

## APPENDIX B PLOTS OF THE SAR MEASUREMENTS

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

**Table: 1600 MHz SAR Plots**

| Test Position | Antenna   | Plot Number | Test Channel |
|---------------|-----------|-------------|--------------|
| Touch Right   | Retracted | 1           | 0544         |
|               | Extended  | 2           | 0544         |
| Tilted Right  | Retracted | 3           | 0544         |
|               | Extended  | 4           | 0544         |
| Touch Left    | Retracted | 5           | 0001         |
|               |           | 6           | 0544         |
|               |           | 7           | 1087         |
|               | Extended  | 8           | 0544         |
| Tilted Left   | Retracted | 9           | 0544         |
|               | Extended  | 10          | 0544         |

**Table: SAR Validation Plots**

| Date                         | Plot Number | Frequency |
|------------------------------|-------------|-----------|
| 1 <sup>st</sup> October 2008 | 11          | 1640 MHz  |



Test Date: 1 October 2008

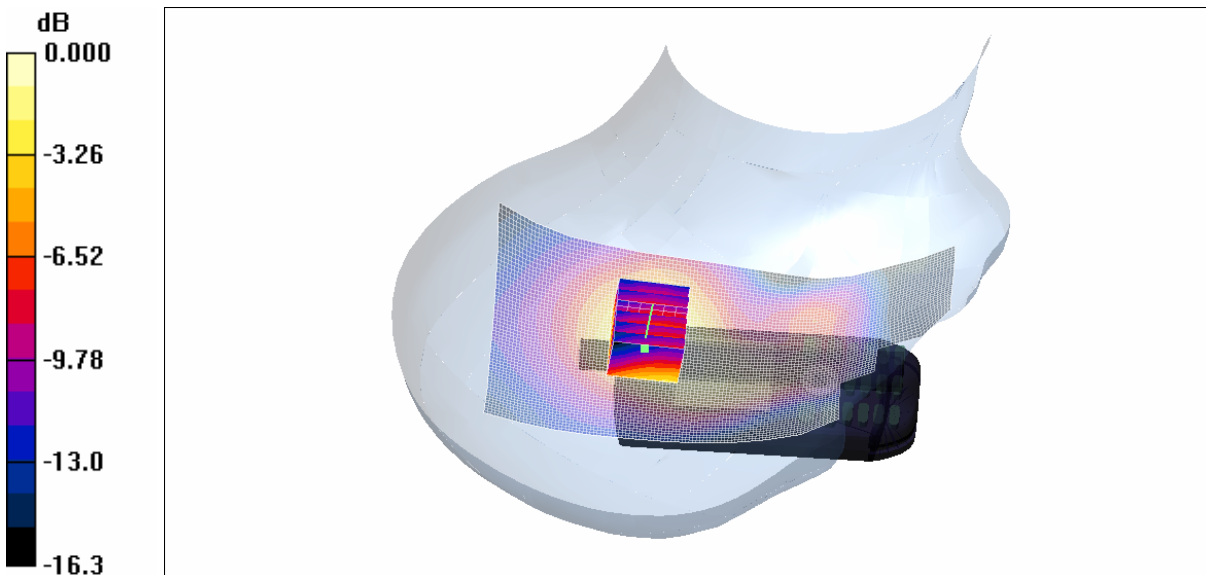
File Name: Touch Right 1600 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: **Thuraya Satellite Phone; Type: XT; Serial: IMEI:35697802-010029-0**

- \* Communication System: 1640 MHz Satellite; Frequency: 1643 MHz; Duty Cycle: 1:8
- \* Medium parameters used:  $f = 1642 \text{ MHz}$ ;  $\sigma = 1.33 \text{ mho/m}$ ;  $\epsilon_r = 39.5$ ;  $\rho = 1000 \text{ kg/m}^3$
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Right Section

**Channel 0544 Test/Area Scan (131x61x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.397 mW/g

**Channel 0544 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 7.76 V/m; Power Drift = -0.031 dB  
 Peak SAR (extrapolated) = 0.518 W/kg  
**SAR(1 g) = 0.361 mW/g; SAR(10 g) = 0.232 mW/g**  
 Maximum value of SAR (measured) = 0.405 mW/g



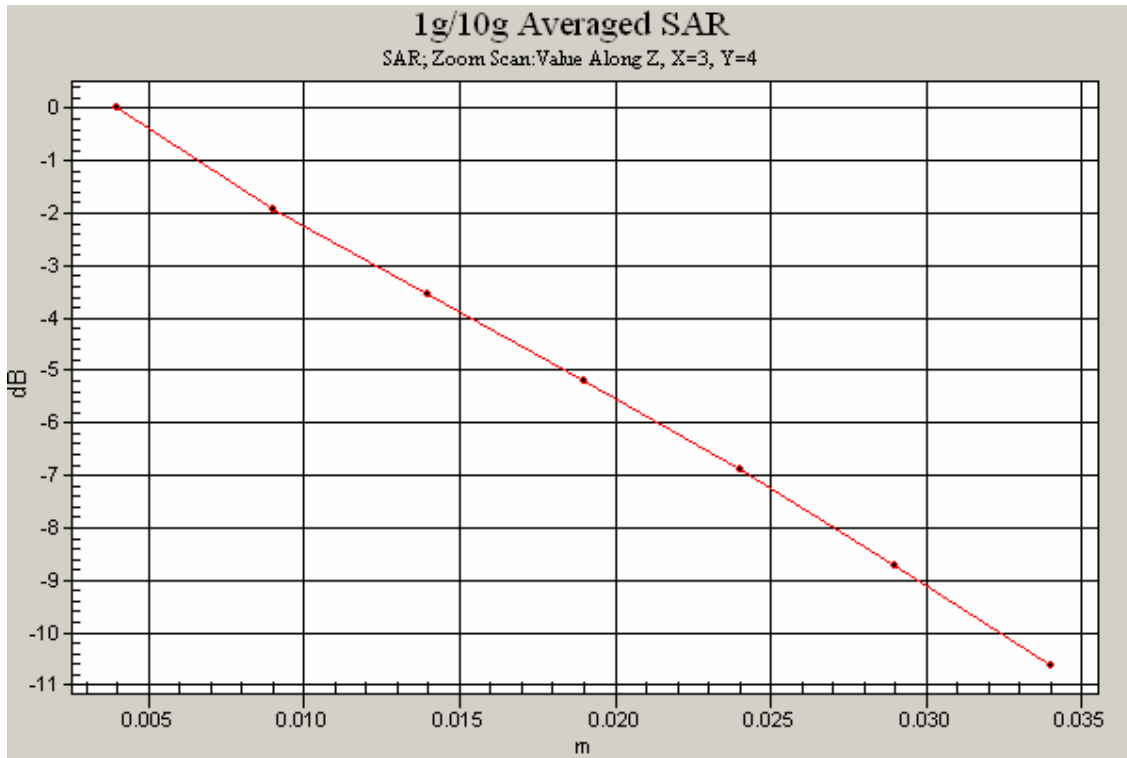
0 dB = 0.405mW/g

**SAR MEASUREMENT PLOT 1**

Ambient Temperature  
 Liquid Temperature  
 Humidity

**20.7 Degrees Celsius**  
**20.5 Degrees Celsius**  
**33.0 %**





Test Date: 1 October 2008

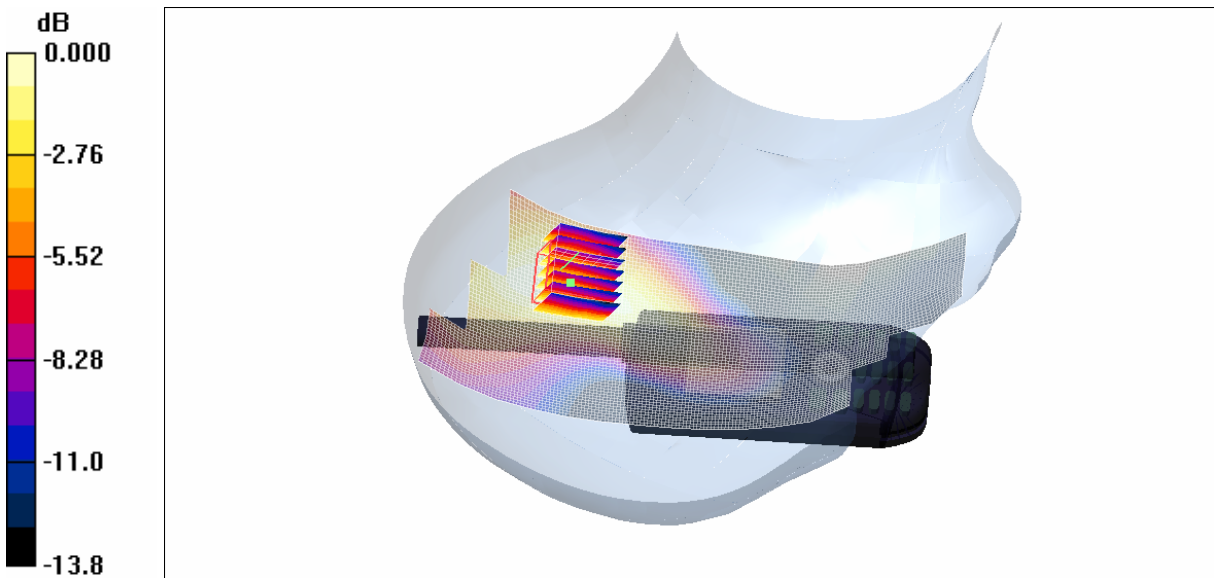
File Name: Touch Right Extended Antenna 1600 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: **Thuraya Satellite Phone; Type: XT; Serial: IMEI:35697802-010029-0**

- \* Communication System: 1640 MHz Satellite; Frequency: 1643 MHz; Duty Cycle: 1:8
- \* Medium parameters used:  $f = 1642$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Right Section

**Channel 0544 Test/Area Scan (171x61x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.070 mW/g

**Channel 0544 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 7.73 V/m; Power Drift = -0.043 dB  
 Peak SAR (extrapolated) = 0.087 W/kg  
**SAR(1 g) = 0.065 mW/g; SAR(10 g) = 0.045 mW/g**  
 Maximum value of SAR (measured) = 0.069 mW/g



