Test Report

Test Report Identifier:

SC-0474-000-01

Tested Device:

GSM Phone - LG KU250

According to the standards:

CENELEC EN 50360

Compliance of mobile phones with the basic restrictions related to human exposure

Council Recommendation 1999/519/EC

on the limitation of exposure of the general public to electromagnetic fields

PARTIAL TESTING FOR INTER-LABORATORY COMPARISON PURPOSES

Sicom test s.r.l.

AREA Science Park

Palazzina E3

Padriciano 99

34012 Trieste

Italy

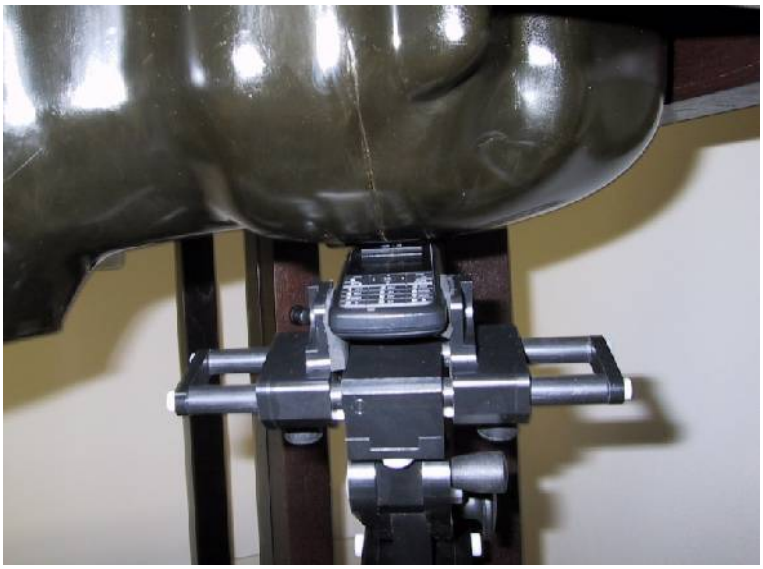
1.General information

Test Standard: CENELEC EN 50360 Compliance of mobile phones with the basic restrictions related to human exposure

Council Recommendation 1999/519/EC - on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

Tested Device:	GSM Phone - LG KU250
	IMEI: 356385011143919
	HW version: n.d.
	SW version: n.d.
	Supported mode(s): GSM, UMTS, Bluetooth
	Supported band(s): 900, 1800, 1900, 2100, 2450
	Type of antenna: fixed
	Power class(es): GSM 900 : class 4 (max power 33 dBm)
	GSM 1800 : class 1 (max power 30 dBm)
	GSM 1900 : class 1 (max power 30 dBm)
	UMTS : class 3 (max power 24 dBm)
	Bluetooth class 2
Date of Report:	March 25, 2009
Test site:	Sicom test s.r.l
	AREA Science Park
	Palazzina E3
	Padriciano 99
	34012 Trieste Italy
Client:	ICMET CRAIOVA
	Calea Bucureşti, 144
	200515 Craiova-România
Contact Person:	Prof. Dr. Andrei Marinescu

2.Photographs



Picture 1 - Tested device during the test

Picture 2 - Tested device during the test

This test report shall not be reproduced except in full.

Total number of pages: 20

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. Uncertainty evaluation
8. System validation check uncertainty

Test Operator: Antonio Dieni

Technical responsible: Roberto Passini

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 standard IEC EN 50360 “Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz - 3 GHz)”.

The IEC EN 50360 standard applies to any transmitting devices intended to be used with the radiating part of the equipment in close proximity to the human ear. The frequency range covered is 300 MHz to 3 GHz.

The exposure limits are specified into the Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz). Alternatively the limit as stated into the International Commission on Non-Ionising Radiation Protection (ICNIRP) Guidelines for limiting exposure in time-varying electric, magnetic and electromagnetic fields (up to 300 GHz) of April 1998 may be applied.

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.

