

## SAR Compliance Test Report

|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         |                                                                                                                                                                            |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test report no.:                                 | FCC_RM-1071_01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Date of report:         | 2014-12-02                                                                                                                                                                 |
| Template version:                                | 19.7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Number of pages:        | 58                                                                                                                                                                         |
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| Tested device:                                   | RM-1071                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                         |                                                                                                                                                                            |
| FCC ID:                                          | PYA-VDB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | IC:                     | -                                                                                                                                                                          |
| Supplement reports:                              | SAR_Photo_RM-1071_02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                            |
| Testing has been carried out in accordance with: | <b>47CFR §2.1093</b><br>Radiofrequency Radiation Exposure Evaluation: Portable Devices<br><b>FCC published RF exposure KDB procedures</b><br><b>RSS-102, Issue 4</b><br>Evaluation Procedure for Mobile and Portable Radio Transmitters with Respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields<br><b>IEEE 1528 - 2013</b><br>IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Technique |                         |                                                                                                                                                                            |
| Documentation:                                   | The documentation of the testing performed on the tested devices is archived for 15 years at TCC Microsoft.                                                                                                                                                                                                                                                                                                                                                                                                                                          |                         |                                                                                                                                                                            |
| Test results:                                    | <b>The tested device complies with the requirements in respect of all parameters subject to the test.</b> The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.                                                                                                                                                                                                                                                                       |                         |                                                                                                                                                                            |

Date and signatures:

For the contents:

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## 1. SUMMARY OF SAR TEST REPORT

### 1.1 Test Details

|                                        |                                                                                                                                                                                                                                     |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Period of test                         | 2014-11-17 to 2014-11-25                                                                                                                                                                                                            |
| SN, HW and SW numbers of tested device | SN: 004402/74/060151/7, HW: 0141, SW: 02050.00000.14445.30000, DUT: 54649<br>SN: 004402/74/060003/0, HW: 0141, SW: 02050.00000.14445.30000, DUT: 54645<br>SN: 004402/74/060060/0, HW: 0141, SW: 02050.00000.14445.30000, DUT: 54644 |
| Batteries used in testing              | BV-5J, DUT: 54634, 54635, 54636, 54637, 54638                                                                                                                                                                                       |
| Headsets used in testing               | WH-108, DUT: 54083, 54169, 54180                                                                                                                                                                                                    |
| Other accessories used in testing      | -                                                                                                                                                                                                                                   |
| State of sample                        | Prototype unit                                                                                                                                                                                                                      |
| Notes                                  | -                                                                                                                                                                                                                                   |

### 1.2 Maximum Results

The maximum measured SAR values for Head configuration, Body Worn configuration and Wireless Router configuration are given in section 1.2.1, 1.2.2 and 1.2.3 respectively. The device conforms to the requirements of the standard(s) when the maximum measured SAR value is less than or equal to the limit.

#### 1.2.1 Head Configuration

| Mode                                                  | Reported*<br>SAR value<br>(1g avg) | SAR limit<br>(1g avg) | Result        | Plot # |
|-------------------------------------------------------|------------------------------------|-----------------------|---------------|--------|
| 4-slot GPRS850                                        | <b>0.39 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | 1      |
| 2-slot GPRS1900                                       | <b>0.24 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | 2      |
| WLAN2450                                              | <b>0.79 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | 3      |
| Maximum of SPEAG combined multiband algorithm results |                                    |                       |               |        |
| 4-slot GPRS850<br>+ WLAN2450                          | <b>0.81 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | -      |

## 1.2.2 Body Worn Configuration

Summary of Maximum Results for Wireless Router mode at 15.0mm

| Mode                                                  | Reported*<br>SAR value (1g<br>avg) | SAR limit<br>(1g avg) | Result        | Plot # |
|-------------------------------------------------------|------------------------------------|-----------------------|---------------|--------|
| 4-slot GPRS850                                        | <b>0.49 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | 4      |
| 2-slot GPRS1900                                       | <b>0.29 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | 5      |
| WLAN2450                                              | <b>0.10 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | 6      |
| Maximum of SPEAG combined multiband algorithm results |                                    |                       |               |        |
| 4-slot GPRS850<br>+ WLAN2450                          | <b>0.53 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | -      |

## 1.2.3 Wireless Router Configuration

Summary of Maximum Results for Wireless Router mode at 10.0mm

| Mode                                                  | Reported*<br>SAR value (1g<br>avg) | SAR limit<br>(1g avg) | Result        | Plot # |
|-------------------------------------------------------|------------------------------------|-----------------------|---------------|--------|
| 4-slot GPRS850                                        | <b>0.72 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | 7      |
| 2-slot GPRS1900                                       | <b>0.50 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | 8      |
| WLAN2450                                              | <b>0.21 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | 9      |
| Maximum of SPEAG combined multiband algorithm results |                                    |                       |               |        |
| 4-slot GPRS850<br>+ WLAN2450                          | <b>0.78 W/kg</b>                   | 1.6 W/kg              | <b>PASSED</b> | -      |

\* Reported SAR values are scaled to, or measured at, upper limit of power tuning tolerance.

## 1.2.4 Summary SAR data

|                                                                                     | FCC-defined SAR values for the Grants of Equipment Authorization |           |     |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------|-----|
|                                                                                     | PCE                                                              | DTS       | NII |
| <b>Maximum Head SAR values</b>                                                      | 0.39 W/kg                                                        | 0.79 W/kg | -   |
| {Max + Max} Simultaneous Head SAR value                                             | 1.08 W/kg                                                        |           |     |
| <b>Maximum Body SAR values</b>                                                      | 0.49 W/kg                                                        | 0.10 W/kg | -   |
| {Max + Max} Simultaneous Body SAR value                                             | 0.60 W/kg                                                        |           |     |
| <b>Maximum Product Specific (Wireless Router) SAR values</b>                        | 0.72 W/kg                                                        | 0.21 W/kg | -   |
| {Max + Max} Simultaneous Product Specific SAR value                                 | 0.89 W/kg                                                        |           |     |
| <b>Maximum Simultaneous SAR value</b><br><b>Head SAR: 4-slot GPRS850 + WLAN2450</b> | 1.08 W/kg                                                        |           |     |

### Note:

PCE contains the highest results between all cellular modes (cellular, AWS and PCS bands)

DTS contains the highest results between WLAN 2.4GHz + RLAN 5725-5850MHz

NII contains the highest results between RLAN 5150-5250, 5250-5350 and 5470-5725

## 1.2.5 Maximum Drift

|                                                          |                                   |
|----------------------------------------------------------|-----------------------------------|
| Maximum drift covered by 5% scaling up of the SAR values | Maximum drift during measurements |
| 0.2dB                                                    | 0.17dB                            |

## 1.2.6 Measurement Uncertainty

|                                |         |
|--------------------------------|---------|
| Expanded Uncertainty (k=2) 95% | ± 29.8% |
|--------------------------------|---------|

## 2. DESCRIPTION OF THE DEVICE UNDER TEST

|                      |                                   |
|----------------------|-----------------------------------|
| Device category      | Portable                          |
| Exposure environment | General population / uncontrolled |

| Modes of Operation | Bands | Modulation Mode | Duty Cycle | Transmitter Frequency Range (MHz) | Power Tuning Target (dBm) |         |        |        | Upper Limit of Power Tuning Tolerance (dBm) |         |        |        |
|--------------------|-------|-----------------|------------|-----------------------------------|---------------------------|---------|--------|--------|---------------------------------------------|---------|--------|--------|
|                    |       |                 |            |                                   | 1-slot                    | 2-slot  | 3-slot | 4-slot | 1-slot                                      | 2-slot  | 3-slot | 4-slot |
| GSM / GPRS         | 850   | GMSK            | 1/8 to 4/8 | 824 – 849                         | 31.7                      | 28.7    | 26.9   | 25.7   | 32.1                                        | 29.1    | 27.3   | 26.1   |
|                    | 1900  |                 |            | 1850 – 1910                       | 30.0                      | 27.0    | 25.2   | 24.0   | 30.4                                        | 27.4    | 25.6   | 24.4   |
| EGPRS              | 850   | GMSK            | 1/8 to 4/8 | 824 – 849                         | 27.0                      | 24.0    | 22.2   | 21.0   | 27.4                                        | 24.4    | 22.6   | 21.4   |
|                    | 1900  |                 |            | 1850 – 1910                       | 26.0                      | 23.0    | 21.2   | 20.0   | 26.4                                        | 23.4    | 21.6   | 20.4   |
| BT                 | 2450  | GFSK            | 1          | 2402 – 2480                       | 8.0                       |         |        |        | 9.5                                         |         |        |        |
|                    |       |                 |            |                                   | Ch 1                      | Ch 2-10 | Ch 11  |        | Ch 1                                        | Ch 2-10 | Ch 11  |        |
| WLAN b-mode        | 2450  | DSSS            | 1          | 2412 – 2472                       | 16.0                      | 16.0    | 16.0   |        | 17.5                                        | 17.5    | 17.5   |        |
| WLAN g-mode        | 2450  | OFDM            | 1          | 2412 – 2472                       | 11.0                      | 16.0    | 11.0   |        | 12.5                                        | 17.5    | 12.5   |        |
| WLAN n-mode        | 2450  | OFDM            | 1          | 2412 – 2462<br>2412 – 2472        | 11.0                      | 16.0    | 11.0   |        | 12.5                                        | 17.5    | 12.5   |        |

Outside of USA, the transmitter of the device is capable of operating also in GSM/GPRS/EGPRS900, GSM/GPRS/EGPRS1800, HSPA/WCDMA900 and HSPA/WCDMA2100 bands which are not part of this filing.

This device has Voice-over-IP/Dual Transfer Mode capability for use at the ear. Therefore, SAR for multi slot GPRS mode was evaluated against the head profile of the phantom. Dual Transfer Mode is a feature that utilises the multi-slot GPRS capability in this device; it allows simultaneous transmission of voice and data during the same call, using the same transmitter and antenna.

This is a BT Class 1 device and its power tuning target upper limit is 9.5dBm. WLAN2450 power tuning target upper limit is 17.5dBm. Since WLAN2450 and BT use same frequency and antenna, WLAN2450 power is 8.0dB higher, and they cannot transmit simultaneously, the WLAN2450 standalone SAR is conservative estimation of BT SAR. As WLAN2450 SAR result is below limit, also BT SAR can be deemed to comply without further analysis or standalone measurements. Also WLAN2450+cellular bands combined SAR results can be regarded as conservative estimation of BT+cellular combined SARs. As WLAN2450+cellular combined SAR result are below limit, also BT+cellular combined SAR can be deemed to comply without further analysis and estimations required in KDB 447498 for simultaneous transmission exclusion.

This device has Wireless Router "Hotspot" mode capability. There is no power reduction in Wireless Router mode.

This device uses a single antenna for transmission of GSM/GPRS/EGPRS850 and GSM/GPRS/EGPRS1900; a separate single antenna is used for WLAN. Simultaneous transmission of any singular cellular and PCS band is possible with WLAN in Head, Body-worn and Wireless Router use according to the table below.

| Simultaneous transmission capabilities in Head, Body-worn and Wireless Router use |          |
|-----------------------------------------------------------------------------------|----------|
|                                                                                   | WLAN2450 |
| GSM/GPRS/EGPRS850                                                                 | ✓        |
| GSM/GPRS/EGPRS1900                                                                | ✓        |

The hotspot mode (Wireless Router mode) may operate concurrently in DTM mode with voice calls. The reported SAR test results are conservative regarding that use case, since output power in hotspot mode is equal to or lower than in normal voice and data modes. Also simultaneous transmissions with WLANs are already conservatively assessed for head and body-worn exposure conditions due to VoIP capability.

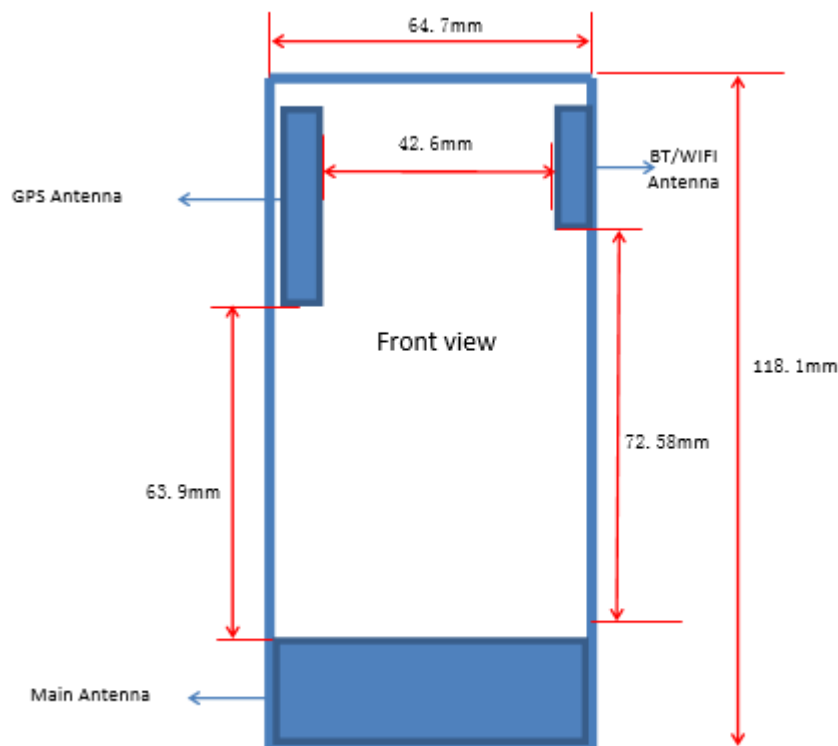


## 2.1 Description of the Antenna

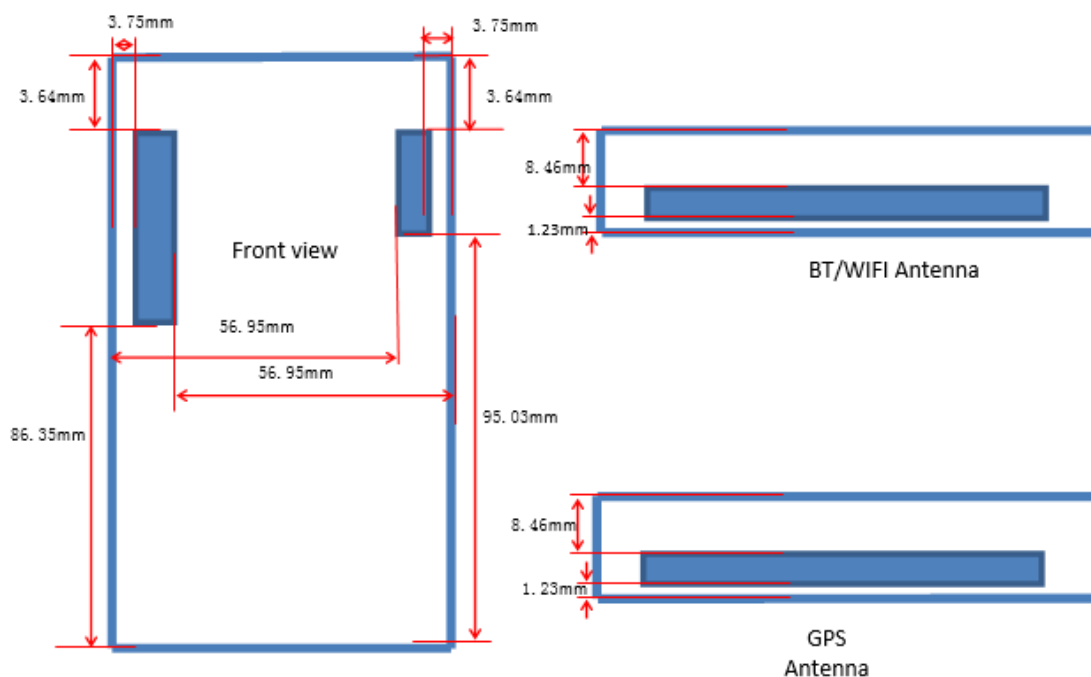
The device has internal antennas for both cellular and WLAN use. The cellular antenna is located at the bottom underneath the back cover. The WLAN antenna is located at the top underneath the back cover.

See the antenn drawing below.

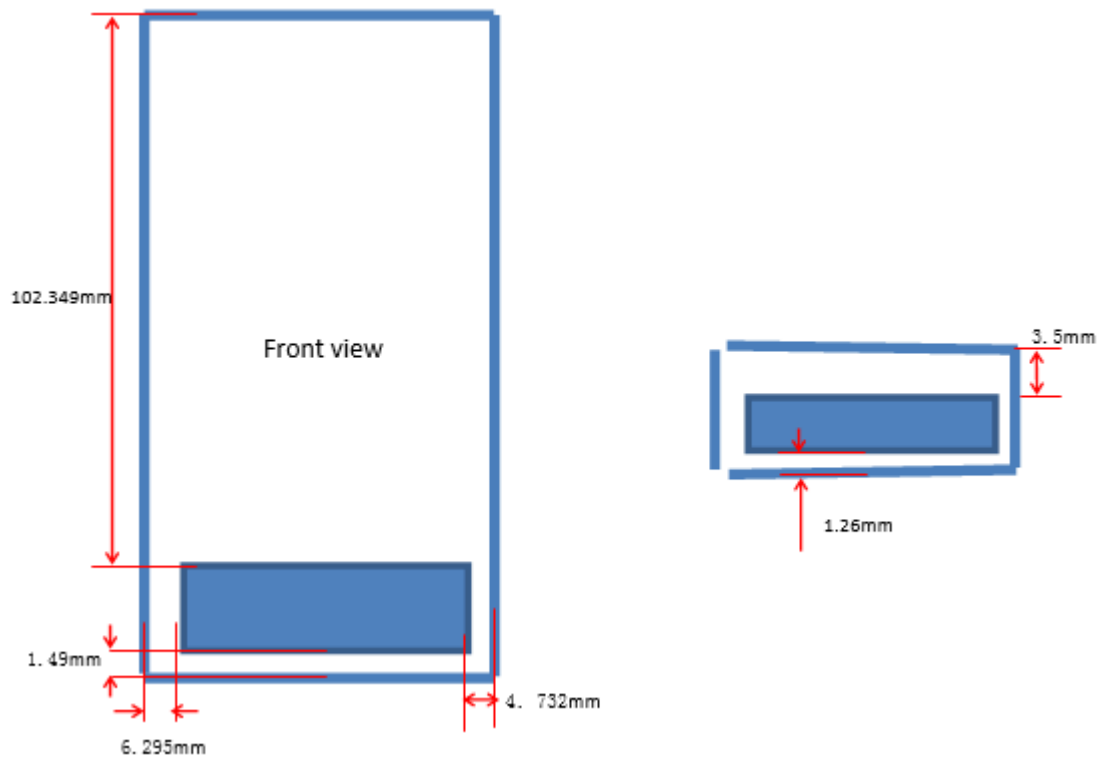
Phone Dimension and Distance Between Main antenna and BT/WIFI/GPS



### Distance between Out of Device and BT/WIFI/GPS Antenna



### Distance between Out of Device and RX Diversity Antenna



### 3. TEST CONDITIONS

#### 3.1 Temperature and Humidity

|                           |             |
|---------------------------|-------------|
| Ambient temperature (°C): | 20.5 – 22.5 |
| Ambient humidity (RH %):  | 35 - 55     |

#### 3.2 Test Signal, Frequencies and Output Power

The device was put into operation by using a call tester except for testing WLAN2450 where control software was used. Communication between the device and the call tester was established by air link.

A CMU200 call tester was used for all the GSM/GPRS/EGPRS and WCDMA bands; in the case of GSM/GPRS/EGPRS the MS signal was always set to maximum power, whereas for WCDMA the UE uplink signal was configured to 12.2kbps RMC with all TPC bit set to 1.

The device output power was set to maximum power level for all tests; a fully charged battery was used for every test sequence.

This device was tested in all the available multi-slot GMSK GPRS modes; Dual Transfer Mode was not specifically tested as the average power in multi-slot GMSK GPRS mode is always greater than, or equal to, the average power in Dual Transfer Mode in Microsoft devices.

In all operating bands the measurements were performed on lowest, middle and highest channels.

The number of Tx slots in all GSM/GPRS mode tests was based on tuning target/conducted power data, see Appendix F. The number of slots with highest, or equal highest, time-averaged power was tested.

The conducted output power of the device was measured by a separate test laboratory on the same unit(s) as used for SAR testing. The results are given in the appendixes F and G of this report.

The transmission mode of the device in all WLAN b-mode tests was BPSK 1Mbps. This mode has the highest (or equal highest) time-averaged output power of all the WLAN b, g and n modulation modes in Microsoft devices. All WLAN testing has been carried out in accordance with FCC KDB 248227: SAR Measurement Procedures for 802.11 a/b/g Transmitters.

## 4. DESCRIPTION OF THE TEST EQUIPMENT

### 4.1 Measurement System and Components

The measurements were performed using an automated DASY near-field scanning system manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements was the 'advanced extrapolation' algorithm.

The following table lists calibration dates of SPEAG components:

| Test Equipment                 | Serial Number | Calibration date | Calibration expiry |
|--------------------------------|---------------|------------------|--------------------|
| DAE 4                          | 710           | 2014-03          | 2015-03            |
| DAE 4                          | 1319          | 2014-09          | 2015-09            |
| DAE 4                          | 887           | 2014-03          | 2015-03            |
| E-field Probe EX3DV4           | 3838          | 2014-03          | 2015-03            |
| E-field Probe EX3DV4           | 3836          | 2014-03          | 2015-03            |
| E-field Probe ES3DV3           | 3280          | 2014-03          | 2015-03            |
| E-field Probe EX3DV4           | 3823          | 2014-09          | 2015-09            |
| Dipole Validation Kit, D835V2  | 4d005         | 2014-03          | 2016-03            |
| Dipole Validation Kit, D1900V2 | 547           | 2013-09          | 2015-09            |
| Dipole Validation Kit, D2450V2 | 883           | 2014-03          | 2016-03            |
| DASY5 software                 | Version 52.8  | -                | -                  |

Additional test equipment used in testing:

| Test Equipment       | Model      | Serial Number | Calibration date | Calibration expiry |
|----------------------|------------|---------------|------------------|--------------------|
| Signal Generator     | E4432B     | US40052231    | 2014-04          | 2015-04            |
| Signal Generator     | SME06      | 829683/005    | 2014-04          | 2015-04            |
| Call Tester          | CMU200     | 831593/001    | -                | -                  |
| Call Tester          | CMU200     | 110735        | -                | -                  |
| Amplifier            | AR 551G4M1 | 306024        | -                | -                  |
| Amplifier            | ZHL-4240W  | e060204/1     | -                | -                  |
| RF Network Analyzer  | 8753ES     | US39170317    | 2014-04          | 2015-04            |
| RF Network Analyzer  | 8753ES     | My40002096    | 2014-04          | 2015-04            |
| Dielectric Probe Kit | 85070C     | 653           | -                | -                  |
| Dielectric Probe Kit | 85070C     | 2577          | -                | -                  |
| Power Meter          | E4419B     | My41291520    | 2014-04          | 2015-04            |
| Power Sensor         | 8482A      | US37295410    | 2014-04          | 2015-04            |
| Power Meter          | NRVD       | 840297/008    | 2014-04          | 2015-04            |
| Power Sensor         | NRV-Z51    | 101135        | 2014-04          | 2015-04            |

#### 4.1.1 Isotropic E-field Probe Type ES3DV3

|                      |                                                                                                                                                                                              |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Construction</b>  | Symmetrical design with triangular core<br>Interleaved sensors<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., butyl diglycol) |
| <b>Calibration</b>   | Calibration certificate in Appendix E                                                                                                                                                        |
| <b>Frequency</b>     | 10 MHz to 4 GHz (dosimetry); Linearity: $\pm 0.2$ dB (30 MHz to 4 GHz)                                                                                                                       |
| <b>Directivity</b>   | $\pm 0.2$ dB in HSL (rotation around probe axis)<br>$\pm 0.3$ dB in HSL (rotation normal to probe axis)                                                                                      |
| <b>Dynamic Range</b> | 5 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.2$ dB                                                                                                                                           |
| <b>Dimensions</b>    | Overall length: 330 mm<br>Tip length: 20 mm<br>Body diameter: 12 mm<br>Tip diameter: 3.9 mm<br>Distance from probe tip to dipole centers: 2.0 mm                                             |
| <b>Application</b>   | General dosimetry up to 4 GHz<br>Compliance tests of mobile phones<br>Fast automatic scanning in arbitrary phantoms                                                                          |

#### 4.1.2 Isotropic E-field Probe Type EX3DV4

|                      |                                                                                                                                                             |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Construction</b>  | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| <b>Calibration</b>   | Calibration certificate in Appendix E                                                                                                                       |
| <b>Frequency</b>     | 10 MHz to >6 GHz (dosimetry); Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)                                                                                     |
| <b>Directivity</b>   | $\pm 0.3$ dB in HSL (rotation around probe axis)<br>$\pm 0.5$ dB in tissue material (rotation normal to probe axis)                                         |
| <b>Dynamic Range</b> | 10 $\mu$ W/g to > 100 mW/g, Linearity: $\pm 0.2$ dB                                                                                                         |
| <b>Dimensions</b>    | Overall length: 330 mm<br>Tip length: 10 mm<br>Body diameter: 12 mm<br>Tip diameter: 2.5 mm<br>Distance from probe tip to dipole centers: 1.0 mm            |
| <b>Application</b>   | General dosimetry up to 6 GHz<br>Compliance tests of mobile phones<br>Fast automatic scanning in arbitrary phantoms                                         |

## 4.2 Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528.

The SPEAG device holder (see Section 5.1) was used to position the device in all tests whilst a tripod was used to position the validation dipoles against the flat section of phantom.

## 4.3 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEEE 1528 and FCC published RF Exposure KDB Procedures. All tests were carried out using simulants whose dielectric parameters were within  $\pm 5\%$  of the recommended values. All tests were carried out within 24 hours of measuring the dielectric parameters.

The depth of the tissue simulant was at least 15.0 cm measured from the ear reference point during system checking and device measurements.

### 4.3.1 Tissue Simulant Recipes

The following recipe(s) were used for Head and Body tissue simulant(s):

#### 800MHz band

| Ingredient      | Head<br>(% by weight) | Body<br>(% by weight) |
|-----------------|-----------------------|-----------------------|
| Deionised Water | 51.50                 | 69.25                 |
| Tween 20        | 47.35                 | 30.00                 |
| Salt            | 1.15                  | 0.75                  |

#### 1900MHz band

| Ingredient      | Head<br>(% by weight) | Body<br>(% by weight) |
|-----------------|-----------------------|-----------------------|
| Deionised Water | 54.50                 | 70.25                 |
| Tween 20        | 45.23                 | 29.41                 |
| Salt            | 0.27                  | 0.34                  |

#### 2450MHz band

| Ingredient      | Head<br>(% by weight) | Body<br>(% by weight) |
|-----------------|-----------------------|-----------------------|
| Deionised Water | 56.0                  | 70.20                 |
| Tween 20        | 44.0                  | 29.62                 |
| Salt            | -                     | 0.18                  |

## 4.4 System validation and System checking

### 4.4.1 System validation status

| Probe<br>Calibration<br>Point<br>f / MHz | Test<br>System         | DASY<br>SW | Dipole<br>Type / SN | Probe<br>Type / SN | Calibrated<br>signal<br>type(s) | DAE unit<br>Type / SN | Validation done            |                            |
|------------------------------------------|------------------------|------------|---------------------|--------------------|---------------------------------|-----------------------|----------------------------|----------------------------|
|                                          |                        |            |                     |                    |                                 |                       | Head<br>tissue<br>simulant | Body<br>tissue<br>simulant |
| 835                                      | TCC Beijing<br>/ SAR-3 | V52.8      | D835V2 /<br>4d005   | EX3DV4 /<br>3838   | CW                              | DAE4 /<br>480         | 2014-05                    | 2014-04                    |
| 1900                                     | TCC Beijing<br>/ SAR-4 | V52.8      | D1900V2 /<br>547    | EX3DV4 /<br>3836   | CW                              | DAE4 /<br>887         | 2014-06                    | 2014-11                    |
| 2450                                     | TCC Beijing<br>/ SAR-2 | V52.8      | D2450V2 /<br>883    | ES3DV3 /<br>3823   | CW                              | DAE4 /<br>1319        | 2014-10                    | 2014-11                    |
| 2450                                     | TCC Beijing<br>/ SAR-4 | V52.8      | D2450V2 /<br>883    | EX3DV4 /<br>3280   | CW                              | DAE4 /<br>887         | 2014-05                    | 2014-06                    |

#### 4.4.2 System checking

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyser. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom for head system checking, and under the flat phantom for body system checking. The system checking results (dielectric parameters and SAR values) are given in the table below.