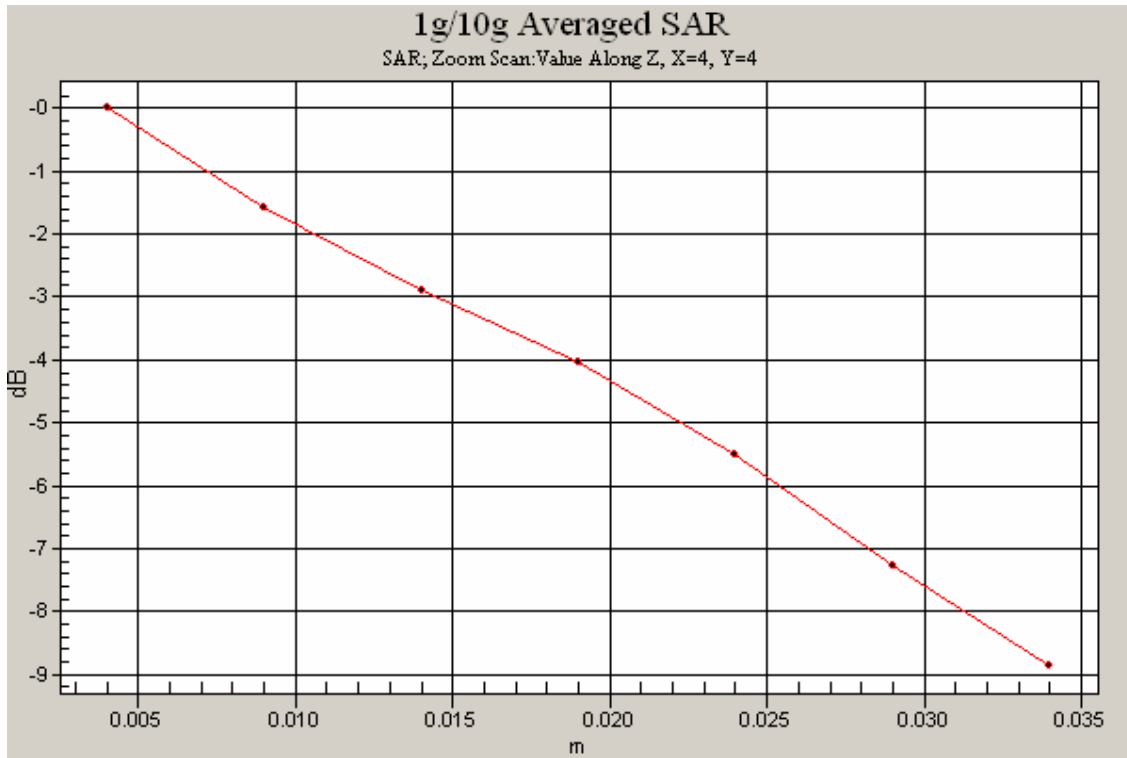
0 dB = 0.069mW/g

**SAR MEASUREMENT PLOT 2**

**Ambient Temperature**  
**Liquid Temperature**  
**Humidity**

**20.7 Degrees Celsius**  
**20.5 Degrees Celsius**  
**33.0 %**





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Test Date: 1 October 2008

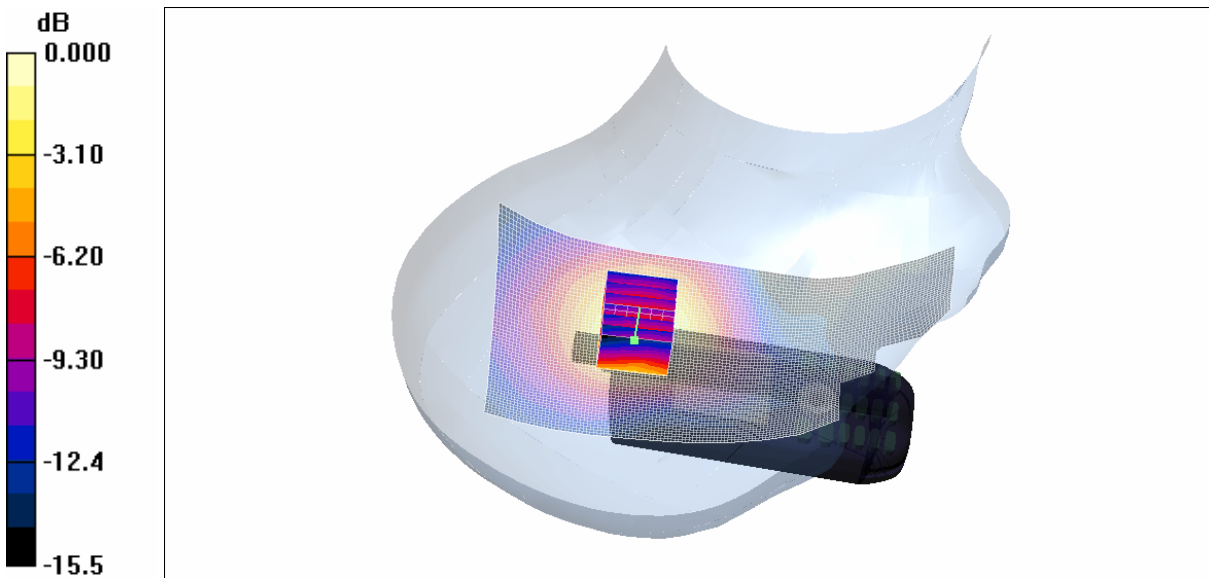
File Name: Tilted Right 1600 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: **Thuraya Satellite Phone; Type: XT; Serial: IMEI:35697802-010029-0**

- \* Communication System: 1640 MHz Satellite; Frequency: 1643 MHz; Duty Cycle: 1:8
- \* Medium parameters used:  $f = 1642$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Right Section

**Channel 0544 Test/Area Scan (131x61x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.381 mW/g

**Channel 0544 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 9.41 V/m; Power Drift = 0.039 dB  
 Peak SAR (extrapolated) = 0.474 W/kg  
**SAR(1 g) = 0.347 mW/g; SAR(10 g) = 0.217 mW/g**  
 Maximum value of SAR (measured) = 0.382 mW/g



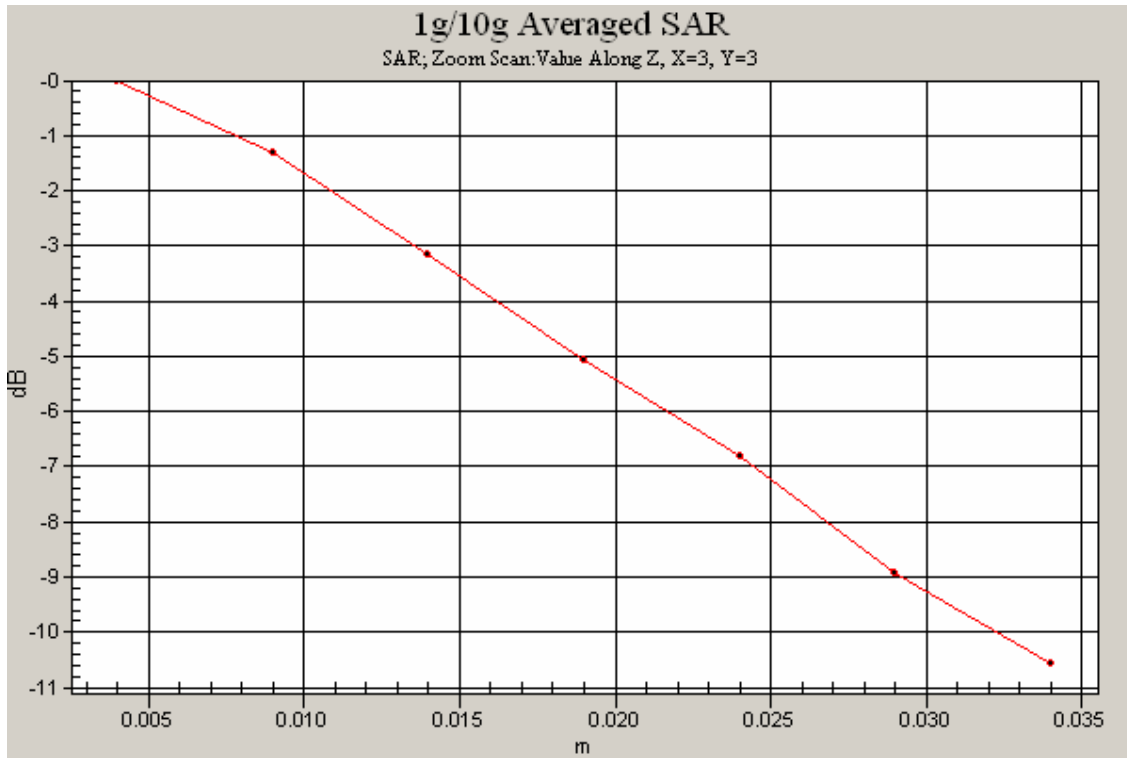
0 dB = 0.382mW/g

**SAR MEASUREMENT PLOT 3**

Ambient Temperature  
 Liquid Temperature  
 Humidity

**20.7 Degrees Celsius**  
**20.5 Degrees Celsius**  
**33.0 %**





Test Date: 1 October 2008

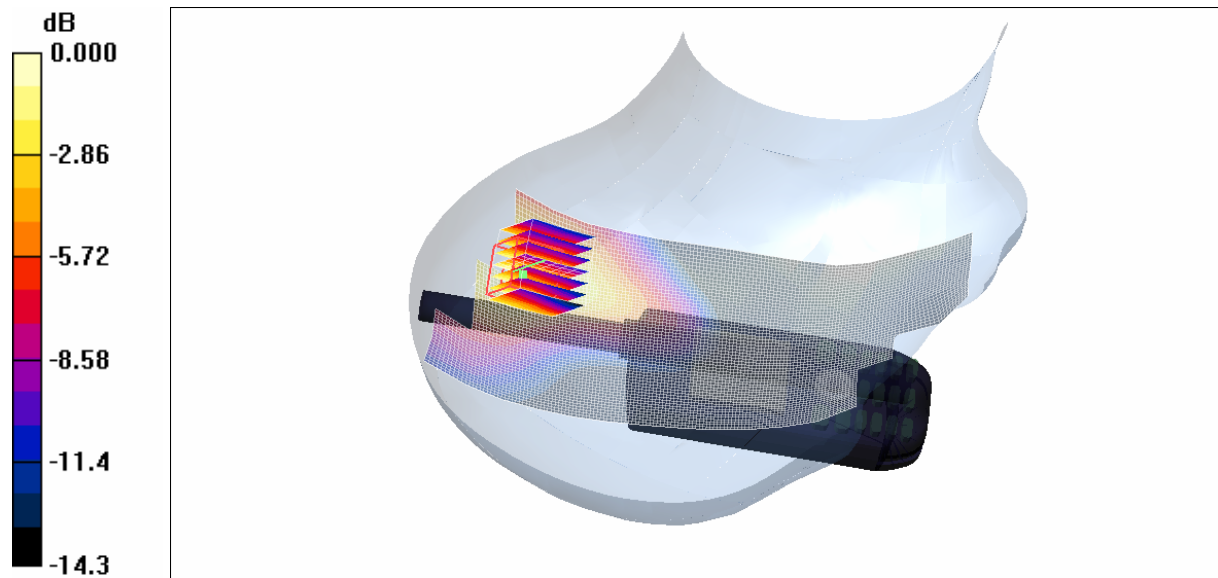
File Name: Tilted Right Extended Antenna 1600 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: **Thuraya Satellite Phone; Type: XT; Serial: IMEI:35697802-010029-0**

