

信息产业部通信计量中心

Telecommunication Metrology Center of MII



No. DAT-P-114/01-01



No. L0442

# TEST REPORT

No. 2007EEE02103

<b>FCC ID</b>	QISV720
<b>Test name</b>	Electromagnetic Field (Specific Absorption Rate)
<b>Product</b>	WCDMA/GPRS/GSM Mobile Phone
<b>Model</b>	V720/Vodafone 720/U5700
<b>Client</b>	HUAWEI Technologies Co., Ltd.
<b>Type of test</b>	Non Type Approval

Telecommunication Metrology Center  
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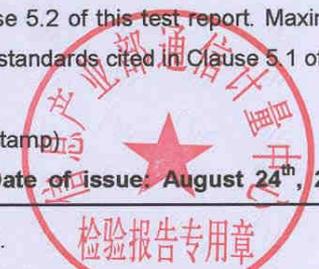
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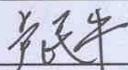
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## TABLE OF CONTENT

<b>1 COMPETENCE AND WARRANTIES</b> .....	<b>5</b>
<b>2 GENERAL CONDITIONS</b> .....	<b>5</b>
<b>3 DESCRIPTION OF EUT</b> .....	<b>5</b>
3.1 ADDRESSING INFORMATION RELATED TO EUT.....	5
3.2 CONSTITUENTS OF EUT .....	6
3.3 GENERAL DESCRIPTION.....	6
<b>4 OPERATIONAL CONDITIONS DURING TEST</b> .....	<b>7</b>
4.1 SCHEMATIC TEST CONFIGURATION .....	7
4.2 SAR MEASUREMENT SET-UP.....	7
4.3 DASY4 E-FIELD PROBE SYSTEM.....	8
4.4 E-FIELD PROBE CALIBRATION.....	9
4.5 OTHER TEST EQUIPMENT .....	9
4.6 EQUIVALENT TISSUES .....	10
4.7 SYSTEM SPECIFICATIONS .....	10
<b>5 CHARACTERISTICS OF THE TEST</b> .....	<b>11</b>
5.1 APPLICABLE LIMIT REGULATIONS.....	11
5.2 APPLICABLE MEASUREMENT STANDARDS.....	11
<b>6 LABORATORY ENVIRONMENT</b> .....	<b>12</b>
<b>7 CONDUCTED OUTPUT POWER MEASUREMENT</b> .....	<b>12</b>
7.1 SUMMARY.....	12
7.2 CONDUCTED POWER .....	12
<b>8 TEST RESULTS</b> .....	<b>13</b>
8.1 DIELECTRIC PERFORMANCE .....	13
8.2 SYSTEM VALIDATION.....	13
8.3 SUMMARY OF MEASUREMENT RESULTS (PCS1900MHz) .....	14
8.4 SUMMARY OF MEASUREMENT RESULTS (WITH BLUETOOTH FUNCTION) .....	15
8.5 CONCLUSION.....	15
<b>9 MEASUREMENT UNCERTAINTY</b> .....	<b>15</b>
<b>10 MAIN TEST INSTRUMENTS</b> .....	<b>16</b>
<b>11 TEST PERIOD</b> .....	<b>16</b>
<b>12 TEST LOCATION</b> .....	<b>17</b>
<b>ANNEX A MEASUREMENT PROCESS</b> .....	<b>18</b>
<b>ANNEX B TEST LAYOUT</b> .....	<b>19</b>
<b>ANNEX C GRAPH RESULTS</b> .....	<b>23</b>
<b>ANNEX D SYSTEM VALIDATION RESULTS</b> .....	<b>57</b>
<b>ANNEX E PROBE CALIBRATION CERTIFICATE</b> .....	<b>58</b>
<b>ANNEX F DIPOLE CALIBRATION CERTIFICATE</b> .....	<b>67</b>

Product Name	WCDMA/GPRS/GSM Mobile phone	Sample Model	V720/Vodafone 720/U5700
Client	HUAWEI Technologies Co., Ltd.	Type of test	Non Type Approval
Factory	HUAWEI Technologies Co., Ltd.	Sampling arrival date	July 19 <sup>th</sup> , 2007
Manufacturer	HUAWEI Technologies Co., Ltd.		
Sampling/ Sending sample	Sending sample	Sample sent by	Xie Yan
Sampling location	/	Sampling person	/
Sample quantity	1	Sample matrix	/
Series number of the Sample	04470870447087-7-04		
Test basis	<p><b>EN 50360-2001:</b> Product standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.</p> <p><b>EN 50361-2001:</b> Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.</p> <p><b>ANSI C95.1-1999:</b> IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.</p> <p><b>IEEE 1528-2003:</b> Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.</p> <p><b>OET Bulletin 65 (Edition 97-01) and Supplement C(Edition 01-01):</b> Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits.</p> <p><b>IEC 62209-1-2005:</b> 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)</p> <p><b>IEC 62209-2 (Draft):</b> 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.</p>		
Test conclusion	<p>Localized Specific Absorption Rate (SAR) of this portable wireless equipment has been measured in all cases requested by the relevant standards cited in Clause 5.2 of this test report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 5.1 of this test report.</p> <p>General Judgment: <b>Pass</b></p> <p>(Stamp) </p> <p>Date of issue: August 24<sup>th</sup>, 2007</p>		
Note	The test results relate only to the items tested of the sample(s).		