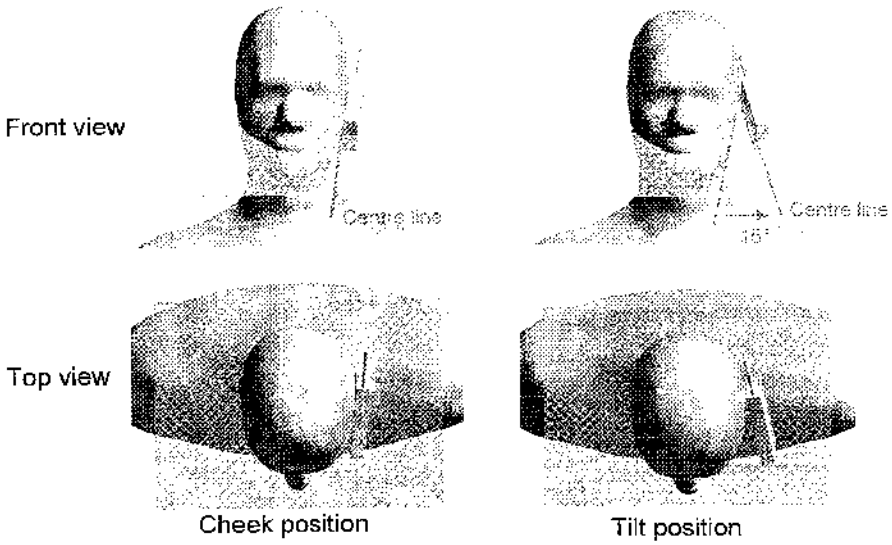
The Dosimetric Assessment System

The SAR Dosimetric Assessment System used is able to determine the SAR distribution inside a phantom conforming to the European and U.S. standards. It consists of a robot, a field probe calibrated for use in liquids, a twin phantom, a flat 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.

Picture 3 - 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.
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 ± 2°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 with the tolerance of ± 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 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 ± 10% of the target value, determined during the system validation check.
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.
The output power and frequency are controlled using a network emulator. The device is set to transmit at its highest output peak power level.
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.



Picture 4 - “Cheek” and “tilt” positions of the mobile phone on the left side

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

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.

4.Test equipment and test conditions

Test Equipment:

1. Type: SAR Dosimetric Assessment System
   Manufacturer: Satimo
   Model: COMOSAR TWINS

Instrument Type	Model	Manufacturer	Serial Number
Robot	KR3	Kuka	846427
Robot Remote Controller	KRC3	Kuka	599
Robot Control Panel	KCP2	Kuka	1438
Isotropic E-field probe	---	Satimo	SN 46/06 EP65
Dipole	1800 MHz	Satimo	SN 39/05 DIPF28
SAM shell	Twins phantom	Satimo	SN 39/05 SAM26
Mobile phone positioning system	---	Satimo	SN 39/05 MSH13
Open coaxial probe	---	Satimo	SN 39/05 OCP8
Liquid head	1800 MHz	Satimo	---

2. Type: Universal Radio Communication Tester GSM-DCS
   Manufacturer: Rohde & Schwarz
   Model: CMU 200
   Serial Number: 837983/013

3. Type: Multimeter
   Manufacturer: Keithley
   Model: Mod. 2000
   Serial Number: 1062722

4. Type: Power amplifier
   Manufacturer: RFPA
   Model: RF 4002000-2
   Serial Number: 52627

5. Type: Signal Generator
   Manufacturer: Rohde & Schwarz
   Model: SMIQ03B
   Serial Number: 831389/028

6. Type: Power meter
   Manufacturer: Rohde & Schwarz
   Model: NRVS
   Serial Number: 827023/049

7. Type: Sensor head
   Manufacturer: Rohde & Schwarz
   Model: NRV-Z51
   Serial Number: 829759/003

8. Type: Vector Network Analyser
   Manufacturer: Anritsu
   Model: MS4622B
   Serial Number: 984502

9. Type: Attenuator 20 dB
   Manufacturer: HP
   Model: HP8941A
   Serial Number: 2708A44001

Test Conditions:

The testing has been performed within the period:

From:	March 25, 2009
To:	March 25, 2009

Conditions:

