 1900 Body |
|--|------------|------------|------|----------------|---------------|---------------|
| Measurement System | | | | | | |
| Probe Calibration | ±4.4 | N | 1 | 1 | ±4.4 | ±4.4 |
| Axial Isotropy | ±4.7 | R | √3 | 0.5 | ±1.4 | ±1.4 |
| Spherical Isotropy | ±9.6 | R | √3 | 0.5 | ±2.8 | ±2.8 |
| Spatial resolution | ±0.0 | R | √3 | 1 | ±0.0 | ±0.0 |
| Boundary effect | ±5.5 | R | √3 | 1 | ±3.2 | ±3.2 |
| 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 |
| Measurement System Uncertainty | | | | | ±7.7 | ±7.7 |
| Test Sample Related | | | | | | |
| Device positioning | ±6.0 | N | 0.89 | 1 | ±6.7 | ±6.7 |
| Device holder uncertainty | ±5.0 | N | 0.84 | 1 | ±5.9 | ±5.9 |
| Power drift | ±3.5/1.2 | R | √3 | 1 | ±2 | ±0.7 |
| Test Sample Related Uncertainty | | | | | ±9.1 | ±9 |
| Phantom and Tissue Parameters | | | | | | |
| Phantom uncertainty | ±4.0 | R | √3 | 1 | ±2.3 | ±2.3 |
| Liquid conductivity (meas) | ±(5.0/2.6) | R | √3 | 0.6 | ±2.9 | ±1.5 |
| Liquid conductivity (target) | ±5.0 | R | √3 | 0.6 | ±1.7 | ±1.7 |
| Liquid Permittivity (meas) | ±(1.8/1.0) | R | √3 | 0.6 | ±1.0 | ±0.6 |
| Liquid Permittivity (target) | ±5.0 | R | √3 | 0.6 | ±1.7 | ±1.7 |
| Phantom and Tissue Parameters Uncertainty | | | | | ±4.4 | ±3.7 |
| Combined standard uncertainty | | | | | ±12.7 | ±12.4 |
| Extended standard uncertainty (k=2) | | | | | ±25.4 | ±24.8 |



Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File

8 Test results

The measured 1-gram averaged SAR values of the device against the head are provided in Tables 1. The ambient humidity and temperature of test facility were 40±2% and 22±1 respectively. The depth of the head tissue simulating liquid was 15.8cm. 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 all modes, the device was tested at the lowest, middle and highest frequencies in the transmit band. On position and frequency where it find max SAR values, was measured SAR with Portable hands free accessory HBH-60.

| Mode | Chanel | Peak Output Power(dBm) | Phone Position | Liquid temp(°C) | SAR (W/kg) 1g mass | |
|----------|--------|------------------------|----------------|-----------------|--------------------|-----------|
| | | | | | Right-hand | Left-hand |
| 1900 GSM | 512 | 28.9 | Cheek | 21/21.2 | 0.63 | 0.51 |
| | | | Tilt | 21.2/21.3 | 0.78 | 0.65 |
| | | | Tilt | 21.2/21.3 | 0.80 | 0.65 |
| | 661 | 29 | Cheek | 21/21.2 | 0.56 | 0.42 |
| | | | Tilt | 21.2/21.3 | 0.62 | 0.53 |
| | 810 | 29 | Cheek | 21/21.2 | 0.43 | 0.34 |
| Tilt | | | 21.2/21.3 | 0.46 | 0.40 | |

Table1: SAR measurement result for Sony Ericsson PY7A102101B telephone at highest possible output power. Measured against the head.

For body measurement, the device was tested in three different cases under flat phantom on 15mm distances between phone and phantom. In two cases phone was turn with back to the flat phantom and on frequency where it find max SAR values, was measured SAR value with a Portable hands free accessory HBH-60. In the third case phone was turned with front to the flat phantom. For all cases and phone position, the device was tested at lowest, middle and highest frequencies in the transmit band. The depth of the head tissue simulating liquid was 15.1cm. Results are provided in Table 2.

| Mode | Chanel | Peak Output Power(dBm) | Phone Position | Liquid temp(°C) | SAR (W/kg) |
|----------|--------|------------------------|------------------|-----------------|-------------|
| | | | | | 1g mass |
| 1900 GSM | 512 | 28.9 | Back with HBH-60 | 21 | 0.63 |
| | | | Back | 21 | 0.59 |
| | | | Front | 21 | 0.12 |
| | 661 | 29 | Back | 21 | 0.51 |
| | | | Front | 21 | 0.11 |
| | 810 | 29 | Back | 21 | 0.40 |
| Front | | | 21 | 0.09 | |

Table2: SAR measurement result for Sony Ericsson PY7A102101B telephone at highest possible output power. Measured against the body.



Company Internal
REPORT

Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File

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.



Company Internal
REPORT

Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File

10 Appendix

10.1 SAR distribution comparison for system accuracy verification

Validation Dipole , measured with head simulating tissue on *day/month/year*

Dipole 1900 MHz

SAM 4 Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz

Probe: ET3DV6 - SN1585; ConvF(5.26,5.26,5.26); Crest factor: 1.0; Head 1900MHz: $\sigma = 1.47$ mho/m $\epsilon_r = 39.3$ $\rho = 1.00$ g/cm³

Cubes (2): SAR (1g): 4.25 mW/g \pm 0.03 dB, SAR (10g): 2.15 mW/g \pm 0.01 dB, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

