



FCC SAR Compliance Test Report

Project Name: cdma2000 Digital Mobile Phone;

Model : HUAWEI M660, M660

FCC ID : QISM660

Report No. : SYBH(Z-SAR)001042012-2

	APPROVED	CHECKED	PREPARED
BY	<i>Liu Chunlin</i>	<i>Alcinway</i>	<i>Yang Hong</i>
DATE	2012-05-24	2012-05-24	2012-05-24

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

Reliability Laboratory of Huawei Technologies Co., Ltd.

Table of Contents

1	General Information	4
1.1	Statement of Compliance	4
1.2	RF exposure limits.....	4
1.3	EUT Description	5
1.3.1	General Description	5
1.4	Test specification(s)	6
1.5	Testing laboratory.....	6
1.6	Applicant and Manufacturer	6
1.7	Application details	6
1.8	Ambient Condition.....	6
2	SAR Measurement System	7
2.1	SAR Measurement Set-up.....	7
2.2	Test environment.....	8
2.3	Data Acquisition Electronics description.....	8
2.4	Probe description	9
2.5	Phantom description	10
2.6	Device holder description.....	10
2.7	Test Equipment List	11
3	SAR Measurement Procedure.....	12
3.1	Scanning procedure.....	12
3.2	Spatial Peak SAR Evaluation	13
3.3	Data Storage and Evaluation.....	14
4	System Verification Procedure.....	16
4.1	Tissue Verification	16
4.2	System Check.....	18
4.3	Validation Procedure.....	19
5	Measurement Uncertainty Evaluation.....	20
5.1	Measurement uncertainty evaluation for SAR test.....	20
5.2	Measurement uncertainty evaluation for system validation	21
6	SAR Test Configuration	22
6.1	CDMA Test Configuration	22
6.1.1	CDMA 1x Devices.....	22
6.1.2	CDMA Ev-Do Devices	23
6.2	WiFi Test Configuration.....	23
7	SAR Measurement Results	24
7.1	Conducted power measurements.....	24
7.1.1	Conducted power measurements CDMA800	24
7.1.2	Conducted power measurements CDMA1700	24
7.1.3	Conducted power measurements CDMA1900	25
7.2	SAR measurement Result.....	26
7.2.1	SAR measurement Result of CDMA800	26
7.2.2	SAR measurement Result of CDMA1700	27
7.2.3	SAR measurement Result of CDMA1900	28
7.2.4	SAR measurement Result of WiFi.....	29
7.3	Multiple Transmitter Evaluation	30
7.3.1	Stand-alone SAR	31
7.3.2	Simultaneous SAR.....	31
7.3.3	SAR Summation Scenario	31
	Appendix A. System Check Plots	33
	Appendix B. SAR Measurement Plots	33
	Appendix C. Calibration Certificate	33
	Appendix D. Photo documentation.....	33

※ ※ Modified History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev1.0	Initial Release	2012-04-28	YangHang
Rev1.1	1. Added the Simultaneous SAR _{Max} in Table 1 on Page 4 2. Modified the Simultaneous SAR Value 1.502W/kg to 1.371W/kg on Page 32 3. Added section 7.3.2 and 7.3.3 to describe the Simultaneous SAR configurations and values	2012-05-24	Yang Hang

1 General Information

1.1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for HUAWEI M660, M660 are as below Table 1.

Band	Test Configuration	Test Mode	Measured MAX SAR _{1g} (W/kg)	Conducted Power (dBm)	Tune-up Power (dBm)	Extrapolated Result(W/kg)
CDMA 800	Head	RC3 SO55	0.630	24.48	25.00	0.710
	Body Worn(15mm)	EVDO Rev.A	1.130	23.85	25.00	1.473
	Hotspot(10mm)	EVDO Rev.A	0.834	22.10	23.00	1.026
CDMA 1700	Head	RC3 SO55	0.679	24.46	25.50	0.863
	Body Worn(15mm)	EVDO Rev.A	1.020	24.50	25.50	1.284
	Hotspot(10mm)	EVDO Rev.A	0.931	21.17	22.50	1.265
CDMA 1900	Head	RC3 SO55	0.900	24.40	24.75	0.976
	Body Worn(15mm)	EVDO Rev.A	1.330	24.06	24.75	1.559
	Hotspot(10mm)	EVDO Rev.A	0.982	19.74	20.25	1.104
WiFi	Head	802.11 b	0.172	15.45	16.00	0.195
	Body Worn(15mm)	802.11 b	0.041	15.45	16.00	0.047
	Hotspot(10mm)	802.11 b	0.066	15.45	16.00	0.075
Simultaneous SAR _{Max} is 1.371W/kg						