Temperature:	+24°C ± 2°C

5.System validation check data

VALIDATION 1

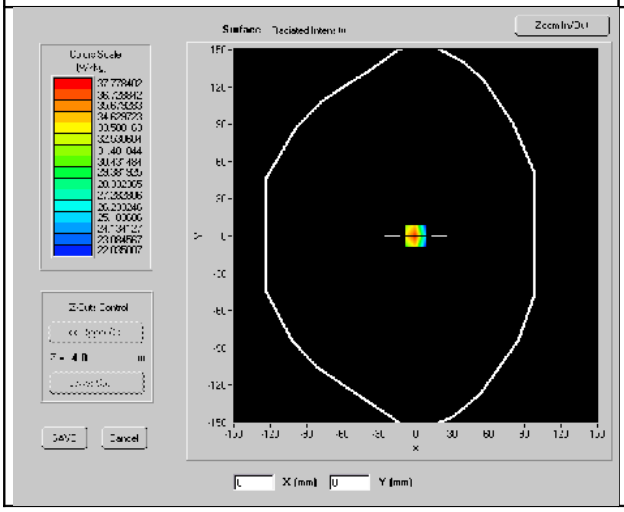
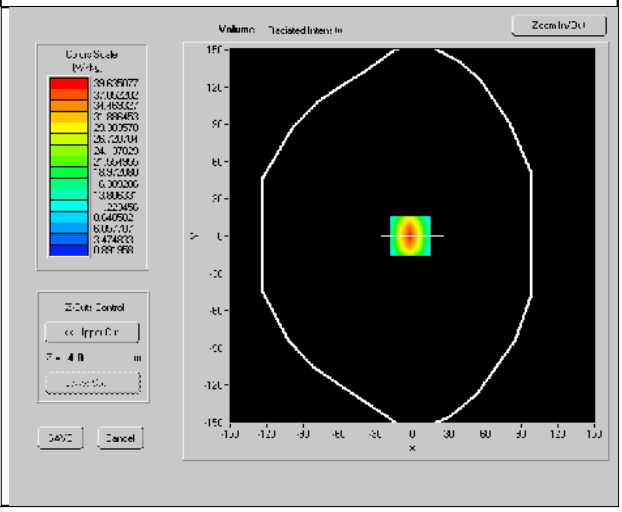
Type: Dipole measurement (Complete)
Date of measurement: 25/03/2009

A. Experimental conditions.

Phantom	Validation plane
Device Position	Dipole
Band	1800
Channel	Middle
Signal	CW
Probe Path	Adaptative 1 max

B. SAR Measurement Results

Frequency (MHz)	1747.4
Relative permittivity (real part)	38.28
Relative permittivity (imaginary part)	14.40
Conductivity (S/m)	1.40

SURFACE SAR	VOLUME SAR
	

SAR	SAR (W/kg)	Target value (W/kg)	Variation (%)
SAR 10g	19.54	19.8	-1.3

VALIDATION 2

Type: Dipole measurement (Complete)
Date of measurement: 25/03/2009

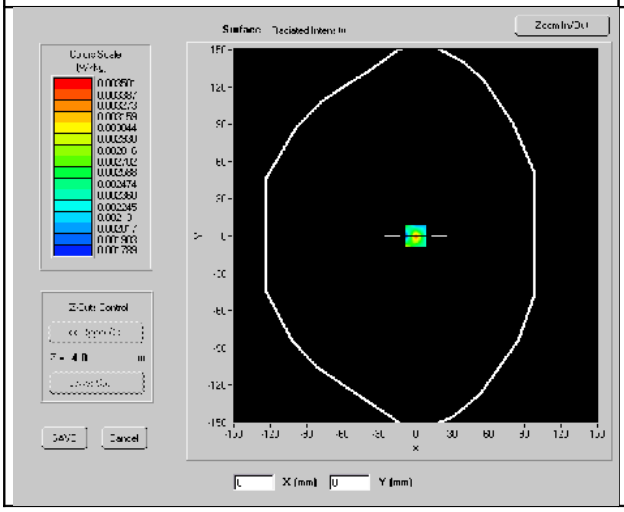
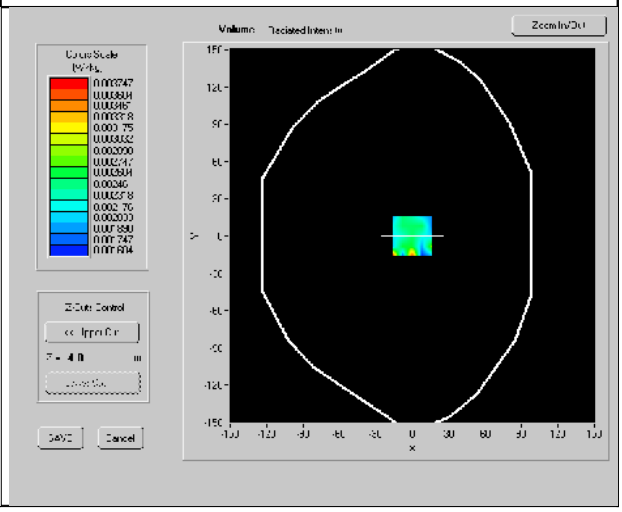
A. Experimental conditions.