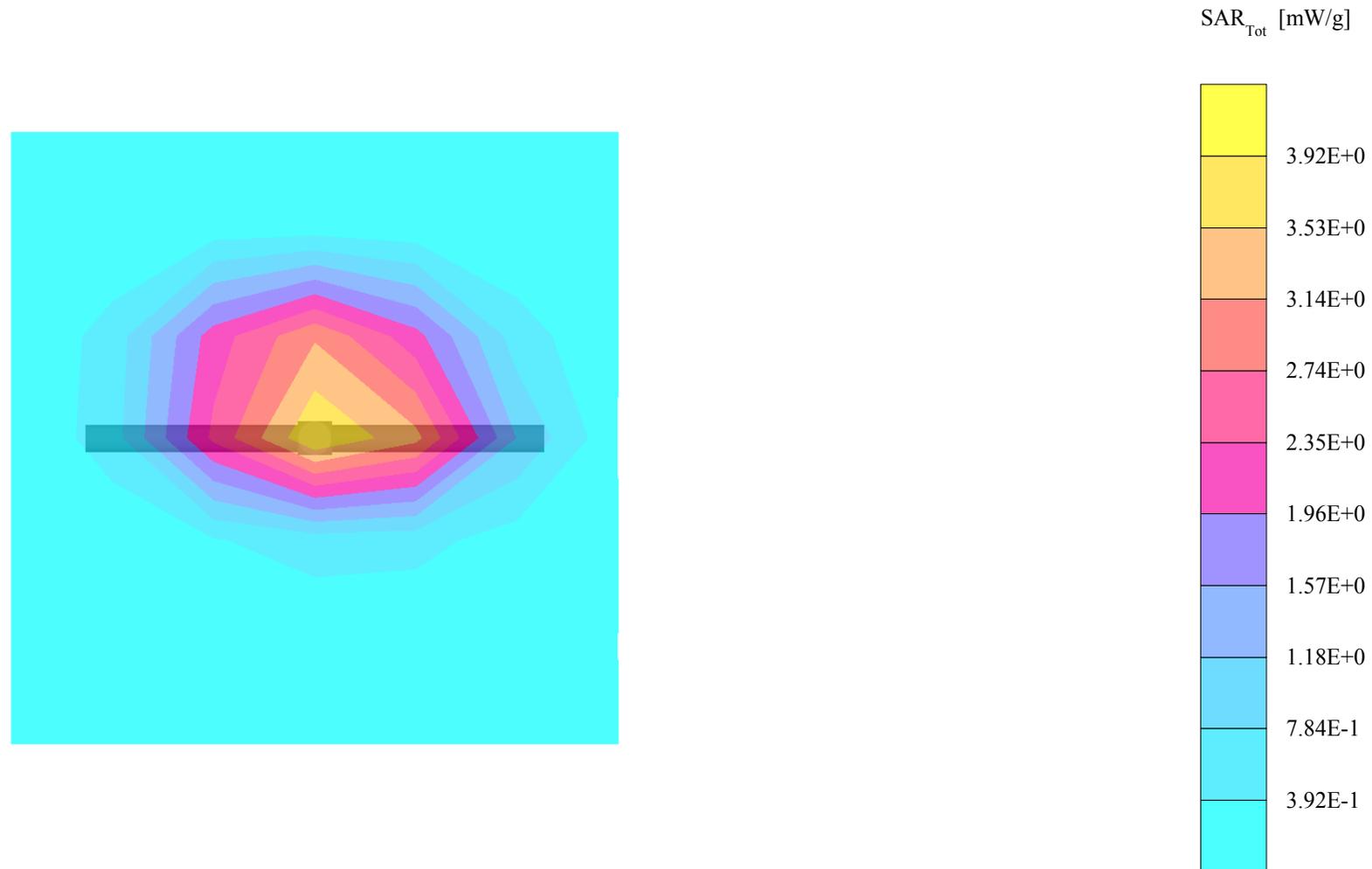
Powerdrift: 0.01 dB

P=100mW, d=10mm, 1900MHz dipol D1900V2 s/n 5d002

Target values: 1g mass 41.6 mW/g, 10g mass 21.5 mW/g

Measured values: 1g mass 42.5mW/g(+2.2%), 10g mass 21.5mW/g(+0%)

LIQUID'S Temperature 21C, Ambeint Temperature 21C ,humidity 42.%



Dipole 1900 MHz

SAM 4 Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz

Probe: ET3DV6 - SN1585; ConvF(4.56,4.56,4.56); Crest factor: 1.0; Muscle 1900: $\sigma = 1.58$ mho/m $\epsilon_r = 52.7$ $\rho = 1.00$ g/cm³

Cubes (2): SAR (1g): 4.37 mW/g ± 0.03 dB, SAR (10g): 2.25 mW/g ± 0.03 dB, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

