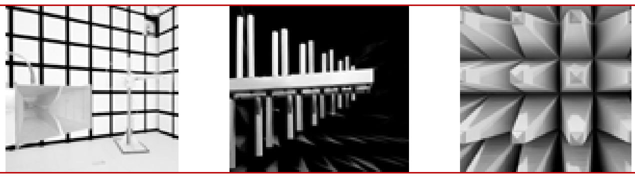

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consulting - testing - certification >>>

TEST REPORT

Test Report No.: 1-1837-01-02/09

Deutscher Akkreditierungs Rat
DAR

Testing Laboratory

CETECOM ICT Services GmbH
Untertürkheimer Straße 6 – 10
66117 Saarbrücken/Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.cetecom-ict.de
e-mail: info@ict.cetecom.de

Accredited Test Laboratory:
The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025

DAR registration number: DGA-PL-176/94-D1

Applicant

Inmarsat Global Ltd
99 City Road
London EC1Y 1AX/UNITED KINGDOM

Phone: +44 (0)20 7728 1000

Contact: Hok Shuen Wong
e-mail: hok_shuen_wong@inmarsat.com
Phone: +44 (0)20 7728 1000
Fax: +44 (0) 20 7728 1702

Manufacturer

Inmarsat Global Ltd
99 City Road
London EC1Y 1AX/UNITED KINGDOM

Test Standard/s

IEEE 1528-2003	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR)in the Human Head from Wireless Communications Devices: Measurement Techniques
RSS-102 Issue 4	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	Satellite Phone
Device type:	portable device
Model name:	**Isat phone Pro**
S/N serial number:	IC10110281
FCC-ID:	YCT-ISATPHONE
IC:	8944A-ISATPHONE
IMEI-Number:	004401510019348
Hardware status:	0322
Software status:	0.1.4
Frequency:	see technical details
Antenna:	Quadrifilar helix antenna (3.8dBi gain)
Battery option:	Inmarsat MH16707 Li-Ion 3.7V, 2600mAh 9.7Wh
Test sample status:	identical prototype
Exposure category:	general population / uncontrolled environment

additional FCC correspondence : tracking number 853278

Test performed:

cn=Oleksandr Hnatovskiy, o=CETECOM ICT Services GmbH, ou=HNA-100322, email=Oleksandr.Hnatovskiy@ict.cetecom.de, c=DE
2010.05.18 09:21:53 +02'00'

2010-04-28 Oleksandr Hnatovskiy

Test Report authorised:

cn=Thomas Vogler, o=CETECOM ICT Services GmbH, ou=VOG-100114, email=thomas.vogler@ict.cetecom.de, c=DE
2010.05.18 09:09:54 +02'00'

2010-04-28 Thomas Vogler

1 Table of contents

2 General information

2.1 Notes

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM ICT Services GmbH.

2.2 Application details

Date of receipt of order:	2010-04-07
Date of receipt of test item:	2010-04-07
Start of test:	2010-04-07
End of test:	2010-04-07
Person(s) present during the test:	Mr. Aki Myllymáki

2.3 Statement of compliance

The SAR values found for the Isat phone Pro Satellite Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1 g tissue according to the FCC rule §2.1093, the ANSI/IEEE C 95.1:1999, the NCRP Report Number 86 for uncontrolled environment, according to the Health Canada's Safety Code 6 and the Industry Canada Radio Standards Specification RSS-102 for General Population/Uncontrolled exposure.

2.4 Technical details

Technology:	GMR-2+(tested)
Frequency band:	1640 MHz
Frequency band and channels:	Downlink frequencies: 1525MHz-1559MHz Downlink extended band frequencies: 1518MHz-1525MHz Uplink frequencies:1626.5MHz-1660.5MHz Uplink extended band frequencies: 1668MHz – 1675MHz Channels:0-169 Channels extended band:170-204
Kind of modulation:	Ground Station-to-User-Terminal (UT) → OQPSK User-Terminal-to-Ground Station →GMSK
Conducted output power:	33.4 dBm (GMR-2+);
Addition technology:	Bluetooth (<10 mW)

3 Test standard/s:

Test Standard	Version	Test Standard Description
IEEE 1528-2003	2003-04	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
RSS-102 Issue 4	2010-03	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Canada's Safety Code No. 6	99-EHD-237	Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
IEEE Std. C95-3	1991	Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave
IEEE Std. C95-1	1999	Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields

3.1 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR* (Brain)	**1.60 mW/g**	8.00 mW/g
Spatial Average SAR** (Whole Body)	0.08 mW/g	0.40 mW/g
Spatial Peak SAR*** (Hands/Feet/Ankle/Wrist)	4.00 mW/g	20.00 mW/g

Table 1: RF exposure limits

The limit applied in this test report is shown in bold letters

Notes:

* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

** The Spatial Average value of the SAR averaged over the whole body.

*** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

4 Summary of Measurement Results

☒	**No deviations from the technical specifications ascertained**
☐	Deviations from the technical specifications ascertained

5 Test Environment

Ambient temperature: 20 – 24 °C
Tissue Simulating liquid: 20 – 24 °C

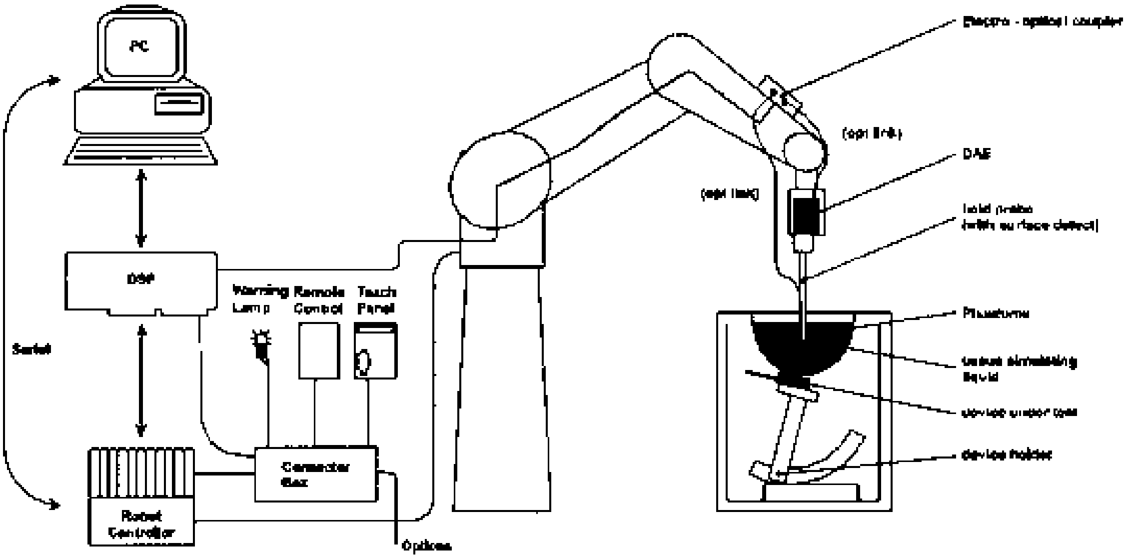
Relative humidity content: 40 – 50 %
Air pressure: not relevant for this kind of testing
Power supply: 230 V / 50 Hz

Exact temperature values for each test are shown in the table(s) under 2.5. and/or on the measurement plots.

6 Test Set-up

6.1 Measurement system

6.1.1 System Description



- The DASY4 system for performing compliance tests consists of the following items:
- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY4 measurement server.
- The DASY4 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2000
- DASY4 software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.

6.1.2 Test environment

The DASY4 measurement system is placed at the head end of a room with dimensions: 5 x 2.5 x 3 m³, the SAM phantom is placed in a distance of 75 cm from the side walls and 1.1m from the rear wall. Above the test system a 1.5 x 1.5 m² array of pyramid absorbers is installed to reduce reflections from the ceiling.
Picture 1 of the photo documentation shows a complete view of the test environment.
The system allows the measurement of SAR values larger than 0.005 mW/g.

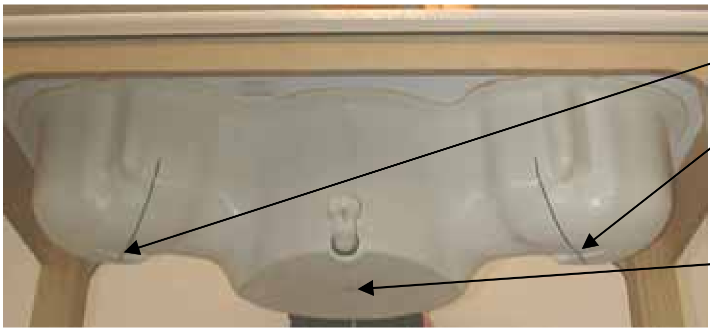
6.1.3 Probe description

Isotropic E-Field Probe ET3DV6 for Dosimetric Measurements

Technical data according to manufacturer information	
Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)
Calibration	In air from 10 MHz to 2.5 GHz In head tissue simulating liquid (HSL) at 900 (800-1000) MHz and 1.8 GHz (1700-1910 MHz) (accuracy ± 9.5%; k=2) Calibration for other liquids and frequencies upon request
Frequency	10 MHz to 3 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces (ET3DV6 only)
Dimensions	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (ET3DV6)

6.1.4 Phantom description

The used SAM Phantom meets the requirements specified in Edition 01-01 of Supplement C to OET Bulletin 65 for Specific Absorption Rate (SAR) measurements.
The phantom consists of a fibreglass shell integrated in a wooden table. It allows left-hand and right-hand head as well as body-worn measurements with a maximum liquid depth of 18 cm in head position and 22 cm in planar position (body measurements). The thickness of the Phantom shell is 2 mm +/- 0.1 mm.



ear reference point right hand side

ear reference point left hand side

reference point flat position

6.1.5 Device holder description

The DASY4 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used.

Larger DUT's (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values.
Therefore those devices are normally only tested at the flat part of the SAM.

6.1.6 Scanning procedure

- The DASY4 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- The „reference“ and „drift“ measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT's output power and should vary max. +/- 5 %.

- The „surface check“ measurement tests the optical surface detection system of the DASY4 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

- The „area scan“ measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strenth is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid spacing for head measurements is 15 mm in x- and y- dimension. If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation. Results of this coarse scan are shown in annex 2.

- A „7x7x7 zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous „coarse“ scan. This is a fine 7x7 grid where the robot additionally moves the probe in 7 steps along the z-axis away from the bottom of the Phantom. Grid spacing for the cube measurement is 5 mm in x and y-direction and 5 mm in z-direction. DASY4 is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in annex 2. Test results relevant for the specified standard (see section 3) are shown in table form in section 7.

- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2mm steps. This measurement shows the continuity of the liquid and can - depending in the field strength – also show the liquid depth. A z-axis scan of the measurement with maximum SAR value is shown in annex 2.

6.1.7 Spatial Peak SAR Evaluation

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of 7 x 7 x 7 points. The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting ‘Graph Evaluated’.

- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.

- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].

Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

Advanced Extrapolation

DASY4 uses the advanced extrapolation option which is able to compansate boundary effects on E-field probes.

6.1.8 Data Storage and Evaluation

Data Storage

The DASY4 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	Dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY4 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf/dcp_i$$

with V_i = compensated signal of channel i (i = x, y, z)
U_i = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes: $$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

H-field probes: $$H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1}f + a_{i2}f^2)/f$$

with V_i = compensated signal of channel i (i = x, y, z)
$Norm_i$ = sensor sensitivity of channel i (i = x, y, z) $[mV/(V/m)^2]$ for E-field Probes
ConvF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
E_i = electric field strength of channel i in V/m
H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (E_{tot}^2 \cdot \sigma) / (\rho \cdot 1000)$$

with SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with P_{pwe} = equivalent power density of a plane wave in mW/cm^2
E_{tot} = total electric field strength in V/m
H_{tot} = total magnetic field strength in A/m

6.1.9 Tissue simulating liquids: dielectric properties

The following materials are used for producing the tissue-equivalent materials.

