# Appendix D

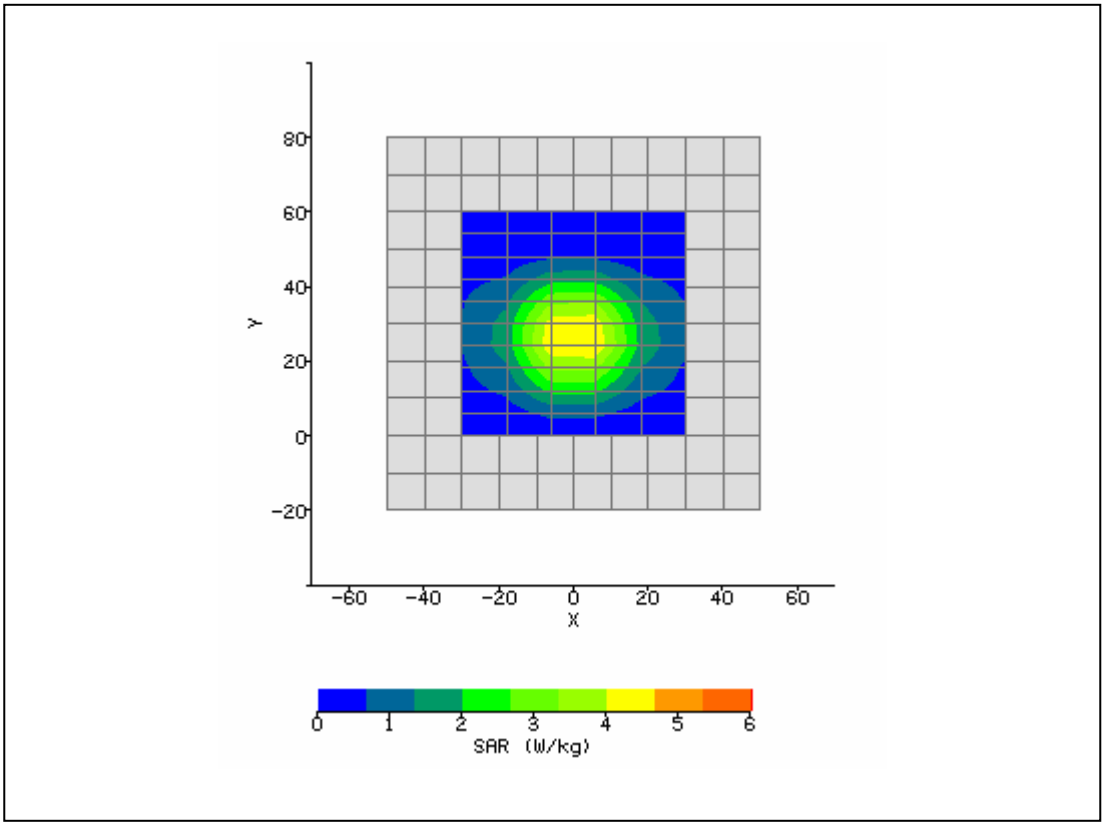
Due to the large frequency span of 802.11a, probe calibration factors and SAR verifications have been extended beyond ± 50 MHz and ± 100 MHz, respectively. Do to this, the Uncertainty Budget has been updated. Extensive SAR verifications have been performed to ensure proper measurements that are performed outside of the defined thresholds.

The SAR probe M0024 has been calibrated for 5200 MHz and 5800 MHz. SAR measurements were performed with the 5800 calibration factors. Probe factors for 5600 MHz were determined by linear extrapolation between 5200 MHz and 5800 MHz. Using the waveguide verification setup in Section 8, SAR measurements were performed with both 5600 extrapolated factors and 5800 probe factors.

| CW Frequency (MHz) | Probe factors | 1g SAR value (W/kg) |
|---|---|---|
| 5600 | 5600B | 4.188 |
| 5600 | 5800B | 3.946 |
| | | |
| | **Percent Difference** | -5.78 % |