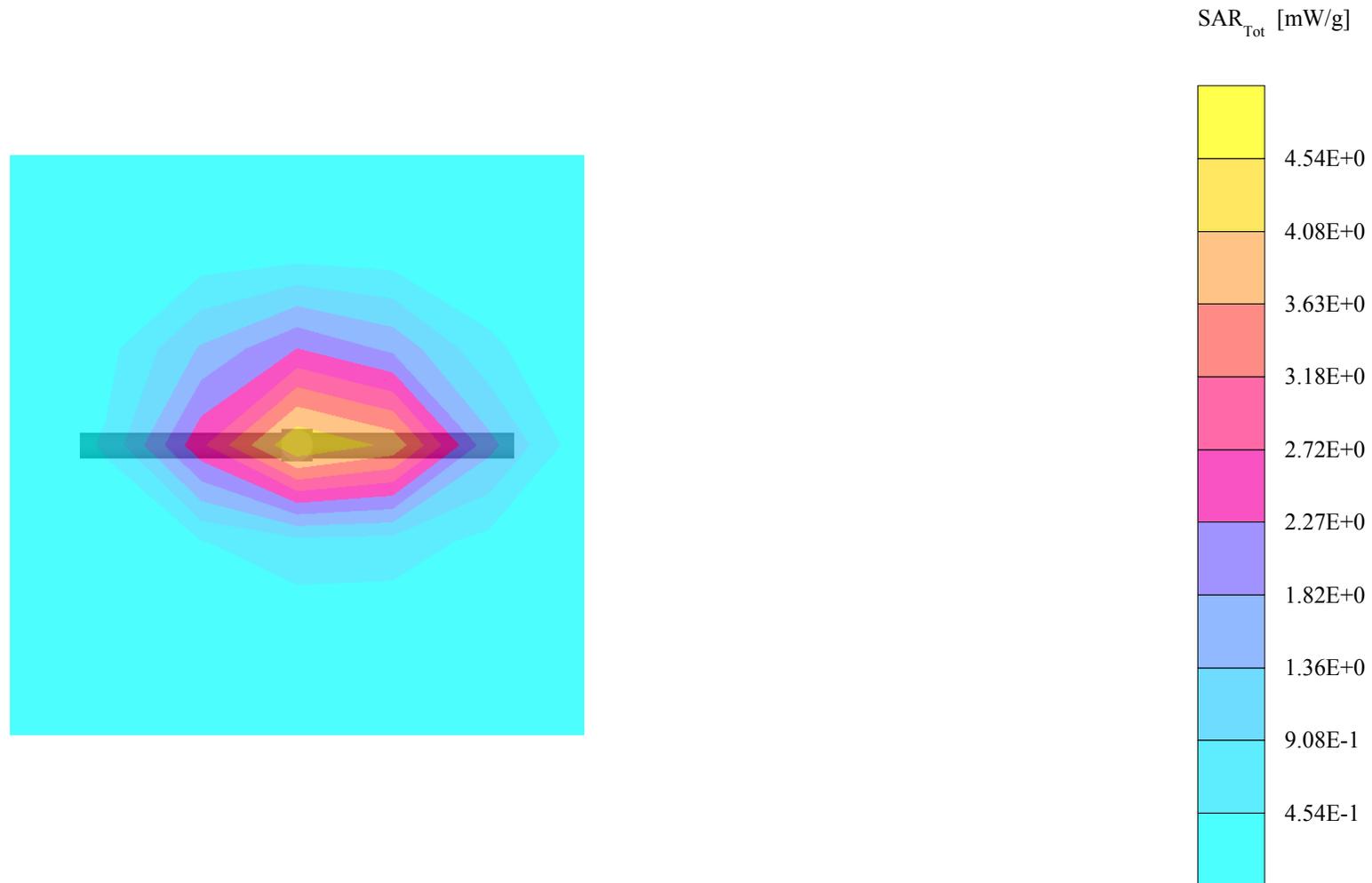
Powerdrift: -0.06 dB

P=100mW, d=10mm, 1900MHz dipol D1900V2 s/n 5d002

Target values: 1g mass 43.2mW/g, 10g mass 22.4 mW/g

Measured values: 1g mass 43.7mW/g(+1.5%), 10g mass 22.5mW/g(+0,5%)

BODY LIQUID'S Temperature 21C ; Room's Temperature 22



**Company Internal
REPORT**

Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

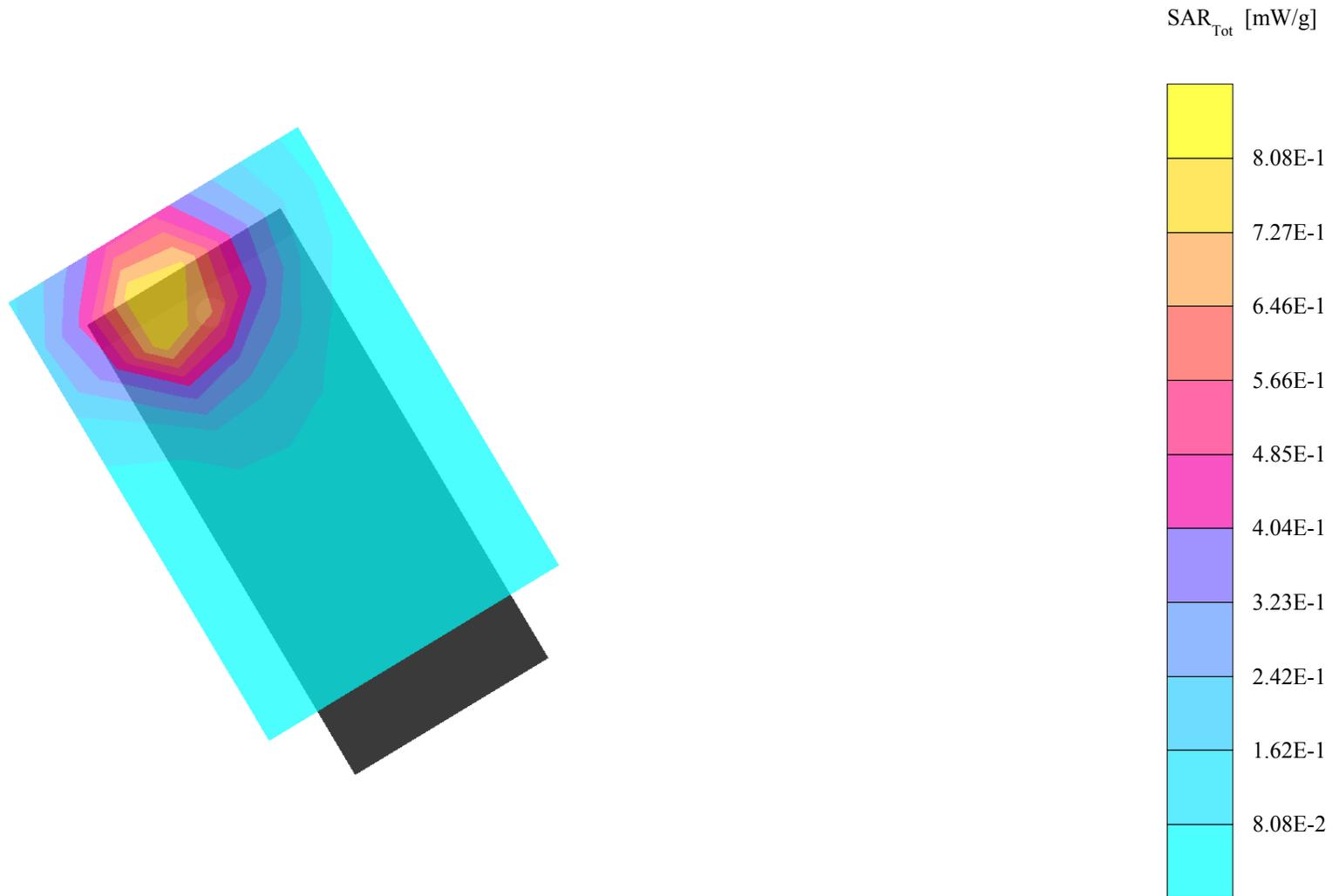
File

10.2 SAR distribution plot

Distribution of max SAR in GSM1900 mode at xxxxMHz. Measured against the head for cheek phone position

