No.: RZA2008-1085FCC

(No. CNAS L2264)

OET 65

TEST REPORT

Test name	Electromagnetic Field (Specific Absorption Rate)
Product	HSDPA/UMTS/GPRS/GSM Mobile Phone with Bluetooth
Model	U7310
FCC ID	QISU7310
Client	Huawei Technologies Co., Ltd.

TA Technology (Shanghai) Co., Ltd.

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GENERAL SUMMARY

Product	HSDPA/UMTS/GPRS/GSM Mobile Phone with Bluetooth	**Model**	U7310
Client	Huawei Technologies Co., Ltd.	**Type of test**	Entrusted
Manufacturer	Huawei Technologies Co., Ltd.	**Arrival Date of sample**	August 12th, 2008
Place of sampling	(Blank)	**Carrier of the samples**	Yan Xie
Quantity of the samples	One	**Date of product**	(Blank)
Base of the samples	(Blank)	**Items of test**	SAR
Series number	VD2AC10871800014		
Standard(s)	**EN 50360–2001:** Product standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones. **BS EN 62209-1:2006:** Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz) **ANSI C95.1–2005:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. **IEEE 1528–2003:** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Experimental Techniques. **OET Bulletin 65 supplement C, published June 2001 including DA 02-1438, published June 2002:** Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits. Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65. **IEC 62209-2 :** Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 2: Procedure to determine the Specific Absorption Rate (SAR)in the head and body for 30MHz to 6GHz Handheld and Body-Mounted Devices used in close proximity to the body.		
Conclusion	Localized Specific Absorption Rate (SAR) of this portable wireless equipment has been measured in all cases requested by the relevant standards cited in Clause 7.2 of this test report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 7.1 of this test report. General Judgment: **Pass** (Stamp) **Date of issue: october13th, 2008**		
Comment	The test result only responds to the measured sample.		

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TABLE OF CONTENT

1. COMPETENCE AND WARRANTIES 6
2. GENERAL CONDITIONS 6
3. DESCRIPTION OF EUT 7
3.1. ADDRESSING INFORMATION RELATED TO EUT 7
3.2. CONSTITUENTS OF EUT 8
3.3. GENERAL DESCRIPTION 8
3.4. TEST ITEM 9
4. OPERATIONAL CONDITIONS DURING TEST 10
4.1. GENERAL DESCRIPTION OF TEST PROCEDURES 10
4.2. GSM TEST CONFIGURATION 10
5. SAR MEASUREMENTS SYSTEM CONFIGURATION 11
5.1. SAR MEASUREMENT SET-UP 11
5.2. DASY4 E-FIELD PROBE SYSTEM 12
5.2.1. ET3DV6 Probe Specification 12
5.2.2. E-field Probe Calibration 13
5.3. OTHER TEST EQUIPMENT 13
5.3.1. Device Holder for Transmitters 13
5.3.2. Phantom 14
5.4. SCANNING PROCEDURE 15
5.5. DATA STORAGE AND EVALUATION 16
5.5.1. Data Storage 16
5.5.2. Data Evaluation by SEMCAD 16
5.6. SYSTEM SPECIFICATIONS 18
5.6.1. Robotic System Specifications 18
5.7. SYSTEM VALIDATION 19
5.8. EQUIVALENT TISSUES 20
6. LABORATORY ENVIRONMENT 20
7. CHARACTERISTICS OF THE TEST 21
7.1. APPLICABLE LIMIT REGULATIONS 21
7.2. APPLICABLE MEASUREMENT STANDARDS 21
8. CONDUCTED OUTPUT POWER MEASUREMENT 22
8.1. SUMMARY 22
8.2. POWER DRIFT 22
8.3. CONDUCTED POWER 22
8.3.1. Measurement Methods 22
8.3.2. Measurement result 22
9. TEST RESULTS 23

9.1. DIELECTRIC PERFORMANCE 23
9.2. SYSTEM VALIDATION RESULTS 23
9.3. SUMMARY OF MEASUREMENT RESULTS....................24
9.3.1. Bluetooth function 27
9.4. CONCLUSION 29
10. MEASUREMENT UNCERTAINTY....................30
11. MAIN TEST INSTRUMENTS....................31
12. TEST PERIOD....................31
13. TEST LOCATION 31
ANNEX A： MEASUREMENT PROCESS 32
ANNEX B： TEST LAYOUT....................33
ANNEX C： GRAPH RESULTS....................35
ANNEX D： SYSTEM VALIDATION RESULTS 139
ANNEX E： PROBE CALIBRATION CERTIFICATE....................140
ANNEX F： D1900V2 DIPOLE CALIBRATION CERTIFICATE....................149
ANNEX G： DAE4 CALIBRATION CERTIFICATE....................158
ANNEX H： THE EUT APPEARANCES AND TEST CONFIGURATION 163

1. COMPETENCE AND WARRANTIES

TA Technology (Shanghai) Co., Ltd. is a test laboratory competent to carry out the tests described in this test report.

TA Technology (Shanghai) Co., Ltd. guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and teCHnical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

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3. DESCRIPTION OF EUT

3.1. Addressing Information Related to EUT

Table 1: Applicant (The Client)

Name or Company	Huawei Technologies Co., Ltd.
Address/Post	Bantian, Longgang District
City	Shenzhen
Postal Code	518129
Country	P.R. China
Telephone	0755-28780808
Fax	0755-28780808

Table 2: Manufacturer

Name or Company	Huawei Technologies Co., Ltd.
Address/Post	Bantian, Longgang District
City	Shenzhen
Postal Code	518129
Country	P.R. China
Telephone	0755-28780808
Fax	0755-28780808

3.2. Constituents of EUT

Table 3: Constituents of Samples

Description	Model	Serial Number	Manufacturer
Handset	U7310	VD2AC10871800014	Huawei Technologies Co.,Ltd.
Lithium Battery	HB5B2H	YAC8426HI1702394	FMT Electronics Co.,Ltd.
AC/DC Adapter	TPCA-050065VY	TP17A1602842	TECH-POWER INTERNATIONAL CO.,LTD
	CHG5065-3C	HKY7C2200005	Shen Zhen Huntkey Power Technology Co.,Ltd
	HS-050040E2	TPI810600016	TECH-POWER INTERNATIONAL CO.,LTD
	HS-050040E2	HKA812200001	Shen Zhen Huntkey Power Technology Co.,Ltd

Note:
The EUT appearances see ANNEX H.

3.3. General Description

Equipment Under Test (EUT) is a model of HSDPA/UMTS/GPRS/GSM mobile phone with internal antenna. It consists of Handset, Lithium Battery and AC/DC Adapter The detail about Mobile phone, Lithium Battery and AC/DC Adapter is in Table 3. SAR is tested for GSM 1900. It has the GPRS and Bluetooth functions, the GPRS class is 10.

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

3.4. Test item

Table 4: Test item of EUT

Device type :	portable device	
Exposure category:	uncontrolled environment / general population	
Device operating configurations :		
Operating mode(s):	GSM900; GSM1800; GSM1900;（tested） WCDMA Band I;	
Modulation:	GMSK, QPSK	
GPRS mobile station class :	B	
GPRS multislot class :	10	
EGPRS multislot class:	---	
Maximum no.of timeslots in uplink:	2	
Standard output power	(33dBm,2W)GSM900; (30dBm,1W)GSM1800; (30dBm,1W)GSM1900; （tested） (24dBm,0.25W)WCDMA Band I	
Operating frequency range(s)	transmitter frequency range	receiver frequency range
GSM900:	880.2 MHz ~ 914.8 MHz	925.2 MHz ~ 959.8 MHz
GSM1800:	1710.2 MHz ~ 1784.8 MHz	1805.2 MHz ~ 1879.8 MHz
GSM1900(tested):	1850.2 MHz ~ 1909.8 MHz	1930.2 MHz ~ 1989.8 MHz
WCDMA Band I:	1922.4 MHz ~ 1977.6 MHz	2112.4 MHz ~ 2167.6 MHz
Power class	GSM 900: 4, tested with power level 5 GSM 1800: 1, tested with power level 0 GSM 1900: 1, tested with power level 0 WCDMA Band I: 3, tested with maximum output power	
Test channel (Low –Middle –High)	975 -38 – 124 (GSM900) 512 - 698 – 885 (GSM1800) 512 - 661 – 810 (GSM1900) (tested) 9612 -9750 -9888 (WCDMA Band I)	
Hardware version:	VER.D	
Software version:	U7300V100R001B110SP01	
Antenna type:	integrated antenna	

4. OPERATIONAL CONDITIONS DURING TEST

4.1. General description of test procedures

The EUT is tested using a E5515C communications tester as controller unit to set test channels and maximum output power to the EUT, as well as for measuring the conducted peak power. Test positions as described in ANNEX H are in accordance with the specified test standard. Conducted output power was measured using an integrated RF connector and attached RF cable.

To make the mobile emits maximum power; the output power of E5515C would be adjusted to minimum power with the sensitivity of the mobile station to build steady connection with mobile station. The power level control parameter”0” of GSM1900 .They mean that requires mobile station to emit with maximum power.

The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the manufacturer. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. If a wireless link is used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the handset. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the handset by at least 30 dB.

4.2. GSM Test Configuration

SAR tests for GSM 1900, a communication link is set up with a System Simulator (SS) by air link. Using E5515C the power lever is set to”0” in head SAR and body SAR of GSM1900,

The test in the band of GSM 1900 are performed in the mode of speech transfer function and GPRS. And since the GPRS class is 10 for this EUT, it has at most 2 timeslots in uplink.

5. SAR MEASUREMENTS SYSTEM CONFIGURATION

5.1. SAR Measurement Set-up

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than ± 0.02mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length =300mm) to the data acquisition unit.