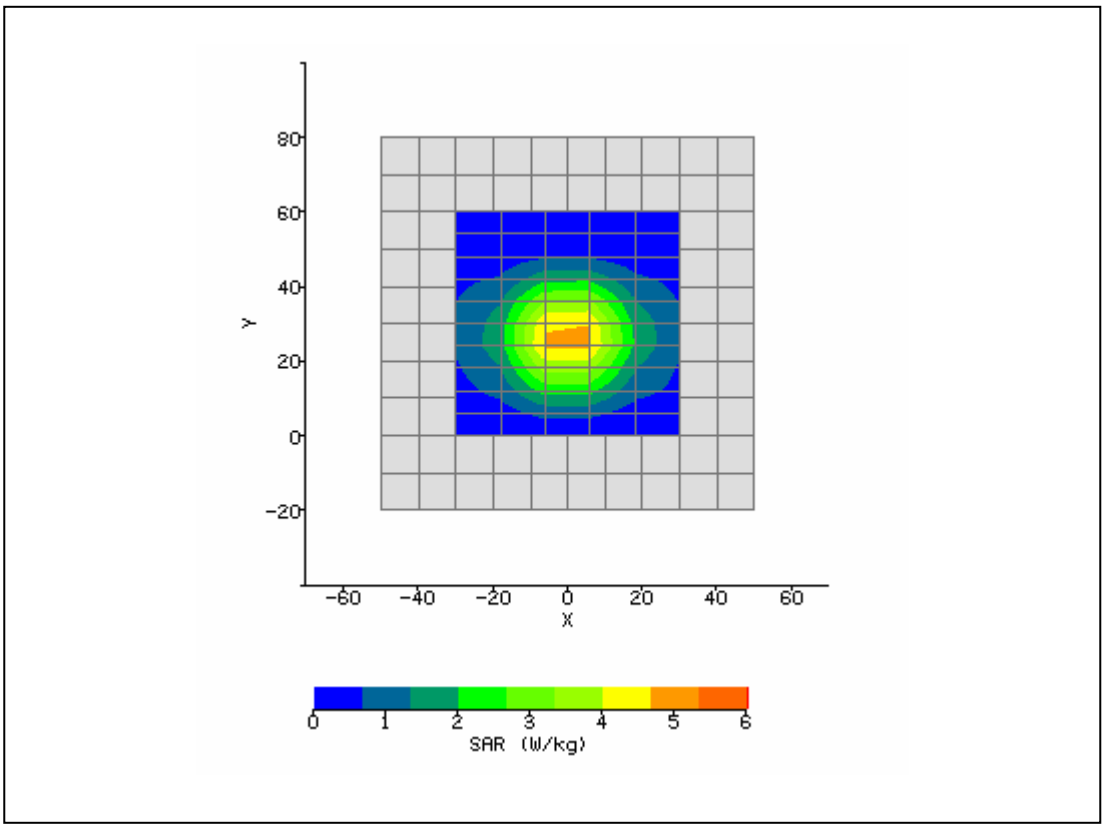
# Appendix D

| | | | | |
|---|---|---|---|---|
| **System / software:** | SARA2 / 2.54 VPM coloc | | **Input Power Drift:** | |
| **Date / Time:** | 12/12/2008 11:33:45 AM | | **DUT Battery Model/No:** | |
| **Filename:** | 9750.txt | | **Probe Serial Number:** | M0024 |
| **Ambient Temperature:** | 21.7°C | | **Liquid Simulant:** | 5800 |
| **Device Under Test:** | System | | **Relative Permittivity:** | 51.40 |
| **Relative Humidity:** | 45.6% | | **Conductivity:** | 5.711 |
| **Phantom S/No:** | Head04_37.csv | | **Liquid Temperature:** | 21.6°C |
| **Phantom Rotation:** | 180° | | **Max SAR X-axis Location:** | 0.00 mm |
| **DUT Position:** | 10mm | | **Max SAR Y-axis Location:** | 26.40 mm |
| **Antenna Configuration:** | WG | | **Max E Field:** | 39.20 V/m |
| **Test Frequency:** | 5600MHz | | **SAR 1g:** | 4.188 W/kg |
| **Air Factors:** | 411.50 / 320.07 / 275.84 | | **SAR 10g:** | 1.607 W/kg |
| **Conversion Factors:** | 3.34 / 3.69 / 4.65 | | **SAR Start:** | 0.000 W/kg |
| **Type of Modulation:** | | | **SAR End:** | 0.000 W/kg |
| **Modn. Duty Cycle:** | | | **SAR Drift during Scan:** | % |
| **Diode Compression Factors (V*200):** | 20 / 20 / 20 | | **Probe battery last changed:** | 12/12/08 |
| **Input Power Level:** | 100mW | | **Extrapolation:** | poly4 |