Table 1: Summary of test result

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits of 1.6 W/Kg as averaged over any 1 g tissue according to the FCC rule §2.1093, the ANSI/IEEE C 95.1:1999, the NCRP Report Number 86 for uncontrolled environment, according to the Health Canada's Safety Code 6 and the Industry Canada Radio Standards Specification RSS-102 for General Population/Uncontrolled exposure, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003 and FCC OET Bulletin 65 Supplement.

1.2 RF exposure limits

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

Table 2: RF exposure limits

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

Notes:

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

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

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

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

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

1.3 EUT Description

Device Information:			
DUT Name:	HUAWEI M660, M660		
Type Identification:	cdma2000 Digital Mobile Phone;		
FCC ID :	QISM660		
SN No.:	Z5W01A9230800188		
Device Type :	portable device		
Exposure Category:	uncontrolled environment / general population		
Hardware Version :	HC1M660M		
Software Version :	M660V100R001C153B811SP01		
Antenna Type :	internal antenna		
Others Accessories	Headset		
Battery Options :	Huawei Technologies Co., Ltd. Rechargeable Li-ion Battery Model: HB5N1H Rated capacity: 1500mAH Nominal Voltage: $\text{---} +3.7\text{V}$; Charging Voltage: $\text{---} +4.2\text{V}$. SN:MLCBC16997500558 SN:UBDC204XXAS00908		
Device Operating Configurations:			
Supporting Mode(s)	CDMA 800,CDMA 1700,CDMA1900, WiFi (Tested) ; Bluetooth,		
Test Modulation	QPSK		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	CDMA 800	824-849	869-894
	CDMA1700	1710-1755	2110-2155
	CDMA1900	1850-1910	1930-1990
	Bluetooth	2400-2483.5	2400-2483.5
Power Class :	WiFi	2400-2483.5	2400-2483.5
	Tested with power control all up (CDMA800)		
	Tested with power control all up (CDMA1700)		
Test Channels (low-mid-high) :	Tested with power control all up (CDMA1900)		
	1013-384-777 (CDMA 800)		
	25-450-850 (CDMA 1700)		
	25-600-1175 (CDMA 1900)		
	1-6-11 (WiFi 2450)		

Table 3: Device information and operating configuration

1.3.1 General Description

cdma2000 Digital Mobile Phone- HUAWEI M660, M660 is subscriber equipment in the CDMA/EVDO system. The frequency band is US Cellular and American PCS and AWS, Their band test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, CDMA2000 1x and 1xEV-DO protocol processing, voice, MMS service, GPS, AGPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service). It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

1.4 Test specification(s)

IEEE Std C95.1 – 1999	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE 1528-2003	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
OET Bulletin No. 65, Supplement C– 2001	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields---Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions
Canada’s Safety Code 6	Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz (99-EHD-237)
RSS-102	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands (Issue 4 of March 2010)
KDB941225 D01	SAR test for 3G devices v02
KDB941225 D06	Hot Spot SAR v01
KDB648474 D01	SAR Handsets Multi Xmitter and Ant v01r05
KDB 248227 D01	SAR meas for 802.11 a/b/g v01r02
Lab PBA	Tracking Number : 659095

1.5 Testing laboratory

Test Site	Reliability Laboratory of Huawei Technologies Co., Ltd.
Test Location	Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China
Telephone	+86-755-28785513
Fax	+86-755-36834474
State of accreditation	The Test laboratory (area of testing) is accredited according to ISO/IEC 17025. CNAS Registration number: L0310