**System checking, Head tissue simulant**

| $f$<br>[MHz] | Description               | SAR 1g<br>[W/kg] | Estimated<br>SAR 1g<br>[W/kg] | Estimated<br>SAR 1g<br>Deviation | Scaled<br>1W SAR<br>1g<br>[W/kg] | Dielectric<br>Parameters* |                   | SAR 1g<br>Deviation<br>from<br>target               | Dielectric<br>Parameters<br>Deviation from<br>target |                  | Temp<br>[°C] | Plot<br># |
|--------------|---------------------------|------------------|-------------------------------|----------------------------------|----------------------------------|---------------------------|-------------------|-----------------------------------------------------|------------------------------------------------------|------------------|--------------|-----------|
|              |                           |                  |                               | dSAR [%]                         |                                  | $\epsilon_r$              | $\sigma$<br>[S/m] | dSAR [%]                                            | $d\epsilon_r$ [%]                                    | $d\sigma$<br>[%] |              |           |
|              | Tolerances                |                  |                               | ±3%                              |                                  |                           |                   | ±10 %                                               | ±5 %                                                 | ±5 %             |              |           |
| 835          | Target result<br>SN:4d005 | -                | -                             | -                                | 9.32                             | 41.5                      | 0.90              | TCC Beijing/SAR-3<br>EX3DV4 SN:3838 Head<br>835MHz  |                                                      |                  |              |           |
|              | 2014-11-17                | 2.24             | 2.26                          | 0.89                             | 8.96                             | 40.4                      | 0.89              | -3.86                                               | -2.65                                                | -1.11            | 21.2         | 1         |
| 1900         | Target result<br>SN:547   | -                | -                             | -                                | 40.9                             | 40.0                      | 1.40              | TCC Beijing/SAR-4<br>EX3DV4 SN:3836 Head<br>1900MHz |                                                      |                  |              |           |
|              | 2014-11-18                | 9.56             | 9.48                          | -0.84                            | 38.2                             | 38.7                      | 1.42              | -6.50                                               | -3.25                                                | 1.43             | 20.8         | 2         |
| 2450         | Target result<br>SN:883   | -                | -                             | -                                | 53.2                             | 39.2                      | 1.80              | TCC Beijing/SAR-2<br>EX3DV4 SN:3823 Head<br>2450MHz |                                                      |                  |              |           |
|              | 2014-11-18                | 13.0             | 13.1                          | 0.77                             | 52.0                             | 39.0                      | 1.86              | -2.26                                               | -0.51                                                | 3.33             | 21.5         | 3         |
|              | Target result<br>SN:883   | -                | -                             | -                                | 53.2                             | 39.2                      | 1.80              | TCC Beijing/SAR-4<br>ES3DV3 SN:3280 Head<br>2450MHz |                                                      |                  |              |           |
|              | 2014-11-25                | 13.7             | 13.6                          | -0.73                            | 54.8                             | 38.1                      | 1.74              | 3.01                                                | -2.81                                                | -3.33            | 21.7         | 4         |

\* Dielectric parameter reference data taken from IEEE1528/IEC62209



### System checking, body tissue simulant

| $f$<br>[MHz] | Description               | SAR<br>1g<br>[W/kg<br>] | Estimate<br>d SAR 1g<br>[W/kg] | Estimated<br>SAR 1g<br>Deviation | Scaled 1W<br>SAR 1g<br>[W/kg] | Dielectric<br>Parameters* |                   | SAR 1g<br>Deviation<br>n from<br>target             | Dielectric<br>Parameters<br>Deviation from<br>target |                    | Tem<br>p | Plot<br># |
|--------------|---------------------------|-------------------------|--------------------------------|----------------------------------|-------------------------------|---------------------------|-------------------|-----------------------------------------------------|------------------------------------------------------|--------------------|----------|-----------|
|              |                           |                         |                                | dSAR [%]                         |                               | $\epsilon_r$              | $\sigma$<br>[S/m] |                                                     | dSAR [%]                                             | d $\epsilon_r$ [%] |          |           |
|              | Tolerances                |                         |                                | ±3%                              |                               |                           |                   | ±10 %                                               | ±5 %                                                 | ±5 %               |          |           |
| 835          | Target result<br>SN:4d005 | -                       | -                              | -                                | 9.31                          | 55.2                      | 0.97              | TCC Beijing/SAR-3<br>EX3DV4 SN:3838 Body<br>835MHz  |                                                      |                    |          |           |
|              | 2014-11-18                | 2.42                    | 2.41                           | -0.41                            | 9.68                          | 53.8                      | 0.94              | 3.97                                                | -2.54                                                | -3.09              | 21.5     | 5         |
| 1900         | Target result<br>SN:547   | -                       | -                              | -                                | 40.9                          | 53.3                      | 1.52              | TCC Beijing/SAR-4<br>EX3DV4 SN:3836 Body<br>1900MHz |                                                      |                    |          |           |
|              | 2014-11-17                | 10.2                    | 10.3                           | 0.98                             | 40.8                          | 51.9                      | 1.51              | -0.24                                               | -2.63                                                | -0.66              | 21.4     | 6         |
| 2450         | Target result<br>SN:883   | -                       | -                              | -                                | 51.0                          | 52.7                      | 1.95              | TCC Beijing/SAR-2<br>EX3DV4 SN:3823 Body<br>2450MHz |                                                      |                    |          |           |
|              | 2014-11-19                | 13.0                    | 13.1                           | 0.77                             | 52.0                          | 51.5                      | 2.03              | 1.96                                                | -2.28                                                | 4.10               | 21.5     | 7         |
|              | Target result<br>SN:883   | -                       | -                              | -                                | 51.0                          | 52.7                      | 1.95              | TCC Beijing/SAR-4<br>ES3DV3 SN:3280 Body<br>2450MHz |                                                      |                    |          |           |
|              | 2014-11-25                | 13.6                    | 13.6                           | 0.00                             | 54.4                          | 50.6                      | 1.87              | 6.67                                                | -3.98                                                | -4.10              | 21.7     | 8         |

\* Dielectric parameter reference data taken from FCC Published RF Exposure KDB Procedures

Plots of the system checking scans are given in Appendix A.

## 4.5 Tissue Simulants used in the Measurements

### Head tissue simulant measurements

| f<br>[MHz] | Description       | Dielectric Parameters |                | Dielectric Parameters Deviation from recommended value |                | Temp<br>[°C] |
|------------|-------------------|-----------------------|----------------|--------------------------------------------------------|----------------|--------------|
|            |                   | $\epsilon_r$          | $\sigma$ [S/m] | d $\epsilon_r$ [%]                                     | d $\sigma$ [%] |              |
|            | Tolerances        |                       |                | ±5 %                                                   | ±5 %           |              |
| 836        | Recommended value | 41.5                  | 0.90           |                                                        |                |              |
|            | 2014-11-17        | 40.4                  | 0.89           | -2.65                                                  | -1.11          | 21.2         |
| 1880       | Recommended value | 40.0                  | 1.40           |                                                        |                |              |
|            | 2014-11-18        | 38.8                  | 1.40           | -3.00                                                  | 0.00           | 20.8         |
| 2437       | Recommended value | 39.2                  | 1.79           |                                                        |                |              |
|            | 2014-11-18        | 39.1                  | 1.84           | -0.26                                                  | 2.79           | 21.5         |
|            | 2014-11-25        | 38.2                  | 1.73           | -2.55                                                  | -3.35          | 21.7         |

### Body tissue simulant measurements

| f<br>[MHz] | Description       | Dielectric Parameters |                | Dielectric Parameters Deviation from Recommended value |                | Temp<br>[°C] |
|------------|-------------------|-----------------------|----------------|--------------------------------------------------------|----------------|--------------|
|            |                   | $\epsilon_r$          | $\sigma$ [S/m] | d $\epsilon_r$ [%]                                     | d $\sigma$ [%] |              |
|            | Tolerances        |                       |                | ±5 %                                                   | ±5 %           |              |
| 836        | Recommended value | 55.2                  | 0.97           |                                                        |                |              |
|            | 2014-11-18        | 53.7                  | 0.94           | -2.72                                                  | -3.09          | 21.5         |
| 1880       | Recommended value | 53.3                  | 1.52           |                                                        |                |              |
|            | 2014-11-17        | 51.9                  | 1.49           | -2.63                                                  | -1.97          | 21.4         |
| 2437       | Recommended value | 52.7                  | 1.94           |                                                        |                |              |
|            | 2014-11-19        | 51.6                  | 2.01           | -2.09                                                  | 3.61           | 21.5         |
|            | 2014-11-25        | 50.7                  | 1.86           | -3.80                                                  | -4.12          | 21.7         |

Dielectric parameter data for the band edges is given in Appendix C.

## 5. DESCRIPTION OF THE TEST PROCEDURE

### 5.1 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the Dasy system.



Device holder supplied by SPEAG

A spacer (illustrated below) was used to position the device within the SPEAG holder. The spacer positions the device so that the holder has minimal effect on the test results but still holds the device securely. The spacer was removed before the tests.



Spacer

### 5.2 Test Positions

#### 5.2.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to IEEE 1528 "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques".

### 5.2.2 Body Worn Configuration

The device was placed in the SPEAG holder using the spacer and placed below the flat phantom. The distance between the device and the phantom was kept at the separation distance indicated in Section 1.2.2 and 1.2.3 using a separate flat spacer that was removed before the start of the measurements. The device was oriented with both sides facing the phantom to find the highest results.

Microsoft body-worn accessories are commonly available for the separation distance used in this testing.

### 5.2.3 Wireless Router Configuration

The device was placed in the SPEAG holder and, in sequence, the back, display and each of the 4 edges was positioned 10.0mm away from the flat phantom. The spacer was removed before the start of the measurements.

## 5.3 Scan Procedures

First, area scans were used for determination of the field distribution. Next, a zoom scan, a minimum of 5x5x7 points covering a volume of at least 30x30x30mm, was performed around the highest E-field value to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan. Fast SAR is measured according to the KDB 447498 D01 General RF Exposure Guidance v05r01.

## 5.4 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.

The interpolation, extrapolation and maximum search routines within Dasy4 are all based on the modified Quadratic Shepard's method (Robert J. Renka, "Multivariate Interpolation Of Large Sets Of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).

The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighbouring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.

In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

## 6. MEASUREMENT UNCERTAINTY

Table 6.1 – Measurement uncertainty evaluation for 1g Full SAR in 0.3-6GHz range

| Uncertainty Component                                                           | Section in IEEE 1528 | Tol. (%) | Prob Dist | Div | $C_i$           | $C_i \cdot U_i$ (%) | $V_i$ |
|---------------------------------------------------------------------------------|----------------------|----------|-----------|-----|-----------------|---------------------|-------|
| <b>Measurement System</b>                                                       |                      |          |           |     |                 |                     |       |
| Probe Calibration                                                               | E2.1                 | ±6.6     | N         | 1   | 1               | ±6.6                | ∞     |
| Axial Isotropy                                                                  | E2.2                 | ±4.7     | R         | √3  | $(1-c_p)^{1/2}$ | ±1.9                | ∞     |
| Hemispherical Isotropy                                                          | E2.2                 | ±9.6     | R         | √3  | $(c_p)^{1/2}$   | ±3.9                | ∞     |
| Boundary Effect                                                                 | E2.3                 | ±2.0     | R         | √3  | 1               | ±1.2                | ∞     |
| Linearity                                                                       | E2.4                 | ±4.7     | R         | √3  | 1               | ±2.7                | ∞     |
| System Detection Limits                                                         | E2.5                 | ±1.0     | R         | √3  | 1               | ±0.6                | ∞     |
| Modulation response                                                             | E2.5                 | ±2.4     | R         | √3  | 1               | ±1.4                |       |
| Readout Electronics                                                             | E2.6                 | ±0.3     | N         | 1   | 1               | ±0.3                | ∞     |
| Response Time                                                                   | E2.7                 | ±0.8     | R         | √3  | 1               | ±0.5                | ∞     |
| Integration Time                                                                | E2.8                 | ±2.6     | R         | √3  | 1               | ±1.5                | ∞     |
| RF Ambient Conditions - Noise                                                   | E6.1                 | ±3.0     | R         | √3  | 1               | ±1.7                | ∞     |
| RF Ambient Conditions - Reflections                                             | E6.1                 | ±3.0     | R         | √3  | 1               | ±1.7                | ∞     |
| Probe Positioner Mechanical Tolerance                                           | E6.2                 | ±0.8     | R         | √3  | 1               | ±0.5                | ∞     |
| Probe Positioning with respect to Phantom Shell                                 | E6.3                 | ±6.7     | R         | √3  | 1               | ±3.9                | ∞     |
| Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation | E5                   | ±4.0     | R         | √3  | 1               | ±2.3                | ∞     |
| <b>Test sample Related</b>                                                      |                      |          |           |     |                 |                     |       |
| Test Sample Positioning                                                         | E4.2                 | ±6.0     | N         | 1   | 1               | ±6.0                | 11    |
| Device Holder Uncertainty                                                       | E4.1                 | ±3.6     | N         | 1   | 1               | ±3.6                | 5     |
| Output Power Variation - SAR drift measurement                                  | E2.9                 | ±5.0     | R         | √3  | 1               | ±2.9                | ∞     |
| <b>Phantom and Tissue Parameters</b>                                            |                      |          |           |     |                 |                     |       |
| Phantom Uncertainty (shape and thickness tolerances)                            | E3.1                 | ±6.6     | R         | √3  | 1               | ±3.8                | ∞     |
| SAR correction                                                                  | E3.2                 | ±1.9     | R         | √3  | 1               | ±1.1                | ∞     |
| Conductivity Target - tolerance                                                 | E3.4                 | ±5.0     | R         | √3  | 0.6             | ±1.8                | ∞     |
| Conductivity - measurement uncertainty                                          | E3.3                 | ±5.5     | N         | 1   | 0.6             | ±3.5                | 5     |
| Permittivity Target - tolerance                                                 | E3.4                 | ±5.0     | R         | √3  | 0.6             | ±1.7                | ∞     |
| Permittivity - measurement uncertainty                                          | E3.3                 | ±2.9     | N         | 1   | 0.6             | ±1.7                | 5     |
| <b>Combined Standard Uncertainty</b>                                            |                      |          | RSS       |     |                 | ±14.0               | 198   |
| <b>Coverage Factor for 95%</b>                                                  |                      |          | k=2       |     |                 |                     |       |
| <b>Expanded Uncertainty</b>                                                     |                      |          |           |     |                 | ±28.2               |       |

Table 6.2 – Measurement uncertainty evaluation for 1g Fast SAR in 0.3-6GHz range

| Relative DASY5 Uncertainty Budget for Fast SAR Tests<br>According to IEEE 1528/2011 and IEC 62209-1/2011<br>(0.3-6 GHz range) |             |               |      |                 |                        |       |
|-------------------------------------------------------------------------------------------------------------------------------|-------------|---------------|------|-----------------|------------------------|-------|
| Uncertainty Component                                                                                                         | Tol.<br>(%) | Prob<br>Dist. | Div. | $C_i$           | $C_i \cdot U_i$<br>(%) | $V_i$ |
| <b>Measurement System</b>                                                                                                     |             |               |      |                 |                        |       |
| Probe Calibration                                                                                                             | ±6.6        | N             | 1    | 0               |                        |       |
| Axial Isotropy                                                                                                                | ±4.7        | R             | √3   | $(1-c_p)^{1/2}$ | ±1.9                   | ∞     |
| Hemispherical Isotropy                                                                                                        | ±9.6        | R             | √3   | $(c_p)^{1/2}$   | ±3.9                   | ∞     |
| Boundary Effect                                                                                                               | ±2.0        | R             | √3   | 1               | ±1.2                   | ∞     |
| Linearity                                                                                                                     | ±4.7        | R             | √3   | 1               | ±2.7                   | ∞     |
| System Detection Limits                                                                                                       | ±1.0        | R             | √3   | 1               | ±0.6                   | ∞     |
| Modulation Response                                                                                                           | ±2.4        | R             | √3   | 1               | ±1.4                   | ∞     |
| Readout Electronics                                                                                                           | ±0.3        | N             | 1    | 0               |                        |       |
| Response Time                                                                                                                 | ±0.8        | R             | √3   | 0               |                        |       |
| Integration Time                                                                                                              | ±2.6        | R             | √3   | 1               | ±1.5                   | ∞     |
| RF Ambient Conditions - Noise                                                                                                 | ±3.0        | R             | √3   | 1               | ±1.7                   | ∞     |
| RF Ambient Conditions - Reflections                                                                                           | ±3.0        | R             | √3   | 0               |                        |       |
| Probe Positioner Mechanical Tolerance                                                                                         | ±0.8        | R             | √3   | 1               | ±0.5                   | ∞     |
| Probe Positioning with respect to Phantom Shell                                                                               | ±6.7        | R             | √3   | 1               | ±3.9                   | ∞     |
| Spatial x-y Resolution                                                                                                        | ±10.0       | R             | √3   | 1               | ±5.8                   | ∞     |
| Fast SAR z Approximation                                                                                                      | ±14.0       | R             | √3   | 1               | ±8.1                   | ∞     |
| <b>Test sample Related</b>                                                                                                    |             |               |      |                 |                        |       |
| Test Sample Positioning                                                                                                       | ±6.0        | N             | 1    | 1               | ±6.0                   | 12    |
| Device Holder Uncertainty                                                                                                     | ±3.6        | N             | 1    | 1               | ±3.6                   | 5     |
| Output Power Variation - SAR drift measurement                                                                                | ±5.0        | R             | √3   | 1               | ±2.9                   | ∞     |
| Power Scaling                                                                                                                 | ±0          | R             | √3   | 0               |                        |       |
| <b>Phantom and Setup</b>                                                                                                      |             |               |      |                 |                        |       |
| Phantom Uncertainty (shape and thickness tolerances)                                                                          | ±6.6        | R             | √3   | 1               | ±3.8                   | ∞     |
| SAR correction                                                                                                                | ±1.9        | R             | √3   | 0               |                        |       |
| Conductivity Target - tolerance                                                                                               | ±1.9        | R             | √3   | 0               |                        |       |
| Conductivity - measurement uncertainty                                                                                        | ±5.0        | R             | √3   | 0               |                        |       |
| Permittivity Target - tolerance                                                                                               | ±5.5        | N             | 1    | 0               |                        |       |
| Permittivity - measurement uncertainty                                                                                        | ±5.0        | R             | √3   | 0               |                        |       |
| <b>Combined Standard Uncertainty</b>                                                                                          |             |               |      |                 |                        |       |
|                                                                                                                               |             | RSS           |      |                 | ±14.9                  | 748   |
| <b>Coverage Factor for 95%</b>                                                                                                |             |               |      |                 |                        |       |
|                                                                                                                               |             | k=2           |      |                 |                        |       |
| <b>Expanded Uncertainty</b>                                                                                                   |             |               |      |                 |                        |       |
|                                                                                                                               |             |               |      |                 | ±29.8                  |       |

## 7. RESULTS

### 7.1 The measured Head SAR values for the test device are tabulated below:

850MHz Band Head SAR results

| Mode              | Device orientation                 | SAR measurement | Measured 1g SAR [W/kg]                          |                     |                     | Reported* 1g SAR [W/kg] |                     |                     | Max Deviation (Estimated SAR - Full SAR) [W/kg] | Plot # |
|-------------------|------------------------------------|-----------------|-------------------------------------------------|---------------------|---------------------|-------------------------|---------------------|---------------------|-------------------------------------------------|--------|
|                   |                                    |                 | Ch 128<br>824.2 MHz                             | Ch 190<br>836.6 MHz | Ch 251<br>848.8 MHz | Ch 128<br>824.2 MHz     | Ch 190<br>836.6 MHz | Ch 251<br>848.8 MHz |                                                 |        |
| GSM GPRS          | Tuning Target + Tolerance [dBm]    |                 | 32.1                                            |                     |                     | Scaling factor*         |                     |                     |                                                 |        |
|                   | Conducted Slot Average Power [dBm] |                 | 31.6                                            | 31.7                | 31.7                | 0.5                     | 0.4                 | 0.4                 | dB                                              |        |
|                   | Time-averaged power [dBm]          |                 | 22.6                                            | 22.7                | 22.7                | 1.12                    | 1.10                | 1.10                | Lin                                             |        |
|                   |                                    |                 | No testing required for this slot configuration |                     |                     |                         |                     |                     |                                                 |        |
| 2-slot GPRS       | Tuning Target + Tolerance [dBm]    |                 | 29.1                                            |                     |                     | Scaling factor*         |                     |                     |                                                 |        |
|                   | Conducted Slot Average Power [dBm] |                 | 28.6                                            | 28.6                | 28.7                | 0.5                     | 0.5                 | 0.4                 | dB                                              |        |
|                   | Time-averaged power [dBm]          |                 | 22.6                                            | 22.6                | 22.7                | 1.12                    | 1.12                | 1.10                | Lin                                             |        |
|                   |                                    |                 | No testing required for this slot configuration |                     |                     |                         |                     |                     |                                                 |        |
| 3-slot GPRS       | Tuning Target + Tolerance [dBm]    |                 | 27.3                                            |                     |                     | Scaling factor*         |                     |                     |                                                 |        |
|                   | Conducted Slot Average Power [dBm] |                 | 26.9                                            | 26.8                | 26.8                | 0.4                     | 0.5                 | 0.5                 | dB                                              |        |
|                   | Time-averaged power [dBm]          |                 | 22.6                                            | 22.5                | 22.5                | 1.10                    | 1.12                | 1.12                | Lin                                             |        |
|                   |                                    |                 | No testing required for this slot configuration |                     |                     |                         |                     |                     |                                                 |        |
| 4-slot GPRS       | Tuning Target + Tolerance [dBm]    |                 | 26.1                                            |                     |                     | Scaling factor*         |                     |                     |                                                 |        |
|                   | Conducted Slot Average Power [dBm] |                 | 25.7                                            | 25.7                | 25.7                | 0.4                     | 0.4                 | 0.4                 | dB                                              |        |
|                   | Time-averaged power [dBm]          |                 | 22.7                                            | 22.7                | 22.7                | 1.10                    | 1.10                | 1.10                | Lin                                             |        |
|                   | Left Cheek                         | Estimated SAR   | -                                               | 0.256               | -                   | -                       | 0.281               | -                   | -                                               | -      |
|                   |                                    | Full SAR        | -                                               | -                   | -                   | -                       | -                   | -                   |                                                 |        |
|                   | Left Tilt                          | Estimated SAR   | -                                               | 0.136               | -                   | -                       | 0.149               | -                   | -                                               | -      |
|                   |                                    | Full SAR        | -                                               | -                   | -                   | -                       | -                   | -                   |                                                 |        |
|                   | Right Cheek                        | Estimated SAR   | 0.249                                           | 0.283               | 0.361               | 0.273                   | 0.310               | 0.396               | 0.00                                            | 1      |
|                   |                                    | Full SAR        | -                                               | -                   | 0.357               | -                       | -                   | 0.391               |                                                 |        |
|                   | Right Tilt                         | Estimated SAR   | -                                               | 0.145               | -                   | -                       | 0.159               | -                   | -                                               | -      |
| Full SAR          |                                    | -               | -                                               | -                   | -                   | -                       | -                   |                     |                                                 |        |
| 1-Slot 8PSK EGPRS | Tuning Target + Tolerance [dBm]    |                 | 27.4                                            |                     |                     | Scaling factor*         |                     |                     |                                                 |        |
|                   | Conducted Slot Average Power [dBm] |                 | 27.0                                            | 27.1                | 26.9                | 0.4                     | 0.3                 | 0.5                 | dB                                              |        |
|                   | Time-averaged power [dBm]          |                 | 18.0                                            | 18.1                | 17.9                | 1.10                    | 1.07                | 1.12                | Lin                                             |        |
|                   |                                    |                 | No testing required for this slot configuration |                     |                     |                         |                     |                     |                                                 |        |

(850MHz Head SAR Table continues)

(850MHz Head SAR Table continues)

|                         | Tuning Target + Tolerance [dBm]    |               | 24.4                                            |      |       | Scaling factor* |      |       |     |   |
|-------------------------|------------------------------------|---------------|-------------------------------------------------|------|-------|-----------------|------|-------|-----|---|
|                         | Conducted Slot Average Power [dBm] |               | 23.9                                            | 24.0 | 24.1  | 0.5             | 0.4  | 0.3   | dB  |   |
| 2-Slot<br>8PSK<br>EGPRS | Time-averaged power [dBm]          |               | 17.9                                            | 18.0 | 18.1  | 1.12            | 1.10 | 1.07  | Lin |   |
|                         | Left Cheek                         | Estimated SAR | -                                               | -    | -     | -               | -    | -     | -   | - |
|                         |                                    | Full SAR      | -                                               | -    | -     | -               | -    | -     | -   | - |
|                         | Left Tilt                          | Estimated SAR | -                                               | -    | -     | -               | -    | -     | -   | - |
|                         |                                    | Full SAR      | -                                               | -    | -     | -               | -    | -     | -   | - |
|                         | Right Cheek                        | Estimated SAR | -                                               | -    | 0.138 | -               | -    | 0.148 | -   | - |
|                         |                                    | Full SAR      | -                                               | -    | -     | -               | -    | -     | -   | - |
|                         | Right Tilt                         | Estimated SAR | -                                               | -    | -     | -               | -    | -     | -   | - |
|                         |                                    | Full SAR      | -                                               | -    | -     | -               | -    | -     | -   | - |
|                         |                                    |               |                                                 |      |       |                 |      |       |     |   |
| 3-Slot<br>8PSK<br>EGPRS | Tuning Target + Tolerance [dBm]    |               | 22.6                                            |      |       | Scaling factor* |      |       |     |   |
|                         | Conducted Slot Average Power [dBm] |               | 22.2                                            | 22.1 | 22.2  | 0.4             | 0.5  | 0.4   | dB  |   |
|                         | Time-averaged power [dBm]          |               | 17.9                                            | 17.8 | 17.9  | 1.10            | 1.12 | 1.10  | Lin |   |
|                         |                                    |               | No testing required for this slot configuration |      |       |                 |      |       |     |   |
| 4-Slot<br>8PSK<br>EGPRS | Tuning Target + Tolerance [dBm]    |               | 21.4                                            |      |       | Scaling factor* |      |       |     |   |
|                         | Conducted Slot Average Power [dBm] |               | 21.0                                            | 21.0 | 20.9  | 0.4             | 0.4  | 0.5   | dB  |   |
|                         | Time-averaged power [dBm]          |               | 18.0                                            | 18.0 | 17.9  | 1.10            | 1.10 | 1.12  | Lin |   |
|                         |                                    |               | No testing required for this slot configuration |      |       |                 |      |       |     |   |



### 1900MHz Band Head SAR results

| Mode              | Device orientation                 | SAR measurement        | Measured 1g SAR [W/kg]                          |                      |                      | Reported* 1g SAR [W/kg] |                      |                      | Max Deviation (Estimated SAR - Full SAR) [W/kg] | Plot # |
|-------------------|------------------------------------|------------------------|-------------------------------------------------|----------------------|----------------------|-------------------------|----------------------|----------------------|-------------------------------------------------|--------|
|                   |                                    |                        | Ch 512<br>1850.2 MHz                            | Ch 661<br>1880.0 MHz | Ch 810<br>1909.8 MHz | Ch 512<br>1850.2 MHz    | Ch 661<br>1880.0 MHz | Ch 810<br>1909.8 MHz |                                                 |        |
| 1-slot GPRS       | Tuning Target + Tolerance [dBm]    |                        | 30.4                                            |                      |                      | Scaling factor*         |                      |                      |                                                 |        |
|                   | Conducted Slot Average Power [dBm] |                        | 30.0                                            | 29.9                 | 30.0                 | 0.4                     | 0.5                  | 0.4                  | dB                                              |        |
|                   | Time-averaged power [dBm]          |                        | 21.0                                            | 20.9                 | 21.0                 | 1.10                    | 1.12                 | 1.10                 | Lin                                             |        |
|                   |                                    |                        | No testing required for this slot configuration |                      |                      |                         |                      |                      |                                                 |        |
| 2-slot GPRS       | Tuning Target + Tolerance [dBm]    |                        | 27.4                                            |                      |                      | Scaling factor*         |                      |                      |                                                 |        |
|                   | Conducted Slot Average Power [dBm] |                        | 27.0                                            | 27.0                 | 27.1                 | 0.4                     | 0.4                  | 0.3                  | dB                                              |        |
|                   | Time-averaged power [dBm]          |                        | 21.0                                            | 21.0                 | 21.1                 | 1.10                    | 1.10                 | 1.07                 | Lin                                             |        |
|                   | Left Cheek                         | Estimated SAR Full SAR | 0.217                                           | 0.190                | 0.175                | 0.238                   | 0.208                | 0.188                | 0.00                                            | 2      |
|                   |                                    |                        | 0.217                                           | -                    | -                    | 0.238                   | -                    | -                    |                                                 |        |
|                   | Left Tilt                          | Estimated SAR Full SAR | -                                               | 0.121                | -                    | -                       | 0.133                | -                    | -                                               | -      |
|                   |                                    |                        | -                                               | -                    | -                    | -                       | -                    | -                    | -                                               | -      |
|                   | Right Cheek                        | Estimated SAR Full SAR | -                                               | 0.081                | -                    | -                       | 0.089                | -                    | -                                               | -      |
|                   |                                    |                        | -                                               | -                    | -                    | -                       | -                    | -                    | -                                               | -      |
|                   | Right Tilt                         | Estimated SAR Full SAR | -                                               | 0.114                | -                    | -                       | 0.125                | -                    | -                                               | -      |
|                   |                                    | -                      | -                                               | -                    | -                    | -                       | -                    | -                    | -                                               |        |
| 3-slot GPRS       | Tuning Target + Tolerance [dBm]    |                        | 25.6                                            |                      |                      | Scaling factor*         |                      |                      |                                                 |        |
|                   | Conducted Slot Average Power [dBm] |                        | 25.2                                            | 25.1                 | 25.2                 | 0.4                     | 0.5                  | 0.4                  | dB                                              |        |
|                   | Time-averaged power [dBm]          |                        | 20.9                                            | 20.8                 | 20.9                 | 1.10                    | 1.12                 | 1.10                 | Lin                                             |        |
|                   |                                    |                        | No testing required for this slot configuration |                      |                      |                         |                      |                      |                                                 |        |
| 4-slot GPRS       | Tuning Target + Tolerance [dBm]    |                        | 24.4                                            |                      |                      | Scaling factor*         |                      |                      |                                                 |        |
|                   | Conducted Slot Average Power [dBm] |                        | 24.0                                            | 24.0                 | 23.9                 | 0.4                     | 0.4                  | 0.5                  | dB                                              |        |
|                   | Time-averaged power [dBm]          |                        | 21.0                                            | 21.0                 | 20.9                 | 1.10                    | 1.10                 | 1.12                 | Lin                                             |        |
|                   |                                    |                        | No testing required for this slot configuration |                      |                      |                         |                      |                      |                                                 |        |
| 1-slot 8PSK EGPRS | Tuning Target + Tolerance [dBm]    |                        | 26.4                                            |                      |                      | Scaling factor*         |                      |                      |                                                 |        |
|                   | Conducted Slot Average Power [dBm] |                        | 26.0                                            | 26.0                 | 25.9                 | 0.4                     | 0.4                  | 0.5                  | dB                                              |        |
|                   | Time-averaged power [dBm]          |                        | 17.0                                            | 17.0                 | 16.9                 | 1.10                    | 1.10                 | 1.12                 | Lin                                             |        |
|                   |                                    |                        | No testing required for this slot configuration |                      |                      |                         |                      |                      |                                                 |        |

