

NO.: RZA2007-1081FCC-1

TEST REPORT

Test name	Electromagnetic Field (Specific Absorption Rate)
Product	HSPA USB STICK
Model	E170
FCC ID	QISE170
Client	HUAWEI Technologies Co., Ltd.

TA Technology (Shanghai) Co., Ltd.



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1 COMPETENCE AND WARRANTIES

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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

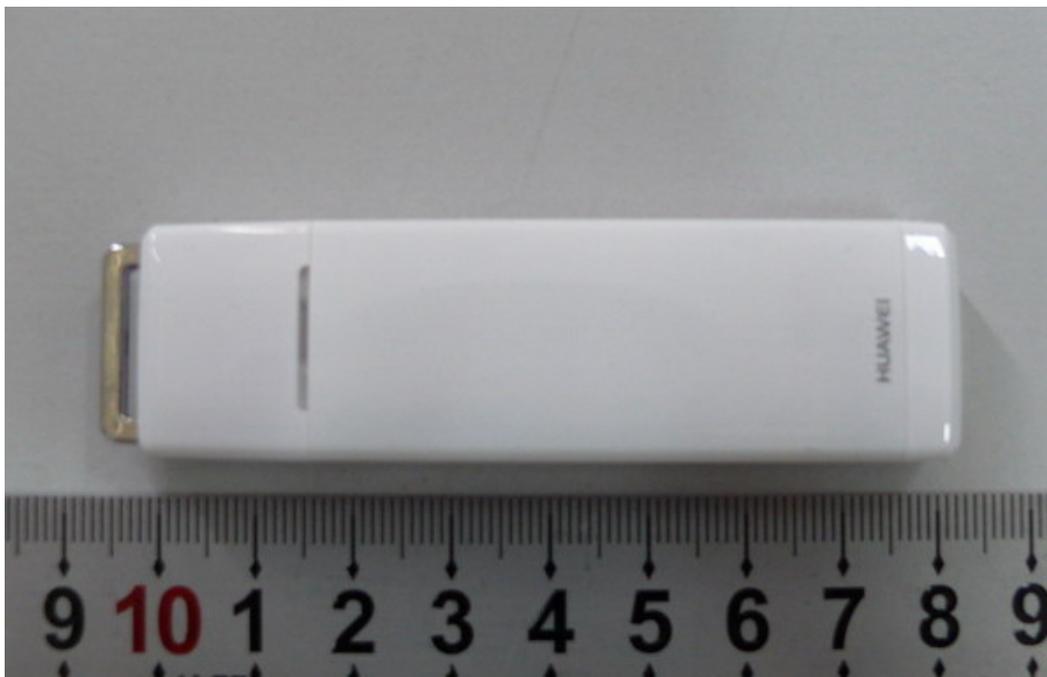
Table 2: Manufacturer

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
HSPA USB STICK	E170	EV7NAA17A2711096	HUAWEI Technologies Co., Ltd.



Picture 1: Constituents of the sample

3.3 General Description

Equipment Under Test (EUT) is a HSPA USB STICK with internal antenna. During SAR test of the EUT, it was connected to three different portable computers. SAR is tested for the EUT respectively for GSM 850 and GSM1900. The EUT have GPRS (class 12) and EGPRS functions.

Since the EUT only has the data transfer function, but does not have the voice transfer function, the tests in the band of GSM 850 and GSM 1900 are only performed in the mode of GPRS and EGPRS. The measurements were performed in combination with three different host products [BenQ Joybook S72, Acer ZH1 and BenQ Joybook R55V (118)]. BenQ Joybook S72 and Acer ZH1 laptop have horizontal USB slots, BenQ Joybook R55V (118) laptop has vertical USB slot

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

4 OPERATIONAL CONDITIONS DURING TEST

4.1 Schematic Test Configuration

For the SAR body tests for GSM 850 and GSM1900, a communication link is set up with a System Simulator (SS) by air link. The EUT is commanded to operate at maximum transmitting power.

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Since the EUT only has the data transfer function, but does not have the voice transfer function. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS and EGPRS. And since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink. According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3.0
3	1.8 to 4.8
4	3.0 to 6.0

For this EUT, the tests for GSM 850 GPRS and GSM 1900 GPRS band will be performed under the following 4 setups at one same test position:

- 1) Using 1 timeslot in uplink with the power of 33 dBm for 850MHz and 30 dBm for 1900MHz
- 2) Using 2 timeslots in uplink with the power reduced 2dB
- 3) Using 3 timeslots in uplink with the power reduced 4dB
- 4) Using 4 timeslots in uplink with the power reduced 6dB

After drawn the worst case, the tests will be continued to perform with the same EUT setup for the whole tests for 850 GPRS and 1900 GPRS.

And according to the "2 dB rule" specified in the OET Bulletin 65 (Edition 97-01) and Supplement C (Edition 01-01), " **If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tile/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s)**".

Then The Absolute Radio Frequency Channel Number (ARFCN) is firstly allocated to 190 and 661 respectively in the case of GSM 850 and GSM 1900 then to low and high if necessary the EUT is tested at the following 7 test positions:

- Test Position 1: The EUT is connected to the portable computer with horizontal USB slot. The back side of the EUT is towards the bottom of the flat phantom. (Picture 2-a)
- Test Position 2: The EUT is connected to the portable computer with horizontal USB slot. The front side of the EUT is towards the bottom of the flat phantom. (Picture 2-b)
- Test Position 3: The EUT is connected to the portable computer with horizontal USB slot. The top side of the EUT is towards the bottom of the flat phantom. (Picture 2-c)
- Test Position 4: The EUT is connected to the portable computer with vertical USB slot. The front side of the EUT is towards the bottom of the flat phantom. (Picture 2-d)
- Test Position 5: The EUT is connected to the portable computer with vertical USB slot. The left side of the EUT is towards the bottom of the flat phantom. (Picture 2-e)
- Test Position 6: The EUT is connected to the portable computer with vertical USB slot. The right side of the EUT is towards the bottom of the flat phantom. (Picture 2-f)
- Test Position 7: The EUT is connected to the portable computer with vertical USB slot. The top side of the EUT is towards the bottom of the flat phantom. (Picture 2-g)

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Picture 2-a: Test position 1



Picture 2-b: Test position 2



Picture 2-c: Test position 3



Picture 2-d: Test position 4



Picture 2-e: Test position 5



Picture 2-f: Test Position 6



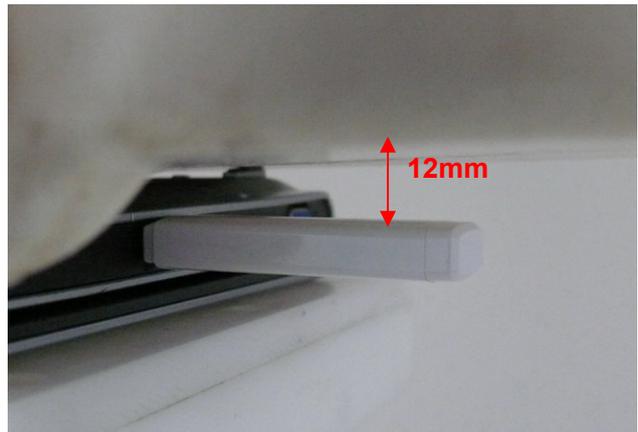
Picture 2-g: Test Position 7

Picture 2: Test positions of EUT

Show the distance that the back side of the EUT with different computer is towards the bottom of the Phantom.



Picture 3-a: EUT with BenQ Joybook S72



Picture 3-b: EUT with Acer ZH1

Picture 3: The EUT back side towards the phantom with different computer

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During the test, The BenQ Joybook S72 laptop, Acer ZH1 laptop and BenQ Joybook R55V (118) laptop are used as an assistant to help to setup communication. (See Picture 4)



Picture 4-a: BenQ Joybook S72 Close



Picture 4-b: BenQ Joybook S72 Open



Picture 4-c: Acer ZH1 Close



Picture 4-d: Acer ZH1 Open



Picture 4-e: BenQ Joybook R55V(118) Close



Picture 4-f: BenQ Joybook R55V(118) Open



Picture 4-g: BenQ Joybook S72 with horizontal USB slot



Picture 4-h: Acer ZH1 with horizontal USB slot



Picture 4-i: BenQ Joybook R55V(118) with Vertical USB slot

Picture 4: Computer as a test assistant

4.2 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 $\pm 0.02\text{mm}$. 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 2000 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.