Phantom	Validation plane
Device Position	Dipole
Band	1800
Channel	Middle
Signal	CW
Probe Path	Adaptative 1 max

NOTE	**As requested by the client, this validation has been executed applying at the 1800 MHz dipole a power level equal to -15.0 dBm instead of the +30 dBm value stated in the standard.**

B. SAR Measurement Results

Frequency (MHz)	1747.4
Relative permittivity (real part)	38.28
Relative permittivity (imaginary part)	14.40
Conductivity (S/m)	1.40

SURFACE SAR	VOLUME SAR
	

SAR	SAR (W/kg)	Target value (W/kg)	Variation (%)
SAR 10g	0.002	-	-

6.Test results

MEASUREMENT 1

Type: Phone measurement (Complete)
Date of measurement: 25/03/2009
Mobile Phone IMEI number: 356385011143919

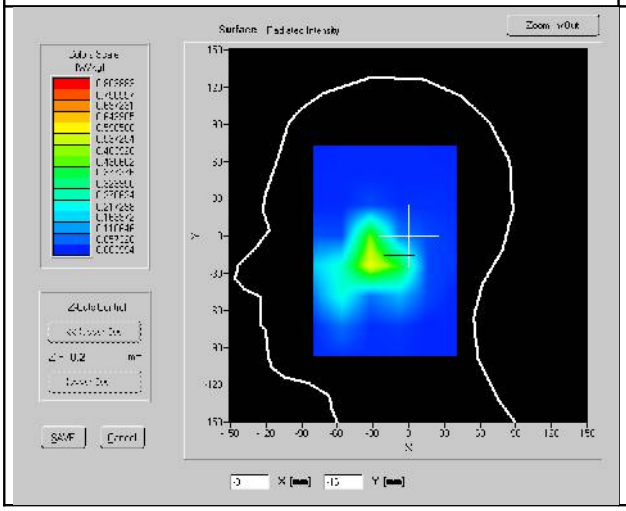
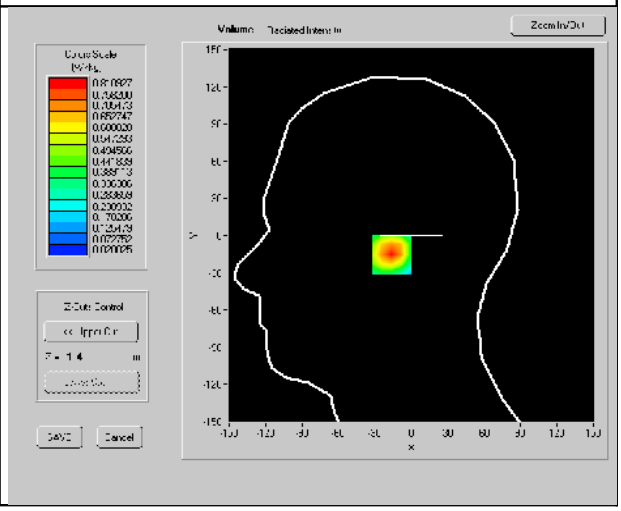
A. Experimental conditions.

Phantom	Left head
Device Position	Cheek
Antenna Position	Fixed
Band	GSM 1800
Channel	Middle
Signal	TDMA
Probe Path	Path 4

B. SAR Measurement Results

Middle Band SAR (Channel 698):

Frequency (MHz)	1747.4
Relative permittivity (real part)	38.28
Relative permittivity (imaginary part)	14.40
Conductivity (S/m)	1.40

SURFACE SAR	VOLUME SAR
	

SAR	SAR (W/kg)	Limit (W/kg)
SAR 10g	0.426	2.000

Test ID	Test title	Result
SAR_GSM1800	SAR in the GSM 1800 band	**PASS**

MEASUREMENT 2

Type: Phone measurement (Complete)
Date of measurement: 25/03/2009
Mobile Phone IMEI number: 356385011143919