A cell controller system contains the power supply, robot controller, teaches pendant (Joystick) and remote control, is used to drive the robot motors. The PC consists of the Micron Pentium Ⅲ 800 MHz computer with Windows 2003 system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, meCHanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

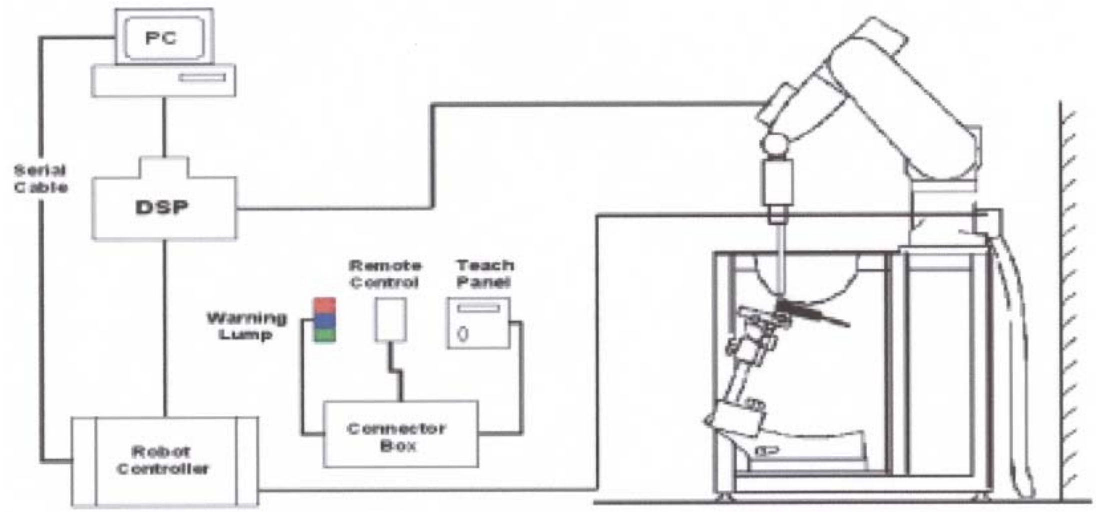


Figure 1. SAR Lab Test Measurement Set-up

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

5.2. Dasy4 E-field Probe System

The SAR measurements were conducted with the dosimetric probe ET3DV6 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the standard procedure with an accuracy of better than ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB.

5.2.1. ET3DV6 Probe Specification

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System (ET3DV6 only) Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.q., glycol)
Calibration	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at frequencies of 900MHz, 1750MHz, 1950MHz and 2450MHz (accuracy±8%) Calibration for other liquids and frequencies upon request
Frequency	10 MHz to 2.5 GHz; Linearity: ±0.2 dB (30 MHz to 2.5 GHz)
Directivity	±0.2 dB in brain tissue (rotation around probe axis) ±0.4 dB in brain tissue (rotation around probe axis)
Dynamic Range	5u W/g to > 100mW/g; Linearity: ±0.2dB
Surface Detection	±0.2 mm repeatability in air and clear liquids over diffuse reflecting surface
Dimensions	Overall length: 330mm Tip length: 16mm Body diameter: 12mm Tip diarneter: 6.8mm Distance from probe tip to dipole centers: 2.7mm
Application	General dosimetry up to 2.5GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

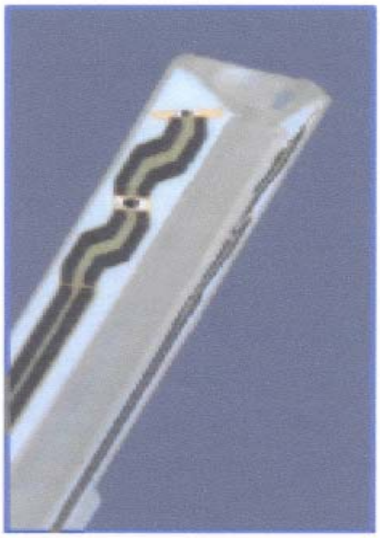


Figure 2.ET3DV6 E-field Probe

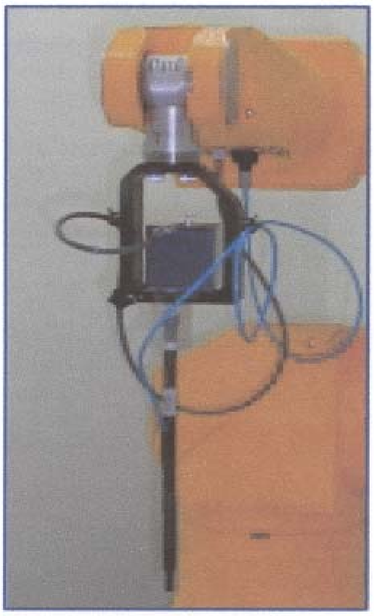


Figure 3. ET3DV6 E-field probe

5.2.2. E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test Chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.
E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$\mathrm{SAR} = C\frac{\Delta T}{\Delta t}$$

Where: Δt = Exposure time (30 seconds),
C = Heat capacity of tissue (brain or muscle),
ΔT = Temperature increase due to RF exposure.
Or

$$\mathrm{SAR} = \frac{|E|^2 \sigma}{\rho}$$

Where:
σ = Simulated tissue conductivity,
ρ = Tissue density (kg/m3).

5.3. Other Test Equipment

5.3.1. Device Holder for Transmitters

In combination with the Generic Twin Phantom V3.0, the Mounting Device (POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeat ably positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Figure 4. Device Holder

5.3.2. Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

Shell Thickness	2±0.1 mm
Filling Volume	Approx. 20 liters
Dimensions	810 x l000 x 500 mm (H x L x W)
Available	Special

Figure 5. Generic Twin Phantom

5.4. 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 strength 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.

- 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 5mm 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.

- 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.

5.5. Data Storage and Evaluation

5.5.1. 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.

5.5.2. 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	Normi, ai_0, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	Dcp_i
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:

$$V_i = U_i + U_i^2 \cdot c\,f / d\,c\,p_i$$

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

$\boldsymbol{E_{tot}}$ = 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.

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

with P_{pwe} = equivalent power density of a plane wave in mW/cm^2

$\boldsymbol{E_{tot}}$ = total electric field strength in V/m

$\boldsymbol{H_{tot}}$ = total magnetic field strength in A/m

5.6. System Specifications

5.6.1. Robotic System Specifications

Specifications

Positioner: Stäubli Unimation Corp. Robot Model: RX90L

Repeatability: ±0.02 mm

No. of Axis: 6

Data Acquisition Electronic (DAE) System

Cell Controller

Processor: Pentium III

Clock Speed: 800 MHz

Operating System: Windows 2003

Data Converter

Features: Signal Amplifier, multiplexer, A/D converter, and control logic

Software: DASY4 software

Connecting Lines: Optical downlink for data and status info. Optical uplink for commands and clock.

5.7. System validation

System 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.

Validation results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System validation is performed regularly on all frequency bands where tests are performed with the DASY 4 system. Results are stored to have a long time overview of system performance and are shown in EN test reports at request.

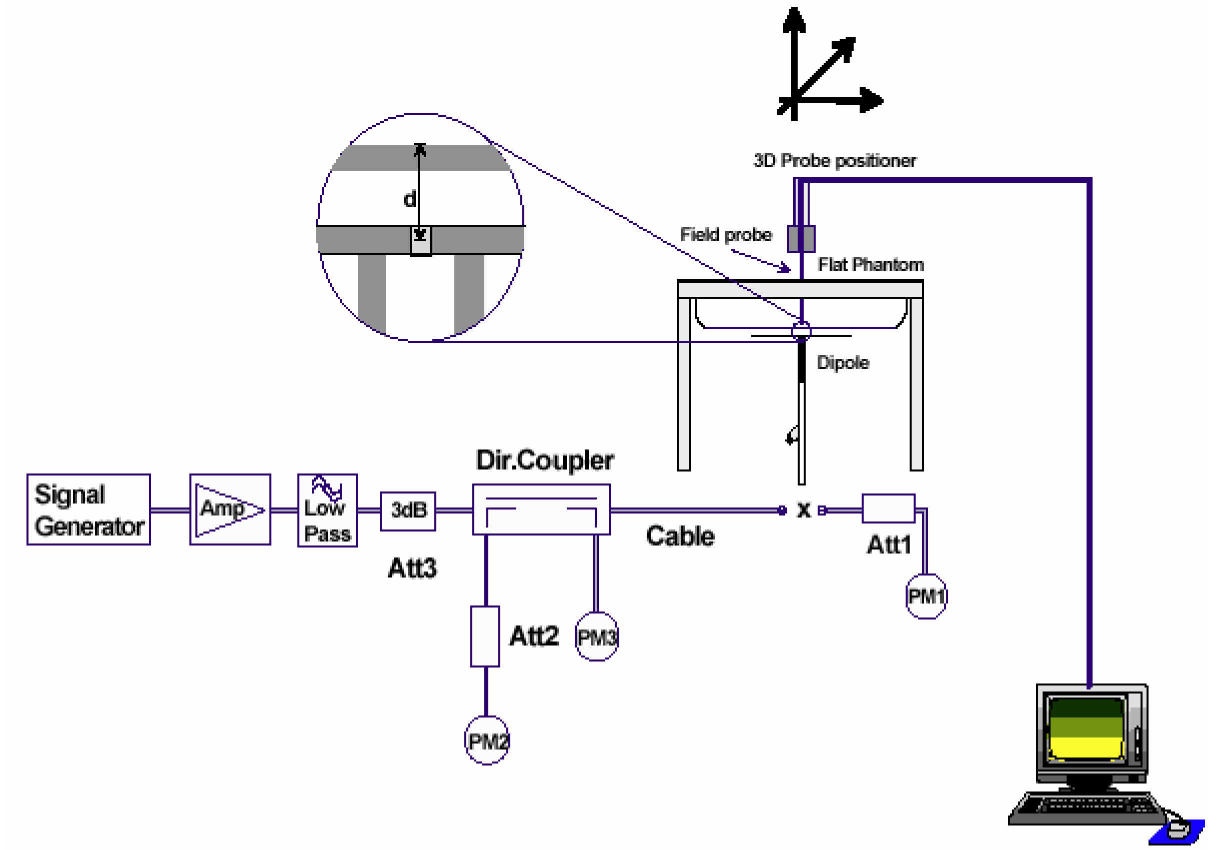


Figure 6. System validation Set-up

5.8. Equivalent Tissues

The liquid used for the frequency range of 800-2000 MHz consisted of water, sugar, salt, Preventol,Glycol and Cellulose. The liquid has previously been proven to be suited for worst-case. The Table 5 and Table 6 show the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528.