- \* Communication System: 1640 MHz Satellite; Frequency: 1643 MHz; Duty Cycle: 1:8
- \* Medium parameters used:  $f = 1642$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Right Section

**Channel 0544 Test/Area Scan (171x61x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.213 mW/g

**Channel 0544 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 10.9 V/m; Power Drift = -0.139 dB  
 Peak SAR (extrapolated) = 0.306 W/kg  
**SAR(1 g) = 0.202 mW/g; SAR(10 g) = 0.130 mW/g**  
 Maximum value of SAR (measured) = 0.222 mW/g



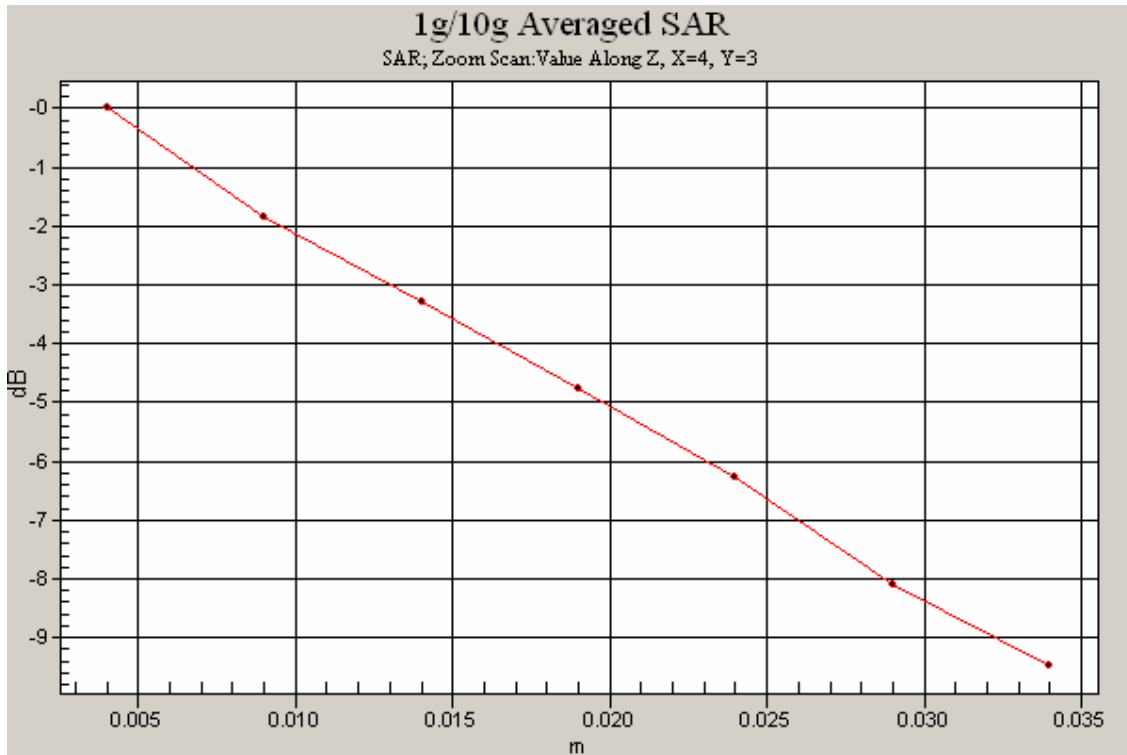
**SAR MEASUREMENT PLOT 4**

Ambient Temperature  
 Liquid Temperature  
 Humidity

**20.7 Degrees Celsius**  
**20.5 Degrees Celsius**  
**33.0 %**







Test Date: 1 October 2008

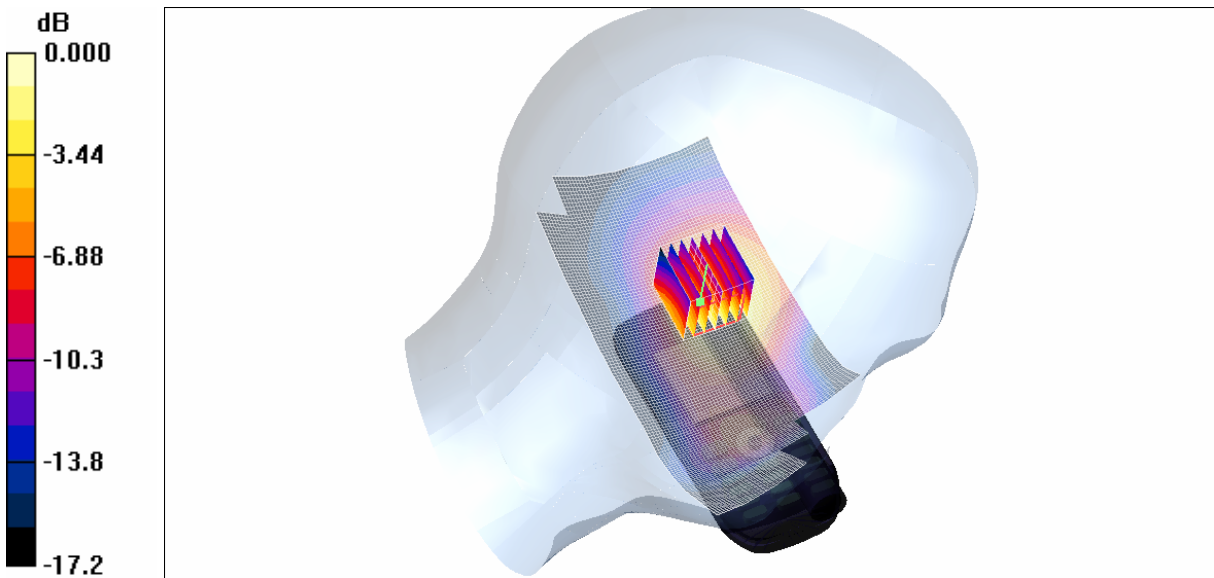
File Name: Touch Left 1600 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: **Thuraya Satellite Phone; Type: XT; Serial: IMEI:35697802-010029-0**

- \* Communication System: 1640 MHz Satellite; Frequency: 1626 MHz; Duty Cycle: 1:8
- \* Medium parameters used:  $f = 1626 \text{ MHz}$ ;  $\sigma = 1.32 \text{ mho/m}$ ;  $\epsilon_r = 39.6$ ;  $\rho = 1000 \text{ kg/m}^3$
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Left Section

**Channel 0001 Test/Area Scan (131x61x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.483 mW/g

**Channel 0001 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 7.71 V/m; Power Drift = -0.191 dB  
 Peak SAR (extrapolated) = 0.601 W/kg  
**SAR(1 g) = 0.424 mW/g; SAR(10 g) = 0.262 mW/g**  
 Maximum value of SAR (measured) = 0.479 mW/g