1.6 Applicant and Manufacturer

Company Name	HUAWEI TECHNOLOGIES CO., LTD
Address	Huawei Base, Bantian, Longgang District, Shenzhen, P.R.China

1.7 Application details

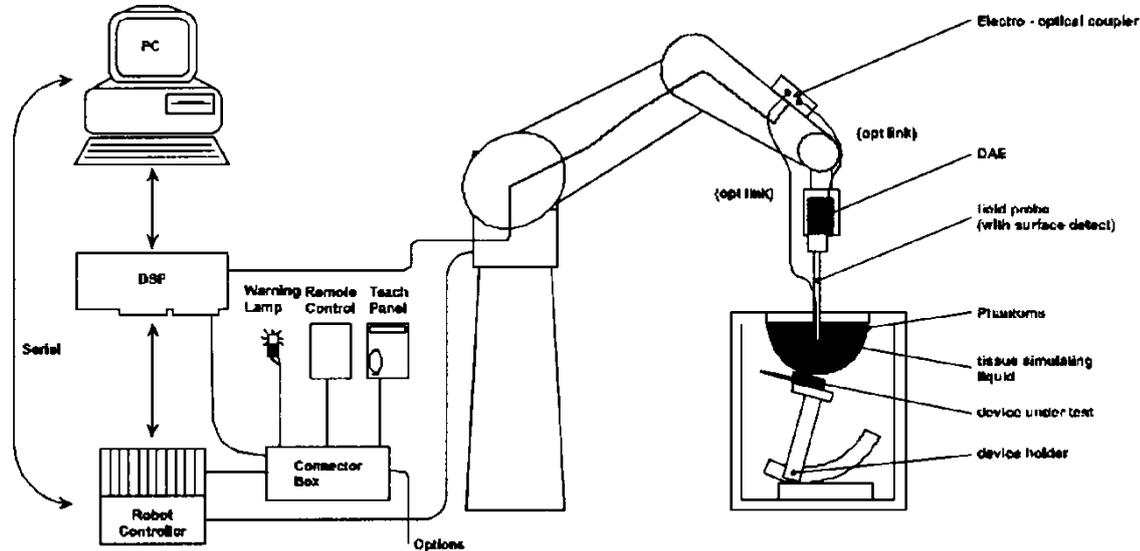
Start Date of test	2012-03-30
End Date of test	2012-04-06

1.8 Ambient Condition

Ambient temperature	20°C – 24°C
Relative Humidity	30% – 70%

2 SAR Measurement System

2.1 SAR Measurement Set-up



The DASY5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
- The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows XP.
- DASY5 software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.

2.2 Test environment

The DASY4 measurement system is placed at the head end of a room with dimensions: 5 x 2.5 x 3 m³, the SAM phantom is placed in a distance of 75 cm from the side walls and 1.1m from the rear wall. Above the test system a 1.5 x 1.5 m² array of pyramid absorbers is installed to reduce reflections from the ceiling.

Picture 1 of the photo documentation shows a complete view of the test environment.

The system allows the measurement of SAR values larger than 0.005 mW/g.

2.3 Data Acquisition Electronics description

The data acquisition electronics (DAE) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converte and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

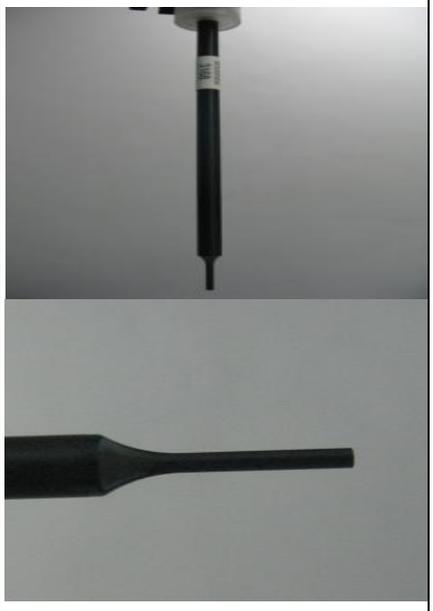
DAE4

Input Impedance	200MOhm	
The Inputs	symmetrical and floating	
Common mode rejection	above 80 dB	

2.4 Probe description

These probes are specially designed and calibrated for use in liquids with high permittivities. They should not be used in air, since the spherical isotropy in air is poor (± 2 dB). The dosimetric probes have special calibrations in various liquids at different frequencies.