(1900MHz Head SAR Table continues)

(1900MHz Head SAR Table continues)

| 2-slot<br>8PSK<br>EGPRS | Tuning Target + Tolerance [dBm]    |               | 23.4                                            |      |      | Scaling factor* |       |      |     |   |
|-------------------------|------------------------------------|---------------|-------------------------------------------------|------|------|-----------------|-------|------|-----|---|
|                         | Conducted Slot Average Power [dBm] |               | 23.0                                            | 23.1 | 23.0 | 0.4             | 0.3   | 0.4  | dB  |   |
|                         | Time-averaged power [dBm]          |               | 17.0                                            | 17.1 | 17.0 | 1.10            | 1.07  | 1.10 | Lin |   |
|                         |                                    |               | No testing required for this slot configuration |      |      |                 |       |      |     |   |
| 3-slot<br>8PSK<br>EGPRS | Tuning Target + Tolerance [dBm]    |               | 21.6                                            |      |      | Scaling factor* |       |      |     |   |
|                         | Conducted Slot Average Power [dBm] |               | 21.0                                            | 21.0 | 21.1 | 0.6             | 0.6   | 0.5  | dB  |   |
|                         | Time-averaged power [dBm]          |               | 16.7                                            | 16.7 | 16.8 | 1.15            | 1.15  | 1.12 | Lin |   |
|                         |                                    |               | No testing required for this slot configuration |      |      |                 |       |      |     |   |
| 4-slot<br>8PSK<br>EGPRS | Tuning Target + Tolerance [dBm]    |               | 20.4                                            |      |      | Scaling factor* |       |      |     |   |
|                         | Conducted Slot Average Power [dBm] |               | 20.0                                            | 20.1 | 20.0 | 0.4             | 0.3   | 0.4  | dB  |   |
|                         | Time-averaged power [dBm]          |               | 17.0                                            | 17.1 | 17.0 | 1.10            | 1.07  | 1.10 | Lin |   |
|                         | Left Cheek                         | Estimated SAR | 0.091                                           | -    | -    | -               | 0.083 | -    | -   | - |
|                         |                                    | Full SAR      | -                                               | -    | -    | -               | -     | -    | -   | - |
|                         | Left Tilt                          | Estimated SAR | -                                               | -    | -    | -               | -     | -    | -   | - |
|                         |                                    | Full SAR      | -                                               | -    | -    | -               | -     | -    | -   | - |
|                         | Right Cheek                        | Estimated SAR | -                                               | -    | -    | -               | -     | -    | -   | - |
|                         |                                    | Full SAR      | -                                               | -    | -    | -               | -     | -    | -   | - |
|                         | Right Tilt                         | Estimated SAR | -                                               | -    | -    | -               | -     | -    | -   | - |
|                         |                                    | Full SAR      | -                                               | -    | -    | -               | -     | -    | -   | - |

2450MHz Head SAR results

| Mode                            | Device orientation              | SAR measurement | Measured 1g SAR [W/kg] |                    |                     | Reported* 1g SAR [W/kg] |                    |                     | Max Deviation (Estimated SAR - Full SAR) [W/kg] | Plot # |
|---------------------------------|---------------------------------|-----------------|------------------------|--------------------|---------------------|-------------------------|--------------------|---------------------|-------------------------------------------------|--------|
|                                 |                                 |                 | Ch 1<br>2412.0 MHz     | Ch 6<br>2437.0 MHz | Ch 11<br>2462.0 MHz | Ch 1<br>2412.0 MHz      | Ch 6<br>2437.0 MHz | Ch 11<br>2462.0 MHz |                                                 |        |
| WLAN<br>b-mode<br>BPSK<br>1Mbps | Tuning Target + Tolerance [dBm] |                 | 17.5                   |                    |                     | Scaling factor*         |                    |                     |                                                 |        |
|                                 | Conducted Power [dBm]           |                 | 16.1                   | 16.2               | 16.1                | 1.4                     | 1.3                | 1.4                 | dB                                              |        |
|                                 | Time-averaged power [dBm]       |                 | 16.1                   | 16.2               | 16.1                | 1.38                    | 1.35               | 1.38                | Lin                                             |        |
|                                 | Left Cheek                      | Estimated SAR   | 0.556                  | 0.521              | 0.459               | 0.767                   | 0.703              | 0.634               | 0.02                                            | 3      |
|                                 |                                 | Full SAR        | 0.575                  | -                  | -                   | 0.794                   | -                  | -                   |                                                 |        |
|                                 | Left Tilt                       | Estimated SAR   | -                      | 0.246              | -                   | -                       | 0.332              | -                   | -                                               | -      |
|                                 |                                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   |                                                 |        |
|                                 | Right Cheek                     | Estimated SAR   | -                      | 0.274              | -                   | -                       | 0.370              | -                   | -                                               | -      |
|                                 |                                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   |                                                 |        |
|                                 | Right Tilt                      | Estimated SAR   | -                      | 0.218              | -                   | -                       | 0.294              | -                   | -                                               | -      |
|                                 |                                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   |                                                 |        |

**Simultaneous transmissions: Combined head SAR results –  
Individual band Max results**

| Test configuration | Max. Reported* 1g SAR results |                |                 |
|--------------------|-------------------------------|----------------|-----------------|
|                    | WLAN                          | 4-slot GPRS850 | 2-slot GPRS1900 |
| Head: Left, Cheek  | 0.794                         | 0.281          | 0.238           |
| Head: Left, Tilt   | 0.332                         | 0.149          | 0.133           |
| Head: Right, Cheek | 0.370                         | 0.391          | 0.089           |
| Head: Right, Tilt  | 0.294                         | 0.159          | 0.125           |

**Simultaneous transmissions: Combined head SAR results –  
Max + Max combined results**

| Test configuration | Max. Reported* 1g SAR results |                         |
|--------------------|-------------------------------|-------------------------|
|                    | 4-slot GPRS 850 + WLAN        | 2-slot GPRS 1900 + WLAN |
| Head: Left, Cheek  | 1.08                          | 1.03                    |
| Head: Left, Tilt   | 0.481                         | 0.465                   |
| Head: Right, Cheek | 0.761                         | 0.459                   |
| Head: Right, Tilt  | 0.453                         | 0.419                   |

Note: Simultaneous Transmission Procedures as described in KDB648474 are not required for this product.

#### 7.1.1 Combined Head SAR data

**The Combined SAR data given in the tables below has been voluntarily calculated and should be ignored for FCC certification.**

The following table gives a more accurate assessment of the SAR values for simultaneous transmission. These values have been calculated using the SPEAG Combined Multiband algorithm, which is based on area scans. It a) converts the 2D area scans into 3D volume scans by assuming frequency-dependent decay characteristics for the E-field, b) sums the SAR values for WLAN2450 and the cellular bands point-by-point and c) calculates the combined average SAR values.

**Simultaneous transmissions: Combined head SAR results –  
SPEAG Combined Multiband algorithm results**

| Test configuration | Max. Reported* 1g SAR results |                            |
|--------------------|-------------------------------|----------------------------|
|                    | 4-slot GPRS<br>850 + WLAN     | 2-slot GPRS<br>1900 + WLAN |
| Head: Left, Cheek  | <b>0.814</b>                  | <b>0.814</b>               |
| Head: Left, Tilt   | -                             | -                          |
| Head: Right, Cheek | -                             | -                          |
| Head: Right, Tilt  | -                             | -                          |

Highest result within individual zoom scan or individual expanded zoom scan results is given in Section 1.2 for each transmitter. Highest result within contributing individual zoom scan, individual expanded zoom scan, Speag combined algorithm or combined expanded zoom scan results are given in Section for each simultaneous transmitter combination.

## 7.2 The measured Body SAR values for the test device are tabulated below:

### 850MHz Band Body SAR results

| Mode        | Device orientation                 |                 | SAR measurement | Measured 1g SAR [W/kg] |           |           | Reported* 1g SAR [W/kg] |           |           | Max Deviation (Estimated SAR - Full SAR) [W/kg] | Plot # |
|-------------|------------------------------------|-----------------|-----------------|------------------------|-----------|-----------|-------------------------|-----------|-----------|-------------------------------------------------|--------|
|             |                                    |                 |                 | Ch 128                 | Ch 190    | Ch 251    | Ch 128                  | Ch 190    | Ch 251    |                                                 |        |
|             |                                    |                 |                 | 824.2 MHz              | 836.6 MHz | 848.8 MHz | 824.2 MHz               | 836.6 MHz | 848.8 MHz |                                                 |        |
| 4-slot GPRS | Tuning Target + Tolerance [dBm]    |                 |                 | 26.1                   |           |           | Scaling factor*         |           |           |                                                 |        |
|             | Conducted Slot Average Power [dBm] |                 |                 | 25.7                   | 25.7      | 25.7      | 0.4                     | 0.4       | 0.4       | dB                                              |        |
|             | Time-averaged power [dBm]          |                 |                 | 22.7                   | 22.7      | 22.7      | 1.10                    | 1.10      | 1.10      | Lin                                             |        |
|             | Back facing phantom                | Without headset | Estimated SAR   | 0.322                  | 0.394     | 0.449     | 0.353                   | 0.432     | 0.492     | 0.00                                            | 4      |
|             |                                    |                 | Full SAR        | -                      | -         | 0.449     | -                       | -         | 0.492     |                                                 |        |
|             |                                    | Headset WH-108  | Estimated SAR   | -                      | 0.209     | -         | -                       | 0.229     | -         | -                                               | -      |
|             |                                    |                 | Full SAR        | -                      | -         | -         | -                       | -         | -         |                                                 |        |
|             | Display facing phantom             | Without headset | Estimated SAR   | -                      | 0.306     | -         | -                       | 0.336     | -         | -                                               | -      |
|             |                                    |                 | Full SAR        | -                      | -         | -         | -                       | -         | -         |                                                 |        |
|             |                                    | Headset WH-108  | Estimated SAR   | -                      | 0.177     | -         | -                       | 0.194     | -         | -                                               | -      |
|             |                                    |                 | Full SAR        | -                      | -         | -         | -                       | -         | -         |                                                 |        |

### 1900MHz Band Body SAR results

| Mode        | Device orientation                 |                 | SAR measurement | Measured 1g SAR [W/kg] |            |            | Reported* 1g SAR [W/kg] |            |            | Max Deviation (Estimated SAR - Full SAR) [W/kg] | Plot # |
|-------------|------------------------------------|-----------------|-----------------|------------------------|------------|------------|-------------------------|------------|------------|-------------------------------------------------|--------|
|             |                                    |                 |                 | Ch 512                 | Ch 661     | Ch 810     | Ch 512                  | Ch 661     | Ch 810     |                                                 |        |
|             |                                    |                 |                 | 1850.2 MHz             | 1880.0 MHz | 1909.8 MHz | 1850.2 MHz              | 1880.0 MHz | 1909.8 MHz |                                                 |        |
| 2-slot GPRS | Tuning Target + Tolerance [dBm]    |                 |                 | 27.4                   |            |            | Scaling factor*         |            |            |                                                 |        |
|             | Conducted Slot Average Power [dBm] |                 |                 | 27.0                   | 27.0       | 27.1       | 0.4                     | 0.4        | 0.3        | dB                                              |        |
|             | Time-averaged power [dBm]          |                 |                 | 21.0                   | 21.0       | 21.1       | 1.10                    | 1.10       | 1.07       |                                                 |        |
|             | Back facing phantom                | Without headset | Estimated SAR   | 0.264                  | 0.234      | 0.207      | 0.289                   | 0.257      | 0.222      | 0.00                                            | 5      |
|             |                                    |                 | Full SAR        | 0.260                  | -          | -          | 0.285                   | -          | -          |                                                 |        |
|             |                                    | Headset WH-108  | Estimated SAR   | -                      | 0.233      | -          | -                       | 0.255      | -          | -                                               | -      |
|             |                                    |                 | Full SAR        | -                      | -          | -          | -                       | -          | -          |                                                 |        |
|             | Display facing phantom             | Without headset | Estimated SAR   | -                      | 0.121      | -          | -                       | 0.133      | -          | -                                               | -      |
|             |                                    |                 | Full SAR        | -                      | -          | -          | -                       | -          | -          |                                                 |        |
|             |                                    | Headset WH-108  | Estimated SAR   | -                      | 0.089      | -          | -                       | 0.097      | -          | -                                               | -      |
|             |                                    |                 | Full SAR        | -                      | -          | -          | -                       | -          | -          |                                                 |        |

### 2450MHz Body SAR results

| Mode                             | Device orientation              |                 | SAR measurement | Measured 1g SAR [W/kg] |                    |                     | Reported* 1g SAR [W/kg] |                    |                     | Max Deviation (Estimated SAR - Full SAR) [W/kg] | Plot # |
|----------------------------------|---------------------------------|-----------------|-----------------|------------------------|--------------------|---------------------|-------------------------|--------------------|---------------------|-------------------------------------------------|--------|
|                                  |                                 |                 |                 | Ch 1<br>2412.0 MHz     | Ch 6<br>2437.0 MHz | Ch 11<br>2462.0 MHz | Ch 1<br>2412.0 MHz      | Ch 6<br>2437.0 MHz | Ch 11<br>2462.0 MHz |                                                 |        |
| WLAN<br>b-mode<br>BPSK<br>1 Mbps | Tuning Target + Tolerance [dBm] |                 |                 | 17.5                   |                    |                     | Scaling factor*         |                    |                     |                                                 |        |
|                                  | Conducted Power [dBm]           |                 |                 | 16.1                   | 16.2               | 16.1                | 1.4                     | 1.3                | 1.4                 | dB                                              |        |
|                                  | Time-averaged power [dBm]       |                 |                 | 16.1                   | 16.2               | 16.1                | 1.38                    | 1.35               | 1.38                | Lin                                             |        |
|                                  | Back facing phantom             | Without headset | Estimated SAR   | 0.066                  | 0.069              | 0.057               | 0.091                   | 0.094              | 0.078               | 0.01                                            | 6      |
|                                  |                                 |                 | Full SAR        | -                      | 0.077              | -                   | -                       | <b>0.104</b>       | -                   |                                                 |        |
|                                  |                                 | Headset WH-108  | Estimated SAR   | -                      | 0.067              | -                   | -                       | 0.091              | -                   | -                                               | -      |
|                                  |                                 |                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   |                                                 |        |
|                                  | Display facing phantom          | Without headset | Estimated SAR   | -                      | 0.056              | -                   | -                       | 0.076              | -                   | -                                               | -      |
|                                  |                                 |                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   |                                                 |        |
|                                  |                                 | Headset WH-108  | Estimated SAR   | -                      | 0.039              | -                   | -                       | 0.052              | -                   | -                                               | -      |
|                                  |                                 |                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   |                                                 |        |

### Simultaneous transmissions: Combined body SAR results – Individual band Max results

| Test configuration                            | Max. Reported*1g SAR results |                |                 |
|-----------------------------------------------|------------------------------|----------------|-----------------|
|                                               | WLAN                         | 4-slot GPRS850 | 2-slot GPRS1900 |
| Body: Back facing phantom, Without Headset    | 0.104                        | 0.492          | 0.285           |
| Body: Back facing phantom, Headset WH-108     | 0.091                        | 0.229          | 0.255           |
| Body: Display facing phantom, Without Headset | 0.076                        | 0.336          | 0.133           |
| Body: Display facing phantom, Headset WH-108  | 0.052                        | 0.194          | 0.097           |

### Simultaneous transmissions: Combined body SAR results – Max + Max combined results

| Test configuration                            | Max. Reported*1g SAR results |                         |
|-----------------------------------------------|------------------------------|-------------------------|
|                                               | 4-slot GPRS 850 + WLAN       | 2-slot GPRS 1900 + WLAN |
| Body: Back facing phantom, Without Headset    | <b>0.596</b>                 | <b>0.389</b>            |
| Body: Back facing phantom, Headset WH-108     | 0.320                        | 0.346                   |
| Body: Display facing phantom, Without Headset | 0.412                        | 0.209                   |
| Body: Display facing phantom, Headset WH-108  | 0.246                        | 0.149                   |

Note: Simultaneous Transmission Procedures as described in KDB648474 are not required for this product.

### 7.2.1 Combined Body SAR data

The Combined SAR data given in the tables below has been voluntarily calculated and should be ignored for FCC certification.

The following table gives a more accurate assessment of the SAR values for simultaneous transmission. These values have been calculated using the SPEAG Combined Multiband algorithm, which is based on area scans. It a) converts the 2D area scans into 3D volume scans by assuming frequency-dependent decay characteristics for the E-field, b) sums the SAR values for WLAN2450 and the cellular bands point-by-point and c) calculates the combined average SAR values.

**Simultaneous transmissions: Combined body SAR results –  
SPEAG Combined Multiband algorithm results**

| Test configuration                               | Max. Reported*1g SAR results |                            |
|--------------------------------------------------|------------------------------|----------------------------|
|                                                  | 4-slot GPRS<br>850 + WLAN    | 2-slot GPRS<br>1900 + WLAN |
| Body: Back facing phantom,<br>Without Headset    | 0.533                        | 0.302                      |
| Body: Back facing phantom,<br>Headset WH-108     | -                            | -                          |
| Body: Display facing phantom,<br>Without Headset | -                            | -                          |
| Body: Display facing phantom,<br>Headset WH-108  | -                            | -                          |

Highest result within individual zoom scan or individual expanded zoom scan results is given in Section 1.2 for each transmitter. Highest result within contributing individual zoom scan, individual expanded zoom scan, Speag combined algorithm or combined expanded zoom scan results are given in Section for each simultaneous transmitter combination.



### 7.3 Body SAR assessment of Wireless Router mode at 10.0mm separation distance

#### 850MHz Band Wireless Router SAR results

| Mode        | Device orientation                 | SAR measurement | Measured 1g SAR [W/kg] |           |           | Reported* 1g SAR [W/kg] |           |           | Max Deviation (Estimated SAR - Full SAR) [W/kg] | Plot # |
|-------------|------------------------------------|-----------------|------------------------|-----------|-----------|-------------------------|-----------|-----------|-------------------------------------------------|--------|
|             |                                    |                 | Ch 128                 | Ch 190    | Ch 251    | Ch 128                  | Ch 190    | Ch 251    |                                                 |        |
|             |                                    |                 | 824.2 MHz              | 836.6 MHz | 848.8 MHz | 824.2 MHz               | 836.6 MHz | 848.8 MHz |                                                 |        |
| 4-slot GPRS | Tuning Target + Tolerance [dBm]    |                 | 26.1                   |           |           | Scaling factor*         |           |           |                                                 |        |
|             | Conducted Slot Average Power [dBm] |                 | 25.7                   | 25.7      | 25.7      | 0.4                     | 0.4       | 0.4       | dB                                              |        |
|             | Time-averaged power [dBm]          |                 | 22.7                   | 22.7      | 22.7      | 1.10                    | 1.10      | 1.10      | Lin                                             |        |
|             | Back facing phantom                | Estimated SAR   | 0.488                  | 0.584     | 0.654     | 0.535                   | 0.640     | 0.717     | 0.00                                            | 7      |
|             |                                    | Full SAR        | -                      | -         | 0.654     | -                       | -         | 0.717     |                                                 |        |
|             | Display facing phantom             | Estimated SAR   | -                      | 0.390     | -         | -                       | 0.428     | -         | -                                               | -      |
|             |                                    | Full SAR        | -                      | -         | -         | -                       | -         | -         |                                                 |        |
|             | Top edge facing phantom            | Estimated SAR   | -                      | 0.020     | -         | -                       | 0.022     | -         | -                                               | -      |
|             |                                    | Full SAR        | -                      | -         | -         | -                       | -         | -         |                                                 |        |
|             | Bottom edge facing phantom         | Estimated SAR   | -                      | 0.101     | -         | -                       | 0.111     | -         | -                                               | -      |
|             |                                    | Full SAR        | -                      | -         | -         | -                       | -         | -         |                                                 |        |
|             | Left edge facing phantom           | Estimated SAR   | -                      | 0.269     | -         | -                       | 0.295     | -         | -                                               | -      |
|             |                                    | Full SAR        | -                      | -         | -         | -                       | -         | -         |                                                 |        |
|             | Right edge facing phantom          | Estimated SAR   | -                      | 0.317     | -         | -                       | 0.348     | -         | -                                               | -      |
|             |                                    | Full SAR        | -                      | -         | -         | -                       | -         | -         |                                                 |        |

#### 1900MHz Band Wireless Router SAR results

| Mode        | Device orientation                 | SAR measurement | Measured 1g SAR [W/kg] |                      |                      | Reported* 1g SAR [W/kg] |                      |                      | Max Deviation (Estimated SAR - Full SAR) [W/kg] | Plot # |
|-------------|------------------------------------|-----------------|------------------------|----------------------|----------------------|-------------------------|----------------------|----------------------|-------------------------------------------------|--------|
|             |                                    |                 | Ch 512<br>1850.2 MHz   | Ch 661<br>1880.0 MHz | Ch 810<br>1909.8 MHz | Ch 512<br>1850.2 MHz    | Ch 661<br>1880.0 MHz | Ch 810<br>1909.8 MHz |                                                 |        |
| 2-slot GPRS | Tuning Target + Tolerance [dBm]    |                 | 27.4                   |                      |                      | Scaling factor*         |                      |                      |                                                 |        |
|             | Conducted Slot Average Power [dBm] |                 | 27.0                   | 27.0                 | 27.1                 | 0.4                     | 0.4                  | 0.3                  | dB                                              |        |
|             | Time-averaged power [dBm]          |                 | 21.0                   | 21.0                 | 21.1                 | 1.10                    | 1.10                 | 1.07                 | Lin                                             |        |
|             | Back facing phantom                | Estimated SAR   | 0.456                  | 0.436                | 0.404                | 0.500                   | 0.478                | 0.433                | 0.00                                            | 8      |
|             |                                    | Full SAR        | 0.453                  | -                    | -                    | 0.497                   | -                    | -                    |                                                 |        |
|             | Display facing phantom             | Estimated SAR   | -                      | 0.185                | -                    | -                       | 0.203                | -                    | -                                               | -      |
|             |                                    | Full SAR        | -                      | -                    | -                    | -                       | -                    | -                    |                                                 |        |
|             | Top edge facing phantom            | Estimated SAR   | -                      | 0.042                | -                    | -                       | 0.046                | -                    | -                                               | -      |
|             |                                    | Full SAR        | -                      | -                    | -                    | -                       | -                    | -                    |                                                 |        |
|             | Bottom edge facing phantom         | Estimated SAR   | -                      | 0.226                | -                    | -                       | 0.248                | -                    | -                                               | -      |
|             |                                    | Full SAR        | -                      | -                    | -                    | -                       | -                    | -                    |                                                 |        |
|             | Left edge facing phantom           | Estimated SAR   | -                      | 0.081                | -                    | -                       | 0.088                | -                    | -                                               | -      |
|             |                                    | Full SAR        | -                      | -                    | -                    | -                       | -                    | -                    |                                                 |        |
|             | Right edge facing phantom          | Estimated SAR   | -                      | 0.035                | -                    | -                       | 0.038                | -                    | -                                               | -      |
|             |                                    | Full SAR        | -                      | -                    | -                    | -                       | -                    | -                    |                                                 |        |



### 2450MHz Wireless Router SAR results

| Mode                              | Test configuration              | SAR measurement | Measured 1g SAR [W/kg] |                    |                     | Reported* 1g SAR [W/kg] |                    |                     | Max Deviation (Estimated SAR - Full SAR) [W/kg] | Plot # |
|-----------------------------------|---------------------------------|-----------------|------------------------|--------------------|---------------------|-------------------------|--------------------|---------------------|-------------------------------------------------|--------|
|                                   |                                 |                 | Ch 1<br>2412.0 MHz     | Ch 6<br>2437.0 MHz | Ch 11<br>2462.0 MHz | Ch 1<br>2412.0 MHz      | Ch 6<br>2437.0 MHz | Ch 11<br>2462.0 MHz |                                                 |        |
| -WLAN<br>b-mode<br>BPSK<br>1 Mbps | Tuning Target + Tolerance [dBm] |                 | 17.5                   |                    |                     | Scaling factor*         |                    |                     |                                                 |        |
|                                   | Conducted Power [dBm]           |                 | 16.1                   | 16.2               | 16.1                | 1.4                     | 1.3                | 1.4                 | dB                                              |        |
|                                   | Time-averaged power [dBm]       |                 | 16.1                   | 16.2               | 16.1                | 1.38                    | 1.35               | 1.38                | Lin                                             |        |
|                                   | Back facing phantom             | Estimated SAR   | -                      | 0.126              | -                   | -                       | 0.170              | -                   | -                                               | -      |
|                                   |                                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   | -                                               | -      |
|                                   | Display facing phantom          | Estimated SAR   | -                      | 0.097              | -                   | -                       | 0.131              | -                   | -                                               | -      |
|                                   |                                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   | -                                               | -      |
|                                   | Top edge facing phantom         | Estimated SAR   | -                      | 0.103              | -                   | -                       | 0.139              | -                   | -                                               | -      |
|                                   |                                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   | -                                               | -      |
|                                   | Bottom edge facing phantom      | Estimated SAR   | -                      | 0.008              | -                   | -                       | 0.011              | -                   | -                                               | -      |
|                                   |                                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   | -                                               | -      |
|                                   | Left edge facing phantom        | Estimated SAR   | -                      | 0.035              | -                   | -                       | 0.048              | -                   | -                                               | -      |
|                                   |                                 | Full SAR        | -                      | -                  | -                   | -                       | -                  | -                   | -                                               | -      |
|                                   | Right edge facing phantom       | Estimated SAR   | 0.146                  | 0.143              | 0.105               | 0.202                   | 0.193              | 0.145               | 0.00                                            | 9      |
|                                   |                                 | Full SAR        | 0.150                  | -                  | -                   | 0.207                   | -                  | -                   |                                                 |        |

### Simultaneous transmissions: Combined SAR results – Individual band Max results

| Test configuration         | Max. Reported* 1g SAR results |                |                 |
|----------------------------|-------------------------------|----------------|-----------------|
|                            | WLAN                          | 4-slot GPRS850 | 2-slot GPRS1900 |
| Back facing phantom        | 0.170                         | 0.717          | 0.497           |
| Display facing phantom     | 0.131                         | 0.428          | 0.203           |
| Top edge facing phantom    | 0.139                         | 0.022          | 0.046           |
| Bottom edge facing phantom | 0.011                         | 0.111          | 0.248           |
| Left edge facing phantom   | 0.048                         | 0.295          | 0.088           |
| Right edge facing phantom  | 0.207                         | 0.348          | 0.038           |

### Simultaneous transmissions: Combined SAR results – Max + Max combined results

| Test configuration         | Max. Reported* 1g SAR results |                            |
|----------------------------|-------------------------------|----------------------------|
|                            | 4-slot GPRS<br>850 + WLAN     | 2-slot GPRS<br>1900 + WLAN |
| Back facing phantom        | 0.887                         | 0.667                      |
| Display facing phantom     | 0.559                         | 0.334                      |
| Top edge facing phantom    | 0.161                         | 0.185                      |
| Bottom edge facing phantom | 0.122                         | 0.259                      |
| Left edge facing phantom   | 0.343                         | 0.136                      |
| Right edge facing phantom  | 0.555                         | 0.245                      |

Note: Simultaneous Transmission Procedures as described in KDB648474 are not required for this product.

#### 7.3.1 Combined Body SAR data

The Combined SAR data given in the tables below has been voluntarily calculated and should be ignored for FCC certification.

The following table gives a more accurate assessment of the SAR values for simultaneous transmission. These values have been calculated using the SPEAG Combined Multiband algorithm, which is based on area scans. It a) converts the 2D area scans into 3D volume scans by assuming frequency-dependent decay characteristics for the E-field, b) sums the SAR values for WLAN2450 and the cellular bands point-by-point and c) calculates the combined average SAR values.

### Simultaneous transmissions: Combined SAR results – SPEAG Combined Multiband algorithm results

| Test configuration         | Max. Reported* 1g SAR results |                            |
|----------------------------|-------------------------------|----------------------------|
|                            | 4-slot GPRS<br>850 + WLAN     | 2-slot GPRS<br>1900 + WLAN |
| Back facing phantom        | 0.777                         | 0.526                      |
| Display facing phantom     | -                             | -                          |
| Top edge facing phantom    | -                             | -                          |
| Bottom edge facing phantom | -                             | -                          |
| Left edge facing phantom   | -                             | -                          |
| Right edge facing phantom  | -                             | -                          |

Highest result within individual zoom scan or individual expanded zoom scan results is given in Section 1.2 for each transmitter. Highest result within contributing individual zoom scan, individual expanded zoom scan, Speag combined algorithm or combined expanded zoom scan results are given in Section for each simultaneous transmitter combination.

Plots of the Measurement scans are given in Appendix B.