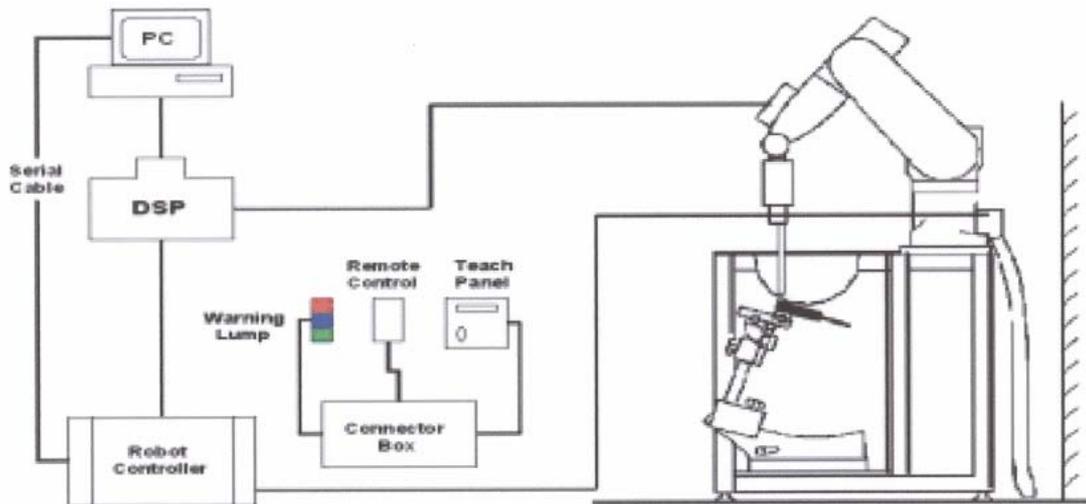


Figure1. SAR Lab Test Measurement Set-up

The DAE3 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.

4.3 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 $\pm 10\%$. The spherical isotropy was evaluated and found to be better than $\pm 0.25\text{dB}$.

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.g., glycol)
Calibration	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at frequencies of 450MHz, 900MHz and 1.8GHz (accuracy $\pm 8\%$)

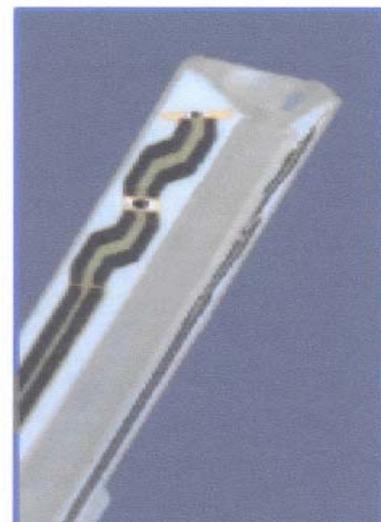


Figure2. ET3DV6 E-field Probe

	Calibration for other liquids and frequencies upon request
Frequency	10 MHz to > 6 GHz; Linearity: ±0.2 dB (30 MHz to 3 GHz)
Directivity	±0.2 dB in brain tissue (rotation around probe axis) ±0.4 dB in brain tissue (rotation normal 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(ET3DV6 only)
Dimensions	Overall length: 330mm Tip length: 16mm Body diameter: 12mm Tip diameter: 6.8mm Distance from probe tip to dipole centers: 2.7mm
Application	General dosimetry up to 3GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

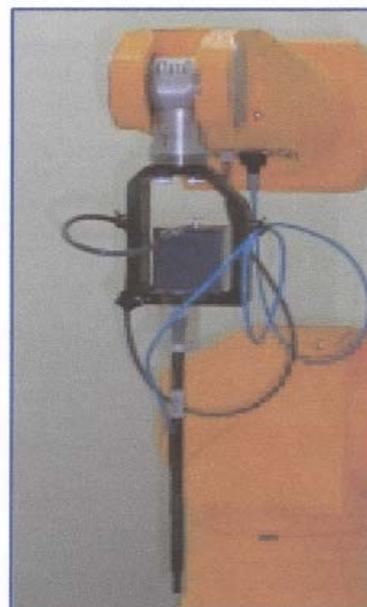


Figure3. ET3DV6 E-field probe

4.4 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 below 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.

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

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

Or

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

Where:

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

4.5 Other Test Equipment

4.5.1 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).



Figure4. Device Holder

4.5.2 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 1000 x 500 mm (H x L x W)
Available	Special



Figure5. Generic Twin Phantom

4.6 Equivalent Tissues

The liquid used for the frequency range of 800-2000 MHz consisted of water, sugar, and salt, Preventol, Glycol and Cellulose. The liquid has previously been proven to be suited for worst-case. The Table 4 and Table 5 show the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528.

Table 4: Composition of the Body Tissue Equivalent Matter

MIXTURE%	FREQUENCY 835MHz
Water	52.5
Sugar	45
Salt	1.4
Preventol	0.1
Cellulose	1.0
Dielectric Parameters Target Value	f=835MHz $\epsilon=55.2$ $\sigma=0.97$

Table 5: Composition of the Body Tissue Equivalent Matter

MIXTURE%	FREQUENCY 1900MHz
Water	69.91
Glycol	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1800MHz $\epsilon=53.3$ $\sigma=1.52$

4.7 System Specifications

4.7.1 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 2000

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 CHARACTERISTICS OF THE TEST

5.1 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 C95.1–1999: 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.

5.2 Applicable Measurement Standards

EN 50361–2001: Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.

It specifies the measurement method for demonstration of compliance with the SAR limits for such equipments.

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

OET Bulletin 65 (Edition 97-01) and Supplement C (Edition 01-01): Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits.

IEC 62209-1: Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 1: 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)

Vodafone SAR_Data_cards_V1.1: Global Test Specification for Terminals for Performance Measurements –Performance TST- Specific Absorption Rate (SAR) for Data Cards and External Antennas.

6 LABORATORY ENVIRONMENT

Table 6: 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 CONDUCTED OUTPUT POWER MEASUREMENT

7.1 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 within 5% than EMI measurement.

7.2 Conducted Power

7.2.1 Measurement Methods

The EUT was set up for the maximum output power. The channel power was measured. The measurements were done at 6 channels both before and after SAR tests for each test band.

7.2.2 Measurement result

Table 7: Conducted Power Measurement Results

GSM 850	Conducted Power		
	Channel 128 (824.2MHz)	Channel 192 (837MHz)	Channel 251 (848.8MHz)
Before Test (dBm)	32.43	32.47	32.42
After Test (dBm)	32.41	32.43	32.47
GSM 850 +GPRS	Conducted Power		
	Channel 128 (824.2MHz)	Channel 192 (837MHz)	Channel 251 (848.8MHz)
Before Test (dBm)	32.43	32.47	32.42
After Test (dBm)	32.41	32.43	32.47
GSM 850 + EGPRS	Conducted Power		
	Channel 128 (824.2MHz)	Channel 192 (837MHz)	Channel 251 (848.8MHz)
Before Test (dBm)	26.63	26.52	26.67
After Test (dBm)	26.6	26.56	26.63
GSM 1900	Conducted Power		
	Channel 512 (1850.2MHz)	Channel 661 (1880MHz)	Channel 810 (1909.8MHz)
Before Test (dBm)	28.87	28.94	28.93
After Test (dBm)	28.85	28.91	28.94
GSM 1900 + GPRS	Conducted Power		
	Channel 512 (1850.2MHz)	Channel 661 (1880MHz)	Channel 810 (1909.8MHz)

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Before Test (dBm)	28.87	28.94	28.93
After Test (dBm)	28.85	28.91	28.94
GSM 1900 + EGPRS	Conducted Power		
	Channel 512 (1850.2MHz)	Channel 661 (1880MHz)	Channel 810 (1909.8MHz)
Before Test (dBm)	24.71	24.82	24.83
After Test (dBm)	24.75	24.83	24.81

7.2.3 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 10 to Table 21 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

8 TEST RESULTS

8.1 Dielectric Performance

Table 8: Dielectric Performance of 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	Permittivity ϵ	Conductivity σ (S/m)
Target value	835MHz	55.2	0.97
	1900MHz	53.3	1.52
Measurement value (Average of 10 tests)	835MHz	54.88	0.99
	1900MHz	52.54	1.52

8.2 System Validation

Table 9: System Validation

Measurement is made at temperature 23.2 °C, relative humidity 50%, input power 250 mW. Liquid temperature during the test: 22.3°C					
Liquid parameters		Frequency	Permittivity ϵ	Conductivity σ (S/m)	
		835MHz	42.8	0.89	
		1900MHz	39.4	1.42	
Verification results	Frequency	Target value (W/kg)		Measurement value (W/kg)	
		10 g Average	1 g Average	10 g Average	1 g Average
	835MHz	1.60	2.48	1.53	2.34
1900MHz	5.09	9.73	5.12	9.69	

Note: Target Values used are one fourth of those in IEEE Std 1528-2003 (feeding power is normalized to 1 Watt), i.e. 250 mW is used as feeding power to the validation dipole (SPEAG using).