Table 5: Composition of the Head Tissue Equivalent Matter

MIXTURE%	FREQUENCY(Brain)1900MHz
Water	55.242
Glycol monobutyl	44.452
Salt	0.306
Dielectric Parameters Target Value	f=1900MHz ε=40.0 σ=1.40

Table 6: Composition of the Body Tissue Equivalent Matter

MIXTURE%	FREQUENCY(Body)1900MHz
Water	69.91
Glycol	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1900MHz ε=53.3 σ=1.52

6. LABORATORY ENVIRONMENT

Table 7: The Ambient Conditions during Test

Temperature	Min. = 20°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

7. CHARACTERISTICS OF THE TEST

7.1. Applicable Limit Regulations

EN 50360–2001: Product standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.
It specifies the maximum exposure limit of 2.0 W/kg as averaged over any 10 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

ANSI C95.1–2005: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
It specifies the maximum exposure limit of 1.6 W/kg as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

7.2. Applicable Measurement Standards

BS EN 62209-1:2006: Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)

IEEE 1528–2003: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Experimental Techniques.

OET Bulletin 65 supplement C, published June 2001 including DA 02-1438, published June 2002: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits. Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65.

IEC 62209-2: Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 2: Procedure to determine the Specific Absorption Rate (SAR) in the head and body for 30MHz to 6GHz Handheld and Body-Mounted Devices used in close proximity to the body.

8. CONDUCTED OUTPUT POWER MEASUREMENT

8.1. Summary

During the process of testing, the EUT was controlled via Digital Radio Communication tester to ensure the maximum power transmission and proper modulation. This result contains conducted output power and ERP for the EUT. In all cases, the measured peak output power should be greater and with in 5% than EMI measurement.

8.2. Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Table 11 to Table 16 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 0.21dB.

8.3. Conducted Power

8.3.1. Measurement Methods

The EUT was set up for the maximum output power. The channel power was measured .The measurements were done both before and after SAR tests for each test band.

8.3.2. Measurement result

Table 8: Conducted Power Measurement Results

GSM 1900	**Conducted Power**		
	Channel 512	Channel 661	Channel 810
Before Test (dBm)	29.67	29.77	29.67
After Test (dBm)	29.72	29.79	29.74
GSM 1900+GPRS	**Conducted Power**		
	Channel 512	Channel 661	Channel 810
Before Test (dBm)	29.70	29.68	29.70
After Test (dBm)	29.74	29.72	29.81

9. TEST RESULTS

9.1. Dielectric Performance

Table 9: Dielectric Performance of Head and Body Tissue Simulating Liquid

Measurement is made at temperature 22.5 °C and relative humidity 51%. Liquid temperature during the test: 22.3°C				
Frequency (MHz)		**Target value**	**Measurement value**	**Difference percentage**
1900 (Head)	Permittivity ε_r	40.0	39.83	-0.43 %
	Conductivity σ	1.40	1.45	3.57 %
1900 (Body)	Permittivity ε_r	53.30	52.65	-1.22 %
	Conductivity σ	1.52	1.56	2.63 %

9.2. System Validation Results

Table 10: System Validation

Measurement is made at temperature 23.2 °C, relative humidity 50%, and input power 250 mW. Liquid temperature during the test: 22.3°C							
Liquid parameters	**Frequency**	**Permittivity ε**			**Conductivity σ (S/m)**		
	1900MHz	39.83			1.446		
Verification results	**Frequency**	**Target value (W/kg)**		**Measurement value (W/kg)**		**Difference percentage**	
		10 g Average	**1 g Average**	**10 g Average**	**1 g Average**	**10 g Average**	**1g Average**
	1900MHz	4.98	9.45	4.93	9.36	-1.00%	-0.95%

Note：

1. Target Values used derive from the SPEAG calibration certificate and 250 mW is used as feeding power to the validation dipole (SPEAG using).
2. The graph results see ANNEX D.

9.3. Summary of Measurement Results

Table 11: SAR Values (GSM1900, Head, Open)

Liquid Temperature: 22.5℃					
Limit of SAR (W/kg)		**10 g Average**	**1 g Average**	**Power Drift (dB)**	**Graph Results**
		2.0	**1.6**	**± 0.21**	
Test Case Of Head		**Measurement Result (W/kg)**		**Power Drift (dB)**	
Different Test Position	**Channel**	**10 g Average**	**1 g Average**		
Left hand, Touch cheek	High	0.091	0.141	-0.151	Figure 8
	Middle	0.087	0.135	-0.022	Figure 10
	Low	0.081	0.126	-0.108	Figure 12
Left hand, Tilt 15 Degree	High	0.062	0.106	-0.035	Figure 14
	Middle	0.057	0.096	-0.081	Figure 16
	Low	0.057	0.096	0.126	Figure 18
Right hand, Touch cheek	High	0.085	0.144	-0.194	Figure 20
	Middle	0.081	0.137	-0.073	Figure 22
	Low	0.088	0.146	-0.102	Figure 24
Right hand, Tilt 15 Degree	High	0.054	0.095	-0.016	Figure 26
	Middle	0.049	0.083	-0.088	Figure 28
	Low	0.057	0.094	0.068	Figure 30

Table 12: SAR Values (GSM1900, Body, Open，Distance 15mm)

Liquid Temperature: 22.5℃					
Limit of SAR (W/kg)		**10 g Average**	**1 g Average**	**Power Drift (dB)**	**Graph Results**
		2.0	**1.6**	**± 0.21**	
Test Case Of Body		**Measurement Result (W/kg)**		**Power Drift (dB)**	
		10 g Average	**1 g Average**		
Different Test Position	**Channel**				
Towards Ground	High	**0.118**	**0.209**	0.027	Figure 32
	Middle	0.097	0.177	-0.023	Figure 34
	Low	0.097	0.177	-0.013	Figure 36
Towards Phantom	High	0.036	0.060	0.125	Figure 38
	Middle	0.029	0.049	0.038	Figure 40
	Low	0.031	0.051	0.028	Figure 42
Worst case position of Body with Earphone					
Towards Ground	High	0.112	0.204	-0.133	Figure 44
Worst case position of Body with Bluetooth Earphone					
Towards Ground	High	0.117	0.204	-0.021	Figure 46
Test Case of Body with GPRS(2 timeslots in uplink)					
Towards Ground	High	0.205	0.327	0.058	Figure 48
	Middle	0.190	0.299	0.057	Figure 50
	Low	0.217	0.337	0.060	Figure 52
Towards Phantom	High	0.094	0.150	-0.069	Figure 54
	Middle	0.083	0.131	0.003	Figure 56
	Low	0.089	0.139	-0.169	Figure 58

Note 1. Tests in body position were performed with 15 mm air gap between DUT and Phantom to simulate the use of a non-metallic belt-clip or holster.

Table 13: SAR Values (GSM1900, Head, Close)

Liquid Temperature: 22.5℃					
Limit of SAR (W/kg)		**10 g Average**	**1 g Average**	**Power Drift (dB)**	**Graph Results**
		2.0	**1.6**	**± 0.21**	
Test Case Of Head		**Measurement Result (W/kg)**		**Power Drift (dB)**	
Different Test Position	**Channel**	**10 g Average**	**1 g Average**		
Left hand, Touch cheek	High	0.215	0.352	0.109	Figure 60
	Middle	0.216	0.355	0.030	Figure 62
	Low	0.173	0.287	0.057	Figure 64
Left hand, Tilt 15 Degree	High	0.101	0.178	0.143	Figure 66
	Middle	0.087	0.152	0.020	Figure 68
	Low	0.066	0.113	0.167	Figure 70
Right hand, Touch cheek	High	0.159	0.242	-0.017	Figure 72
	Middle	0.156	0.249	-0.008	Figure 74
	Low	0.138	0.220	-0.095	Figure 76
Right hand, Tilt 15 Degree	High	0.093	0.163	0.010	Figure 78
	Middle	0.080	0.141	0.014	Figure 80
	Low	0.072	0.125	0.006	Figure 82

Table 14: SAR Values (GSM1900, Body, Close，Distance 15mm)

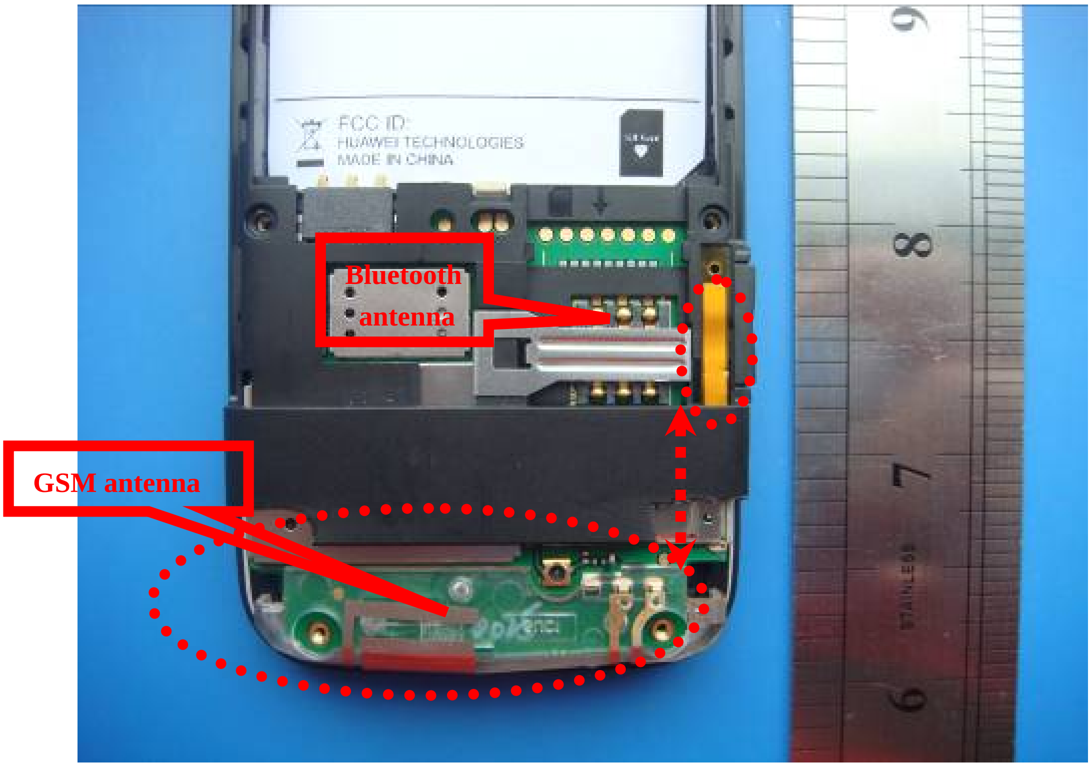
Liquid Temperature: 22.5℃					
Limit of SAR (W/kg)		**10 g Average**	**1 g Average**	**Power Drift (dB)**	**Graph Results**
		2.0	**1.6**	**± 0.21**	
Test Case Of Body		**Measurement Result (W/kg)**		**Power Drift (dB)**	
Different Test Position	**Channel**	**10 g Average**	**1 g Average**		
Towards Ground	High	**0.290**	**0.478**	0.020	Figure 84
	Middle	0.256	0.421	0.028	Figure 86
	Low	0.187	0.309	0.033	Figure 88
Towards Phantom	High	0.054	0.087	-0.049	Figure 90
	Middle	0.055	0.091	0.127	Figure 92
	Low	0.057	0.094	-0.055	Figure 94
Worst case position of Body with Earphone					
Towards Ground	High	0.198	0.335	-0.133	Figure 96
Worst case position of Body with Bluetooth Earphone					
Towards Ground	High	0.313	0.519	0.183	Figure 98
Test Case of Body with GPRS(2 timeslots in uplink)					
Towards Ground	High	0.551	0.905	0.039	Figure 100
	Middle	0.478	0.779	0.029	Figure 102
	Low	0.343	0.563	0.005	Figure 104
Towards Phantom	High	0.108	0.172	-0.071	Figure 106
	Middle	0.106	0.176	0.001	Figure 108
	Low	0.110	0.178	-0.015	Figure 110

Note: 1. the value with blue color is the maximum SAR Value of each test band.