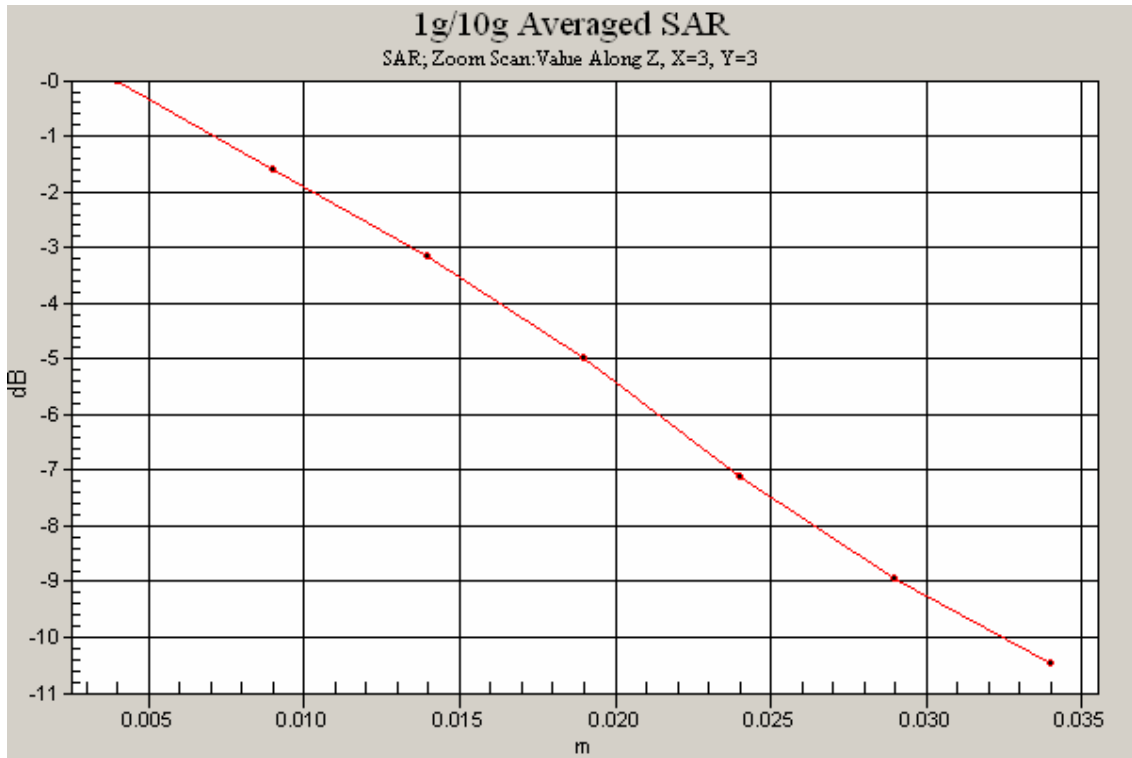


**SAR MEASUREMENT PLOT 5**

Ambient Temperature  
 Liquid Temperature  
 Humidity

**20.7 Degrees Celsius**  
**20.5 Degrees Celsius**  
**33.0 %**





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Test Date: 1 October 2008

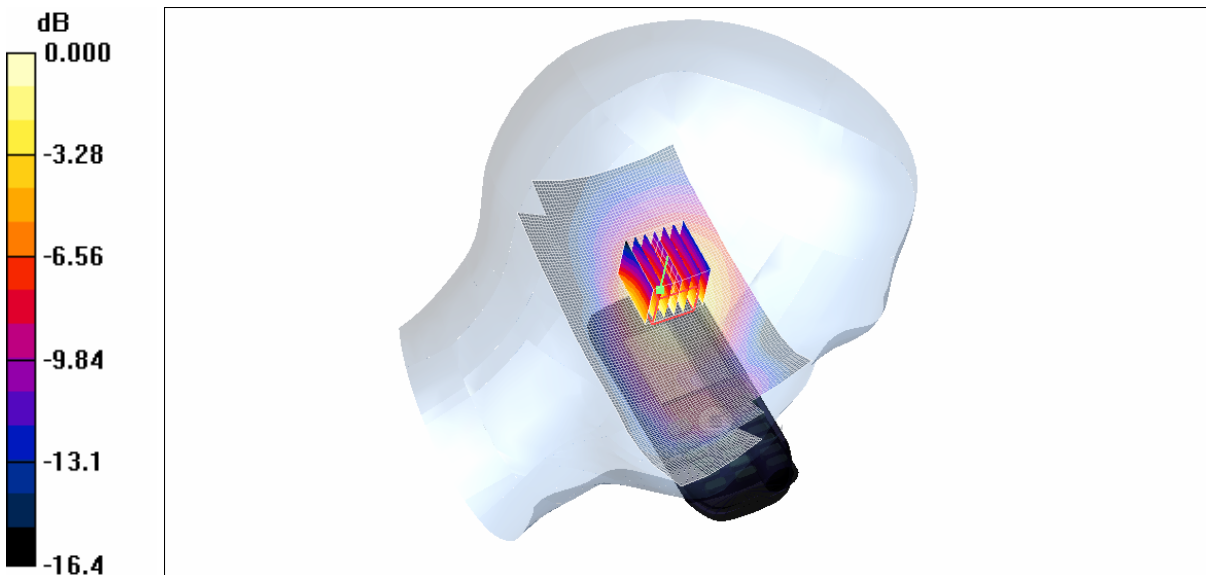
File Name: Touch Left 1600 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: **Thuraya Satellite Phone; Type: XT; Serial: IMEI:35697802-010029-0**

- \* Communication System: 1640 MHz Satellite; Frequency: 1643 MHz; Duty Cycle: 1:8
- \* Medium parameters used:  $f = 1642$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Left Section

**Channel 0544 Test/Area Scan (131x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.534 mW/g

**Channel 0544 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 8.63 V/m; Power Drift = -0.204 dB  
Peak SAR (extrapolated) = 0.674 W/kg  
**SAR(1 g) = 0.457 mW/g; SAR(10 g) = 0.288 mW/g**  
Maximum value of SAR (measured) = 0.503 mW/g



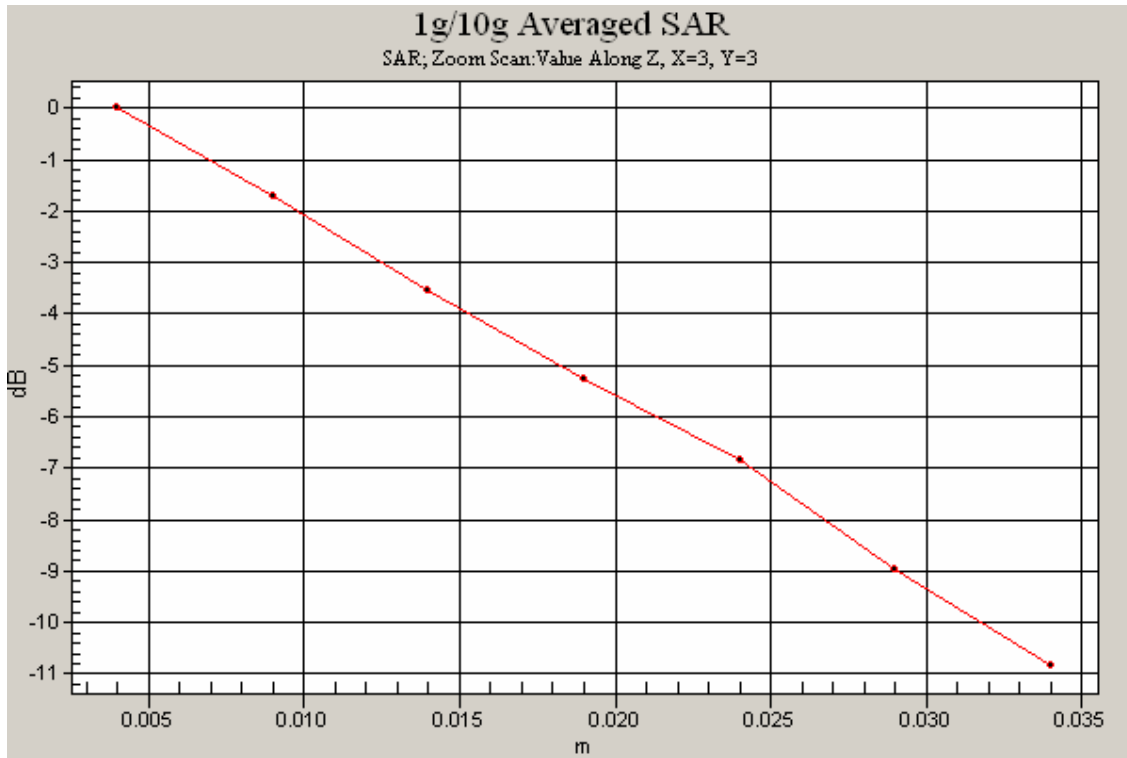
0 dB = 0.503mW/g

**SAR MEASUREMENT PLOT 6**

Ambient Temperature  
Liquid Temperature  
Humidity

20.7 Degrees Celsius  
20.5 Degrees Celsius  
33.0 %





Test Date: 1 October 2008

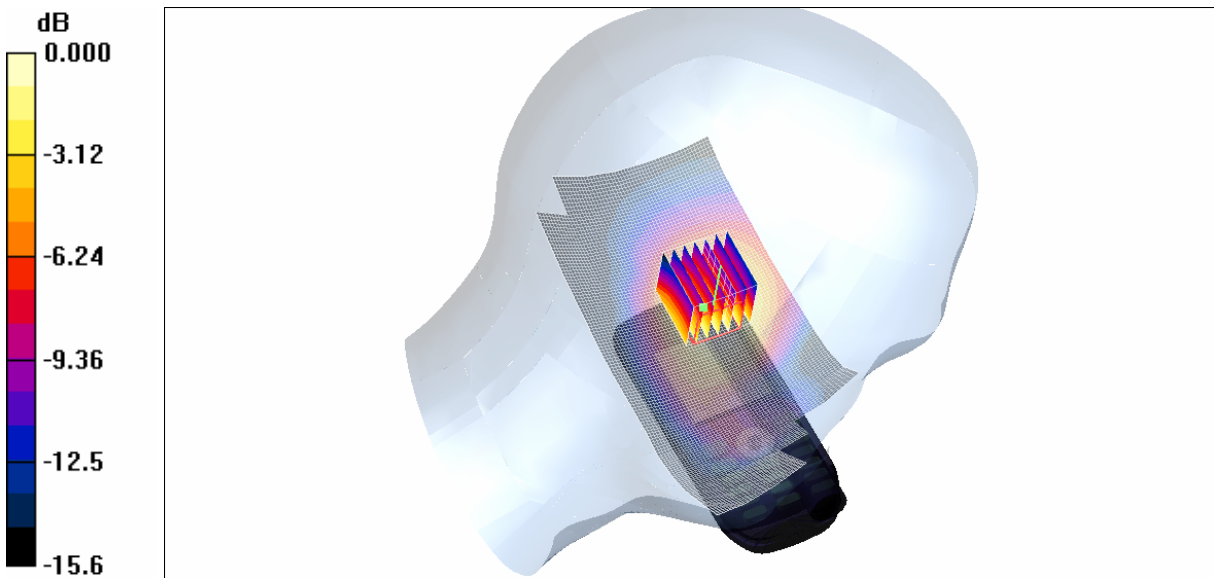
File Name: Touch Left 1600 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: **Thuraya Satellite Phone; Type: XT; Serial: IMEI:35697802-010029-0**

- \* Communication System: 1640 MHz Satellite; Frequency: 1660 MHz; Duty Cycle: 1:8
- \* Medium parameters used:  $f = 1660$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Left Section

**Channel 1087 Test/Area Scan (131x61x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.538 mW/g

**Channel 1087 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 7.48 V/m; Power Drift = -0.076 dB  
 Peak SAR (extrapolated) = 0.594 W/kg  
**SAR(1 g) = 0.456 mW/g; SAR(10 g) = 0.291 mW/g**  
 Maximum value of SAR (measured) = 0.499 mW/g