## APPENDIX A: SYSTEM CHECKING SCANS

### Plot1:

Date/Time: 2014-11-17 10:40:29 AM

Test Laboratory: TCC Microsoft

Type: D835V2; Serial: 4d005

### Communication System: CW835

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Head 835 SAR3; Medium Notes: Medium Temperature:  $t=21.2$

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.891$  S/m;  $\epsilon_r = 40.376$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

#### DASY Configuration:

- Probe: EX3DV4 - SN3838
- ConvF(9.2, 9.2, 9.2); Calibrated: 2014-03-21;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn710; Calibrated: 2014-03-24
- Phantom: SAR3 - SAM3; Type: QD 000 P40 CB; Serial: TP - 1410
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=15mm, Pin=250mW/Area Scan (61x81x1):** Interpolated grid:  $dx=1.500$  mm,  $dy=1.500$  mm

Reference Value = 49.63 V/m

Fast SAR: SAR(1 g) = 2.26 W/kg

Fast SAR(10 g) = 1.53 W/kg

Maximum value of SAR (interpolated) = 2.43 W/kg

**d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

Reference Value = 49.63 V/m

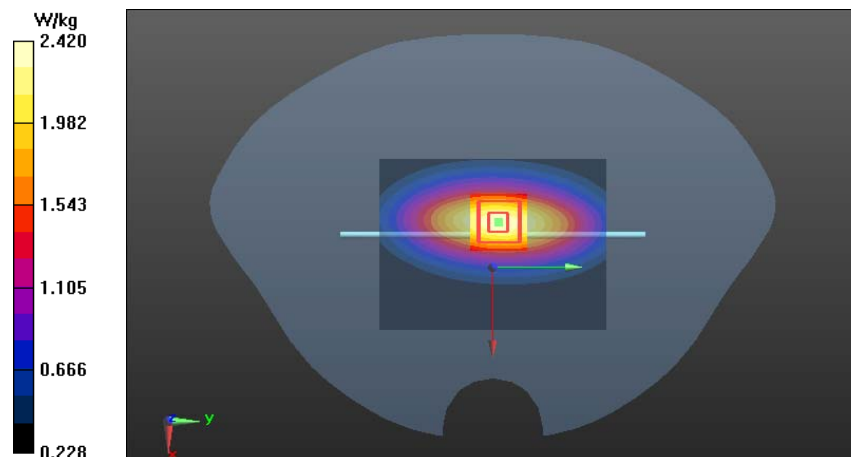
Peak SAR (extrapolated) = 3.33 W/kg

**SAR(1 g) = 2.24 W/kg**

**SAR(10 g) = 1.47 W/kg**

**Power Drift = -0.05 dB**

Maximum value of SAR (measured) = 2.42 W/kg



**Plot2:**

Date/Time: 2014-11-18 11:20:28 AM

Test Laboratory: TCC Microsoft

Type: D1900V2; Serial: 547

**Communication System: CW1900**

Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: Head 1900 SAR4; Medium Notes: Medium Temperature:  $t=20.8$  C

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.421$  S/m;  $\epsilon_r = 38.724$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3836
- ConvF(7.9, 7.9, 7.9); Calibrated: 2014-03-21;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn887; Calibrated: 2014-03-31
- Phantom: SAR4 - SAM1; Type: QD000 P40 CA; Serial: TP - 1274
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=10mm, Pin=250mW/Area Scan (61x81x1):** Interpolated grid:  $dx=1.500$  mm,  $dy=1.500$  mm

Reference Value = 86.82 V/m

Fast SAR: SAR(1 g) = 9.48 W/kg

Fast SAR(10 g) = 5.01 W/kg

Maximum value of SAR (interpolated) = 11.2 W/kg

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

Reference Value = 86.82 V/m

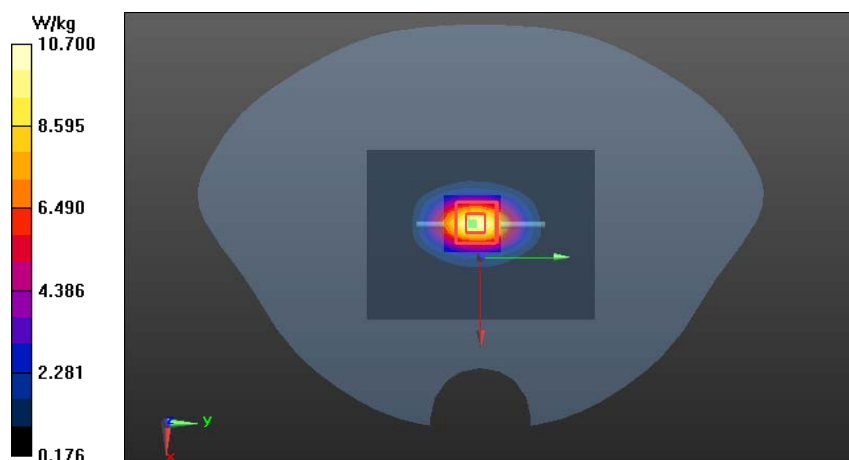
Peak SAR (extrapolated) = 17.8 W/kg

**SAR(1 g) = 9.56 W/kg**

**SAR(10 g) = 4.95 W/kg**

**Power Drift = -0.03 dB**

Maximum value of SAR (measured) = 10.7 W/kg



**Plot3:**

Date/Time: 2014-11-18 10:11:17 AM

Test Laboratory: TCC Microsoft

Type: D2450V2; Serial: D2450V2 - SN:883

**Communication System: CW2450**

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: Head 2450 SAR2; Medium Notes: Medium Temperature:  $t=21.5^{\circ}\text{C}$

Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.86 \text{ S/m}$ ;  $\epsilon_r = 39.019$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3823
- ConvF(6.95, 6.95, 6.95); Calibrated: 2014-09-10;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1319; Calibrated: 2014-09-09
- Phantom: SAR2 - SAM2; Type: QD 000P40 CD; Serial: TP - 1771
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=10mm, Pin=250mW/Area Scan (61x81x1):** Interpolated grid:  $dx=1.000 \text{ mm}$ ,  $dy=1.000 \text{ mm}$

Reference Value =  $90.33 \text{ V/m}$

Fast SAR: SAR(1 g) =  $13.1 \text{ W/kg}$

Fast SAR(10 g) =  $5.82 \text{ W/kg}$

Maximum value of SAR (interpolated) =  $15.0 \text{ W/kg}$

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

Reference Value =  $90.33 \text{ V/m}$

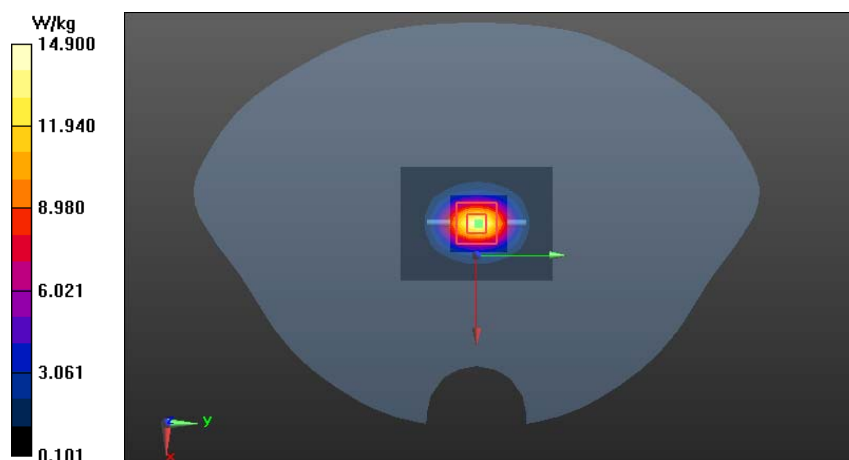
Peak SAR (extrapolated) =  $27.1 \text{ W/kg}$

**SAR(1 g) =  $13 \text{ W/kg}$**

**SAR(10 g) =  $5.99 \text{ W/kg}$**

**Power Drift =  $-0.04 \text{ dB}$**

Maximum value of SAR (measured) =  $14.9 \text{ W/kg}$



**Plot4:**

Date/Time: 2014-11-25 10:22:24 AM

Test Laboratory: TCC Microsoft

Type: D2450V2; Serial: D2450V2 - SN:883

**Communication System: CW2450**

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: Head 2450 SAR4; Medium Notes: Medium Temperature:  $t=21.7^{\circ}\text{C}$

Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.741 \text{ S/m}$ ;  $\epsilon_r = 38.096$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

**DASY Configuration:**

- Probe: ES3DV3 - SN3280
- ConvF(4.54, 4.54, 4.54); Calibrated: 2014-03-20;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn887; Calibrated: 2014-03-31
- Phantom: SAR4 - SAM3; Type: QD000 P40 CB; Serial: TP - 1301
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=10mm, Pin=250mW/Area Scan (61x81x1):** Interpolated grid:  $dx=1.000 \text{ mm}$ ,  $dy=1.000 \text{ mm}$

Reference Value =  $94.27 \text{ V/m}$

Fast SAR: SAR(1 g) =  $13.6 \text{ W/kg}$

Fast SAR(10 g) =  $6.06 \text{ W/kg}$

Maximum value of SAR (interpolated) =  $15.8 \text{ W/kg}$

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

Reference Value =  $94.27 \text{ V/m}$

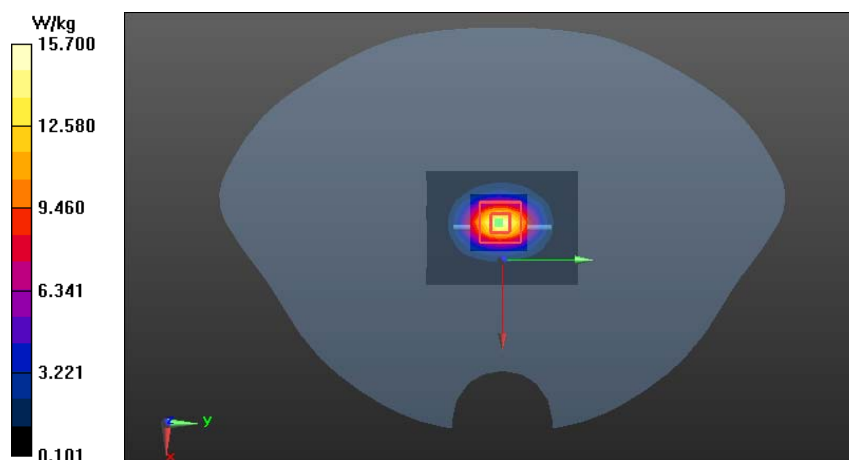
Peak SAR (extrapolated) =  $28.6 \text{ W/kg}$

**SAR(1 g) =  $13.7 \text{ W/kg}$**

**SAR(10 g) =  $6.3 \text{ W/kg}$**

**Power Drift =  $-0.02 \text{ dB}$**

Maximum value of SAR (measured) =  $15.7 \text{ W/kg}$



**Plot5:**

Date/Time: 2014-11-18 10:05:00 AM

Test Laboratory: TCC Microsoft

Type: D835V2; Serial: 4d005

**Communication System: CW835**

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Body 835 SAR3; Medium Notes: Medium Temperature:  $t=21.5$

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.945$  S/m;  $\epsilon_r = 53.758$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Center Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3838
- ConvF(8.97, 8.97, 8.97); Calibrated: 2014-03-21;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn710; Calibrated: 2014-03-24
- Phantom: SAR3 - TFP; Type: QD 000 P51 CA; Serial: TP - 1125/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=15mm, Pin=250mW/Area Scan (81x61x1):** Interpolated grid:  $dx=1.500$  mm,  $dy=1.500$  mm

Reference Value = 52.33 V/m

Fast SAR: SAR(1 g) = 2.41 W/kg

Fast SAR(10 g) = 1.63 W/kg

Maximum value of SAR (interpolated) = 2.59 W/kg

**d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

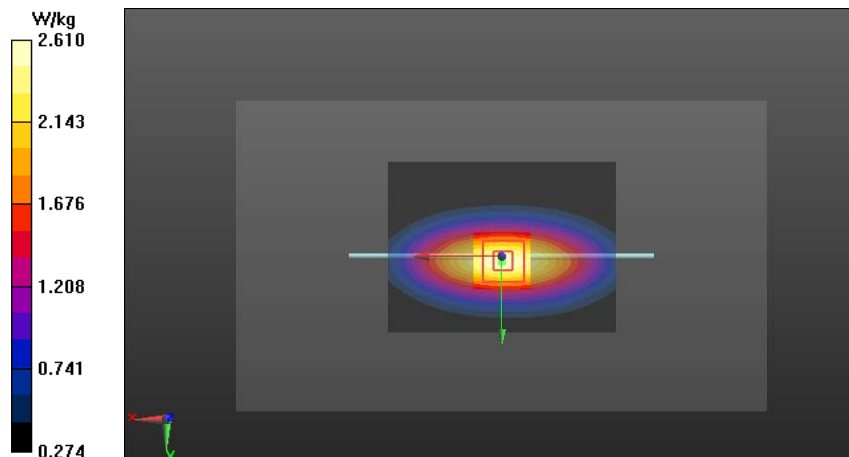
Reference Value = 52.33 V/m

Peak SAR (extrapolated) = 3.54 W/kg

**SAR(1 g) = 2.42 W/kg**

Maximum value of SAR (measured) = 2.61 W/kg

**Power Drift = -0.02 dB**



**Plot6:**

Date/Time: 2014-11-17 11:17:23 AM

Test Laboratory: TCC Microsoft

Type: D1900V2; Serial: 547

**Communication System: CW1900**

Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: Body 1900 SAR1; Medium Notes: Medium Temperature:  $t=21.4^{\circ}\text{C}$

Medium parameters used:  $f = 1900\text{ MHz}$ ;  $\sigma = 1.513\text{ S/m}$ ;  $\epsilon_r = 51.852$ ;  $\rho = 1000\text{ kg/m}^3$

Phantom section: Center Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3836
- ConvF(7.18, 7.18, 7.18); Calibrated: 2014-03-21;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn887; Calibrated: 2014-03-31
- Phantom: SAR4 - TFP; Type: QD000 P51 CA; Serial: S/N 1130/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=10mm, Pin=250mW/Area Scan (81x61x1):** Interpolated grid:  $dx=1.500\text{ mm}$ ,  $dy=1.500\text{ mm}$

Reference Value =  $87.83\text{ V/m}$

Fast SAR: SAR(1 g) =  $10.3\text{ W/kg}$

Fast SAR(10 g) =  $5.33\text{ W/kg}$

Maximum value of SAR (interpolated) =  $12.0\text{ W/kg}$

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

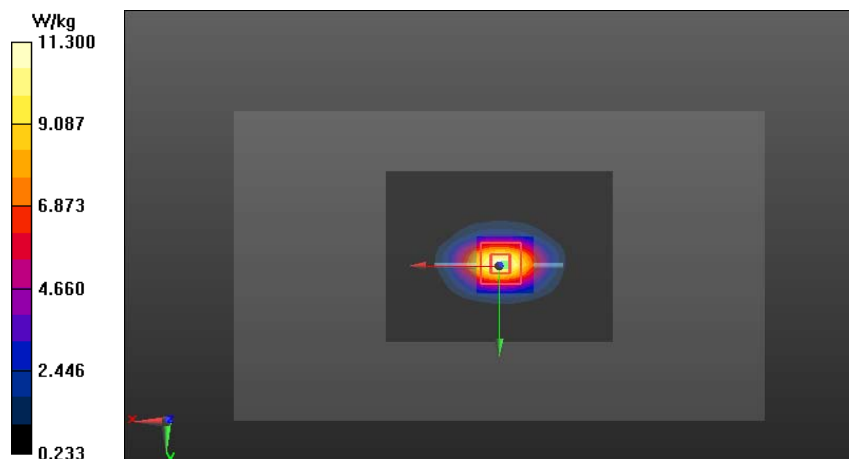
Reference Value =  $87.83\text{ V/m}$

Peak SAR (extrapolated) =  $18.4\text{ W/kg}$

**SAR(1 g) =  $10.2\text{ W/kg}$**

Maximum value of SAR (measured) =  $11.3\text{ W/kg}$

**Power Drift =  $-0.17\text{ dB}$**





**Plot7:**

Date/Time: 2014-11-19 10:03:28 AM

Test Laboratory: TCC Microsoft

Type: D2450V2; Serial: D2450V2 - SN:883

**Communication System: CW2450**

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: Body 2450 SAR2; Medium Notes: Medium Temperature: t=21.5C

Medium parameters used: f = 2450 MHz;  $\sigma = 2.035$  S/m;  $\epsilon_r = 51.536$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Center Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3823
- ConvF(6.95, 6.95, 6.95); Calibrated: 2014-09-10;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1319; Calibrated: 2014-09-09
- Phantom: SAR2 - TFP; Type: QD 000 P51 CA; Serial: TP - 1130/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=10mm, Pin=250mW/Area Scan (81x61x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 85.64 V/m

Fast SAR: SAR(1 g) = 13.1 W/kg

Fast SAR(10 g) = 5.77 W/kg

Maximum value of SAR (interpolated) = 15.0 W/kg

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

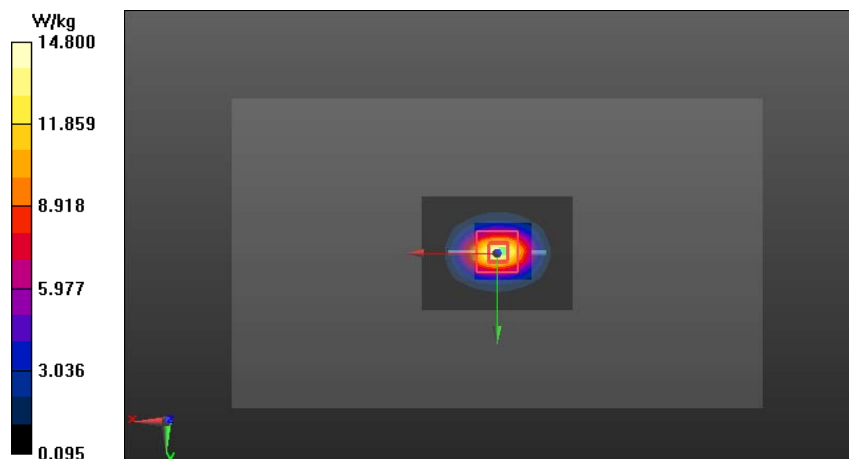
Reference Value = 85.64 V/m

Peak SAR (extrapolated) = 26.3 W/kg

**SAR(1 g) = 13 W/kg**

Maximum value of SAR (measured) = 14.8 W/kg

**Power Drift = -0.01 dB**



**Plot8:**

Date/Time: 2014-11-25 11:27:04 AM

Test Laboratory: TCC Microsoft

Type: D2450V2; Serial: D2450V2 - SN:883

**Communication System: CW2450**

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: Body 2450 SAR4; Medium Notes: Medium Temperature:  $t=21.7^{\circ}\text{C}$

Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.873 \text{ S/m}$ ;  $\epsilon_r = 50.638$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

**DASY Configuration:**

- Probe: ES3DV3 - SN3280
- ConvF(4.2, 4.2, 4.2); Calibrated: 2014-03-20;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn887; Calibrated: 2014-03-31
- Phantom: SAR4 - TFP; Type: QD000 P51 CA; Serial: S/N 1130/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=10mm, Pin=250mW/Area Scan (81x61x1):** Interpolated grid:  $dx=1.000 \text{ mm}$ ,  $dy=1.000 \text{ mm}$

Reference Value =  $91.43 \text{ V/m}$

Fast SAR: SAR(1 g) =  $13.6 \text{ W/kg}$

Fast SAR(10 g) =  $5.96 \text{ W/kg}$

Maximum value of SAR (interpolated) =  $15.9 \text{ W/kg}$

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

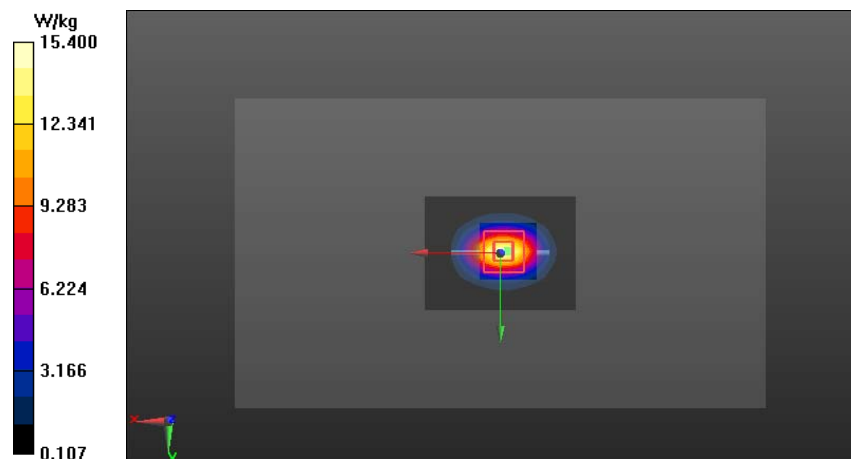
Reference Value =  $91.43 \text{ V/m}$

Peak SAR (extrapolated) =  $28.1 \text{ W/kg}$

**SAR(1 g) =  $13.6 \text{ W/kg}$**

Maximum value of SAR (measured) =  $15.4 \text{ W/kg}$

**Power Drift =  $-0.01 \text{ dB}$**



## APPENDIX B: MEASUREMENT SCANS

### Plot1:

Date/Time: 2014-11-17 3:52:38 PM

Test Laboratory: TCC Microsoft

Type: RM-1071; Serial: 004402/74/060060/0

### Communication System: 4-slot GPRS850

Frequency: 848.8 MHz; Duty Cycle: 1:2.09991

Medium: Head 835 SAR3; Medium Notes: Medium Temperature: t=21.2

Medium parameters used: f = 849 MHz;  $\sigma$  = 0.901 S/m;  $\epsilon_r$  = 40.266;  $\rho$  = 1000 kg/m<sup>3</sup>

Phantom section: Right Section

#### DASY Configuration:

- Probe: EX3DV4 - SN3838
- ConvF(9.2, 9.2, 9.2); Calibrated: 2014-03-21;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn710; Calibrated: 2014-03-24
- Phantom: SAR3 - SAM3; Type: QD 000 P40 CB; Serial: TP - 1410
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### 4-slot GPRS850 - Right/Cheek - High/Area Scan (71x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Reference Value = 6.044 V/m

Fast SAR: SAR(1 g) = 0.361 W/kg

Fast SAR(10 g) = 0.250 W/kg

Maximum value of SAR (interpolated) = 0.386 W/kg

### 4-slot GPRS850 - Right/Cheek - High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 6.044 V/m

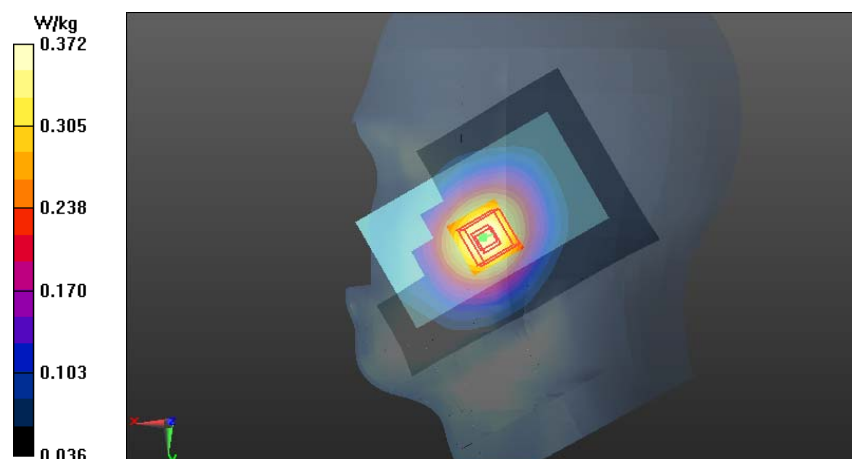
Peak SAR (extrapolated) = 0.441 W/kg

**SAR(1 g) = 0.357 W/kg**

**SAR(10 g) = 0.268 W/kg**

**Power Drift = -0.14 dB**

Maximum value of SAR (measured) = 0.372 W/kg



**Plot2:**

Date/Time: 2014-11-18 12:29:25 PM

Test Laboratory: TCC Microsoft

Type: RM-1071; Serial: 004402/74/060003/0

**Communication System: 2-slot GPRS1900**

Frequency: 1850.2 MHz; Duty Cycle: 1:4.19952

Medium: Head 1900 SAR4; Medium Notes: Medium Temperature:  $t=20.8$  C

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.369$  S/m;  $\epsilon_r = 38.962$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3836
- ConvF(7.9, 7.9, 7.9); Calibrated: 2014-03-21;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn887; Calibrated: 2014-03-31
- Phantom: SAR4 - SAM1; Type: QD000 P40 CA; Serial: TP - 1274
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**2-slot GPRS1900 - Left/Cheek - Low/Area Scan (71x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm**

Reference Value = 5.315 V/m

Fast SAR: SAR(1 g) = 0.217 W/kg

Fast SAR(10 g) = 0.126 W/kg

Maximum value of SAR (interpolated) = 0.245 W/kg

**2-slot GPRS1900 - Left/Cheek - Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm**

Reference Value = 5.315 V/m

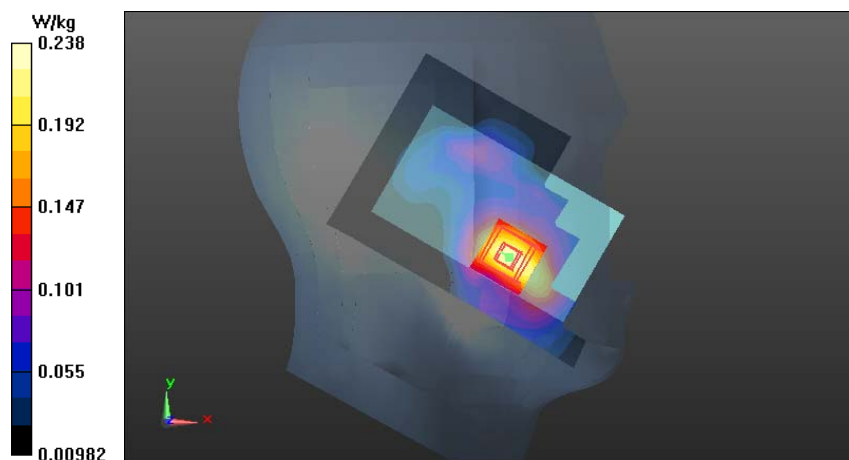
Peak SAR (extrapolated) = 0.333 W/kg

**SAR(1 g) = 0.217 W/kg**

**SAR(10 g) = 0.134 W/kg**

**Power Drift = 0.15 dB**

Maximum value of SAR (measured) = 0.238 W/kg



**Plot3:**

Date/Time: 2014-11-18 11:42:20 AM

Test Laboratory: TCC Microsoft

Type: RM-1071; Serial: 004402/74/060151/7

**Communication System: WLAN2450**

Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: Head 2450 SAR2; Medium Notes: Medium Temperature:  $t=21.5^{\circ}\text{C}$

Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.814 \text{ S/m}$ ;  $\epsilon_r = 39.175$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3823
- ConvF(6.95, 6.95, 6.95); Calibrated: 2014-09-10;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1319; Calibrated: 2014-09-09
- Phantom: SAR2 - SAM2; Type: QD 000P40 CD; Serial: TP - 1771
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**WLAN2450 b-mode - Left/Cheek - Channel 1 - BPSK 1 Mbps/Area Scan (101x151x1): Interpolated grid:**

$dx=1.000 \text{ mm}$ ,  $dy=1.000 \text{ mm}$

Reference Value =  $9.531 \text{ V/m}$

Fast SAR: SAR(1 g) =  $0.556 \text{ W/kg}$

Fast SAR(10 g) =  $0.260 \text{ W/kg}$

Maximum value of SAR (interpolated) =  $0.666 \text{ W/kg}$

**WLAN2450 b-mode - Left/Cheek - Channel 1 - BPSK 1 Mbps/Zoom Scan (8x7x7)/Cube 0: Measurement grid:**

$dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value =  $9.531 \text{ V/m}$

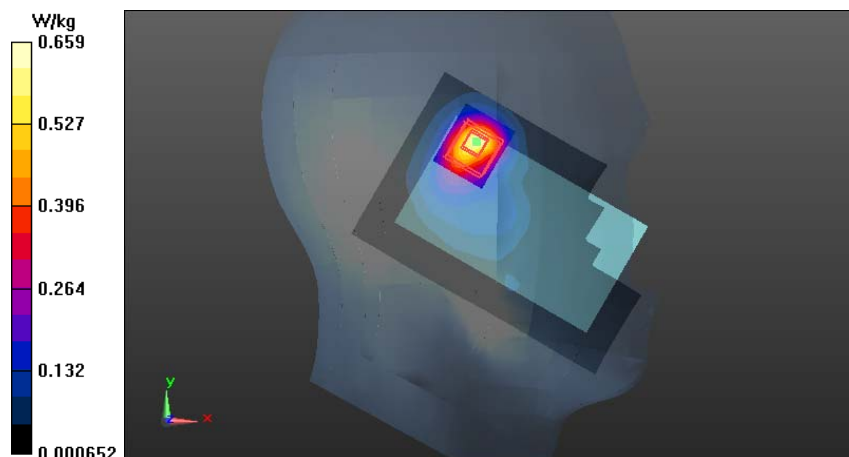
Peak SAR (extrapolated) =  $1.35 \text{ W/kg}$