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8.3 Summary of Measurement Results

Table 10: SAR Values [GSM 850 GPRS (4 timeslots in uplink) at Test Position 1 with different model computer, Middle frequency]

Liquid Temperature: 22.4°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		
	10 g Average	1 g Average	
With BenQ Joybook S72 (See Figure 7)	0.505	0.761	0.023
With Acer ZH1 (See Figure 9)	0.319	0.475	0.017

Table 11: SAR Values [GSM 850 GPRS (different timeslots in uplink) at Test Position 1 with BenQ Joybook S72, Middle frequency]

Liquid Temperature: 22.4°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		
	10 g Average	1 g Average	
4 timeslots in uplink (See Figure 7)	0.505	0.761	0.023
3 timeslots in uplink (See Figure 11)	0.622	0.936	-0.152
2 timeslots in uplink (See Figure 13)	0.771	1.160	-0.040
1 timeslot in uplink (See Figure 15)	0.575	0.866	0.081

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Table 12: SAR Values [GSM 850 GPRS (2 timeslots in uplink) at Test Position 1 with BenQ Joybook S72, different Channel]

Liquid Temperature: 22.2°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
High frequency (See Figure 17)	0.840	1.280	0.073
Mid frequency (See Figure 13)	0.771	1.160	-0.040
Low frequency (See Figure 19)	0.732	1.120	-0.044

Remark: The value with blue color is the maximum SAR Value of each test band.

Table 13: SAR Values [GSM 850 GPRS (2 timeslots in uplink) at different Position with BenQ Joybook S72, Middle frequency]

Liquid Temperature: 22.4°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
Test Position 1 (See Figure 21)	0.771	1.160	-0.040
Test Position 2 (See Figure 13)	0.436	0.642	-0.171
Test Position 3 (See Figure 23)	0.131	0.452	-0.126

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Table 14: SAR Values [GSM 850 GPRS (2 timeslots in uplink) at different Position with BenQ Joybook R55V, Middle frequency]

Liquid Temperature: 22.4°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
Test Position 4 (See Figure 25)	0.309	0.527	0.088
Test Position 5 (See Figure 27)	0.148	0.206	-0.059
Test Position 6 (See Figure 29)	0.376	0.553	0.083
Test Position 7 (See Figure 31)	0.279	1.010	0.196

Table 15: SAR Values [GSM 850 GPRS (2 timeslots in uplink) at Test Position 7 with BenQ Joybook R55V, different Channel]

Liquid Temperature: 22.2°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
High frequency (See Figure 33)	0.277	1.010	-0.038
Mid frequency (See Figure 31)	0.279	1.010	0.196
Low frequency (See Figure 35)	0.248	0.895	-0.058

Table 16: SAR Values [GSM 850 EGPRS (2 timeslots in uplink) at Test Position 1 with BenQ Joybook S72, Middle frequency]

Liquid Temperature: 22.4°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
GSM 850, EGPRS (See Figure 37)	0.205	0.310	-0.022

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Table 17: SAR Values [GSM 1900 GPRS (4 timeslots in uplink) at Test Position 1 with different model computer, Middle frequency]

Liquid Temperature: 22.2°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		
	10 g Average	1 g Average	
With BenQ Joybook S72 (See Figure 39)	0.384	0.700	-0.126
With Acer ZH1 (See Figure 41)	0.238	0.395	-0.066

Table 18: SAR Values [GSM 1900 GPRS (different timeslots in uplink) at Test Position 1 with BenQ Joybook S72, Middle frequency]

Liquid Temperature: 22.2°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		
	10 g Average	1 g Average	
4 timeslots in uplink (See Figure 39)	0.384	0.700	-0.126
3 timeslots in uplink (See Figure 43)	0.468	0.848	0.049
2 timeslots in uplink (See Figure 45)	0.505	0.912	-0.151
1 timeslot in uplink (See Figure 47)	0.407	0.738	0.003

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Table 19: SAR Values [GSM 1900 GPRS (2 timeslots in uplink) at different Position with BenQ Joybook S72, Middle frequency]

Liquid Temperature: 22.2°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
Test Position 1 (See Figure 45)	0.505	0.912	-0.151
Test Position 2 (See Figure 49)	0.204	0.319	-0.196
Test Position 3 (See Figure 51)	0.387	0.998	0.167

Remark: The value with blue color is the maximum SAR Value of each test band.

Table 20: SAR Values [GSM 1900 GPRS (2 timeslots in uplink) at different Position with BenQ Joybook R55V, Middle frequency]

Liquid Temperature: 22.2°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
Test Position 4 (See Figure 53)	0.194	0.308	-0.029
Test Position 5 (See Figure 55)	0.192	0.323	0.053
Test Position 6 (See Figure 57)	0.494	0.905	-0.134
Test Position 7 (See Figure 59)	0.367	0.836	-0.054

Table 21: SAR Values [GSM1900 EGPRS (2 timeslots in uplink) at Test Position 3 with BenQ Joybook S72, Middle frequency]

Liquid Temperature: 22.2°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case Of Body	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
GSM 1900, EGPRS (See Figure 61)	0.136	0.345	0.091

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8.4 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 5.2 of this report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 5.1 of this test report.

9 Measurement Uncertainty

No.	a	Type	c	d	e= f(d, k)	f	h=cxf / 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	∞

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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	

10 MAIN TEST INSTRUMENTS

Table 22: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	Agilent 8753E	US37390326	September 15, 2007	One year
02	Dielectric Probe Kit	Agilent 85070E	US44020115	No Calibration Requested	
03	Power meter	Agilent E4417A	GB41291714	January 25, 2007	One year
04	Power sensor	Agilent 8481H	MY41091316	January 25, 2007	One year
05	Signal Generator	HP 8341B	2730A00804	September 15, 2007	One year
06	Amplifier	IXA-020	0401	No Calibration Requested	
07	Validation Kit 835MHz	SPEAG D835V2	443	February 19, 2007	Two years
08	Validation Kit 1900MHz	SPEAG D1900V2	541	February 20, 2007	Two years
09	BTS	E5515C	GB46490218	September 15, 2007	One year
10	E-field Probe	ET3DV6	1737	February 20, 2007	One year
11	DAE	DAE3	452	September 6, 2007	One year

11 TEST PERIOD

The test is performed from Nov. 2nd, 2007 to Nov. 11th, 2007.

12 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 20 mm x 20 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 7 x 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.

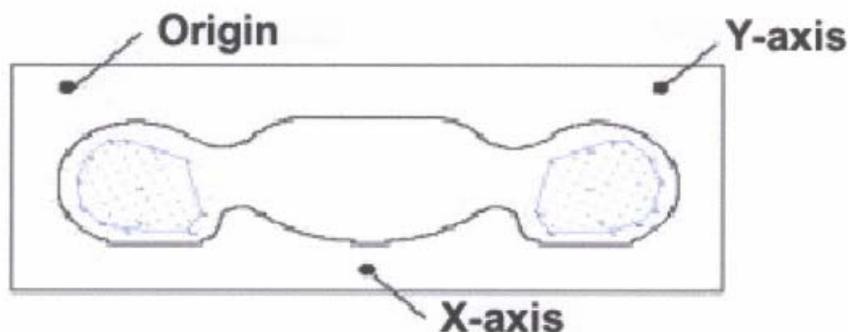
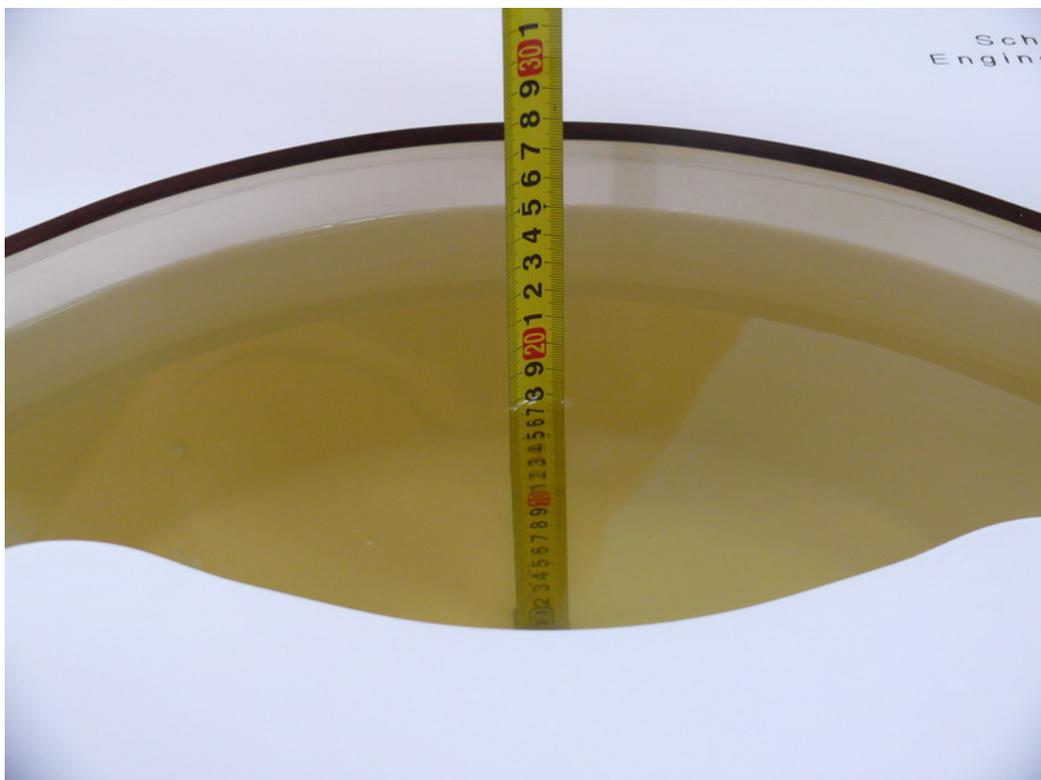


