



Test Report

Test Report Identifier:

SC-1402-516-02

Tested Device:

Wireless Hand-Held Transmitter –
dBtechnologies MOVING D-H

According to the standard(s):

FCC KDB 447498 D01 v06

Mobile and Portable Devices RF Exposure Procedures and
Equipment Authorization Policies - General RF Exposure Guidance

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1. General information

| Customer | |
|-----------------------|---|
| Company name | A.E.B. Industriale s.r.l. a socio unico |
| V.A.T. number | IT02685631208 |
| Address | Via G.Brodolini 8 |
| City | Valsamoggia Loc. Crespellano (BO) |
| Postal Code | 40053 |
| Country | Italy |
| Telephone number | +39 051 969870 |
| Contact person name | Andrea Molinari |
| Contact person e-mail | a.molinari@dbtechnologies-aeb.com |

| Product Identification | |
|---------------------------------|--|
| Device type (brief description) | Wireless Hand-Held Transmitter |
| Trademark / Brand | dBtechnologies |
| Model name | MOVING D-H |
| Hardware version | 1 |
| Software / Firmware version(s) | 1 |
| Antenna informations | fixed, not removable, PCB embedded antenna |
| Accessories informations | none |
| Power Source | 3V (2 x Alkaline battery size AA) |
| Battery data | Duracell ultra power 1,5V LR6 AA |
| FCC ID | 2ADDV-MOVINGDH |
| RF exposure environment | general public |

Test Standard: KDB 447498 D01 v06 10/23/2015 - *Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies - General RF Exposure Guidance*

Technical Standards: KDB 865664 D01 v01r04 08/07/2015 - *SAR Measurement for 100 MHz to 6 GHz*
IEEE1528: 2013 - IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

The test results of this report relate only to the tested sample identified in this report.

Tested Device(s):

Sample A: dBtechnologies MOVING D-H

IMEI / Serial number: D257000039

Supported mode: FM digital (Peak deviation = ± 55 kHz max)

Frequency range: 470.1MHz to 698MHz

Supported bands: B1: 470.1MHz to 608MHz

B2: 614MHz to 698MHz

Type of antenna: fixed, not removable, PCB embedded antenna

Power: 87.1 mW at 470.1 MHz (max conducted).

Date of Report: 09 December 2015

Test headquarters: Sicom test s.r.l - Via dell'Industria 9 (Loc. Begliano)

I-34075 San Canzian d'Isonzo Gorizia GO Italy

Test site: Sicom test s.r.l - AREA Science Park

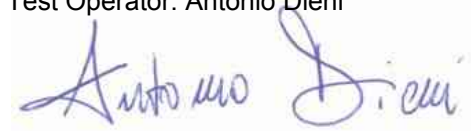
Padriciano 99 - I-34149 Trieste Italy

Total number of pages: 95

This test report includes the following sections:

1. General information
2. Photographs
3. Test description
4. Test equipment and test conditions
5. System validation check data
6. Test results
7. Evaluation
8. Uncertainty evaluation
9. System validation check uncertainty
10. Annex A: Electric field probe calibration reports
11. Annex B: dipoles reference SAR value and calibration

Test Operator: Antonio Dieni



Technical responsible: Roberto Passini





2. Photographs



Figure 1 – The tested device, front view



Figure 2 – The tested device, rear view

Note1: DUT antenna highlighted in red



Figure 3 – The tested device, label



Figure 4 – The tested device with its receiver



Figure 5 – The tested device during test



Figure 6 – The tested device during test



Figure 7 – Tested device position: with the Front side against the phantom



Figure 8 – Tested device position: with the Rear side against the phantom



Figure 9 – Tested device position: with the Right side against the phantom



Figure 10 – Tested device position: with the Left side against the phantom



Figure 11 – Tested device position: with the Bottom against the phantom



Figure 12 – Device positioning for peak SAR locations

Note2: DUT dimensions: 274 mm x 55 mm (the surface scan covers this area);

Note3: DUT rectangle dimensions: 200 mm x 55 mm

Note4: DUT cross coincides with the center of the shell in all measurements

3. Test description

Scope, references and evaluation of compliance to the limits

This report contains the results of the measurements performed on the DUT described in the General Information section in order to evaluate its compliance to the basic restrictions related to human exposure to radio frequency electromagnetic fields, according to the recommended test positions for body, head and/or other configurations included in the Test Standard.

The Test Standard generally require SAR evaluation for devices that have a radiating element normally operating at or below 6 GHz, with a separation distance of up to 20 cm between the user and the device and specifies measurement methods in accordance with the latest version of IEEE 1528 and/or IEC EN 62209 series technical standards. A list of accepted FCC KDB procedures and/or IC Notices for SAR measurements details for specific families of devices is also given in Technical Standard(s) paragraph.

The exposure limits are specified in the Test Condition section and are generally referred in the Test Standard for General Public / Uncontrolled Environment exposure or in general references such as Health Canada's RF exposure guideline or European Council Recommendation 1999/519/EC.

The results of Specific Absorption Rate (SAR) measurements are compared directly to the limit and the DUT is declared to fulfill the requirements of the standard if the measured values are less than or equal to the limit.

The Dosimetric Assessment System

The SAR Dosimetric Assessment System used is able to determine the SAR distribution inside a phantom conforming to the European, Canadian and U.S. standards. It consists of a robot, a field probe calibrated for use in liquids, a twin phantom, a flat phantom, a flat ellipsoidal phantom, a tissue simulating liquid, a mobile phone holder and software. The software controls the robot and processes the measured data to compare them to the limits.



Figure 13 - SAR Dosimetric Assessment System

The twin phantom is a shell made with low loss and low permittivity material integrated in a wooden table. The shape of the shell is based on data from an anthropomorphic study and resembles the head and neck of a user, with average size and dimensions. The shell enables the dosimetric evaluation of left and right hand phone usage together with body phone usage through the flat part of the phantom. A fully flat ellipsoidal phantom made with low loss and low permittivity material is used for dosimetric evaluation of body usage of devices with bigger dimensions.

The E-field probe is a 3-axis system made of 3 distinct dipoles. It has a triangular section bar and on each face a dipole and a resistive line are located. The three orthogonal dipoles are linked to special Schottky diodes with low detection thresholds. The probe is designed to fulfill CENELEC and IEEE recommendations for the measurement of electromagnetic fields radiated by mobile phones, base stations and all radiating devices.

The mobile positioning device is made of low-loss and low permittivity material.

SAR measurement procedure

The dielectric properties of the tissue equivalent liquids are measured prior to the SAR measurements and at the same temperature with a tolerance of $\pm 2^{\circ}\text{C}$. The measured values are the permittivity ϵ and the electric conductivity σ and they shall comply with the values defined at the specific frequencies into the standard for body simulating tissue liquids with the tolerance of $\pm 5\%$.

A performance check is made before the DUT SAR measurements in order to verify that the system operates within its specifications. It is a 1 g (or 10 g) averaged SAR measurement using a simplified set-up with a dipole source. The components and procedures in the simplified performance check are the same as those used for the compliance tests. The result of this check shall be within $\pm 10\%$ of the target value, determined during the system validation.

During all the tests is monitored ambient temperature of the laboratory and liquid, relative humidity and that the liquid depth is above 15 cm in all cases.

The tested device uses its internal transmitter; the antenna(s), battery and accessories are those specified by the manufacturer. The battery is fully charged before each measurement and there are no external connections except those required for normal operating conditions (defined by the manufacturer or by the intended use of the tested device).

The output power and frequency are controlled using a network emulator when applicable. In any case the tested device is set to transmit at its highest output peak power level on the required frequencies of each transmitting band.

For “head” measurements the device is tested in the “cheek” and “tilt” positions on left and right sides of the phantom at the required test conditions and test frequencies of each transmitting band (typically following the IEC EN 62209-1 or IEEE 1528 provisions). If the mobile phone has a retractable antenna, all of the tests are performed both with the antenna fully extended and fully retracted.

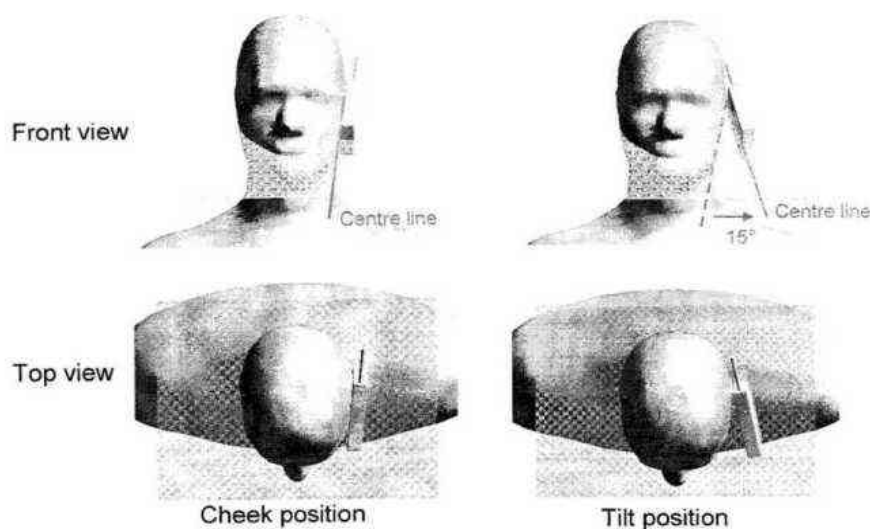


Figure 14 - “cheek” and “tilt” positions of the mobile phone on the left side

For “body” measurements the device is tested in the body operating configurations (typically following the IEC EN 62209-2 or FCC KDB or IC DRS Notices provisions), with the belt clips and holsters attached to the device and positioned against a flat phantom in normal use configuration. Devices with a headset output are tested with a headset connected to the device also.

Both the physical spacing to the body of the user as dictated by the accessory and the materials used in an accessory affect the SAR produced by the transmitting device.

When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest space to the body.

When multiple accessories that contain metallic components are supplied with the device, the device is tested with each accessory that contain a unique metallic component. If multiple accessories share an identical metallic component, only the accessory that dictates the closest spacing to the body must be tested. Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance between the back of the device and the flat phantom is used for testing body-worn SAR compliance under such circumstances stated by the standards. If the mobile phone has a retractable antenna, all of the tests are performed both with the antenna fully extended and fully retracted. Any measurement detail related to bands, channels, and configurations is enumerated in Test Conditions section.

From measured data the average SAR, in a volume in the shape of a cube and side dimension of a 1g and 10g of tissue, is calculated and compared to the limits.

Spatial Peak SAR, resolution, volume or zoom scan procedure

The system software includes all numerical procedures necessary to evaluate the spatial peak SAR values. The spatial-peak SAR can be computed over any required mass. The base for the evaluation is a “cube” measurement in a volume of 30mm³ (7x7x7 points, dx=5mm, dy=5mm, dz=5mm). The measured volume includes the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan. The entire evaluation of the spatial peak values is performed within the post-processing engine. The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. Extraction of the measured data (grid and values) from the Zoom Scan
2. Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. Generation of a high-resolution mesh within the measured volume
4. Interpolation of all measured values from the measurement grid to the high-resolution grid
5. Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. Calculation of the averaged SAR within masses of 1g and 10g

Description of interpolation/extrapolation scheme

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimise measurements errors, but the highest local SAR will occur at the surface of the phantom.

An extrapolation is used to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1 mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

An interpolation is used to provide an array of sufficient resolution. The measured and extrapolated SAR values are interpolated on a 1 mm grid with a three dimensional thin plate spline algorithm.

SAR measurement system technical data: phantom description

The SAM phantom is delivered with a CAD CD-ROM including the 3D data of the internal shape of the shell. These data are used by the 6 axis robot control software to define movements relative to its internal surface through 5 additional CAD-linked reference points.

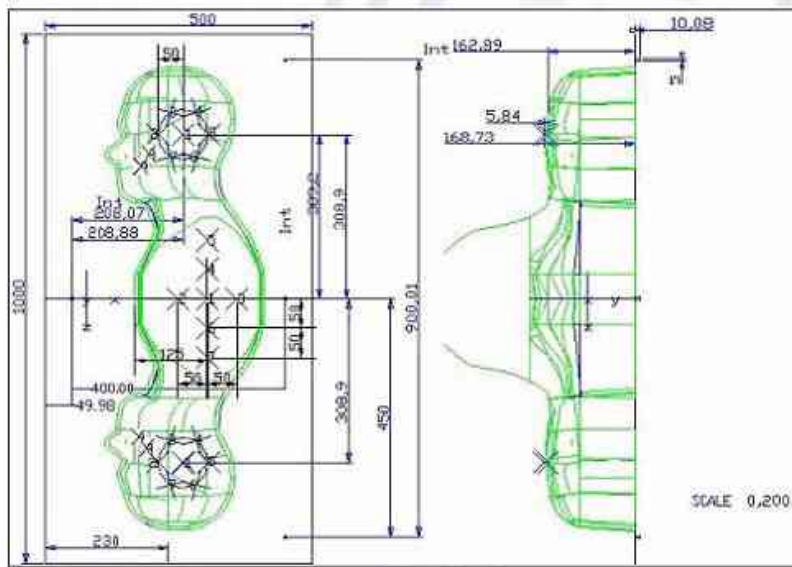


Figure 15 - SAM and ellipsoidal shell

SAM shell technical data:

| | |
|--------------------------------------|---|
| Shell thickness | 2 mm ± 0.2 mm |
| Permittivity / loss tangent | 3.3 / 0.017 |
| Filling phantom volume/ liquid depth | 27 litres / 20 cm |
| Dimensions | 1000 mm (length) x 500 mm (width) x 200 mm (height) |
| References | IEEE 1528, EN 50361 and IEC 62209-1 |

Ellipsoidal shell technical data:

| | |
|-----------------------------|--|
| Shell thickness | 2 mm ± 0.2 mm |
| Permittivity / loss tangent | 4.4 / 0.017 |
| Filling Volume | 35 litres / 20 cm |
| Dimensions | 800 mm (length) x 500 mm (width) x 200 mm (height) |
| References | IEC 62209-2 |

SAR measurement system technical data: device holder

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source in 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. An accurate device positioning is therefore crucial for accurate and repeatable measurements.

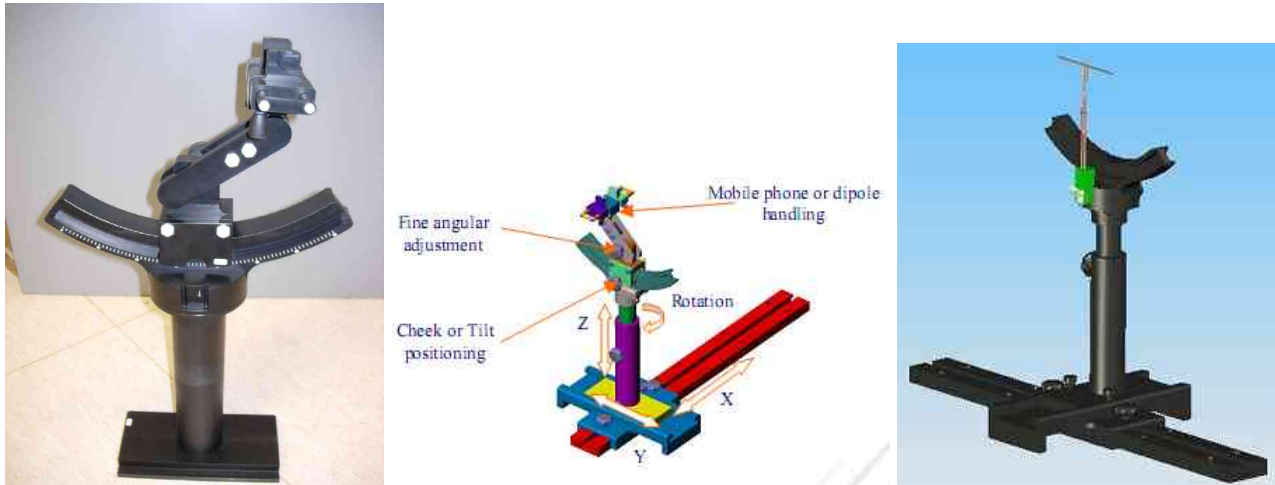


Figure 16 - positioning holder overview

Device holder system characteristics:

| | |
|-----------------------------|---|
| General | Totally metal-free design. Three graduated translation and five rotation point to lock the device under test under the flat part or under the left or right ear. Ensured repeatability with fine angular adjustment. Mobile phone or dipole handling. |
| Permittivity / loss tangent | 3.0 / 0.017 |
| Material | POM |
| X translation | 700 mm |
| Y translation | 250 mm |
| Z translation | 100 mm |

SAR measurement system technical data: isotropic E-Field Probe

Probes are constructed with a triangular section bar in alumina. On each face, a dipole and a resistive line are printed. A Schottky diode is placed in the center of each dipole. Symmetrical design with triangular core. These uncoupled dipoles perform the isotropic and wide-band measurements. See Annex A for calibration.



Figure 17 - Isotropic E-Field Probe

isotropic E-Field Probe technical data:

| | |
|--|------------------|
| Frequency range | 100 MHz - 30 GHz |
| Length | 330 mm |
| Dipoles Length | 4.5 mm |
| Maximum external diameter | 8 mm |
| Probe tip external diameter | 5 mm |
| Distance between dipoles and the probe tip | <2.7mm |
| Dipole resistance (in the connector plane) | 1MΩ to 2MΩ |

| | |
|--|----------------------------|
| Axial isotropy in human-equivalent liquids | ± 0.2 dB |
| Hemispherical Isotropy in human-equivalent liquids | ± 0.3 dB |
| Linearity | ± 0.5 dB |
| Maximum operating SAR | 100 Watts/kg |
| Lower SAR detection threshold | 0.0015 Watts/kg |
| Connectors | 6 male wires (Hirose SR30) |

SAR measurement system technical data: reference dipoles

The antennas are developed with a $\lambda/4$ balun, so that all calibration dipoles are totally symmetrical. Each validation dipole is used to check the whole SAR measurement chain in its frequency band. They are especially developed to make SAR measurements near a flat SAM phantom filled with human-equivalent liquid, according to CENELEC and IEEE standards. Each dipole has been designed to be plugged in the device holder positioning system. See Annex A for calibration.

Reference dipoles technical data:

| | |
|-------------|---|
| Frequencies | 450, 750, 900, 1800, 2000, 2450 MHz |
| Adaptation | S11 < -20dB in specified validation position. |
| Power | 100W |
| Connectors | SMA |
| Dimensions | Height : between 200 mm and 300 mm Length : between 25 mm and 83 mm depends on the dipole frequency |

4. Test equipment and test conditions

Test Equipment:

SAR Dosimetric Assessment System - Manufacturer: Satimo Model: COMOSAR TWINS

| Instrument Type | Model | Manufacturer | Serial Number | Calibration periodicity | Last Calibration |
|--------------------------|------------------------|--------------|-----------------|-------------------------|------------------|
| Robot | KR3 | Kuka | 846427 | N.S. | - |
| Robot Remote Controller | KRC3 | Kuka | 599 | N.S. | - |
| Robot Control Panel | KCP2 | Kuka | 1438 | N.S. | - |
| Isotropic E-field probe | --- | Satimo | SN 46/06 EP60 | 15 months | 27/02/2015 |
| Dipole | 450 MHz | Satimo | SN 39/05 DIPB26 | 24 months | 21/02/2014 |
| Dipole | 750 MHz | Satimo | SN 39/05 DIPC31 | 24 months | 21/02/2014 |
| SAM shell | Twins phantom | Satimo | SN 39/05 SAM26 | N.S. | - |
| Flat shell | Flat phantom | Satimo | SN 39/05 FVA11 | N.S. | - |
| Flat ellipsoidal shell | Flat shell ellipsoidal | Satimo | SN 46/07 ELLI13 | N.S. | - |
| Positioning system | --- | Satimo | SN 39/05 MSH13 | N.S. | - |
| Open coaxial probe | --- | Satimo | SN 39/05 OCP8 | 36 months | 26/02/2014 |
| Tissue-simulating liquid | 450 MHz 750 MHz | Satimo | - | every test session | - |

N.S. = no periodic calibration required

Supporting test equipment

| Instrument Type | Model | Manufacturer | Serial Number | Calibration periodicity | Last Calibration |
|--|--------------|-----------------|---------------|-------------------------|------------------|
| Multimeter | Mod. 2000 | Keithley | 1062722 | 24 months | 19/02/2014 |
| Power amplifier | RF 4002000-2 | RFPA | 52627 | N.S. | - |
| Signal Generator | SMIQ03B | Rohde & Schwarz | 831389/028 | 24 months | 11/03/2014 |
| Power meter | NRVS | Rohde & Schwarz | 827023/049 | 24 months | 11/03/2014 |
| Sensor head | NRV-Z51 | Rohde & Schwarz | 829759/003 | 24 months | 11/03/2014 |
| Directional coupler | ZFDC-20-5 | Minicircuits | -- | 24 months | 11/03/2014 |
| Directional coupler | R433563000 | Radiall | -- | 24 months | 11/03/2014 |
| Attenuator 20 dB | HP8941A | HP | 2708A44001 | 24 months | 11/03/2014 |
| Vector Network Analyser | MS4622B | Anritsu | 984502 | 24 months | 24/02/2014 |
| Digital Spectrum Analyzer / Radio Transmitter Tester | MS8609A | Anritsu | 6200456808 | 24 months | 12/03/2014 |
| Test Fixture / Antenna Coupler | 4916 | Willtek | LX717852 | 24 months | 12/01/2015 |

N.S. = no periodic calibration required

Test Conditions:

The testing has been performed within the period:

From: 04 December 2015
To: 04 December 2015

Ambient Conditions:

Temperature: $+22^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Tested device conditions:

DUT Use: Handheld wireless microphone transmitter. Device mainly operated in extremity only exposure conditions (hands). Device also operates in close proximity to the user's body.
DUT Sample: Supplied from the manufacturer as production units.
DUT Mode: FM digital (Peak deviation = ± 55 kHz max)
Bands: B1: 470.1MHz to 608MHz
B2: 614MHz to 698MHz
Power Source: Two alkaline battery (2 x 1,5V AA).
DUT Antenna: Fixed, not removable, PCB embedded antenna.
DUT Accessories/fixings: None.