(Liquids used for tests described in section 7. are marked with ☒) :

Ingredients (% of weight)	Frequency (MHz)
frequency band	☒ 1640
Tissue Type	Head
Water	52.64
Salt (NaCl)	0.36
Sugar	0.0
HEC	0.0
Bactericide	0.0
Triton X-100	0.0
DGBE	47.0

Table 2: Head tissue dielectric properties

Salt: 99+% Pure Sodium Chloride
Sugar: 98+% Pure Sucrose
Water: De-ionized, 16MΩ+ resistivity
HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

Note: Due to their availability body tissue simulating liquids as defined by FCC OET Bulletin 65 Supplement C are generally used for body worn SAR testing according to European standards.

6.1.10 Tissue simulating liquids: parameters

Used Target Frequency	Target Head Tissue		Measured Head Tissue		Measured Date
[MHz]	Permittivity	Conductivity [S/m]	Permittivity	Conductivity [S/m]	
1640	40.0	1.29	40.3	1.25	2010-04-07

Table 3: Parameter of the head tissue simulating liquid

Note: The dielectric properties have been measured using the contact probe method at 22°C.

6.1.11 Measurement uncertainty evaluation for SAR test

The overall combined measurement uncertainty of the measurement system is ± 10.3% (K=1).
The expanded uncertainty (k=2) is assessed to be ± 20.6%
This measurement uncertainty budget is suggested by IEEE 1528-2003 and determined by Schmid & Partner Engineering AG. The breakdown of the individual uncertainties is as follows:

Error Sources	Uncertainty Value	Probability Distribution	Divi-sor	c_i 1g	c_i 10g	Standard Uncertainty 1g	Standard Uncertainty 10g	v_i^2 or v_{eff}
Measurement System								
Probe calibration	± 4.8%	Normal	1	1	1	± 4.8%	± 4.8%	∞
Axial isotropy	± 4.7%	Rectangular	√3	0.7	0.7	± 1.9%	± 1.9%	∞
Hemispherical isotropy	± 9.6%	Rectangular	√3	0.7	0.7	± 3.9%	± 3.9%	∞
Spatial resolution	± 0.0%	Rectangular	√3	1	1	± 0.0%	± 0.0%	∞
Boundary effects	± 1.0%	Rectangular	√3	1	1	± 0.6%	± 0.6%	∞
Probe linearity	± 4.7%	Rectangular	√3	1	1	± 2.7%	± 2.7%	∞
System detection limits	± 1.0%	Rectangular	√3	1	1	± 0.6%	± 0.6%	∞
Readout electronics	± 1.0%	Normal	1	1	1	± 1.0%	± 1.0%	∞
Response time	± 0.8%	Rectangular	√3	1	1	± 0.5%	± 0.5%	∞
Integration time	± 2.6%	Rectangular	√3	1	1	± 1.5%	± 1.5%	∞
RF ambient conditions	± 3.0%	Rectangular	√3	1	1	± 1.7%	± 1.7%	∞
Probe positioner	± 0.4%	Rectangular	√3	1	1	± 0.2%	± 0.2%	∞
Probe positioning	± 2.9%	Rectangular	√3	1	1	± 1.7%	± 1.7%	∞
Max. SAR evaluation	± 1.0%	Rectangular	√3	1	1	± 0.6%	± 0.6%	∞
Test Sample Related								
Device positioning	± 2.9%	Normal	1	1	1	± 2.9%	± 2.9%	145
Device holder uncertainty	± 3.6%	Normal	1	1	1	± 3.6%	± 3.6%	5
Power drift	± 5.0%	Rectangular	√3	1	1	± 2.9%	± 2.9%	∞
Phantom and Set-up								
Phantom uncertainty	± 4.0%	Rectangular	√3	1	1	± 2.3%	± 2.3%	∞
Liquid conductivity (target)	± 5.0%	Rectangular	√3	0.64	0.43	± 1.8%	± 1.2%	∞
Liquid conductivity (meas.)	± 2.5%	Normal	1	0.64	0.43	± 1.6%	± 1.1%	∞
Liquid permittivity (target)	± 5.0%	Rectangular	√3	0.6	0.49	± 1.7%	± 1.4%	∞
Liquid permittivity (meas.)	± 2.5%	Normal	1	0.6	0.49	± 1.5%	± 1.2%	∞
Combined Uncertainty						± 10.3%	± 10.0%	330
Expanded Std. Uncertainty						**± 20.6%**	**± 20.1%**	

Table 4: Measurement uncertainties

6.1.12 Measurement uncertainty evaluation for system validation

The overall combined measurement uncertainty of the measurement system is ± 8.4% (K=1).
The expanded uncertainty (k=2) is assessed to be ± 16.8%
This measurement uncertainty budget is suggested by IEEE 1528-2003 and determined by Schmid & Partner Engineering AG. The breakdown of the individual uncertainties is as follows:

Error Sources	Uncertainty Value	Probability Distribution	Divi-sor	c_i 1g	c_i 10g	Standard Uncertainty 1g	Standard Uncertainty 10g	v_i^2 or v_{eff}
Measurement System								
Probe calibration	± 4.8%	Normal	1	1	1	± 4.8%	± 4.8%	∞
Axial isotropy	± 4.7%	Rectangular	√3	0.7	0.7	± 1.9%	± 1.9%	∞
Hemispherical isotropy	± 0.0%	Rectangular	√3	0.7	0.7	± 0.0%	± 3.9%	∞
Boundary effects	± 1.0%	Rectangular	√3	1	1	± 0.6%	± 0.6%	∞
Probe linearity	± 4.7%	Rectangular	√3	1	1	± 2.7%	± 2.7%	∞
System detection limits	± 1.0%	Rectangular	√3	1	1	± 0.6%	± 0.6%	∞
Readout electronics	± 1.0%	Normal	1	1	1	± 1.0%	± 1.0%	∞
Response time	± 0.0%	Rectangular	√3	1	1	± 0.0%	± 0.0%	∞
Integration time	± 0.0%	Rectangular	√3	1	1	± 0.0%	± 0.0%	∞
RF ambient conditions	± 3.0%	Rectangular	√3	1	1	± 1.7%	± 1.7%	∞
Probe positioner	± 0.4%	Rectangular	√3	1	1	± 0.2%	± 0.2%	∞
Probe positioning	± 2.9%	Rectangular	√3	1	1	± 1.7%	± 1.7%	∞
Max. SAR evaluation	± 1.0%	Rectangular	√3	1	1	± 0.6%	± 0.6%	∞
Test Sample Related								
Dipole axis to liquid distance	± 2.0%	Normal	1	1	1	± 1.2%	± 1.2%	∞
Power drift	± 4.7%	Rectangular	√3	1	1	± 2.7%	± 2.7%	∞
Phantom and Set-up								
Phantom uncertainty	± 4.0%	Rectangular	√3	1	1	± 2.3%	± 2.3%	∞
Liquid conductivity (target)	± 5.0%	Rectangular	√3	0.64	0.43	± 1.8%	± 1.2%	∞
Liquid conductivity (meas.)	± 2.5%	Normal	1	0.64	0.43	± 1.6%	± 1.1%	∞
Liquid permittivity (target)	± 5.0%	Rectangular	√3	0.6	0.49	± 1.7%	± 1.4%	∞
Liquid permittivity (meas.)	± 2.5%	Normal	1	0.6	0.49	± 1.5%	± 1.2%	∞
Combined Uncertainty						**± 8.4%**	**± 8.1%**	
Expanded Std. Uncertainty						**± 16.8%**	**± 16.2%**	

Table 5: Measurement uncertainties

6.1.13 System validation

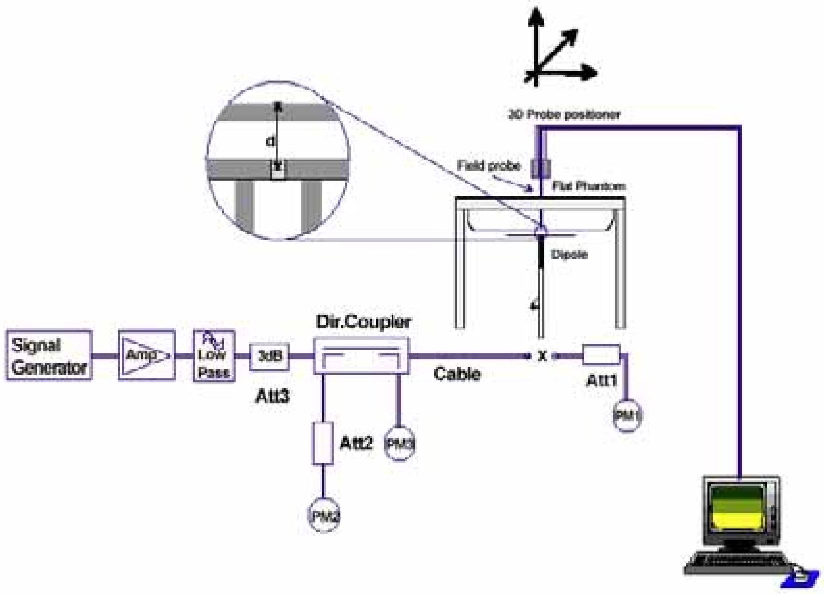
The system validation is performed for verifying the accuracy of the complete measurement system and performance of the software. The system validation is performed with tissue equivalent material according to IEEE 1528. The following table shows validation results for all frequency bands and tissue liquids used during the tests (plot(s) see annex A).

Validation Kit	Frequency	Target Peak SAR (1000 mW) (+/- 10%)	Target SAR_{1g} (1000 mW) (+/- 10%)	Measured Peak SAR (1000 mW)	Measured SAR_{1g} (1000 mW)	Measured date
D1640V2 S/N: 323	1640 MHz head	**60.0 mW/g**	**34.3 mW/g**	**55.0 mW/g**	**31.9 mW/g**	**2010-04-07**

Table 6: Results system validation

6.1.14 Validation procedure

The validation is performed by using a validation dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 1000 mW. To adjust this power a power meter is used. The power sensor is connected to the cable before the validation to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the validation to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).
Validation results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.