Figure 6 SAR Measurement Points in Area Scan

ANNEX B: TEST LAYOUT



Picture 5 Specific Absorption Rate Test Layout



Picture 6 Liquid depth in the Flat Phantom (GSM850)

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Picture 7 Liquid depth in the Flat Phantom (GSM1900)

ANNEX C: GRAPH RESULTS

GSM 850 GPRS (4 timeslots in uplink) at Test position 1 with BenQ Joybook S72 Middle

Communication System: GSM850 + GPRS (4Up); Frequency: 836.6 MHz; Duty Cycle: 1:2
Medium: Body 835MHz

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 0.991 \text{ mho/m}$; $\epsilon_r = 54.8$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1737; ConvF(6.52, 6.52, 6.52);

- Electronics: DAE3 Sn452;

Test Position 1 Middle/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.872 mW/g

Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 26.8 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 1.07 W/kg

SAR(1 g) = 0.761 mW/g; SAR(10 g) = 0.505 mW/g

Maximum value of SAR (measured) = 0.816 mW/g

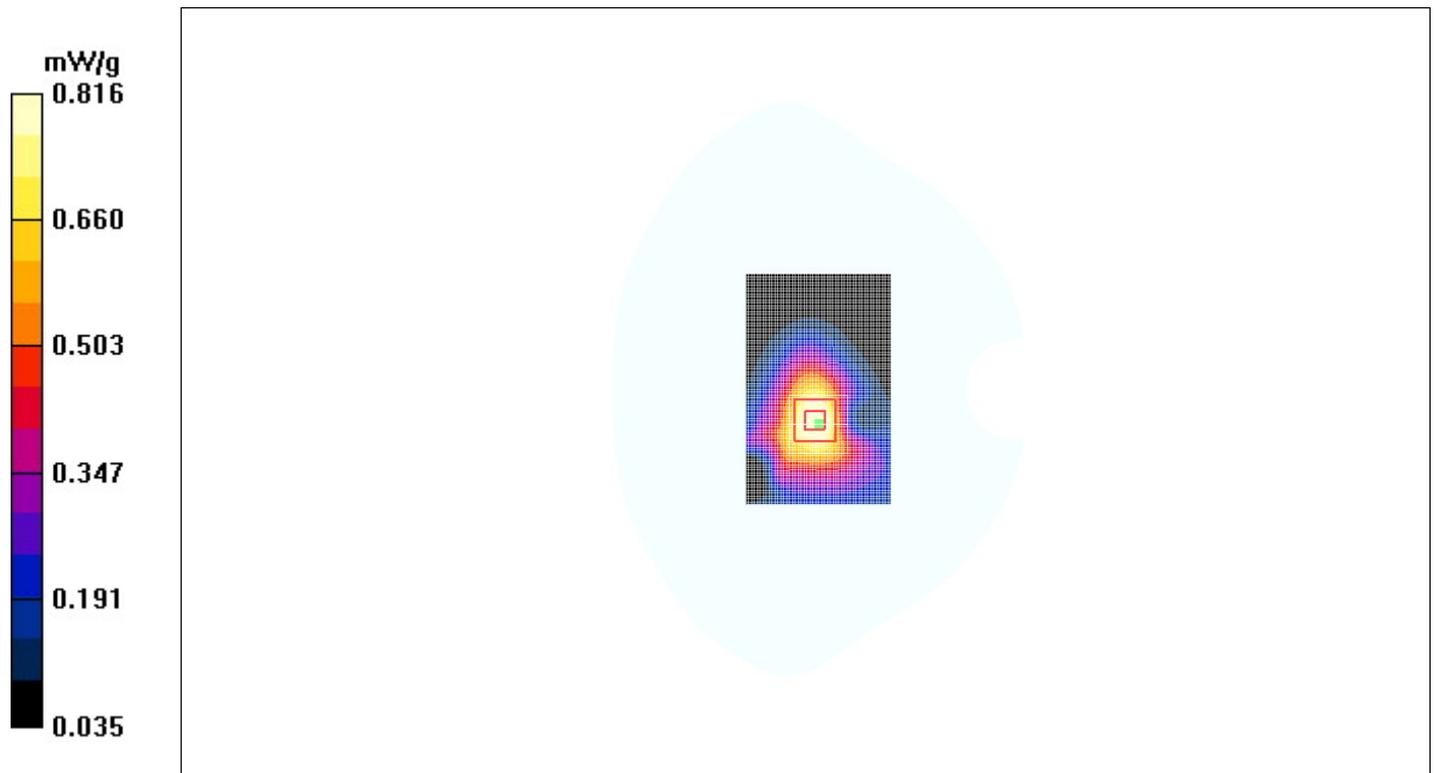


Figure 7 GSM 850 GPRS (4 timeslots in uplink) at Test Position 1 with BenQ Joybook S72
Channel 190

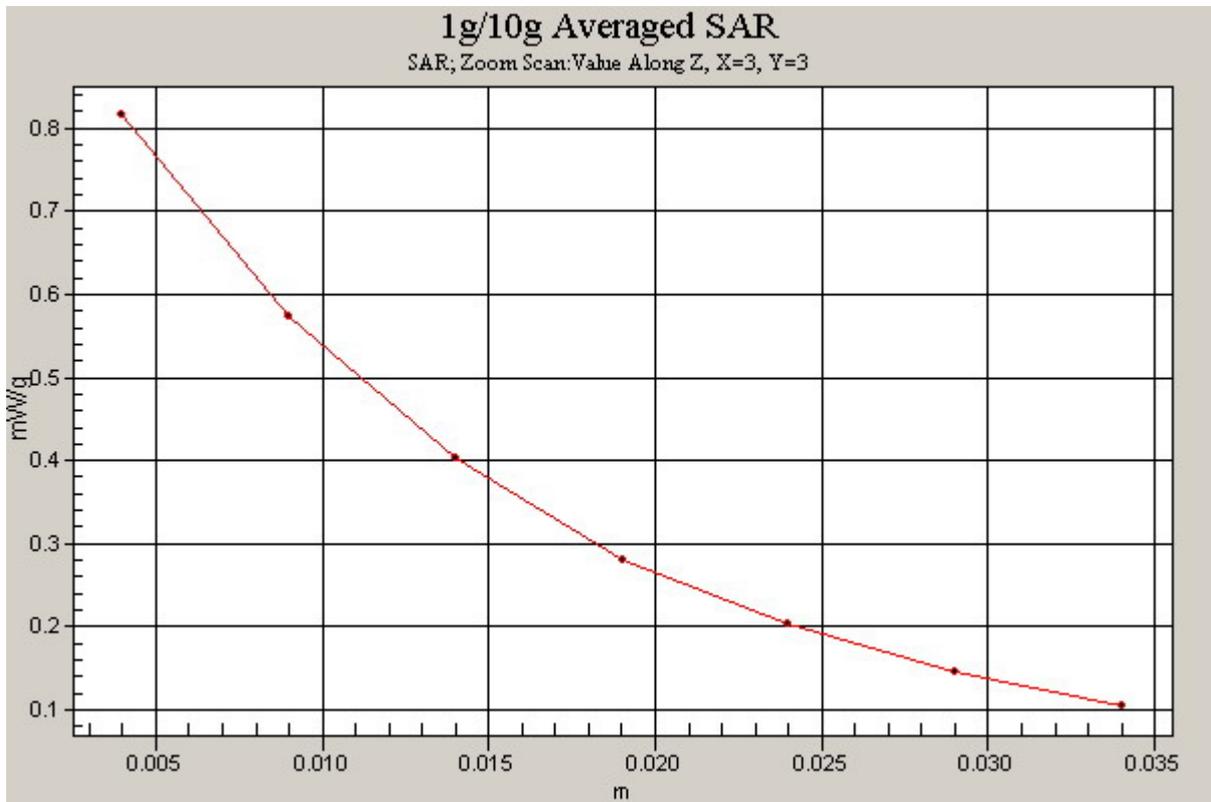


Figure 8 Z-Scan at power reference point [GSM 850 GPRS (4 timeslots in uplink) at Test Position 1 with BenQ Joybook S72 Channel 190]