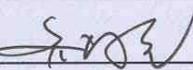
Approved by



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## 1 COMPETENCE AND WARRANTIES

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**Telecommunication Metrology Center of Ministry of Information Industry** 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 **Telecommunication Metrology Center of Ministry of Information Industry** at the time of execution of the test.

**Telecommunication Metrology Center of Ministry of Information Industry** is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test.

## 2 GENERAL CONDITIONS

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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, Shenzhen, Guangdong
City	Shenzhen
Postal Code	518129
Country	China
Telephone	0755-28780808
Fax	0755-28780808

**Table 2: Manufacturer**

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

**3.2 Constituents of EUT****Table 3: Constituents of Samples**

Description	Model	Serial Number	Manufacturer
Handset	V720/Vodafone 720/U5700	04470870447087- 7-04	HUAWEI Technologies Co., Ltd.
Lithium Battery	HBU570	FMT750100355Y	Shenzhen FMT Co., Ltd.
AC/DC Adapter	TPCA-050065	/	TECH-POWER Electronics(Shenzhen) Co., Ltd.

**Picture 1: Constituents of the sample (Lithium Battery is in the Handset)****3.3 General Description**

Equipment Under Test (EUT) is a model of WCDMA/GSM/GPRS mobile phone with integrated antenna. It consists of Handset and normal options: Lithium Battery and AC/DC Adapter as Table 3 and Picture 1. With the request of the client, SAR is tested for PCS 1900MHz. Its GPRS class is 10 and it has Bluetooth function.

The sample undergoing 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

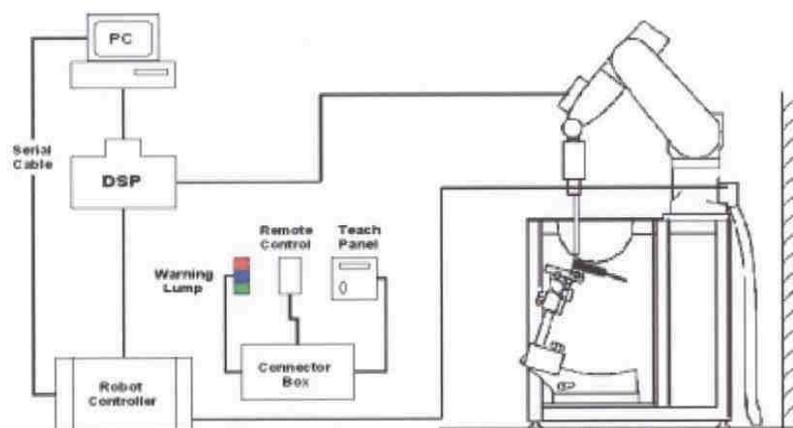
A communication link is set up with a System Simulator (SS) by air link, and a call is established. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 512, 661 and 810 respectively in the case of PCS 1900 MHz. The EUT is commanded to operate at maximum transmitting power.

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 SAR Measurement Set-up

These measurements were performed with the automated near-field scanning system DASY4 Professional 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.



Picture 2: SAR Lab Test Measurement Set-up

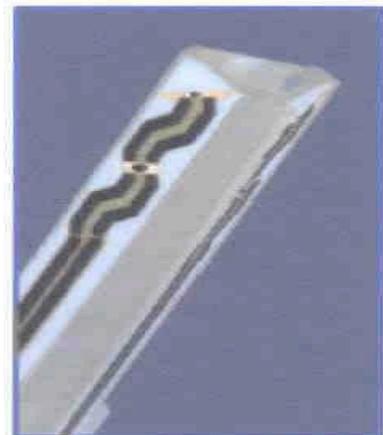
The DAE consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information 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 $\pm 8\%$ ) Calibration for other liquids and frequencies upon request
Frequency	1.0 MHz to > 6 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 3 GHz)
Directivity	$\pm 0.2$ dB in brain tissue (rotation around probe axis) $\pm 0.4$ dB in brain tissue (rotation normal probe axis)
Dynamic Range	5 $\mu\text{W/g}$ to > 100mW/g; Linearity: $\pm 0.2$ dB
Surface Detection	$\pm 0.2$ 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



Picture 3: ET3DV6 E-field Probe



Picture4:ET3DV6 E-field probe

#### 4.4 E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than  $\pm 10\%$ . The spherical isotropy was evaluated and found to be better than  $\pm 0.25\text{dB}$ . 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.

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

Where:  $\Delta t$  = Exposure time (30 seconds),

$C$  = Heat capacity of tissue (brain or muscle),

$\Delta T$  = Temperature increase due to RF exposure.

Or

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

Where:  $\sigma$  = Simulated tissue conductivity,

$\rho$  = Tissue density ( $\text{kg}/\text{m}^3$ ).

Note: Please see Annex E to check the probe calibration certificate.



Picture 5: Device Holder

#### 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 repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

##### 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 all predefined phantom

positions and measurement grids by the complete setup of 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



**Picture6:Generic Twin Phantom**

#### 4.6 Equivalent Tissues

The liquid used for the frequency range of 800-2000 MHz consisted of water, sugar, salt and Cellulose. The liquid has previously been proven to be suited for worst-case. The Table 4 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and OET Bulletin 65 (Edition 97-01) and Supplement C (Edition 01-01).

**Table 4. Composition of the Head Tissue Equivalent Matter**

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

**Table 5. Composition of the Body Tissue Equivalent Matter**

MIXTURE %	FREQUENCY 1900MHz
Water	69.91
Glycol monobutyl	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1900MHz    ε=53.3    σ=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**