2. Tests in body position were performed with 15 mm air gap between DUT and Phantom to simulate the use of a non-metallic belt-clip or holster.

9.3.1. Bluetooth function

The distance between BT antenna and GSM antenna is <2.5cm. The location of the antennas inside mobile phone is shown below:



The output power of BT antenna is as following:

Channel	Ch 0 2402 MHz	Ch 39 2441 Mhz	Ch 78 2480 MHz
Peak Conducted Output Power(dBm)	-0.7	-1.1	-0.8

According to the output power measurement result and the distance between the two antennas, we can draw the conclusion that: stand-alone SAR is not required for BT transmitter, because the output power of BT transmitter is $\leq P_{Ref}$ and the GSM antenna is within 2.5cm

So, because of the power and the distance, we didn't perform the standalone BT SAR tests, and just did the BT and GSM simultaneously SAR test with the request of the client.

Table 15: SAR Values (1900MHz open Band-Body with Bluetooth)

<table>
<tr><td colspan="6">Liquid Temperature: 22.5℃</td></tr>
<tr><td colspan="2" rowspan="2">Limit of SAR (W/kg)</td><td>10 g Average</td><td>1 g Average</td><td>Power Drift (dB)</td><td rowspan="5">Graph Results</td></tr>
<tr><td>2.0</td><td>1.6</td><td>± 0.2</td></tr>
<tr><td colspan="2">Test Case Of Body</td><td colspan="2">Measurement Result (W/kg)</td><td rowspan="3">Power Drift (dB)</td></tr>
<tr><td colspan="2"></td><td rowspan="2">10 g Average</td><td rowspan="2">1 g Average</td></tr>
<tr><td>Different Test Position</td><td>Channel</td></tr>
<tr><td>Towards Ground</td><td>High</td><td>0.117</td><td>0.204</td><td>-0.021</td><td>Figure 46</td></tr>
</table>

Table 16: SAR Values (1900MHz close Band-Body with Bluetooth)

<table>
<tr><td colspan="6">Liquid Temperature: 22.5℃</td></tr>
<tr><td colspan="2" rowspan="2">Limit of SAR (W/kg)</td><td>10 g Average</td><td>1 g Average</td><td>Power Drift (dB)</td><td rowspan="5">Graph Results</td></tr>
<tr><td>2.0</td><td>1.6</td><td>± 0.2</td></tr>
<tr><td colspan="2">Test Case Of Body</td><td colspan="2">Measurement Result (W/kg)</td><td rowspan="3">Power Drift (dB)</td></tr>
<tr><td colspan="2"></td><td rowspan="2">10 g Average</td><td rowspan="2">1 g Average</td></tr>
<tr><td>Different Test Position</td><td>Channel</td></tr>
<tr><td>Towards Ground</td><td>High</td><td>0.313</td><td>0.519</td><td>0.183</td><td>Figure 98</td></tr>
</table>

9.4. Conclusion

Localized Specific Absorption Rate (SAR) of this portable wireless device has been measured in all cases requested by the relevant standards cited in Clause 7.2 of this report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 7.1 of this test report.

10. MEASUREMENT UNCERTAINTY

No.	a	Type	c	d	e=f(d、k)	f	h=c×f / e	k
	Uncertainty Component		Tol. (±%)	Prob. Dist	Div.	c_1(1g)	1g u (± %)	v_1
1	System repetivity	A	0.5	N	1	1	0.5	9
	Measurement system							
2	Probe Calibration	B	5	N	2	1	2.5	∞
3	Axial isotropy	B	4.7	R	$\sqrt{3}$	$(1-cp)^{1/2}$	4.3	∞
4	Hemisphere Isotropy	B	9.4	R	$\sqrt{3}$	$\sqrt{C_P}$		∞
5	Boundary Effect	B	0.4	R	$\sqrt{3}$	1	0.23	∞
6	Linearity	B	4.7	R	$\sqrt{3}$	1	2.7	∞
7	System Detection Limits	B	1.0	R	$\sqrt{3}$	1	0.6	∞
8	Readout Electronics	B	1.0	N	1	1	1.0	∞
9	RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1.73	∞
10	Probe Positioner Mechanical Tolerance	B	0.4	R	$\sqrt{3}$	1	0.2	∞
11	Probe Positioning with respect to Phantom Shell	B	2.9	R	$\sqrt{3}$	1	1.7	∞
12	Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	B	3.9	R	$\sqrt{3}$	1	2.3	∞
	Test Sample Related							
13	Test Sample Positioning	A	4.9	N	1	1	4.9	N-1
14	Device Holder Uncertainty	A	6.1	N	1	1	6.1	N-1
15	Output Power Variation-SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.9	∞
	Phantom and Tissue Parameters							
16	Phantom Uncertainty(shape and thickness tolerances)	B	1.0	R	$\sqrt{3}$	1	0.6	∞
17	Liquid Conductivity-deviation from target values	B	5.0	R	$\sqrt{3}$	0.64	1.7	∞
18	Liquid Conductivity-measurement uncertainty	B	5.0	N	1	0.64	1.7	M
19	Liquid Permittivity-deviation from target values	B	5.0	R	$\sqrt{3}$	0.6	1.7	∞
20	Liquid Permittivity- measurement uncertainty	B	5.0	N	1	0.6	1.7	M
Combined Standard Uncertainty				RSS			11.25	
Expanded Uncertainty (95 % CONFIDENCE INTERVAL)				K=2			22.5	

11. MAIN TEST INSTRUMENTS

Table 17: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	Agilent 8753E	US37390326	September 14, 2008	One year
02	Dielectric Probe Kit	Agilent 85070E	US44020115	No Calibration Requested	
03	Power meter	Agilent E4417A	GB41291714	March 14, 2008	One year
04	Power sensor	Agilent 8481H	MY41091316	March 14, 2008	One year
05	Signal Generator	HP 8341B	2730A00804	September 14, 2008	One year
06	Amplifier	IXA-020	0401	No Calibration Requested	
07	BTS	E5515C	GB46490218	September 14, 2008	One year
08	E-field Probe	ET3DV6	1531	January 29, 2008	One year
09	DAE	DAE4	452	July 21, 2008	One year
10	Validation Kit 1900MHz	D1900V2	5d018	March 21, 2008	One year

12. TEST PERIOD

The test is performed from October 10, 2008 to October 12, 2008.

13. TEST LOCATION

The test is performed at TA Technology (Shanghai) Co., Ltd.

*******END OF REPORT BODY*******

ANNEX A： MEASUREMENT PROCESS

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point was measured and was used as a reference value for assessing the power drop.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15 mm x 15 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Around this point, a volume of 32 mm x 32 mm x 34 mm was assessed by measuring 7 x 7x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

b. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot"-condition (in x ~ y and z-directions). The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation is repeated.