Isotropic E-Field Probe ES3DV3 for Dosimetric Measurements

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Calibration	ISO/IEC 17025 calibration service available.	
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)	
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)	
Dynamic range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm	
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones	

Isotropic E-Field Probe EX3DV4 for Dosimetric Measurements

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)	
Calibration	In air from 10 MHz to 2.5 GHz In head tissue simulating liquid (HSL) at 900 (800-1000) MHz and 1.8 GHz (1700-1910 MHz) (accuracy $\pm 11\%$; $k=2$) Calibration for other liquids and frequencies upon request	
Frequency	10 MHz to 3 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 3 GHz)	
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)	
Dynamic range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB	
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces (EX3DV4 only)	
Dimensions	Overall length: 337 mm Tip length: 9 mm Body diameter: 10 mm Tip diameter: 2.5 mm Distance from probe tip to dipole centers: 1.0 mm	
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (EX3DV4)	

2.5 Phantom description

SAM Twin Phantom

Shell Thickness	2mm +/- 0.2 mm; The ear region: 6mm	
Filling Volume	Approximately 30 liters	
Dimensions	Length:1000mm; Width:500mm; Height: adjustable feet	
Measurement Areas	Left hand Right hand Flat phantom	

The bottom plate contains three pairs of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to cover the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on top of this phantom cover are possible. Three reference marks are provided on the phantom counter. These reference marks are used to teach the absolute phantom position relative to the robot.

ELI4 Phantom

Shell Thickness	2mm +/- 0.2 mm	
Filling Volume	Approximately 30 liters	
Dimensions	Length:1000mm; Width:500mm; Height: adjustable feet	
Measurement Areas	Flat phantom	

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209-2 and all known tissue simulating liquids.

2.6 Device holder description

The DASY5 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used.



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

Therefore those devices are normally only tested at the flat part of the SAM.