Test mode conditions:

Test signal: The tested device transmit continuously.
Duty factor: CW (a 100% duty factor were used in the test).
RF power: DUT power setting selected for highest level: "50 mW". Antenna port is not available on the supplied device and is not possible arrange an RF antenna connector to support conducted power measurements. Power level verified separately, basing on the test report with the code FCCTR_151062H-0 (date 25/03/2015) supplied from the Customer, and also verified with spectrum analyzer and precalibrated test fixture.
Battery drift: To minimize the battery influence the battery were changed with new and full charge battery every SAR measurement. Also the battery drift was evaluated, with a radiated E-field comparison between the first and the last measurement, and recorded. If the power deviation more than 5% occurred, the test was repeated.
Distance: Separation distance between the device and the phantom = **0.0 mm**
Positioning: The device is tested in the hand-held and body-worn operating configurations with a separation distance of 0.0 mm between the device and the flat phantom with 5 sides against the phantom.
Test channels/frequencies: 12, according to KDB 447498, B1 CH1 channel with the highest output power tested first.
B1 CH1 470.1 MHz (conducted power 87.1 mW);
B1 CH2 493 MHz;
B1 CH3 516 MHz;
B1 CH4 539 MHz;
B1 CH5 562 MHz;
B1 CH6 585 MHz;
B1 CH7 608 MHz (conducted power 40.7 mW);
B2 CH1 614 MHz;
B2 CH2 635 MHz;
B2 CH3 656 MHz;
B2 CH4 677 MHz;
B2 CH5 698 MHz (conducted power 69.2 mW);

SAR test reduction considerations: According to KDB 447498 § 4.3.1 microphone side was excluded. In this position the distance from the device antenna to user mouth/body is more than 200 mm with a maximum power of 87.1 mW. This consideration was confirmed by the results of all the surface scan performed on the

tested device.

Tested Configurations: Extremity SAR and body SAR evaluated with the following orientations:

1. Front side against the flat phantom.
2. Rear side against the flat phantom.
3. Right side against the flat phantom.
4. Left side against the flat phantom.
5. Bottom against the flat phantom.

Exposure limits applied: FCC Limit for General population/Uncontrolled exposure

Body SAR (averaged over any 1g of tissue) limit: **1.6 W/Kg**

Extremity SAR (averaged over any 10g of tissue) limit: **4.0 W/Kg**

5. System validation check data

Measurement for Tissue Simulant Liquid

Tissue dielectric property measurement procedure: contact probe

The measurement is performed using a calibration kit (pre-calibrated open coaxial probe, pre-calibrated cable, and vector network analyzer as detailed in Test Equipment section of this Report) to determinate the S₁₁ parameters of the tissue simulant liquid. The system software is able to calculate the complex permittivity (i.e. ϵ and σ) of the liquid in the frequency band of 300 MHz to 3 GHz. Steps of the permittivity measurement: 1) SOL (Short, Open and Load) calibration at the end of the cable; 2) measurement of the S₁₁ parameters of known reference fluid (pure water) at known temperature; 3) measurement of the S₁₁ parameters of Tissue Simulant Liquid. The tests were conducted on the same days as the measurement of the EUT.



Figure 18 - Open coaxial probe with the bottle cap

Dielectric properties measured:

The conductivity σ and permittivity ϵ_r are listed in table below for the SAR measurement given in this report and were verified to be within a tolerance of $\pm 5\%$ from the target values:

Date of measurement: 04 December 2015;

Temperature: 22.6°C.

| Band | Tissue Type | Frequency** | Values* | ϵ_r relative permittivity | σ conductivity (S/m) |
|------------------------------|-------------|---------------------|-----------------|------------------------------------|-----------------------------|
| 470.1-608 MHz 614-698 MHz | Body | 450 MHz | Target value | 56.7 | 0.94 |
| | | | $\pm 5\%$ range | 53.865 - 59.535 | 0.893 - 0.987 |
| | | | Measured | 56.52 | 0.944 |
| 470.1-608 MHz 614-698 MHz | Body | 750 MHz | Target value | 55.531 | 0.963 |
| | | | $\pm 5\%$ range | 52.754 - 58.308 | 0.915 - 1.011 |
| | | | Measured | 55.12 | 0.982 |
| 470.1-608 MHz 614-698 MHz | Body | B1 CH1 470.1 MHz | Target value | 56.622 | 0.942 |
| | | | $\pm 5\%$ range | 53.790 - 59.453 | 0.895 - 0.989 |
| | | | Measured | 56.17 | 0.951 |
| 470.1-608 MHz 614-698 MHz | Body | B1 CH2 493 MHz | Target value | 56.532 | 0.943 |
| | | | $\pm 5\%$ range | 53.705 - 59.359 | 0.896 - 0.990 |
| | | | Measured | 56.13 | 0.953 |

| | | | | | |
|------------------------------|------|-------------------|-----------------|-----------------|---------------|
| 470.1-608 MHz 614-698 MHz | Body | B1 CH3 516 MHz | Target value | 56.443 | 0.945 |
| | | | ± 5% range | 53.620 - 59.265 | 0.898 - 0.993 |
| | | | Measured | 56.11 | 0.954 |
| 470.1-608 MHz 614-698 MHz | Body | B1 CH4 539 MHz | Target value | 56.353 | 0.947 |
| | | | ± 5% range | 53.535 - 59.171 | 0.899 - 0.994 |
| | | | Measured | 56.07 | 0.955 |
| 470.1-608 MHz 614-698 MHz | Body | B1 CH5 562 MHz | Target value | 56.264 | 0.949 |
| | | | ± 5% range | 53.450 - 59.077 | 0.902 - 0.996 |
| | | | Measured | 56.01 | 0.955 |
| 470.1-608 MHz 614-698 MHz | Body | B1 CH6 585 MHz | Target value | 56.174 | 0.951 |
| | | | ± 5% range | 53.365 - 58.983 | 0.903 - 0.999 |
| | | | Measured | 55.97 | 0.956 |
| 470.1-608 MHz 614-698 MHz | Head | B1 CH7 608 MHz | Target value | 56.084 | 0.952 |
| | | | ± 5% range | 53.279 - 58.888 | 0.904 - 1.000 |
| | | | Measured | 55.95 | 0.955 |
| 470.1-608 MHz 614-698 MHz | Head | B2 CH1 614 MHz | Target value | 56.061 | 0.953 |
| | | | ± 5% range | 53.258 - 58.864 | 0.905 - 1.000 |
| | | | Measured | 55.93 | 0.956 |
| 470.1-608 MHz 614-698 MHz | Head | B2 CH2 635 MHz | Target value | 55.979 | 0.954 |
| | | | ± 5% range | 53.180 - 58.778 | 0.906 - 1.002 |
| | | | Measured | 55.89 | 0.961 |
| 470.1-608 MHz 614-698 MHz | Head | B2 CH3 656 MHz | Target value | 55.897 | 0.956 |
| | | | ± 5% range | 53.102 - 58.692 | 0.908 - 1.004 |
| | | | Measured | 55.81 | 0.969 |
| 470.1-608 MHz 614-698 MHz | Head | B2 CH4 677 MHz | Target value | 55.816 | 0.958 |
| | | | ± 5% range | 53.025 - 58.607 | 0.910 - 1.005 |
| | | | Measured | 55.77 | 0.975 |
| 470.1-608 MHz 614-698 MHz | Head | B2 CH5 698 MHz | Target value | 55.734 | 0.959 |
| | | | ± 5% range | 52.947 - 58.521 | 0.911 - 1.007 |
| | | | Measured | 55.69 | 0.977 |

* target values from KDB 865664, linear interpolated.

** test frequencies from KDB 447498 § 4.1.

Tissue simulant theoretical composition of ingredients (in % by weight):

| | |
|--------------------------------|---|
| Liquid body 450 MHz 750 MHz | Water: 51.18 % Sucrose: 46.76 % NaCl salt: 1.48 % Hydroxyethyl cellulose: 0.51 % Bactericide: 0.05% DGBE: Diethylenglykol-monobutylether: 0.01 % |
|--------------------------------|---|

SAR system verification

SAR measurement system verification procedure

The microwave circuit arrangement for system verification is showed in the bottom figure. Instruments and reference dipoles detailed in Test Equipment section of this Report. The tests were conducted daily on the same days as the measurement of the EUT. Steps of the measurement: 1) a CW power level of **1 W** at the same frequency of the reference dipole is measured in the point A; 2) this power level is input to the reference dipole positioned (through a calibrated jig) at the center of the flat section of the SAM phantom (or at the center of ellipsoidal shell) and a SAR measurement was performed to verify if the measured SAR was within +/- 10% from the target reference SAR values.

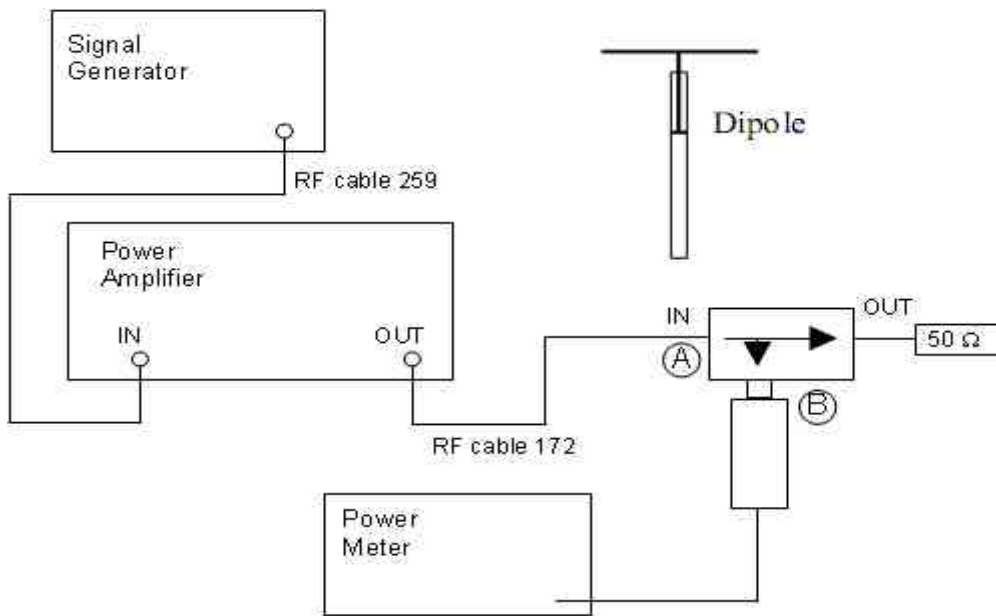


Figure 19 - System verification scheme

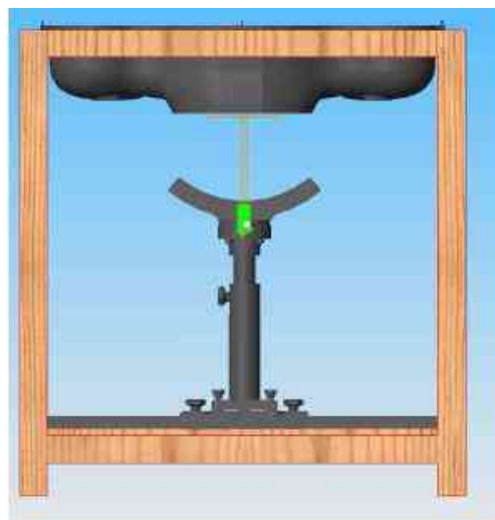


Figure 20 - Reference dipole position for system verification

| |
|---------------------|
| VALIDATION 1 |
|---------------------|

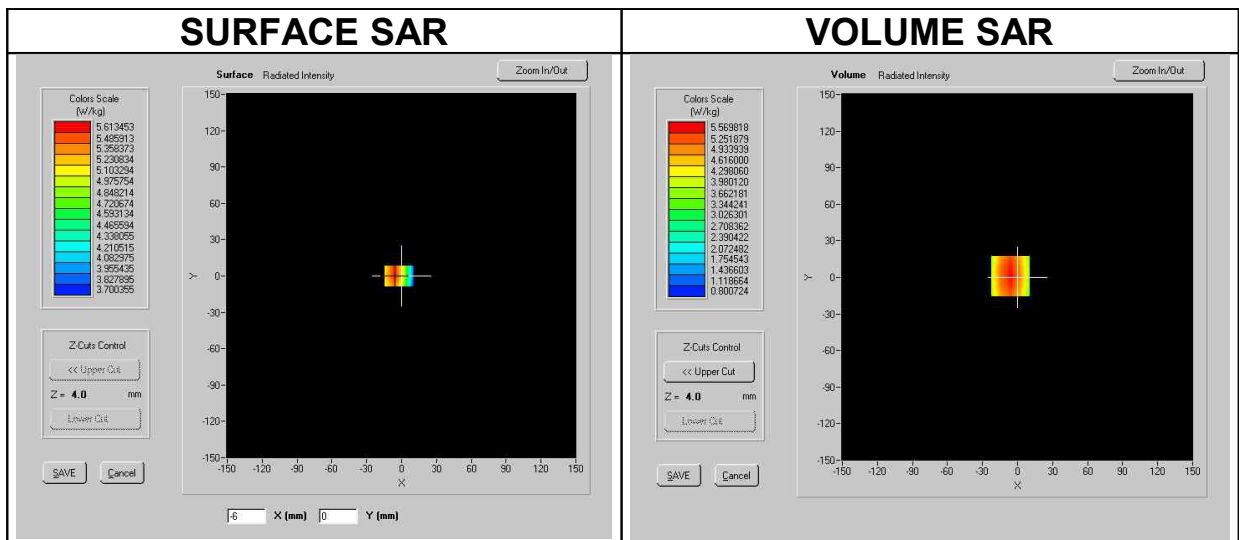
Type: Dipole measurement (Complete)
Date of measurement: 04/12/2015

A. Experimental conditions.

| | |
|---------------------------|------------------------|
| Phantom | Flat ellipsoidal shell |
| Device Position | Dipole |
| Band | 450 |
| Channel | Middle |
| Signal | CW (Duty Cycle: 1:1) |
| Dipole input power | 1 W |
| Probe | EP60 |
| Probe Path | Adaptative 1 max |
| Liquid Temperature | 22.6 °C |

B. SAR Measurement Results

| | |
|--|-----------------|
| Frequency (MHz) | 450.0 |
| Relative permittivity (real part) | 56.52 |
| Conductivity (S/m) | 0.944 |
| Maximum location | X=-6.00, Y=0.00 |



| SAR | SAR (W/kg) | Target value* (W/kg) | Variation (%) |
|---------|------------|----------------------|---------------|
| SAR 1g | 5.098 | 5.05 | +1.0 |
| SAR 10g | 3.510 | 3.47 | +1.2 |

* target value from manufacturer calibration dipole reference SAR.

VALIDATION 2

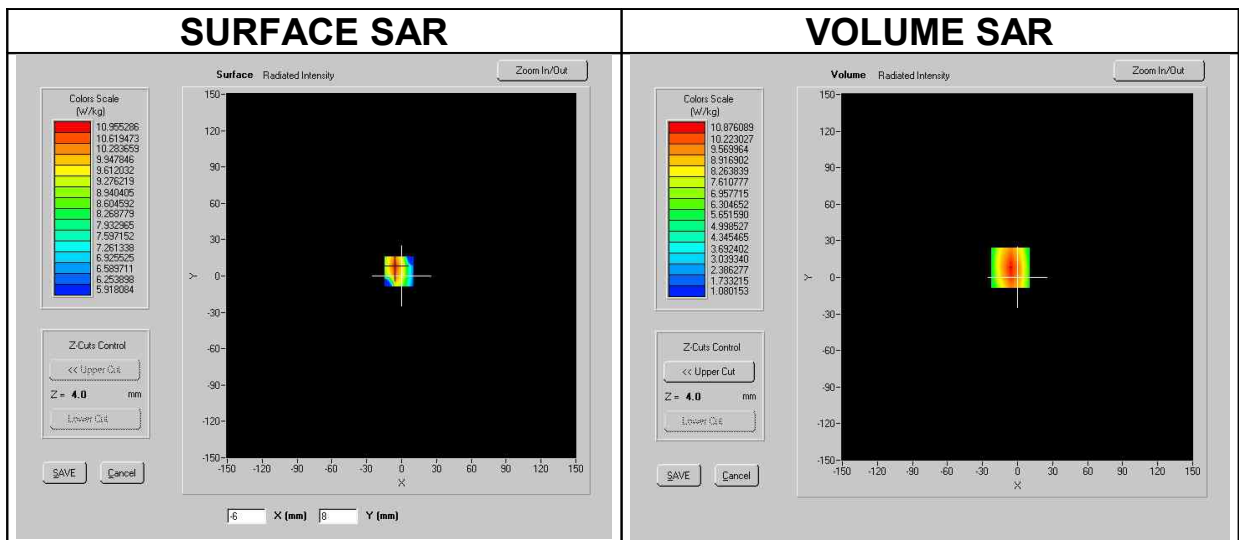
Type: Dipole measurement (Complete)
Date of measurement: 04/12/2015

A. Experimental conditions.

| | |
|---------------------------|------------------------|
| Phantom | Flat ellipsoidal shell |
| Device Position | Dipole |
| Band | 750 |
| Channel | Middle |
| Signal | CW (Duty Cycle: 1:1) |
| Dipole input power | 1 W |
| Probe | EP60 |
| Probe Path | Adaptative 1 max |
| Liquid Temperature | 22.6 °C |

B. SAR Measurement Results

| | |
|--|-----------------|
| Frequency (MHz) | 750.0 |
| Relative permittivity (real part) | 55.12 |
| Conductivity (S/m) | 0.982 |
| Maximum location | X=-6.00, Y=8.00 |



| SAR | SAR (W/kg) | Target value* (W/kg) | Variation (%) |
|---------|------------|----------------------|---------------|
| SAR 1g | 9.269 | 9.12 | +1.6 |
| SAR 10g | 6.119 | 6.01 | +1.8 |

* target value from manufacturer calibration dipole reference SAR value.

6. Test results

MEASUREMENT 1

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

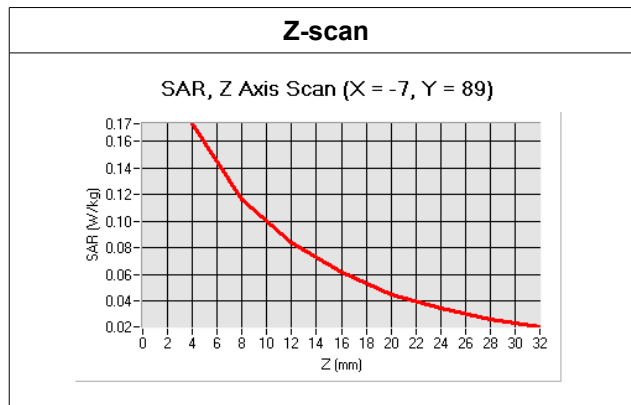
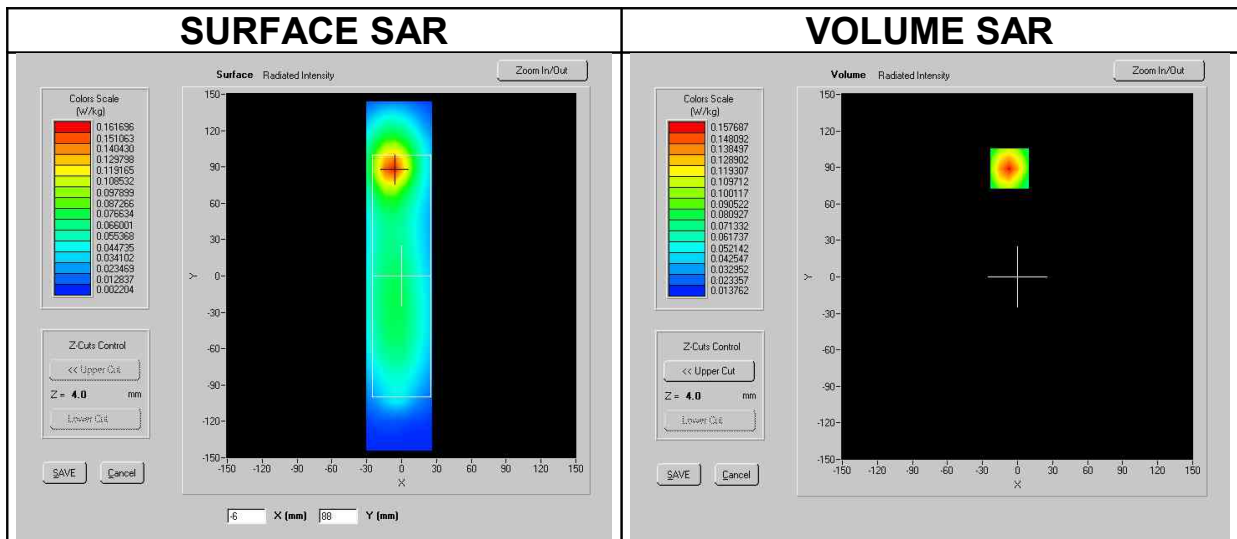
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Front side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH1 |
| Frequency | 470.1 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat (-30<=X<=26, -144<=Y<=144) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 470.1 |
| Relative permittivity (real part) | 56.17 |
| Conductivity (S/m) | 0.951 |
| Battery Power drift | -0.49 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|----------------------------|---------------------|---------------|
| Body SAR 1g | 0.162 | 1.6 | PASS |
| Extremity SAR 10g | 0.098 | 4.0 | PASS |