7 Detailed Test Results

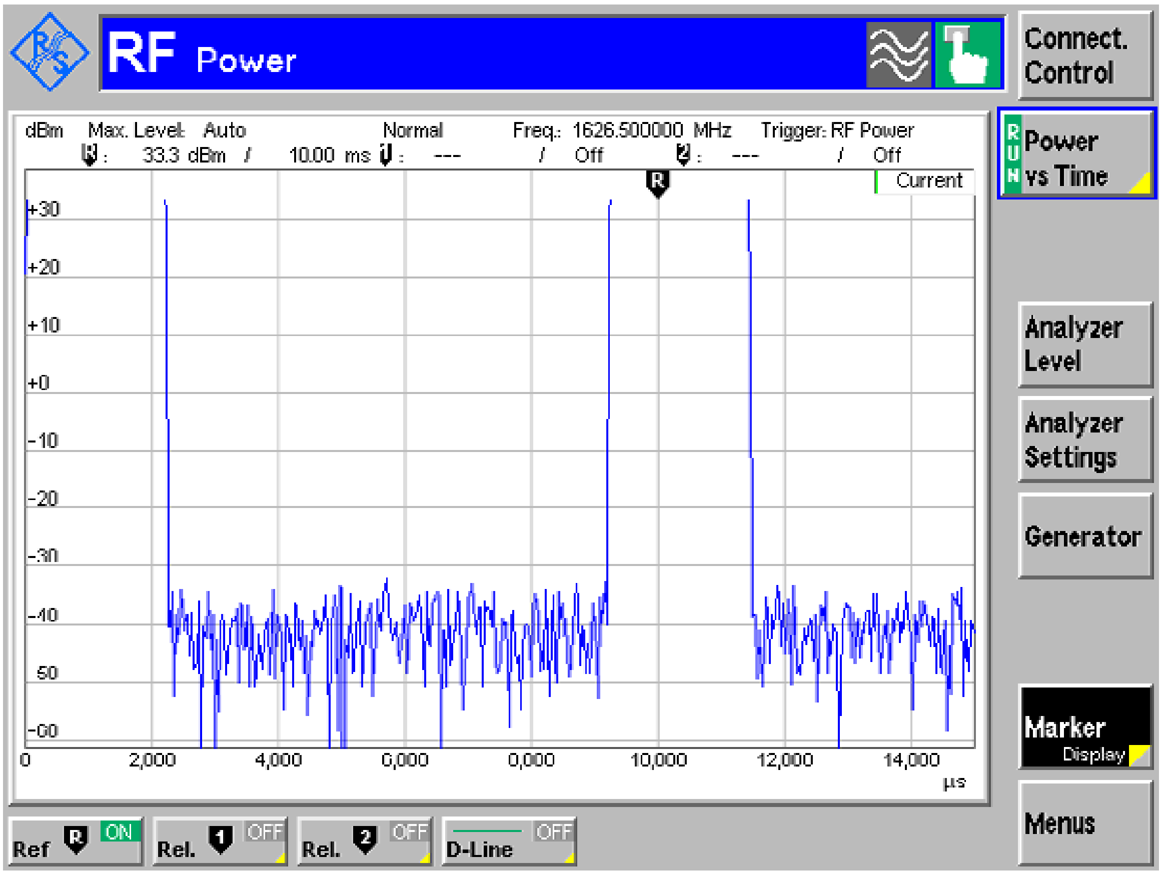
7.1 Conducted power measurements

For the measurements a Rohde & Schwarz Radio Communication Tester CMU 200 was used.
The output power was measured using an integrated RF connector and attached RF cable.
The conducted output power was also checked before and after each SAR measurement. The resulting power values were within a 0.2 dB tolerance of the values shown below.

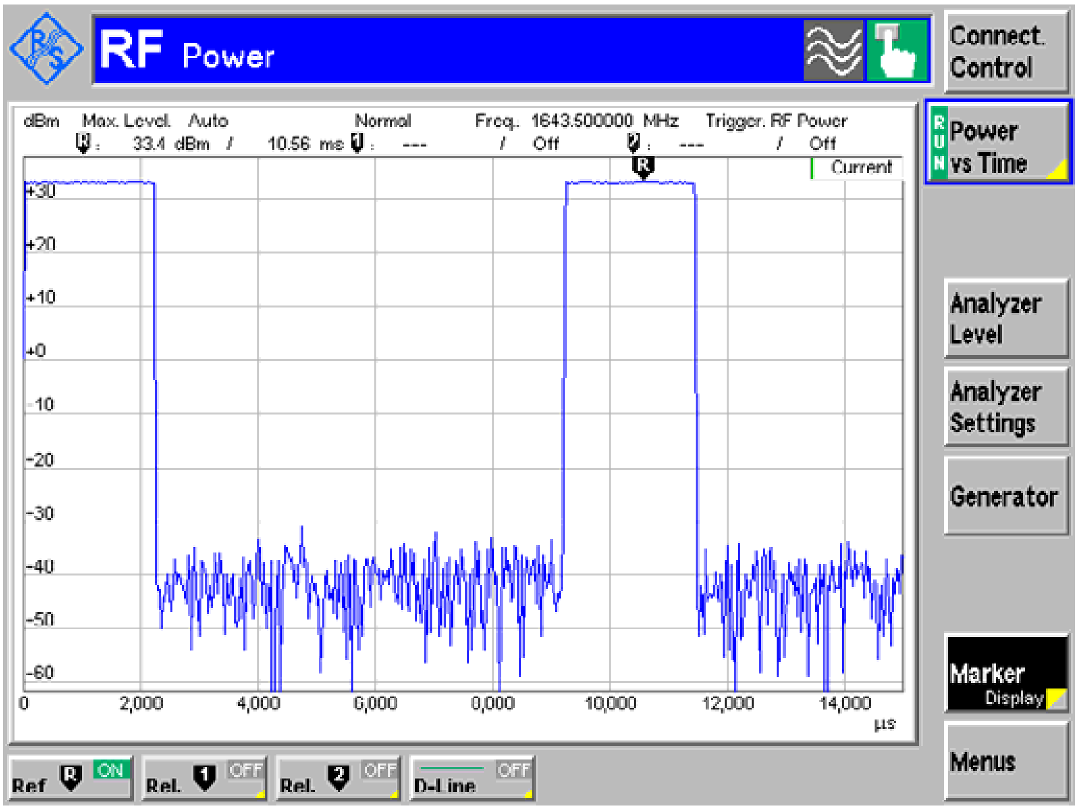
frequency	modulation	timeslots	slotted avg. power
1626.5 MHz	GMSK	1	33.3dBm
1643.5 MHz	GMSK	1	33.4dBm
1660.3 MHz	GMSK	1	33.3dBm

Table 7: Test results conducted power measurement 1640MHz

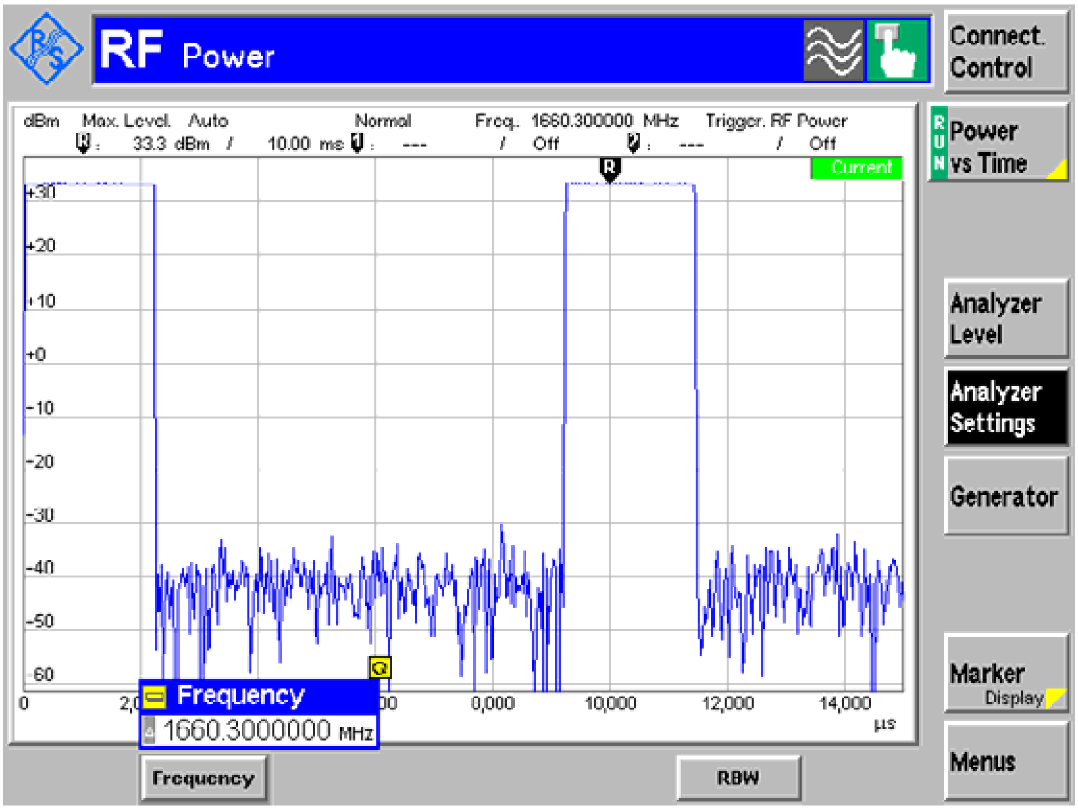
The DUT is able to transmit at 'half rate' or 'quarter rate'. SAR tests were performed at 'half rate' (worst case condition). Signal form and power level are displayed on the following plots.



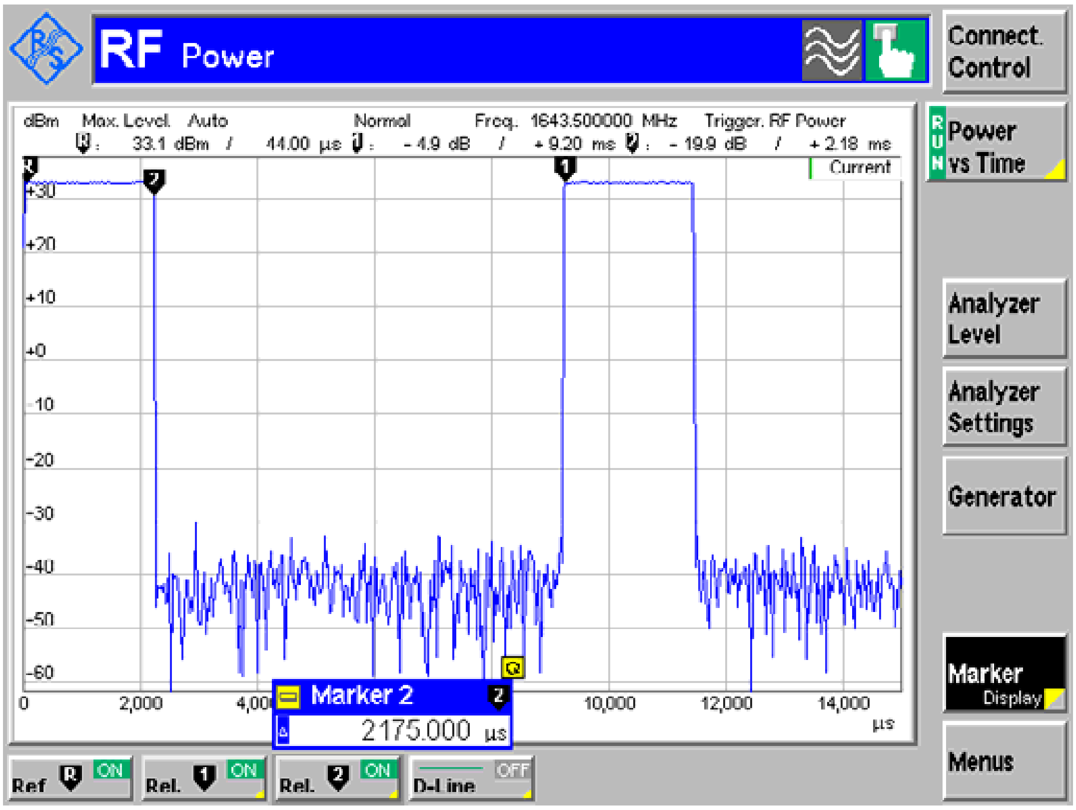
Test results conducted power measurement 1626.5MHz



Test results conducted power measurement 1643.5MHz



Test results conducted power measurement 1660.3MHz



Test results conducted power measurement 1643.5MHz (duty cycle 1:4)

7.1.1 Multiple Transmitter Information

The distance from the hot spot of the main antenna to the Bluetooth antenna of the DUT is > 5 cm and the sum of the SAR values is < 1.6 W/kg :
No simultaneous transmission SAR evaluation is necessary with GMR-2+.
The Bluetooth output power is below P_{ref} (12 mW). So standalone SAR for BT is not necessary.