2.7 Test Equipment List

This table gives a complete overview of the SAR measurement equipment

Devices used during the test described are marked

	Manufacturer	Device	Type	Serial number	Date of last calibration)*
<input type="checkbox"/>	SPEAG	Dosimetric E-Field Probe	ES3DV3	3168	2011-09-27
<input type="checkbox"/>	SPEAG	Dosimetric E-Field Probe	EX3DV4	3736	2011-11-23
<input checked="" type="checkbox"/>	SPEAG	Dosimetric E-Field Probe	EX3DV4	3578	2011-06-21
<input type="checkbox"/>	SPEAG	750 MHz Validation Dipole	D750V3	1044	2011-09-16
<input checked="" type="checkbox"/>	SPEAG	835 MHz Validation Dipole	D835V2	4d126	2011-11-07
<input checked="" type="checkbox"/>	SPEAG	1800 MHz Validation Dipole	D1800V2	2d184	2011-03-08
<input checked="" type="checkbox"/>	SPEAG	1900 MHz Validation Dipole	D1900V2	5d143	2011-09-26
<input checked="" type="checkbox"/>	SPEAG	2450 MHz Validation Dipole	D2450V2	860	2011-03-08
<input checked="" type="checkbox"/>	SPEAG	Data acquisition electronics	DAE4	852	2011-11-16
<input type="checkbox"/>	SPEAG	Data acquisition electronics	DAE4	1236	2011-11-11
<input type="checkbox"/>	SPEAG	Data acquisition electronics	DAE4	914	2011-12-08
<input checked="" type="checkbox"/>	SPEAG	Software	DASY 5	N/A	N/A
<input type="checkbox"/>	SPEAG	Twin Phantom	SAM1	TP-1475	N/A
<input type="checkbox"/>	SPEAG	Twin Phantom	SAM2	TP-1474	N/A
<input checked="" type="checkbox"/>	SPEAG	Twin Phantom	SAM3	TP-1597	N/A
<input checked="" type="checkbox"/>	SPEAG	Twin Phantom	SAM4	TP-1620	N/A
<input type="checkbox"/>	SPEAG	Flat Phantom	ELI 4.0	TP-1038	N/A
<input type="checkbox"/>	SPEAG	Flat Phantom	ELI 4.0	TP-1111	N/A
<input type="checkbox"/>	R & S	Universal Radio Communication Tester	CMU 200	113989	2011-06-02
<input checked="" type="checkbox"/>	R & S	Universal Radio Communication Tester	CMU 200	111379	2011-08-06
<input checked="" type="checkbox"/>	Agilent)*	Network Analyser	E5071B	MY42404956	2012-02-14
<input checked="" type="checkbox"/>	Agilent	Dielectric Probe Kit	85070E	2484	N/A
<input checked="" type="checkbox"/>	Agilent	Signal Generator	N5181A	MY47420989	2012-02-14
<input checked="" type="checkbox"/>	MINI-CIRCUITS	Amplifier	ZHL-42W	QA0746001	N/A
<input checked="" type="checkbox"/>	Agilent	Power Meter	E4417A	MY45101339	2012-02-14
<input checked="" type="checkbox"/>	Agilent	Power Meter Sensor	E9321A	MY44420359	2012-02-14

Note: The calibration interval of validation dipoles is 3 years.

1) Per KDB 450824 D02 requirements for dipole calibration, Huawei SAR lab has adopted three years calibration interval. But each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

- a) There is no physical damage on the dipole;
- b) System validation with specific dipole is within 10% of calibrated value;
- c) Return-loss is within 10% of calibrated measurement;
- d) Impedance is within 5Ω from the previous measurement.

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

3 SAR Measurement Procedure

3.1 Scanning procedure

The DASY5 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 DASY5 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 $\pm 0.1\text{mm}$). 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 $\pm 30^\circ$.)
- 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. Results of this coarse scan are shown in Appendix B.
- A 7x7x7 zoom scan measures the field in a volume around the 2D peak SAR value acquired in the previous coarse scan. This is a fine 7x7 grid where the robot additionally moves the probe in 7 steps along the z-axis away from the bottom of the Phantom. Grid spacing for the cube measurement is 5 mm in x and y-direction and 5 mm in z-direction. DASY5 is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in Appendix B. Test results relevant for the specified standard (see chapter 1.4.) are shown in table form in chapter 7.2.
- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2mm steps. This measurement shows the continuity of the liquid and can - depending in the field strength – also show the liquid depth. A z-axis scan of the measurement with maximum SAR value is shown in Appendix B.

3.2 Spatial Peak SAR Evaluation

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

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting 'Graph Evaluated'.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

Extrapolation

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

Interpolation

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

Volume Averaging

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

Advanced Extrapolation

DASY5 uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

3.3 Data Storage and Evaluation

Data Storage

The DASY5 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 ".DAE4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

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

Data Evaluation by SEMCAD

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

Probe parameters:	- Sensitivity	Norm _i , a ₁₀ , a ₁₁ , a ₁₂
	- Conversion factor	ConvF _i
	- Diode compression point	Dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

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

with	V _i	= compensated signal of channel i	(i = x, y, z)
	U _i	= input signal of channel i	(i = x, y, z)
	cf	= crest factor of exciting field (DASY parameter)	
	dcp _i	= diode compression point	(DASY parameter)

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

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

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

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

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

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

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

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

with SAR = local specific absorption rate in mW/g
 E_{tot} = total field strength in V/m
 σ = conductivity in [mho/m] or [Siemens/m]
 ρ = equivalent tissue density in g/cm³

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

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

with P_{pwe} = equivalent power density of a plane wave in mW/cm²
 E_{tot} = total electric field strength in V/m
 H_{tot} = total magnetic field strength in A/m

4 System Verification Procedure

4.1 Tissue Verification

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within $\pm 5\%$ of the target values.