# Appendix D

| | | | | |
|---|---|---|---|---|
| **System / software:** | SARA2 / 2.54 VPM coloc | | **Input Power Drift:** | |
| **Date / Time:** | 12/12/2008 11:33:45 AM | | **DUT Battery Model/No:** | |
| **Filename:** | 9750.txt | | **Probe Serial Number:** | M0024 |
| **Ambient Temperature:** | 21.7°C | | **Liquid Simulant:** | 5800 |
| **Device Under Test:** | System | | **Relative Permittivity:** | 51.40 |
| **Relative Humidity:** | 45.6% | | **Conductivity:** | 5.711 |
| **Phantom S/No:** | Head04_37.csv | | **Liquid Temperature:** | 21.6°C |
| **Phantom Rotation:** | 180° | | **Max SAR X-axis Location:** | 0.00 mm |
| **DUT Position:** | 10mm | | **Max SAR Y-axis Location:** | 26.40 mm |
| **Antenna Configuration:** | WG | | **Max E Field:** | 37.14 V/m |
| **Test Frequency:** | 5600MHz | | **SAR 1g:** | 3.946 W/kg |
| **Air Factors:** | 411.50 / 320.07 / 275.84 | | **SAR 10g:** | 1.507 W/kg |
| **Conversion Factors:** | 3.21 / 3.56 / 4.43 | | **SAR Start:** | 0.000 W/kg |
| **Type of Modulation:** | | | **SAR End:** | 0.000 W/kg |
| **Modn. Duty Cycle:** | | | **SAR Drift during Scan:** | % |
| **Diode Compression Factors (V*200):** | 20 / 20 / 20 | | **Probe battery last changed:** | 12/12/08 |
| **Input Power Level:** | 100mW | | **Extrapolation:** | poly4 |



# Appendix D

## Uncertainty Budget 5.6 GHz

| *a* | *b* | *c* | *d* | *e = f(d,k)* | *f* | *g = c x f / e* | *k* |
|---|---|---|---|---|---|---|---|
| **Uncertainty Component** | **Sec.** | **Tol. (± %)** | **Prob. Dist.** | **Div.** | **$c_i$ (1-g)** | **1-g $u_i$ (±%)** | **$v_i$** |
| **Measurement System** | | | | | | | |
| Probe Calibration | E2.1 | 3.6 | N | 1 | 1 | 10.0 | ∞ |
| Axial Isotropy | E2.2 | 4.23 | R | √3 | $(1\text{-cp})^{1/2}$ | 0.00 | ∞ |
| Hemispherical Isotropy | E2.2 | 10.7 | R | √3 | $\sqrt{c_p}$ | 6.18 | ∞ |
| Boundary Effect | E2.3 | 1.7 | R | √3 | 1 | 0.98 | ∞ |
| Linearity | E2.4 | 2.92 | R | √3 | 1 | 1.69 | ∞ |
| System Detection Limits | E2.5 | 0.00 | R | √3 | 1 | 0.00 | ∞ |
| Readout Electronics | E2.6 | 0.00 | N | 1 | 1 | 0.00 | ∞ |
| Response Time | E2.7 | 0.00 | R | √3 | 1 | 0.00 | ∞ |
| Integration Time | E2.8 | 0.0 | R | √3 | 1 | 0.23 | ∞ |
| RF Ambient Conditions | E6.1 | 0.00 | R | √3 | 1 | 0.00 | ∞ |
| Probe Positioner Mechanical Tolerance | E6.2 | 0.57 | R | √3 | 1 | 0.33 | ∞ |
| Probe Positioning with respect to Phantom Shell | E6.3 | 1.43 | R | √3 | 1 | 0.83 | ∞ |
| Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation | E5.2 | 3.6 | R | √3 | 1 | 2.08 | ∞ |
| **Test sample Related** | | | | | | | |
| Test Sample Positioning | E4.2 | 4.81 | N | 1 | 1 | 4.81 | *29* |
| Device Holder Uncertainty | E4.1 | 0.00 | N | 1 | 1 | 0.00 | *0* |
| Output Power Variation - SAR drift measurement | 6.6.2 | 5.0 | R | √3 | 1 | 2.89 | ∞ |
| **Phantom and Tissue Parameters** | | | | | | | |
| Phantom Uncertainty (shape and thickness tolerances) | E3.1 | 1.43 | R | √3 | 1 | 0.83 | ∞ |
| Liquid Conductivity Target - tolerance | E3.2 | 5.0 | R | √3 | 0.7 | 2.02 | ∞ |
| Liquid Conductivity - measurement uncertainty | E3.3 | 2.0 | R | √3 | 0.7 | 0.81 | ∞ |
| Liquid Permittivity Target tolerance | E3.2 | 5.0 | R | √3 | 0.6 | 1.73 | ∞ |
| Liquid Permittivity - measurement uncertainty | E3.3 | 1.0 | R | √3 | 0.6 | 0.35 | ∞ |
| **Combined Standard Uncertainty** | | | RSS | | | **± 13.7%** | |
| **Expanded Uncertainty** (95% CONFIDENCE INTERVAL) | | | *k*= 2.00705 | | | **± 27.5%** | |