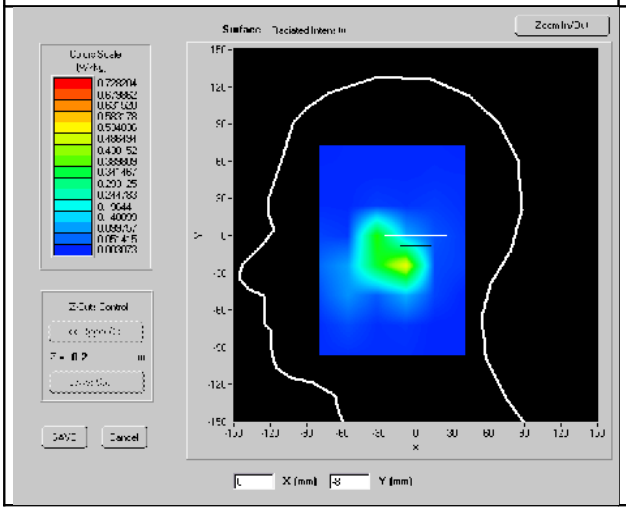
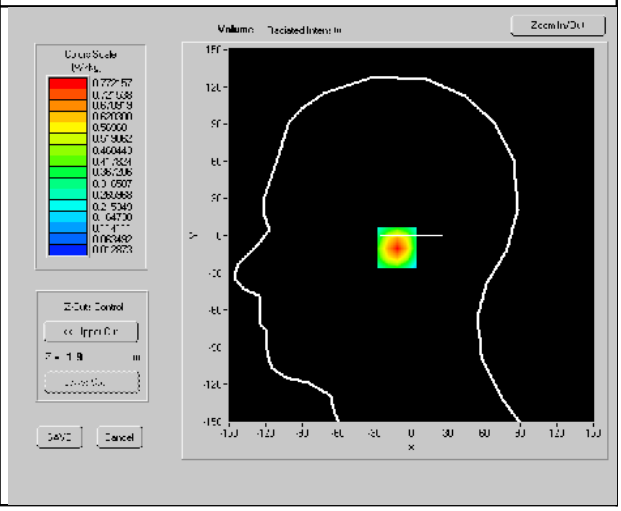
A. Experimental conditions.

Phantom	Left head
Device Position	Tilt
Antenna Position	Fixed
Band	GSM 1800
Channel	Middle
Signal	TDMA
Probe Path	Path 4

B. SAR Measurement Results

Middle Band SAR (Channel 698):

Frequency (MHz)	1747.4
Relative permittivity (real part)	38.28
Relative permittivity (imaginary part)	14.40
Conductivity (S/m)	1.40

SURFACE SAR	VOLUME SAR
	

SAR	SAR (W/kg)	Limit (W/kg)
SAR 10g	0.397	2.000

Test ID	Test title	Result
SAR_GSM1800	SAR in the GSM 1800 band	**PASS**

7.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.