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

Ingredients (% of weight)	Head Tissue					
	750	835	900	1800	1900	2450
Frequency Band (MHz)	750	835	900	1800	1900	2450
Water	39.2	41.45	40.92	52.64	55.242	62.7
Salt (NaCl)	2.7	1.45	1.48	0.36	0.306	0.5
Sugar	57.0	56.0	56.5	0.0	0.0	0.0
HEC	0.0	1.0	1.0	0.0	0.0	0.0
Bactericide	0.0	0.1	0.1	0.0	0.0	0.0
Cellulose	1.0	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	0.0	47.0	44.542	36.8
Preventol	0.1	0.0	0.0	0.0	0.0	0.0
Ingredients (% of weight)	Body Tissue					
	750	835	900	1800	1900	2450
Frequency Band (MHz)	750	835	900	1800	1900	2450
Water	50.3	52.4	56.0	69.91	69.91	73.2
Salt (NaCl)	1.6	1.40	0.76	0.13	0.13	0.04
Sugar	47	45.0	41.76	0.0	0.0	0.0
HEC	0.0	1.0	1.21	0.0	0.0	0.0
Bactericide	0.0	0.1	0.27	0.0	0.0	0.0
Cellulose	1.0	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	0.0	29.96	29.96	26.7
Preventol	0.1	0.0	0.0	0.0	0.0	0.0

Table 4: Tissue Dielectric Properties

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

Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		ϵ_r (+/-5%)	σ (S/m) (+/-5%)	ϵ_r	σ (S/m)		
835H	825	41.6 (39.52~43.68)	0.90 (0.86~0.95)	42.56	0.878	21.4°C	2012-4-5
	835	41.5 (39.43~43.58)	0.90 (0.86~0.95)	42.40	0.886		
	850	41.5 (39.43~43.58)	0.92 (0.87~0.96)	42.16	0.890		
835B	825	55.2 (52.44~57.96)	0.97 (0.92~1.02)	53.21	0.973	21.4°C	2012-3-30
	835	55.2 (52.44~57.96)	0.97 (0.92~1.02)	53.20	0.984		
	850	55.2 (52.44~57.96)	0.99 (0.94~1.04)	52.95	0.989		
1800H	1710	40.1 (38.10~42.10)	1.35 (1.28~1.42)	41.25	1.386	21.4°C	2012-4-3
	1730	40.1 (38.10~42.10)	1.36 (1.29~1.43)	41.15	1.404		
	1750	40.1 (38.10~42.10)	1.37 (1.31~1.43)	41.05	1.421		

	1800	40.0 (38.00~42.00)	1.40 (1.33~1.47)	40.82	1.463		
1800B	1710	53.5 (50.83~56.18)	1.46 (1.39~1.53)	53.64	1.466	21.4°C	2012-3-31
	1730	53.5 (50.83~56.18)	1.48 (1.41~1.55)	53.55	1.488		
	1750	53.4 (50.73~56.07)	1.49 (1.42~1.56)	53.46	1.510		
	1800	53.3 (50.64~55.97)	1.52 (1.44~1.60)	53.25	1.561		
1900H	1850	40.0 (38.00~42.00)	1.40 (1.33~1.47)	38.95	1.385	21.4°C	2012-4-3
	1880	40.0 (38.00~42.00)	1.40 (1.33~1.47)	38.87	1.427		
	1910	40.0 (38.00~42.00)	1.40 (1.33~1.47)	38.83	1.454		
	1900	40.0 (38.00~42.00)	1.40 (1.33~1.47)	38.78	1.443		
1900B	1850	53.3 (50.64~55.97)	1.52 (1.44~1.60)	53.15	1.472	21.4°C	2012-4-2
	1880	53.3 (50.64~55.97)	1.52 (1.44~1.60)	53.22	1.513		
	1900	53.3 (50.64~55.97)	1.52 (1.44~1.60)	52.93	1.543		
	1910	53.3 (50.64~55.97)	1.52 (1.44~1.60)	52.95	1.529		
2450H	2410	39.3 (37.34~41.26)	1.76 (1.67~1.85)	39.24	1.798	21.4°C	2012-4-5
	2435	39.2 (37.24~41.16)	1.79 (1.70~1.88)	39.00	1.848		
	2460	39.2 (37.24~41.16)	1.81 (1.72~1.90)	38.90	1.872		
	2450	39.2 (37.24~41.16)	1.80 (1.71~1.89)	38.98	1.858		
2450B	2410	52.8 (50.16~55.44)	1.91 (1.81~2.00)	51.85	1.944	21.4°C	2012-4-6
	2435	52.7 (50.07~55.34)	1.94 (1.84~2.04)	51.65	2.004		
	2460	52.7 (50.07~55.34)	1.96 (1.86~2.06)	51.57	2.039		
	2450	52.7 (50.07~55.34)	1.95 (1.85~2.05)	51.55	2.018		
ϵ_r = Relative permittivity, σ = Conductivity							