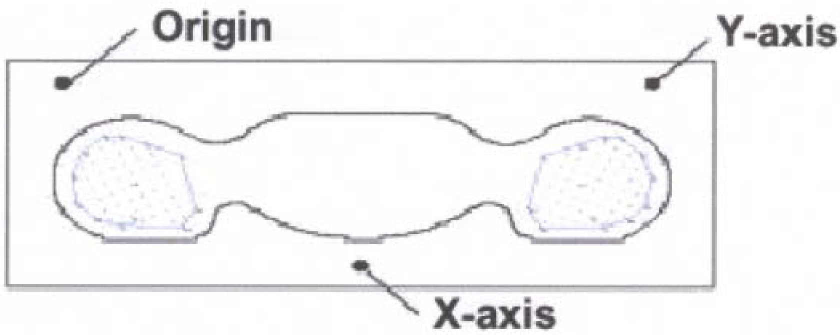
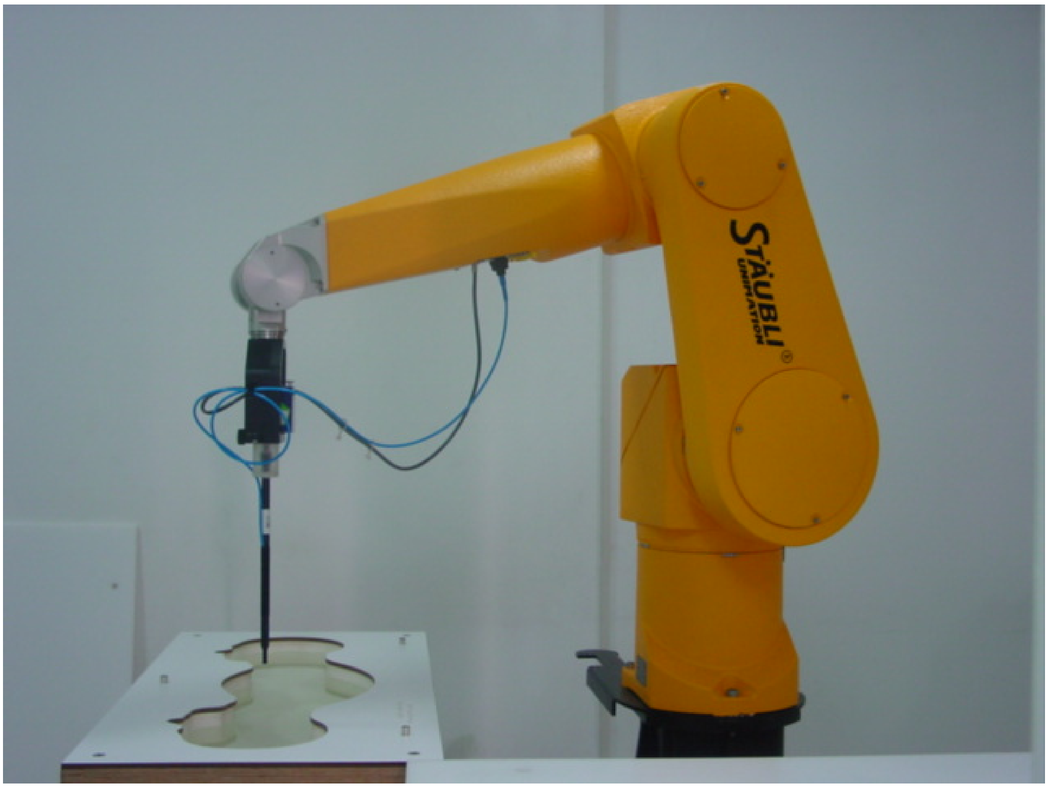
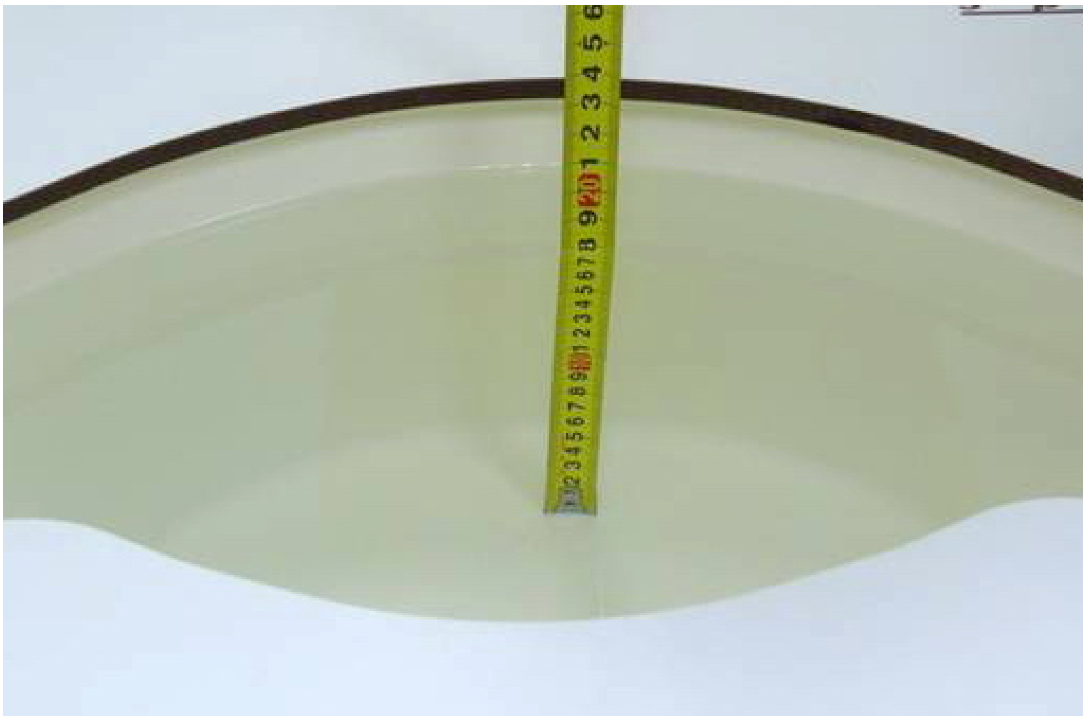


Figure 7 SAR Measurement Points in Area Scan

ANNEX B: TEST LAYOUT



Picture 1: Specific Absorption Rate Test Layout



Picture 2: Liquid depth in the Phantom (1900 MHz)

Picture 3: liquid depth in the head Phantom (1900 MHz)

ANNEX C： GRAPH RESULTS

GSM 1900 Left Cheek High Open

Communication System: GSM 1900; Frequency: 1909.8 MHz;Duty Cycle: 1:8.3

Medium parameters used: f = 1910 MHz; σ = 1.46 mho/m; ε_r = 39.8; ρ = 1000 kg/m^3

Probe: ET3DV6 - SN1531; ConvF(5.15, 5.15, 5.15);

Electronics: DAE4 Sn452;

Cheek High/Area Scan (51x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.164 mW/g

Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.88 V/m; Power Drift = -0.151 dB

Peak SAR (extrapolated) = 0.207 W/kg

SAR(1 g) = 0.141 mW/g; SAR(10 g) = 0.091 mW/g

Maximum value of SAR (measured) = 0.157 mW/g

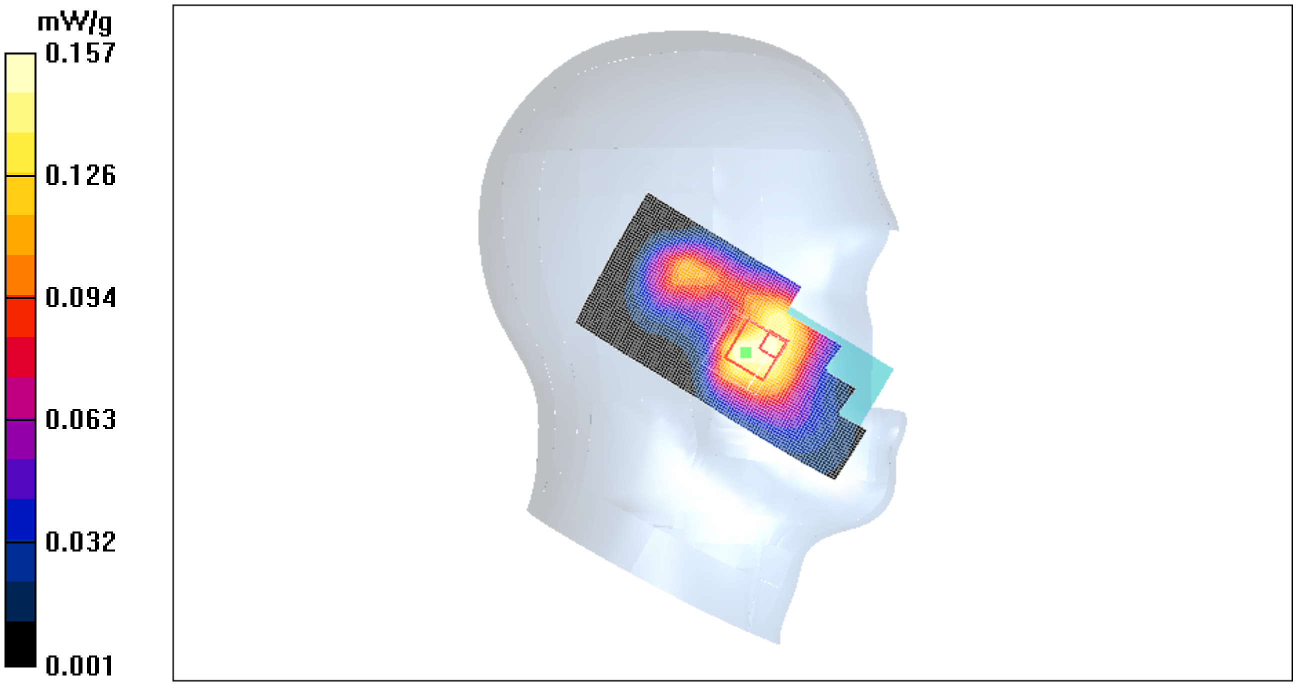


Figure 8 Left Hand Touch Cheek Open GSM 1900 Channel 810

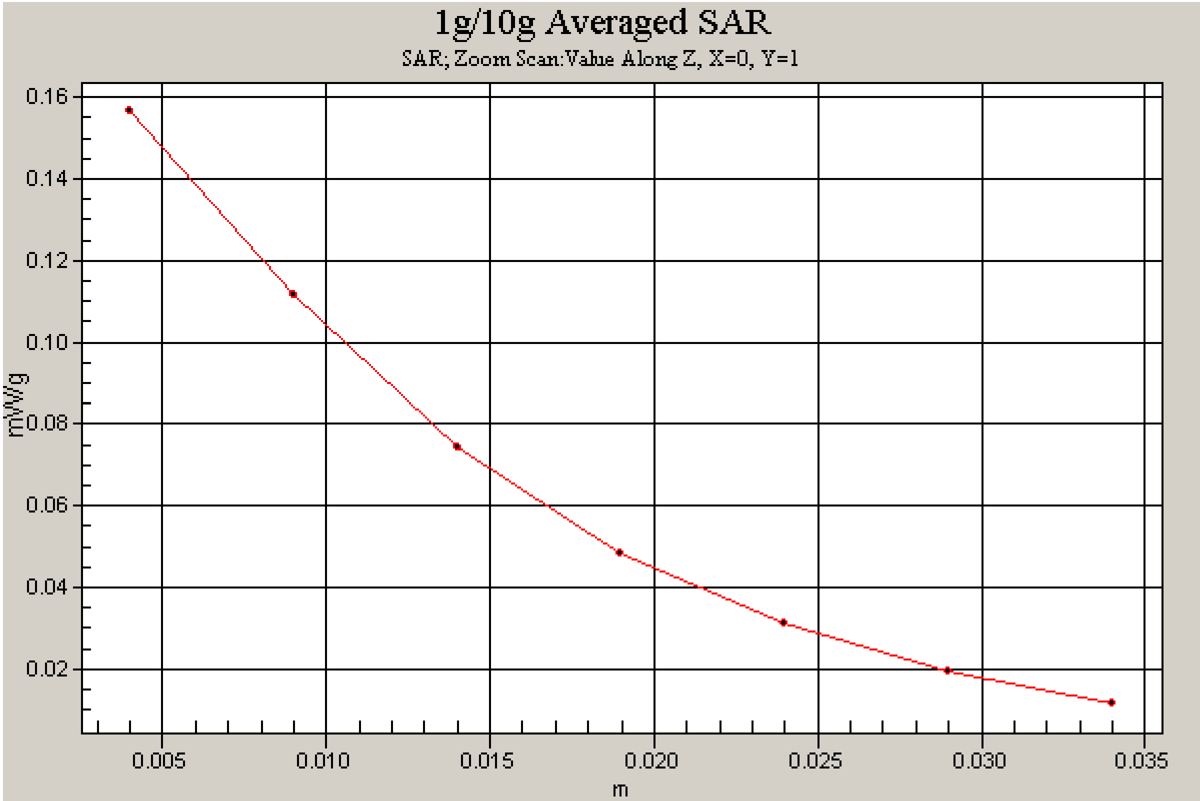


Figure 9 Z-Scan at power reference point (Left Hand Touch Cheek Open GSM 1900 Channel 810)