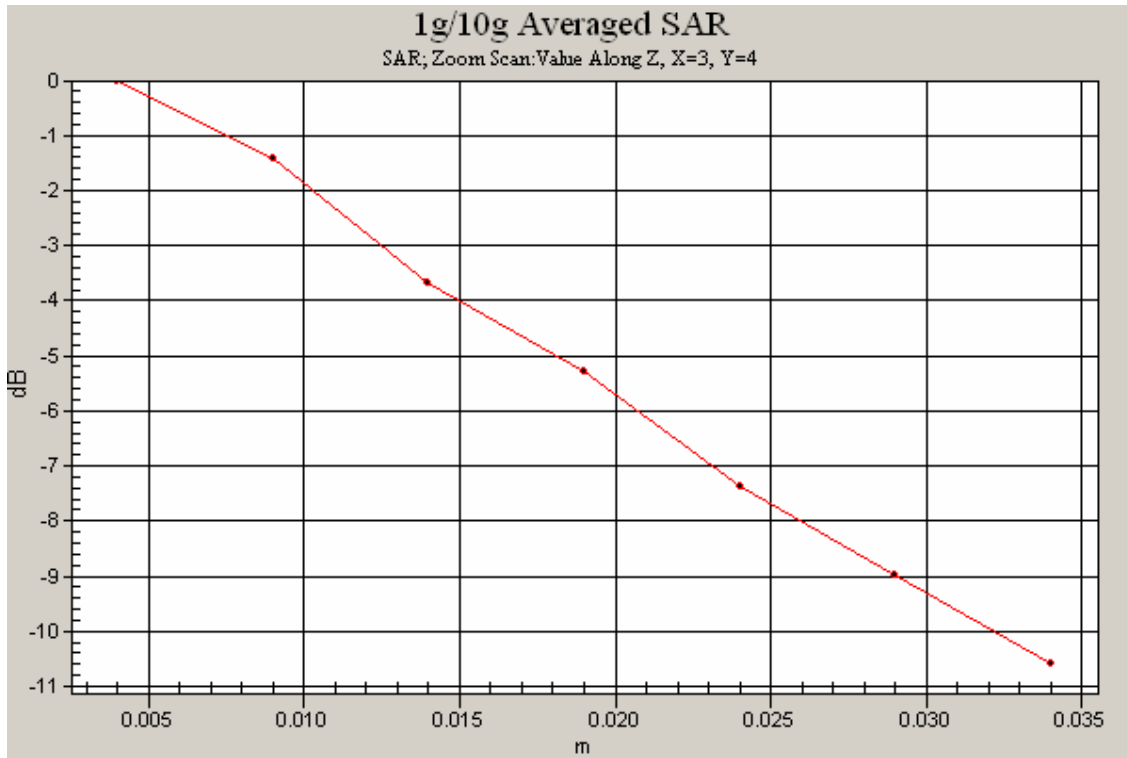


**SAR MEASUREMENT PLOT 7**

Ambient Temperature  
 Liquid Temperature  
 Humidity

20.7 Degrees Celsius  
 20.5 Degrees Celsius  
 33.0 %





Test Date: 1 October 2008

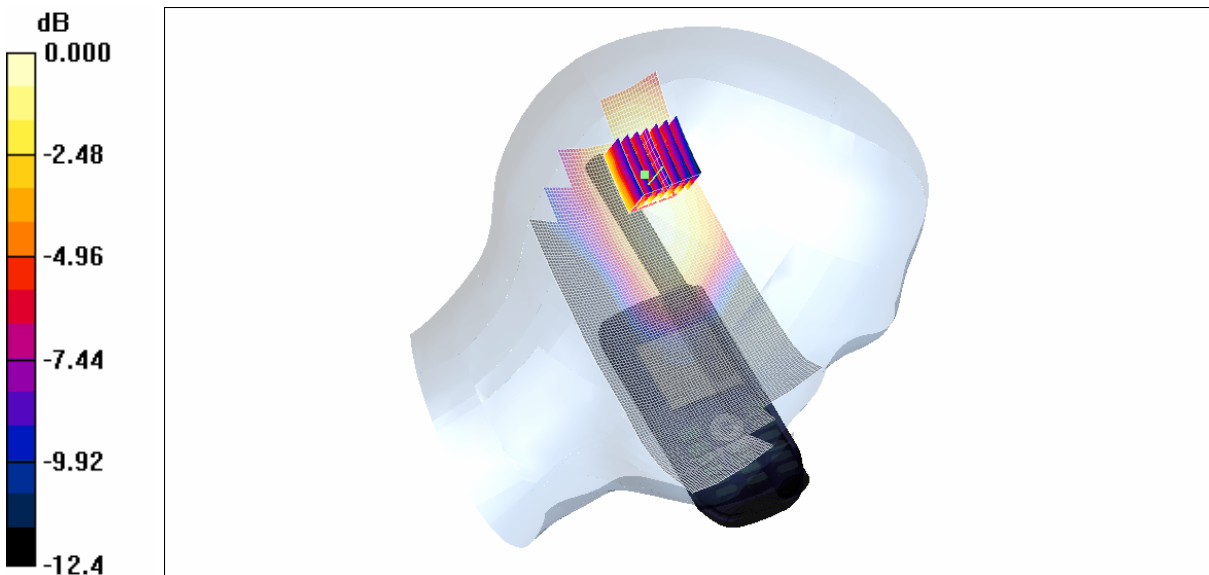
File Name: Touch Left Extended Antenna 1600 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: **Thuraya Satellite Phone; Type: XT; Serial: IMEI:35697802-010029-0**

- \* Communication System: 1640 MHz Satellite; Frequency: 1643 MHz; Duty Cycle: 1:8
- \* Medium parameters used:  $f = 1642$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Left Section

**Channel 0544 Test/Area Scan (171x61x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.099 mW/g

**Channel 0544 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 8.77 V/m; Power Drift = -0.086 dB  
 Peak SAR (extrapolated) = 0.140 W/kg  
**SAR(1 g) = 0.092 mW/g; SAR(10 g) = 0.062 mW/g**  
 Maximum value of SAR (measured) = 0.101 mW/g



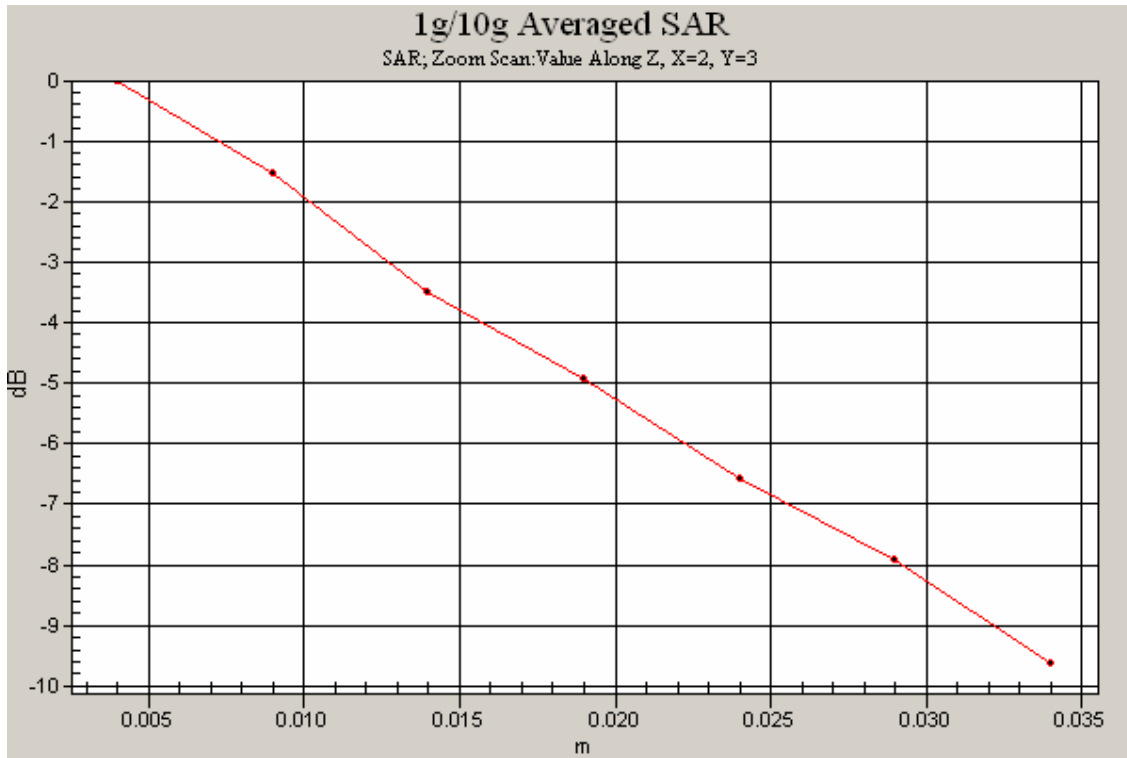
**SAR MEASUREMENT PLOT 8**

**Ambient Temperature**  
**Liquid Temperature**  
**Humidity**

**20.7 Degrees Celsius**  
**20.5 Degrees Celsius**  
**33.0 %**







Test Date: 1 October 2008

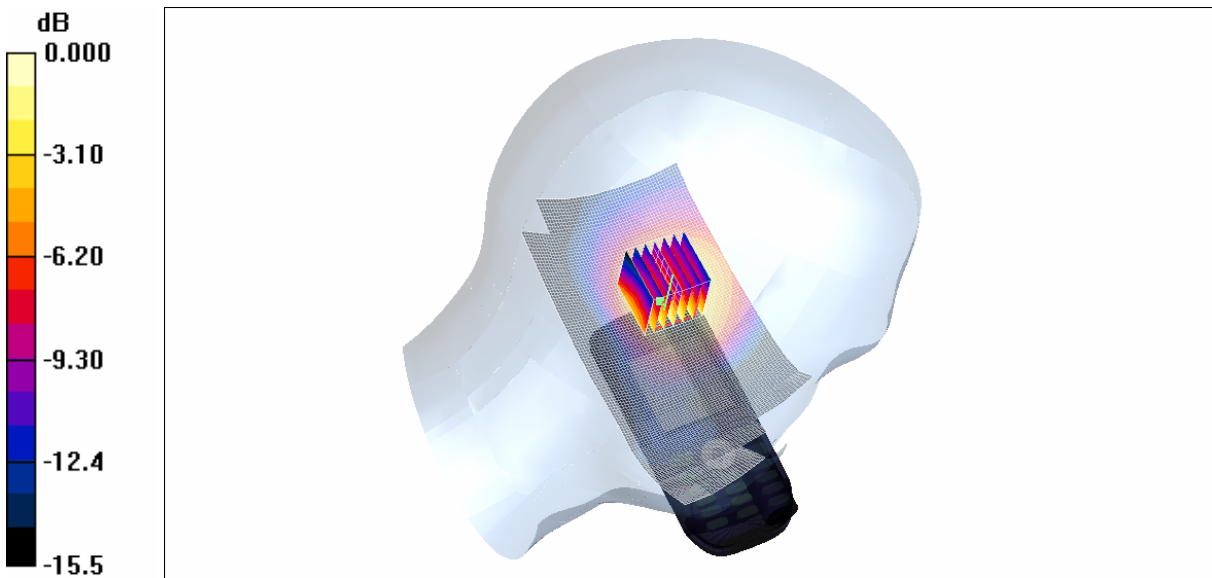
File Name: Tilted Left 1600 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: **Thuraya Satellite Phone; Type: XT; Serial: IMEI:35697802-010029-0**