PY7A102101B

SAM 4 Phantom; Righ Hand Section; Position: (106°,301°); Frequency: 1850 MHz
Probe: ET3DV6 - SN1585; ConvF(5.26,5.26,5.26); Crest factor: 8.0; Head 1900MHz: $\sigma = 1.47$ mho/m $\epsilon_r = 39.3$ $\rho = 1.00$ g/cm³
Cube 5x5x7: SAR (1g): 0.785 mW/g, SAR (10g): 0.418 mW/g, (Worst-case extrapolation)
Coarse: Dx = 11.0, Dy = 11.0, Dz = 10.0
Powerdrift: -0.15 dB
PY7A102101B,s/nT26000YUB6 ;1850MHz(ch512), Tilt phone Position ;Right side phantom ,
(106°) Phone Position,Blue tooth headset HBH 60 is pared with the phone;
meas. Power=29dBm, Nom.Power=28,9dBm; 050124



PY7A102101B

SAM 4 Phantom; Flat Section; Position: (270°,90°); Frequency: 1850 MHz

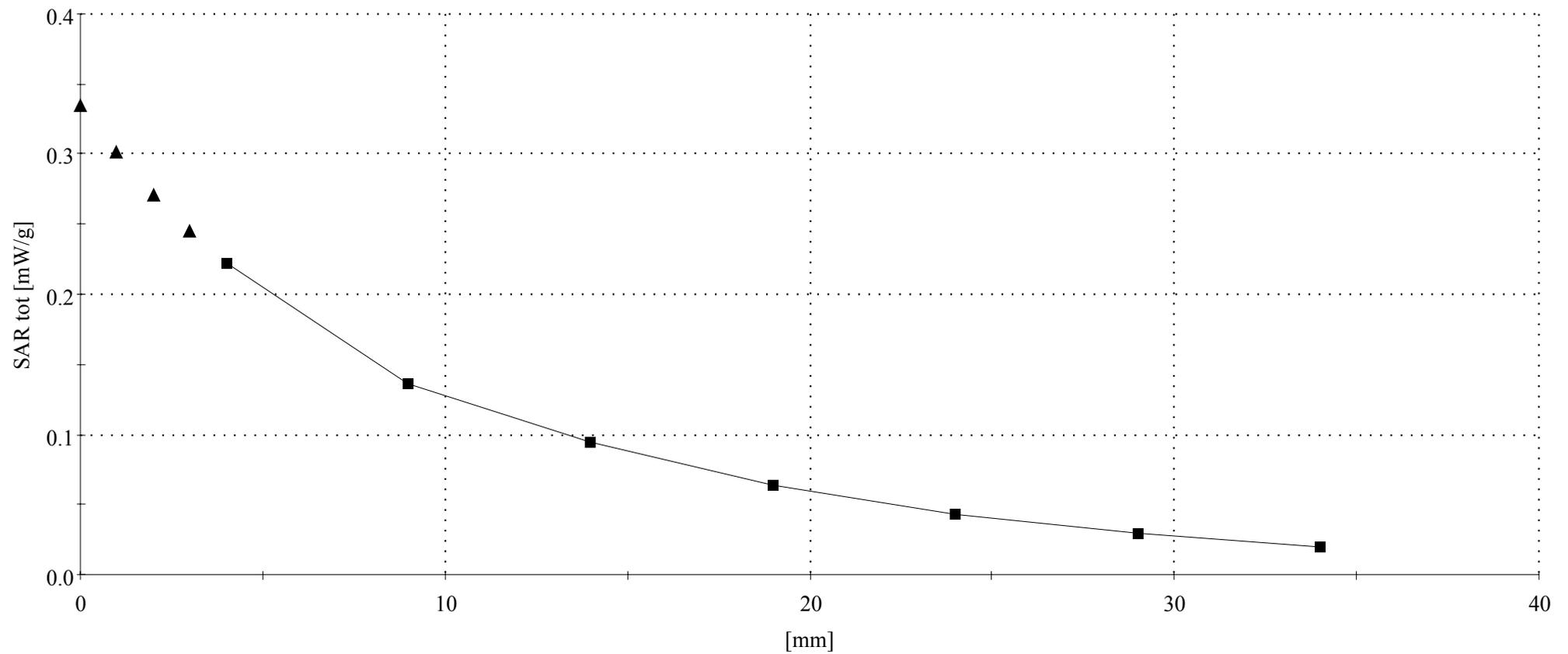
Probe: ET3DV6 - SN1585; ConvF(4.56,4.56,4.56); Crest factor: 8.0; Muscle 1900: $\sigma = 1.58$ mho/m $\epsilon_r = 52.7$ $\rho = 1.00$ g/cm³

Cube 5x5x7: SAR (1g): 0.620 mW/g, SAR (10g): 0.351 mW/g, (Worst-case extrapolation)

Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

PY7A102101B,s/nT26000YUB6 ;1850MHz(ch512), back Side phone +15mm distance to phantom,Flat section of phantom ,(90°) Phone Position, meas. Power=29dBm, Nom.Power=28,9dBm; Bluetooth inconnection with heddset HBH60 050127