7.2 SAR test results

7.2.1 Results overview

Head SAR GMR-2+ 1640 MHz (averaged over 1g tissue volume)						
frequency	Position	Left hand test result	Right hand test result	Limit	Liquid temperature left	right
Antenna at 180°						
1626.5 MHz	cheek	--- W/kg	--- W/kg	1.6 W/kg	--- °C	--- °C
1643.5 MHz	cheek	0.221 W/kg	0.166 W/kg	1.6 W/kg	21.2 °C	21.2 °C
1660.5 MHz	cheek	--- W/kg	--- W/kg	1.6 W/kg	--- °C	--- °C
1626.5 MHz	tilted 15°	--- W/kg	--- W/kg	1.6 W/kg	--- °C	--- °C
1643.5 MHz	tilted 15°	0.590 W/kg	0.446 W/kg	1.6 W/kg	21.2 °C	21.2 °C
1660.5 MHz	tilted 15°	--- W/kg	--- W/kg	1.6 W/kg	--- °C	--- °C
Antenna at 135°			Antenna at 225°			
1626.5 MHz	cheek	--- W/kg	--- W/kg	1.6 W/kg	--- °C	--- °C
1643.5 MHz	cheek	0.266 W/kg	0.318 W/kg	1.6 W/kg	21.2 °C	21.2 °C
1660.5 MHz	cheek	--- W/kg	--- W/kg	1.6 W/kg	--- °C	--- °C
1626.5 MHz	tilted 15°	--- W/kg	**0.884 W/kg**	1.6 W/kg	--- °C	21.2 °C
1643.5 MHz	tilted 15°	0.466 W/kg	0.854 W/kg	1.6 W/kg	21.2 °C	21.2 °C
1660.5 MHz	tilted 15°	--- W/kg	0.854 W/kg	1.6 W/kg	--- °C	21.2 °C

Table 8: Test results head SAR GMR-2+ 1640 MHz

Note:

The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit (< 0.8 W/kg), testing at the high and low channels is optional.

7.2.2 General description of test procedures

The DUT is tested using PC software to control test channels and maximum output power of the DUT.
The signal was monitored by spectrum analyzer function of CMU 200, which was also used for measuring the conducted peak power.
Test positions as described in the tables above are in accordance with the specified test standard.
The antenna of the DUT can be used at 2 angle positions for each side of the head depending on the quality of the satellite link.

8 Test equipment and ancillaries used for tests

To simplify the identification of the test equipment and/or ancillaries which were used, the reporting of the relevant test cases only refer to the test item number as specified in the table below.

No	used	Equipment	Type	Manufacturer	Serial No.	Last Calibration	Frequency (months)
1	☐	Dosimetric E-Field Probe	ET3DV6	Schmid & Partner Engineering AG	1558	August 21, 2009	12
2	☒	Dosimetric E-Field Probe	ET3DV6	Schmid & Partner Engineering AG	1559	January 20, 2010	12
3	☐	900 MHz System Validation Dipole	D900V2	Schmid & Partner Engineering AG	102	August 17, 2009	12
4	☒	1640 MHz System Validation Dipole	D1640V2	Schmid & Partner Engineering AG	323	February 10, 2010	12
4	☐	1800 MHz System Validation Dipole	D1800V2	Schmid & Partner Engineering AG	287	August 18, 2009	12
5	☐	1900 MHz System Validation Dipole	D1900V2	Schmid & Partner Engineering AG	531	August 18, 2009	12
6	☐	2450 MHz System Validation Dipole	D2450V2	Schmid & Partner Engineering AG	710	August 17, 2009	12
7	☐	Data acquisition electronics	DAE3V1	Schmid & Partner Engineering AG	413	January 4, 2010	12
8	☒	Data acquisition electronics	DAE3V1	Schmid & Partner Engineering AG	477	May 14, 2009	12
9	☒	Software	DASY 4 V4.5	Schmid & Partner Engineering AG	---	N/A	--
10	☒	Phantom	SAM	Schmid & Partner Engineering AG	---	N/A	--
11	☒	Universal Radio Communication Tester	CMU 200	Rohde & Schwarz	106826	January 12, 2010	12
12	☒	Network Analyser 300 kHz to 6 GHz	8753C	Hewlett Packard)*	2937U00269	January 8, 2010	12
13	☒	Network Analyser 300 kHz to 6 GHz	85047A	Hewlett Packard)*	2936A00872	January 8, 2010	12
14	☒	Dielectric Probe Kit	85070C	Hewlett Packard	US99360146	N/A	12
15	☒	Signal Generator	8665A	Hewlett Packard	2833A00112	January 8, 2010	12
16	☒	Amplifier	25S1G4 (25 Watt)	Amplifier Reasearch	20452	N/A	--
17	☒	Power Meter	NRP	Rohde & Schwarz	101367	January 8, 2010	12
18	☒	Power Meter Sensor	NRP Z22	Rohde & Schwarz	100227	January 8, 2010	12
19	☒	Power Meter Sensor	NRP Z22	Rohde & Schwarz	100234	January 8, 2010	12

)* : Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

9 Observations

No observations exceeding those reported with the single test cases have been made.

Annex A: System performance verification

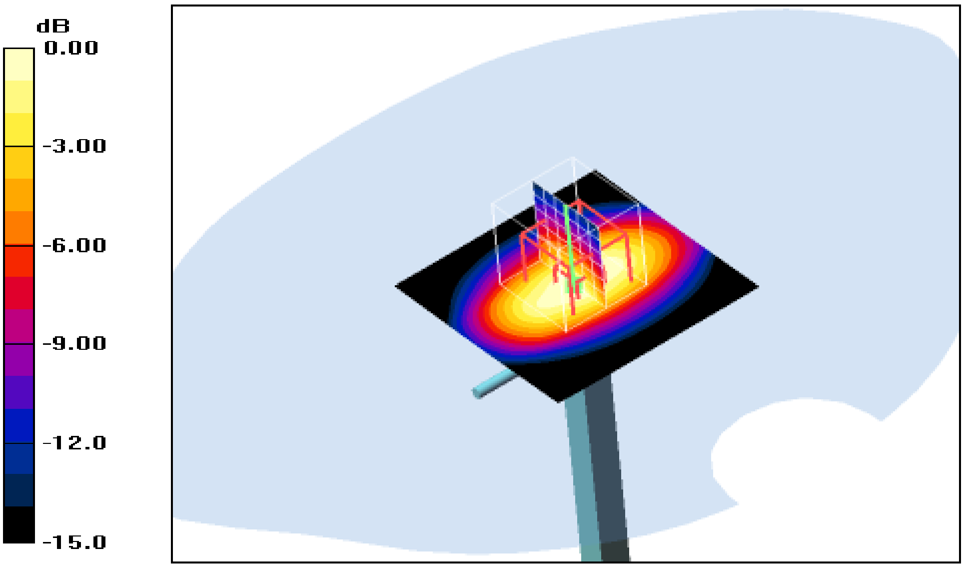
Date/Time: 2010-04-07 08:51:43Date/Time: 2010-04-07 09:12:03

SystemPerformanceCheck-D1640 head-2010-04-07

DUT: Dipole 1640 MHz; Type: D1640V2; Serial: 323
Communication System: CW; Frequency: 1640 MHz; Duty Cycle: 1:1
Medium: HSL1650 Medium parameters used (interpolated): f = 1640 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

d=10mm, Pin=1000mW/Area Scan (51x51x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 39.4 mW/g

d=10mm, Pin=1000mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 179.4 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 55.0 W/kg
SAR(1 g) = 31.9 mW/g; SAR(10 g) = 17.7 mW/g
Maximum value of SAR (measured) = 36.3 mW/g



0 dB = 36.3mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

Annex B: DASY4 measurement results

Annex B.1: GMR-2+ 1640MHz head

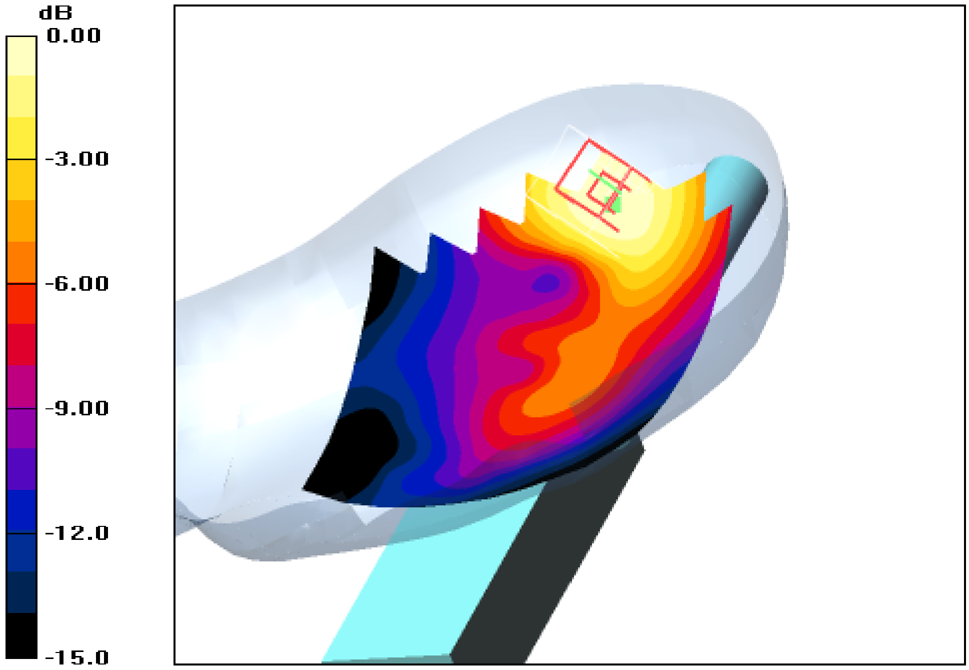
Date/Time: 2010-04-07 10:21:13Date/Time: 2010-04-07 10:37:50

IEEE1528_OET65_EN62209-LeftHandSide-INMARSAT

DUT: INMARSAT; Type: Isat phone Pro; Serial: IC10110281
Communication System: INMARSAT; Frequency: 1643.5 MHz; Duty Cycle: 1:4
Medium: HSL1650 Medium parameters used: f = 1643.5 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Left Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Touch position - Middle/Area Scan (91x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.246 mW/g

Touch position - Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.6 V/m; Power Drift = -0.026 dB
Peak SAR (extrapolated) = 0.271 W/kg
SAR(1 g) = 0.221 mW/g; SAR(10 g) = 0.160 mW/g
Maximum value of SAR (measured) = 0.233 mW/g



0 dB = 0.233mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

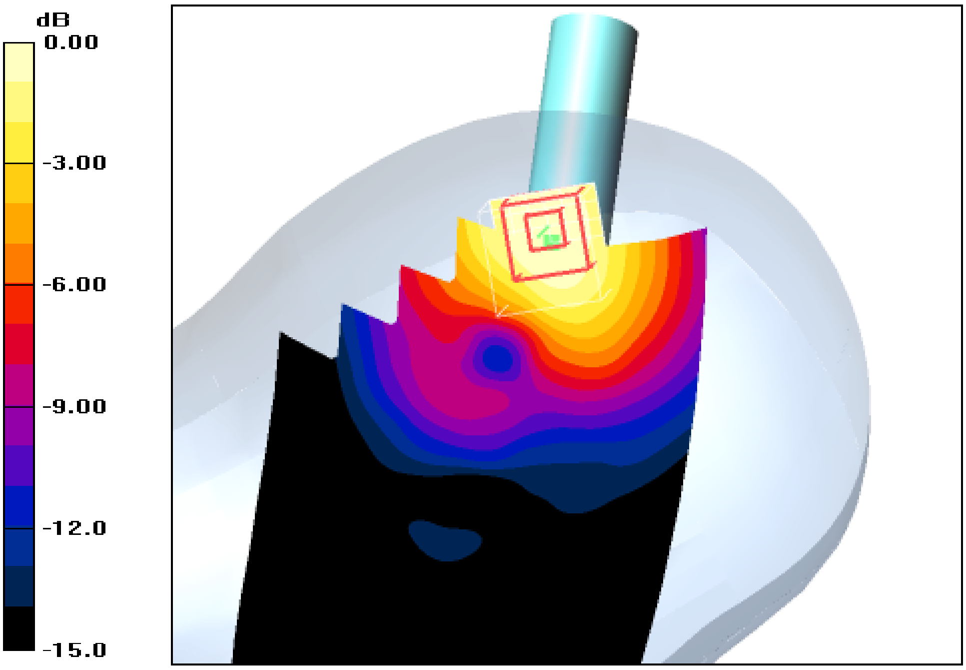
Date/Time: 2010-04-07 11:34:40Date/Time: 2010-04-07 11:55:23