- \* Communication System: 1640 MHz Satellite; Frequency: 1643 MHz; Duty Cycle: 1:8
- \* Medium parameters used:  $f = 1642$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Left Section

**Channel 0544 Test/Area Scan (131x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.503 mW/g

**Channel 0544 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 10.8 V/m; Power Drift = -0.228 dB  
Peak SAR (extrapolated) = 0.592 W/kg  
**SAR(1 g) = 0.411 mW/g; SAR(10 g) = 0.257 mW/g**  
Maximum value of SAR (measured) = 0.452 mW/g

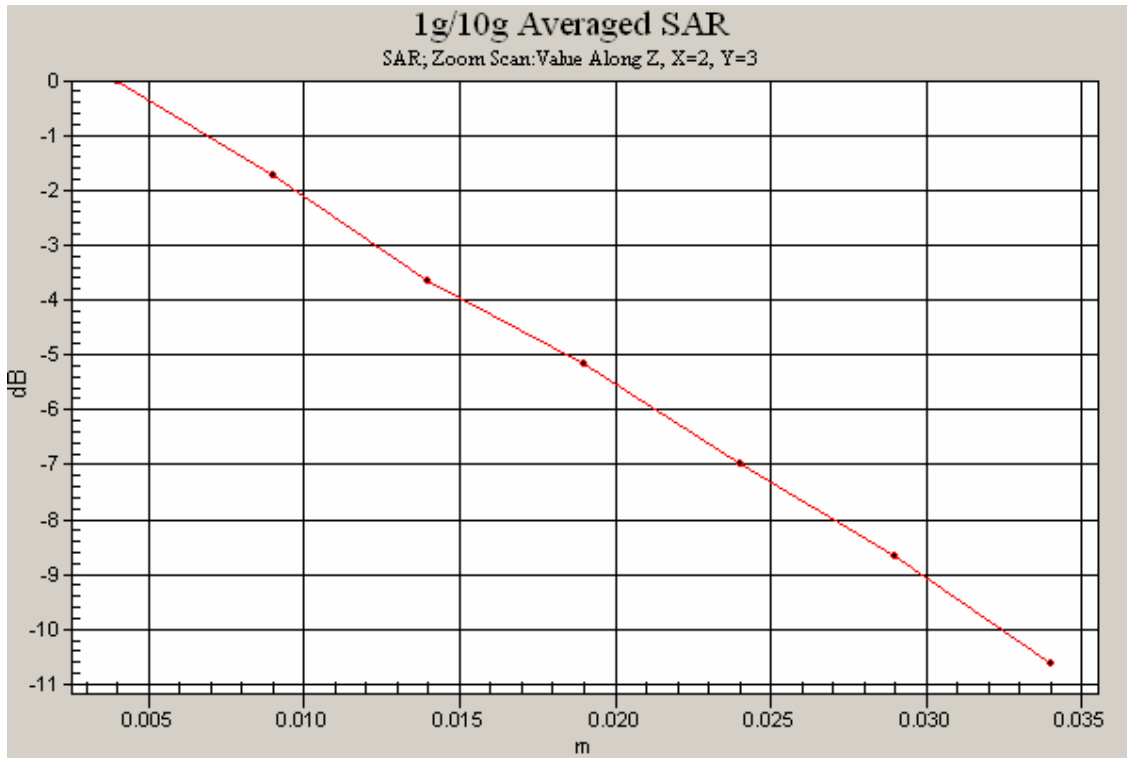


**SAR MEASUREMENT PLOT 9**

Ambient Temperature  
Liquid Temperature  
Humidity

20.7 Degrees Celsius  
20.5 Degrees Celsius  
33.0 %





Test Date: 1 October 2008

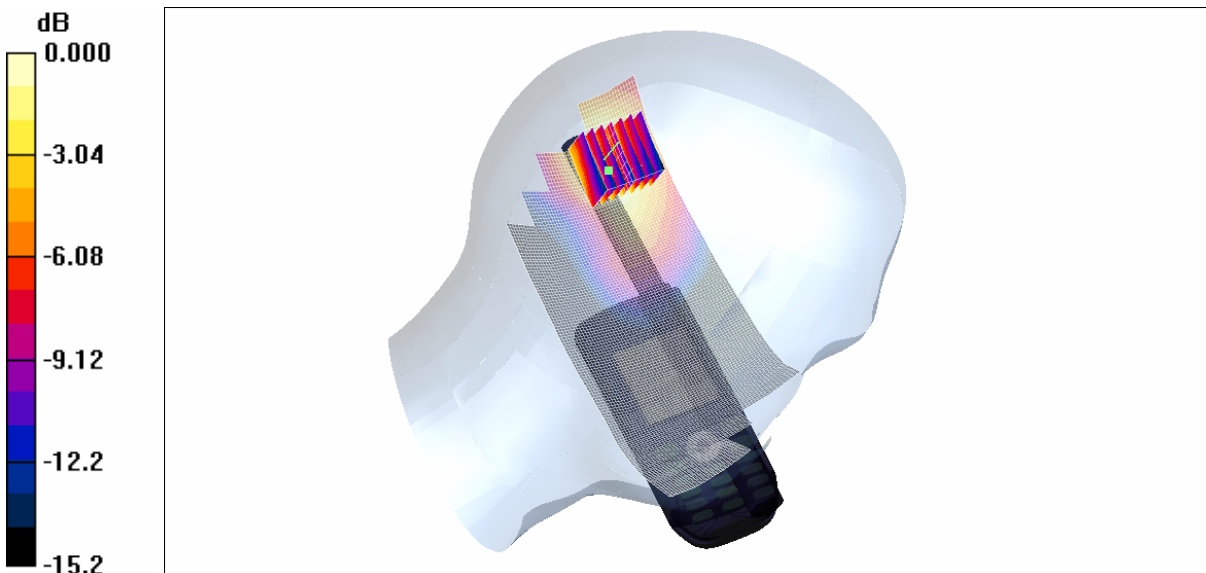
File Name: Tilted Left Extended Antenna 1600 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: **Thuraya Satellite Phone; Type: XT; Serial: IMEI:35697802-010029-0**

- \* Communication System: 1640 MHz Satellite; Frequency: 1643 MHz; Duty Cycle: 1:8
- \* Medium parameters used:  $f = 1642$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Left Section

**Channel 0544 Test/Area Scan (171x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.472 mW/g

**Channel 0544 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 11.3 V/m; Power Drift = -0.162 dB  
Peak SAR (extrapolated) = 0.603 W/kg  
**SAR(1 g) = 0.425 mW/g; SAR(10 g) = 0.260 mW/g**  
Maximum value of SAR (measured) = 0.466 mW/g