GSM 850 GPRS (4 timeslots in uplink) at Test position 1 with Acer ZH1 Middle

Communication System: GSM850 + GPRS (4Up); Frequency: 836.6 MHz; Duty Cycle: 1:2
Medium: Body 835MHz

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 0.991 \text{ mho/m}$; $\epsilon_r = 54.8$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1737; ConvF(6.52, 6.52, 6.52);

- Electronics: DAE3 Sn452;

Test Position 1 Middle/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.559 mW/g

Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 19.8 V/m; Power Drift = 0.017 dB

Peak SAR (extrapolated) = 0.661 W/kg

SAR(1 g) = 0.475 mW/g; SAR(10 g) = 0.319 mW/g

Maximum value of SAR (measured) = 0.514 mW/g

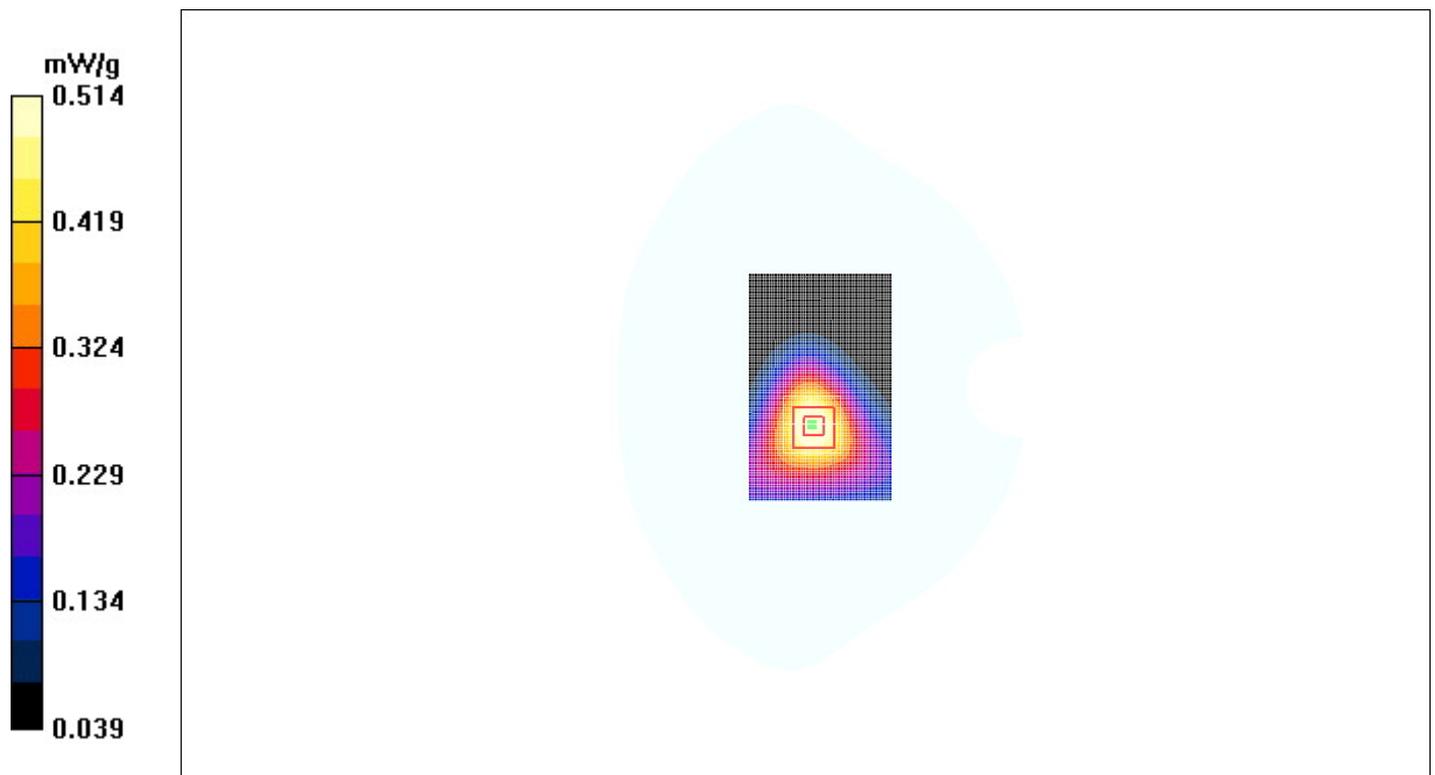


Figure 9 GSM 850 GPRS (4 timeslots in uplink) at Test Position 1 with Acer ZH1 Channel 190

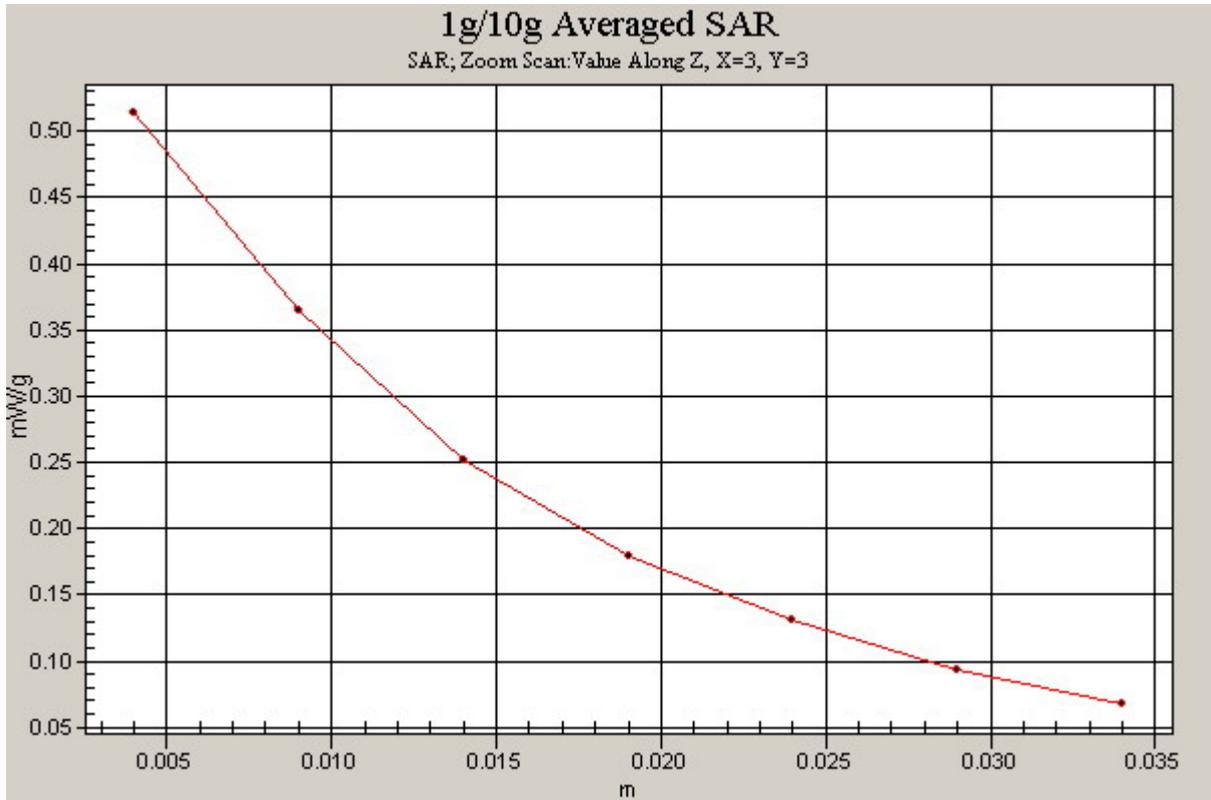


Figure 10 Z-Scan at power reference point [GSM 850 GPRS (4 timeslots in uplink) at Test Position 1 with Acer ZH1 Channel 190]