GSM 1900 Left Cheek Middle Open

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3
Probe: ET3DV6 - SN1531; ConvF(5.15, 5.15, 5.15);
Electronics: DAE4 Sn452;
Cheek Middle/Area Scan (51x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.146 mW/g

Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.34 V/m; Power Drift = -0.022 dB
Peak SAR (extrapolated) = 0.184 W/kg
SAR(1 g) = 0.135 mW/g; SAR(10 g) = 0.087 mW/g
Maximum value of SAR (measured) = 0.147 mW/g

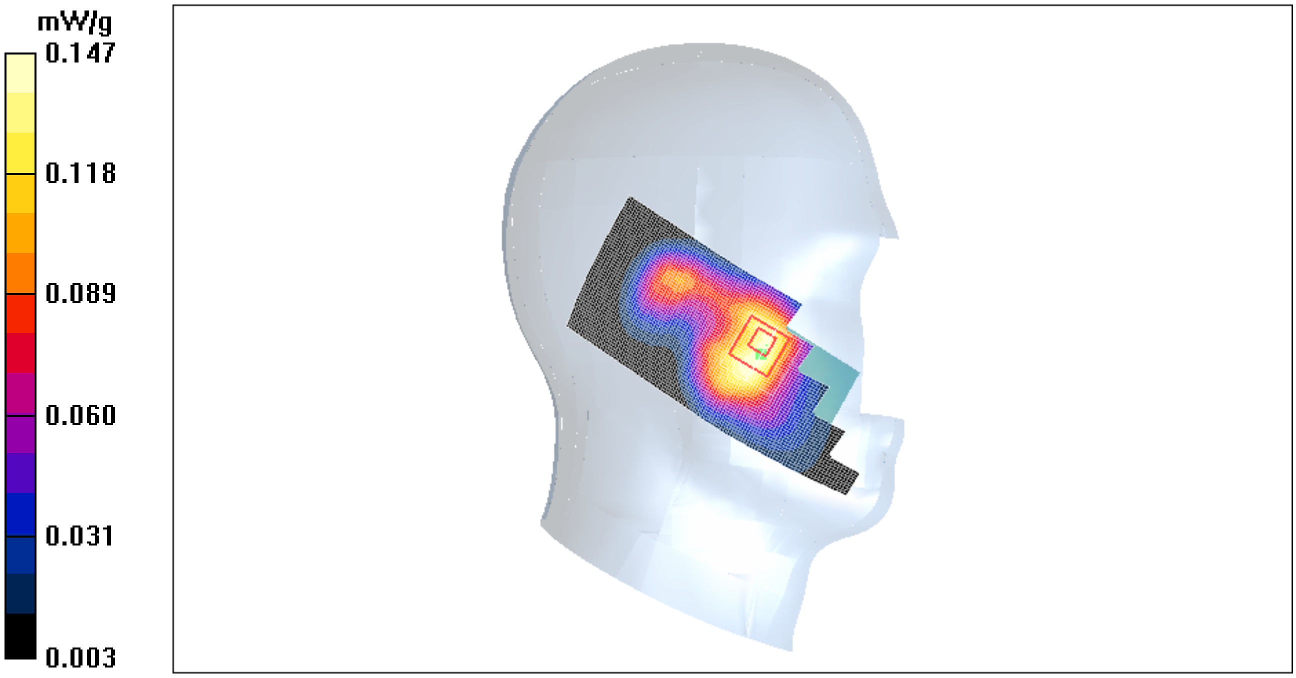


Figure 10 Left Hand Touch Cheek Open GSM 1900 Channel 661

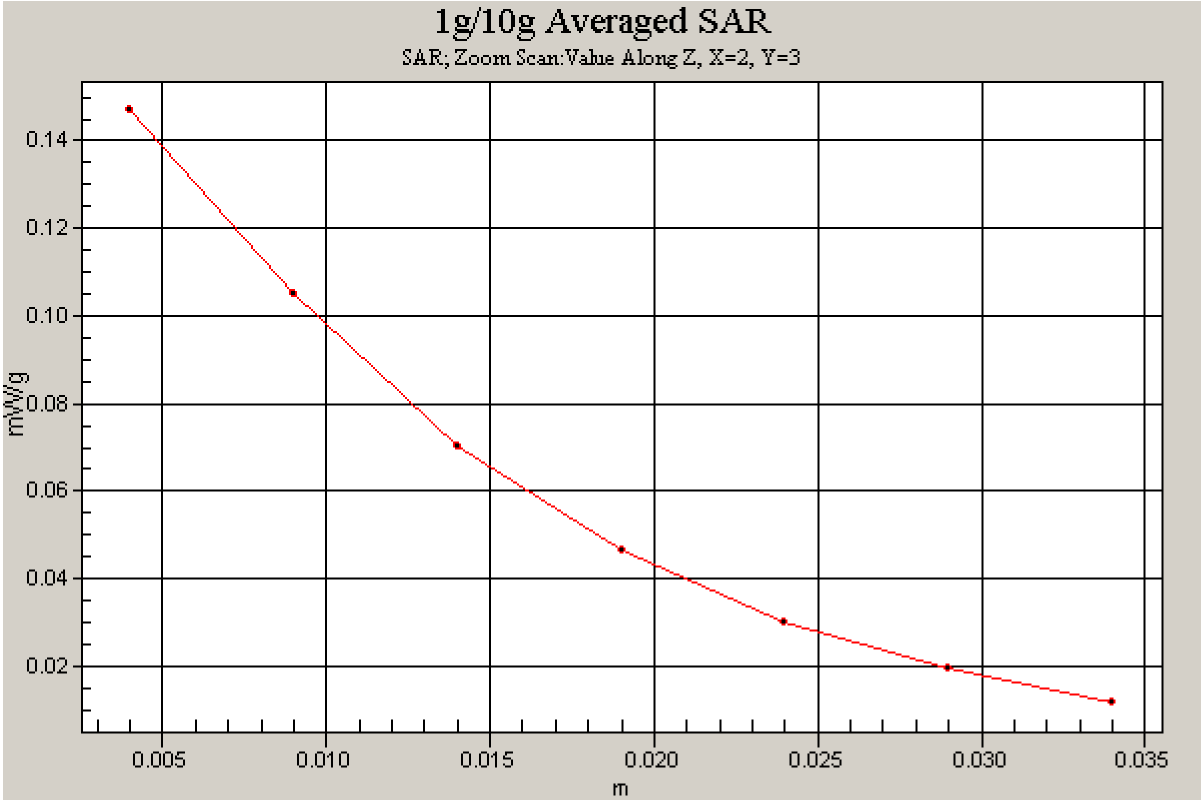


Figure 11 Z-Scan at power reference point (Left Hand Touch Cheek Open GSM 1900 Channel 661)

GSM 1900 Left Cheek Low Open

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3

Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.41 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3

Probe: ET3DV6 - SN1531; ConvF(5.15, 5.15, 5.15);

Electronics: DAE4 Sn452;

Cheek Low/Area Scan (51x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.139 mW/g

Cheek Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.97 V/m; Power Drift = -0.108 dB