**SAR(1 g) =  $0.575 \text{ W/kg}$**

**SAR(10 g) =  $0.271 \text{ W/kg}$**

**Power Drift =  $0.03 \text{ dB}$**

Maximum value of SAR (measured) =  $0.659 \text{ W/kg}$



**Plot4:**

Date/Time: 2014-11-18 11:31:53 AM

Test Laboratory: TCC Microsoft

Type: RM-1071; Serial: 004402/74/060060/0

**Communication System: 4-slot GPRS850**

Frequency: 848.8 MHz; Duty Cycle: 1:2.09991

Medium: Body 835 SAR3; Medium Notes: Medium Temperature:  $t=21.5$

Medium parameters used:  $f = 849$  MHz;  $\sigma = 0.959$  S/m;  $\epsilon_r = 53.612$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Center Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3838
- ConvF(8.97, 8.97, 8.97); Calibrated: 2014-03-21;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn710; Calibrated: 2014-03-24
- Phantom: SAR3 - TFP; Type: QD 000 P51 CA; Serial: TP - 1125/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**4-slot GPRS850/Body - High - Spacer 15mm - No Headset - Back Facing Phantom/Area Scan (71x101x1):**

Interpolated grid:  $dx=1.500$  mm,  $dy=1.500$  mm

Reference Value = 20.53 V/m

Fast SAR: SAR(1 g) = 0.449 W/kg

Fast SAR(10 g) = 0.316 W/kg

Maximum value of SAR (interpolated) = 0.477 W/kg

**4-slot GPRS850/Body - High - Spacer 15mm - No Headset - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0:**

Measurement grid:  $dx=7.5$ mm,  $dy=7.5$ mm,  $dz=5$ mm

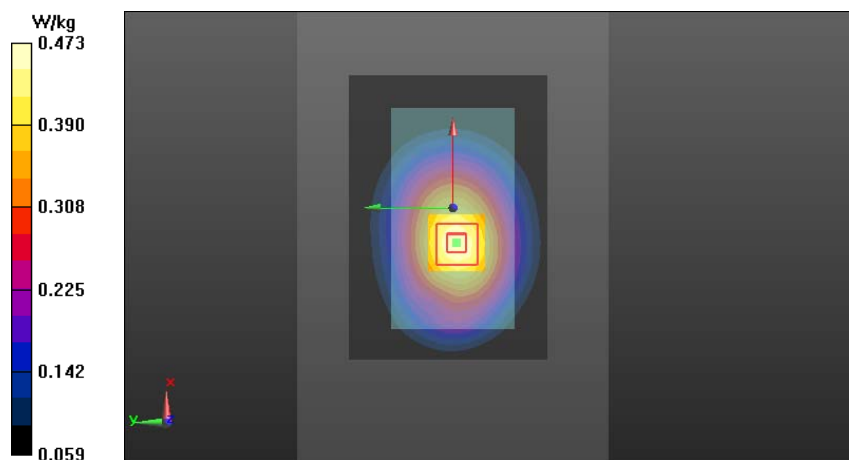
Reference Value = 20.53 V/m

Peak SAR (extrapolated) = 0.579 W/kg

**SAR(1 g) = 0.449 W/kg**

Maximum value of SAR (measured) = 0.473 W/kg

**Power Drift = 0.04 dB**



**Plot5:**

Date/Time: 2014-11-17 1:06:50 PM

Test Laboratory: TCC Microsoft

Type: RM-1071; Serial: 004402/74/060003/0

**Communication System: 2-slot GPRS1900**

Frequency: 1850.2 MHz; Duty Cycle: 1:4.19952

Medium: Body 1900 SAR4; Medium Notes: Medium Temperature:  $t=21.4^{\circ}\text{C}$

Medium parameters used (interpolated):  $f = 1850.2 \text{ MHz}$ ;  $\sigma = 1.459 \text{ S/m}$ ;  $\epsilon_r = 52.043$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3836

- ConvF(7.18, 7.18, 7.18); Calibrated: 2014-03-21;

- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn887; Calibrated: 2014-03-31

- Phantom: SAR4 - TFP; Type: QD000 P51 CA; Serial: S/N 1125/1

- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**2-slot GPRS1900/Body - Low - Spacer 15mm - No Headset - Back Facing Phantom/Area Scan (71x101x1):**

Interpolated grid:  $dx=1.500 \text{ mm}$ ,  $dy=1.500 \text{ mm}$

Reference Value =  $4.890 \text{ V/m}$

Fast SAR: SAR(1 g) =  $0.264 \text{ W/kg}$

Fast SAR(10 g) =  $0.164 \text{ W/kg}$

Maximum value of SAR (interpolated) =  $0.283 \text{ W/kg}$

**2-slot GPRS1900/Body - Low - Spacer 15mm - No Headset - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0:**

Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

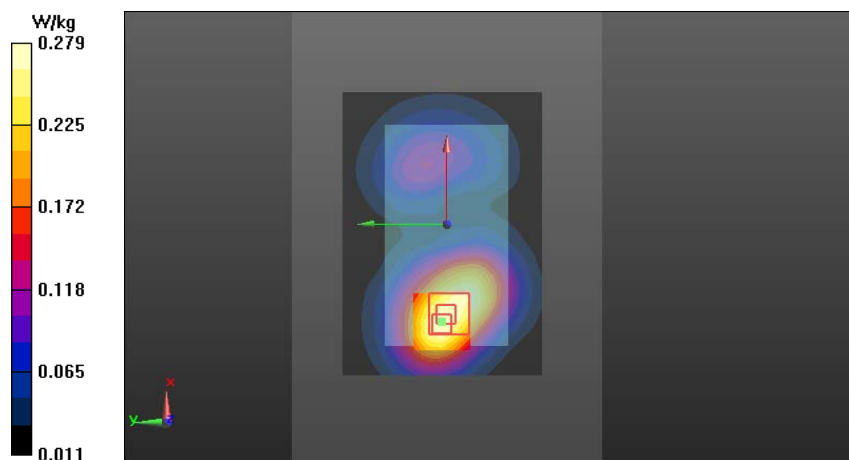
Reference Value =  $4.890 \text{ V/m}$

Peak SAR (extrapolated) =  $0.393 \text{ W/kg}$

**SAR(1 g) =  $0.260 \text{ W/kg}$**

Maximum value of SAR (measured) =  $0.279 \text{ W/kg}$

**Power Drift =  $0.17 \text{ dB}$**



**Plot6:**

Date/Time: 2014-11-19 10:37:52 AM

Test Laboratory: TCC Microsoft

Type: RM-1071; Serial: 004402/74/060151/7

**Communication System: WLAN2450**

Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: Body 2450 SAR2; Medium Notes: Medium Temperature:  $t=21.5^{\circ}\text{C}$

Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 2.018 \text{ S/m}$ ;  $\epsilon_r = 51.581$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3823
- ConvF(6.95, 6.95, 6.95); Calibrated: 2014-09-10;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1319; Calibrated: 2014-09-09
- Phantom: SAR2 - TFP; Type: QD 000 P51 CA; Serial: TP - 1130/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**WLAN2450 b-mode/Body - Channel 6 - BPSK 1 Mbps - Spacer 15mm - No Headset - Back Facing Phantom/Area Scan (101x151x1):** Interpolated grid:  $dx=1.000 \text{ mm}$ ,  $dy=1.000 \text{ mm}$

Reference Value = 4.521 V/m

Fast SAR: SAR(1 g) = 0.069 W/kg

Fast SAR(10 g) = 0.037 W/kg

Maximum value of SAR (interpolated) = 0.0753 W/kg

**WLAN2450 b-mode/Body - Channel 6 - BPSK 1 Mbps - Spacer 15mm - No Headset - Back Facing Phantom/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

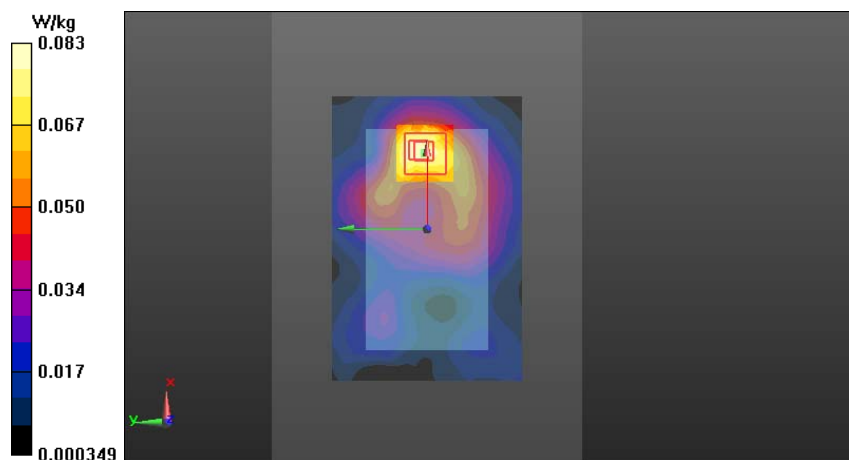
Reference Value = 4.521 V/m

Peak SAR (extrapolated) = 0.133 W/kg

**SAR(1 g) = 0.077 W/kg**

Maximum value of SAR (measured) = 0.0835 W/kg

**Power Drift = 0.13 dB**





**Plot7:**

Date/Time: 2014-11-18 12:23:16 PM

Test Laboratory: TCC Microsoft

Type: RM-1071; Serial: 004402/74/060060/0

**Communication System: 4-slot GPRS850**

Frequency: 848.8 MHz; Duty Cycle: 1:2.09991

Medium: Body 835 SAR3; Medium Notes: Medium Temperature: t=21.5

Medium parameters used: f = 849 MHz;  $\sigma = 0.959$  S/m;  $\epsilon_r = 53.612$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Center Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3838

- ConvF(8.97, 8.97, 8.97); Calibrated: 2014-03-21;

- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn710; Calibrated: 2014-03-24

- Phantom: SAR3 - TFP; Type: QD 000 P51 CA; Serial: TP - 1125/2

- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**4-slot GPRS850/Body - High - Spacer 10mm - No Headset - Back Facing Phantom/Area Scan (71x101x1):**

Interpolated grid: dx=1.500 mm, dy=1.500 mm

Reference Value = 24.36 V/m

Fast SAR: SAR(1 g) = 0.654 W/kg

Fast SAR(10 g) = 0.458 W/kg

Maximum value of SAR (interpolated) = 0.695 W/kg

**4-slot GPRS850/Body - High - Spacer 10mm - No Headset - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0:**

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

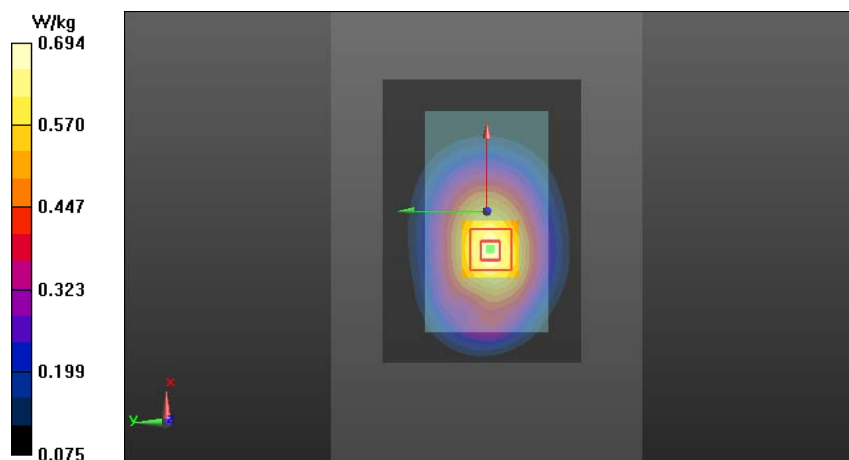
Reference Value = 24.36 V/m

Peak SAR (extrapolated) = 0.842 W/kg

**SAR(1 g) = 0.654 W/kg**

Maximum value of SAR (measured) = 0.694 W/kg

**Power Drift = -0.03 dB**



**Plot8:**

Date/Time: 2014-11-17 2:43:57 PM

Test Laboratory: TCC Microsoft

Type: RM-1071; Serial: 004402/74/060003/0

**Communication System: 2-slot GPRS1900**

Frequency: 1850.2 MHz; Duty Cycle: 1:4.19952

Medium: Body 1900 SAR4; Medium Notes: Medium Temperature:  $t=21.4^{\circ}\text{C}$

Medium parameters used (interpolated):  $f = 1850.2\text{ MHz}$ ;  $\sigma = 1.459\text{ S/m}$ ;  $\epsilon_r = 52.043$ ;  $\rho = 1000\text{ kg/m}^3$

Phantom section: Center Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3836

- ConvF(7.18, 7.18, 7.18); Calibrated: 2014-03-21;

- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn887; Calibrated: 2014-03-31

- Phantom: SAR4 - TFP; Type: QD000 P51 CA; Serial: S/N 1125/1

- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**2-slot GPRS1900/Body - Low - Spacer 10mm - No Headset - Back Facing Phantom/Area Scan (71x101x1):**

Interpolated grid:  $dx=1.500\text{ mm}$ ,  $dy=1.500\text{ mm}$

Reference Value =  $6.392\text{ V/m}$

Fast SAR:  $\text{SAR}(1\text{ g}) = 0.456\text{ W/kg}$

Fast SAR( $10\text{ g}$ ) =  $0.279\text{ W/kg}$

Maximum value of SAR (interpolated) =  $0.510\text{ W/kg}$

**2-slot GPRS1900/Body - Low - Spacer 10mm - No Headset - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0:**

Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

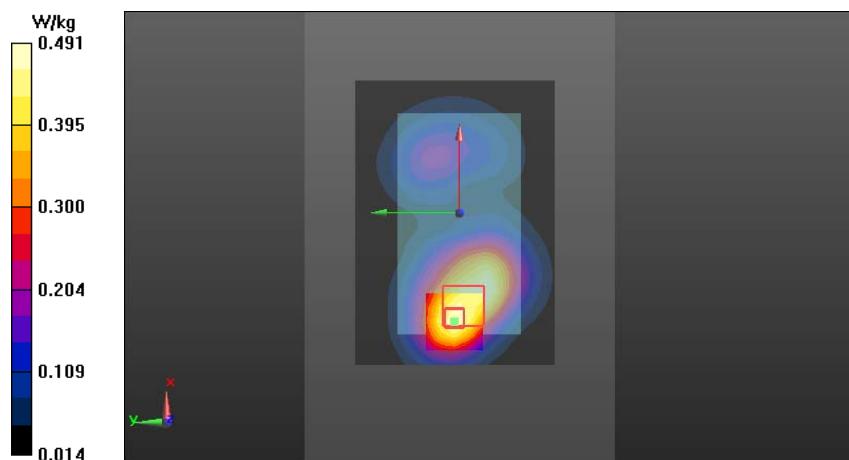
Reference Value =  $6.392\text{ V/m}$

Peak SAR (extrapolated) =  $0.709\text{ W/kg}$

**$\text{SAR}(1\text{ g}) = 0.453\text{ W/kg}$**

Maximum value of SAR (measured) =  $0.491\text{ W/kg}$

**Power Drift = 0.09 dB**



**Plot9:**

Date/Time: 2014-11-19 1:30:14 PM

Test Laboratory: TCC Microsoft

Type: RM-1071; Serial: 004402/74/060151/7

**Communication System: WLAN2450**

Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: Body 2450 SAR2; Medium Notes: Medium Temperature:  $t=21.5^{\circ}\text{C}$

Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.984 \text{ S/m}$ ;  $\epsilon_r = 51.673$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

**DASY Configuration:**

- Probe: EX3DV4 - SN3823

- ConvF(6.95, 6.95, 6.95); Calibrated: 2014-09-10;

- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn1319; Calibrated: 2014-09-09

- Phantom: SAR2 - TFP; Type: QD 000 P51 CA; Serial: TP - 1130/2

- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**WLAN 2450 b-mode/Body - Channel 1 - BPSK 1 Mbps - Spacer 10mm - No Headset - Right Facing**

**Phantom/Area Scan (61x151x1):** Interpolated grid:  $dx=1.000 \text{ mm}$ ,  $dy=1.000 \text{ mm}$

Reference Value = 4.260 V/m

Fast SAR: SAR(1 g) = 0.146 W/kg

Fast SAR(10 g) = 0.071 W/kg

Maximum value of SAR (interpolated) = 0.169 W/kg

**WLAN 2450 b-mode/Body - Channel 1 - BPSK 1 Mbps - Spacer 10mm - No Headset - Right Facing**

**Phantom/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

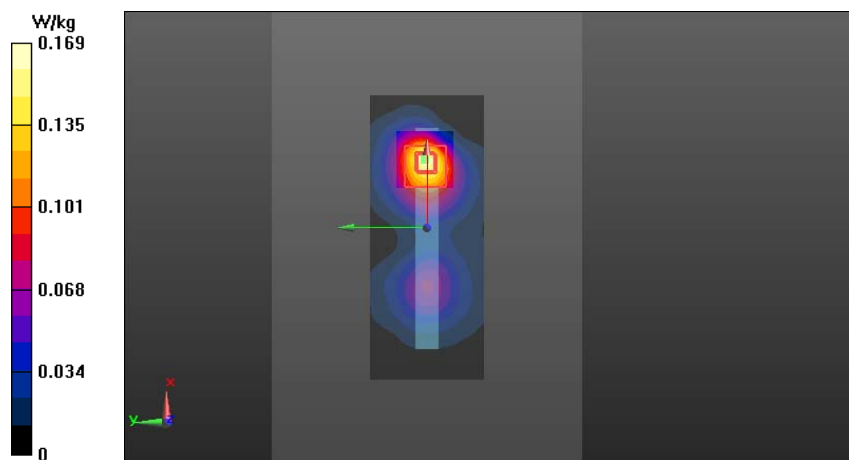
Reference Value = 4.260 V/m

Peak SAR (extrapolated) = 0.285 W/kg

**SAR(1 g) = 0.150 W/kg**

Maximum value of SAR (measured) = 0.169 W/kg

**Power Drift = 0.07 dB**



## APPENDIX C: DIELECTRIC PARAMETERS OF THE TISSUE SIMULANTS

### Head tissue simulant dielectric parameters used in the measurements:

| f<br>(MHz)             | Date       | Dielectric Parameters |                |              |                |              |                |
|------------------------|------------|-----------------------|----------------|--------------|----------------|--------------|----------------|
|                        |            | 824.2MHz              |                | 837.0MHz     |                | 849.0MHz     |                |
|                        |            | $\epsilon_r$          | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] |
| GSM/GPRS/<br>EGPRS850  | 2014-11-17 | 40.5                  | 0.88           | 40.4         | 0.89           | 40.3         | 0.90           |
| f<br>(MHz)             | Date       | Dielectric Parameters |                |              |                |              |                |
|                        |            | 1850.0MHz             |                | 1880.0MHz    |                | 1910.0MHz    |                |
|                        |            | $\epsilon_r$          | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] |
| GSM/GPRS/<br>EGPRS1900 | 2014-11-18 | 39.0                  | 1.37           | 38.8         | 1.40           | 38.7         | 1.43           |
| f<br>(MHz)             | Date       | Dielectric Parameters |                |              |                |              |                |
|                        |            | 2412.0MHz             |                | 2442.0MHz    |                | 2462.0MHz    |                |
|                        |            | $\epsilon_r$          | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] |
| WLAN2450               | 2014-11-18 | 39.2                  | 1.81           | 39.1         | 1.85           | 39.0         | 1.88           |
|                        | 2014-11-25 | 38.3                  | 1.70           | 38.1         | 1.33           | 38.0         | 1.75           |

### Body tissue simulant dielectric parameters used in the measurements:

| f<br>(MHz)             | Date       | Dielectric Parameters |                |              |                |              |                |
|------------------------|------------|-----------------------|----------------|--------------|----------------|--------------|----------------|
|                        |            | 824.2MHz              |                | 837.0MHz     |                | 849.0MHz     |                |
|                        |            | $\epsilon_r$          | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] |
| GSM/GPRS/<br>EGPRS850  | 2014-11-18 | 53.9                  | 0.93           | 53.7         | 0.95           | 53.6         | 0.96           |
| f<br>(MHz)             | Date       | Dielectric Parameters |                |              |                |              |                |
|                        |            | 1850.0MHz             |                | 1880.0MHz    |                | 1910.0MHz    |                |
|                        |            | $\epsilon_r$          | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] |
| GSM/GPRS/<br>EGPRS1900 | 2014-11-17 | 52.0                  | 1.46           | 51.9         | 1.49           | 51.8         | 1.52           |
| f<br>(MHz)             | Date       | Dielectric Parameters |                |              |                |              |                |
|                        |            | 2412.0MHz             |                | 2442.0MHz    |                | 2462.0MHz    |                |
|                        |            | $\epsilon_r$          | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] | $\epsilon_r$ | $\sigma$ [S/m] |
| WLAN2450               | 2014-11-19 | 51.7                  | 1.98           | 51.6         | 2.03           | 51.5         | 2.05           |
|                        | 2014-11-25 | 50.8                  | 1.83           | 50.7         | 1.86           | 50.6         | 1.89           |

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**APPENDIX D: RELEVANT PAGES FROM PROBE CALIBRATION REPORT(S)**



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

Client **Nokia Beijing TCC**

Certificate No: **EX3-3838\_Mar14**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3838**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6**  
Calibration procedure for dosimetric E-field probes

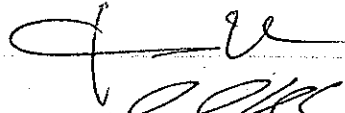
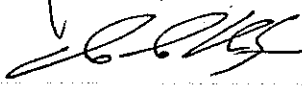
Calibration date: **March 21, 2014**

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  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 04-Apr-13 (No. 217-01733)         | Apr-14                 |
| Power sensor E4412A        | MY41498087      | 04-Apr-13 (No. 217-01733)         | Apr-14                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 04-Apr-13 (No. 217-01737)         | Apr-14                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 04-Apr-13 (No. 217-01735)         | Apr-14                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 04-Apr-13 (No. 217-01738)         | Apr-14                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-13 (No. ES3-3013_Dec13)    | Dec-14                 |
| DAE4                       | SN: 660         | 13-Dec-13 (No. DAE4-660_Dec13)    | Dec-14                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

|                |                               |                                   |                                                                                                    |
|----------------|-------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------|
| Calibrated by: | Name<br><b>Jeton Kastrati</b> | Function<br>Laboratory Technician | Signature<br> |
| Approved by:   | <b>Katja Pokovic</b>          | Technical Manager                 |               |

Issued: March 22, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3838

### Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|-----------------------------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.37     | 0.60     | 0.53     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                                     | 107.0    | 100.2    | 100.2    |           |

### Modulation Calibration Parameters

| UID | Communication System Name |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C   | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----|---------------------------|---|---------|------------------------------|-----|---------|----------|---------------------------|
| 0   | CW                        | X | 0.0     | 0.0                          | 1.0 | 0.00    | 163.7    | ±3.0 %                    |
|     |                           | Y | 0.0     | 0.0                          | 1.0 |         | 161.7    |                           |
|     |                           | Z | 0.0     | 0.0                          | 1.0 |         | 171.8    |                           |

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 Pages 5 and 6).

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

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3838

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>c</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 835                  | 41.5                               | 0.90                            | 9.20    | 9.20    | 9.20    | 0.29               | 1.12                    | ± 12.0 %    |
| 1750                 | 40.1                               | 1.37                            | 7.71    | 7.71    | 7.71    | 0.47               | 0.77                    | ± 12.0 %    |
| 1900                 | 40.0                               | 1.40                            | 7.57    | 7.57    | 7.57    | 0.32               | 0.90                    | ± 12.0 %    |
| 5200                 | 36.0                               | 4.66                            | 4.89    | 4.89    | 4.89    | 0.40               | 1.80                    | ± 13.1 %    |
| 5300                 | 35.9                               | 4.76                            | 4.64    | 4.64    | 4.64    | 0.40               | 1.80                    | ± 13.1 %    |
| 5500                 | 35.6                               | 4.96                            | 4.69    | 4.69    | 4.69    | 0.40               | 1.80                    | ± 13.1 %    |
| 5600                 | 35.5                               | 5.07                            | 4.43    | 4.43    | 4.43    | 0.40               | 1.80                    | ± 13.1 %    |
| 5800                 | 35.3                               | 5.27                            | 4.39    | 4.39    | 4.39    | 0.40               | 1.80                    | ± 13.1 %    |

<sup>c</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.



## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3838

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 835                  | 55.2                               | 0.97                            | 8.97    | 8.97    | 8.97    | 0.38               | 0.93                    | ± 12.0 %    |
| 1750                 | 53.4                               | 1.49                            | 7.37    | 7.37    | 7.37    | 0.68               | 0.68                    | ± 12.0 %    |
| 1900                 | 53.3                               | 1.52                            | 7.14    | 7.14    | 7.14    | 0.42               | 0.89                    | ± 12.0 %    |
| 5200                 | 49.0                               | 5.30                            | 4.49    | 4.49    | 4.49    | 0.50               | 1.90                    | ± 13.1 %    |
| 5300                 | 48.9                               | 5.42                            | 4.28    | 4.28    | 4.28    | 0.50               | 1.90                    | ± 13.1 %    |
| 5500                 | 48.6                               | 5.65                            | 4.11    | 4.11    | 4.11    | 0.50               | 1.90                    | ± 13.1 %    |
| 5600                 | 48.5                               | 5.77                            | 3.90    | 3.90    | 3.90    | 0.50               | 1.90                    | ± 13.1 %    |
| 5800                 | 48.2                               | 6.00                            | 4.13    | 4.13    | 4.13    | 0.50               | 1.90                    | ± 13.1 %    |

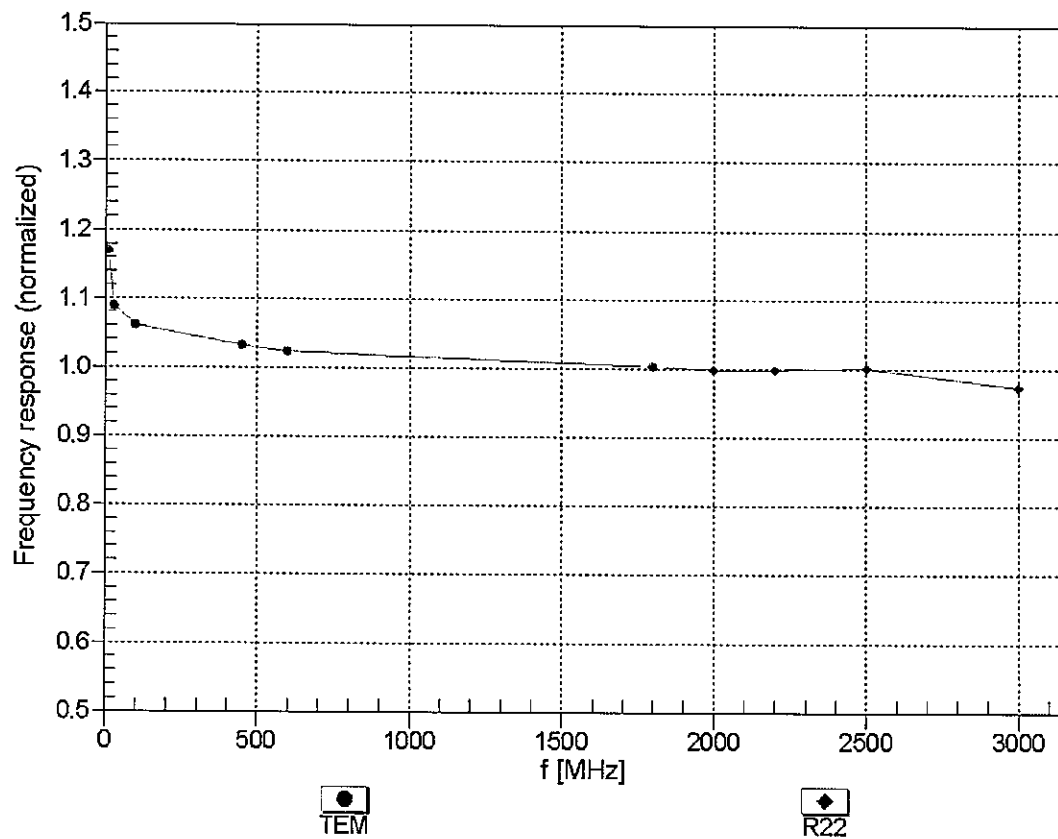
<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

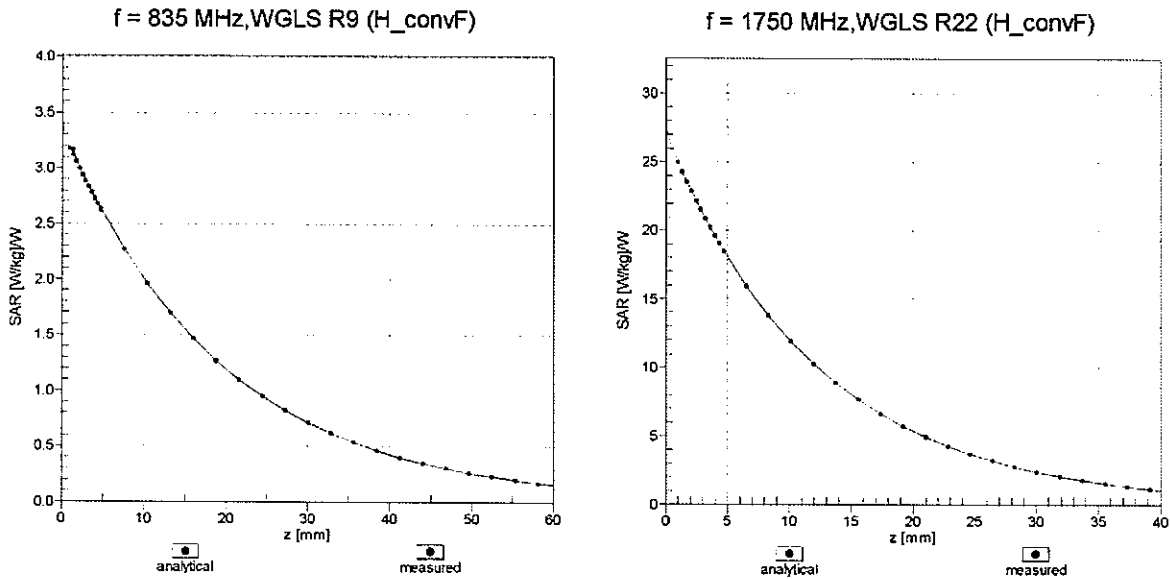
## Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