IEEE1528_OET65_EN62209-LeftHandSide-INMARSAT

DUT: INMARSAT; Type: Isat phone Pro; Serial: IC10110281
Communication System: INMARSAT; Frequency: 1643.5 MHz;Duty Cycle: 1:4
Medium: HSL1650 Medium parameters used: f = 1643.5 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Left Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Tilt position - Middle/Area Scan (81x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.622 mW/g

Tilt position - Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 23.3 V/m; Power Drift = -0.049 dB
Peak SAR (extrapolated) = 0.728 W/kg
SAR(1 g) = 0.590 mW/g; SAR(10 g) = 0.425 mW/g
Maximum value of SAR (measured) = 0.616 mW/g



0 dB = 0.616mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

Date/Time: 2010-04-07 09:42:04Date/Time: 2010-04-07 10:00:10

IEEE1528_OET65_EN62209-LeftHandSide-INMARSAT

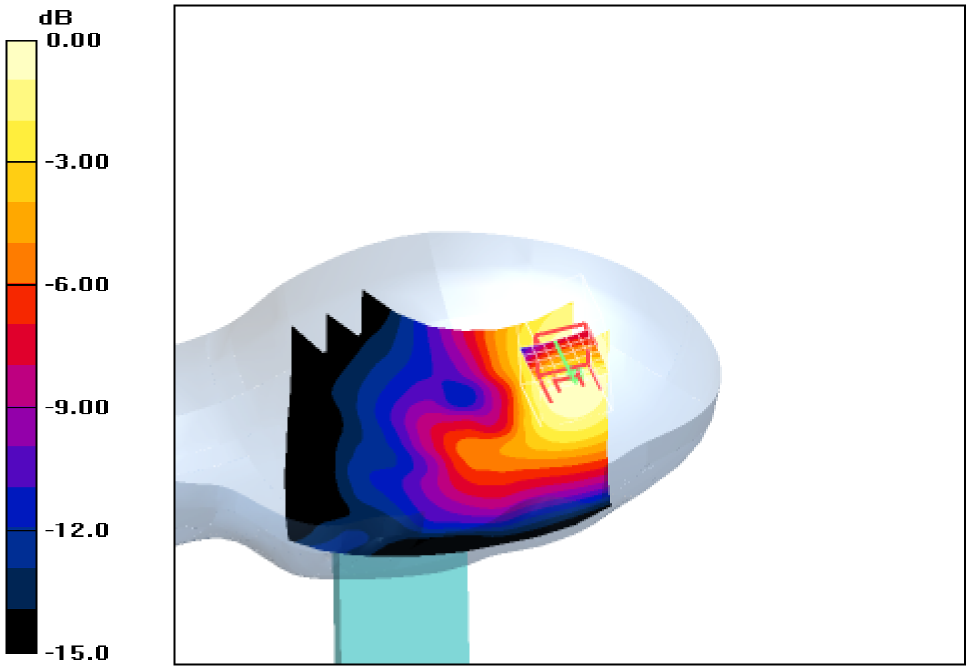
DUT: INMARSAT; Type: Isat phone Pro; Serial: IC10110281
Communication System: INMARSAT; Frequency: 1643.5 MHz;Duty Cycle: 1:4
Medium: HSL1650 Medium parameters used: f = 1643.5 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Left Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Touch position - Middle Antenna at 135°/Area Scan (91x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.286 mW/g

Touch position - Middle Antenna at 135°/Zoom Scan (7x10x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.8 V/m; Power Drift = 0.043 dB
Peak SAR (extrapolated) = 0.339 W/kg
SAR(1 g) = 0.266 mW/g; SAR(10 g) = 0.191 mW/g
Maximum value of SAR (measured) = 0.280 mW/g



0 dB = 0.280mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

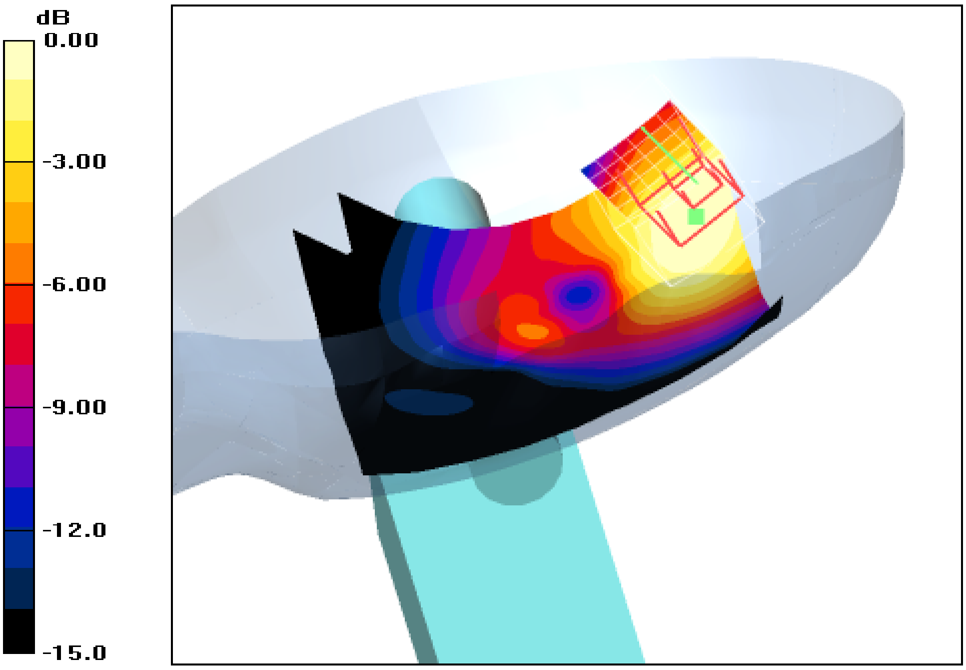
Date/Time: 2010-04-07 10:58:09Date/Time: 2010-04-07 11:13:49

IEEE1528_OET65_EN62209-LeftHandSide-INMARSAT

DUT: INMARSAT; Type: Isat phone Pro; Serial: IC10110281
Communication System: INMARSAT; Frequency: 1643.5 MHz;Duty Cycle: 1:4
Medium: HSL1650 Medium parameters used: f = 1643.5 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Left Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Tilt position - Middle Antenna at 135°/Area Scan (81x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.519 mW/g

Tilt position - Middle Antenna at 135°/Zoom Scan (9x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.3 V/m; Power Drift = -0.055 dB
Peak SAR (extrapolated) = 0.600 W/kg
SAR(1 g) = 0.466 mW/g; SAR(10 g) = 0.336 mW/g
Maximum value of SAR (measured) = 0.482 mW/g



0 dB = 0.482mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

Date/Time: 2010-04-07 12:55:15Date/Time: 2010-04-07 13:11:05

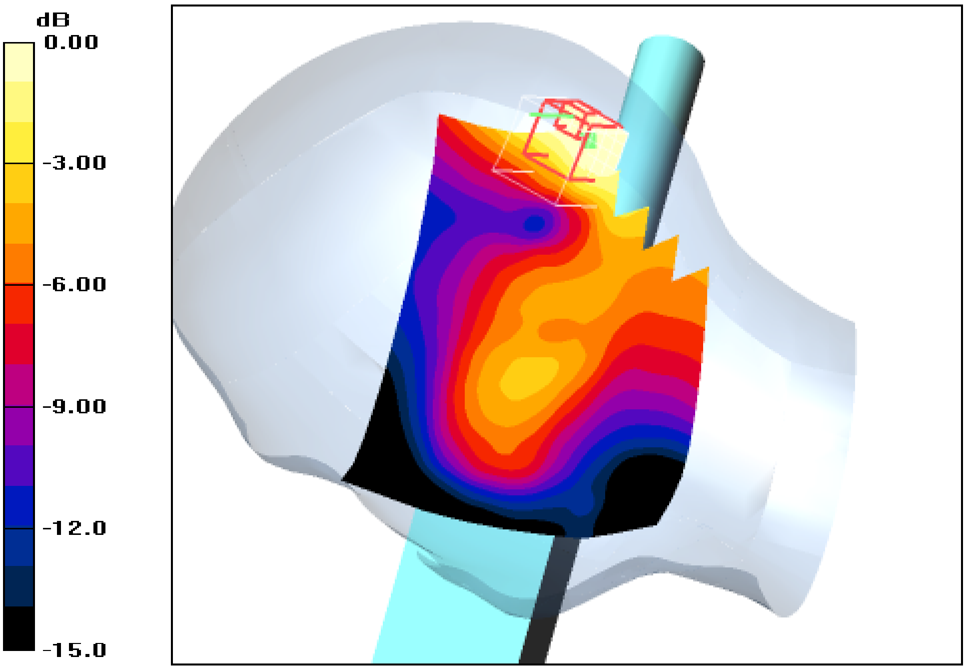
IEEE1528_OET65_EN62209-RightHandSide-INMARSAT

DUT: INMARSAT; Type: Isat phone Pro; Serial: IC10110281

Communication System: INMARSAT; Frequency: 1643.5 MHz;Duty Cycle: 1:4
Medium: HSL1650 Medium parameters used: f = 1643.5 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Right Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Touch position - Middle/Area Scan (81x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.179 mW/g

Touch position - Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.4 V/m; Power Drift = 0.111 dB
Peak SAR (extrapolated) = 0.209 W/kg
SAR(1 g) = 0.166 mW/g; SAR(10 g) = 0.114 mW/g
Maximum value of SAR (measured) = 0.174 mW/g



0 dB = 0.174mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

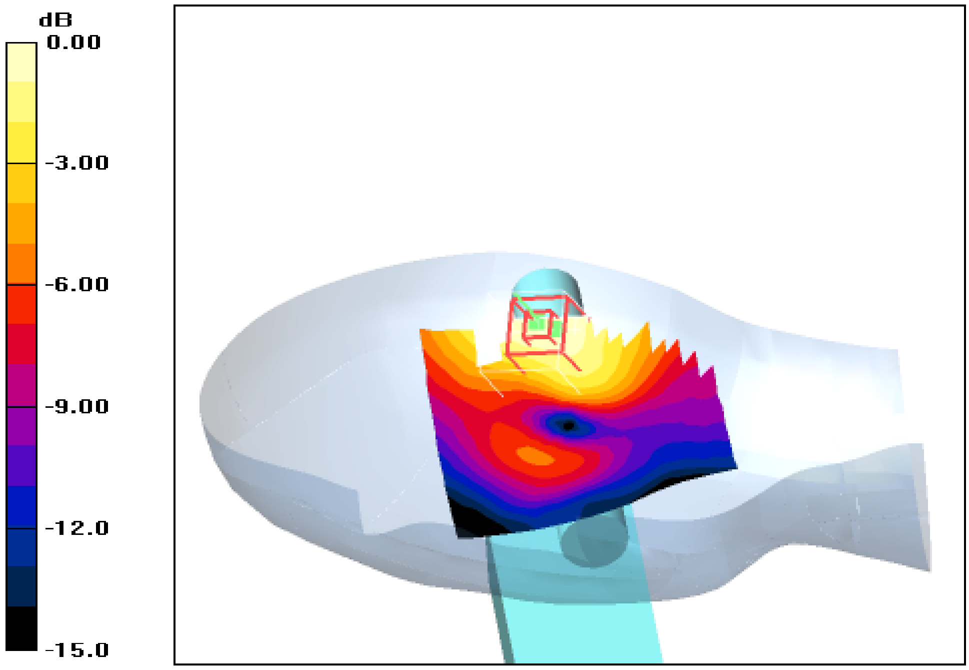
Date/Time: 2010-04-07 17:07:00Date/Time: 2010-04-07 17:58:11

IEEE1528_OET65_EN62209-RightHandSide-INMARSAT

DUT: INMARSAT; Type: Isat phone Pro; Serial: IC10110281
Communication System: INMARSAT; Frequency: 1643.5 MHz;Duty Cycle: 1:4
Medium: HSL1650 Medium parameters used: f = 1643.5 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Right Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Tilt position - Middle/Area Scan (211x231x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (interpolated) = 0.494 mW/g