MEASUREMENT 2

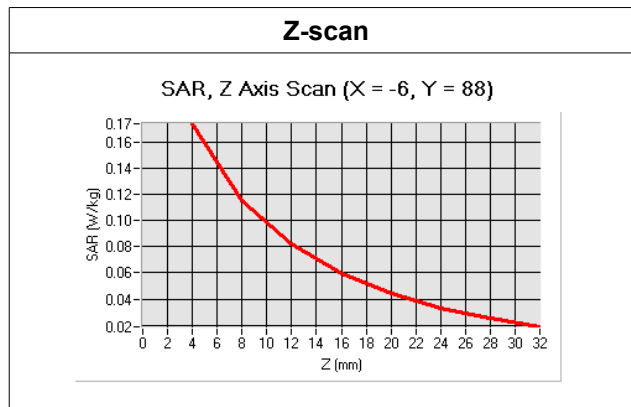
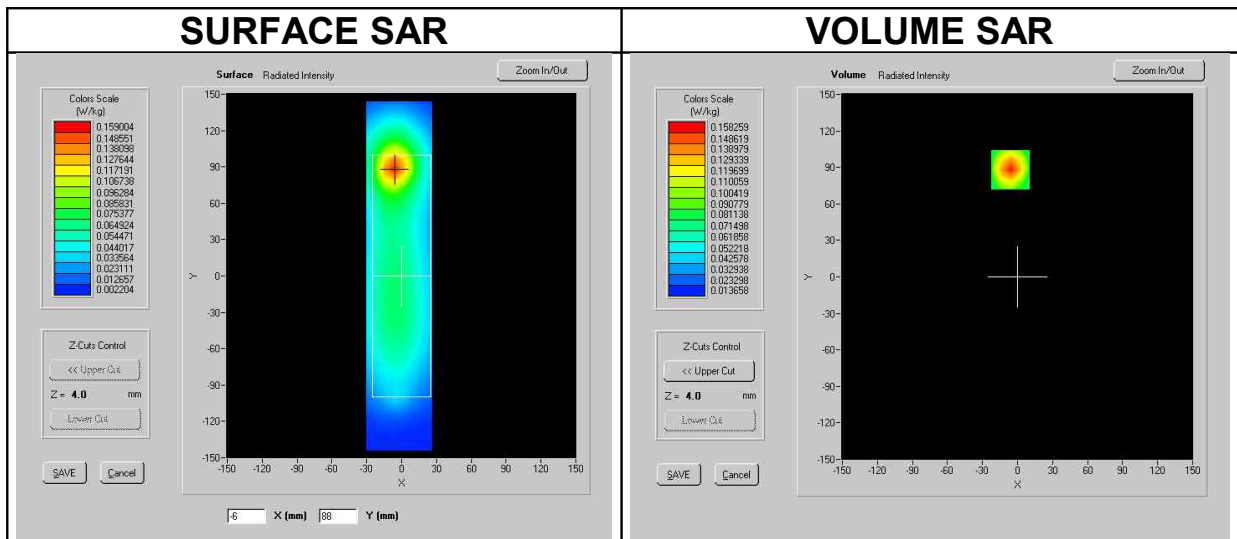
Type: Phone measurement (Complete)
 Date of measurement: 04/12/2015
 Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|--|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Rear side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH1 |
| Frequency | 470.1 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat (-30<=X<=26, -144<=Y<=144) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 470.1 |
| Relative permittivity (real part) | 56.17 |
| Conductivity (S/m) | 0.951 |
| Battery Power drift | -0.35 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.162 | 1.6 | PASS |
| Extremity SAR 10g | 0.097 | 4.0 | PASS |

MEASUREMENT 3

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

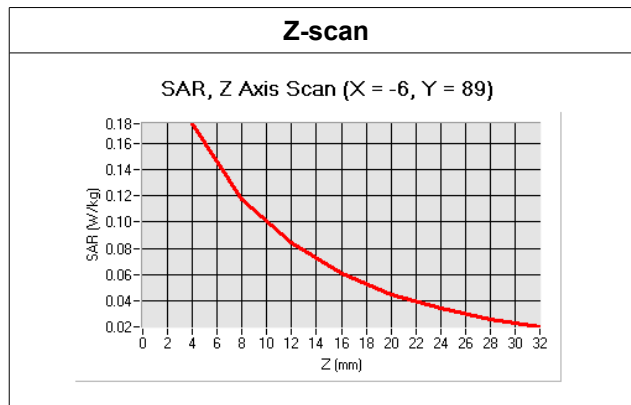
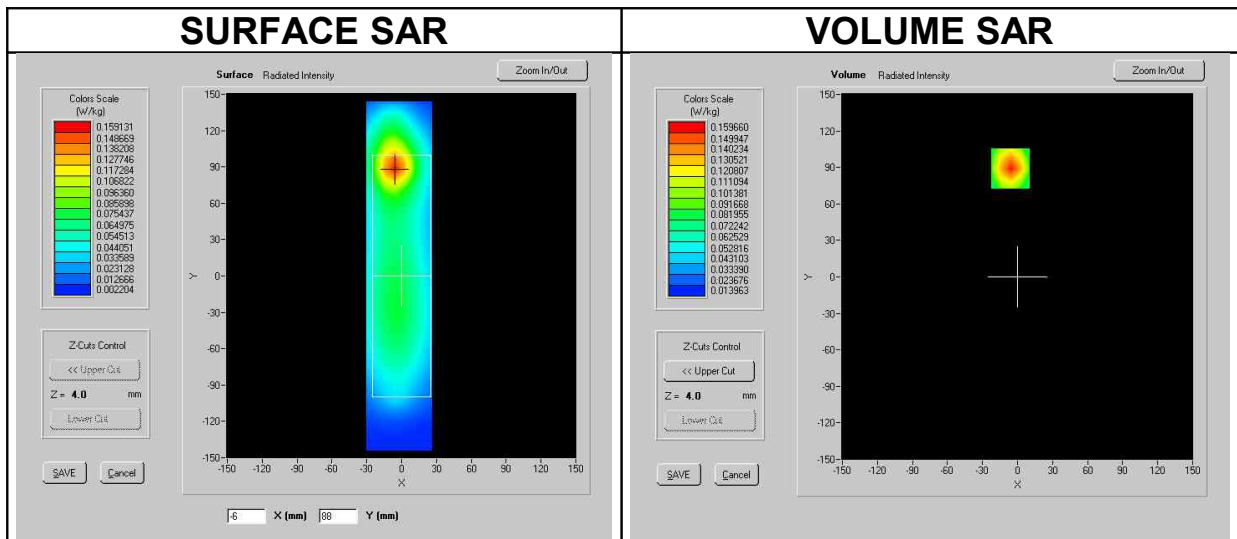
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|--|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Left side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH1 |
| Frequency | 470.1 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat (-30<=X<=26, -144<=Y<=144) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 470.1 |
| Relative permittivity (real part) | 56.17 |
| Conductivity (S/m) | 0.951 |
| Battery Power drift | -0.31 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.164 | 1.6 | PASS |
| Extremity SAR 10g | 0.099 | 4.0 | PASS |

MEASUREMENT 4

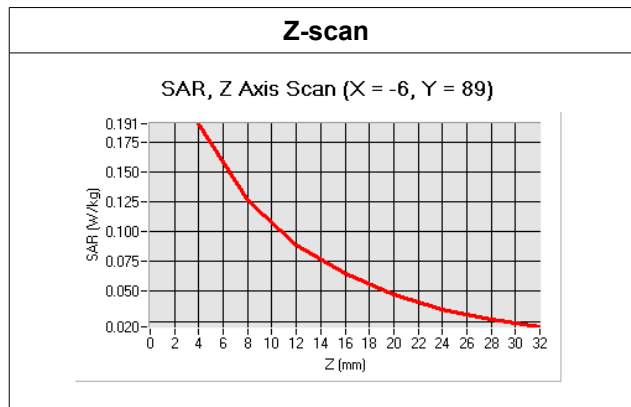
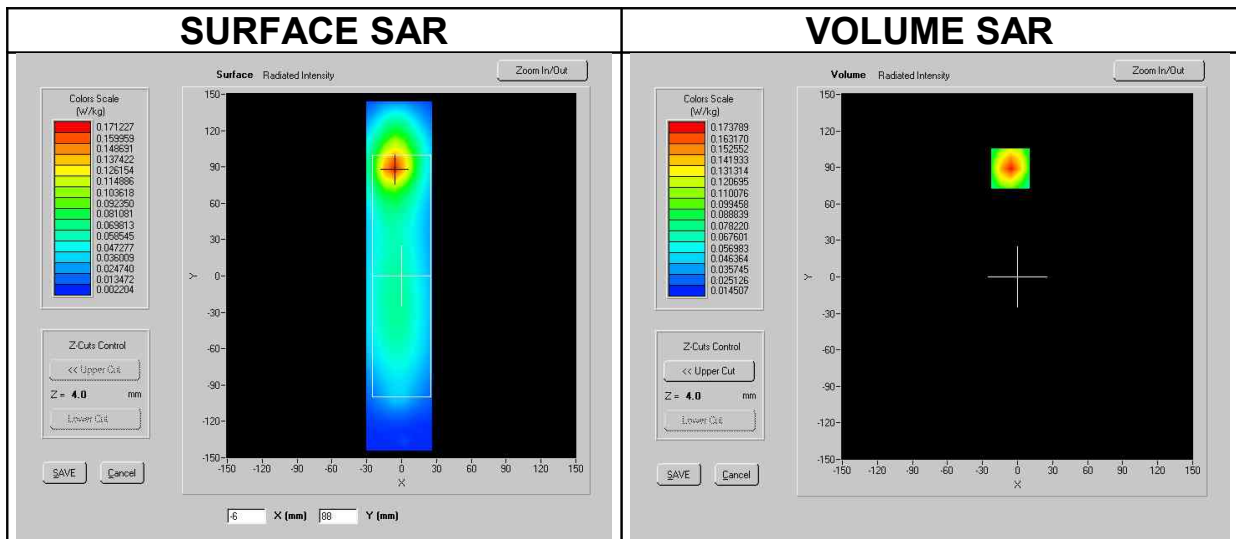
Type: Phone measurement (Complete)
 Date of measurement: 04/12/2015
 Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH1 |
| Frequency | 470.1 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat (-30<=X<=26, -144<=Y<=144) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 470.1 |
| Relative permittivity (real part) | 56.17 |
| Conductivity (S/m) | 0.951 |
| Battery Power drift | +0.52 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.179 | 1.6 | PASS |
| Extremity SAR 10g | 0.106 | 4.0 | PASS |

MEASUREMENT 5

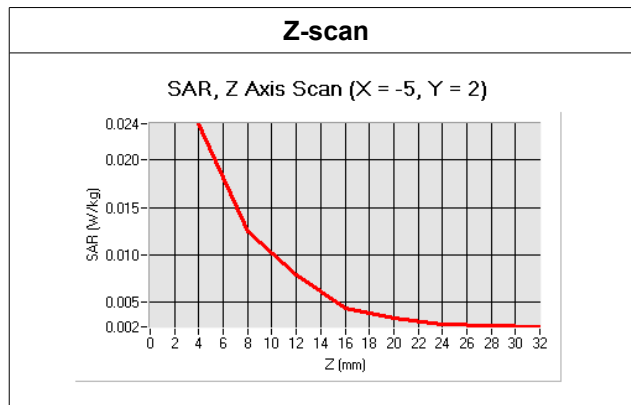
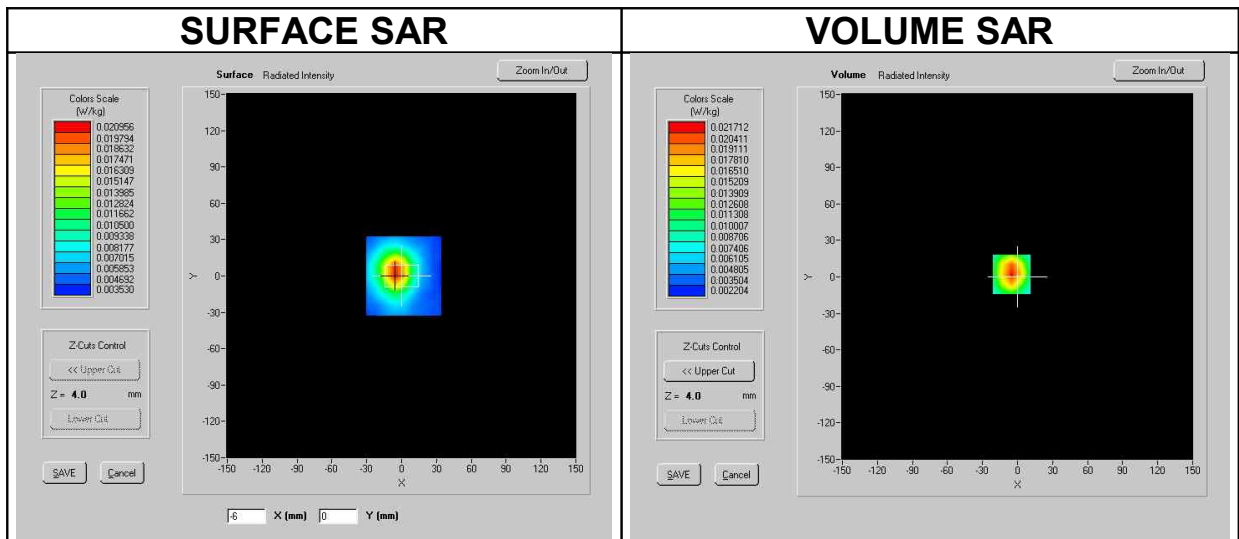
Type: Phone measurement (Complete)
 Date of measurement: 04/12/2015
 Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|--|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Bottom against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH1 |
| Frequency | 470.1 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat (-30<=X<=26, -144<=Y<=144) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|-----------|
| Frequency (MHz) | 470.1 |
| Relative permittivity (real part) | 56.17 |
| Conductivity (S/m) | 0.951 |
| Battery Power drift | -0.76 % |
| Peak SAR location | X=-6, Y=0 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|----------------------------|---------------------|---------------|
| Body SAR 1g | 0.023 | 1.6 | PASS |
| Extremity SAR 10g | 0.012 | 4.0 | PASS |

MEASUREMENT 6

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

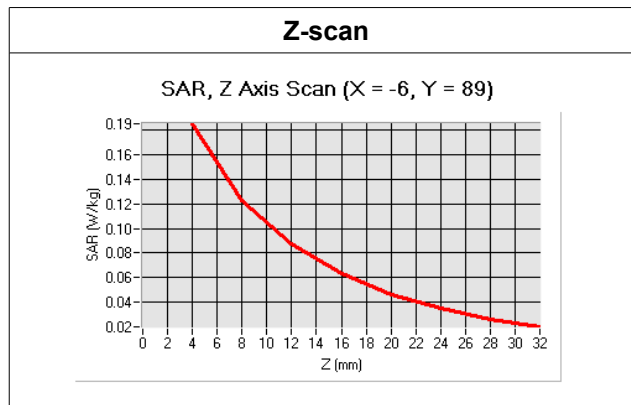
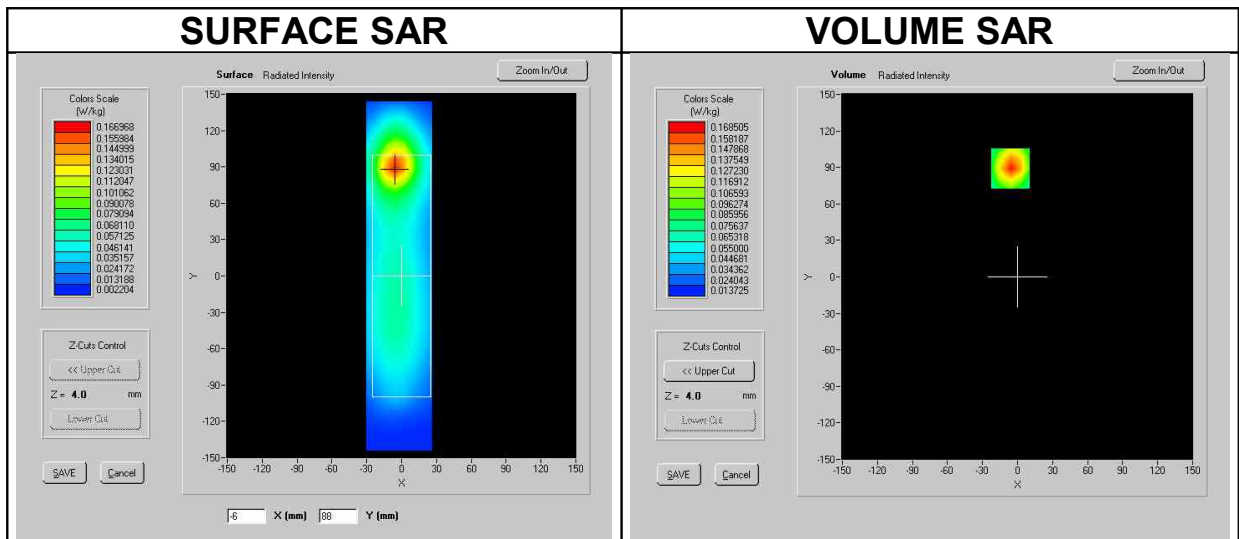
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH2 |
| Frequency | 493 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat (-30<=X<=26, -144<=Y<=144) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 493.0 |
| Relative permittivity (real part) | 56.13 |
| Conductivity (S/m) | 0.953 |
| Battery Power drift | -0.31 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|----------------------------|---------------------|---------------|
| Body SAR 1g | 0.174 | 1.6 | PASS |
| Extremity SAR 10g | 0.103 | 4.0 | PASS |

MEASUREMENT 7

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

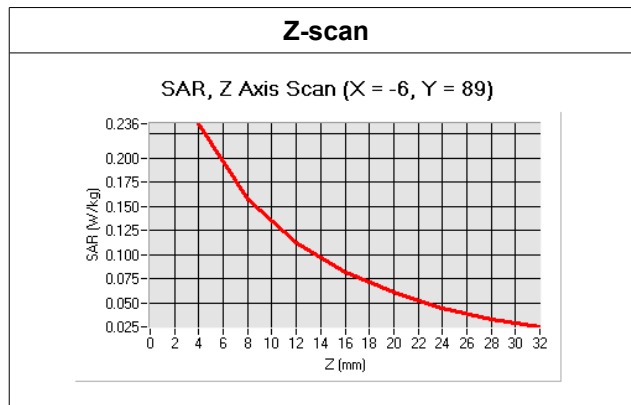
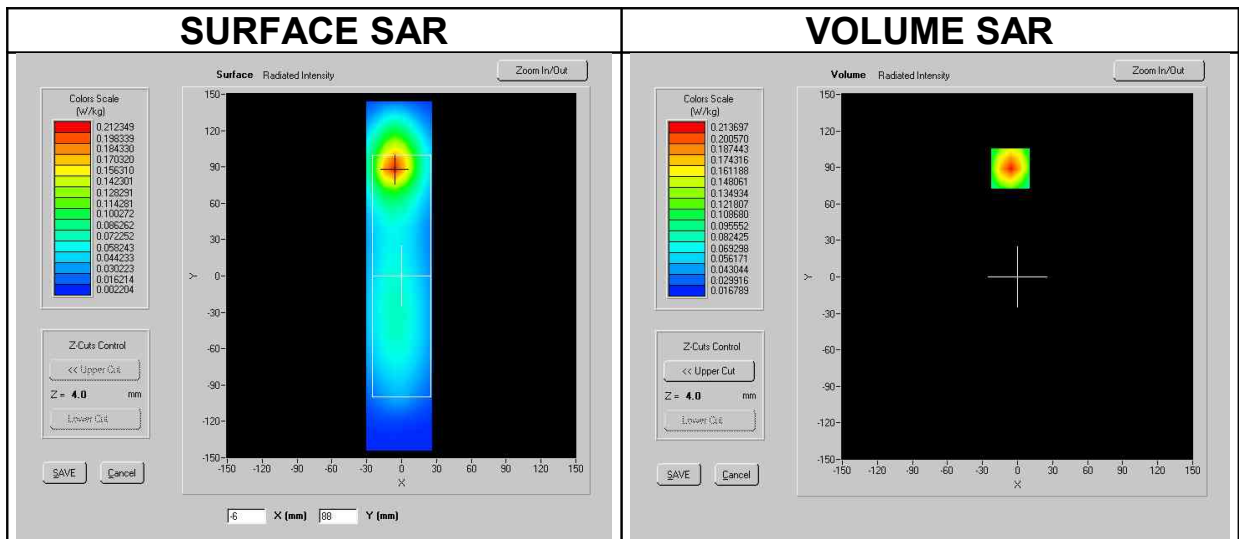
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH3 |
| Frequency | 516 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat ($-30 \leq X \leq 26$, $-144 \leq Y \leq 144$) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 516.0 |
| Relative permittivity (real part) | 56.11 |
| Conductivity (S/m) | 0.954 |
| Battery Power drift | -0.08 % |
| Peak SAR location | X=-6, Y=80 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.220 | 1.6 | PASS |
| Extremity SAR 10g | 0.132 | 4.0 | PASS |

MEASUREMENT 8

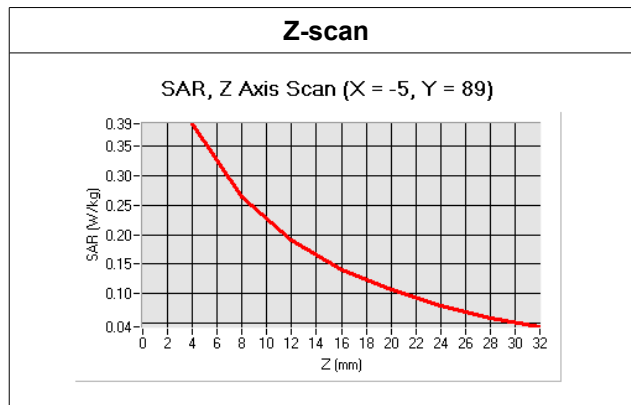
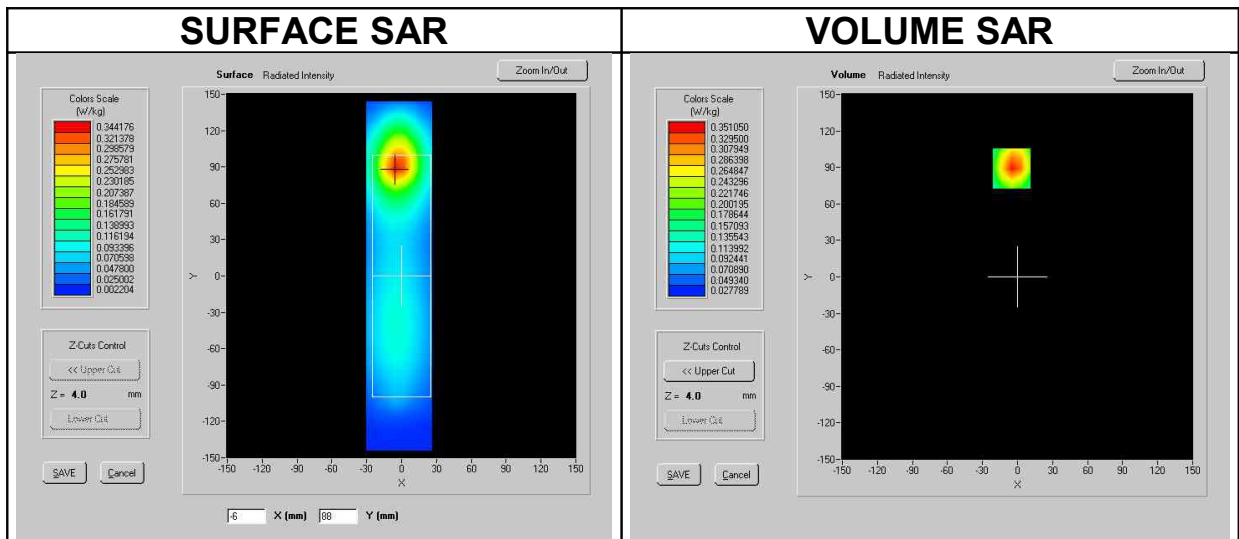
Type: Phone measurement (Complete)
 Date of measurement: 04/12/2015
 Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH4 |
| Frequency | 539 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat (-30<=X<=26, -144<=Y<=144) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 539.0 |
| Relative permittivity (real part) | 56.07 |
| Conductivity (S/m) | 0.955 |
| Battery Power drift | +0.10 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.368 | 1.6 | PASS |
| Extremity SAR 10g | 0.224 | 4.0 | PASS |