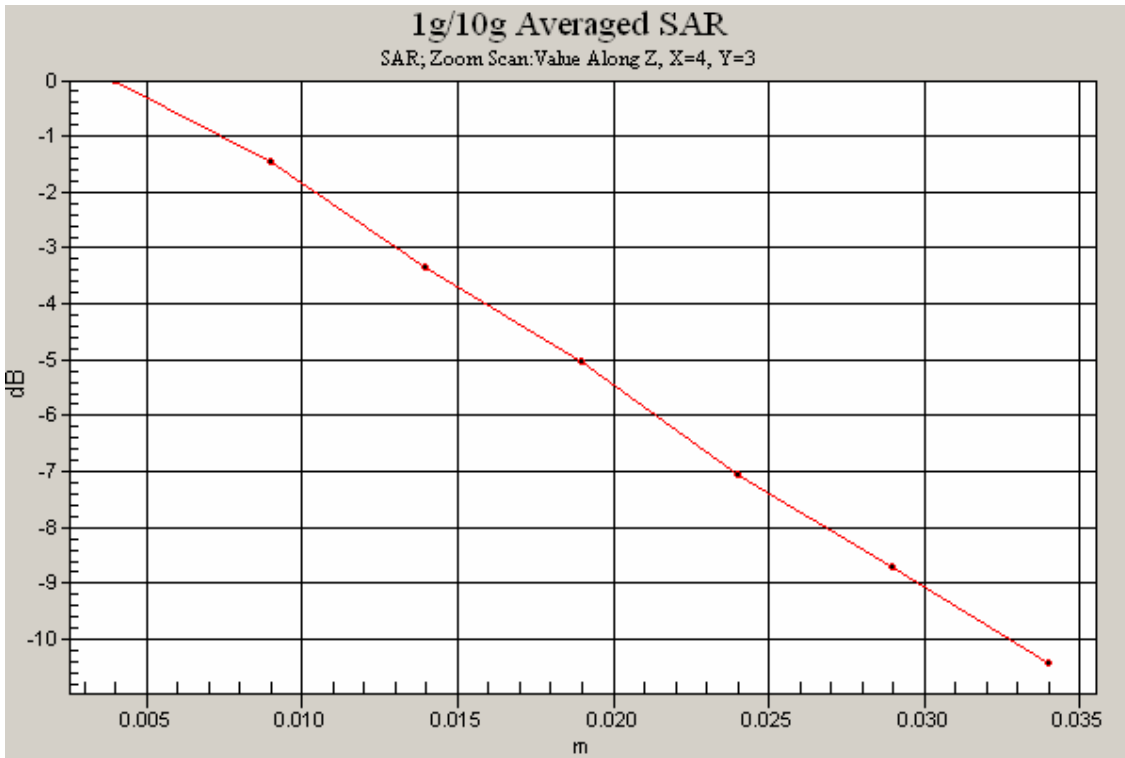


**SAR MEASUREMENT PLOT 10**

Ambient Temperature  
Liquid Temperature  
Humidity

20.7 Degrees Celsius  
20.5 Degrees Celsius  
33.0 %





Test Date: 1 October 2008

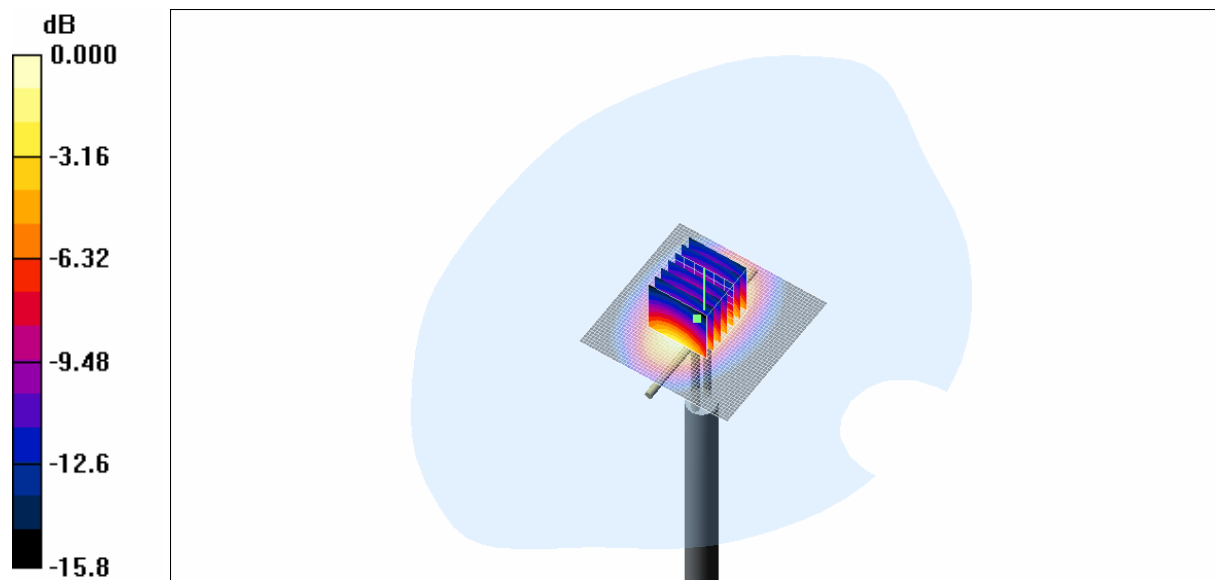
File Name: Validation 1640 MHz (DAE442 Probe1380) 01-10-08.da4

DUT: Dipole 1640 MHz; Type: DV1640V2; Serial: 314

- \* Communication System: CW 1640 MHz; Frequency: 1640 MHz; Duty Cycle: 1:1
- \* Medium parameters used:  $f = 1640$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1380; ConvF(5.6, 5.6, 5.6)
- Phantom: SAM 22; Serial: 1260; Phantom section: Flat Section

**Channel 1 Test/Area Scan (51x51x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 9.77 mW/g

**Channel 1 Test/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 87.8 V/m; Power Drift = 0.010 dB  
 Peak SAR (extrapolated) = 12.9 W/kg  
**SAR(1 g) = 7.98 mW/g; SAR(10 g) = 4.41 mW/g**  
 Maximum value of SAR (measured) = 8.89 mW/g



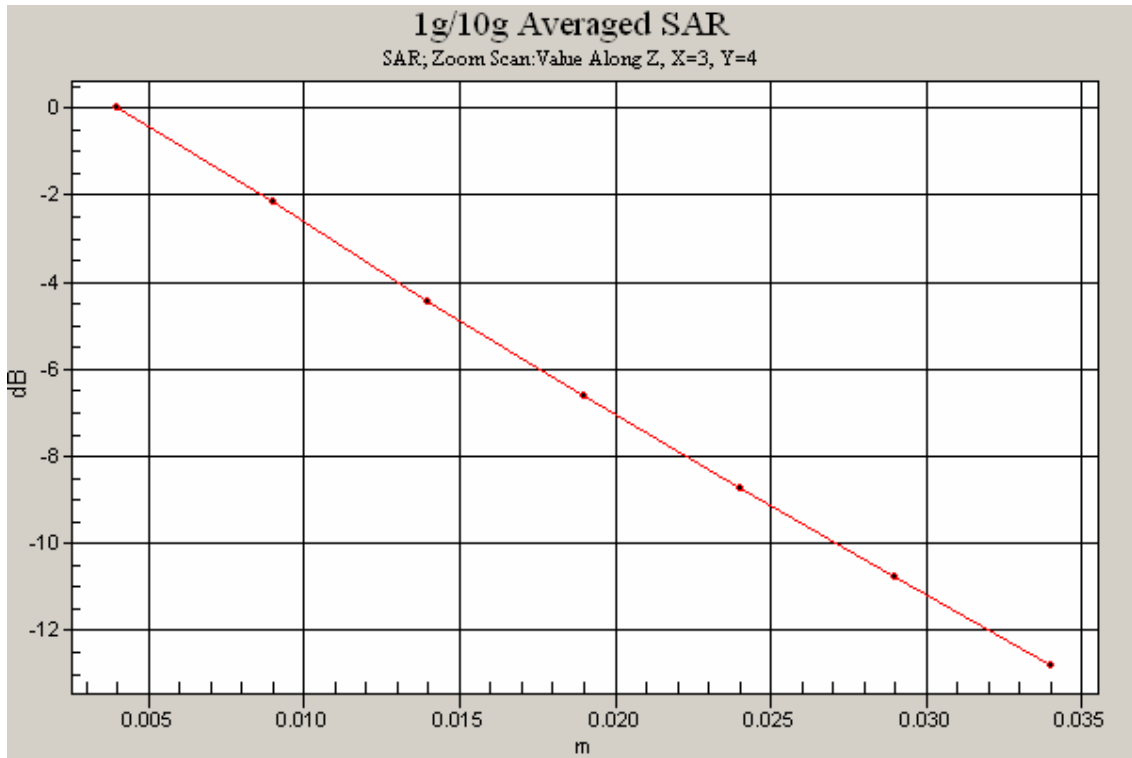
0 dB = 8.89mW/g

**SAR MEASUREMENT PLOT 11**

Ambient Temperature  
 Liquid Temperature  
 Humidity

20.7 Degrees Celsius  
 20.5 Degrees Celsius  
 33.0 %





## APPENDIX C CALIBRATION DOCUMENTS

1. SN: 1380 Probe Calibration Certificate
2. SN: D1640V2 Dipole Calibration Certificate



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**Calibration Laboratory of  
Schmid & Partner  
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Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **EMC Technologies**

Certificate No: **ET3-1380\_Dec07**

**CALIBRATION CERTIFICATE**

Object: **ET3DV6 - SN:1380**

Calibration procedure(s): **QA CAL-01.v6 and QA CAL-12.v5  
Calibration procedure for dosimetric E-field probes**

Calibration date: **December 18, 2007**

Condition of the calibrated item: **In Tolerance**

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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID #            | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|----------------------------|-----------------|---|-----------------------|
| Power meter E4419B         | GB41293874      | 29-Mar-07 (METAS, No. 217-00670)          | Mar-08                |
| Power sensor E4412A        | MY41495277      | 29-Mar-07 (METAS, No. 217-00670)          | Mar-08                |
| Power sensor E4412A        | MY41498087      | 29-Mar-07 (METAS, No. 217-00670)          | Mar-08                |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 8-Aug-07 (METAS, No. 217-00719)           | Aug-08                |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 29-Mar-07 (METAS, No. 217-00671)          | Mar-08                |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 8-Aug-07 (METAS, No. 217-00720)           | Aug-08                |
| Reference Probe ES3DV2     | SN: 3013        | 4-Jan-07 (SPEAG, No. ES3-3013_Jan07)      | Jan-08                |
| DAE4                       | SN: 654         | 20-Apr-07 (SPEAG, No. DAE4-654_Apr07)     | Apr-08                |

| Secondary Standards       | ID #         | Check Date (in house)                    | Scheduled Check        |
|---------------------------|--------------|--|------------------------|
| RF generator HP 8648C     | US3642U01700 | 4-Aug-99 (SPEAG, in house check Oct-07)  | In house check: Oct-09 |
| Network Analyzer HP 8753E | US37390585   | 18-Oct-01 (SPEAG, in house check Oct-07) | In house check: Oct-08 |

|                | Name          | Function          | Signature |
|----------------|---------------|-------------------|-----------|
| Calibrated by: | Katja Pokovic | Technical Manager |           |
| Approved by:   | Niels Kuster  | Quality Manager   |           |

Issued: December 18, 2007

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Certificate No: ET3-1380\_Dec07

Page 1 of 9



ET3DV6 SN:1380

December 18, 2007

**DASY - Parameters of Probe: ET3DV6 SN:1380**

Sensitivity in Free Space<sup>A</sup>

Diode Compression<sup>B</sup>

|       |              |                       |       |       |
|-------|--------------|-----------------------|-------|-------|
| NormX | 1.64 ± 10.1% | μV/(V/m) <sup>2</sup> | DCP X | 90 mV |
| NormY | 1.59 ± 10.1% | μV/(V/m) <sup>2</sup> | DCP Y | 89 mV |
| NormZ | 1.69 ± 10.1% | μV/(V/m) <sup>2</sup> | DCP Z | 92 mV |

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

|   |                              |   |               |               |
|---|------------------------------|---|---------------|---------------|
| <b>TSL</b>                                | <b>900 MHz</b>               | <b>Typical SAR gradient: 5 % per mm</b> |               |               |
| Sensor Center to Phantom Surface Distance |                              |   | <b>3.7 mm</b> | <b>4.7 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm |   | 11.0          | 6.4           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    |   | 0.8           | 0.6           |

|   |                              |  |               |               |
|---|------------------------------|--|---------------|---------------|
| <b>TSL</b>                                | <b>1810 MHz</b>              | <b>Typical SAR gradient: 10 % per mm</b> |               |               |
| Sensor Center to Phantom Surface Distance |                              |  | <b>3.7 mm</b> | <b>4.7 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm |  | 12.4          | 7.9           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    |  | 0.5           | 0.9           |

Sensor Offset

Probe Tip to Sensor Center **2.7 mm**

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).