Tilt position - Middle/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.9 V/m; Power Drift = -0.043 dB
Peak SAR (extrapolated) = 0.596 W/kg
SAR(1 g) = 0.446 mW/g; SAR(10 g) = 0.296 mW/g
Maximum value of SAR (measured) = 0.497 mW/g



0 dB = 0.497mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

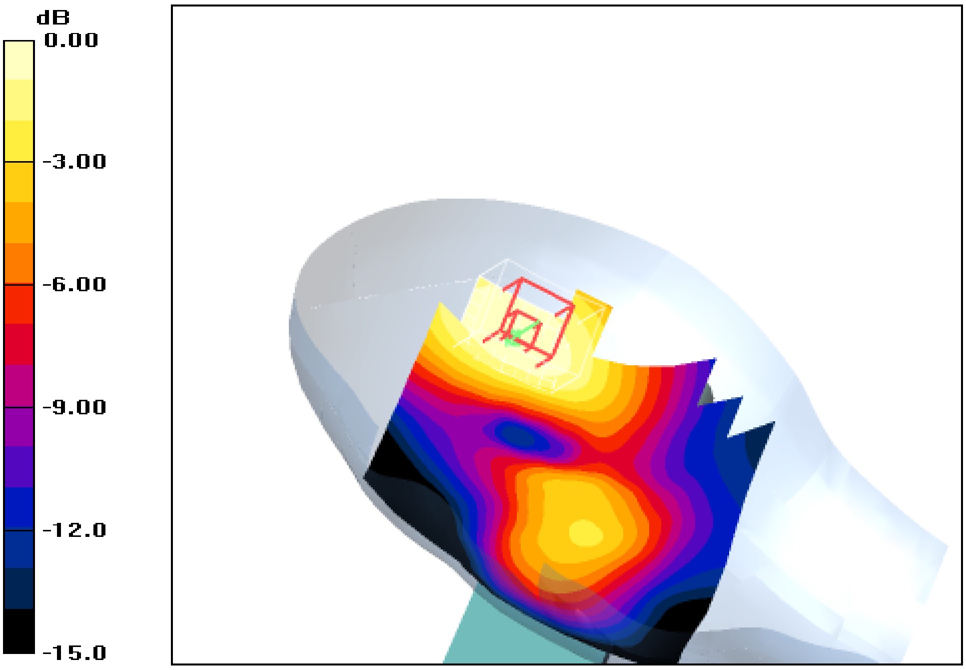
Date/Time: 2010-04-07 12:17:43Date/Time: 2010-04-07 12:35:48

IEEE1528_OET65_EN62209-RightHandSide-INMARSAT

DUT: INMARSAT; Type: Isat phone Pro; Serial: IC10110281
Communication System: INMARSAT; Frequency: 1643.5 MHz;Duty Cycle: 1:4
Medium: HSL1650 Medium parameters used: f = 1643.5 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Right Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Touch position - Middle Antenna at 225°/Area Scan (91x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.336 mW/g

Touch position - Middle Antenna at 225°/Zoom Scan (7x9x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.9 V/m; Power Drift = 0.019 dB
Peak SAR (extrapolated) = 0.405 W/kg
SAR(1 g) = 0.318 mW/g; SAR(10 g) = 0.230 mW/g
Maximum value of SAR (measured) = 0.333 mW/g



0 dB = 0.333mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

Date/Time: 2010-04-07 14:59:52Date/Time: 2010-04-07 15:15:08

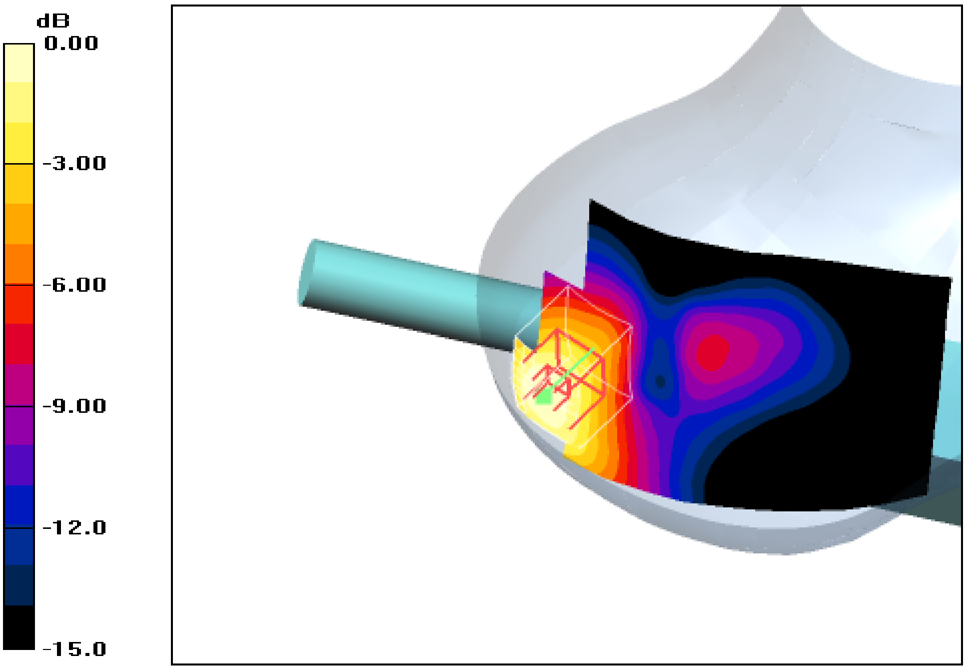
IEEE1528_OET65_EN62209-RightHandSide-INMARSAT

DUT: INMARSAT; Type: Isat phone Pro; Serial: IC10110281

Communication System: INMARSAT; Frequency: 1626.5 MHz;Duty Cycle: 1:4
Medium: HSL1650 Medium parameters used: f = 1626.5 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Right Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Tilt position - Low Antenna at 225°/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.972 mW/g

Tilt position - Low Antenna at 225°/Zoom Scan (9x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 28.2 V/m; Power Drift = 0.026 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.884 mW/g; SAR(10 g) = 0.609 mW/g
Maximum value of SAR (measured) = 0.942 mW/g



0 dB = 0.942mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

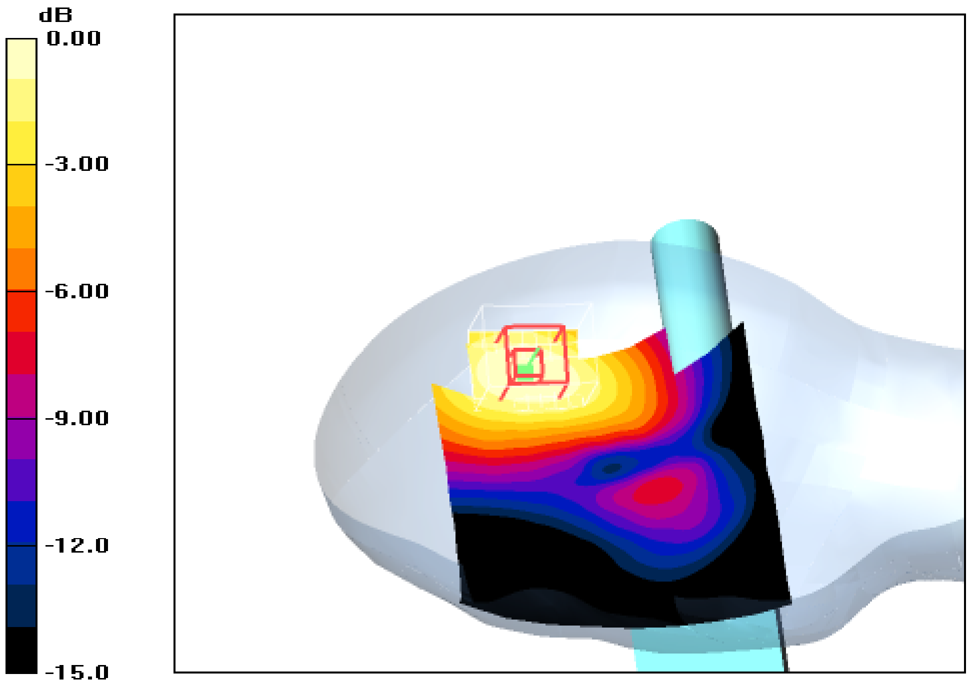
Date/Time: 2010-04-07 14:14:16Date/Time: 2010-04-07 14:32:09

IEEE1528_OET65_EN62209-RightHandSide-INMARSAT

DUT: INMARSAT; Type: Isat phone Pro; Serial: IC10110281
Communication System: INMARSAT; Frequency: 1643.5 MHz;Duty Cycle: 1:4
Medium: HSL1650 Medium parameters used: f = 1643.5 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Right Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Tilt position - Middle Antenna at 225°/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.950 mW/g

Tilt position - Middle Antenna at 225°/Zoom Scan (9x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 28.1 V/m; Power Drift = -0.040 dB
Peak SAR (extrapolated) = 1.10 W/kg
SAR(1 g) = 0.854 mW/g; SAR(10 g) = 0.590 mW/g
Maximum value of SAR (measured) = 0.898 mW/g



0 dB = 0.898mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

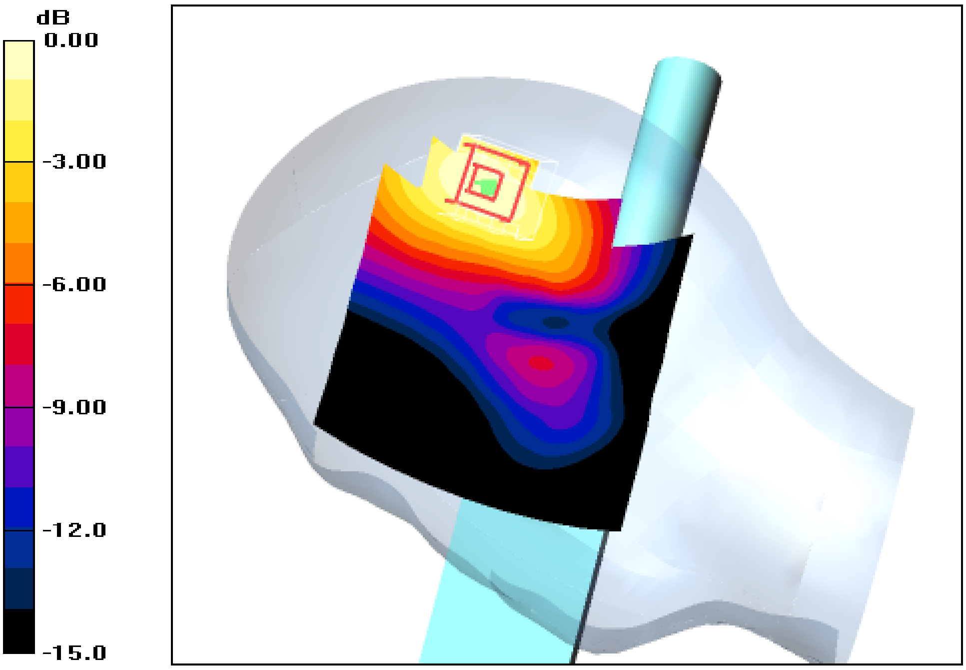
Date/Time: 2010-04-07 15:38:45Date/Time: 2010-04-07 15:49:16

IEEE1528_OET65_EN62209-RightHandSide-INMARSAT

DUT: INMARSAT; Type: Isat phone Pro; Serial: IC10110281
Communication System: INMARSAT; Frequency: 1660.5 MHz;Duty Cycle: 1:4
Medium: HSL1650 Medium parameters used: f = 1660.5 MHz; σ = 1.25 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Right Section
DASY4 Configuration:
- Probe: ET3DV6 - SN1559; ConvF(5.49, 5.49, 5.49); Calibrated: 2010-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn477; Calibrated: 2009-05-14
- Phantom: SAM 12; Type: SAM; Serial: 1043
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Tilt position - High Antenna at 225°/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.945 mW/g