MEASUREMENT 9

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

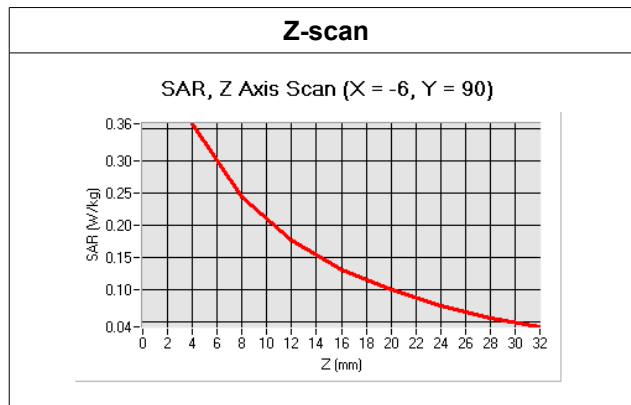
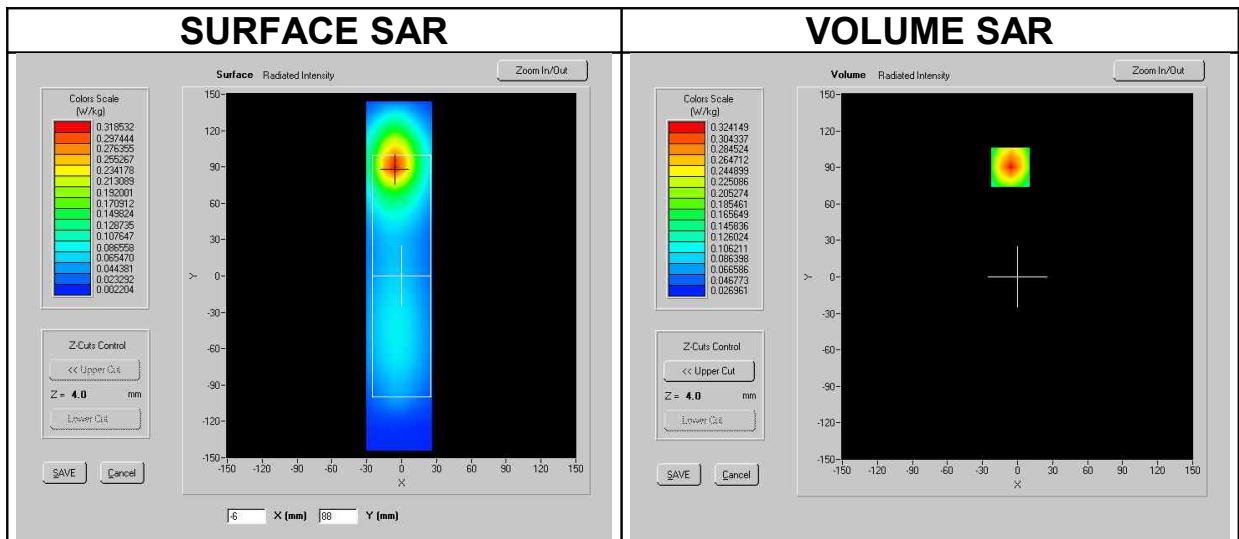
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH5 |
| Frequency | 562 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat (-30<=X<=26, -144<=Y<=144) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 562.0 |
| Relative permittivity (real part) | 56.01 |
| Conductivity (S/m) | 0.955 |
| Battery Power drift | -0.05 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.337 | 1.6 | PASS |
| Extremity SAR 10g | 0.206 | 4.0 | PASS |

MEASUREMENT 10

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

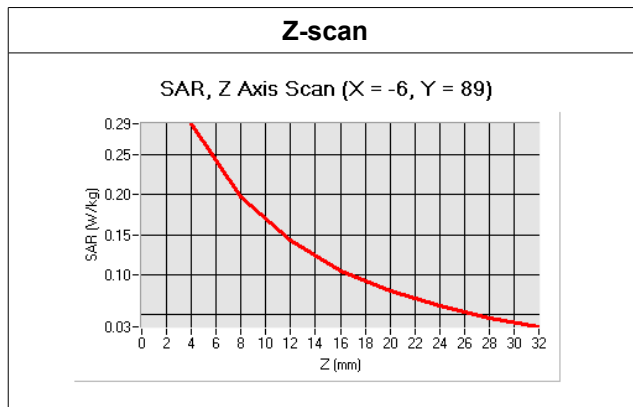
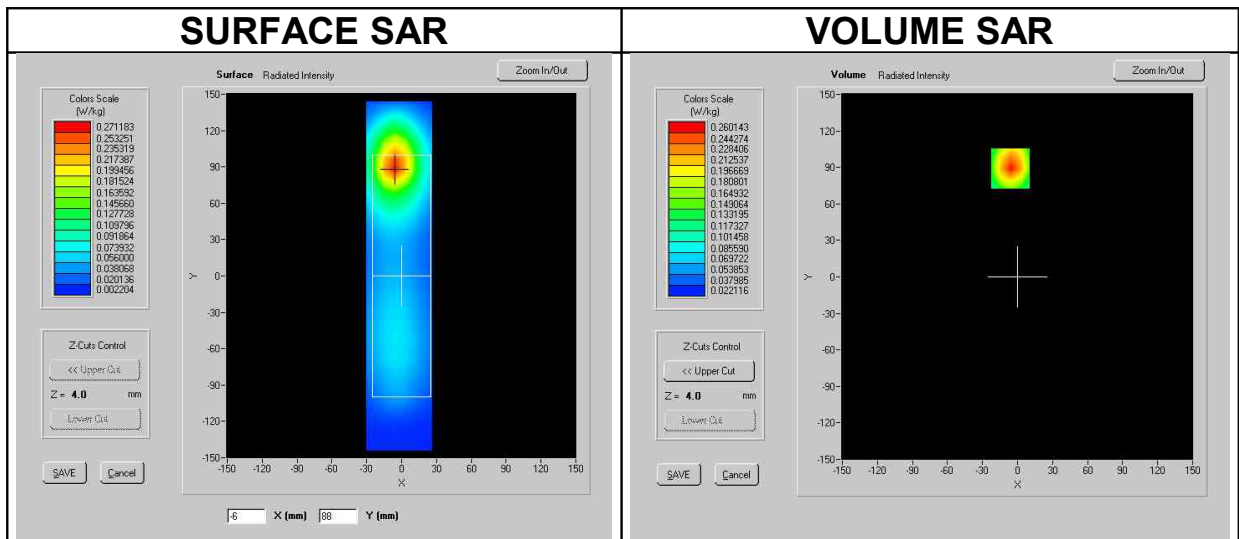
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH6 |
| Frequency | 585 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat ($-30 \leq X \leq 26$, $-144 \leq Y \leq 144$) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 585.0 |
| Relative permittivity (real part) | 55.97 |
| Conductivity (S/m) | 0.956 |
| Battery Power drift | -0.43 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.272 | 1.6 | PASS |
| Extremity SAR 10g | 0.167 | 4.0 | PASS |

MEASUREMENT 11

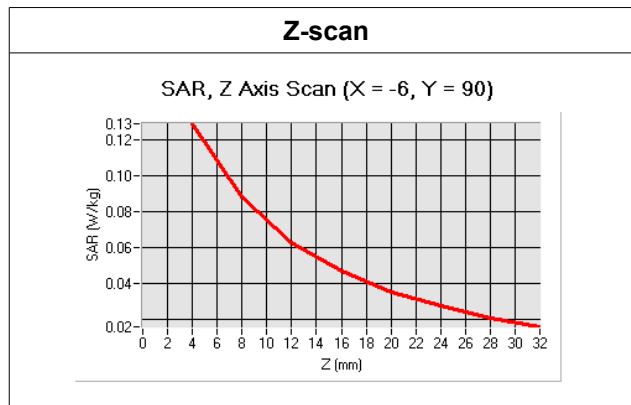
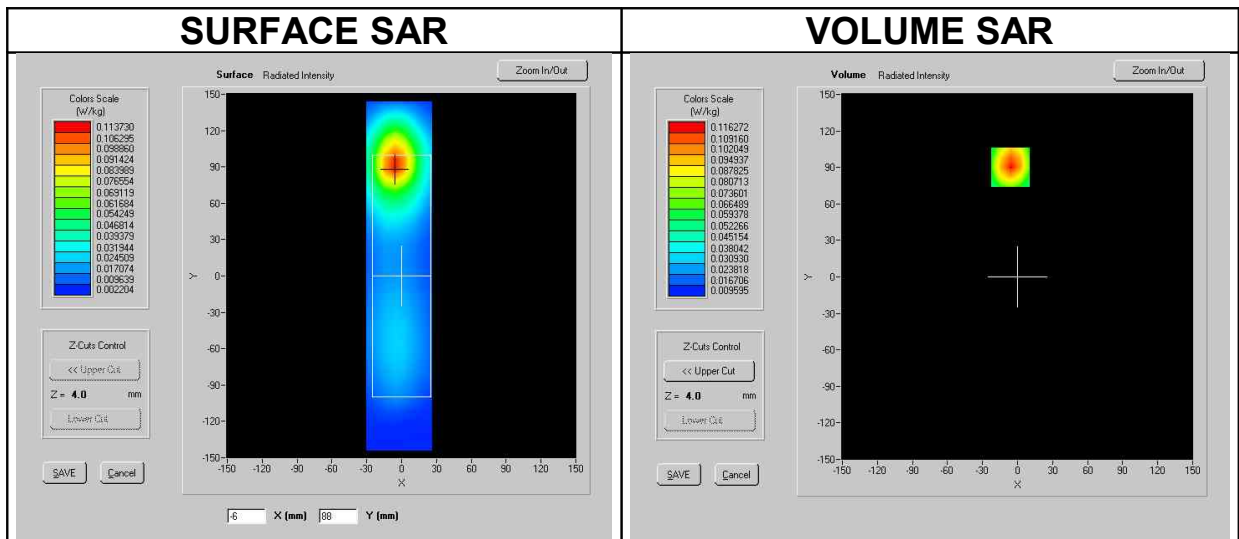
Type: Phone measurement (Complete)
 Date of measurement: 04/12/2015
 Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 470-608 MHz |
| Channel | B1 CH7 |
| Frequency | 608 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat (-30<=X<=26, -144<=Y<=144) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 608.0 |
| Relative permittivity (real part) | 55.95 |
| Conductivity (S/m) | 0.955 |
| Battery Power drift | +0.23 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.122 | 1.6 | PASS |
| Extremity SAR 10g | 0.075 | 4.0 | PASS |

MEASUREMENT 12

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

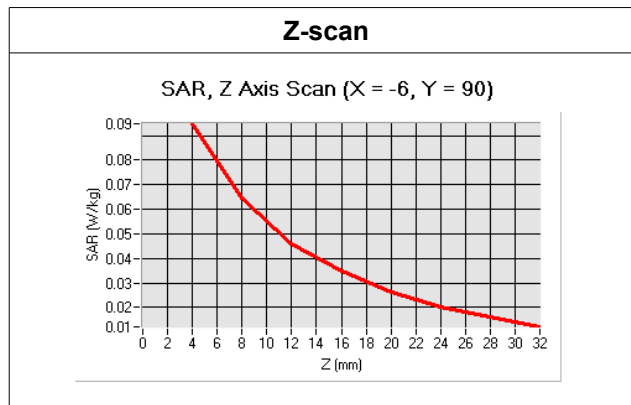
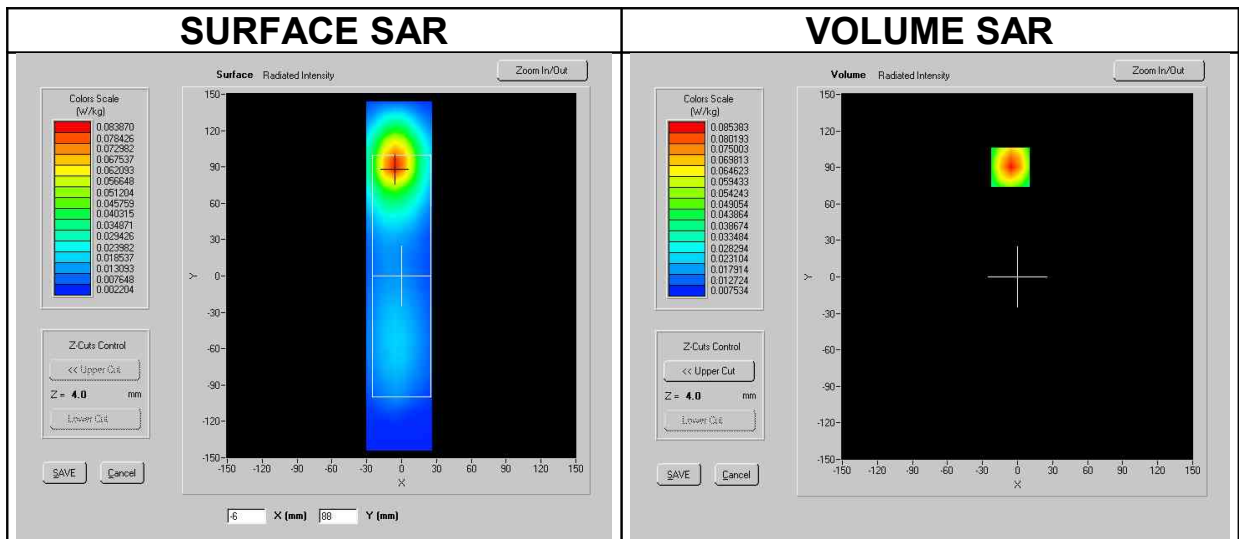
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 614-698 MHz |
| Channel | B2 CH1 |
| Frequency | 614 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat ($-30 \leq X \leq 26$, $-144 \leq Y \leq 144$) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 614.0 |
| Relative permittivity (real part) | 55.93 |
| Conductivity (S/m) | 0.956 |
| Battery Power drift | -0.24 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.090 | 1.6 | PASS |
| Extremity SAR 10g | 0.055 | 4.0 | PASS |

MEASUREMENT 13

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

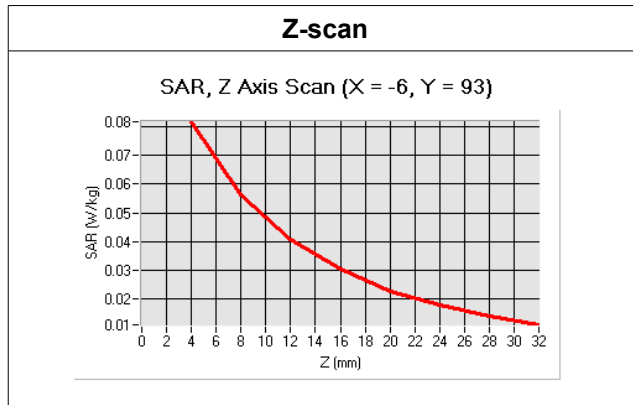
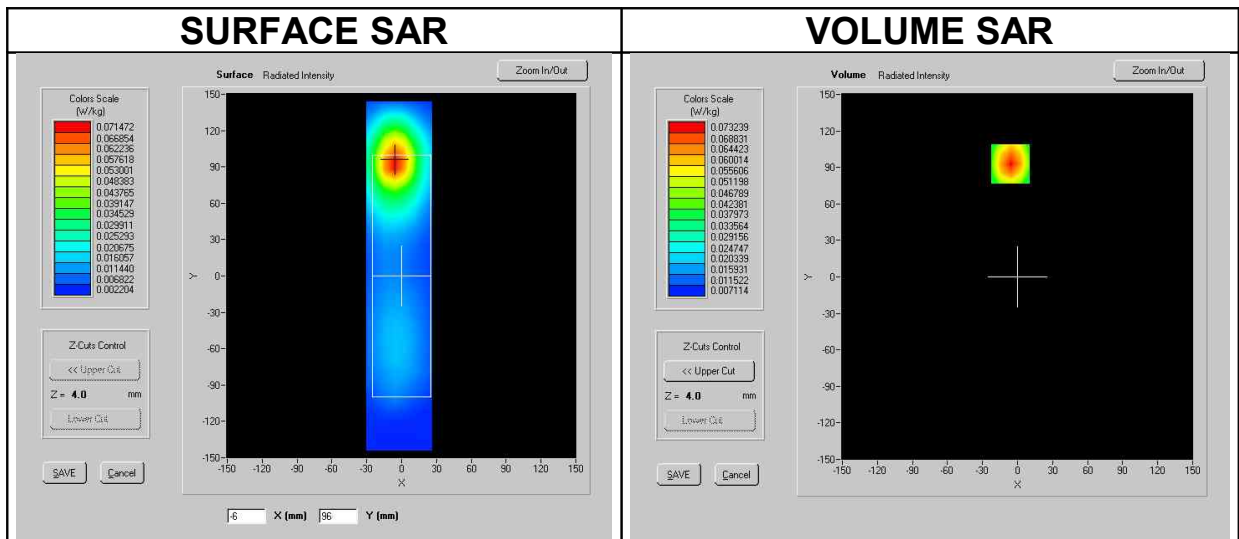
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 614-698 MHz |
| Channel | B2 CH2 |
| Frequency | 635 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat ($-30 \leq X \leq 26$, $-144 \leq Y \leq 144$) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 635.0 |
| Relative permittivity (real part) | 55.89 |
| Conductivity (S/m) | 0.961 |
| Battery Power drift | -0.23 % |
| Peak SAR location | X=-6, Y=96 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.077 | 1.6 | PASS |
| Extremity SAR 10g | 0.048 | 4.0 | PASS |

MEASUREMENT 14

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

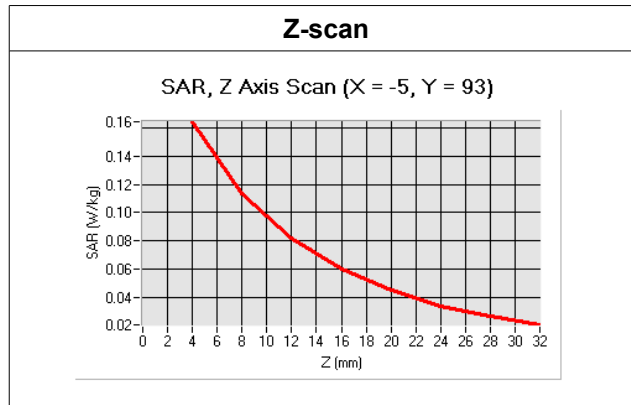
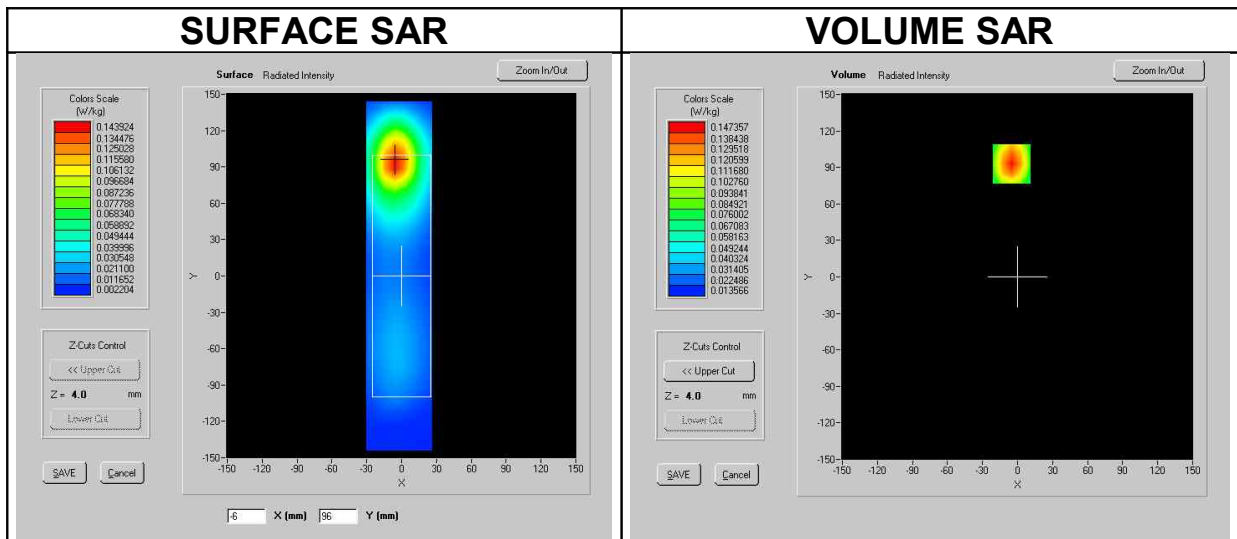
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 614-698 MHz |
| Channel | B2 CH3 |
| Frequency | 656 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat ($-30 \leq X \leq 26$, $-144 \leq Y \leq 144$) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 656.0 |
| Relative permittivity (real part) | 55.81 |
| Conductivity (S/m) | 0.969 |
| Battery Power drift | +0.15 % |
| Peak SAR location | X=-6, Y=96 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.155 | 1.6 | PASS |
| Extremity SAR 10g | 0.096 | 4.0 | PASS |