Z(X)distribution of max SAR i GSM1900 Mode at CH512, Measured against the Body



PY7A102101B

SAM 4 Phantom; Flat Section; Position: (270°,90°); Frequency: 1850 MHz

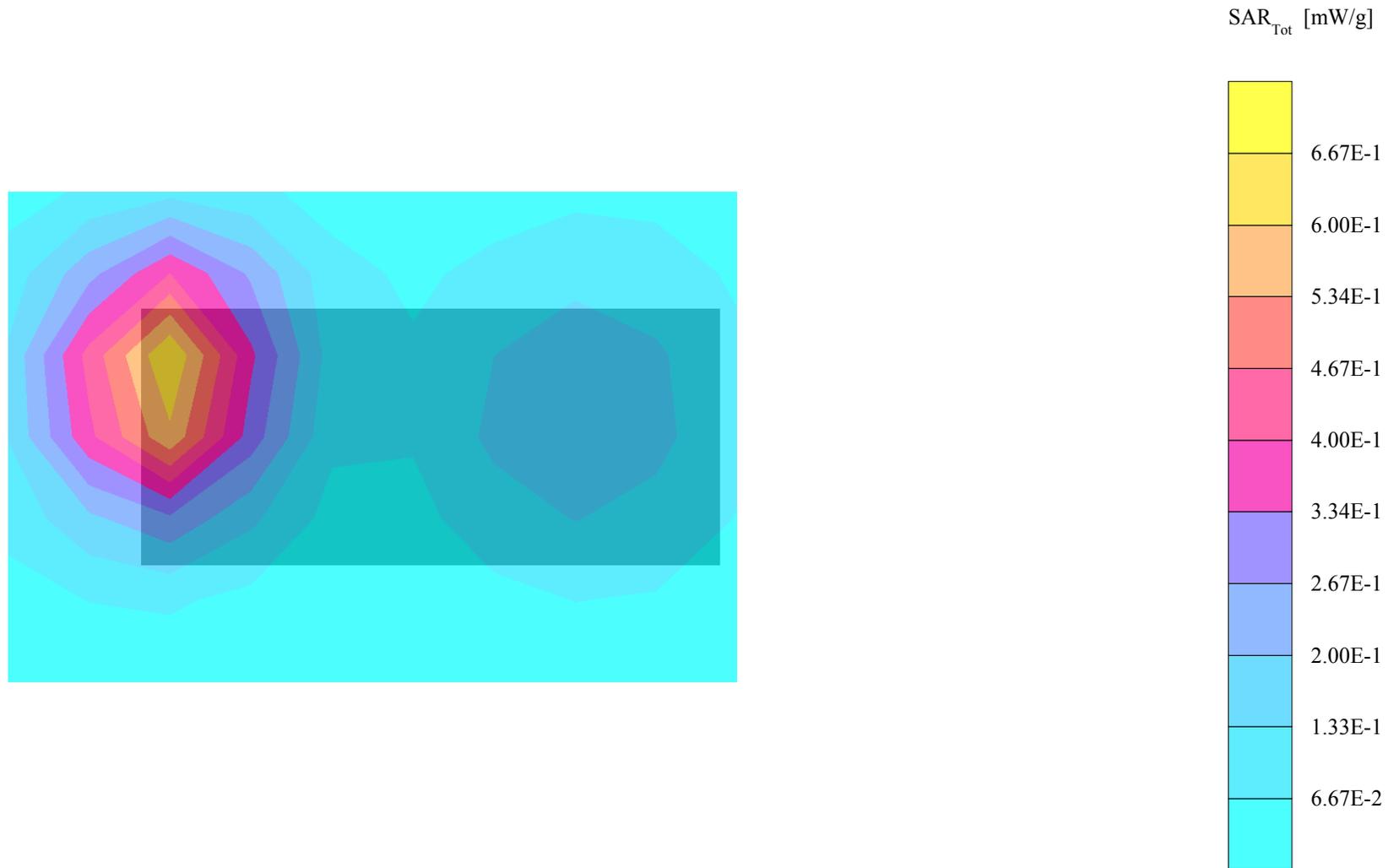
Probe: ET3DV6 - SN1585; ConvF(4.56,4.56,4.56); Crest factor: 8.0; Muscle 1900: $\sigma = 1.58$ mho/m $\epsilon_r = 52.7$ $\rho = 1.00$ g/cm³

Cube 5x5x7: SAR (1g): 0.620 mW/g, SAR (10g): 0.351 mW/g, (Worst-case extrapolation)

Coarse: Dx = 14.0, Dy = 14.0, Dz = 10.0

Powerdrift: -0.05 dB

PY7A102101B,s/nT26000YUB6 ;1850MHz(ch512), back Side phone +15mm distance to phantom,Flat section of phantom ,(90°) Phone Position, meas. Power=29dBm, Nom.Power=28,9dBm; Bluetooth inconnection with heddset HBH60 050127



PY7A102101B

SAM 4 Phantom; Righ Hand Section; Position: (106°,301°); Frequency: 1850 MHz

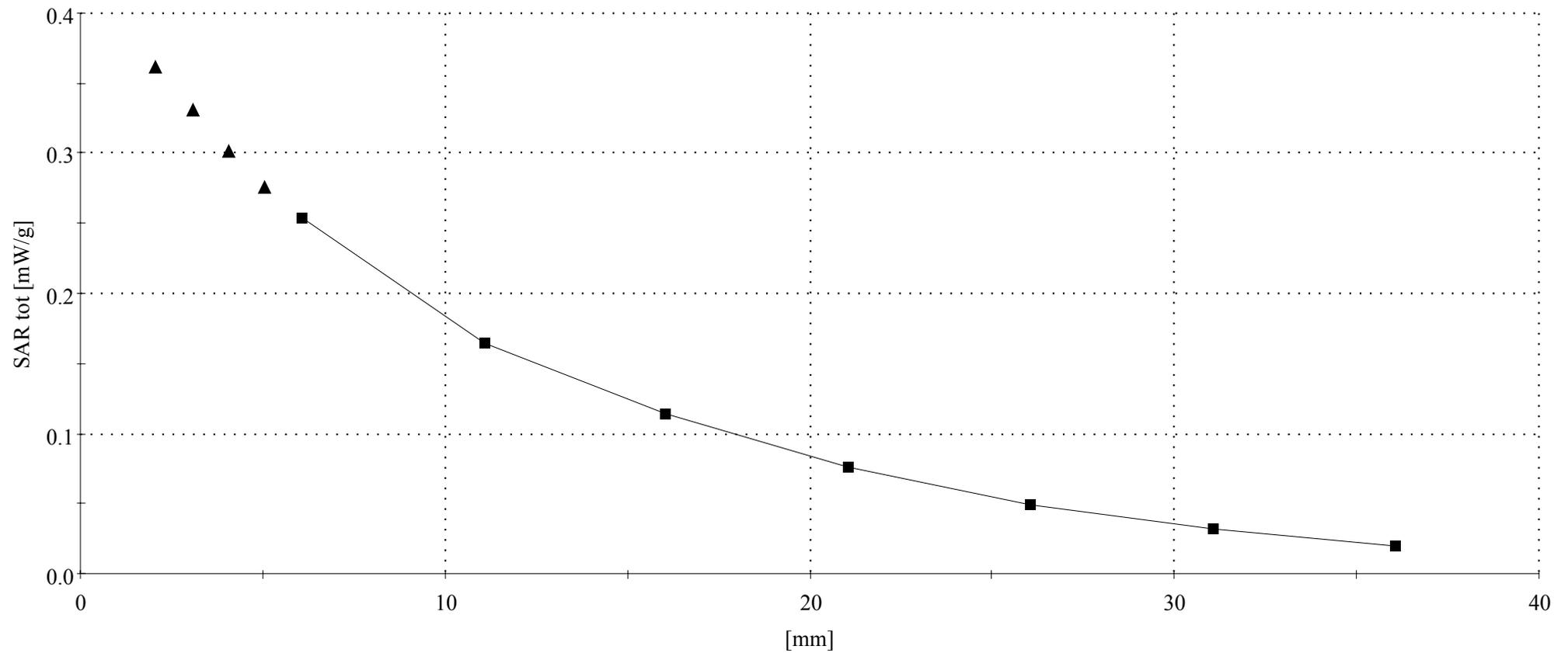
Probe: ET3DV6 - SN1585; ConvF(5.26,5.26,5.26); Crest factor: 8.0; Head 1900MHz: $\sigma = 1.47$ mho/m $\epsilon_r = 39.3$ $\rho = 1.00$ g/cm³