Table 5: Measured Tissue Parameter

Note:

- 1) The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.
- 2) KDB 450824 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.
- 3) The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.

4) For CDMA measurements in AWS band, and for 1800 MHz system verification the same TSL and 1750 MHz SAR probe calibration point have been used.

4.2 System Check

The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system validation is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows validation results for all frequency bands and tissue liquids used during the tests (Graphic Plot(s) see Appendix A).

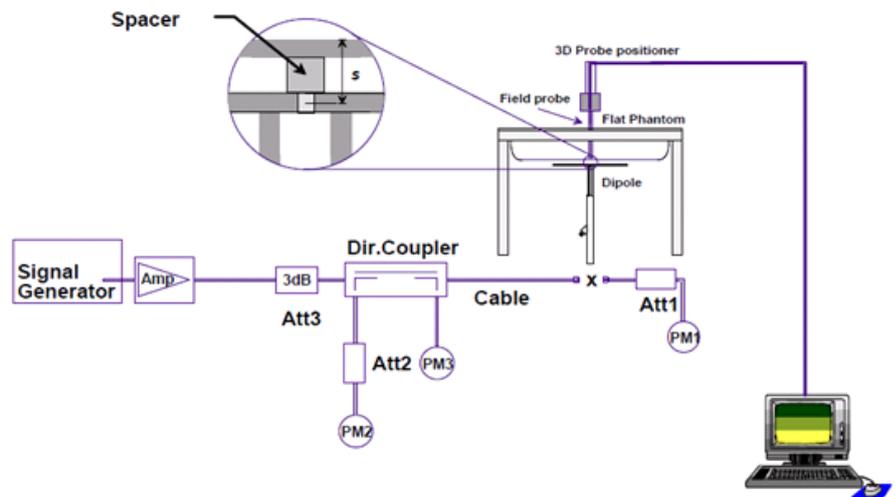
System Check	Target SAR (1W) (+/-10%)		Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (mW/g)	10-g (mW/g)	1-g (mW/g)	10-g (mW/g)		
D835V2 Head	9.40 (8.46~10.34)	6.16 (5.54~6.78)	9.84	6.44	21.4°C	2012-4-5
D1800V2 Head	39.10 (35.19~43.01)	20.30 (18.27~22.33)	39.92	20.44	21.4°C	2012-4-3
D1900V2 Head	40.60 (36.54~44.66)	21.20 (19.08~23.32)	39.16	20.08	21.4°C	2012-4-3
D2450V2 Head	53.70 (48.33~59.07)	24.90 (22.41~27.39)	54.00	24.76	21.4°C	2012-4-5
D835V2 Body	9.54 (8.59~10.49)	6.29 (5.66~6.92)	10.28	6.72	21.4°C	2012-3-30
D1800V2 Body	38.80 (34.92~42.68)	20.40 (18.36~22.44)	38.36	20.00	21.4°C	2012-3-31
D1900V2 Body	41.40 (37.26~45.54)	21.80 (19.62~23.98)	41.20	21.28	21.4°C	2012-4-2
D2450V2 Body	52.80 (47.52~58.08)	24.50 (22.05~26.95)	52.80	23.92	21.4°C	2012-4-6

Table 6: System Check Results

4.3 Validation Procedure

The validation is performed by using a validation dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 250 mW. To adjust this power a power meter is used. The power sensor is connected to the cable before the validation to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the validation to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).