MEASUREMENT 15

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

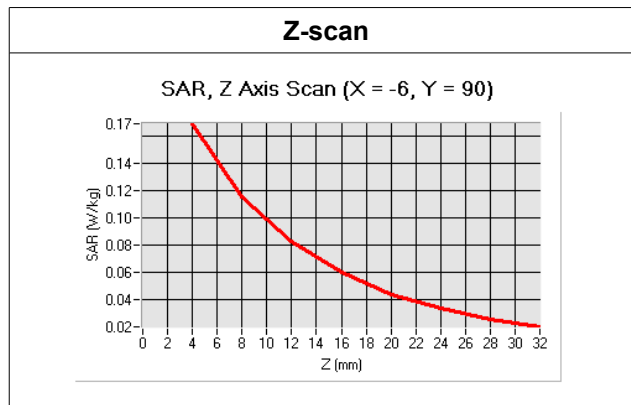
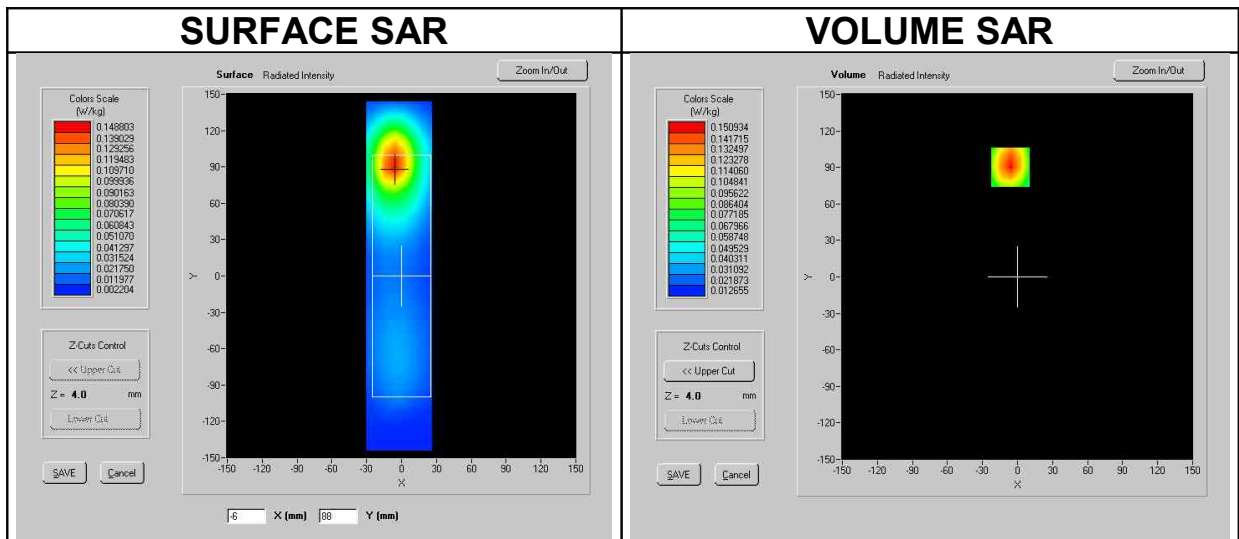
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 614-698 MHz |
| Channel | B2 CH4 |
| Frequency | 677 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat ($-30 \leq X \leq 26$, $-144 \leq Y \leq 144$) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 677.0 |
| Relative permittivity (real part) | 55.77 |
| Conductivity (S/m) | 0.975 |
| Battery Power drift | +0.10 % |
| Peak SAR location | X=-6, Y=88 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.160 | 1.6 | PASS |
| Extremity SAR 10g | 0.099 | 4.0 | PASS |

MEASUREMENT 16

Type: Phone measurement (Complete)

Date of measurement: 04/12/2015

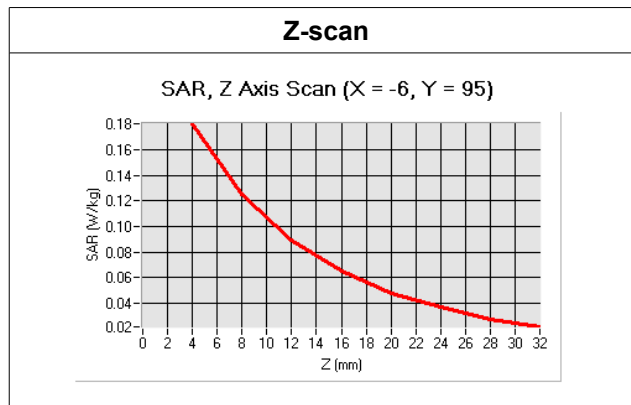
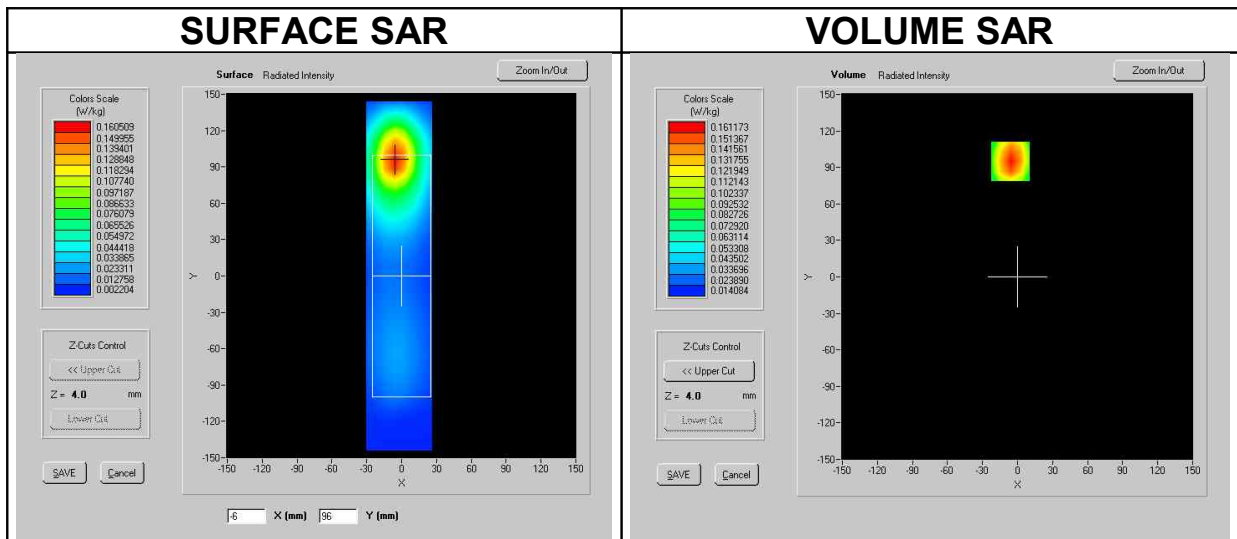
Tested device / Serial number / IMEI: D257000039

A. Experimental conditions.

| | |
|--------------------------------|---|
| Phantom | Flat ellipsoidal shell SN 46/07 ELLI13 |
| Device Use | Handheld and Body-worn |
| DUT Position | With the Right side against the phantom |
| Antenna Position | Fixed embedded |
| Accessories | none |
| Band | 614-698 MHz |
| Channel | B2 CH5 |
| Frequency | 698 MHz |
| Transmission modulation | FM digital |
| Signal | CW (Duty Cycle: 1:1) |
| Probe Path | Flat ($-30 \leq X \leq 26$, $-144 \leq Y \leq 144$) mm |
| Distance | d=0 mm |
| Probe | EP60 |
| Liquid temperature | 22.5°C ÷ 22.6°C |

B. SAR Measurement Results

| | |
|--|------------|
| Frequency (MHz) | 698.0 |
| Relative permittivity (real part) | 55.69 |
| Conductivity (S/m) | 0.977 |
| Battery Power drift | -0.02 % |
| Peak SAR location | X=-6, Y=96 |



| SAR | Measured SAR (W/kg) | Limit (W/kg) | Result |
|-------------------|---------------------|--------------|-------------|
| Body SAR 1g | 0.171 | 1.6 | PASS |
| Extremity SAR 10g | 0.106 | 4.0 | PASS |

7. Evaluation

In the following table the SAR results for the tested device are summarized.

| Meas. # | Band | Frequency | Mode | Phantom | DUT orientation against the phantom | Antenna | Measured Body SAR 1g (W/kg) | Limit SAR 1g (W/kg) | Measured Extremity SAR 10g (W/kg) | Limit SAR 10g (W/kg) | Result |
|---------|-------------|---------------------|----------------------------------|------------------|-------------------------------------|---------|-----------------------------|---------------------|-----------------------------------|----------------------|--------|
| 1 | 470-608 MHz | B1 CH1 470.1 MHz | FM Max power setting 50 mW | flat ellipsoidal | Front side | fixed | 0.162 | 1.6 | 0.098 | 4 | Pass |
| 2 | 470-608 MHz | B1 CH1 470.1 MHz | FM Max power setting 50 mW | flat ellipsoidal | Rear side | fixed | 0.162 | 1.6 | 0.097 | 4 | Pass |
| 3 | 470-608 MHz | B1 CH1 470.1 MHz | FM Max power setting 50 mW | flat ellipsoidal | Left side | fixed | 0.164 | 1.6 | 0.099 | 4 | Pass |
| 4 | 470-608 MHz | B1 CH1 470.1 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.179 | 1.6 | 0.106 | 4 | Pass |
| 5 | 470-608 MHz | B1 CH1 470.1 MHz | FM Max power setting 50 mW | flat ellipsoidal | Bottom | fixed | 0.023 | 1.6 | 0.012 | 4 | Pass |
| 6 | 470-608 MHz | B1 CH2 493 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.174 | 1.6 | 0.103 | 4 | Pass |
| 7 | 470-608 MHz | B1 CH3 516 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.220 | 1.6 | 0.132 | 4 | Pass |
| 8 | 470-608 MHz | B1 CH4 539 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.368 | 1.6 | 0.224 | 4 | Pass |

| | | | | | | | | | | | |
|----|-------------|----------------|----------------------------|------------------|------------|-------|-------|-----|-------|---|------|
| 9 | 470-608 MHz | B1 CH5 562 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.337 | 1.6 | 0.206 | 4 | Pass |
| 10 | 470-608 MHz | B1 CH6 585 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.272 | 1.6 | 0.167 | 4 | Pass |
| 11 | 470-608 MHz | B1 CH7 608 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.122 | 1.6 | 0.075 | 4 | Pass |
| 12 | 614-698 MHz | B2 CH1 614 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.090 | 1.6 | 0.055 | 4 | Pass |
| 13 | 614-698 MHz | B2 CH2 635 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.077 | 1.6 | 0.048 | 4 | Pass |
| 14 | 614-698 MHz | B2 CH3 656 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.155 | 1.6 | 0.096 | 4 | Pass |
| 15 | 614-698 MHz | B2 CH4 677 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.160 | 1.6 | 0.099 | 4 | Pass |
| 16 | 614-698 MHz | B2 CH5 698 MHz | FM Max power setting 50 mW | flat ellipsoidal | Right side | fixed | 0.171 | 1.6 | 0.106 | 4 | Pass |

The maximum Body Specific Absorption Rate (SAR) averaged over 1g, determined at 539 MHz frequency in FM mode, of the Wireless Hand-Held Transmitter – dBtechnologies MOVING D-H portable unit, is **0.368 W/kg**.

The overall margin of uncertainty for these measurements is given at the Uncertainty evaluation section.

The SAR 1g exposure limit applied, as detailed in the FCC KDB 447498 D01 v06 “Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies - General RF Exposure Guidance” for General population/Uncontrolled exposure - Spatial Peak (averaged over any 1g of tissue)

is equal to **1.6 W/Kg**.

This unit as tested is found to be **COMPLIANT** with this requirement.

The maximum Extremity (hand) Specific Absorption Rate (SAR) averaged over 10g, determined at 539 MHz frequency in FM mode, of the Wireless Hand-Held Transmitter – dBtechnologies MOVING D-H portable unit, is **0.224 W/kg**.

The overall margin of uncertainty for these measurements is given at the Uncertainty evaluation section.

The Extremity SAR 10g exposure limit applied, as detailed in the FCC KDB 447498 D01 v06 “Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies - General RF Exposure Guidance” for General population/Uncontrolled exposure - Spatial Peak (averaged over any 1g of tissue) is equal to **4.0 W/Kg**.

This unit as tested is found to be **COMPLIANT** with this requirement.

8. Uncertainty evaluation

Below the contributions of each component of uncertainty is reported together with its name, probability distribution, sensitivity coefficient and uncertainty value. The results are recorded in a table and the combined uncertainty is given, as required by the standards.

The following table includes the uncertainty table of the IEEE 1528:2013.
The values are determined by the manufacturer of SAR System.

UNCERTAINTY EVALUATION FOR HANDSET SAR TEST

| a | b | c | d | e= f(d,k) | f | g | h= c*f/e | i= c*g/e | k |
|---|-------|--------------|----------------|------------|-----------------|-----------------|----------------|-----------------|-----|
| Uncertainty Component | Sec. | Tol (+-%) | Prob. Dist. | Div. | Ci (1g) | Ci (10g) | 1g Ui (+-%) | 10g Ui (+-%) | Vi |
| Measurement System | | | | | | | | | |
| Probe calibration | E.2.1 | 7.0 | N | 1 | 1 | 1 | 7.00 | 7.00 | ∞ |
| Axial Isotropy | E.2.2 | 1.5 | R | $\sqrt{3}$ | $(1-C_p)^{1/2}$ | $(1-C_p)^{1/2}$ | 0.61 | 0.61 | ∞ |
| Hemispherical Isotropy | E.2.2 | 1.7 | R | $\sqrt{3}$ | $\sqrt{C_p}$ | $\sqrt{C_p}$ | 0.69 | 0.69 | ∞ |
| Boundary effect | E.2.3 | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.58 | 0.58 | ∞ |
| Linearity | E.2.4 | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.71 | 2.71 | ∞ |
| System detection limits | E.2.4 | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.58 | 0.58 | ∞ |
| Modulation response | E.2.5 | 2.4 | R | $\sqrt{3}$ | 1 | 1 | 1.39 | 1.39 | ∞ |
| Readout Electronics | E.2.6 | 0.02 | N | 1 | 1 | 1 | 0.02 | 0.02 | ∞ |
| Reponse Time | E.2.7 | 3.0 | R | $\sqrt{3}$ | 1 | 1 | 1.73 | 1.73 | ∞ |
| Integration Time | E.2.8 | 2.0 | R | $\sqrt{3}$ | 1 | 1 | 1.15 | 1.15 | ∞ |
| RF ambient Conditions - noise | E.6.1 | 3.0 | R | $\sqrt{3}$ | 1 | 1 | 1.73 | 1.73 | ∞ |
| RF ambient Conditions - reflections | E.6.1 | 3.0 | R | $\sqrt{3}$ | 1 | 1 | 1.73 | 1.73 | ∞ |
| Probe positioner Mechanical Tolerance | E.6.2 | 2.0 | R | $\sqrt{3}$ | 1 | 1 | 1.15 | 1.15 | ∞ |
| Probe positioning with respect to Phantom Shell | E.6.3 | 0.05 | R | $\sqrt{3}$ | 1 | 1 | 0.03 | 0.03 | ∞ |
| Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation | E.5 | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.89 | 2.89 | ∞ |
| Test sample Related | | | | | | | | | |
| SAR scaling / Power scaling | E.6.5 | 0.0 | R | $\sqrt{3}$ | 1 | 1 | 0.0 | 0.0 | ∞ |
| Test sample positioning | E.4.2 | 0.03 | N | 1 | 1 | 1 | 0.03 | 0.03 | N-1 |
| Device Holder Uncertainty | E.4.1 | 5.00 | N | 1 | 1 | 1 | 5.00 | 5.00 | N-1 |
| Output power Variation - SAR drift measurement | E.2.9 | 3.0 | R | $\sqrt{3}$ | 1 | 1 | 1,7320 | 1,7320 | ∞ |

| Phantom and Tissue Parameters | | | | | | | | | |
|---|-------|-------|-------|------------|------|------|-------|-------|----------|
| Phantom Uncertainty (Shape and thickness tolerances) | E.3.1 | 0.05 | R | $\sqrt{3}$ | 1 | 1 | 0.03 | 0.03 | ∞ |
| Liquid conductivity - deviation from target value | E.3.2 | 1.54 | R | $\sqrt{3}$ | 0.64 | 0.43 | 0.57 | 0.38 | ∞ |
| Liquid conductivity - measurement uncertainty | E.3.3 | 5.00 | N | 1 | 0.64 | 0.43 | 3.20 | 2.15 | M |
| Liquid permittivity - deviation from target value | E.3.2 | 1.12 | R | $\sqrt{3}$ | 0.6 | 0.49 | 0.39 | 0.32 | ∞ |
| Liquid permittivity - measurement uncertainty | E.3.3 | 10.00 | N | 1 | 0.6 | 0.49 | 6.00 | 4.90 | M |
| Temp. unc. - Conductivity | E.3.4 | 1.7 | R | $\sqrt{3}$ | 0.78 | 0.71 | 0.8 | 0.7 | ∞ |
| Temp. unc. - Permittivity | E.3.4 | 0.4 | R | $\sqrt{3}$ | 0.23 | 0.26 | 0.05 | 0.06 | ∞ |
| Combined Standard Uncertainty | | | RSS | | | | 11.90 | 11.42 | |
| Expanded Uncertainty (95% Confidence interval) | | | k = 2 | | | | 23.80 | 22.64 | |

9. System validation check uncertainty

Below the contributions of each component of uncertainty is reported together with its name, probability distribution, sensitivity coefficient and uncertainty value. The results are recorded in a table and the combined uncertainty is given, as required by the standards.


The following table includes the uncertainty table of the IEEE 1528:2013.
The values are determined by the manufacturer of SAR System.

UNCERTAINTY FOR SYSTEM PERFORMANCE CHECK

| a | b | c | d | e= f(d,k) | f | g | h= c*f/e | i= c*g/e | k |
|---|---------|-----------|-------------|------------|-----------------|-----------------|-------------|--------------|-----|
| Uncertainty Component | Sec. | Tol (+-%) | Prob. Dist. | Div. | Ci (1g) | Ci (10g) | 1g Ui (+-%) | 10g Ui (+-%) | Vi |
| Measurement System | | | | | | | | | |
| Probe calibration | E.2.1 | 7.0 | N | 1 | 1 | 1 | 7.00 | 7.00 | ∞ |
| Axial Isotropy | E.2.2 | 1.5 | R | $\sqrt{3}$ | $(1-C_p)^{1/2}$ | $(1-C_p)^{1/2}$ | 0.61 | 0.61 | ∞ |
| Hemispherical Isotropy | E.2.2 | 1.7 | R | $\sqrt{3}$ | $\sqrt{C_p}$ | $\sqrt{C_p}$ | 0.69 | 0.69 | ∞ |
| Boundary effect | E.2.3 | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.58 | 0.58 | ∞ |
| Linearity | E.2.4 | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.71 | 2.71 | ∞ |
| System detection limits | E.2.4 | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.58 | 0.58 | ∞ |
| Modulation response | E.2.5 | 0 | R | $\sqrt{3}$ | 1 | 1 | 0.0 | 0.0 | ∞ |
| Readout Electronics | E.2.6 | 0.02 | N | 1 | 1 | 1 | 0.02 | 0.02 | ∞ |
| Reponse Time | E.2.7 | 3.0 | R | $\sqrt{3}$ | 1 | 1 | 1.73 | 1.73 | ∞ |
| Integration Time | E.2.8 | 2.0 | R | $\sqrt{3}$ | 1 | 1 | 1.15 | 1.15 | ∞ |
| RF ambient Conditions - noise | E.6.1 | 3.0 | R | $\sqrt{3}$ | 1 | 1 | 1.73 | 1.73 | ∞ |
| RF ambient Conditions - reflections | E.6.1 | 3.0 | R | $\sqrt{3}$ | 1 | 1 | 1.73 | 1.73 | ∞ |
| Probe positioner Mechanical Tolerance | E.6.2 | 2.0 | R | $\sqrt{3}$ | 1 | 1 | 1.15 | 1.15 | ∞ |
| Probe positioning with respect to Phantom Shell | E.6.3 | 0.05 | R | $\sqrt{3}$ | 1 | 1 | 0.03 | 0.03 | ∞ |
| Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation | E.5 | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.89 | 2.89 | ∞ |
| Dipole | | | | | | | | | |
| Deviation of experimental dipole from numerical dipole | E.6.4 | 5.0 | N | 1 | 1 | 1 | 5.0 | 5.0 | ∞ |
| Dipole axis to liquid Distance | 8,E.6.6 | 1.00 | N | $\sqrt{3}$ | 1 | 1 | 0.58 | 0.58 | N-1 |
| Input power and SAR drift measurement | 8,6.6.4 | 2.00 | R | $\sqrt{3}$ | 1 | 1 | 1.1547 | 1,1547 | ∞ |
| Phantom and Tissue Parameters | | | | | | | | | |
| Phantom Uncertainty (Shape and thickness tolerances) | E.3.1 | 0.05 | R | | 1 | 1 | 0.03 | 0.03 | ∞ |

| | | | | | | | | | |
|---|-------|-------|-------|------------|------|------|--------|-------|----------|
| Liquid conductivity - deviation from target value | E.3.2 | 1.54 | R | $\sqrt{3}$ | 0.64 | 0.43 | 0.57 | 0.38 | ∞ |
| Liquid conductivity - measurement uncertainty | E.3.3 | 5.00 | N | 1 | 0.64 | 0.43 | 3.20 | 2.15 | M |
| Liquid permittivity - deviation from target value | E.3.2 | 1.12 | R | $\sqrt{3}$ | 0.6 | 0.49 | 0.39 | 0.32 | ∞ |
| Liquid permittivity - measurement uncertainty | E.3.3 | 10.00 | N | 1 | 0.6 | 0.49 | 6.00 | 4.90 | M |
| Temp. unc. - Conductivity | E.3.4 | 1.7 | R | $\sqrt{3}$ | 0.78 | 0.71 | 0.8 | 0.7 | ∞ |
| Temp. unc. - Permittivity | E.3.4 | 0.4 | R | $\sqrt{3}$ | 0.23 | 0.26 | 0.05 | 0.06 | ∞ |
| Combined Standard Uncertainty | | | RSS | | | | 10.005 | 9.985 | |
| Expanded Uncertainty (95% Confidence interval) | | | k = 2 | | | | 20.01 | 19.97 | |

10. Annex A: Electric field probe calibration reports

| | |
|---|---|
|  | Bâtiment PONANT, Ave La Pérouse Zone du Technopole Brest Iroise, 29280 PLOUZANE. ☎ : +33 (0)2-98-05-13-34. ☎ : +33 (0)2-98-05-53-87. |
|---|---|

COMOSAR SEPT ISOTROPIC E-FIELD PROBE CALIBRATION REPORT


DATE: 27/02/2015
REFERENCE: SN 46/06 EP60
OBJECT: COMOSAR SEPT ISOTROPIC E-FIELD PROBE
MANUFACTURER: SATIMO
SERIAL NUMBER: SN 46/06 EP60
CUSTOMER: SICOM
ORDER:
DATE OF CALIBRATION: 27/02/2015

WARRANTY:

This Calibration certificate may not be reproduced other than in full. Calibration certificates without signature and seal are not valid. This documentation contains property information which is protected by copyright. All right are reserved. No part of this document may be photocopied, reproduced without the prior written agreement of SATIMO. SATIMO shall not be liable for errors contained herein or for incidental or consequential in connection with the furnishing, performance or use of this material. Warranty doesn't apply to Normal wear, Normal tear, Improper use, Improper maintain, Improper installation.

| | |
|------|------|
| Date | SEAL |
|------|------|

COMOSAR PROJECT MANAGER



SATIMO
Bâtiment PONANT
Avenue La Pérouse
Technopôle BREST IROISE
29280 PLOUZANE
Tél. 02.98.05.13.34 - Fax 02.98.05.53.87

1

| | |
|---|---|
|  | Bâtiment PONANT, Ave La Pérouse Zone du Technopole Brest Iroise, 29280 PLOUZANE. ☎ : +33 (0)2-98-05-13-34. 📠 : +33 (0)2-98-05-53-87. |
|---|---|

PRODUCT DESCRIPTION



| | |
|---|--|
| Frequency Range | 100 MHz - 30 GHz |
| Probe length | 330 mm |
| Length of one dipole | 4.5 mm |
| Maximum external diameter | 8 mm |
| Probe extremity diameter | 6.5 mm |
| Distance between dipoles/probe extremity | < 2.7 mm |
| Resistance of the three dipole (at the connector) | Dipole 1: R1=1.2306 MΩ Dipole 2: R2=1.0729 MΩ Dipole 3: R3=1.3666 MΩ |
| Connector (HIROSE series SR30) | 6 wire male (Hirose SR30series) |

The probe could be checked by measuring the resistance of the three dipoles.