GSM 850 GPRS (3 timeslots in uplink) at Test position 1 with BenQ Joybook S72 Middle

Communication System: GSM850 + GPRS (3Up); Frequency: 836.6 MHz; Duty Cycle: 1:2.67

Medium: Body 835MHz

Medium parameters used: $f = 837$ MHz; $\sigma = 0.991$ mho/m; $\epsilon_r = 54.8$; $\rho = 1000$ kg/m³

- Probe: ET3DV6 - SN1737; ConvF(6.52, 6.52, 6.52);

- Electronics: DAE3 Sn452;

Test Position 1 Middle/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.01 mW/g

Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 29.2 V/m; Power Drift = -0.152 dB

Peak SAR (extrapolated) = 1.31 W/kg

SAR(1 g) = 0.936 mW/g; SAR(10 g) = 0.622 mW/g

Maximum value of SAR (measured) = 1.01 mW/g

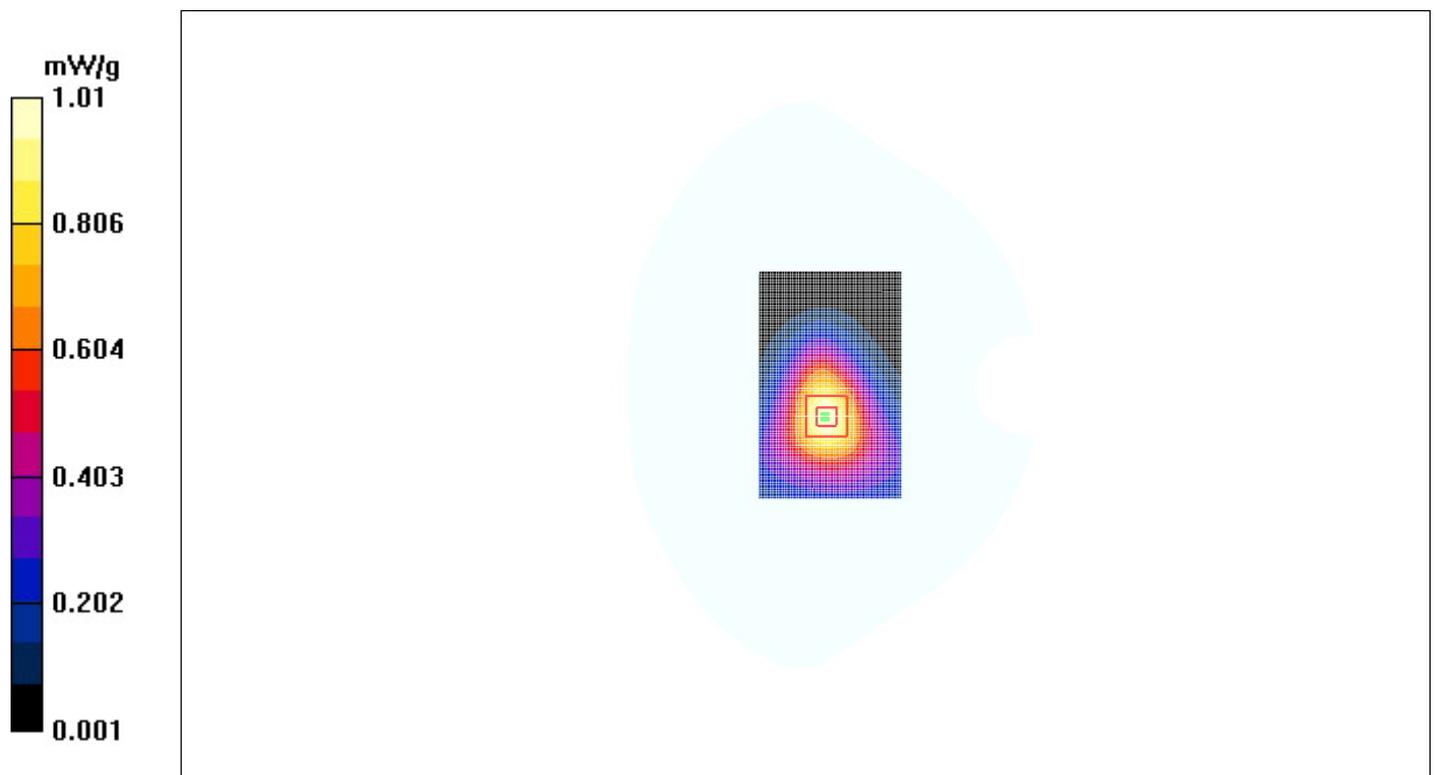


Figure 11 GSM 850 GPRS (3 timeslots in uplink) at Test position 1 with BenQ Joybook S72 Channel 190

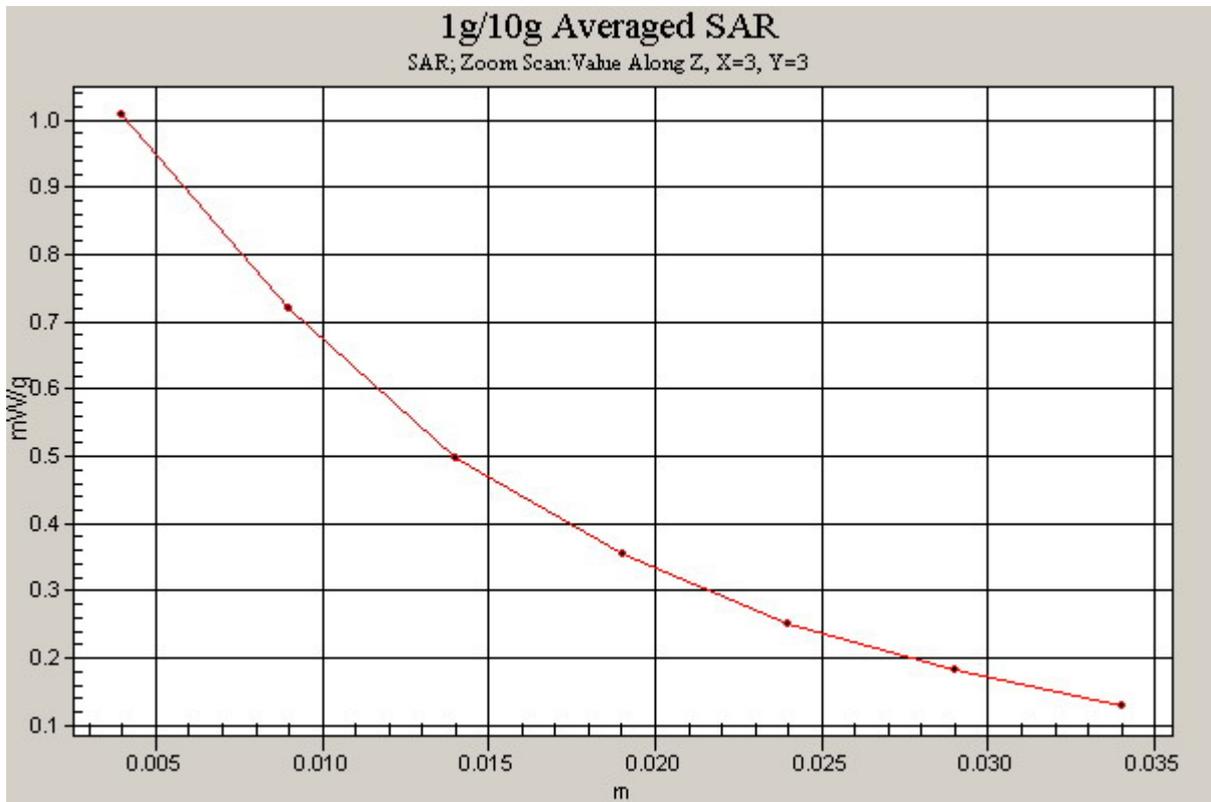


Figure 12 Z-Scan at power reference point [GSM 850 GPRS (3 timeslots in uplink) at Test position 1 with BenQ Joybook S72 Channel 190]

GSM 850 GPRS (2 timeslots in uplink) at Test position 1 with BenQ Joybook S72 Middle