UNCERTAINTY EVALUATION FOR HANDSET SAR TEST									
a	b	c	d	e= f(d,k)	f	g	h= cxf/e	i= cxg/e	k
Uncertainty Component	Sec.	Tol. (± %)	Prob. Dist.	Div.	c_i (1 g)	c_i (10 g)	1 g u_i (± %)	10 g u_i (± %)	v_i
Measurement System									
Probe Calibration	E.2.1.	7	N	1	1	1	7	7	∞
Axial Isotropy	E.2.2.	2,5	R	√3	$(1-c_p)^{1/2}$	$(1-c_p)^{1/2}$	1,02062	1,02062	∞
Hemispherical Isotropy	E.2.2.	4	R	√3	$\sqrt{C_p}$	$\sqrt{C_p}$	1,63299	1,63299	∞
Boundary Effect	E.2.3.	1	R	√3	1	1	0,57735	0,57735	∞
Linearity	E.2.4.	5	R	√3	1	1	2,88675	2,88675	∞
System Detection Limits	E.2.5.	1	R	√3	1	1	0,57735	0,57735	∞
Readout Electronics	E.2.6.	0,02	N	1	1	1	0,02	0,02	∞
Response Time	E.2.7.	3	R	√3	1	1	1,73205	1,73205	∞
Integration Time	E.2.8.	2	R	√3	1	1	1,1547	1,1547	∞
RF Ambient Conditions	E.6.1.	3	R	√3	1	1	1,73205	1,73205	∞
Probe Positioner Mechanical Tolerance	E.6.2.	2	R	√3	1	1	1,1547	1,1547	∞
Probe Positioning with respect to Phantom Shell	E.6.3.	0,05	R	√3	1	1	0,02887	0,02887	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E.5.2.	5	R	√3	1	1	2,88675	2,88675	∞
Test sample Related									
Test Sample Positioning	E.4.2.1.	0,03	N	1	1	1	0,03	0,03	N-1
Device Holder Uncertainty	E.4.1.1.	5	N	1	1	1	5	5	N-1
Output Power Variation - SAR drift measurement	6.6.2.	3	R	√3	1	1	1,73205	1,73205	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1.	0,05	R	√3	1	1	0,02887	0,02887	∞
Liquid Conductivity - deviation from target values	E.3.2.	5	R	√3	0,64	0,43	1,84752	1,2413	∞
Liquid Conductivity - measurement uncertainty	E.3.3.	5	N	1	0,64	0,43	3,2	2,15	M
Liquid Permittivity - deviation from target values	E.3.2.	3	R	√3	0,6	0,49	1,03923	0,8487	∞
Liquid Permittivity - measurement uncertainty	E.3.3.	10	N	1	0,6	0,49	6	4,9	M
Combined Standard Uncertainty			RSS				11,1265	10,5799	
Expanded Uncertainty (95% CONFIDENCE INTERVAL)			k				21,8079	20,7366	

8.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.

UNCERTAINTY FOR SYSTEM PERFORMANCE CHECK									
a	b	c	d	e= f(d,k)	f	g	h= cxf/e	i= cxg/e	k
Uncertainty Component	Sec.	Tol. (± %)	Prob. Dist.	Div.	c_i (1 g)	c_i (10 g)	1 g u_i (± %)	10 g u_i (± %)	v_i
Measurement System									
Probe Calibration	E.2.1.	7	N	1	1	1	7	7	∞
Axial Isotropy	E.2.2.	2,5	R	√3	$(1-c_p)^{1/2}$	$(1-c_p)^{1/2}$	1,02062	1,02062	∞
Hemispherical Isotropy	E.2.2.	4	R	√3	$\sqrt{C_p}$	$\sqrt{C_p}$	1,63299	1,63299	∞
Boundary Effect	E.2.3.	1	R	√3	1	1	0,57735	0,57735	∞
Linearity	E.2.4.	5	R	√3	1	1	2,88675	2,88675	∞
System Detection Limits	E.2.5.	1	R	√3	1	1	0,57735	0,57735	∞
Readout Electronics	E.2.6.	0,02	N	1	1	1	0,02	0,02	∞
Response Time	E.2.7.	3	R	√3	1	1	1,73205	1,73205	∞
Integration Time	E.2.8.	2	R	√3	1	1	1,1547	1,1547	∞
RF Ambient Conditions	E.6.1.	3	R	√3	1	1	1,73205	1,73205	∞
Probe Positioner Mechanical Tolerance	E.6.2.	2	R	√3	1	1	1,1547	1,1547	∞
Probe Positioning with respect to Phantom Shell	E.6.3.	0,05	R	√3	1	1	0,02887	0,02887	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E.5.2.	5	R	√3	1	1	2,88675	2,88675	∞
Dipole									
Dipole Axis to Liquid Distance	8, E.4.2.	1	N	√3	1	1	0,57735	0,57735	N-1
Input Power and SAR drift measurement	8, 6.6.2.	2	R	√3	1	1	1,1547	1,1547	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1.	0,05	R	√3	1	1	0,02887	0,02887	∞
Liquid Conductivity - deviation from target values	E.3.2.	5	R	√3	0,64	0,43	1,84752	1,2413	∞
Liquid Conductivity - measurement uncertainty	E.3.3.	5	N	1	0,64	0,43	3,2	2,15	M
Liquid Permittivity - deviation from target values	E.3.2.	3	R	√3	0,6	0,49	1,03923	0,8487	∞
Liquid Permittivity - measurement uncertainty	E.3.3.	10	N	1	0,6	0,49	6	4,9	M
Combined Standard Uncertainty			RSS				9,87239	9,25204	
Expanded Uncertainty (95% CONFIDENCE INTERVAL)			k				19,3499	18,134	