Cube 5x5x7: SAR (1g): 0.785 mW/g, SAR (10g): 0.418 mW/g, (Worst-case extrapolation)

Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

PY7A102101B,s/nT26000YUB6 ;1850MHz(ch512), Tilt phone Position ;Right side phantom ,
(106°) Phone Position,Blue tooth headset HBH 60 is pared with the phone;
meas. Power=29dBm, Nom.Power=28,9dBm; 050124

Z(X)distribution of max SAR i GSM1900 Mode at CH512, Measured against the Head position.



Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File

10.3 Photographs of the device under test



Front and Back sides



Down Connector

Company Internal
REPORT

Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File



Back side with battery

Prepared (also subject responsible if other)

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

Approved

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

Checked

No.

BGGIN05:030

Date

050128

Rev

A

Reference

File

10.4 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

Company Internal
REPORT

Prepared (also subject responsible if other)

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

No.

BGGIN05:030

Approved

Checked

Date

Rev

Reference

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

050128

A

File



Device position against the body: Phone with 15mm distance



Company Internal
REPORT

Prepared (also subject responsible if other)

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

No.

BGGIN05:030

Approved

Checked

Date

Rev

Reference

LD/SEMC/BGGI/NM *Ramadan Plicanic* 050201

050128

A

File

10.5 Probe calibration parameters

Client **Sony Ericsson Lund**

CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN:1585**
 Calibration procedure(s) **QA CAL-01.v2
Calibration procedure for dosimetric E-field probes**
 Calibration date: **March 18, 2004**
 Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

| Model Type | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|-----------------------------------|----------------|---|------------------------|
| Power meter EPM E4419B | GB41293874 | 2-Apr-03 (METAS, No 252-0250) | Apr-04 |
| Power sensor E4412A | MY41495277 | 2-Apr-03 (METAS, No 252-0250) | Apr-04 |
| Reference 20 dB Attenuator | SN: 5086 (20b) | 3-Apr-03 (METAS, No. 251-0340) | Apr-04 |
| Fluke Process Calibrator Type 702 | SN: 6295803 | 8-Sep-03 (Sintrel SCS No. E-030020) | Sep-04 |
| Power sensor HP 8481A | MY41092180 | 18-Sep-02 (SPEAG, in house check Oct-03) | In house check: Oct 05 |
| RF generator HP 8684C | US3642U01700 | 4-Aug-99 (SPEAG, in house check Aug-02) | In house check: Aug-05 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (SPEAG, in house check Oct-03) | In house check: Oct 05 |

| | Name | Function | Signature |
|----------------|---------------|---------------------|---|
| Calibrated by: | Nico Vetterli | Technician |  |
| Approved by: | Katja Pokovic | Laboratory Director |  |

Date issued: March 19, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for
 Calibration Laboratory of Schmid & Partner Engineering AG is completed.

Probe ET3DV6

SN:1585

| | |
|------------------|----------------|
| Manufactured: | May 7, 2001 |
| Last calibrated: | April 16, 2003 |
| Recalibrated: | March 18, 2004 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1585

| Sensitivity in Free Space | | Diode Compression ^A | |
|---------------------------|--|--------------------------------|-------|
| NormX | 1.84 $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP X | 95 mV |
| NormY | 1.71 $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Y | 95 mV |
| NormZ | 1.90 $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Z | 95 mV |

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

| | | | |
|--|------------------------------|--------|--------|
| Sensor Cener to Phantom Surface Distance | | 3.7 mm | 4.7 mm |
| SAR _{be} [%] | Without Correction Algorithm | 8.3 | 4.4 |
| SAR _{be} [%] | With Correction Algorithm | 0.0 | 0.2 |

Head 1800 MHz Typical SAR gradient: 10 % per mm

| | | | |
|----------------------------|------------------------------|--------|--------|
| Sensor to Surface Distance | | 3.7 mm | 4.7 mm |
| SAR _{be} [%] | Without Correction Algorithm | 12.1 | 8.2 |
| SAR _{be} [%] | With Correction Algorithm | 0.2 | 0.1 |