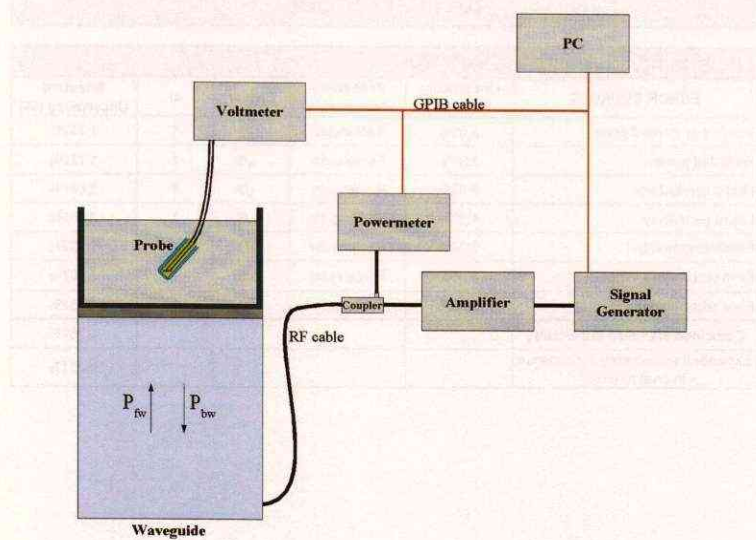
CALIBRATION TEST EQUIPMENT

| TYPE | IDENTIFICATION |
|-------------------|----------------|
| Calibration bench | CALISAR |
| Multimeter | Keithley 2000 |

| | |
|---|---|
|  | Bâtiment PONANT, Ave La Pérouse Zone du Technopole Brest Iroise, 29280 PLOUZANE. ☎ : +33 (0)2-98-05-13-34. ☎ : +33 (0)2-98-05-53-87. |
|---|---|

MEASUREMENT PROCEDURE

Probe calibration is realized, in compliance with CENELEC EN 50361 and IEEE 1528 std, with CALISAR, Satimo proprietary calibration system. The calibration is performed with the EN 50361 annexe technique using reference guide at the five frequencies.



$$SAR = \frac{4(P_{fw} - P_{bw})}{ab\delta} \cos^2\left(\pi \frac{y}{a}\right) e^{-(2z/\delta)}$$

- Where :
- P_{fw} = Forward Power
 - P_{bw} = Backward Power
 - a and b = Waveguide dimensions
 - δ = Skin depth

Keithley configuration:

Rate = Medium; Filter =ON; RDGS=10; FILTER TYPE =MOVING AVERAGE; RANGE AUTO

After each calibration, a SAR measurement is performed on a validation dipole and compared with a NPL calibrated probe, to verify it.

| | |
|---|---|
|  | Bâtiment PONANT, Ave La Pérouse Zone du Technopole Brest Iroise, 29280 PLOUZANE. ☎ : +33 (0)2-98-05-13-34. 📠 : +33 (0)2-98-05-53-87. |
|---|---|

PROBE UNCERTAINTIES

**Calibration report of dosimetric
SATIMO probe**

| Uncertainty on calibration system | | | | | |
|--|-----------------------|--------------------------|------------|----|--------------------------|
| ERROR SOURCES | Uncertainty value (%) | Probability Distribution | Divisor | ci | Standard Uncertainty (%) |
| Incident or forward power | 3,00% | Rectangular | $\sqrt{3}$ | 1 | 1,732% |
| Reflected power | 3,00% | Rectangular | $\sqrt{3}$ | 1 | 1,732% |
| Liquid conductivity | 5,00% | Rectangular | $\sqrt{3}$ | 1 | 2,887% |
| Liquid permittivity | 4,00% | Rectangular | $\sqrt{3}$ | 1 | 2,309% |
| Field homogeneity | 3,00% | Rectangular | $\sqrt{3}$ | 1 | 1,732% |
| Field probe positioning | 5,00% | Rectangular | $\sqrt{3}$ | 1 | 2,887% |
| Field probe linearity | 3,00% | Rectangular | $\sqrt{3}$ | 1 | 1,732% |
| Combined standard uncertainty | | | | | 4,761% |
| Expanded uncertainty (confidence interval of 95%) | | | | | 9,331% |

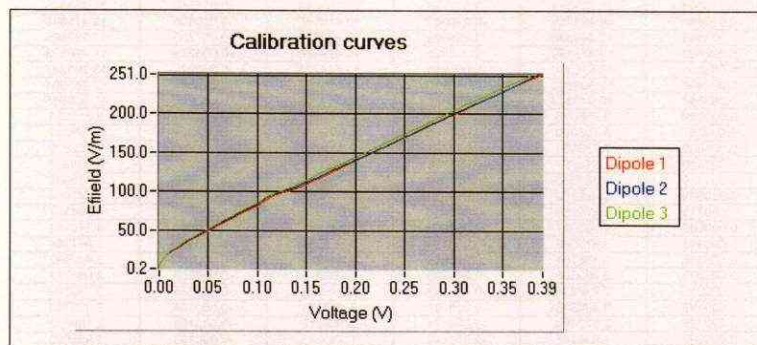
| | |
|---|---|
|  | Bâtiment PONANT, Ave La Pérouse Zone du Technopole Brest Iroise, 29280 PLOUZANE. ☎ : +33 (0)2-98-05-13-34. 📠 : +33 (0)2-98-05-53-87. |
|---|---|

1. Calibration at 450.00 MHz

A. Calibration parameters.

| | |
|----------------------------|-----------------------|
| Label | GSM450 |
| Epsilon | 43.33 |
| Sigma | 0.84 S/m |
| Temperature | 21°C |
| Antenna gain | 2.03 dB |
| Antenna S11 | -10.50 dB |
| Low limit detection | 1.66 V/m (2.31 mW/kg) |

Calibration curves $e_i=f(V)$ ($i=1,2,3$) allow to obtain E-field value using the formula:
 $E=(e_1 \cdot e_1 + e_2 \cdot e_2 + e_3 \cdot e_3) \text{pow}(1/2)$



The following tables represent the calibration curves linearization by curve segment in CW signal.

Bâtiment PONANT, Ave La Pérouse
 Zone du Technopole Brest Iroise, 29280 PLOUZANE.
 ☎ : +33 (0)2-98-05-13-34.
 📠 : +33 (0)2-98-05-53-87.

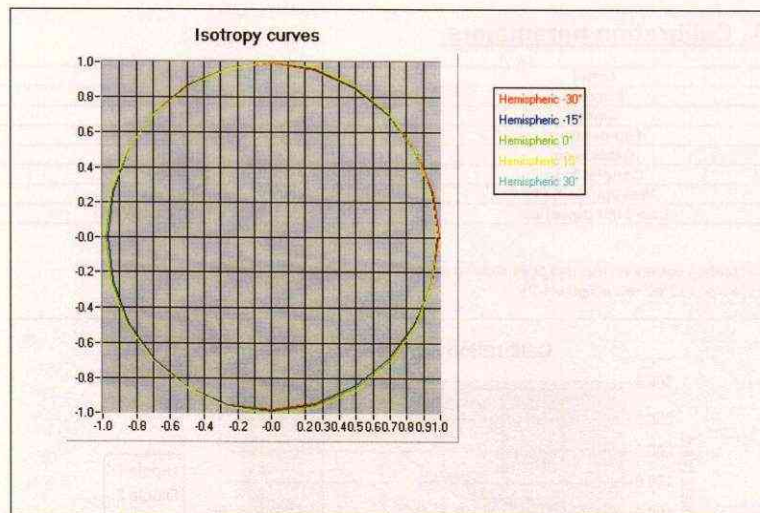
Calibration coefficients for the three dipoles in CW:

| v1 | e1 | v2 | e2 | v3 | e3 |
|----------|------------|-----------|------------|-----------|------------|
| 0.390027 | 251.001230 | -0.386042 | 250.695400 | -0.376740 | 250.105988 |
| 0.366258 | 237.736292 | -0.363554 | 236.787975 | -0.354679 | 236.787975 |
| 0.339500 | 222.072445 | -0.337008 | 221.186610 | -0.328598 | 221.186610 |
| 0.311463 | 205.295068 | -0.308712 | 204.712502 | -0.300644 | 204.476157 |
| 0.283636 | 188.692124 | -0.280417 | 187.939442 | -0.273013 | 187.939442 |
| 0.256654 | 172.433067 | -0.252967 | 171.745241 | -0.245920 | 171.745241 |
| 0.230715 | 156.667434 | -0.226695 | 156.042496 | -0.220370 | 156.222813 |
| 0.206445 | 142.343234 | -0.202087 | 141.775434 | -0.196303 | 141.775434 |
| 0.183645 | 129.030238 | -0.179221 | 128.367222 | -0.173929 | 128.515544 |
| 0.162409 | 116.557803 | -0.158001 | 116.092860 | -0.153202 | 116.092860 |
| 0.142655 | 105.047888 | -0.138513 | 104.628858 | -0.134233 | 104.628858 |
| 0.114926 | 94.238168 | -0.111965 | 93.862257 | -0.110685 | 93.862257 |
| 0.104027 | 84.638434 | -0.101130 | 84.300816 | -0.099583 | 84.396340 |
| 0.092936 | 75.928948 | -0.089992 | 75.626072 | -0.087196 | 75.713499 |
| 0.080253 | 68.036895 | -0.077392 | 67.765500 | -0.074788 | 67.843957 |
| 0.068634 | 60.894908 | -0.066076 | 60.652001 | -0.063785 | 60.722110 |
| 0.058285 | 54.439678 | -0.056065 | 54.222521 | -0.054067 | 54.222521 |
| 0.049187 | 48.556435 | -0.047203 | 48.362746 | -0.045499 | 48.362746 |
| 0.041377 | 43.358902 | -0.039629 | 43.235904 | -0.038172 | 43.235904 |
| 0.034626 | 38.762659 | -0.033080 | 38.608037 | -0.031847 | 38.608037 |
| 0.028813 | 34.573630 | -0.027466 | 34.435717 | -0.026410 | 34.475417 |
| 0.023924 | 30.837228 | -0.022664 | 30.714220 | -0.021789 | 30.749598 |
| 0.019633 | 27.536241 | -0.018631 | 27.426401 | -0.017892 | 27.426401 |
| 0.016008 | 24.503942 | -0.015174 | 24.406197 | -0.014559 | 24.406197 |
| 0.013042 | 21.855528 | -0.012358 | 21.768348 | -0.011849 | 21.768348 |
| 0.010587 | 19.493705 | -0.010024 | 19.415946 | -0.009606 | 19.415946 |
| 0.008546 | 17.346896 | -0.008093 | 17.297985 | -0.007756 | 17.297985 |
| 0.006893 | 15.472199 | -0.006525 | 15.428528 | -0.006253 | 15.428528 |
| 0.005561 | 13.816360 | -0.005245 | 13.744774 | -0.005028 | 13.761247 |
| 0.004448 | 12.308602 | -0.004220 | 12.259504 | -0.004044 | 12.259504 |
| 0.003547 | 10.940343 | -0.003371 | 10.909905 | -0.003230 | 10.909905 |
| 0.002829 | 9.758078 | -0.002696 | 9.719153 | -0.002584 | 9.719153 |
| 0.002257 | 8.703900 | -0.002159 | 8.658517 | -0.002071 | 8.669181 |
| 0.001800 | 7.753551 | -0.001731 | 7.731915 | -0.001662 | 7.722622 |
| 0.001430 | 6.916527 | -0.001386 | 6.898937 | -0.001330 | 6.898937 |
| 0.001139 | 6.161560 | -0.001110 | 6.130303 | -0.001070 | 6.136982 |
| 0.000899 | 5.469502 | -0.000886 | 5.447684 | -0.000850 | 5.447684 |
| 0.000711 | 4.879656 | -0.000707 | 4.870699 | -0.000681 | 4.864397 |
| 0.000560 | 4.352907 | -0.000568 | 4.335543 | -0.000548 | 4.340254 |
| 0.000443 | 3.877568 | -0.000464 | 3.867394 | -0.000441 | 3.867394 |
| 0.000345 | 3.456781 | -0.000369 | 3.442992 | -0.000360 | 3.442992 |
| 0.000273 | 3.069309 | -0.000298 | 3.060398 | -0.000288 | 3.063727 |
| 0.000212 | 2.736734 | -0.000242 | 2.725818 | -0.000235 | 2.733280 |
| 0.000157 | 2.439318 | -0.000197 | 2.433773 | -0.000194 | 2.433773 |
| 0.000125 | 2.172484 | -0.000171 | 2.168512 | -0.000160 | 2.168512 |
| 0.000089 | 1.938165 | -0.000142 | 1.930433 | -0.000133 | 1.935690 |
| 0.000074 | 1.725784 | -0.000111 | 1.718900 | -0.000112 | 1.724797 |
| 0.000054 | 1.537689 | -0.000095 | 1.524916 | -0.000094 | 1.524916 |
| 0.000039 | 1.368867 | -0.000080 | 1.363407 | -0.000081 | 1.363407 |
| 0.000025 | 1.218869 | -0.000069 | 1.214007 | -0.000072 | 1.214007 |
| 0.000014 | 1.086023 | -0.000067 | 1.081691 | -0.000062 | 1.081691 |
| 0.000005 | 0.966789 | -0.000055 | 0.962933 | -0.000053 | 0.962933 |

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|---|--|

B. Isotropy.

- Axial isotropy: 0.04 dB
- Hemispherical isotropy: 0.08 dB



$E\text{-field } E \text{ (V/m)} = f(\phi, \theta)$

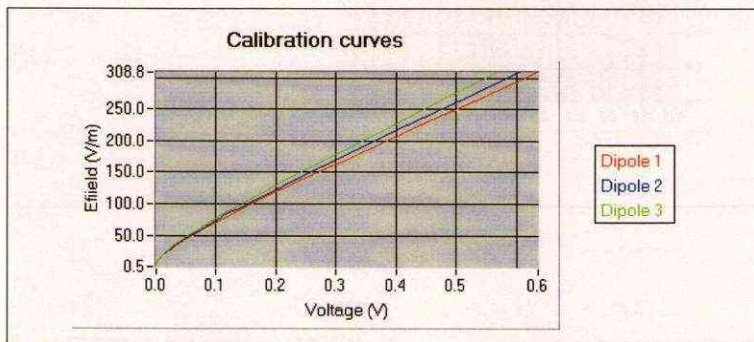


2. Calibration at 835.00 MHz

A. Calibration parameters.

| | |
|---------------------|-----------------------|
| Label | GSM850 |
| Epsilon | 43.72 |
| Sigma | 0.90 S/m |
| Temperature | 21°C |
| Cable loss | 0.00 dB |
| Coupler loss | 20.50 dB |
| Waveguide S11 | -13.91 dB |
| Low limit detection | 0.96 V/m (0.84 mW/kg) |

Calibration curves $e_i=f(V)$ ($i=1,2,3$) allow to obtain E-field value using the formula:
 $E=(e1*e1+e2*e2+e3*e3)pow(1/2)$



The following tables represent the calibration curves linearization by curve segment in CW signal.



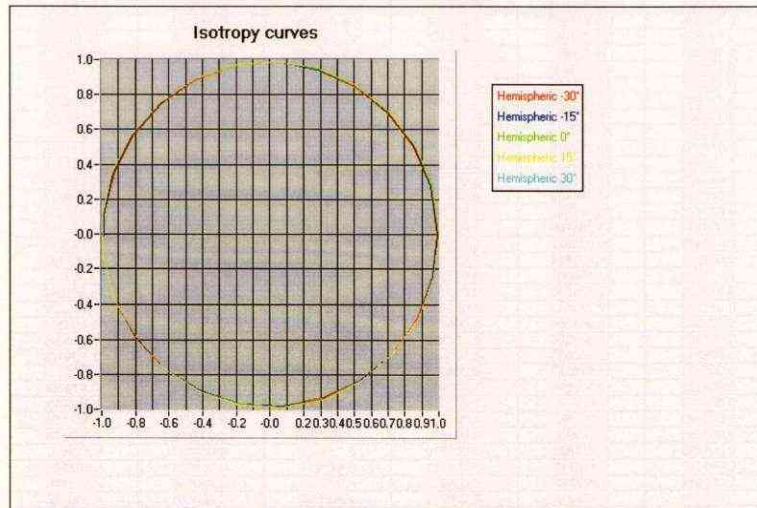
Calibration coefficients for the three dipoles in CW:

| v1 | e1 | v2 | e2 | v3 | e3 |
|----------|------------|-----------|------------|-----------|------------|
| 0.635587 | 308.082146 | -0.604183 | 308.789236 | -0.565402 | 306.584464 |
| 0.529656 | 262.201294 | -0.503486 | 262.612528 | -0.471169 | 261.045773 |
| 0.441380 | 223.967252 | -0.419571 | 224.131937 | -0.392640 | 223.096863 |
| 0.306514 | 165.119244 | -0.291369 | 164.929254 | -0.272667 | 164.739481 |
| 0.290555 | 159.146719 | -0.276427 | 158.963600 | -0.258259 | 158.597995 |
| 0.268411 | 149.209919 | -0.255467 | 149.038233 | -0.238392 | 148.695455 |
| 0.244835 | 138.610998 | -0.233209 | 138.451509 | -0.217240 | 138.133080 |
| 0.220829 | 127.731407 | -0.210592 | 127.584435 | -0.196765 | 127.144533 |
| 0.199691 | 116.626621 | -0.187954 | 116.492427 | -0.174452 | 116.090770 |
| 0.173928 | 105.876040 | -0.166016 | 105.632534 | -0.153977 | 105.389584 |
| 0.151847 | 95.235242 | -0.145092 | 95.125662 | -0.134330 | 94.797676 |
| 0.130863 | 85.074164 | -0.116894 | 84.976276 | -0.113424 | 84.683284 |
| 0.110829 | 75.213828 | -0.103844 | 75.127284 | -0.097728 | 74.782106 |
| 0.086907 | 62.776585 | -0.083093 | 62.704353 | -0.076637 | 62.560137 |
| 0.074182 | 56.207943 | -0.070921 | 56.078668 | -0.065266 | 56.014143 |
| 0.063386 | 50.442627 | -0.060565 | 50.384586 | -0.055632 | 50.268705 |
| 0.054223 | 45.373021 | -0.051774 | 45.373021 | -0.047474 | 45.268666 |
| 0.046364 | 40.954129 | -0.044245 | 40.954129 | -0.040448 | 40.859937 |
| 0.039475 | 36.965594 | -0.037645 | 36.923061 | -0.034382 | 36.838139 |
| 0.033397 | 33.288765 | -0.031834 | 33.250463 | -0.028981 | 33.173988 |
| 0.027920 | 29.839922 | -0.026578 | 29.839922 | -0.024144 | 29.737036 |
| 0.022982 | 26.594859 | -0.021858 | 26.594859 | -0.019775 | 26.503163 |
| 0.018501 | 23.458362 | -0.017588 | 23.431370 | -0.015876 | 23.350580 |
| 0.013925 | 19.874568 | -0.013101 | 19.851699 | -0.011833 | 19.806042 |
| 0.011273 | 17.774512 | -0.010688 | 17.754059 | -0.009633 | 17.713227 |
| 0.009222 | 15.951359 | -0.008761 | 15.933005 | -0.007862 | 15.896361 |
| 0.007562 | 14.348209 | -0.007180 | 14.331699 | -0.006464 | 14.315209 |
| 0.006215 | 12.950833 | -0.005899 | 12.935931 | -0.005323 | 12.906178 |
| 0.005101 | 11.678097 | -0.004850 | 11.662663 | -0.004328 | 11.635839 |
| 0.004155 | 10.502620 | -0.003953 | 10.490535 | -0.003545 | 10.478466 |
| 0.003354 | 9.414510 | -0.003197 | 9.403675 | -0.002891 | 9.382049 |
| 0.002660 | 8.371392 | -0.002539 | 8.371392 | -0.002271 | 8.352139 |
| 0.002061 | 7.375607 | -0.001985 | 7.367119 | -0.001806 | 7.350176 |
| 0.001439 | 6.127703 | -0.001390 | 6.120652 | -0.001217 | 6.113610 |
| 0.001137 | 5.480216 | -0.001117 | 5.473911 | -0.001022 | 5.467612 |
| 0.000918 | 4.923769 | -0.000902 | 4.918103 | -0.000835 | 4.912446 |
| 0.000734 | 4.428918 | -0.000732 | 4.428918 | -0.000651 | 4.418732 |
| 0.000591 | 3.997585 | -0.000601 | 3.992985 | -0.000565 | 3.988391 |
| 0.000475 | 3.599959 | -0.000499 | 3.595818 | -0.000424 | 3.591681 |
| 0.000389 | 3.238156 | -0.000421 | 3.234430 | -0.000388 | 3.230709 |
| 0.000295 | 2.892662 | -0.000318 | 2.889334 | -0.000319 | 2.886009 |
| 0.000226 | 2.566242 | -0.000286 | 2.566242 | -0.000249 | 2.560339 |
| 0.000167 | 2.250597 | -0.000204 | 2.248006 | -0.000215 | 2.242836 |
| 0.000115 | 1.946694 | -0.000163 | 1.944454 | -0.000132 | 1.942217 |
| 0.000096 | 1.743001 | -0.000139 | 1.740997 | -0.000129 | 1.738992 |
| 0.000088 | 1.567825 | -0.000121 | 1.564218 | -0.000115 | 1.562420 |
| 0.000044 | 1.410296 | -0.000114 | 1.407012 | -0.000087 | 1.407012 |
| 0.000036 | 1.268522 | -0.000088 | 1.271445 | -0.000066 | 1.269982 |
| 0.000023 | 1.142346 | -0.000071 | 0.959949 | -0.000045 | 1.132954 |
| 0.000005 | 0.501457 | -0.000054 | 0.597334 | -0.000024 | 0.561644 |