Peak SAR (extrapolated) = 0.169 W/kg

SAR(1 g) = 0.126 mW/g; SAR(10 g) = 0.081 mW/g

Maximum value of SAR (measured) = 0.139 mW/g

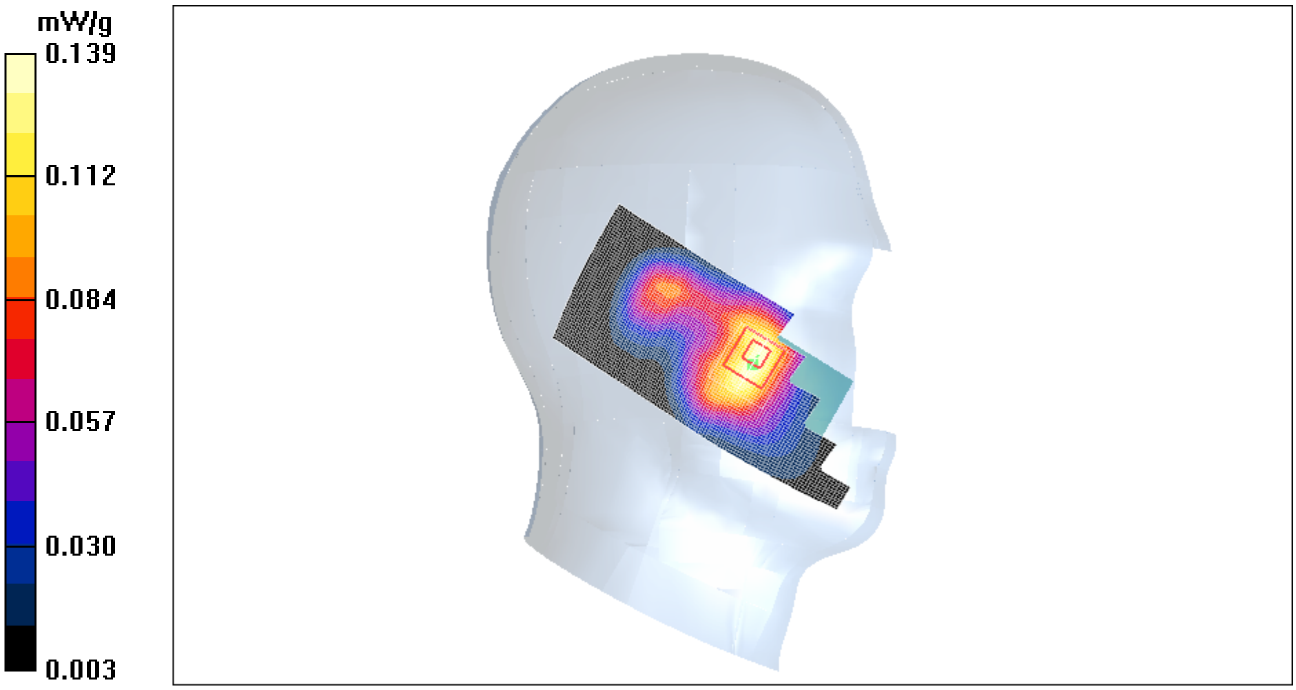


Figure 12 Left Hand Touch Cheek Open GSM 1900 Channel 512

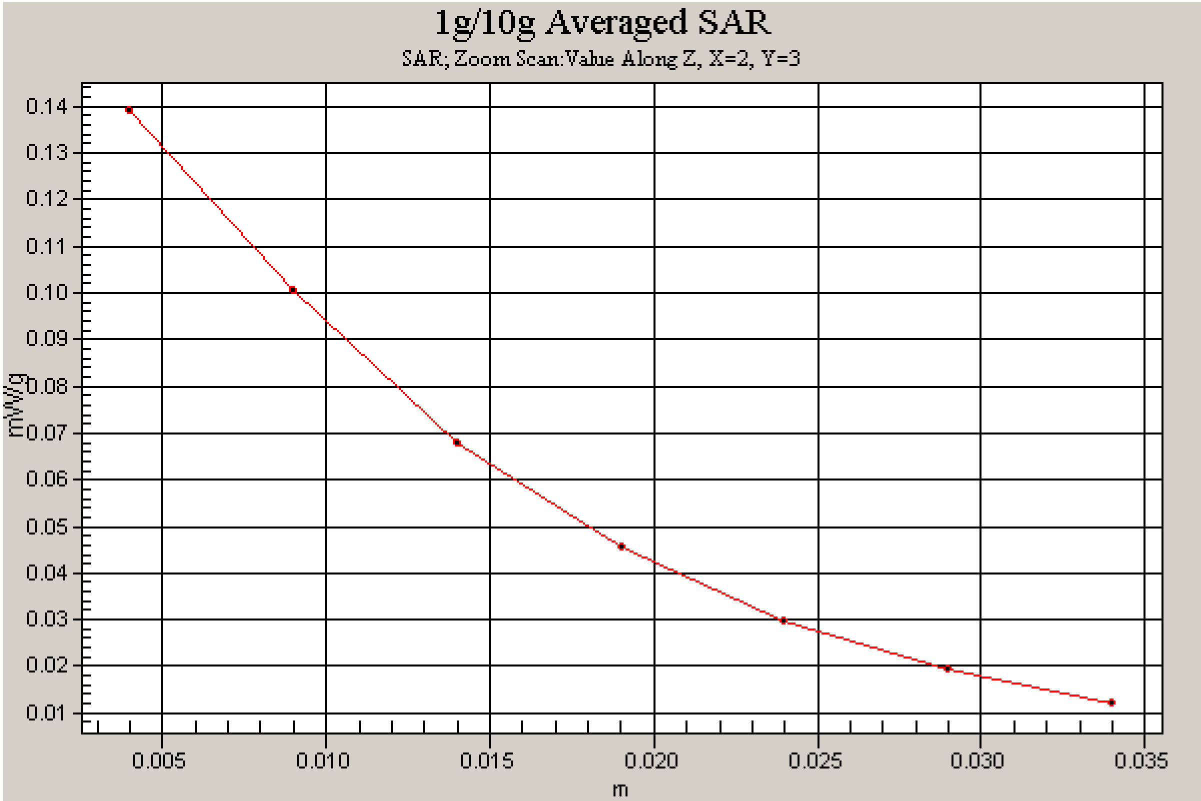


Figure 13 Z-Scan at power reference point (Left Hand Touch Cheek Open GSM 1900 Channel 512)

GSM 1900 Left Tilt High Open

Communication System: GSM 1900; Frequency: 1909.8 MHz;Duty Cycle: 1:8.3

Medium parameters used: f = 1910 MHz; σ = 1.46 mho/m; ε_r = 39.8; ρ = 1000 kg/m^3

Probe: ET3DV6 - SN1531; ConvF(5.15, 5.15, 5.15);

Electronics: DAE4 Sn452;

Tilt High/Area Scan (51x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.123 mW/g

Tilt High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.93 V/m; Power Drift = -0.035 dB

Peak SAR (extrapolated) = 0.157 W/kg

SAR(1 g) = 0.106 mW/g; SAR(10 g) = 0.062 mW/g

Maximum value of SAR (measured) = 0.116 mW/g

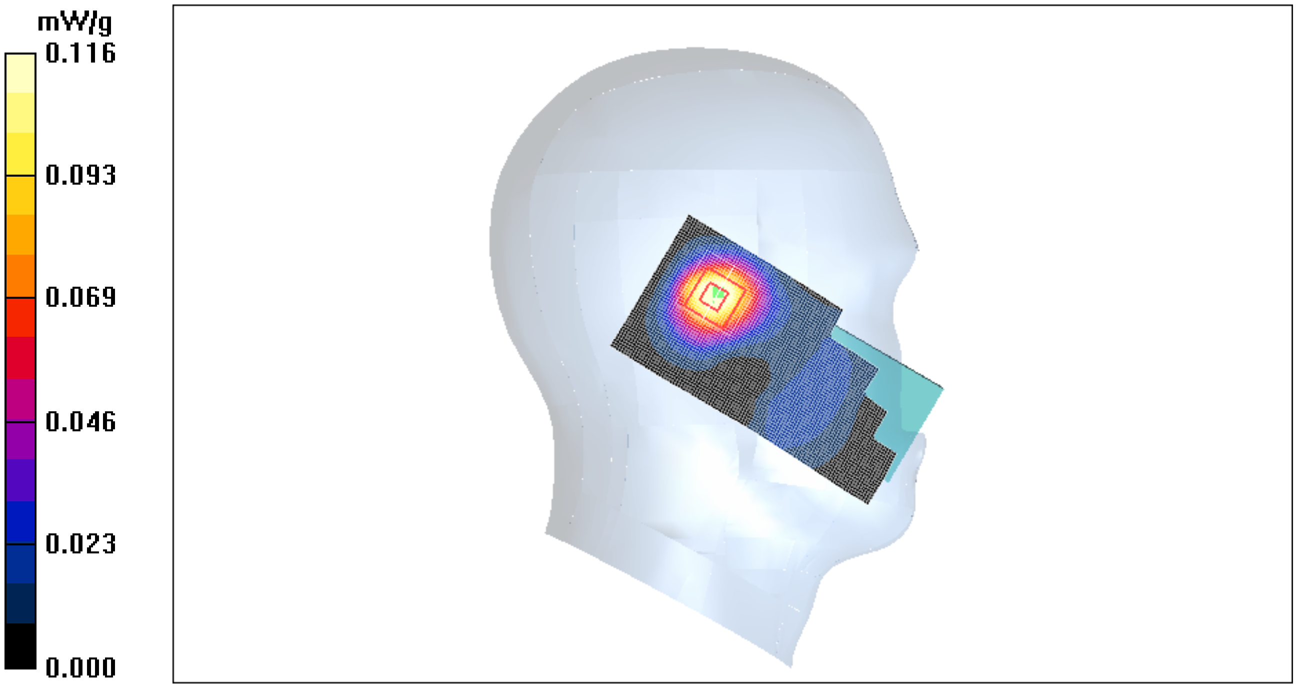


Figure 14 Left Hand Tilt 15°Open GSM 1900 Channel 810

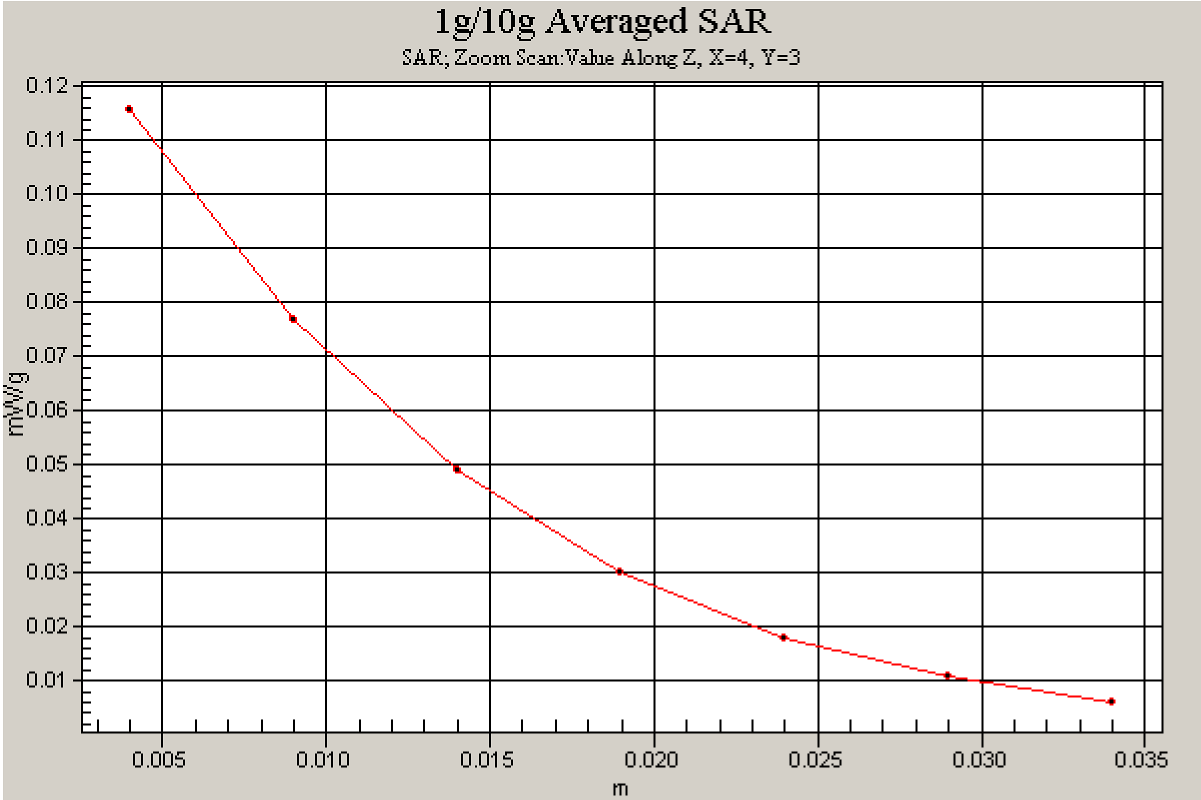


Figure 15 Z-Scan at power reference point (Left Hand Tilt 15°Open GSM 1900 Channel 810)