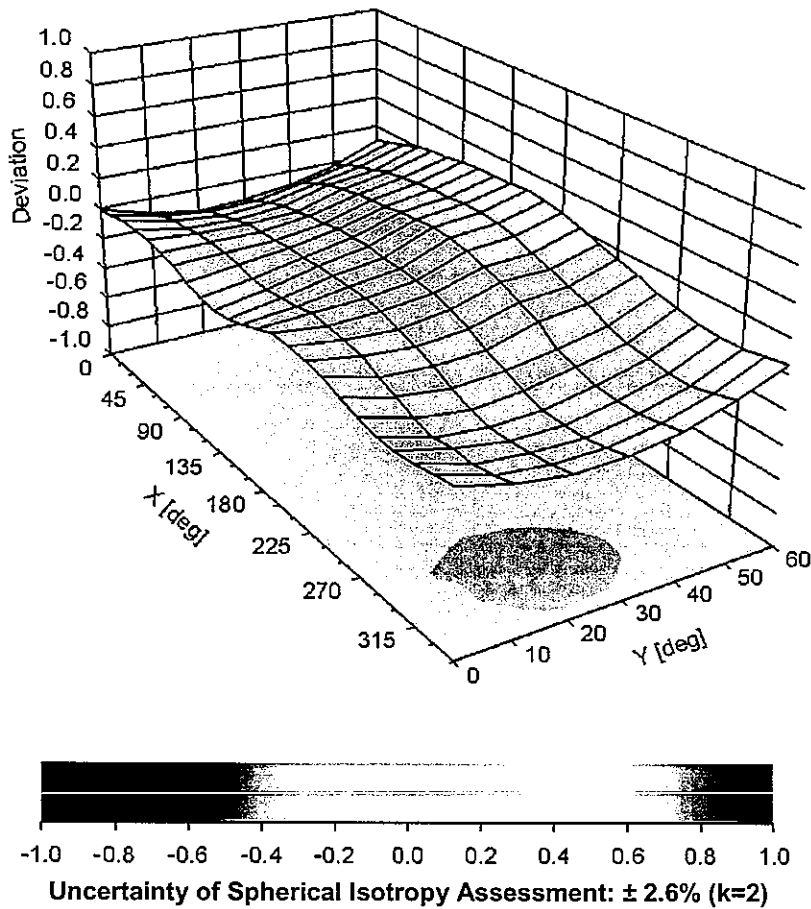


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

# Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi, \vartheta$ ), f = 900 MHz



## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3838

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -9.9       |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 2 mm       |



Accredited by the Swiss Accreditation Service (SAS)

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Nokia Beijing TCC**

Certificate No: **EX3-3836\_Mar14**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3836**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6  
Calibration procedure for dosimetric E-field probes**

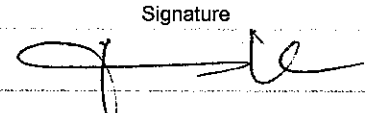
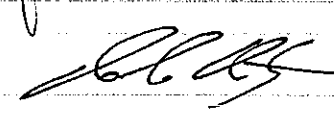
Calibration date: **March 21, 2014**

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  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 04-Apr-13 (No. 217-01733)         | Apr-14                 |
| Power sensor E4412A        | MY41498087      | 04-Apr-13 (No. 217-01733)         | Apr-14                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 04-Apr-13 (No. 217-01737)         | Apr-14                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 04-Apr-13 (No. 217-01735)         | Apr-14                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 04-Apr-13 (No. 217-01738)         | Apr-14                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-13 (No. ES3-3013_Dec13)    | Dec-14                 |
| DAE4                       | SN: 660         | 13-Dec-13 (No. DAE4-660_Dec13)    | Dec-14                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

|                |                               |                                   |                                                                                                    |
|----------------|-------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------|
| Calibrated by: | Name<br><b>Jeton Kastrati</b> | Function<br>Laboratory Technician | Signature<br> |
| Approved by:   | <b>Katja Pokovic</b>          | Technical Manager                 |               |

Issued: March 22, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3836

### Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|-----------------------------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.40     | 0.47     | 0.45     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                                     | 91.1     | 100.4    | 98.0     |           |

### Modulation Calibration Parameters

| UID | Communication System Name |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C   | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----|---------------------------|---|---------|------------------------------|-----|---------|----------|---------------------------|
| 0   | CW                        | X | 0.0     | 0.0                          | 1.0 | 0.00    | 144.9    | ±3.0 %                    |
|     |                           | Y | 0.0     | 0.0                          | 1.0 |         | 131.8    |                           |
|     |                           | Z | 0.0     | 0.0                          | 1.0 |         | 145.7    |                           |

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 Pages 5 and 6).

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

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3836

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 41.9                               | 0.89                            | 9.40    | 9.40    | 9.40    | 0.29               | 1.04                    | ± 12.0 %    |
| 835                  | 41.5                               | 0.90                            | 9.14    | 9.14    | 9.14    | 0.34               | 0.89                    | ± 12.0 %    |
| 1750                 | 40.1                               | 1.37                            | 8.17    | 8.17    | 8.17    | 0.47               | 0.82                    | ± 12.0 %    |
| 1900                 | 40.0                               | 1.40                            | 7.90    | 7.90    | 7.90    | 0.42               | 0.86                    | ± 12.0 %    |

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3836

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 55.5                               | 0.96                            | 8.86    | 8.86    | 8.86    | 0.30               | 1.07                    | ± 12.0 %    |
| 835                  | 55.2                               | 0.97                            | 8.72    | 8.72    | 8.72    | 0.31               | 1.05                    | ± 12.0 %    |
| 1750                 | 53.4                               | 1.49                            | 7.62    | 7.62    | 7.62    | 0.31               | 1.04                    | ± 12.0 %    |
| 1900                 | 53.3                               | 1.52                            | 7.18    | 7.18    | 7.18    | 0.33               | 0.98                    | ± 12.0 %    |

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

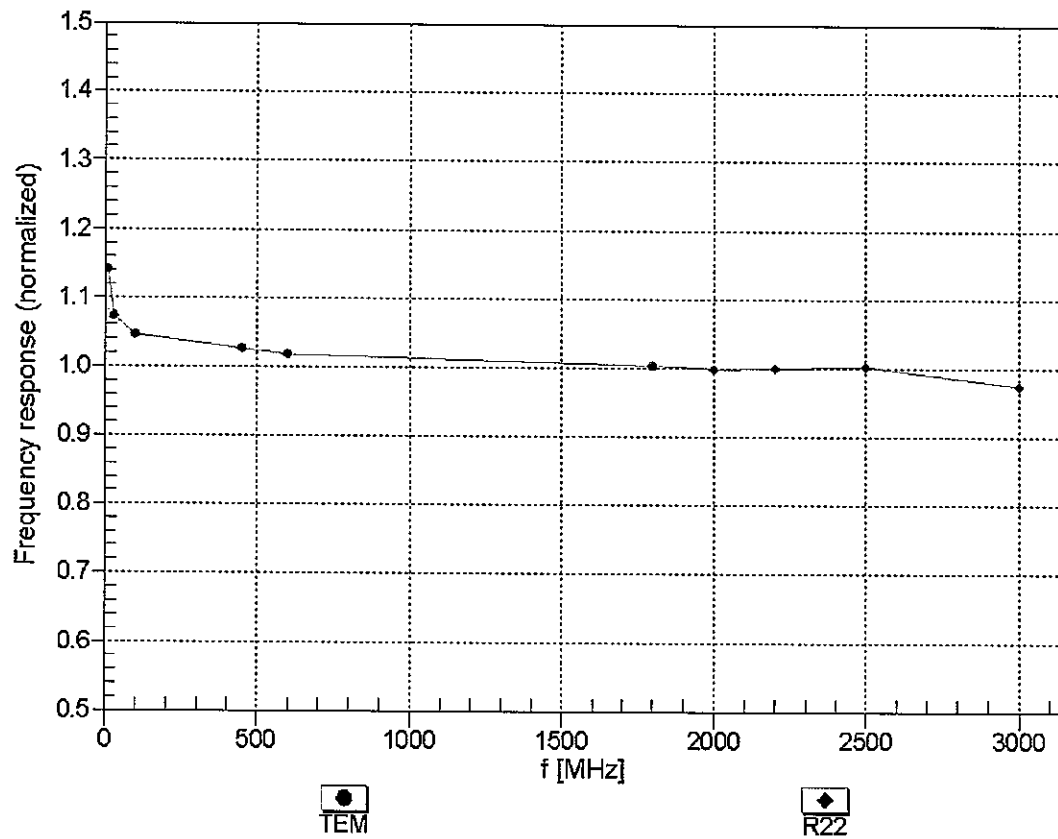
<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.



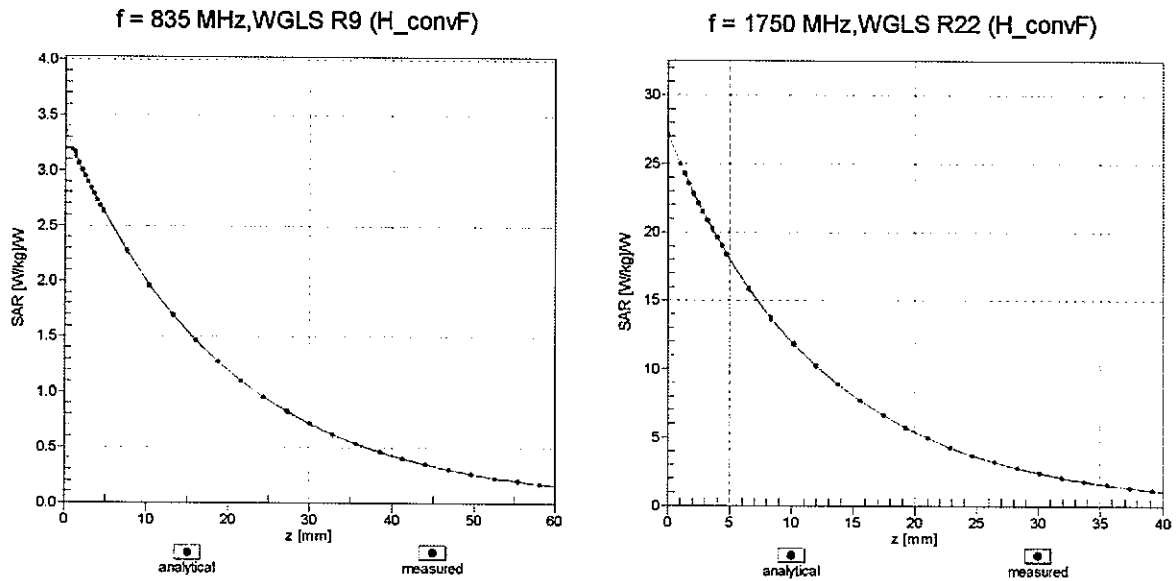
## Frequency Response of E-Field

(TEM-Cell:ifi1110 EXX, Waveguide: R22)



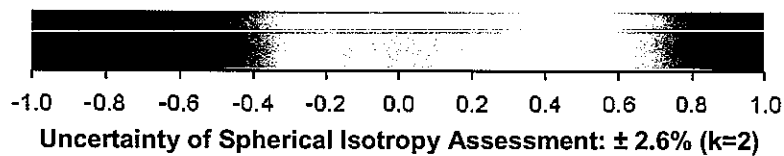
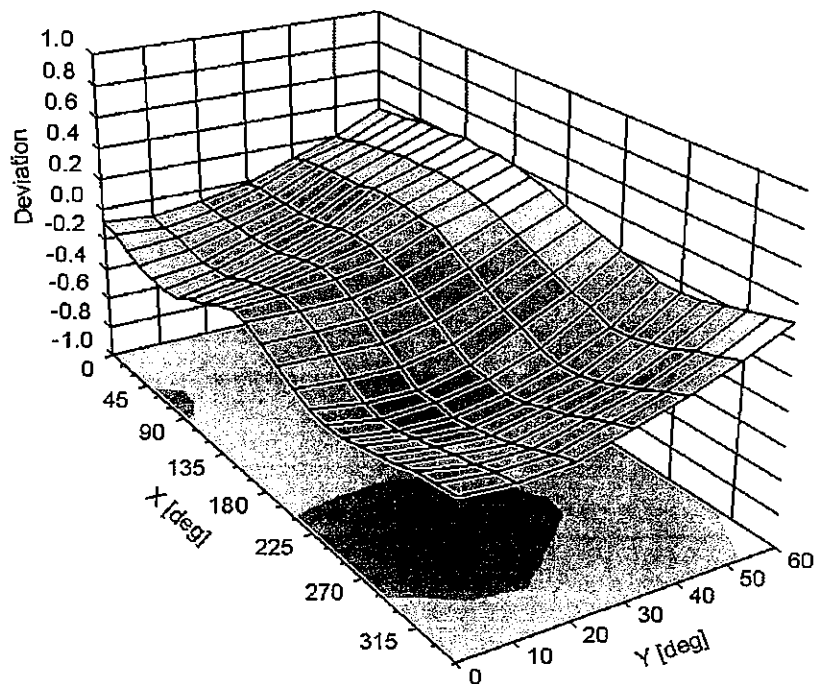
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ),  $f = 900 \text{ MHz}$



## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3836

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -135.3     |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 2 mm       |



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: **Nokia Beijing TCC**

Certificate No: **ES3-3280\_Mar14**

## CALIBRATION CERTIFICATE

Object: **ES3DV3 - SN:3280**

Calibration procedure(s): **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
Calibration procedure for dosimetric E-field probes

Calibration date: **March 20, 2014**

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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 04-Apr-13 (No. 217-01733)         | Apr-14                 |
| Power sensor E4412A        | MY41498087      | 04-Apr-13 (No. 217-01733)         | Apr-14                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 04-Apr-13 (No. 217-01737)         | Apr-14                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 04-Apr-13 (No. 217-01735)         | Apr-14                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 04-Apr-13 (No. 217-01738)         | Apr-14                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-13 (No. ES3-3013_Dec13)    | Dec-14                 |
| DAE4                       | SN: 660         | 13-Dec-13 (No. DAE4-660_Dec13)    | Dec-14                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

|                |                        |                                   |               |
|----------------|------------------------|-----------------------------------|---------------|
| Calibrated by: | Name<br>Israe El-Naouq | Function<br>Laboratory Technician | Signature<br> |
| Approved by:   | Katja Pokovic          | Technical Manager                 |               |

Issued: March 22, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3280

### Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|-----------------------------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 1.27     | 1.31     | 1.33     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                                     | 104.3    | 102.8    | 104.6    |           |

### Modulation Calibration Parameters

| UID | Communication System Name |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C   | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----|---------------------------|---|---------|------------------------------|-----|---------|----------|---------------------------|
| 0   | CW                        | X | 0.0     | 0.0                          | 1.0 | 0.00    | 219.4    | ±3.8 %                    |
|     |                           | Y | 0.0     | 0.0                          | 1.0 |         | 192.4    |                           |
|     |                           | Z | 0.0     | 0.0                          | 1.0 |         | 219.9    |                           |

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 Pages 5 and 6).

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

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3280

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 835                  | 41.5                               | 0.90                            | 6.07    | 6.07    | 6.07    | 0.44               | 1.56                    | ± 12.0 %    |
| 1750                 | 40.1                               | 1.37                            | 5.25    | 5.25    | 5.25    | 0.41               | 1.58                    | ± 12.0 %    |
| 1900                 | 40.0                               | 1.40                            | 5.06    | 5.06    | 5.06    | 0.80               | 1.16                    | ± 12.0 %    |
| 2450                 | 39.2                               | 1.80                            | 4.54    | 4.54    | 4.54    | 0.78               | 1.25                    | ± 12.0 %    |
| 2600                 | 39.0                               | 1.96                            | 4.35    | 4.35    | 4.35    | 0.80               | 1.26                    | ± 12.0 %    |

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3280

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 835                  | 55.2                               | 0.97                            | 6.03    | 6.03    | 6.03    | 0.80               | 1.16                    | ± 12.0 %    |
| 1750                 | 53.4                               | 1.49                            | 4.83    | 4.83    | 4.83    | 0.53               | 1.52                    | ± 12.0 %    |
| 1900                 | 53.3                               | 1.52                            | 4.62    | 4.62    | 4.62    | 0.62               | 1.47                    | ± 12.0 %    |
| 2450                 | 52.7                               | 1.95                            | 4.20    | 4.20    | 4.20    | 0.72               | 1.13                    | ± 12.0 %    |
| 2600                 | 52.5                               | 2.16                            | 3.99    | 3.99    | 3.99    | 0.80               | 1.04                    | ± 12.0 %    |

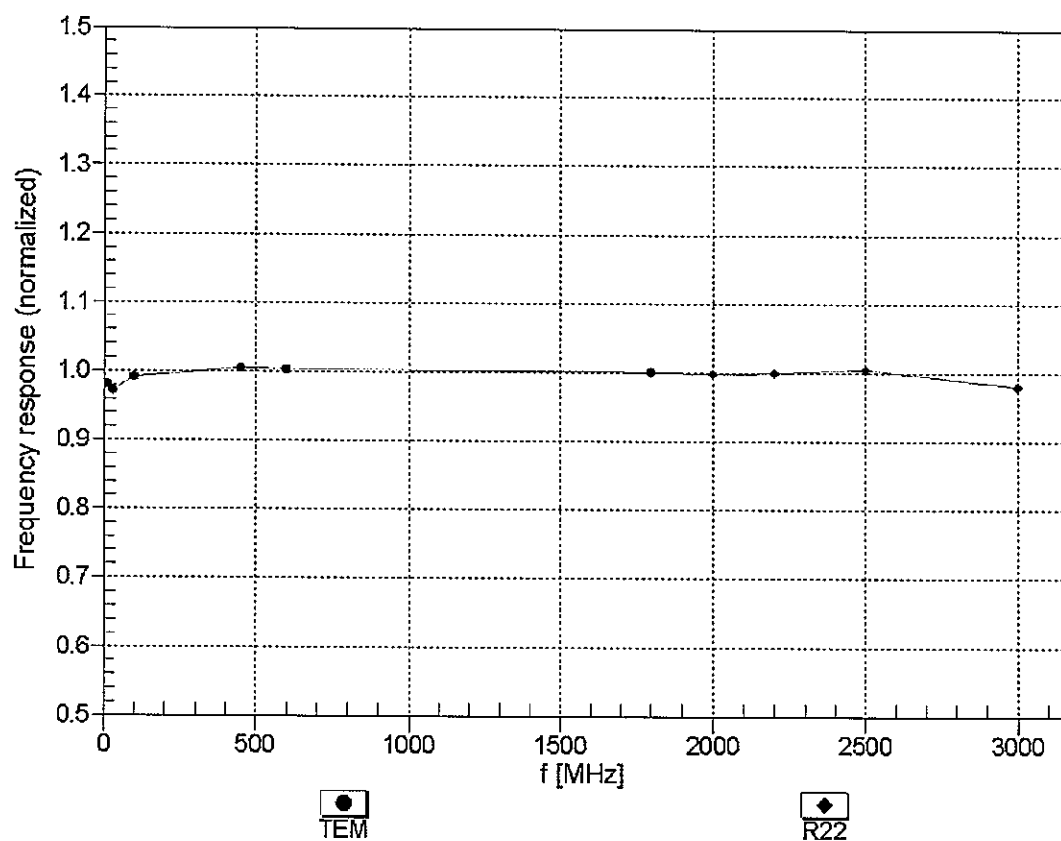
<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

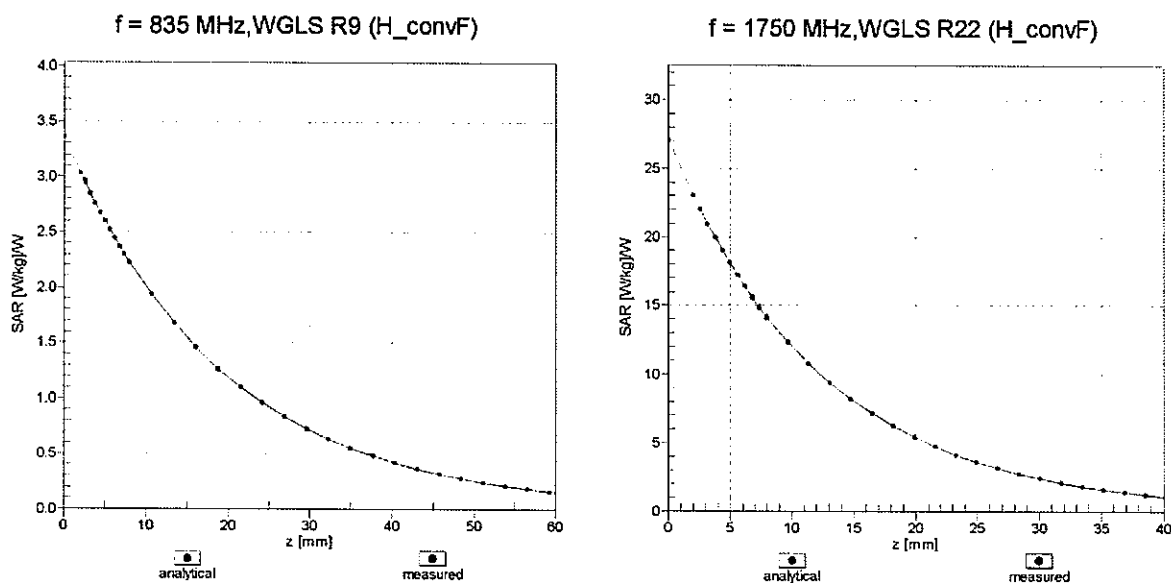
(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

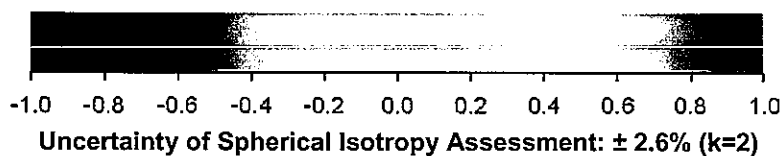
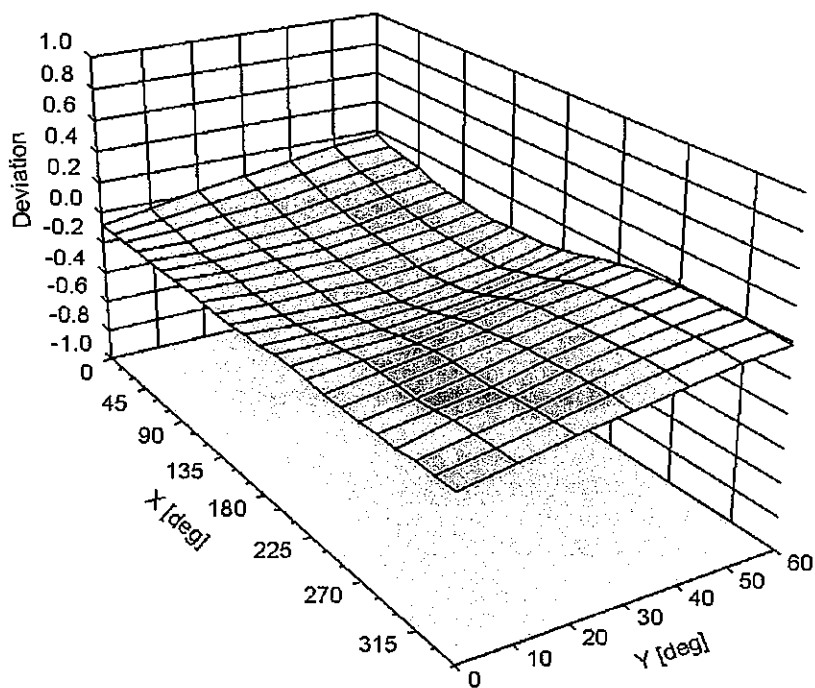


## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ),  $f = 900 \text{ MHz}$



## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3280

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -75.4      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 3 mm       |



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

Client **TCC Microsoft Beijing**

Certificate No: **EX3-3823\_Sep14**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3823**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6  
Calibration procedure for dosimetric E-field probes**

Calibration date: **September 10, 2014**

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  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 03-Apr-14 (No. 217-01911)         | Apr-15                 |
| Power sensor E4412A        | MY41498087      | 03-Apr-14 (No. 217-01911)         | Apr-15                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 03-Apr-14 (No. 217-01915)         | Apr-15                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 03-Apr-14 (No. 217-01919)         | Apr-15                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 03-Apr-14 (No. 217-01920)         | Apr-15                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-13 (No. ES3-3013_Dec13)    | Dec-14                 |
| DAE4                       | SN: 660         | 13-Dec-13 (No. DAE4-660_Dec13)    | Dec-14                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

|                                                                                                                 | Name          | Function              | Signature |
|-----------------------------------------------------------------------------------------------------------------|---------------|-----------------------|-----------|
| Calibrated by:                                                                                                  | Leif Klysner  | Laboratory Technician |           |
| Approved by:                                                                                                    | Katja Pokovic | Technical Manager     |           |
| Issued: September 11, 2014                                                                                      |               |                       |           |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |               |                       |           |

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3823

### Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|-----------------------------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.41     | 0.36     | 0.47     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                                     | 101.2    | 100.2    | 98.8     |           |

### Modulation Calibration Parameters

| UID | Communication System Name |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C   | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----|---------------------------|---|---------|------------------------------|-----|---------|----------|---------------------------|
| 0   | CW                        | X | 0.0     | 0.0                          | 1.0 | 0.00    | 160.0    | ±3.3 %                    |
|     |                           | Y | 0.0     | 0.0                          | 1.0 |         | 158.6    |                           |
|     |                           | Z | 0.0     | 0.0                          | 1.0 |         | 151.9    |                           |

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  $E^2$ -field uncertainty inside TSL (see Pages 5 and 6).