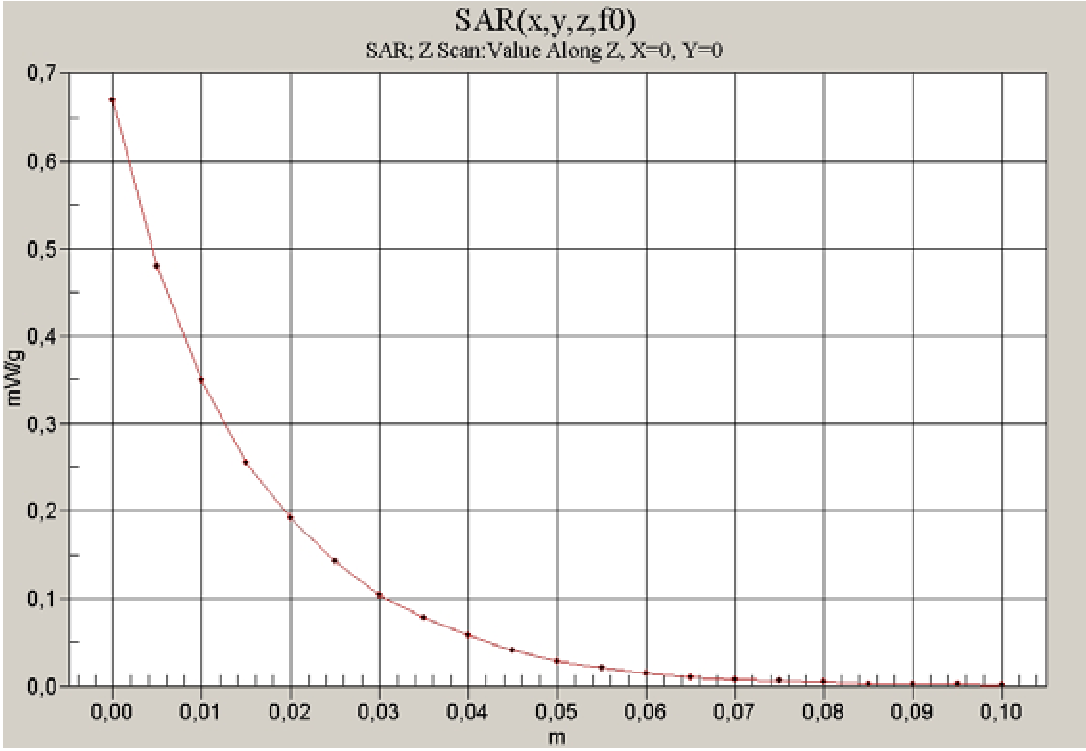
Tilt position - High Antenna at 225°/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 28.0 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.854 mW/g; SAR(10 g) = 0.584 mW/g
Maximum value of SAR (measured) = 0.910 mW/g



0 dB = 0.910mW/g

Additional information:
ambient temperature: 23.0°C; liquid temperature: 21.2°C

Annex B.2: Z-axis scan



1640 head

Annex B.3: Liquid depth

Photo 1: Liquid depth 1640MHz head simulating liquid

Annex C: Photo documentation

Photo 1: Measurement System DASY 4

Photo 2: DUT - front view

Photo 3: DUT - side view

Photo 4: DUT - rear view

Photo 5: DUT - front view (antenna at 135°)

Photo 6: DUT - front view (antenna at 180°)

Photo 7: DUT - front view (antenna at 225°)

Photo 8: DUT - rear view (open)

Photo 9: DUT - rear view (open) without battery

Photo 10: DUT (label)

Photo 11: Battery

Photo 12: Test position left hand touched (antenna at 180°)

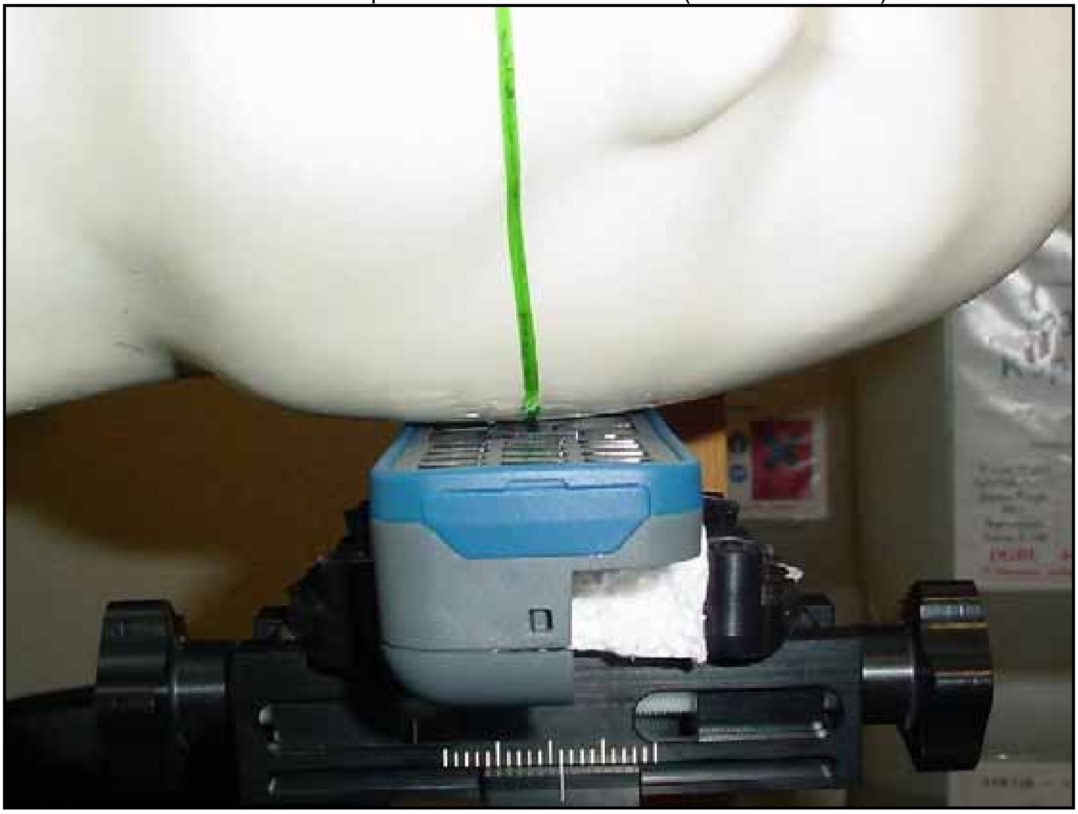


Photo 13: Test position left hand touched (antenna at 180°)

Photo 14: Test position left hand touched (antenna at 180°)

Photo 15: Test position left hand tilted 15° (antenna at 180°)

Photo 16: Test position left hand touched (antenna at 135°)

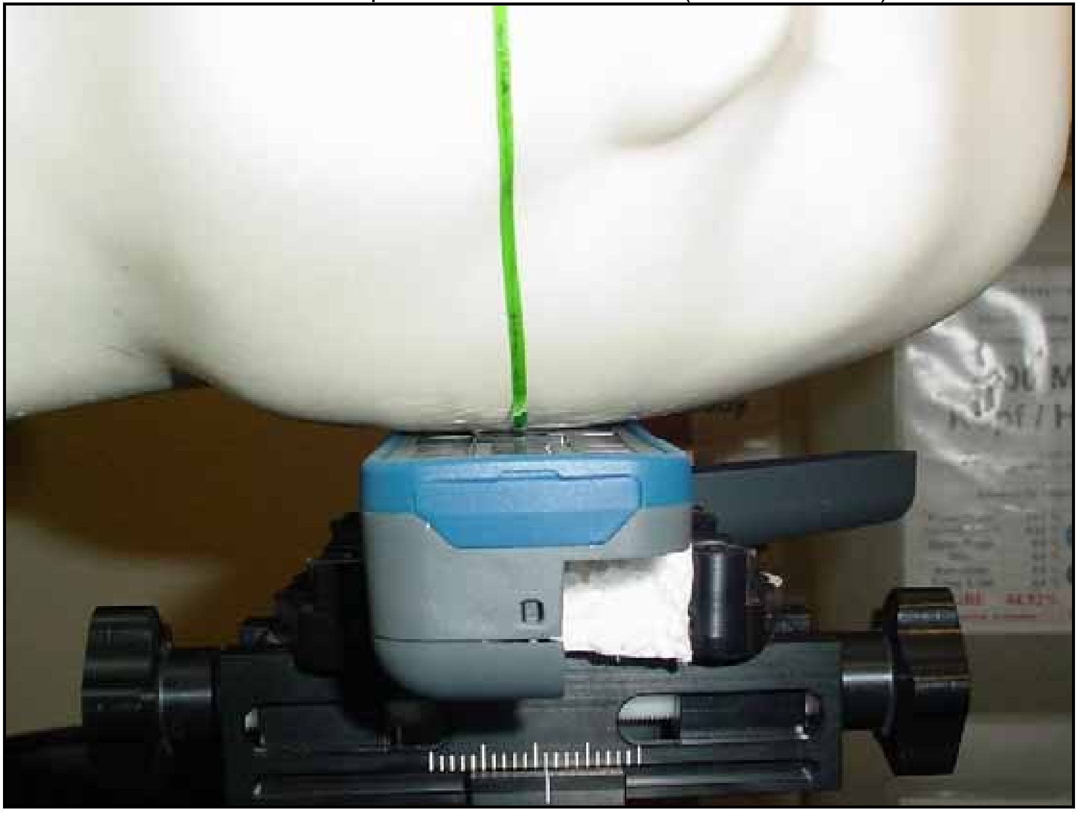


Photo 17: Test position left hand touched (antenna at 135°)

Photo 18: Test position left hand touched (antenna at 135°)

Photo 19: Test position left hand tilted 15° (antenna at 135°)

Photo 20: Test position right hand touched (antenna at 180°)

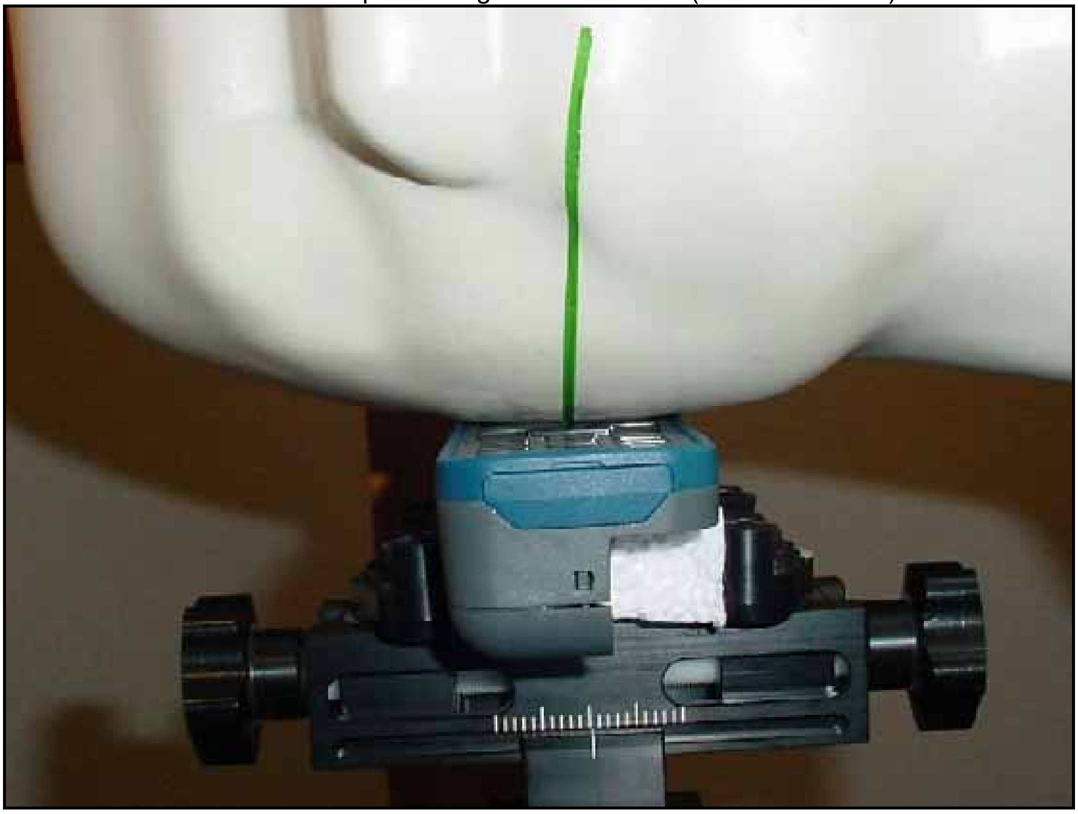


Photo 21: Test position right hand touched (antenna at 180°)