Communication System: GSM850 + GPRS (2Up); Frequency: 836.6 MHz; Duty Cycle: 1:4

Medium: Body 835MHz

Medium parameters used: $f = 837$ MHz; $\sigma = 0.991$ mho/m; $\epsilon_r = 54.8$; $\rho = 1000$ kg/m³

- Probe: ET3DV6 - SN1737; ConvF(6.52, 6.52, 6.52);

- Electronics: DAE3 Sn452;

Test Position 1 Middle/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.32 mW/g

Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 30.0 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 1.99 W/kg

SAR(1 g) = 1.16 mW/g; SAR(10 g) = 0.771 mW/g

Maximum value of SAR (measured) = 1.26 mW/g

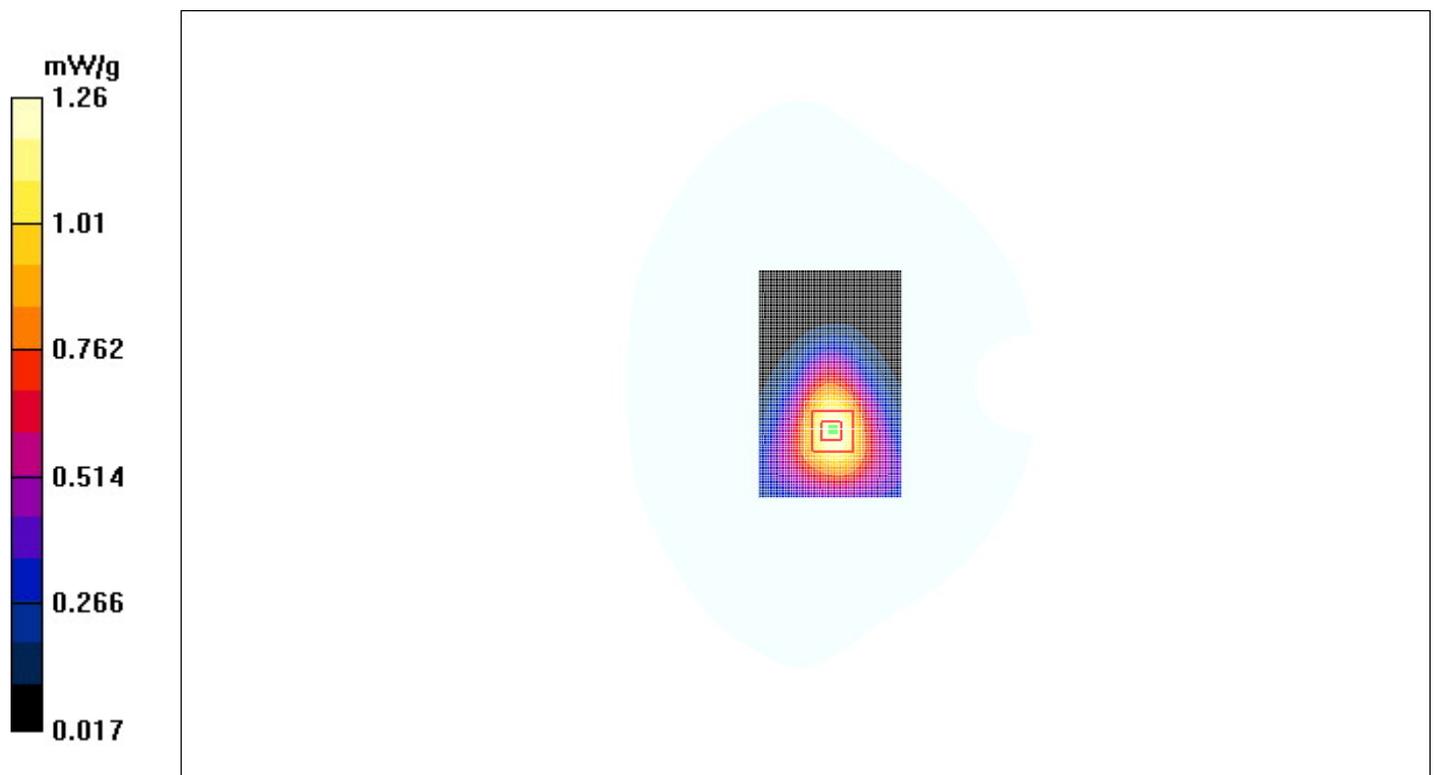


Figure 13 GSM 850 GPRS (2 timeslots in uplink) at Test position 1 with BenQ Joybook S72 Channel 190

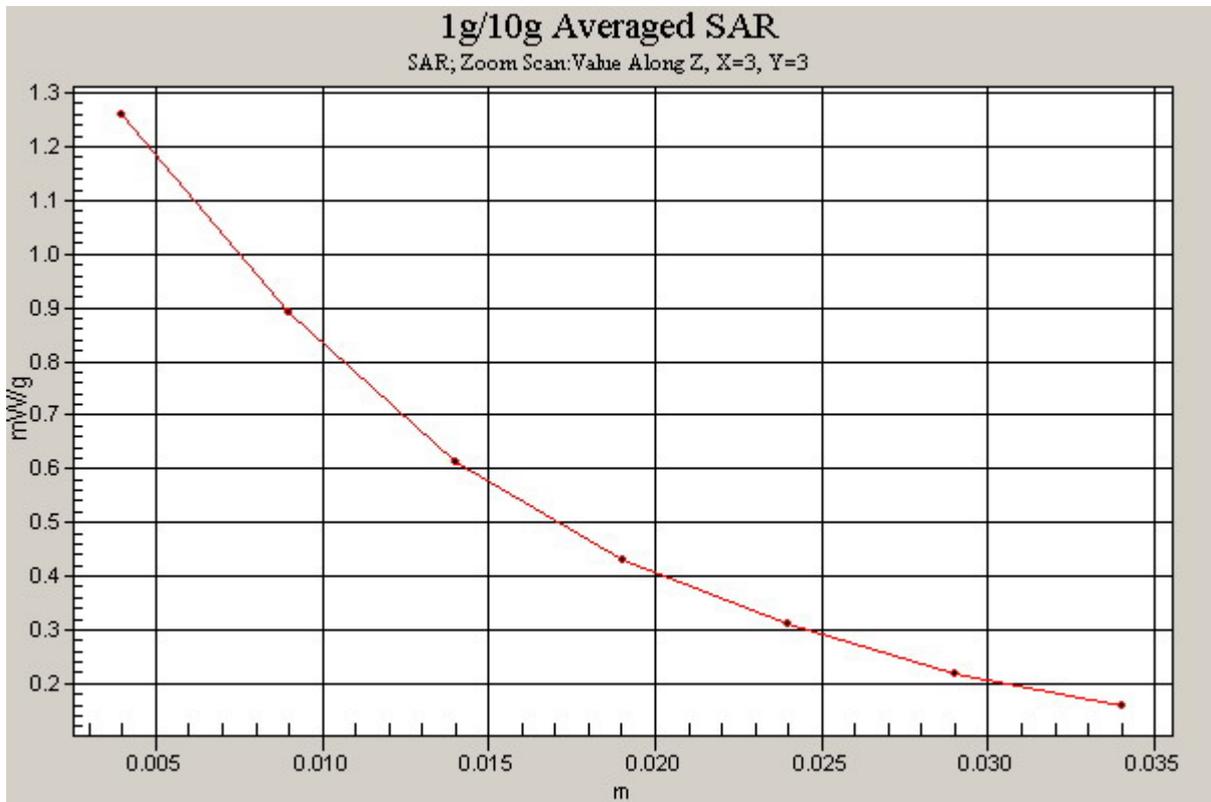


Figure 14 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) at Test position 1 with BenQ Joybook S72 Channel 190]

GSM 850 GPRS (1 timeslot in uplink) at Test position 1 with BenQ Joybook S72 Middle

Communication System: GSM850 + GPRS (1Up); Frequency: 836.6 MHz; Duty Cycle: 1:8

Medium: Body 835MHz

Medium parameters used: $f = 837$ MHz; $\sigma = 0.991$ mho/m; $\epsilon_r = 54.8$; $\rho = 1000$ kg/m³

- Probe: ET3DV6 - SN1737; ConvF(6.52, 6.52, 6.52);

- Electronics: DAE3 Sn452;

Test Position 1 Middle/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.916 mW/g

Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 27.0 V/m; Power Drift = 0.081 dB