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

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3823

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 835                  | 41.5                               | 0.90                            | 9.08    | 9.08    | 9.08    | 0.28               | 1.06                    | ± 12.0 %    |
| 1750                 | 40.1                               | 1.37                            | 7.87    | 7.87    | 7.87    | 0.41               | 0.75                    | ± 12.0 %    |
| 1900                 | 40.0                               | 1.40                            | 7.63    | 7.63    | 7.63    | 0.31               | 0.88                    | ± 12.0 %    |
| 1950                 | 40.0                               | 1.40                            | 7.46    | 7.46    | 7.46    | 0.47               | 0.71                    | ± 12.0 %    |
| 2300                 | 39.5                               | 1.67                            | 7.32    | 7.32    | 7.32    | 0.38               | 0.77                    | ± 12.0 %    |
| 2450                 | 39.2                               | 1.80                            | 6.95    | 6.95    | 6.95    | 0.41               | 0.75                    | ± 12.0 %    |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3823

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 835                  | 55.2                               | 0.97                            | 9.05    | 9.05    | 9.05    | 0.24               | 1.18                    | ± 12.0 %    |
| 1750                 | 53.4                               | 1.49                            | 7.54    | 7.54    | 7.54    | 0.43               | 0.75                    | ± 12.0 %    |
| 1900                 | 53.3                               | 1.52                            | 7.28    | 7.28    | 7.28    | 0.69               | 0.64                    | ± 12.0 %    |
| 2450                 | 52.7                               | 1.95                            | 6.95    | 6.95    | 6.95    | 0.80               | 0.50                    | ± 12.0 %    |

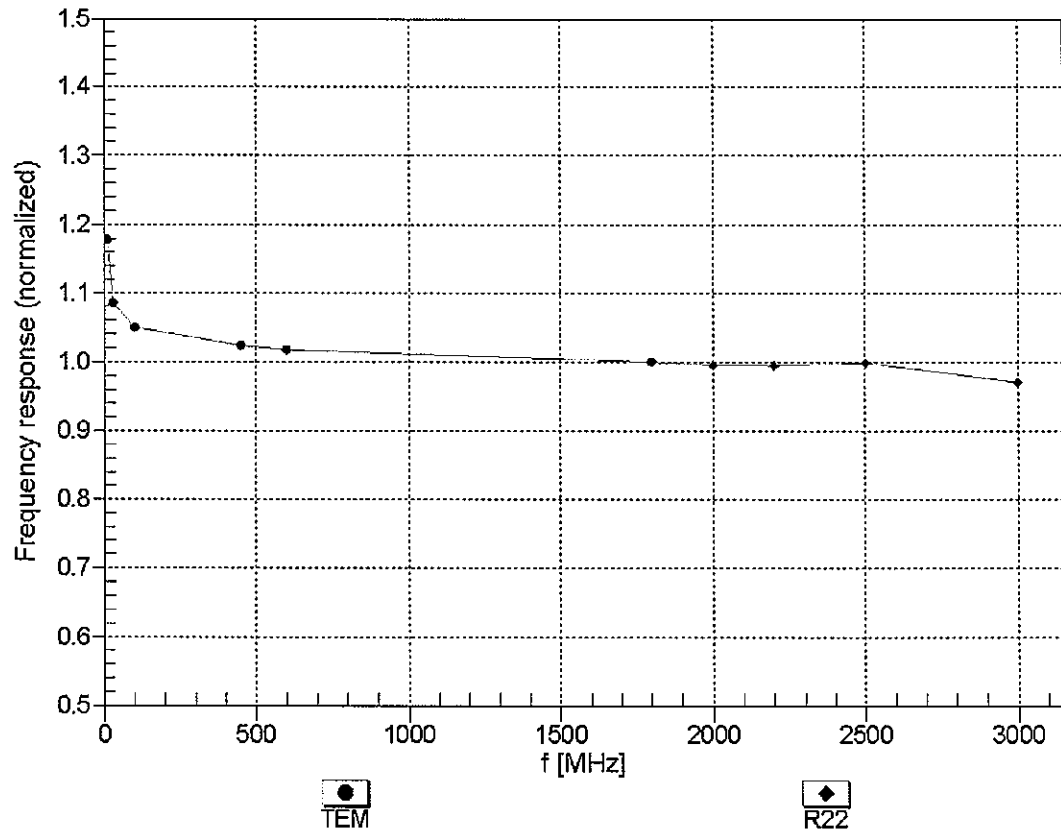
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

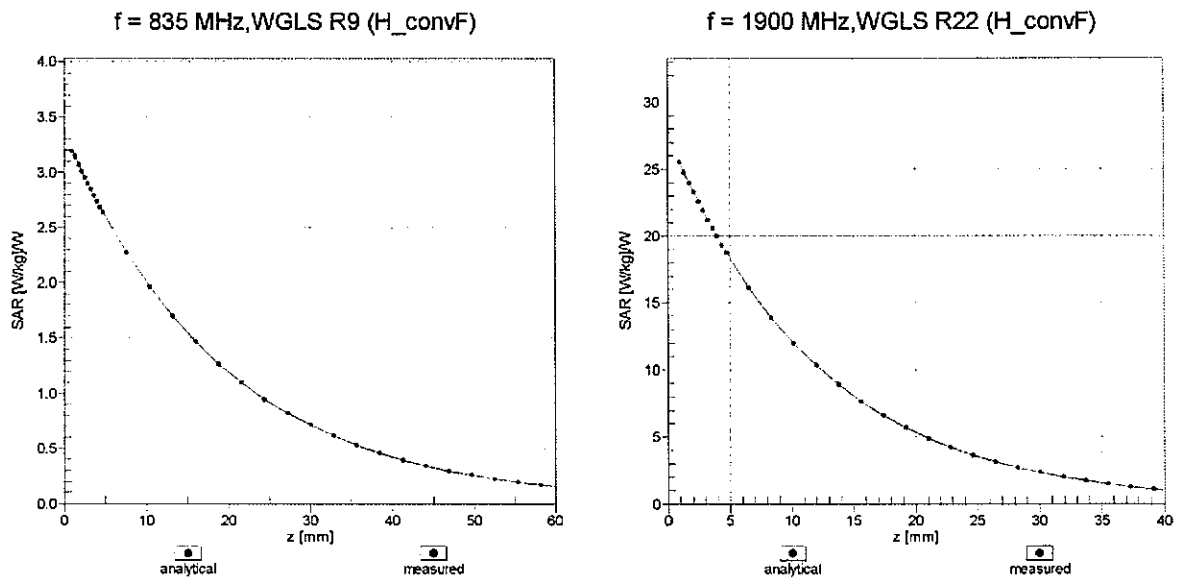
## Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



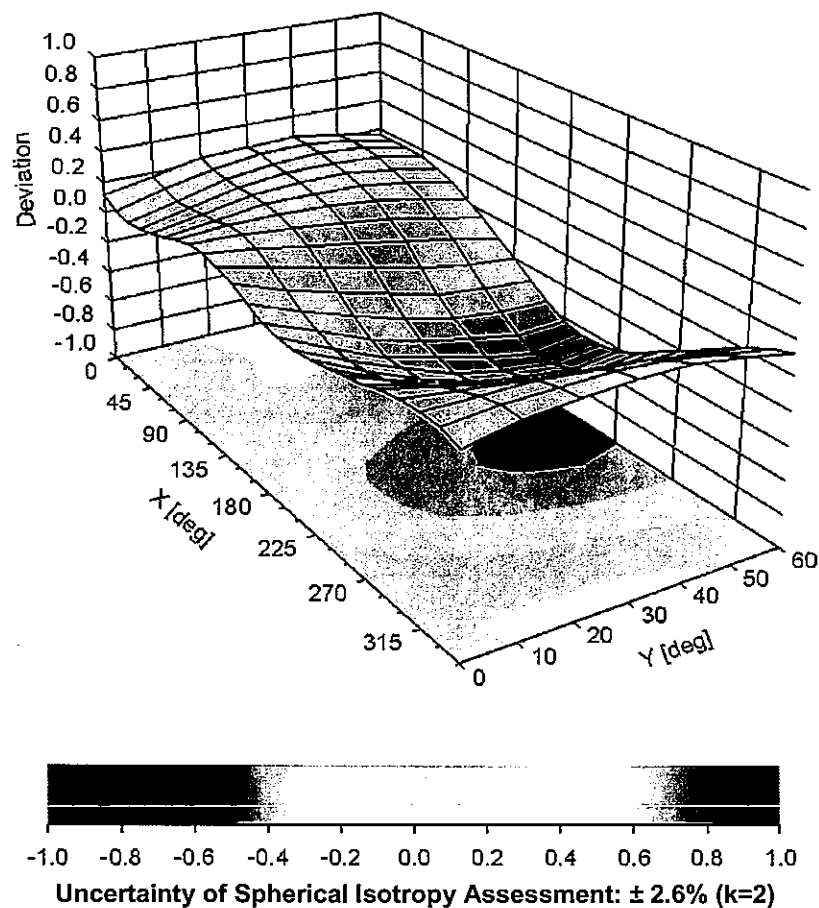
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi$ ,  $\theta$ ),  $f = 900 \text{ MHz}$





## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3823

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -11.7      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 1.4 mm     |

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**APPENDIX E: RELEVANT PAGES FROM DIPOLE VALIDATION KIT REPORT(S)**

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Nokia Beijing TCC**

Certificate No: **D835V2-4d005\_Mar14**

## CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d005**

Calibration procedure(s) **QA CAL-05.v9**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **March 18, 2014**

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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A        | GB37480704         | 09-Oct-13 (No. 217-01827)         | Oct-14                 |
| Power sensor HP 8481A       | US37292783         | 09-Oct-13 (No. 217-01827)         | Oct-14                 |
| Power sensor HP 8481A       | MY41092317         | 09-Oct-13 (No. 217-01828)         | Oct-14                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-13 (No. 217-01736)         | Apr-14                 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739)         | Apr-14                 |
| Reference Probe ES3DV3      | SN: 3205           | 30-Dec-13 (No. ES3-3205_Dec13)    | Dec-14                 |
| DAE4                        | SN: 601            | 25-Apr-13 (No. DAE4-601_Apr13)    | Apr-14                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| RF generator R&S SMT-06     | 100005             | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

Calibrated by: **Israe El-Naouq** Name: **Israe El-Naouq** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager**

Signature

*Israe El-Naouq*  
*Katja Pokovic*

Issued: March 18, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

## Measurement Conditions

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

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.8.7     |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 15 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 835 MHz $\pm$ 1 MHz    |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 41.5           | 0.90 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 40.5 $\pm$ 6 % | 0.94 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °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 | 2.42 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 9.32 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 1.56 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 6.06 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 55.2           | 0.97 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 55.0 $\pm$ 6 % | 1.01 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 2.40 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 9.31 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 1.56 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 6.09 W/kg $\pm$ 16.5 % (k=2) |

## Appendix

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 52.0 $\Omega$ - 2.9 j $\Omega$ |
| Return Loss                          | - 29.2 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.3 $\Omega$ - 6.5 j $\Omega$ |
| Return Loss                          | - 22.2 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.395 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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 | July 11, 2003 |

## DASY5 Validation Report for Head TSL

Date: 18.03.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d005**

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.94$  S/m;  $\epsilon_r = 40.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.22, 6.22, 6.22); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

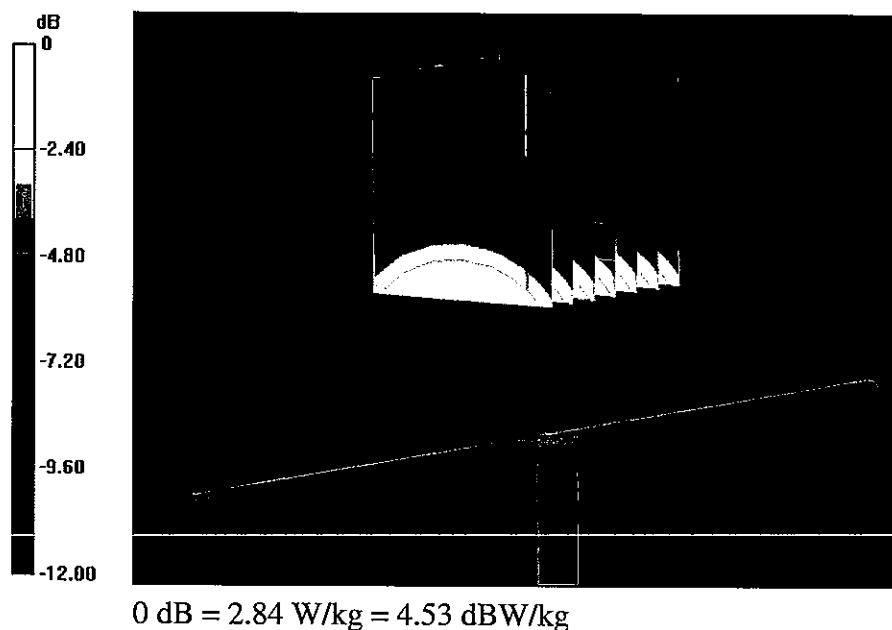
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.167 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 3.67 W/kg

**SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.56 W/kg**

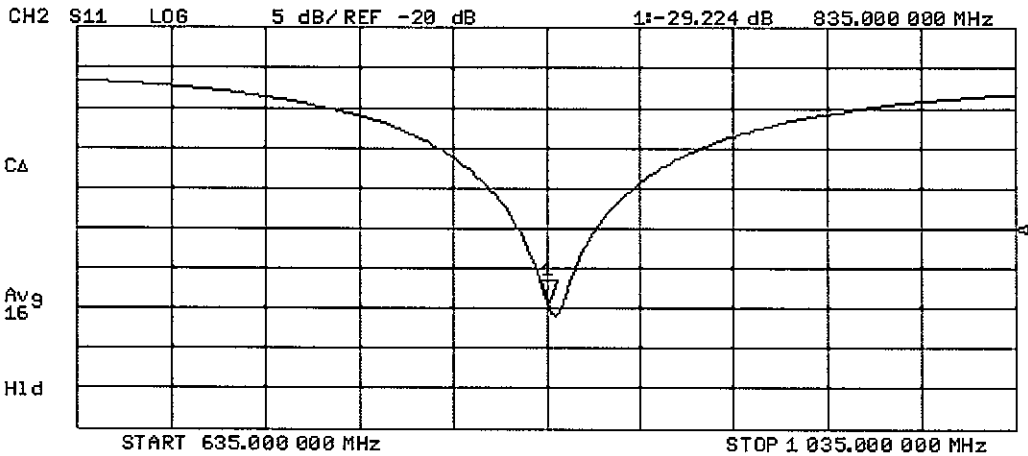
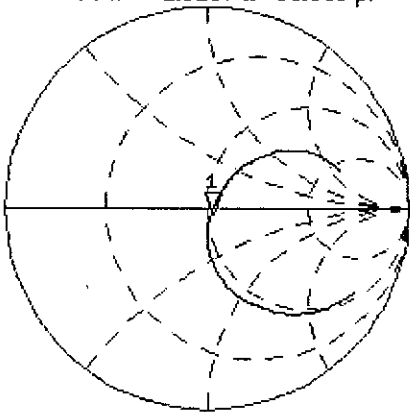
Maximum value of SAR (measured) = 2.84 W/kg



Impedance Measurement Plot for Head TSL

18 Mar 2014 13:04:58  
CH1 S11 1 U FS 1: 51.959  $\angle$  -2.9297  $\angle$  65.060 pF 835.000 000 MHz

\*  
De1  
CA  
Avg  
16  
H1d



## DASY5 Validation Report for Body TSL

Date: 14.03.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d005**

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 1.01$  S/m;  $\epsilon_r = 55$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.09, 6.09, 6.09); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

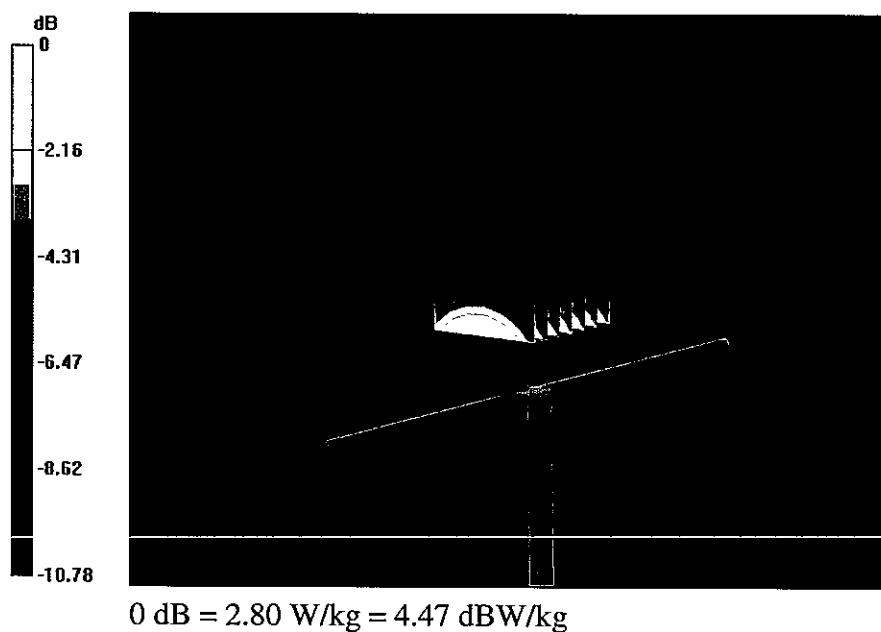
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.814 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 3.56 W/kg

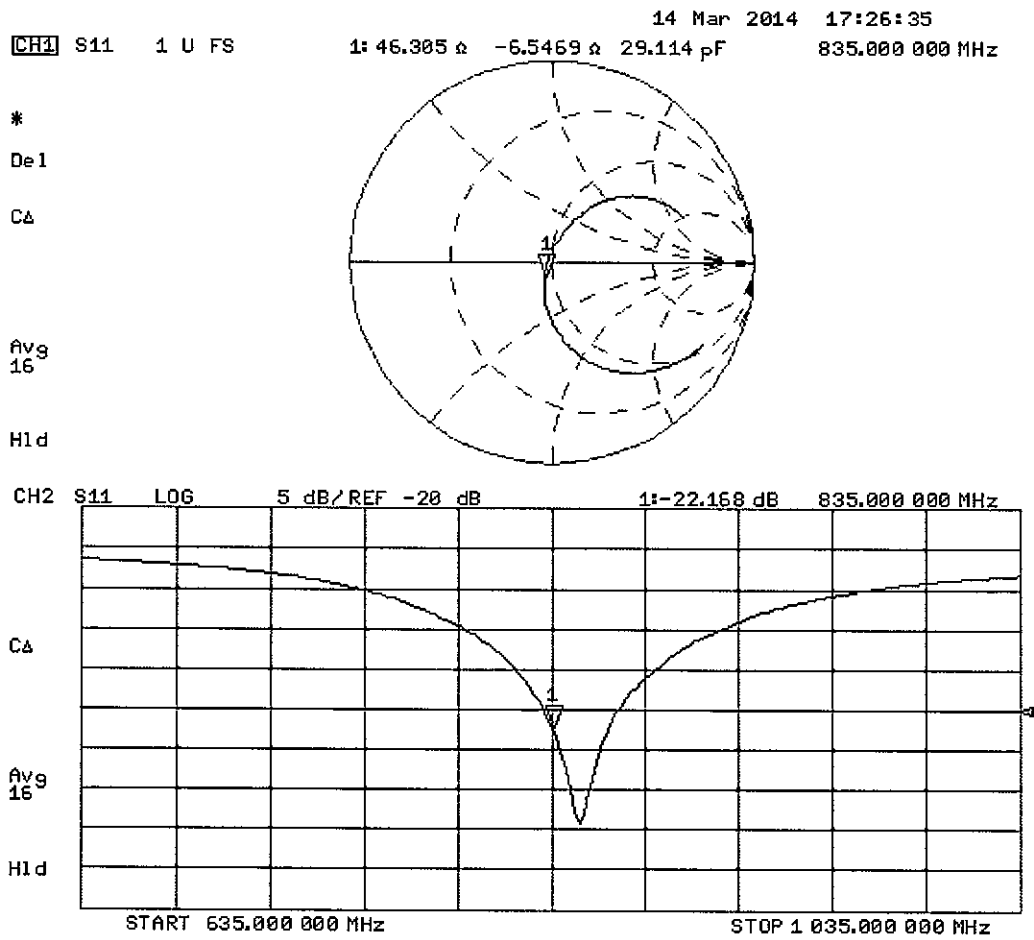
**SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.56 W/kg**

Maximum value of SAR (measured) = 2.80 W/kg





# Impedance Measurement Plot for Body TSL





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 **Nokia Beijing TCC**

Certificate No: **D1900V2-547\_Sep13**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 547**

Calibration procedure(s) **QA CAL-05.v9**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **September 17, 2013**

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  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A        | GB37480704         | 01-Nov-12 (No. 217-01640)         | Oct-13                 |
| Power sensor HP 8481A       | US37292783         | 01-Nov-12 (No. 217-01640)         | Oct-13                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-13 (No. 217-01736)         | Apr-14                 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739)         | Apr-14                 |
| Reference Probe ES3DV3      | SN: 3205           | 28-Dec-12 (No. ES3-3205_Dec12)    | Dec-13                 |
| DAE4                        | SN: 601            | 25-Apr-13 (No. DAE4-601_Apr13)    | Apr-14                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power sensor HP 8481A       | MY41092317         | 18-Oct-02 (in house check Oct-11) | In house check: Oct-13 |
| RF generator R&S SMT-06     | 100005             | 04-Aug-99 (in house check Oct-11) | In house check: Oct-13 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-12) | In house check: Oct-13 |

|                |                |                       |           |
|----------------|----------------|-----------------------|-----------|
|                | Name           | Function              | Signature |
| Calibrated by: | Jeton Kastrati | Laboratory Technician |           |
| Approved by:   | Katja Pokovic  | Technical Manager     |           |

Issued: September 18, 2013

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## Measurement Conditions

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

|                                     |                        |             |
|-------------------------------------|------------------------|-------------|
| <b>DASY Version</b>                 | DASY5                  | V52.8.7     |
| <b>Extrapolation</b>                | Advanced Extrapolation |             |
| <b>Phantom</b>                      | Modular Flat Phantom   |             |
| <b>Distance Dipole Center - TSL</b> | 10 mm                  | with Spacer |
| <b>Zoom Scan Resolution</b>         | dx, dy, dz = 5 mm      |             |
| <b>Frequency</b>                    | 1900 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 40.0           | 1.40 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 39.7 $\pm$ 6 % | 1.37 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 10.1 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>40.9 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 5.30 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>21.3 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Body TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Body TSL parameters</b>             | 22.0 °C             | 53.3           | 1.52 mho/m           |
| <b>Measured Body TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 53.2 $\pm$ 6 % | 1.49 mho/m $\pm$ 6 % |
| <b>Body TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 10.1 W/kg                                      |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>40.9 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 5.35 W/kg                                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>21.6 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Appendix

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.0 $\Omega$ + 3.8 j $\Omega$ |
| Return Loss                          | - 28.5 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.1 $\Omega$ + 3.5 j $\Omega$ |
| Return Loss                          | - 25.2 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.189 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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 | November 15, 2001 |

## DASY5 Validation Report for Head TSL

Date: 17.09.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 547**

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.37$  S/m;  $\epsilon_r = 39.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

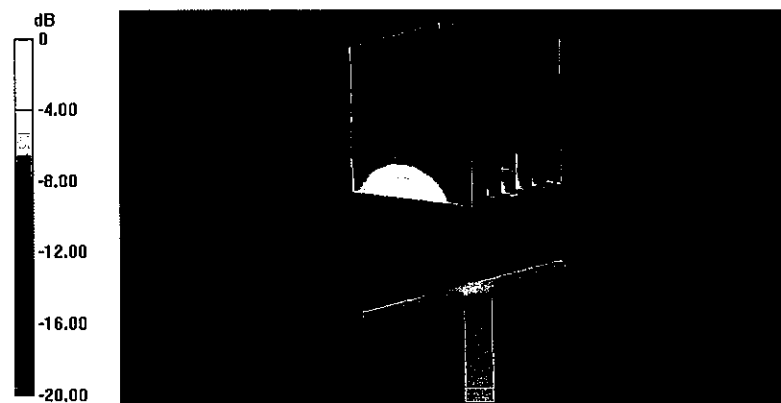
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.940 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 18.5 W/kg

**SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.3 W/kg**

Maximum value of SAR (measured) = 12.5 W/kg

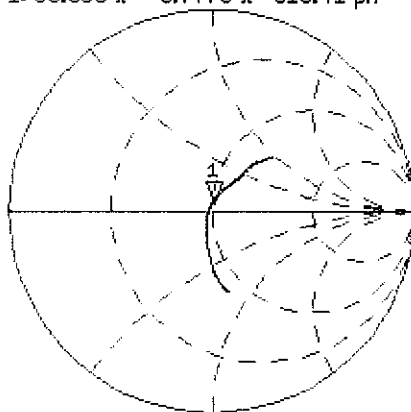


0 dB = 12.5 W/kg = 10.97 dBW/kg

# Impedance Measurement Plot for Head TSL

17 Sep 2013 13:12:34  
 [CH1] S11 1 U FS 1: 50.006  $\Omega$  3.7773  $\Omega$  316.41 pH 1 900.000 000 MHz

\*  
 Del  
 CA



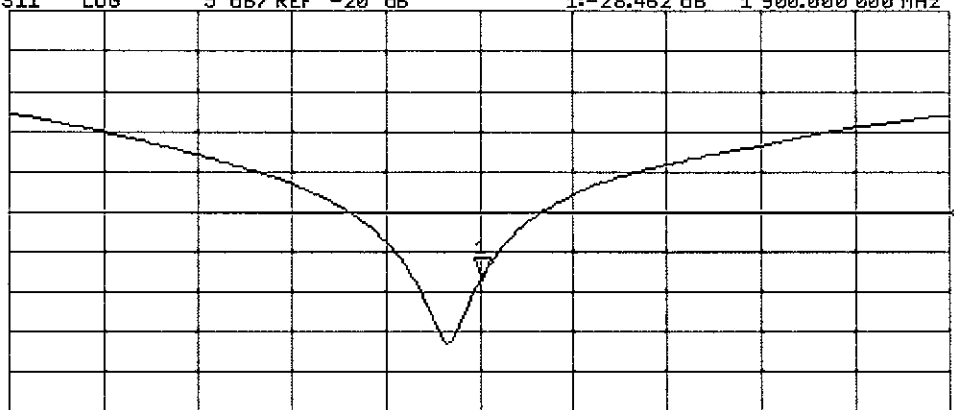
Avg  
 11  
 H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-28.462 dB 1 900.000 000 MHz

CA

Avg  
 11

H1d



START 1 700.000 000 MHz

STOP 2 100.000 000 MHz

## DASY5 Validation Report for Body TSL

Date: 17.09.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 547**

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.49$  S/m;  $\epsilon_r = 53.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

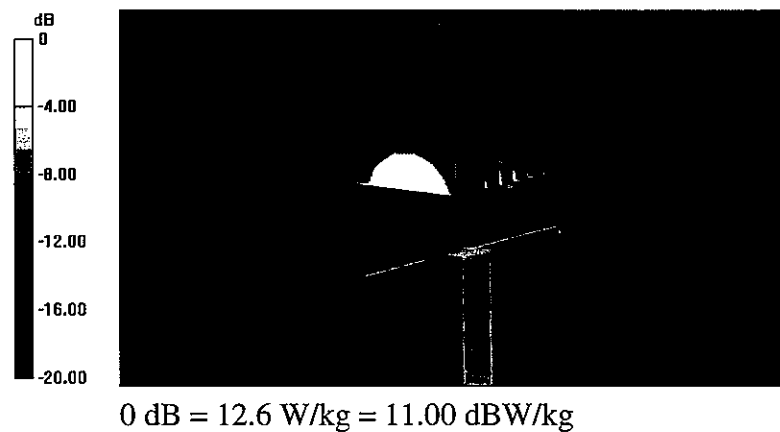
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.940 V/m; Power Drift = 0.02 dB

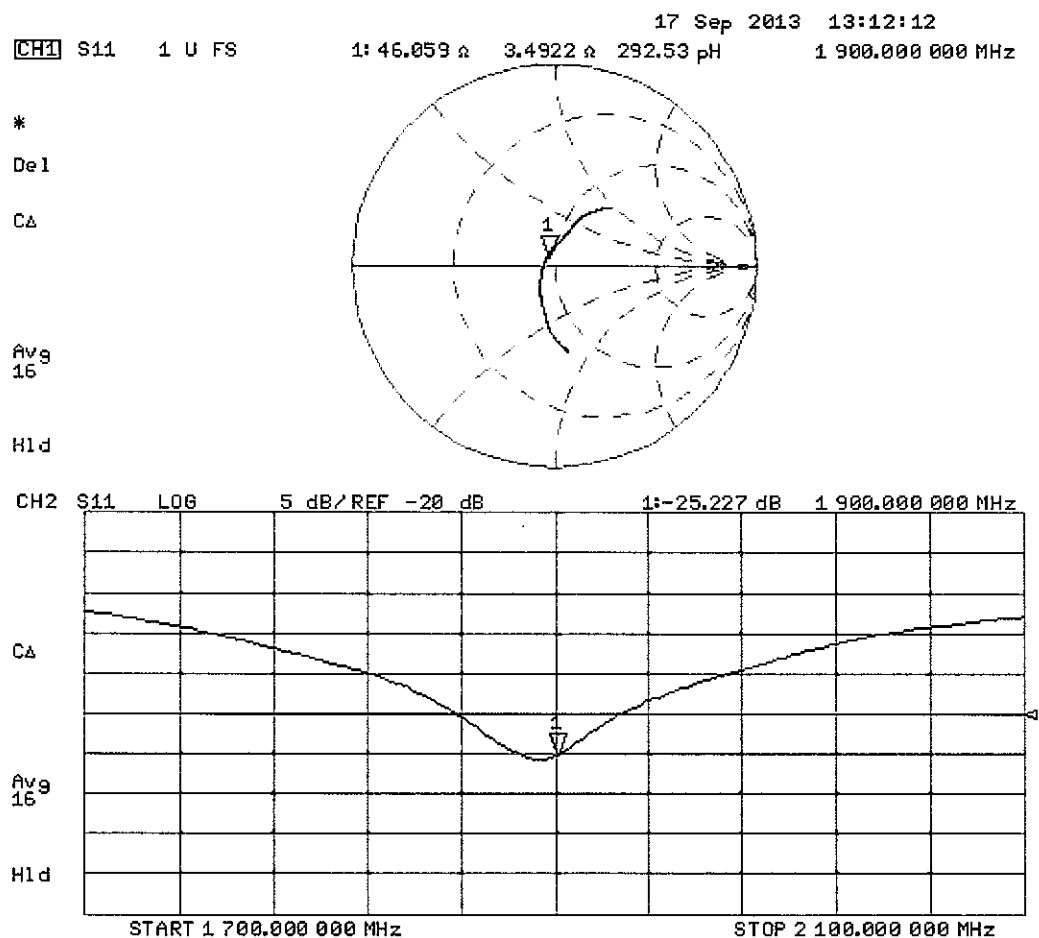
Peak SAR (extrapolated) = 17.3 W/kg

**SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.35 W/kg**

Maximum value of SAR (measured) = 12.6 W/kg



# Impedance Measurement Plot for Body TSL





## Dipole D1900V2 – SN: 547 Antenna Parameters

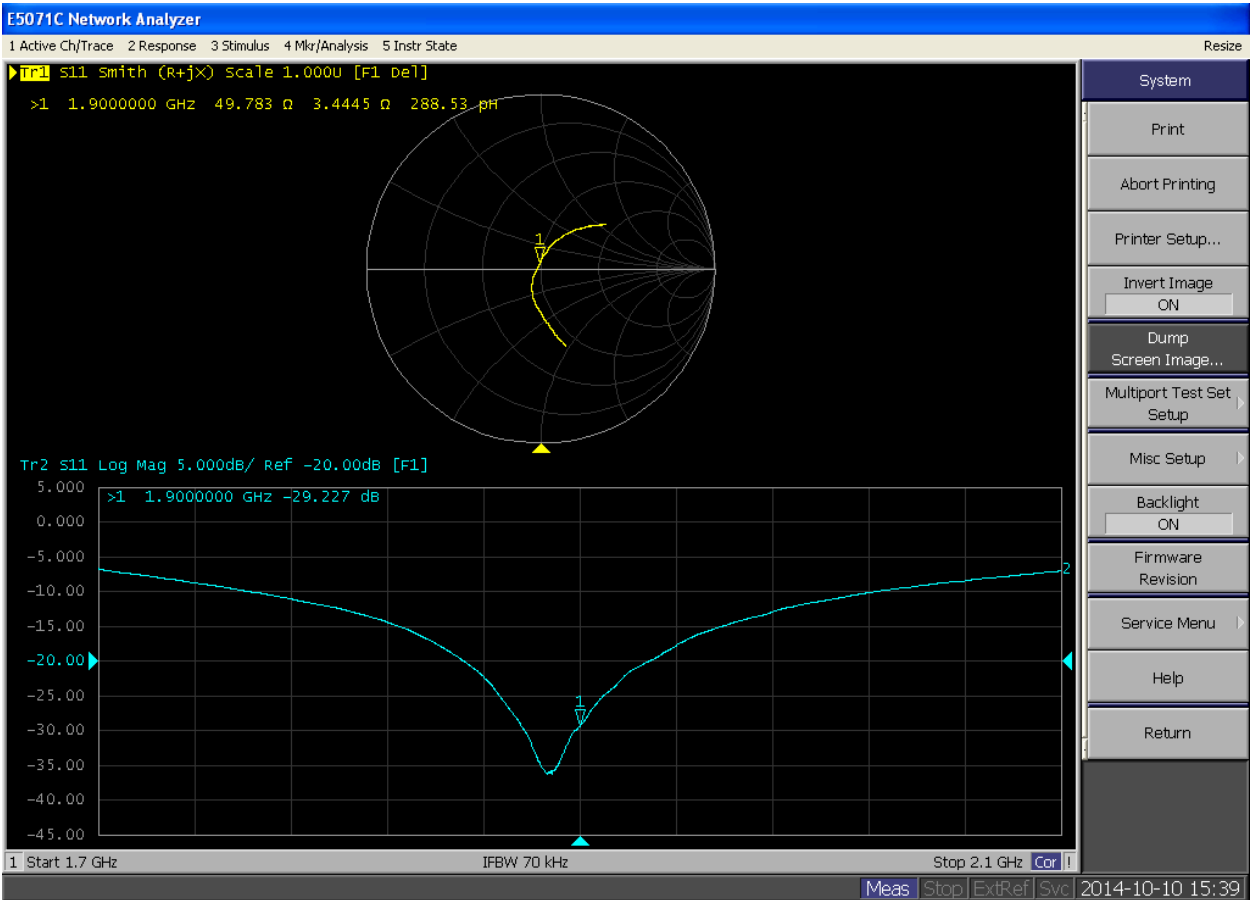
### Antenna Parameters with Head TSL

|                                      | Calibration<br>certificate    | Annual<br>measurement<br>2014-10-10 |
|--------------------------------------|-------------------------------|-------------------------------------|
| Impedance, transformed to feed point | $50.0\ \Omega + 3.8\ j\Omega$ | $49.8\ \Omega + 3.4\ j\Omega$       |
| Return loss                          | - 28.5 dB                     | - 29.2 dB                           |