GSM 1900 Left Tilt Middle Open

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3

Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3

Probe: ET3DV6 - SN1531; ConvF(5.15, 5.15, 5.15);

Electronics: DAE4 Sn452;

Tilt Middle/Area Scan (51x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.110 mW/g

Tilt Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.61 V/m; Power Drift = -0.081 dB

Peak SAR (extrapolated) = 0.139 W/kg

SAR(1 g) = 0.096 mW/g; SAR(10 g) = 0.057 mW/g

Maximum value of SAR (measured) = 0.105 mW/g

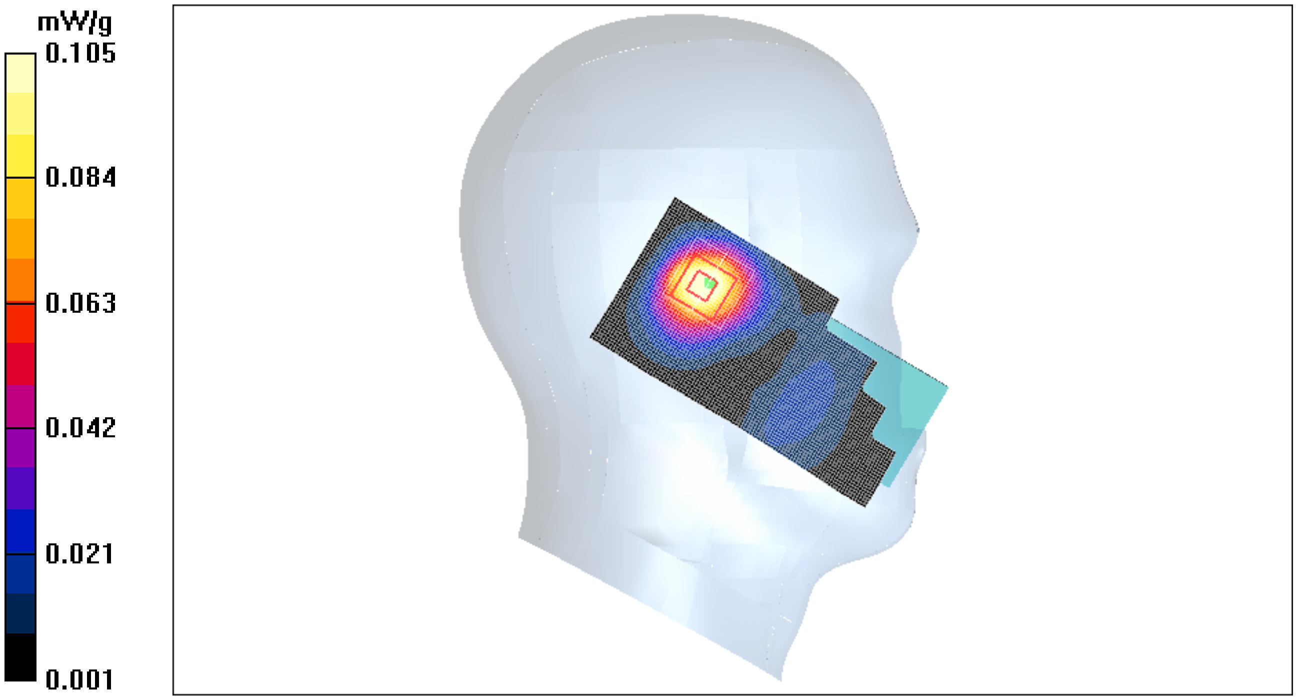


Figure 16 Left Hand Tilt 15° Open GSM 1900 Channel 661

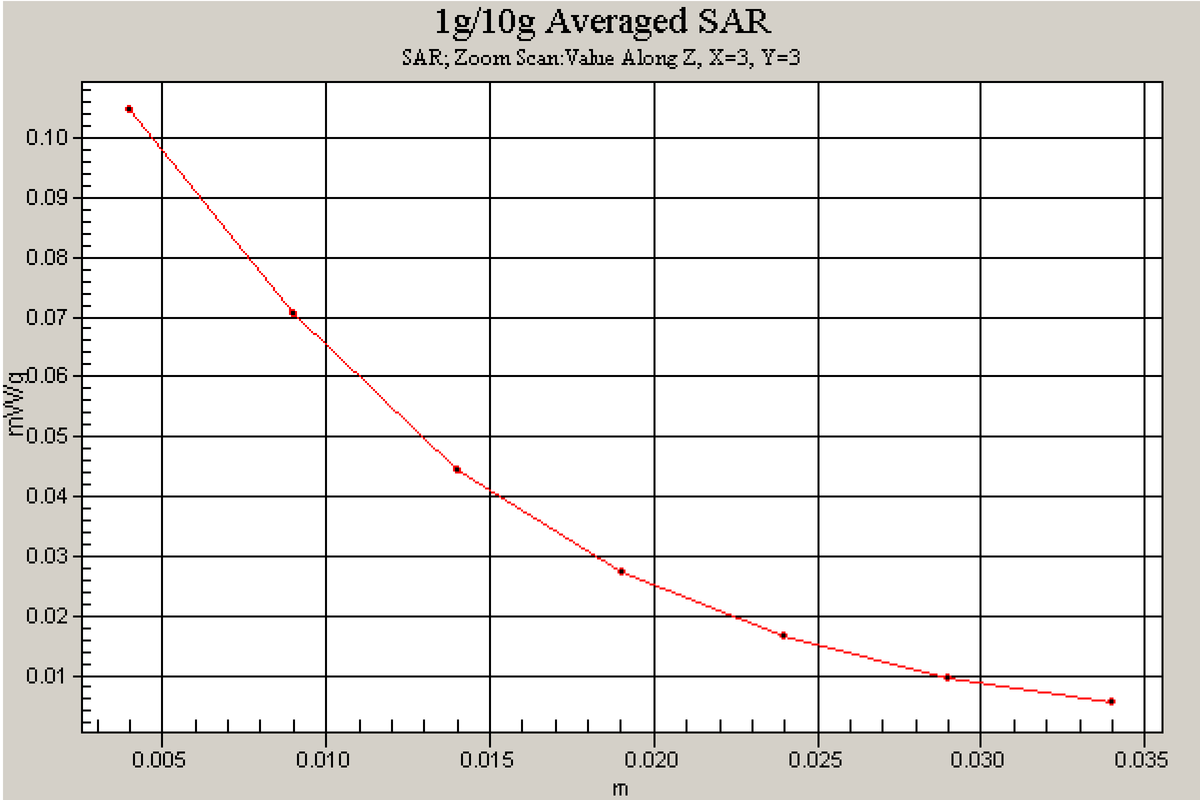


Figure 17 Z-Scan at power reference point (Left Hand Tilt 15° Open GSM 1900 Channel 661)

GSM 1900 Left Tilt Low Open

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3

Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.41 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3

Probe: ET3DV6 - SN1531; ConvF(5.15, 5.15, 5.15);

Electronics: DAE4 Sn452;

Tilt Low/Area Scan (51x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.112 mW/g

Tilt Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.49 V/m; Power Drift = 0.126 dB

Peak SAR (extrapolated) = 0.137 W/kg

SAR(1 g) = 0.096 mW/g; SAR(10 g) = 0.057 mW/g

Maximum value of SAR (measured) = 0.105 mW/g

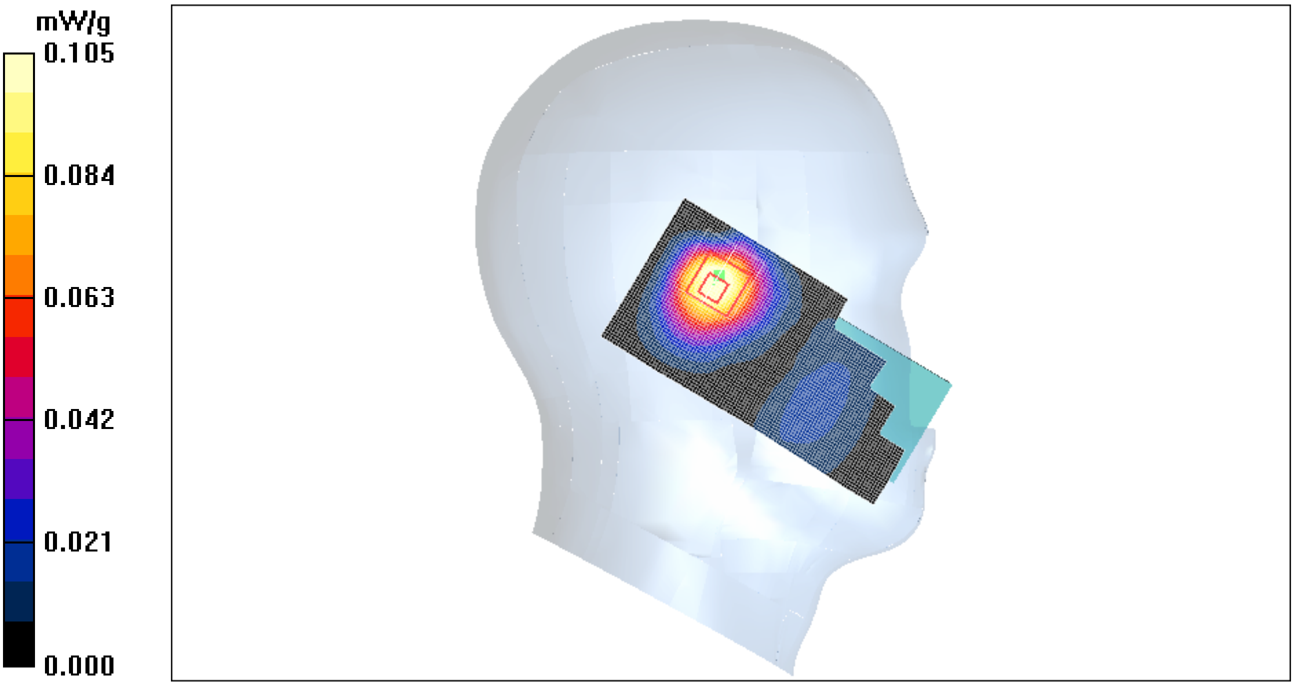


Figure 18 Left Hand Tilt 15° Open GSM 1900 Channel 512