Peak SAR (extrapolated) = 1.21 W/kg

SAR(1 g) = 0.866 mW/g; SAR(10 g) = 0.575 mW/g

Maximum value of SAR (measured) = 0.943 mW/g

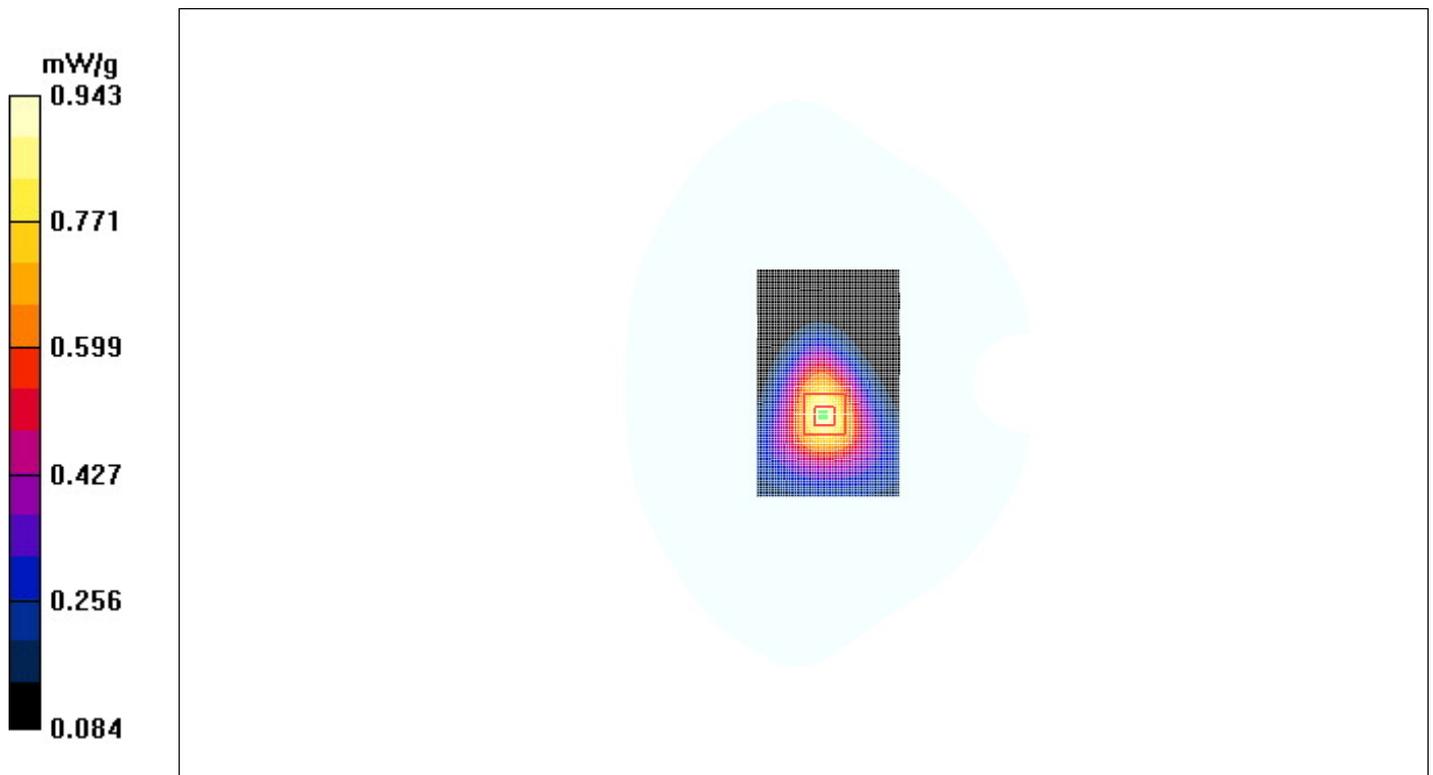


Figure 15 GSM 850 GPRS (1 timeslot in uplink) at Test position 1 with BenQ Joybook S72 Channel 190



Figure 16 Z-Scan at power reference point [GSM 850 GPRS (1 timeslot in uplink) at Test position 1 with BenQ Joybook S72 Channel 190]

GSM 850 GPRS (2 timeslots in uplink) at Test position 1 with BenQ Joybook S72 High

Communication System: GSM850 + GPRS (2Up); Frequency: 848.8 MHz; Duty Cycle: 1:4

Medium: Body 835MHz

Medium parameters used: $f = 849$ MHz; $\sigma = 1$ mho/m; $\epsilon_r = 54.7$; $\rho = 1000$ kg/m³

- Probe: ET3DV6 - SN1737; ConvF(6.52, 6.52, 6.52);

- Electronics: DAE3 Sn452;

Test Position 1 High/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.39 mW/g

Test Position 1 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 28.5 V/m; Power Drift = 0.073 dB

Peak SAR (extrapolated) = 1.81 W/kg

SAR(1 g) = 1.28 mW/g; SAR(10 g) = 0.840 mW/g

Maximum value of SAR (measured) = 1.39 mW/g

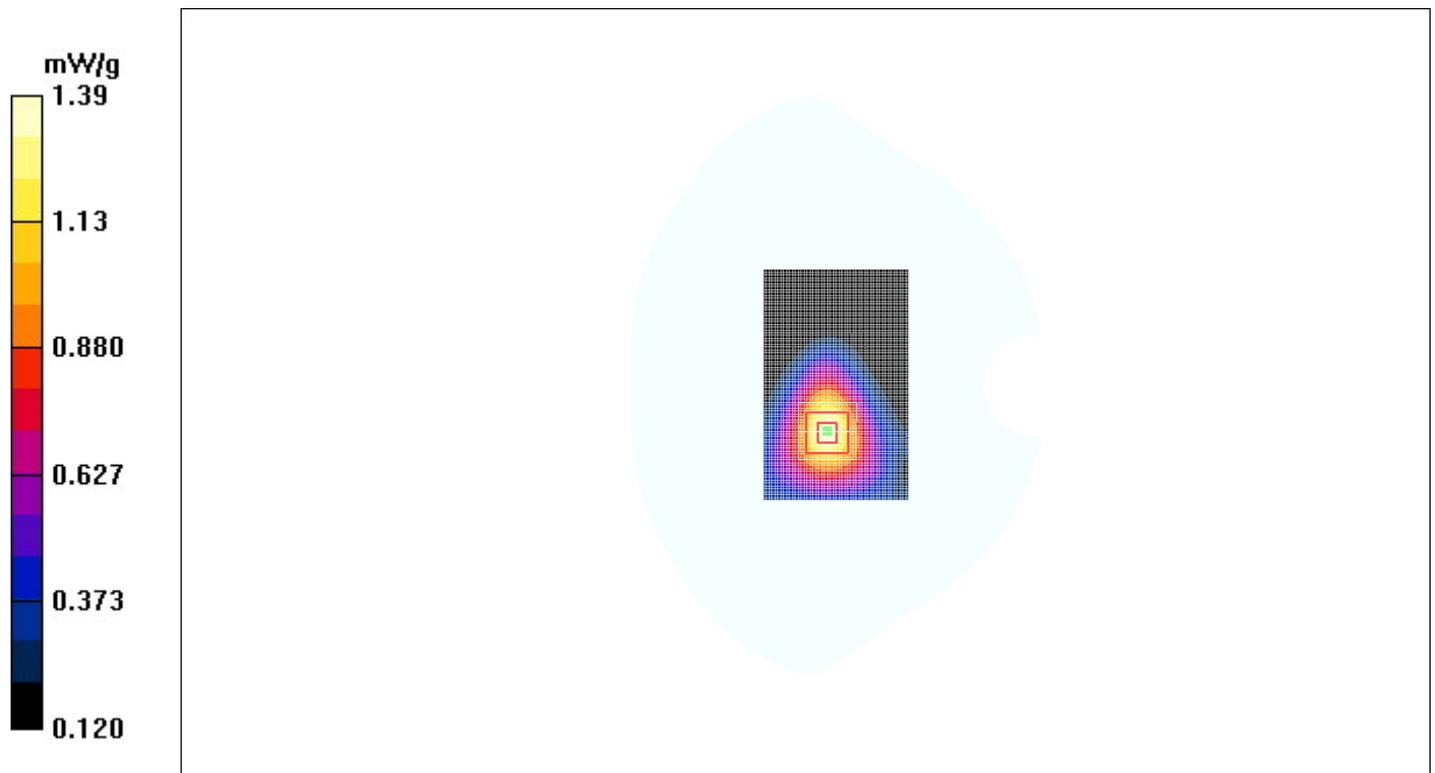


Figure 17 GSM 850 GPRS (2 timeslots in uplink) at Test position 1 with BenQ Joybook S72
Channel 251