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|---|--|

B. Isotropy.

- Axial isotropy: 0.03 dB
- Hemispherical isotropy: 0.04 dB



E-field E (V/m) = $f(\phi, \theta)$

C. Linearity.

- Linearity: 0.19 dB

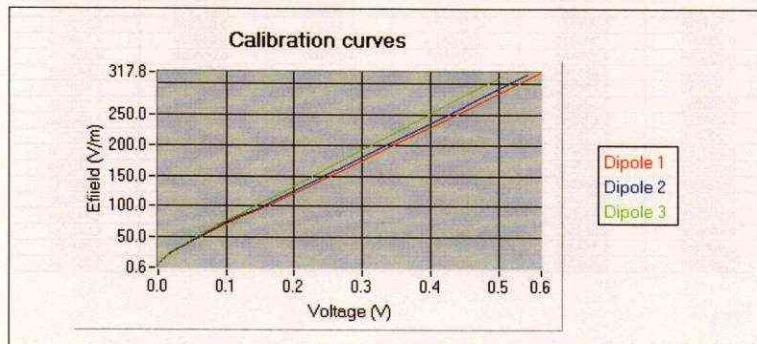
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|---|---|

3. Calibration at 900.00 MHz

A. Calibration parameters.

| | |
|---------------------|-----------------------|
| Label | GSM900 |
| Epsilon | 43.04 |
| Sigma | 0.98 S/m |
| Temperature | 21°C |
| Cable loss | 0.00 dB |
| Coupler loss | 20.30 dB |
| Waveguide S11 | -13.94 dB |
| Low limit detection | 1.26 V/m (1.57 mW/kg) |

Calibration curves $e_i=f(V)$ ($i=1,2,3$) allow to obtain E-field value using the formula:
 $E=(e1*e1+e2*e2+e3*e3)^{pow(1/2)}$



The following tables represent the calibration curves linearization by curve segment in CW signal.



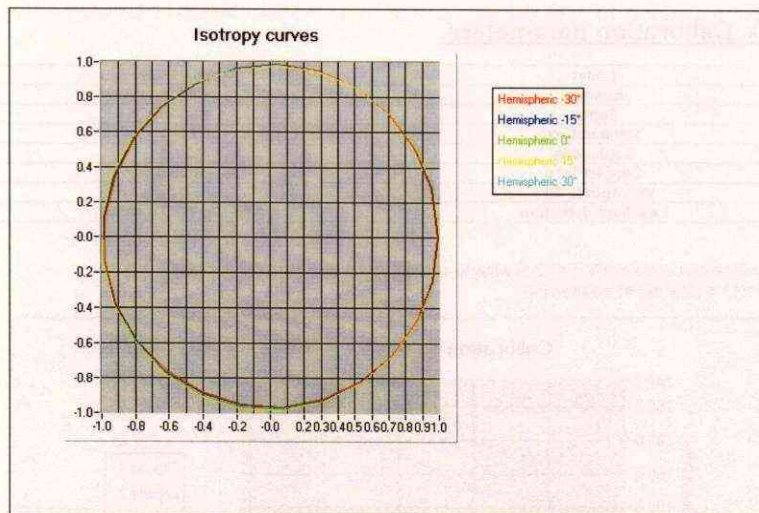
Calibration coefficients for the three dipoles in CW:

| v1 | e1 | v2 | e2 | v3 | e3 |
|----------|------------|-----------|------------|-----------|------------|
| 0.562646 | 317.801076 | -0.542112 | 313.053898 | -0.505287 | 311.994322 |
| 0.468872 | 266.592145 | -0.451760 | 263.347651 | -0.421072 | 262.612228 |
| 0.390727 | 223.918036 | -0.376466 | 221.925779 | -0.350893 | 221.460484 |
| 0.271338 | 158.889567 | -0.261435 | 158.706743 | -0.243676 | 158.706743 |
| 0.253080 | 148.626202 | -0.243021 | 148.455189 | -0.226314 | 148.284371 |
| 0.232479 | 137.276242 | -0.222726 | 137.276242 | -0.207208 | 137.118287 |
| 0.210674 | 125.775305 | -0.201577 | 125.775305 | -0.187307 | 125.630584 |
| 0.188759 | 114.708442 | -0.180478 | 114.576454 | -0.167510 | 114.312937 |
| 0.167251 | 103.895176 | -0.159872 | 103.775631 | -0.148239 | 103.656224 |
| 0.146965 | 93.776794 | -0.140482 | 93.668892 | -0.130117 | 93.561113 |
| 0.127724 | 84.157995 | -0.122159 | 84.061160 | -0.112968 | 83.867826 |
| 0.108227 | 74.919588 | -0.103052 | 74.833383 | -0.096736 | 74.747278 |
| 0.092300 | 66.007819 | -0.088290 | 65.931868 | -0.081313 | 65.856004 |
| 0.071260 | 54.650655 | -0.068090 | 54.524963 | -0.062542 | 54.462225 |
| 0.060603 | 48.875969 | -0.057889 | 48.819730 | -0.053034 | 48.763558 |
| 0.051606 | 43.862701 | -0.049262 | 43.812232 | -0.045010 | 43.761820 |
| 0.043938 | 39.498943 | -0.041926 | 39.454395 | -0.038211 | 39.363651 |
| 0.037401 | 35.652943 | -0.035651 | 35.611920 | -0.032430 | 35.570943 |
| 0.031672 | 32.143684 | -0.030156 | 32.106679 | -0.027355 | 32.069736 |
| 0.026638 | 28.946455 | -0.025333 | 28.913148 | -0.022968 | 28.846650 |
| 0.022129 | 25.977381 | -0.021035 | 25.917636 | -0.018986 | 25.887814 |
| 0.018094 | 23.125727 | -0.017164 | 23.099118 | -0.015482 | 23.045990 |
| 0.014437 | 20.351450 | -0.013691 | 20.328034 | -0.012319 | 20.304644 |
| 0.010878 | 17.381826 | -0.010300 | 17.341849 | -0.009246 | 17.321893 |
| 0.008843 | 15.545166 | -0.008371 | 15.509414 | -0.007494 | 15.491568 |
| 0.007210 | 13.950690 | -0.006932 | 13.934629 | -0.006114 | 13.918594 |
| 0.005895 | 12.548603 | -0.005586 | 12.534165 | -0.005027 | 12.518742 |
| 0.004835 | 11.326491 | -0.004587 | 11.313458 | -0.004105 | 11.300440 |
| 0.003944 | 10.211637 | -0.003749 | 10.199887 | -0.003367 | 10.188151 |
| 0.003220 | 9.185343 | -0.003068 | 9.174773 | -0.002727 | 9.164218 |
| 0.002589 | 8.233707 | -0.002482 | 8.224232 | -0.002211 | 8.214769 |
| 0.002056 | 7.329855 | -0.001974 | 7.321421 | -0.001765 | 7.312996 |
| 0.001594 | 6.450529 | -0.001556 | 6.443107 | -0.001388 | 6.435694 |
| 0.001078 | 5.322251 | -0.001056 | 5.310011 | -0.000938 | 5.310011 |
| 0.000857 | 4.759873 | -0.000870 | 4.754396 | -0.000778 | 4.748925 |
| 0.000686 | 4.276568 | -0.000690 | 4.271647 | -0.000629 | 4.266732 |
| 0.000560 | 3.851194 | -0.000566 | 3.846763 | -0.000528 | 3.842336 |
| 0.000445 | 3.476125 | -0.000481 | 3.472125 | -0.000405 | 3.468130 |
| 0.000355 | 3.130368 | -0.000377 | 3.126766 | -0.000348 | 3.123168 |
| 0.000277 | 2.812518 | -0.000324 | 2.809282 | -0.000306 | 2.806050 |
| 0.000214 | 2.512439 | -0.000245 | 2.512439 | -0.000253 | 2.509547 |
| 0.000165 | 2.228925 | -0.000202 | 2.226360 | -0.000169 | 2.223798 |
| 0.000122 | 1.952519 | -0.000183 | 1.950273 | -0.000168 | 1.948029 |
| 0.000084 | 1.686924 | -0.000118 | 1.684983 | -0.000133 | 1.683043 |
| 0.000059 | 1.510412 | -0.000089 | 1.508674 | -0.000098 | 1.506938 |
| 0.000041 | 1.357048 | -0.000045 | 1.363478 | -0.000063 | 1.443934 |
| 0.000025 | 1.222068 | -0.000023 | 1.240128 | -0.000028 | 1.240128 |
| 0.000019 | 1.104320 | -0.000015 | 1.021952 | -0.000017 | 1.084302 |
| 0.000008 | 0.605325 | -0.000006 | 0.803439 | -0.000007 | 0.757194 |

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|---|--|

B. Isotropy.

- Axial isotropy: 0.05 dB
- Hemispherical isotropy: 0.06 dB



$E\text{-field } E \text{ (V/m)} = f(\phi, \theta)$

C. Linearity.

- Linearity: 0.18 dB

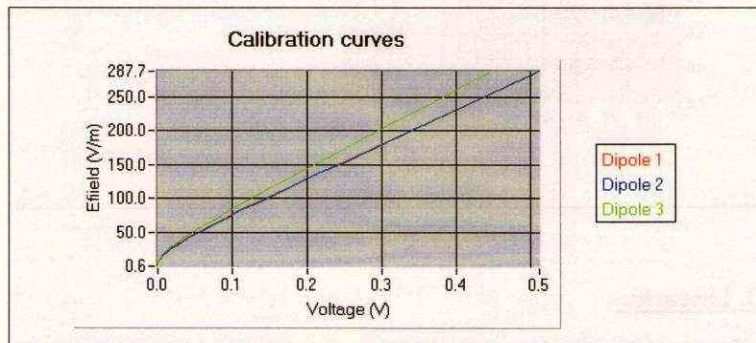
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|---|---|
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|---|---|

4. Calibration at 1747.00 MHz

A. Calibration parameters.

| | |
|---------------------|-----------------------|
| Label | GSM1800 |
| Epsilon | 39.10 |
| Sigma | 1.36 S/m |
| Temperature | 21°C |
| Cable loss | 0.00 dB |
| Coupler loss | 20.18 dB |
| Waveguide S11 | -13.10 dB |
| Low limit detection | 1.05 V/m (1.50 mW/kg) |

Calibration curves $e_i=f(V)$ ($i=1,2,3$) allow to obtain E-field value using the formula:
 $E=(e_1 \cdot e_1 + e_2 \cdot e_2 + e_3 \cdot e_3)^{pow(1/2)}$



The following tables represent the calibration curves linearization by curve segment in CW signal.



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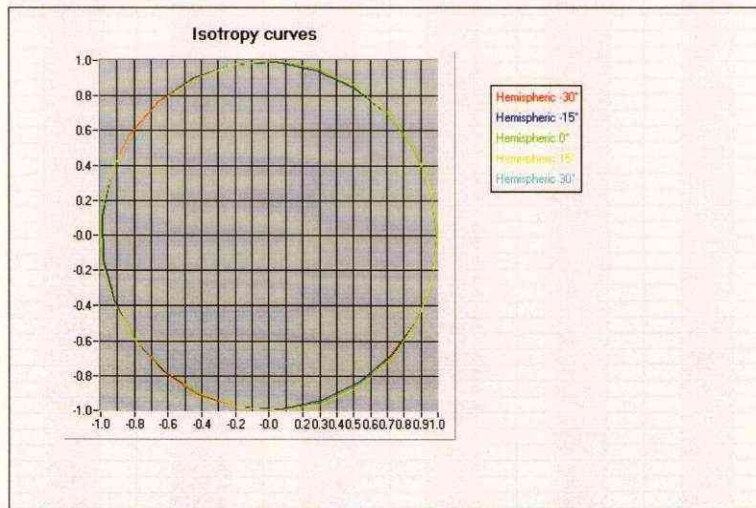
Calibration coefficients for the three dipoles in CW:

| v1 | e1 | v2 | e2 | v3 | e3 |
|----------|------------|-----------|------------|-----------|------------|
| 0.510721 | 286.851496 | -0.510995 | 287.693425 | -0.443939 | 286.309825 |
| 0.425601 | 243.350716 | -0.425829 | 243.900692 | -0.369949 | 243.053215 |
| 0.354668 | 207.100067 | -0.354858 | 207.406747 | -0.308291 | 207.006040 |
| 0.246297 | 151.644785 | -0.246429 | 151.644785 | -0.214091 | 151.819474 |
| 0.219264 | 137.983603 | -0.219592 | 137.824835 | -0.190283 | 138.142555 |
| 0.192454 | 124.258893 | -0.193001 | 124.258893 | -0.166831 | 124.402035 |
| 0.167259 | 111.257035 | -0.167958 | 111.257035 | -0.144922 | 111.385198 |
| 0.144913 | 99.615629 | -0.145778 | 99.615629 | -0.125520 | 99.732447 |
| 0.125258 | 89.295070 | -0.126254 | 89.295070 | -0.107824 | 89.397934 |
| 0.106977 | 80.135967 | -0.106266 | 80.135967 | -0.093715 | 80.228280 |
| 0.093604 | 72.082109 | -0.094642 | 71.999169 | -0.080896 | 72.165144 |
| 0.080853 | 64.912373 | -0.081878 | 64.912373 | -0.069798 | 64.987148 |
| 0.069882 | 58.590537 | -0.070823 | 58.590537 | -0.060179 | 58.725602 |
| 0.059202 | 52.339248 | -0.060092 | 52.339248 | -0.050784 | 52.399541 |
| 0.048472 | 45.795993 | -0.049268 | 45.795993 | -0.041401 | 45.848748 |
| 0.039793 | 40.302082 | -0.040486 | 40.302082 | -0.033855 | 40.348509 |
| 0.032772 | 35.672003 | -0.033401 | 35.713095 | -0.027786 | 35.754234 |
| 0.027117 | 31.792705 | -0.027629 | 31.792705 | -0.022876 | 31.829328 |
| 0.022403 | 28.400598 | -0.022872 | 28.400598 | -0.018844 | 28.433314 |
| 0.018563 | 25.458188 | -0.018968 | 25.458188 | -0.015557 | 25.516875 |
| 0.015394 | 22.873229 | -0.015716 | 22.873229 | -0.012846 | 22.925957 |
| 0.012741 | 20.621844 | -0.013045 | 20.621844 | -0.010627 | 20.645598 |
| 0.010592 | 18.613477 | -0.010825 | 18.613477 | -0.008803 | 18.634918 |
| 0.008587 | 16.646675 | -0.008809 | 16.646675 | -0.007132 | 16.665850 |
| 0.006690 | 14.565570 | -0.006860 | 14.565570 | -0.005540 | 14.582317 |
| 0.005237 | 12.818214 | -0.005410 | 12.818214 | -0.004342 | 12.832979 |
| 0.004144 | 11.345601 | -0.004259 | 11.345601 | -0.003442 | 11.358670 |
| 0.003298 | 10.100142 | -0.003432 | 10.100142 | -0.002748 | 10.111777 |
| 0.002640 | 9.022513 | -0.002740 | 9.022513 | -0.002205 | 9.032906 |
| 0.002126 | 8.087745 | -0.002209 | 8.087745 | -0.001783 | 8.097063 |
| 0.001712 | 7.258176 | -0.001791 | 7.258176 | -0.001445 | 7.274820 |
| 0.001391 | 6.543762 | -0.001478 | 6.536232 | -0.001178 | 6.551300 |
| 0.001132 | 5.906462 | -0.001223 | 5.899667 | -0.000970 | 5.913267 |
| 0.000859 | 5.156173 | -0.000921 | 5.150241 | -0.000749 | 5.162112 |
| 0.000667 | 4.511568 | -0.000735 | 4.511568 | -0.000578 | 4.516765 |
| 0.000509 | 3.974912 | -0.000572 | 3.974912 | -0.000456 | 3.979490 |
| 0.000390 | 3.522309 | -0.000463 | 3.522309 | -0.000366 | 3.526366 |
| 0.000322 | 3.135649 | -0.000360 | 3.135649 | -0.000285 | 3.139262 |
| 0.000211 | 2.801093 | -0.000286 | 2.801093 | -0.000240 | 2.807550 |
| 0.000192 | 2.510888 | -0.000251 | 2.510888 | -0.000198 | 2.513781 |
| 0.000159 | 2.255939 | -0.000205 | 2.255939 | -0.000171 | 2.260171 |
| 0.000123 | 2.031550 | -0.000158 | 2.031550 | -0.000140 | 2.036558 |
| 0.000101 | 1.835809 | -0.000132 | 1.833696 | -0.000119 | 1.840042 |
| 0.000035 | 1.450434 | -0.000124 | 1.628649 | -0.000098 | 1.630525 |
| 0.000022 | 1.075120 | -0.000095 | 1.426683 | -0.000078 | 1.429972 |
| 0.000006 | 0.613424 | -0.000079 | 1.258425 | -0.000072 | 1.258217 |
| | | -0.000066 | 1.116420 | -0.000064 | 1.117705 |
| | | -0.000060 | 0.993866 | -0.000053 | 0.993182 |
| | | -0.000056 | 0.888648 | -0.000042 | 0.862972 |
| | | -0.000046 | 0.794928 | -0.000031 | 0.718691 |
| | | -0.000036 | 0.622424 | -0.000020 | 0.580812 |

| | |
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|---|--|

B. Isotropy.

- Axial isotropy: 0.06 dB
- Hemispherical isotropy: 0.06 dB



E-field E (V/m) = $f(\phi, \theta)$

C. Linearity.

- Linearity: 0.19 dB

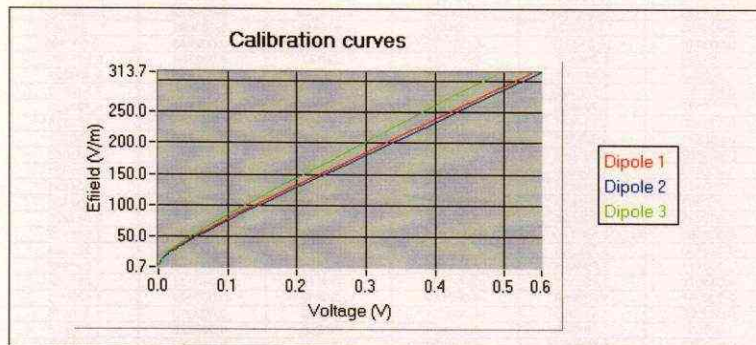
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|---|---|

5. Calibration at 1950.00 MHz

A. Calibration parameters.

| | |
|---------------------|-----------------------|
| Label | IMT2000 |
| Epsilon | 39.43 |
| Sigma | 1.40 S/m |
| Temperature | 21°C |
| Cable loss | 0.00 dB |
| Coupler loss | 20.07 dB |
| Waveguide S11 | -36.66 dB |
| Low limit detection | 1.27 V/m (2.30 mW/kg) |

Calibration curves $e_i=f(V)$ ($i=1,2,3$) allow to obtain E-field value using the formula:
 $E=(e_1 \cdot e_1 + e_2 \cdot e_2 + e_3 \cdot e_3) \cdot \text{pow}(1/2)$



The following tables represent the calibration curves linearization by curve segment in CW signal.