Sensor Offset

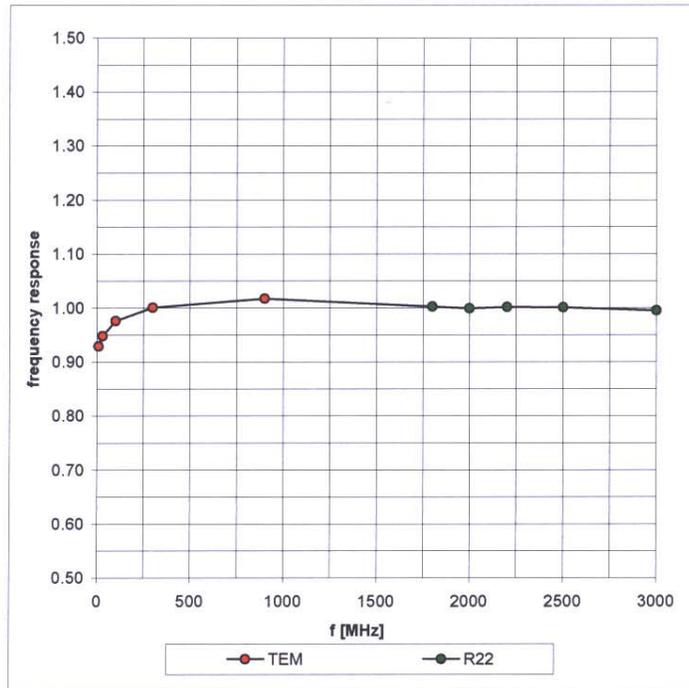
| | |
|----------------------------|--------------|
| Probe Tip to Sensor Center | 2.7 mm |
| Optical Surface Detection | in tolerance |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

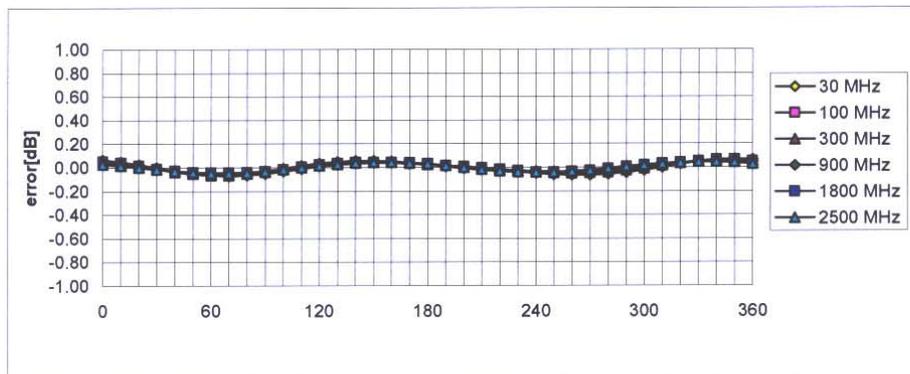
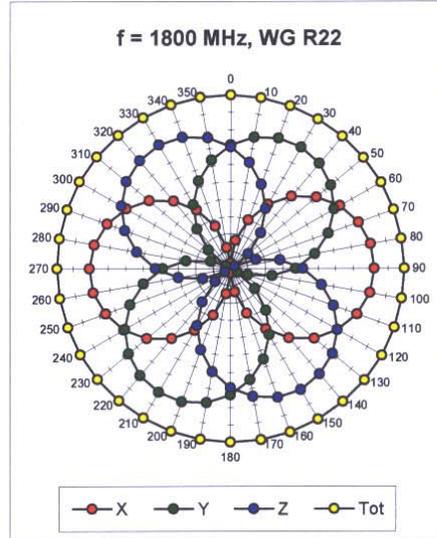
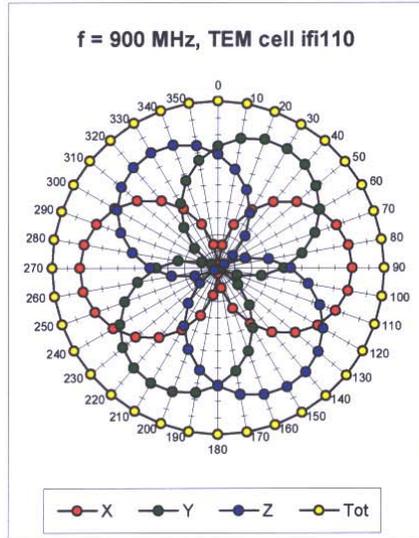
^A numerical linearization parameter: uncertainty not required

Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)

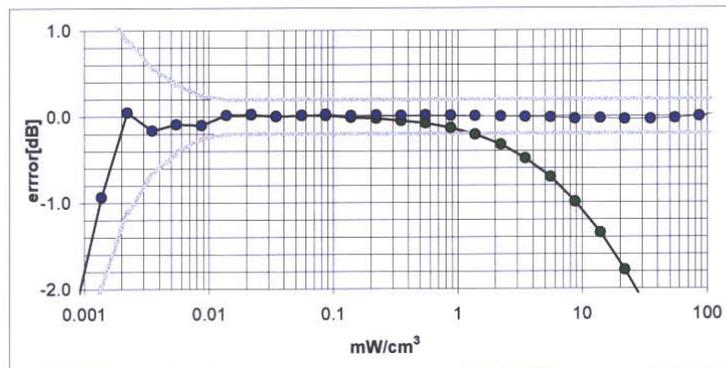
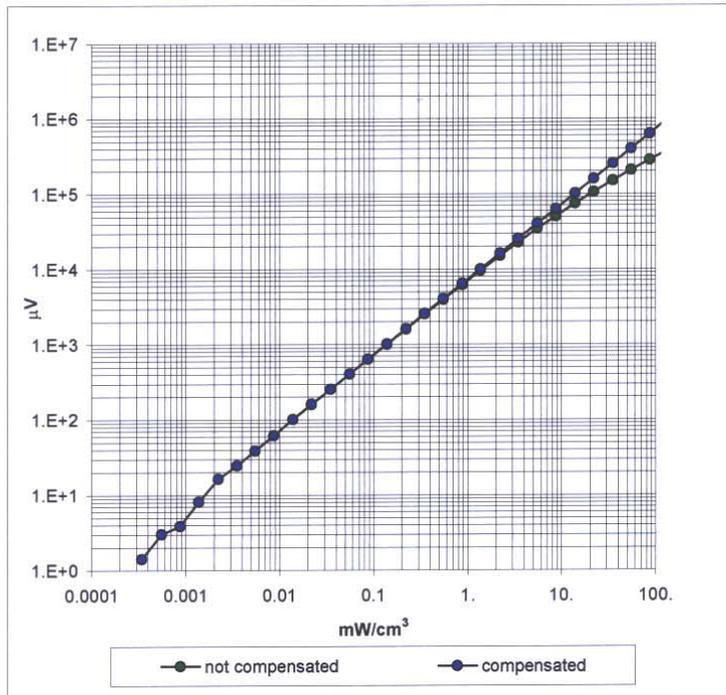