Photo 22: Test position right hand touched (antenna at 180°)

Photo 23: Test position right hand tilted 15° (antenna at 180°)

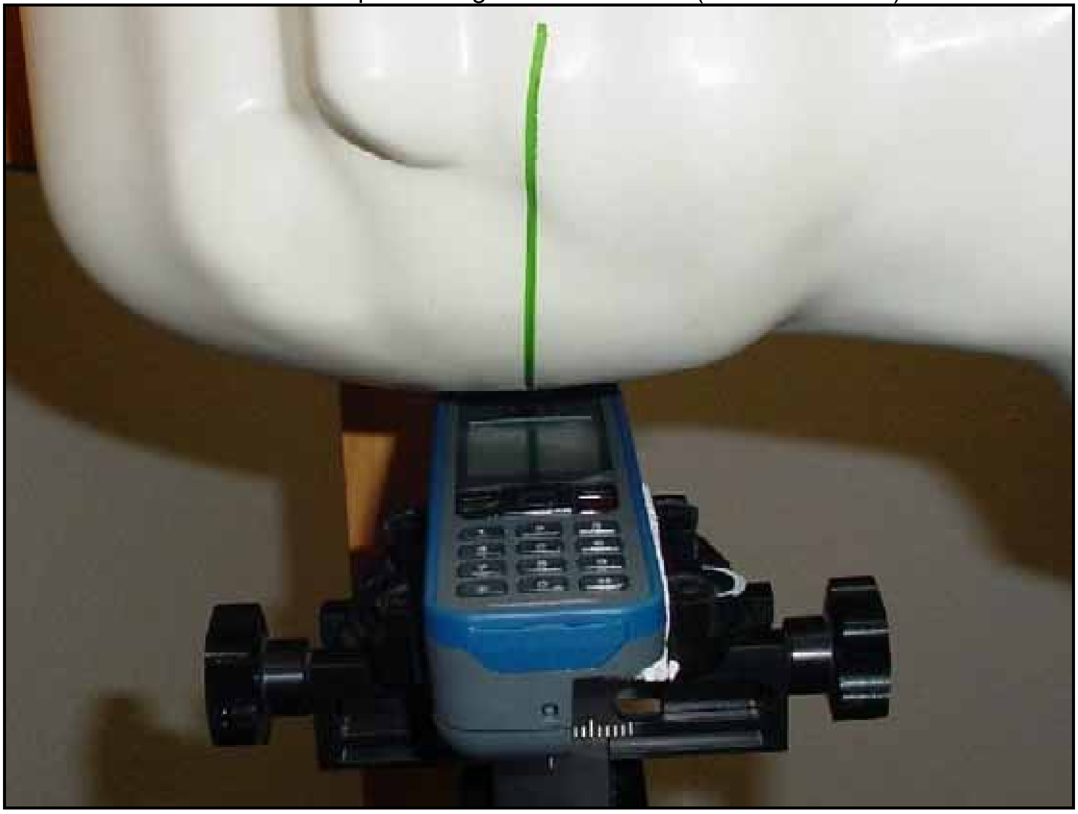


Photo 24: Test position right hand touched (antenna at 225°)

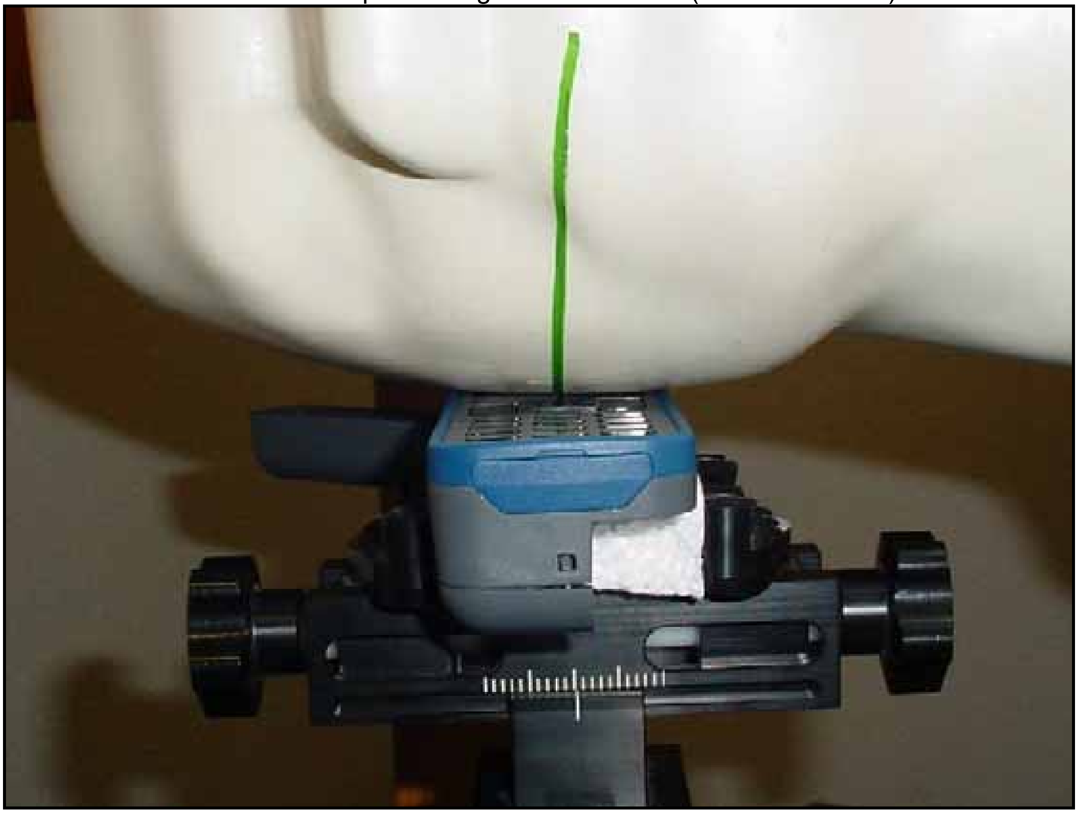
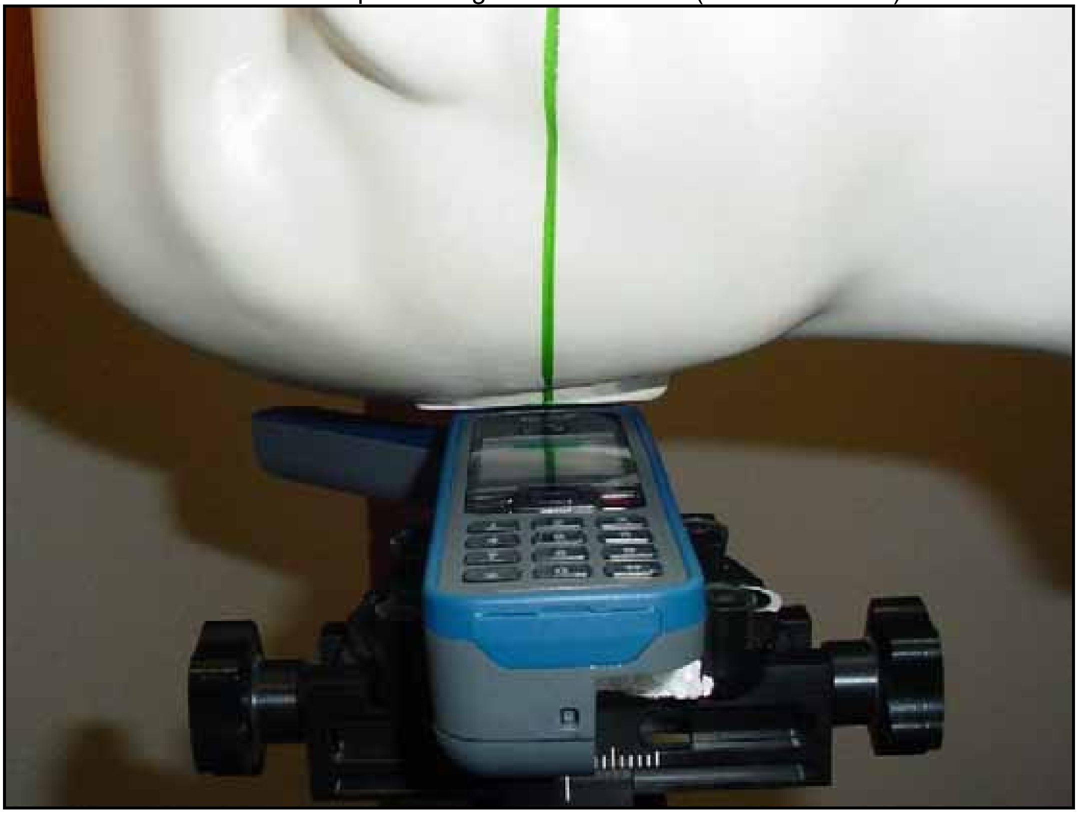


Photo 25: Test position right hand touched (antenna at 225°)

Photo 26: Test position right hand touched (antenna at 225°)

Photo 27: Test position right hand tilted 15° (antenna at 225°)



Annex D: RF Technical Brief Cover Sheet acc. to RSS-102 Annex A

1. COMPANY NUMBER: 8944A

2. MODEL NUMBER: ISATPHONE

3. MANUFACTURER: **Inmarsat Global Ltd**

4. TYPE OF EVALUATION:

(a) SAR Evaluation: Device used in the Vicinity of the Human Head

- Multiple transmitters: Yes ☐ No ☒
- Evaluated against exposure limits: General Public Use ☒ Controlled Use ☐
- Duty cycle used in evaluation: 25 %
- Standard used for evaluation: RSS-102 Issue 4 (2010-03)
- SAR value: **0.884 W/kg**. Measured ☒ Computed ☐ Calculated ☐

Annex D.1: Declaration of RF Exposure Compliance

ATTESTATION: I attest that the information provided in Annex D: is correct; that a Technical Brief was prepared and the information it contains is correct; that the device evaluation was performed or supervised by me; that applicable measurement methods and evaluation methodologies have been followed and that the device meets the SAR and/or RF exposure limits of RSS-102.

Signature: Date: **2010-04-28**

NAME : **Thomas Vogler**

TITLE : Dipl.-Ing. (FH)

COMPANY : CETECOM ICT Services GmbH

Annex E: Calibration parameters

Calibration parameters are described in the additional document :

Appendix to test report no. 1-1837-01-02/09
Calibration data, Phantom certificate
and detail information of the DASY4 System

Annex F: Document History

Version	Applied Changes	Date of Release
	Initial Release	2010-04-28

Annex G: Further Information

Glossary

DUT - Device under Test
EUT - Equipment under Test
FCC - Federal Communication Commission
FCC ID - Company Identifier at FCC
HW - Hardware
IC - Industry Canada
Inv. No. - Inventory number
N/A - not applicable
SAR - Specific Absorption Rate
S/N - Serial Number
SW - Software