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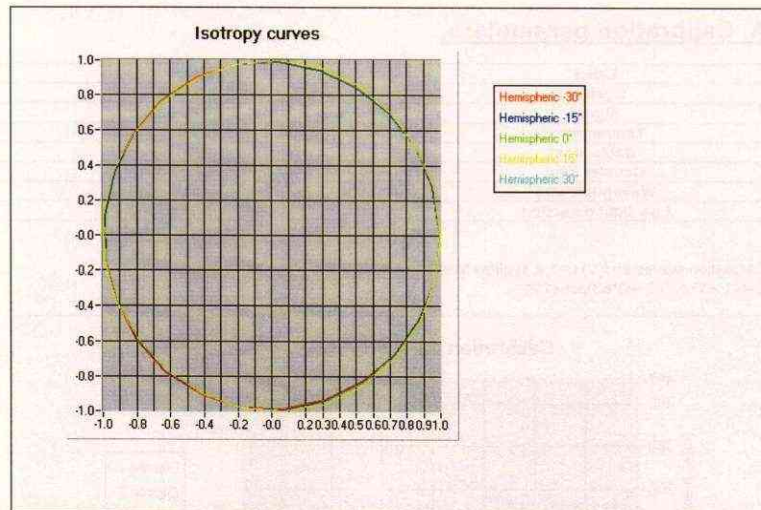
Calibration coefficients for the three dipoles in CW:

| v1 | e1 | v2 | e2 | v3 | e3 |
|----------|------------|-----------|------------|-----------|------------|
| 0.538560 | 311.624390 | -0.553261 | 313.722699 | -0.486674 | 310.530862 |
| 0.448800 | 264.027659 | -0.461051 | 265.427130 | -0.405562 | 263.294326 |
| 0.374000 | 224.363717 | -0.384209 | 225.180822 | -0.337968 | 223.930545 |
| 0.259722 | 163.676878 | -0.266812 | 163.676878 | -0.234700 | 163.676878 |
| 0.228065 | 147.057552 | -0.234742 | 146.888343 | -0.205692 | 147.057552 |
| 0.198097 | 131.216163 | -0.204667 | 131.216163 | -0.178433 | 131.065182 |
| 0.171141 | 116.677559 | -0.177391 | 116.811965 | -0.153946 | 116.677559 |
| 0.147777 | 104.108774 | -0.153689 | 104.108774 | -0.132662 | 103.988984 |
| 0.127488 | 92.893929 | -0.132975 | 93.000939 | -0.114181 | 92.893929 |
| 0.108273 | 83.269764 | -0.115177 | 83.269764 | -0.098330 | 83.173952 |
| 0.095107 | 74.642699 | -0.099090 | 74.642699 | -0.084669 | 74.642699 |
| 0.082157 | 67.140927 | -0.086401 | 67.218270 | -0.072924 | 67.140927 |
| 0.070984 | 60.602052 | -0.074821 | 60.602052 | -0.062842 | 60.532323 |
| 0.060312 | 54.136146 | -0.063747 | 54.136146 | -0.053232 | 54.136146 |
| 0.049369 | 47.368249 | -0.052337 | 47.368249 | -0.043407 | 47.313746 |
| 0.040527 | 41.685722 | -0.043073 | 41.685722 | -0.035485 | 41.637757 |
| 0.033371 | 36.896683 | -0.035550 | 36.854230 | -0.029113 | 36.854230 |
| 0.027567 | 32.808573 | -0.029424 | 32.808573 | -0.023965 | 32.808573 |
| 0.022785 | 29.308078 | -0.024373 | 29.308078 | -0.019748 | 29.274355 |
| 0.018872 | 26.271649 | -0.020203 | 26.271649 | -0.016302 | 26.241420 |
| 0.015625 | 23.576934 | -0.016768 | 23.576934 | -0.013460 | 23.549805 |
| 0.012951 | 21.231825 | -0.013913 | 21.231825 | -0.011131 | 21.231825 |
| 0.010739 | 19.164052 | -0.011576 | 19.164052 | -0.009212 | 19.164052 |
| 0.008971 | 17.397519 | -0.009676 | 17.397519 | -0.007705 | 17.397519 |
| 0.006970 | 15.222547 | -0.007534 | 15.205032 | -0.005982 | 15.205032 |
| 0.005454 | 13.380961 | -0.005908 | 13.365565 | -0.004673 | 13.365565 |
| 0.004298 | 11.830071 | -0.004690 | 11.816458 | -0.003690 | 11.816458 |
| 0.003418 | 10.519312 | -0.003733 | 10.519312 | -0.002948 | 10.507209 |
| 0.002733 | 9.386147 | -0.003014 | 9.386147 | -0.002366 | 9.375348 |
| 0.002203 | 8.413707 | -0.002423 | 8.413707 | -0.001915 | 8.404026 |
| 0.001783 | 7.550702 | -0.001966 | 7.550702 | -0.001546 | 7.542013 |
| 0.001437 | 6.799663 | -0.001604 | 6.799663 | -0.001262 | 6.791839 |
| 0.001163 | 6.137441 | -0.001316 | 6.130380 | -0.001040 | 6.123325 |
| 0.000871 | 5.327057 | -0.001003 | 5.327057 | -0.000779 | 5.320927 |
| 0.000662 | 4.661088 | -0.000780 | 4.661088 | -0.000618 | 4.661088 |
| 0.000499 | 4.106646 | -0.000609 | 4.106646 | -0.000483 | 4.101921 |
| 0.000384 | 3.634858 | -0.000487 | 3.634858 | -0.000381 | 3.634858 |
| 0.000303 | 3.235843 | -0.000391 | 3.235843 | -0.000307 | 3.232120 |
| 0.000239 | 2.890596 | -0.000316 | 2.887270 | -0.000253 | 2.887270 |
| 0.000182 | 2.591119 | -0.000265 | 2.588136 | -0.000208 | 2.588136 |
| 0.000140 | 2.325345 | -0.000217 | 2.325345 | -0.000173 | 2.322669 |
| 0.000117 | 2.094051 | -0.000191 | 2.094051 | -0.000143 | 2.091642 |
| 0.000079 | 1.890112 | -0.000150 | 1.890112 | -0.000132 | 1.887936 |
| 0.000057 | 1.680689 | -0.000137 | 1.680689 | -0.000104 | 1.678755 |
| 0.000029 | 1.473966 | -0.000101 | 1.472269 | -0.000090 | 1.470575 |
| 0.000021 | 1.298636 | -0.000084 | 1.298636 | -0.000075 | 1.298636 |
| 0.000017 | 1.152093 | -0.000080 | 1.152093 | -0.000072 | 1.148120 |
| 0.000012 | 1.025622 | -0.000069 | 1.025622 | -0.000060 | 1.024442 |
| 0.000008 | 0.915140 | -0.000064 | 0.914087 | -0.000051 | 0.914087 |
| 0.000004 | 0.804656 | -0.000051 | 0.818440 | -0.000048 | 0.819383 |
| | | -0.000049 | 0.735338 | -0.000045 | 0.734492 |
| | | | | -0.000036 | 0.659154 |

| | |
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|---|--|

B. Isotropy.

- Axial isotropy: 0.07 dB
- Hemispherical isotropy: 0.07 dB



E-field E (V/m) = $f(\phi, \theta)$

C. Linearity.

- Linearity: 0.17 dB

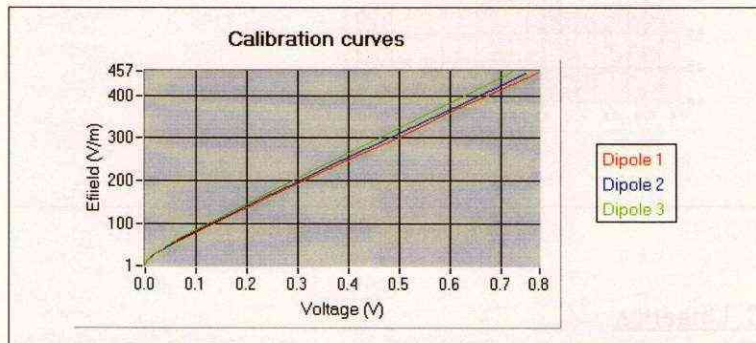
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|---|---|

6. Calibration at 2450.00 MHz

A. Calibration parameters.

| | |
|---------------------|-----------------------|
| Label | Bluetooth |
| Epsilon | 37.79 |
| Sigma | 1.85 S/m |
| Temperature | 21°C |
| Cable loss | 0.00 dB |
| Coupler loss | 21.50 dB |
| Waveguide S11 | -15.00 dB |
| Low limit detection | 0.92 V/m (1.51 mW/kg) |

Calibration curves $e_i=f(V)$ ($i=1,2,3$) allow to obtain E-field value using the formula:
 $E=(e_1*e1+e_2*e2+e_3*e3)^{pow(1/2)}$



The following tables represent the calibration curves linearization by curve segment in CW signal.



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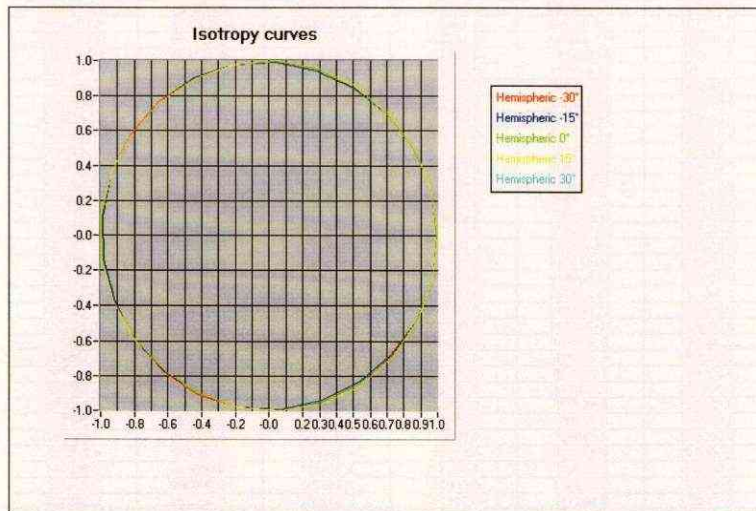
Calibration coefficients for the three dipoles in CW:

| v1 | e1 | v2 | e2 | v3 | e3 |
|-----------|------------|-----------|------------|-----------|------------|
| 0.775885 | 454.454927 | -0.748460 | 450.440543 | -0.725597 | 456.774143 |
| 0.620606 | 368.804659 | -0.606912 | 370.466546 | -0.580020 | 370.842348 |
| 0.499623 | 301.991331 | -0.482063 | 299.834178 | -0.465640 | 303.231159 |
| 0.396761 | 245.082582 | -0.386170 | 245.475034 | -0.374743 | 249.392407 |
| 0.319389 | 202.162943 | -0.311188 | 202.849779 | -0.297735 | 203.642804 |
| 0.257308 | 167.598066 | -0.249926 | 167.884910 | -0.239781 | 169.064921 |
| 0.207152 | 139.527842 | -0.198963 | 138.629007 | -0.192512 | 140.694550 |
| 0.168348 | 117.658041 | -0.158939 | 115.463102 | -0.155199 | 118.116132 |
| 0.135618 | 99.035731 | -0.127146 | 96.856391 | -0.123856 | 98.937582 |
| 0.108916 | 83.645541 | -0.101857 | 81.836550 | -0.098522 | 83.195036 |
| 0.086939 | 70.755962 | -0.082444 | 70.088170 | -0.079125 | 70.899915 |
| 0.070561 | 60.938992 | -0.066997 | 60.524608 | -0.063011 | 60.424288 |
| 0.044971 | 44.928910 | -0.042854 | 44.877214 | -0.040169 | 44.825576 |
| 0.039748 | 41.497877 | -0.037893 | 41.497877 | -0.035485 | 41.450130 |
| 0.032384 | 36.477569 | -0.030815 | 36.477569 | -0.028813 | 36.435596 |
| 0.026448 | 32.212608 | -0.025118 | 32.212608 | -0.023444 | 32.175543 |
| 0.021679 | 28.643487 | -0.020566 | 28.643487 | -0.019158 | 28.610529 |
| 0.017778 | 25.557942 | -0.016851 | 25.557942 | -0.015687 | 25.499160 |
| 0.014629 | 22.883681 | -0.013855 | 22.857350 | -0.012869 | 22.831050 |
| 0.012058 | 20.536475 | -0.011390 | 20.536475 | -0.010563 | 20.512844 |
| 0.009929 | 18.472509 | -0.009400 | 18.472509 | -0.008694 | 18.451255 |
| 0.008208 | 16.673465 | -0.007749 | 16.654282 | -0.007181 | 16.635118 |
| 0.006421 | 14.605819 | -0.006052 | 14.605819 | -0.005596 | 14.589013 |
| 0.005301 | 13.213743 | -0.005014 | 13.213743 | -0.004624 | 13.198540 |
| 0.004097 | 11.601814 | -0.003904 | 11.601814 | -0.003606 | 11.588464 |
| 0.003229 | 10.245328 | -0.003075 | 10.245328 | -0.002831 | 10.233540 |
| 0.002561 | 9.099674 | -0.002432 | 9.099674 | -0.002253 | 9.089205 |
| 0.002029 | 8.110095 | -0.001946 | 8.110095 | -0.001810 | 8.100763 |
| 0.001647 | 7.253138 | -0.001577 | 7.253138 | -0.001453 | 7.244792 |
| 0.001305 | 6.509174 | -0.001289 | 6.509174 | -0.001171 | 6.485386 |
| 0.001041 | 5.854985 | -0.001043 | 5.848249 | -0.000945 | 5.810292 |
| 0.000861 | 5.273301 | -0.000842 | 5.278687 | -0.000787 | 5.287375 |
| 0.000672 | 4.678586 | -0.000677 | 4.645430 | -0.000618 | 4.663597 |
| 0.000540 | 4.213738 | -0.000541 | 4.197841 | -0.000510 | 4.216921 |
| 0.000396 | 3.639535 | -0.000442 | 3.724311 | -0.000399 | 3.702094 |
| 0.000295 | 3.175437 | -0.000334 | 3.208253 | -0.000309 | 3.224887 |
| 0.000257 | 2.982186 | -0.000267 | 2.841382 | -0.000262 | 2.945105 |
| 0.000166 | 2.458408 | -0.000224 | 2.578572 | -0.000197 | 2.507241 |
| 0.000151 | 2.360940 | -0.000169 | 2.197068 | -0.000172 | 2.316902 |
| 0.000104 | 2.025398 | -0.000158 | 2.112516 | -0.000141 | 2.056560 |
| 0.000072 | 1.760726 | -0.000131 | 1.889000 | -0.000122 | 1.879253 |
| 0.000062 | 1.669433 | -0.000106 | 1.655346 | -0.000105 | 1.705051 |
| 0.000037 | 1.415672 | -0.000087 | 1.452851 | -0.000076 | 1.357225 |
| 0.000032 | 1.359248 | -0.000081 | 1.382758 | -0.000059 | 1.103480 |
| 0.000032 | 1.359248 | -0.000081 | 1.117810 | -0.000051 | 0.955439 |
| -0.000001 | 0.902308 | -0.000050 | 0.940804 | -0.000044 | 0.810758 |
| -0.000008 | 0.767889 | -0.000046 | 0.867531 | -0.000039 | 0.698043 |
| -0.000013 | 0.658095 | -0.000041 | 0.766146 | -0.000036 | 0.602865 |
| -0.000017 | 0.561131 | -0.000034 | 0.595901 | -0.000033 | 0.516890 |
| | | -0.000031 | 0.513790 | | |

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|---|--|

B. Isotropy.

- Axial isotropy: 0.07 dB
- Hemispherical isotropy: 0.06 dB




E-field E (V/m) = $f(\phi, \theta)$

C. Linearity.

- Linearity: 0.20 dB

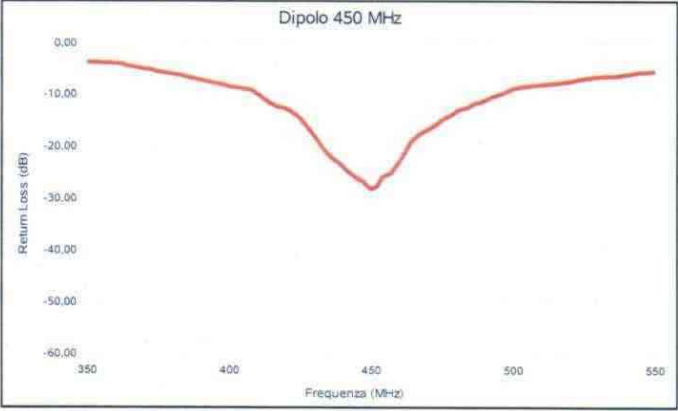
11. Annex B: dipoles reference SAR value and calibration



Verification of measuring instrument

Instrument checked : REFERENCE DIPOLE
 Manufacturer : ANTENNESSA / SANMO
 Model : 450 MHz
 Serial number : SN 39/05 DIPB26
 Date of inspection : 20/02/2014
 Measured quantity (unit) : RETURN LOSS (dB)

Measurements
 Return loss at the frequency of use : -28,32 dB



Instrumentation used for verification:

Instrument : VECTOR NETWORK ANALYZER
 Manufacturer : ANRITSU
 Model : MS 4622B
 Serial Number : 984502

On the basis of measurements carried out the instrument
 is is not
 appropriate for the use within the activities of SICOM.

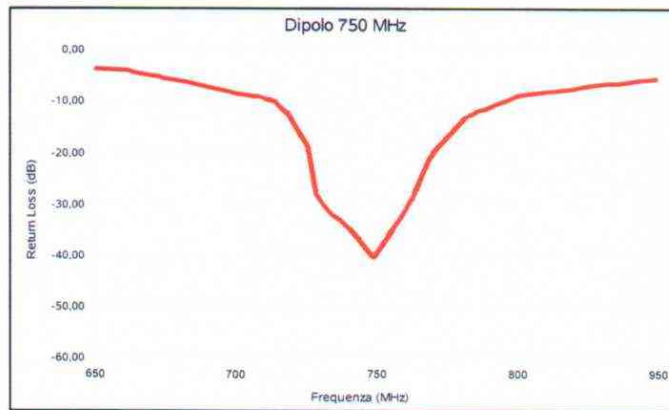
Test Operator : *Antonio Sicari*

Pag. 1 of 1

Verification of measuring instrument

Instrument checked : REFERENCE DIPOLE
Manufacturer : ANTENNESSA / SATMO
Model : 750 MHz
Serial number : SN 39/05 DIPC31
Date of inspection : 20/02/2014
Measured quantity (unit) : RETURN LOSS (dB)

Measurements
Return loss at the frequency of use : -39.99 dB



Instrumentation used for verification:
Instrument : VECTOR NETWORK ANALYZER
Manufacturer : ANRITSU
Model : MS 4622B
Serial Number : 984502

On the basis of measurements carried out the instrument is is not appropriate for the use within the activities of SICOM.

Test Operator : *Antonio Di...*

Dipole historical data

| | |
|--------------------------|-----------------------|
| Instrument checked | : REFERENCE DIPOLE |
| Manufacturer | : AURENCESSA / SATINO |
| Model | : 450.MHz |
| Serial number | : SN. 39/09 DIPB26 |
| Date of inspection | : 21/02/2014 |
| Measured quantity (unit) | : SAR |

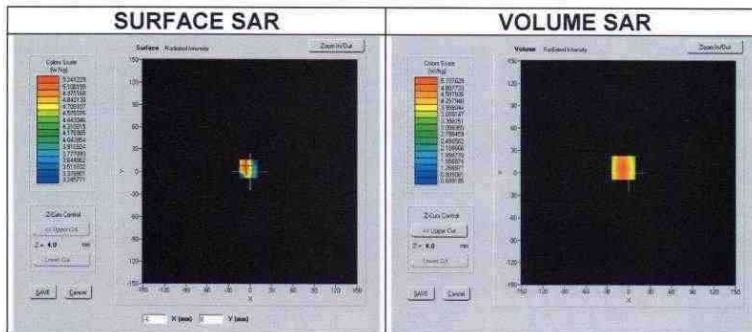
Date of measurement: 21/02/2014

A. Experimental conditions.

| | |
|-----------------|------------------|
| Phantom | Validation plane |
| Device Position | Dipole |
| Band | 450 MHz |
| Channel | Middle |
| Signal | CW |
| Probe Path | Adaptative 1 max |
| Probe | EP_60 |

B. SAR Measurement Results:

| | |
|-----------------------------------|-------|
| Frequency (MHz) | 450.0 |
| Relative permittivity (real part) | 56.74 |
| Conductivity (S/m) | 0.942 |



| SAR | SAR (W/kg) | Reference value (W/kg) | Variation (%) | RESULT |
|---------|------------|------------------------|---------------|--------|
| SAR 1g | 5.14 | 5.05 | +1.78 | PASS |
| SAR 10g | 3.51 | 3.47 | +1.15 | PASS |

| | SAR (W/Kg) | SAR REFERENCE MANUFACTURER VALUE (W/Kg) | VARIATION (%) | VERDICT |
|---------|------------|---|---------------|---------|
| SAR 10g | 3,51 | 3,47 | + 1,15 % | PASS |
| SAR 1g | 5,14 | 5,05 | + 1,78 % | PASS |

On the basis of measurements carried out the instrument is is not appropriate for the use within the activities of SICOM.

Test Operator: 

Dipole historical data

Instrument checked : REFERENCE DIPOLE
Manufacturer : ANTENNESSA / SATIMO
Model : 750 MHz
Serial number : SN 39/05 DiPC31
Date of inspection : 22/02/2014
Measured quantity (unit) : SAR (W/kg)

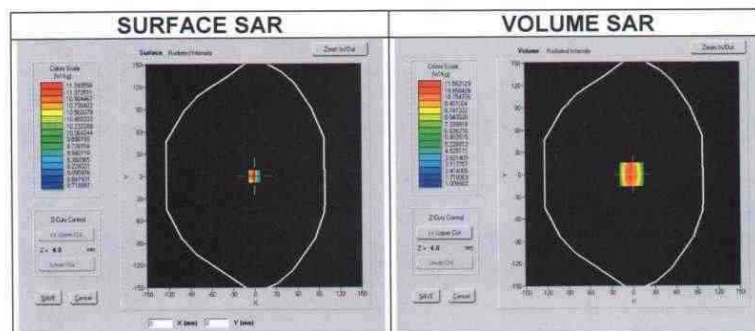
Date of measurement: 21/02/2014

A. Experimental conditions.

| | |
|-----------------|------------------|
| Phantom | Validation plane |
| Device Position | Dipole |
| Band | 750 MHz |
| Channel | Middle |
| Signal | CW |
| Probe Path | Adaptative 1 max |
| Probe | EP_60 |

B. SAR Measurement Results:

| | |
|-----------------------------------|-------|
| Frequency (MHz) | 750.0 |
| Relative permittivity (real part) | 55.22 |
| Conductivity (S/m) | 0.978 |



| SAR | SAR (W/kg) | Reference value (W/kg) | Variation (%) | RESULT |
|---------|------------|------------------------|---------------|--------|
| SAR 1g | 9.37 | 9.12 | +2.74 | PASS |
| SAR 10g | 6.11 | 6.01 | +1.66 | PASS |

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| | SAR (W/Kg) | SAR REFERENCE MANUFACTURER VALUE (W/Kg) | VARIATION (%) | VERDICT |
|---------|---------------|---|------------------|---------|
| SAR 10g | 6,11 | 6,01 | +1,66 | PASS |
| SAR 1g | 9,37 | 9,12 | +2,74 | PASS |

On the basis of measurements carried out the instrument
is is not
appropriate for the use within the activities of SICOM.

Test Operator

Mark Bean