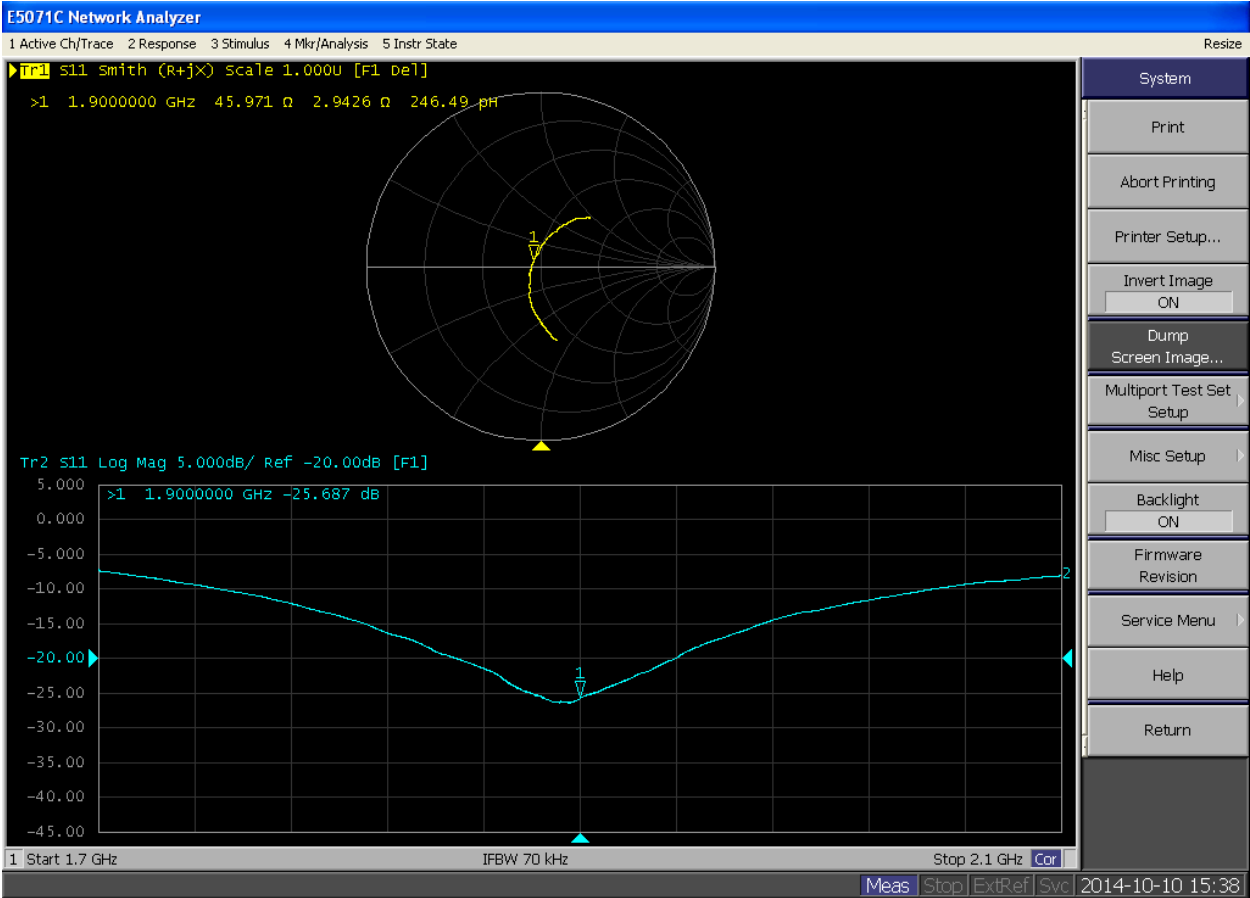
### Antenna Parameters with Body TSL

|                                      | Calibration<br>certificate    | Annual<br>measurement<br>2014-10-10 |
|--------------------------------------|-------------------------------|-------------------------------------|
| Impedance, transformed to feed point | $46.1\ \Omega + 3.5\ j\Omega$ | $50.0\ \Omega + 2.9\ j\Omega$       |
| Return loss                          | - 25.2 dB                     | - 25.7 dB                           |

Impedance Measurement plot for Head TSL 1900



Impedance Measurement plot for Body TSL 1900





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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**

Client **Nokia Beijing TCC**

Certificate No: **D2450V2-883\_Mar14**

## CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 883**

Calibration procedure(s) **QA CAL-05.v9**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **March 12, 2014**

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  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A        | GB37480704         | 09-Oct-13 (No. 217-01827)         | Oct-14                 |
| Power sensor HP 8481A       | US37292783         | 09-Oct-13 (No. 217-01827)         | Oct-14                 |
| Power sensor HP 8481A       | MY41092317         | 09-Oct-13 (No. 217-01828)         | Oct-14                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-13 (No. 217-01736)         | Apr-14                 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739)         | Apr-14                 |
| Reference Probe ES3DV3      | SN: 3205           | 30-Dec-13 (No. ES3-3205_Dec13)    | Dec-14                 |
| DAE4                        | SN: 601            | 25-Apr-13 (No. DAE4-601_Apr13)    | Apr-14                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| RF generator R&S SMT-06     | 100005             | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

Calibrated by: **Leif Klysner**      Function: **Laboratory Technician**

Signature

Approved by: **Katja Pokovic**      Technical Manager

Issued: March 12, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

## Measurement Conditions

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

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.8.7     |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 2450 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 39.2           | 1.80 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 38.2 $\pm$ 6 % | 1.86 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °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 | 13.6 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 53.2 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 6.30 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 24.9 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 52.7           | 1.95 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 50.6 $\pm$ 6 % | 2.02 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 13.1 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 51.0 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 6.03 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 23.7 W/kg $\pm$ 16.5 % (k=2) |

## Appendix

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 54.1 $\Omega$ - 1.1 j $\Omega$ |
| Return Loss                          | - 27.9 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.5 $\Omega$ + 1.0 j $\Omega$ |
| Return Loss                          | - 38.9 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.167 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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 | October 06, 2011 |

## DASY5 Validation Report for Head TSL

Date: 11.03.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 883**

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.86$  S/m;  $\epsilon_r = 38.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

### **Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

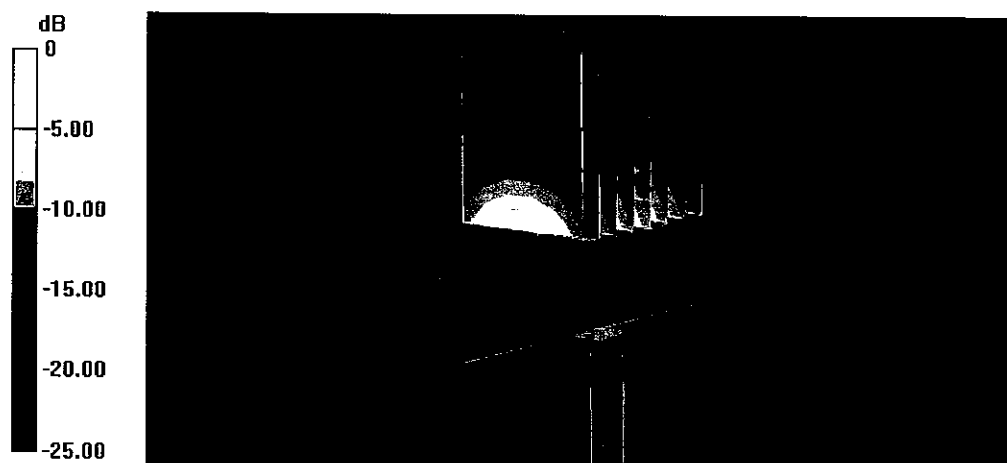
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.4 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 28.4 W/kg

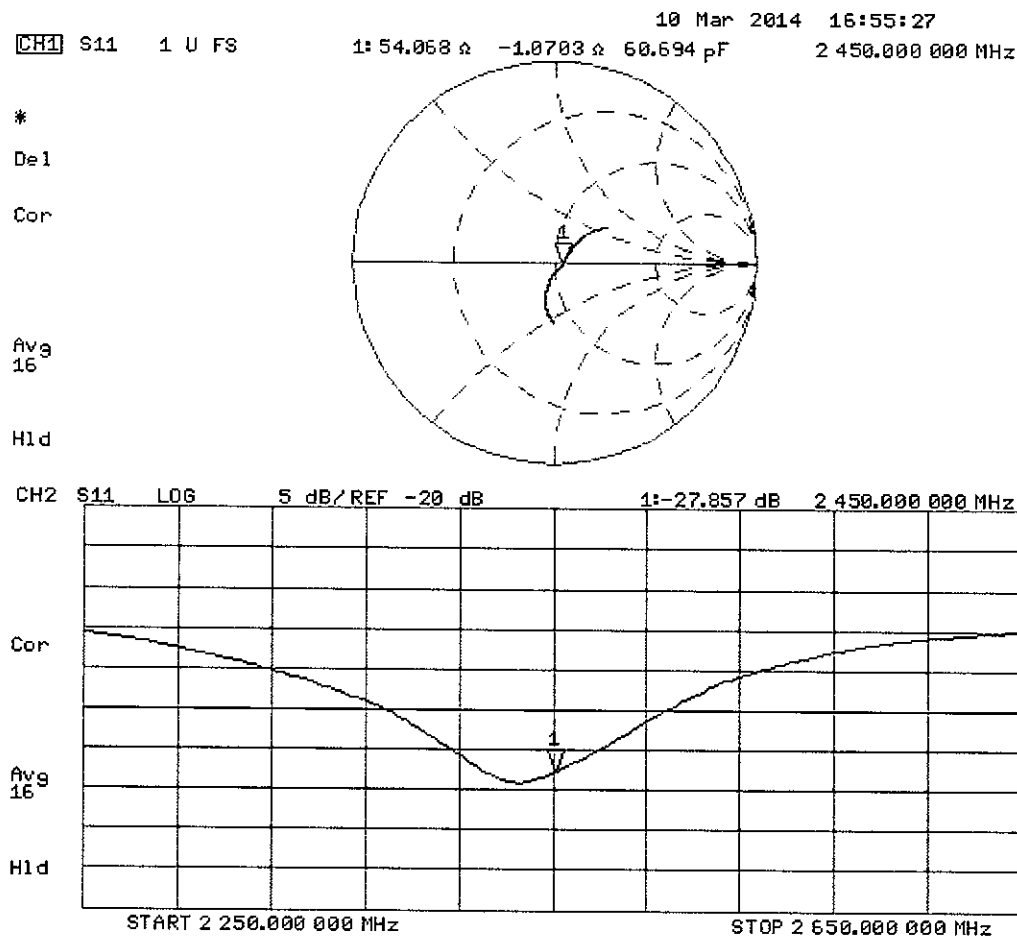
**SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.3 W/kg**

Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

Impedance Measurement Plot for Head TSL





## DASY5 Validation Report for Body TSL

Date: 12.03.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 883**

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.02$  S/m;  $\epsilon_r = 50.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

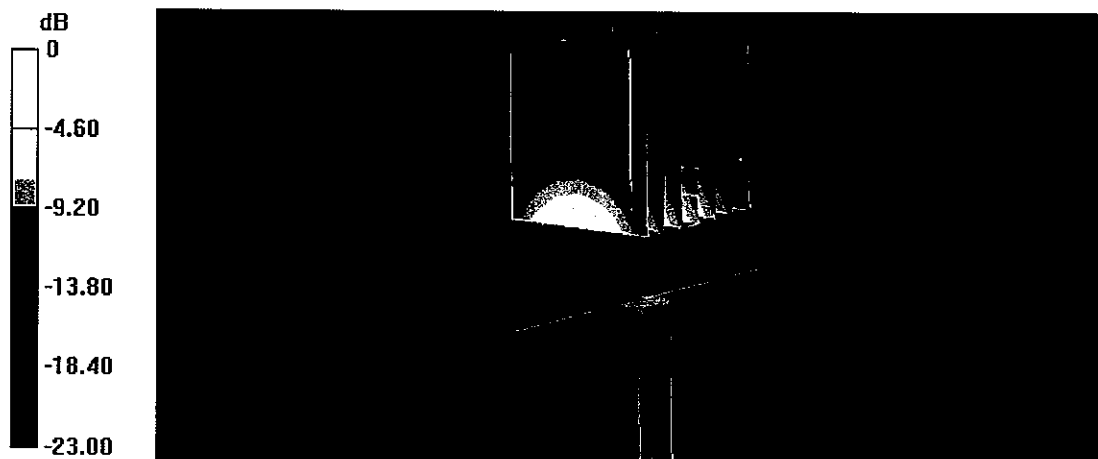
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.054 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 27.6 W/kg

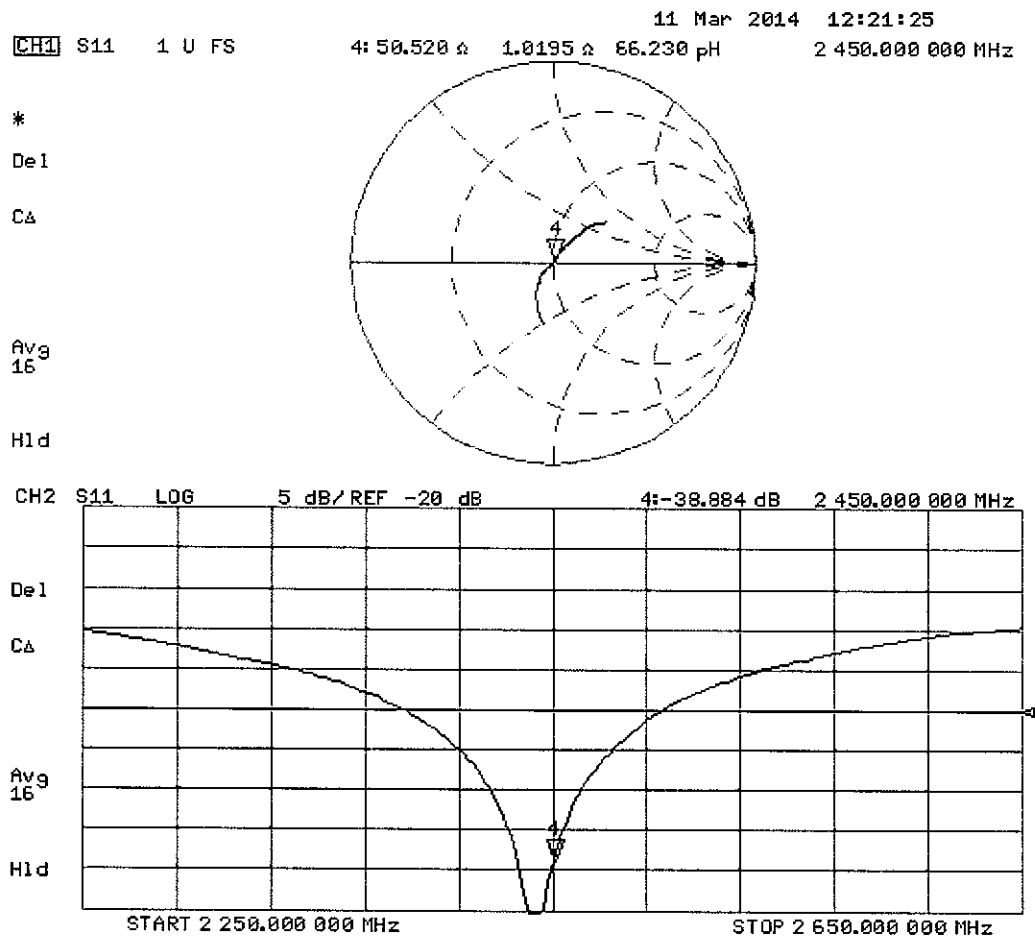
**SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.03 W/kg**

Maximum value of SAR (measured) = 17.5 W/kg



0 dB = 17.5 W/kg = 12.43 dBW/kg

# Impedance Measurement Plot for Body TSL



## APPENDIX F: CONDUCTED POWER MEASUREMENTS FOR SUPPORTED GSM/GPRS/EGPRS TRANSMISSION MODES

Type: RM-1071; SN: 004402/74/060060/0, HW: 0141, SW: 02050.00000.14445 used for GSM/GPRS/EGPRS850 Head, Body-worn and Wireless router SAR measurements

| GSM/GPRS/EGPRS850 / Tuning target (dBm)<br>Head, Body-worn and Wireless Router   |                     |                     |                     |
|----------------------------------------------------------------------------------|---------------------|---------------------|---------------------|
| Slot configuration                                                               | Ch 128<br>824.2 MHz | Ch 190<br>836.6 MHz | Ch 251<br>848.8 MHz |
| GSM 1-slot                                                                       | 31.7                | 31.7                | 31.7                |
| GPRS 2-slot                                                                      | 28.7                | 28.7                | 28.7                |
| GPRS 3-slot                                                                      | 26.9                | 26.9                | 26.9                |
| GPRS 4-slot                                                                      | 25.7                | 25.7                | 25.7                |
| EGPRS 1-slot                                                                     | 27.0                | 27.0                | 27.0                |
| EGPRS 2-slot                                                                     | 24.0                | 24.0                | 24.0                |
| EGPRS 3-slot                                                                     | 22.2                | 22.2                | 22.2                |
| EGPRS 4-slot                                                                     | 21.0                | 21.0                | 21.0                |
| GSM/GPRS/EGPRS850 / Conducted power (dBm)<br>Head, Body-worn and Wireless Router |                     |                     |                     |
| Slot configuration                                                               | Ch 128<br>824.2 MHz | Ch 190<br>836.6 MHz | Ch 251<br>848.8 MHz |
| GSM 1-slot                                                                       | 31.6                | 31.7                | 31.7                |
| GPRS 2-slot                                                                      | 28.6                | 28.6                | 28.7                |
| GPRS 3-slot                                                                      | 26.9                | 26.8                | 26.8                |
| GPRS 4-slot                                                                      | 25.7                | 25.7                | 25.7                |
| EGPRS 1-slot                                                                     | 27.0                | 27.1                | 26.9                |
| EGPRS 2-slot                                                                     | 23.9                | 24.0                | 24.1                |
| EGPRS 3-slot                                                                     | 22.2                | 22.1                | 22.2                |
| EGPRS 4-slot                                                                     | 21.0                | 21.0                | 20.9                |

Type: RM-1071; SN: 004402/74/060003/0, HW: 0141, SW: 02050.00000.14445 used for GSM/GPRS/EGPRS1900 Head, Body-worn and Wireless router SAR measurements

| GSM/GPRS/EGPRS1900 / Tuning target (dBm)<br>Head, Body-worn and Wireless Router   |                      |                      |                      |
|-----------------------------------------------------------------------------------|----------------------|----------------------|----------------------|
| Slot configuration                                                                | CH 512<br>1850.2 MHz | CH 661<br>1880.0 MHz | CH 810<br>1909.8 MHz |
| GSM 1-slot                                                                        | 30.0                 | 30.0                 | 30.0                 |
| GPRS 2-slot                                                                       | 27.0                 | 27.0                 | 27.0                 |
| GPRS 3-slot                                                                       | 25.2                 | 25.2                 | 25.2                 |
| GPRS 4-slot                                                                       | 24.0                 | 24.0                 | 24.0                 |
| EGPRS 1-slot                                                                      | 26.0                 | 26.0                 | 26.0                 |
| EGPRS 2-slot                                                                      | 23.0                 | 23.0                 | 23.0                 |
| EGPRS 3-slot                                                                      | 21.2                 | 21.2                 | 21.2                 |
| EGPRS 4-slot                                                                      | 20.0                 | 20.0                 | 20.0                 |
| GSM/GPRS/EGPRS1900 / Conducted power (dBm)<br>Head, Body-worn and Wireless Router |                      |                      |                      |
| Slot configuration                                                                | CH 512<br>1850.2 MHz | CH 661<br>1880.0 MHz | CH 810<br>1909.8 MHz |
| GSM 1-slot                                                                        | 30.0                 | 29.9                 | 30.0                 |
| GPRS 2-slot                                                                       | 27.0                 | 27.0                 | 27.1                 |
| GPRS 3-slot                                                                       | 25.2                 | 25.1                 | 25.2                 |
| GPRS 4-slot                                                                       | 24.0                 | 24.0                 | 23.9                 |
| EGPRS 1-slot                                                                      | 26.0                 | 26.0                 | 25.9                 |
| EGPRS 2-slot                                                                      | 23.0                 | 23.1                 | 23.0                 |
| EGPRS 3-slot                                                                      | 21.0                 | 21.0                 | 21.1                 |
| EGPRS 4-slot                                                                      | 20.0                 | 20.1                 | 20.0                 |

## APPENDIX G: CONDUCTED POWER RESULTS FOR WLAN2450

### G.1 Power Tuning Targets

| WLAN 2.4 GHz: 20 MHz channel bandwidth |            |                   |      |      |      |      |       |       |
|----------------------------------------|------------|-------------------|------|------|------|------|-------|-------|
| Standard                               | Modulation | Data speed [Mbps] | CH 1 | CH 2 | CH 6 | CH 7 | CH 10 | CH 11 |
| 802.11b                                | BPSK       | 1                 | 16.0 | 16.0 | 16.0 | 16.0 | 16.0  | 16.0  |
| 802.11b                                | QPSK       | 2                 | 16.0 | 16.0 | 16.0 | 16.0 | 16.0  | 16.0  |
| 802.11b                                | QPSK       | 5,5               | 16.0 | 16.0 | 16.0 | 16.0 | 16.0  | 16.0  |
| 802.11b                                | QPSK       | 11                | 16.0 | 16.0 | 16.0 | 16.0 | 16.0  | 16.0  |
| 802.11g                                | BPSK       | 6                 | 11.0 | 16.0 | 16.0 | 16.0 | 16.0  | 11.0  |
| 802.11g                                | BPSK       | 9                 | 11.0 | 16.0 | 16.0 | 16.0 | 16.0  | 11.0  |
| 802.11g                                | QPSK       | 12                | 11.0 | 16.0 | 16.0 | 16.0 | 16.0  | 11.0  |
| 802.11g                                | QPSK       | 18                | 11.0 | 15.5 | 15.5 | 15.5 | 15.5  | 11.0  |
| 802.11g                                | 16QAM      | 24                | 11.0 | 15.5 | 15.5 | 15.5 | 15.5  | 11.0  |
| 802.11g                                | 16QAM      | 36                | 11.0 | 14.5 | 14.5 | 14.5 | 14.5  | 11.0  |
| 802.11g                                | 64QAM      | 48                | 11.0 | 14.5 | 14.5 | 14.5 | 14.5  | 11.0  |
| 802.11g                                | 64QAM      | 54                | 11.0 | 13.0 | 13.0 | 13.0 | 13.0  | 11.0  |
| 802.11n                                | BPSK       | 6.5 / 7.25        | 11.0 | 16.0 | 16.0 | 16.0 | 16.0  | 11.0  |
| 802.11n                                | QPSK       | 13.0 / 14.4       | 11.0 | 16.0 | 16.0 | 16.0 | 16.0  | 11.0  |
| 802.11n                                | QPSK       | 19.5 / 21.7       | 11.0 | 16.0 | 16.0 | 16.0 | 16.0  | 11.0  |
| 802.11n                                | 16QAM      | 26.0 / 28.9       | 11.0 | 16.0 | 16.0 | 16.0 | 16.0  | 11.0  |
| 802.11n                                | 16QAM      | 39.0 / 43.3       | 11.0 | 15.0 | 15.0 | 15.0 | 15.0  | 11.0  |
| 802.11n                                | 64QAM      | 52.0 / 57.8       | 11.0 | 14.5 | 14.5 | 14.5 | 14.5  | 11.0  |
| 802.11n                                | 64QAM      | 58.5 / 65.0       | 11.0 | 13.0 | 13.0 | 13.0 | 13.0  | 11.0  |
| 802.11n                                | 64QAM      | 65.0 / 72.2       | 11.0 | 11.0 | 11.0 | 11.0 | 11.0  | 11.0  |

## G.2 Conducted Power from the Samples used in the Testing

Type: RM-1071; SN: 004402/74/060151/7, HW: 0141, SW: 02050.00000.14445 used for WLAN2450 Head, Body-worn and Wireless router SAR measurements

| WLAN 2.4 GHz: 20 MHz channel bandwidth |            |                   |      |      |      |      |       |       |
|----------------------------------------|------------|-------------------|------|------|------|------|-------|-------|
| Standard                               | Modulation | Data speed [Mbps] | CH 1 | CH 2 | CH 6 | CH 7 | CH 10 | CH 11 |
| 802.11b                                | BPSK       | 1                 | 16.1 | 16.2 | 16.2 | 16.2 | 16.2  | 16.1  |
| 802.11b                                | QPSK       | 2                 | 15.6 | 15.6 | 15.7 | 15.7 | 15.7  | 15.6  |
| 802.11b                                | QPSK       | 5,5               | 15.6 | 15.6 | 15.7 | 15.6 | 15.7  | 15.6  |
| 802.11b                                | QPSK       | 11                | 15.5 | 15.6 | 15.5 | 15.6 | 15.5  | 15.5  |
| 802.11g                                | BPSK       | 6                 | 11.3 | 15.7 | 15.8 | 15.7 | 15.7  | 10.2  |
| 802.11g                                | BPSK       | 9                 | 11.2 | 15.6 | 15.6 | 15.7 | 15.6  | 10.2  |
| 802.11g                                | QPSK       | 12                | 11.3 | 15.7 | 15.7 | 15.7 | 15.5  | 10.1  |
| 802.11g                                | QPSK       | 18                | 11.3 | 15.4 | 15.3 | 15.3 | 15.2  | 10.1  |
| 802.11g                                | 16QAM      | 24                | 11.4 | 15.4 | 15.4 | 15.3 | 15.1  | 10.1  |
| 802.11g                                | 16QAM      | 36                | 11.2 | 14.5 | 14.5 | 14.5 | 14.4  | 10.2  |
| 802.11g                                | 64QAM      | 48                | 11.3 | 14.5 | 14.4 | 14.5 | 14.3  | 10.1  |
| 802.11g                                | 64QAM      | 54                | 11.2 | 12.9 | 12.8 | 12.8 | 12.7  | 10.2  |
| 802.11n                                | BPSK       | 6.5 / 7.25        | 11.3 | 15.7 | 15.6 | 15.6 | 15.7  | 10.1  |
| 802.11n                                | QPSK       | 13.0 / 14.4       | 11.2 | 15.6 | 15.6 | 15.5 | 15.5  | 10.2  |
| 802.11n                                | QPSK       | 19.5 / 21.7       | 11.3 | 15.6 | 15.6 | 15.7 | 15.7  | 10.2  |
| 802.11n                                | 16QAM      | 26.0 / 28.9       | 11.2 | 15.6 | 15.6 | 15.6 | 15.6  | 10.2  |
| 802.11n                                | 16QAM      | 39.0 / 43.3       | 11.1 | 14.6 | 14.5 | 14.6 | 14.4  | 10.3  |
| 802.11n                                | 64QAM      | 52.0 / 57.8       | 11.2 | 14.1 | 14.1 | 14.1 | 14.0  | 10.2  |
| 802.11n                                | 64QAM      | 58.5 / 65.0       | 11.0 | 13.1 | 13.1 | 13.0 | 13.0  | 10.1  |
| 802.11n                                | 64QAM      | 65.0 / 72.2       | 11.0 | 11.0 | 10.9 | 11.0 | 11.0  | 10.1  |