Receiving Pattern (ϕ) , $\theta = 0^\circ$



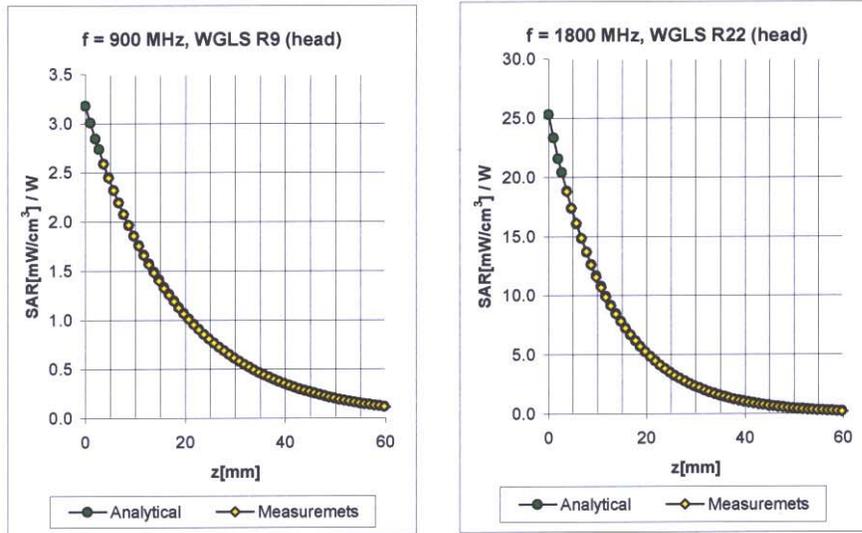
Axial Isotropy Error < ± 0.2 dB

Dynamic Range f(SAR_{head}) (Waveguide R22)



Probe Linearity < ± 0.2 dB

Conversion Factor Assessment

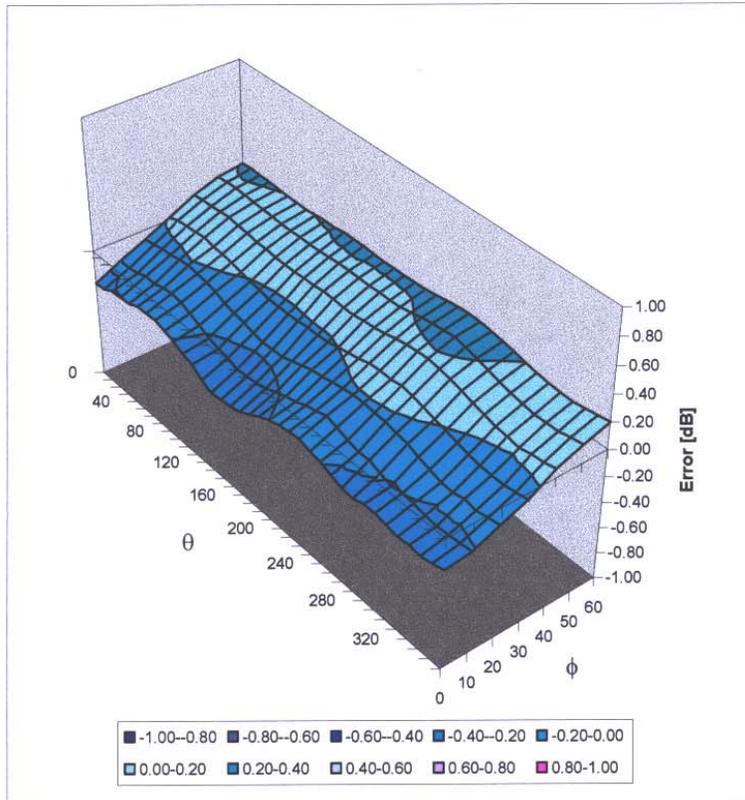


| f [MHz] | Validity [MHz] ^B | Tissue | Permittivity | Conductivity | Alpha | Depth | ConvF | Uncertainty |
|---------|-----------------------------|--------|--------------|--------------|-------|-------|-------------------|-------------|
| 835 | 785-885 | Head | 41.5 ± 5% | 0.90 ± 5% | 0.43 | 2.18 | 6.91 ± 9.7% (k=2) | |
| 900 | 850-950 | Head | 41.5 ± 5% | 0.97 ± 5% | 0.58 | 1.83 | 6.67 ± 9.7% (k=2) | |
| 1750 | 1700-1800 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.45 | 2.67 | 5.57 ± 9.7% (k=2) | |
| 1900 | 1850-1950 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.45 | 2.94 | 5.26 ± 9.7% (k=2) | |
| 2000 | 1950-2050 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.45 | 3.21 | 4.96 ± 9.7% (k=2) | |
| 2450 | 2400-2500 | Head | 39.2 ± 5% | 1.80 ± 5% | 0.80 | 2.03 | 4.74 ± 9.7% (k=2) | |
| 835 | 785-885 | Body | 55.2 ± 5% | 0.97 ± 5% | 0.46 | 2.10 | 6.58 ± 9.7% (k=2) | |
| 900 | 850-950 | Body | 55.0 ± 5% | 1.05 ± 5% | 0.81 | 1.51 | 6.38 ± 9.7% (k=2) | |
| 1750 | 1700-1800 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.52 | 2.86 | 4.77 ± 9.7% (k=2) | |
| 1900 | 1850-1950 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.56 | 2.88 | 4.56 ± 9.7% (k=2) | |
| 2000 | 1950-2050 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.65 | 2.45 | 4.45 ± 9.7% (k=2) | |
| 2450 | 2400-2500 | Body | 52.7 ± 5% | 1.95 ± 5% | 1.01 | 1.60 | 4.36 ± 9.7% (k=2) | |

^B The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



Spherical Isotropy Error < ± 0.4 dB