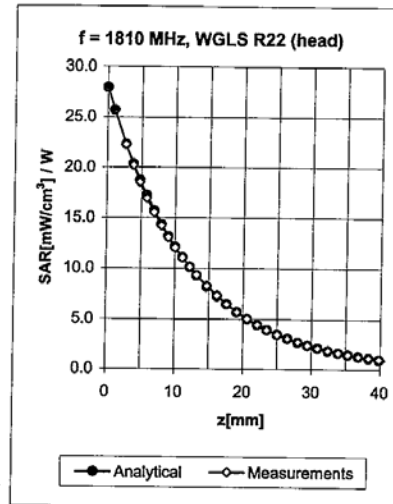
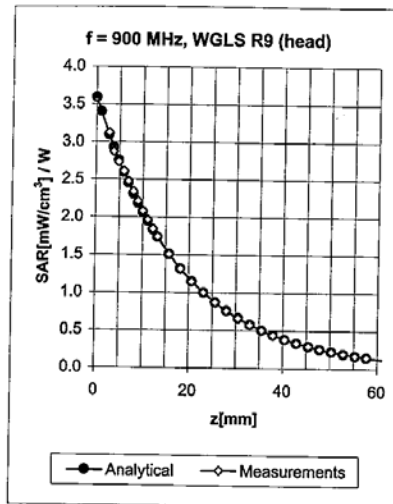
<sup>B</sup> Numerical linearization parameter: uncertainty not required.



ET3DV6 SN:1380

December 18, 2007

### Conversion Factor Assessment



| f [MHz] | Validity [MHz] <sup>c</sup> | TSL  | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty  |
|---------|-----------------------------|------|--------------|--------------|-------|-------|--------------------|
| 450     | ± 50 / ± 100                | Head | 43.5 ± 5%    | 0.87 ± 5%    | 0.38  | 1.95  | 6.93 ± 13.3% (k=2) |
| 900     | ± 50 / ± 100                | Head | 41.5 ± 5%    | 0.97 ± 5%    | 0.77  | 1.96  | 6.30 ± 11.0% (k=2) |
| 1640    | ± 50 / ± 100                | Head | 40.3 ± 5%    | 1.29 ± 5%    | 0.62  | 2.51  | 5.60 ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.73  | 2.11  | 5.11 ± 11.0% (k=2) |
| 1950    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.64  | 2.38  | 4.92 ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Head | 39.2 ± 5%    | 1.80 ± 5%    | 0.95  | 1.68  | 4.55 ± 11.8% (k=2) |
| 450     | ± 50 / ± 100                | Body | 56.7 ± 5%    | 0.94 ± 5%    | 0.32  | 1.99  | 7.44 ± 13.3% (k=2) |
| 900     | ± 50 / ± 100                | Body | 55.0 ± 5%    | 1.05 ± 5%    | 0.82  | 1.93  | 6.03 ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.89  | 1.79  | 4.79 ± 11.0% (k=2) |
| 1950    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.71  | 2.12  | 4.55 ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Body | 52.7 ± 5%    | 1.95 ± 5%    | 0.99  | 1.58  | 4.18 ± 11.8% (k=2) |

<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.



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Zeughausstrasse 43, 8004 Zurich, Switzerland



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client: **EMC Technologies**

Certificate No. **D1640V2-314-Jul08**

**CALIBRATION CERTIFICATE**

Object: **D1640V2 - SN: 314**

Calibration procedure(s): **QA CAL-05 v6  
Calibration procedure for dipole validation kits**

Calibration date: **July 16, 2008**

Condition of the calibrated item: **In tolerance** *28/07/08 PJ*

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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration  |
|-----------------------------|--------------------|---|------------------------|
| Power meter EPM-442A        | GB37480704         | 04-Oct-07 (No. 217-00736)                 | Oct-08                 |
| Power sensor HP 8481A       | US37292783         | 04-Oct-07 (No. 217-00736)                 | Oct-08                 |
| Reference 20 dB Attenuator  | SN: 5086 (20g)     | 01-Jul-08 (No. 217-00864)                 | Jul-09                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 01-Jul-08 (No. 217-00867)                 | Jul-09                 |
| Reference Probe ES3DV2      | SN: 3025           | 28-Apr-08 (No. ES3-3025_Apr08)            | Apr-09                 |
| DAE4                        | SN: 601            | 14-Mar-08 (No. DAE4-601_Mar08)            | Mar-09                 |
| Secondary Standards         | ID #               | Check Date (in house)                     | Scheduled Check        |
| Power sensor HP 8481A       | MY41092317         | 18-Oct-02 (in house check Oct-07)         | In house check: Oct-09 |
| RF generator R&S SMT-06     | 100005             | 4-Aug-99 (in house check Oct-07)          | In house check: Oct-09 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-07)         | In house check: Oct-08 |

Calibrated by: **Jeton Kasrat** (Name), **Laboratory Technician** (Function), *[Signature]* (Signature)

Approved by: **Katala Pokovic** (Name), **Technical Manager** (Function), *[Signature]* (Signature)

Issued: July 17, 2008

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**S** Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

**Glossary:**

TSL tissue simulating liquid  
ConvF sensitivity in TSL / NORM x,y,z  
N/A not applicable or not measured

**Calibration is Performed According to the Following Standards:**

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

- d) DASY4 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.



**Measurement Conditions**

DASY system configuration, as far as not given on page 1.

|                              |                           |             |
|------------------------------|---------------------------|-------------|
| DASY Version                 | DASY4                     | V4.7        |
| Extrapolation                | Advanced Extrapolation    |             |
| Phantom                      | Modular Flat Phantom V5.0 |             |
| Distance Dipole Center - TSL | 10 mm                     | with Spacer |
| Area Scan resolution         | dx, dy = 15 mm            |             |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm         |             |
| Frequency                    | 1640 MHz ± 1 MHz          |             |

**Head TSL parameters**

The following parameters and calculations were applied.

|                                  | Temperature     | Permittivity | Conductivity     |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters      | 22.0 °C         | 40.2         | 1.31 mho/m       |
| Measured Head TSL parameters     | (22.0 ± 0.2) °C | 39.3 ± 6 %   | 1.34 mho/m ± 6 % |
| Head TSL temperature during test | (22.0 ± 0.2) °C | ----         | ----             |

**SAR result with Head TSL**

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | condition          |                                   |
|---|--------------------|-----------------------------------|
| SAR measured  | 250 mW input power | 8.44 mW / g                       |
| SAR normalized  | normalized to 1W   | 33.8 mW / g                       |
| SAR for nominal Head TSL parameters <sup>1</sup>      | normalized to 1W   | <b>33.0 mW / g ± 17.0 % (k=2)</b> |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                                   |
|---|--------------------|-----------------------------------|
| SAR measured  | 250 mW input power | 4.55 mW / g                       |
| SAR normalized  | normalized to 1W   | 18.2 mW / g                       |
| SAR for nominal Head TSL parameters <sup>1</sup>        | normalized to 1W   | <b>17.9 mW / g ± 16.5 % (k=2)</b> |

<sup>1</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"



**Appendix****Antenna Parameters with Head TSL**

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 52.7 $\Omega$ + 3.1 j $\Omega$ |
| Return Loss                          | - 28.0 dB                      |

**General Antenna Parameters and Design**

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.231 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

**Additional EUT Data**

|                 |                |
|-----------------|----------------|
| Manufactured by | SPEAG          |
| Manufactured on | March 19, 2004 |



**DASY4 Validation Report for Head TSL**

Date/Time: 16.07.2008 10:38:27

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1640 MHz; Type: D1640V2; Serial: D1640V2 - SN314**

Communication System: CW-1640; Frequency: 1640 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB;

Medium parameters used:  $f = 1640$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

**DASY4 Configuration:**

- Probe: ES3DV2 - SN3025; ConvF(5.16, 5.16, 5.16); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

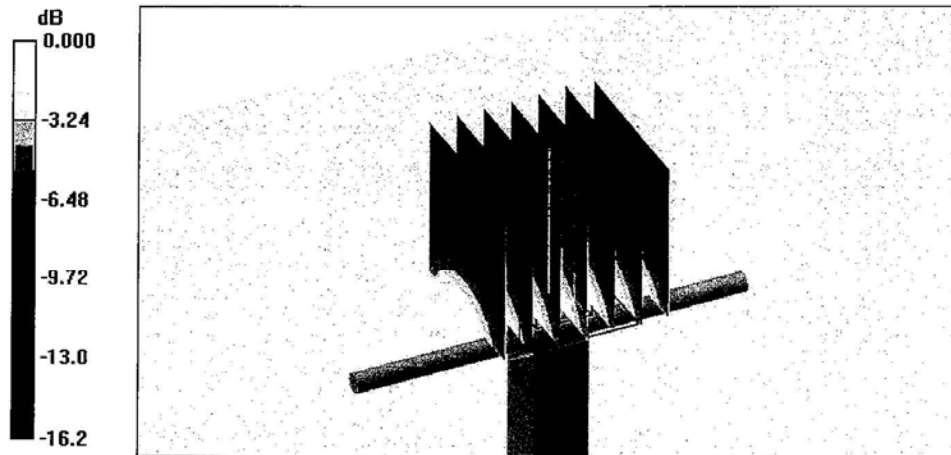
**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.2 V/m; Power Drift = 0.009 dB

Peak SAR (extrapolated) = 14.9 W/kg

**SAR(1 g) = 8.44 mW/g; SAR(10 g) = 4.55 mW/g**

Maximum value of SAR (measured) = 10.1 mW/g



0 dB = 10.1mW/g





### Impedance Measurement Plot for Head TSL