Validation results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.



5 Measurement Uncertainty Evaluation

5.1 Measurement uncertainty evaluation for SAR test

The overall combined measurement uncertainty of the measurement system is $\pm 10.9\%$ ($K=1$).
The expanded uncertainty ($k=2$) is assessed to be $\pm 21.9\%$

This measurement uncertainty budget is suggested by IEEE P1528 and determined by Schmid & Partner Engineering AG. The breakdown of the individual uncertainties is as follows:

Error Sources	Uncertainty Value	Probability Distribution	Divisor	c_i 1g	c_i 10g	Standard Uncertainty 1g	Standard Uncertainty 10g	v_i^2 or v_{eff}
Measurement System								
Probe calibration	$\pm 6.0\%$	Normal	1	1	1	$\pm 6.0\%$	$\pm 6.0\%$	∞
Axial isotropy	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 1.9\%$	$\pm 1.9\%$	∞
Hemispherical isotropy	$\pm 9.6\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 3.9\%$	$\pm 3.9\%$	∞
Spatial resolution	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
Boundary effects	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Probe linearity	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
System detection limits	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Readout electronics	$\pm 0.3\%$	Normal	1	1	1	$\pm 0.3\%$	$\pm 0.3\%$	∞
Response time	$\pm 0.8\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.5\%$	$\pm 0.5\%$	∞
Integration time	$\pm 2.6\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.5\%$	$\pm 1.5\%$	∞
RF ambient conditions	$\pm 3.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
Probe positioner	$\pm 0.4\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.2\%$	$\pm 0.2\%$	∞
Probe positioning	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
Max. SAR evaluation	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Test Sample Related								
Device positioning	$\pm 2.9\%$	Normal	1	1	1	$\pm 2.9\%$	$\pm 2.9\%$	145
Device holder uncertainty	$\pm 3.6\%$	Normal	1	1	1	$\pm 3.6\%$	$\pm 3.6\%$	5
Power drift	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.9\%$	$\pm 2.9\%$	∞
Phantom and Set-up								
Phantom uncertainty	$\pm 4.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.3\%$	$\pm 2.3\%$	∞
Liquid conductivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.64	0.43	$\pm 1.8\%$	$\pm 1.2\%$	∞
Liquid conductivity (meas.)	$\pm 2.5\%$	Normal	1	0.64	0.43	$\pm 1.6\%$	$\pm 1.1\%$	∞
Liquid permittivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.6	0.49	$\pm 1.7\%$	$\pm 1.4\%$	∞
Liquid permittivity (meas.)	$\pm 2.5\%$	Normal	1	0.6	0.49	$\pm 1.5\%$	$\pm 1.2\%$	∞
Combined Uncertainty						$\pm 10.9\%$	$\pm 10.7\%$	387
Expanded Std. Uncertainty						$\pm 21.9\%$	$\pm 21.4\%$	

Table 7: Measurement uncertainties

5.2 Measurement uncertainty evaluation for system validation

The overall combined measurement uncertainty of the measurement system is $\pm 9.5\%$ ($K=1$).

The expanded uncertainty ($k=2$) is assessed to be $\pm 18.9\%$

This measurement uncertainty budget is suggested by IEEE P1528 and determined by Schmid & Partner Engineering AG. The breakdown of the individual uncertainties is as follows:

Error Sources	Uncertainty Value	Probability Distribution	Divisor	c_i 1g	c_i 10g	Standard Uncertainty 1g	Standard Uncertainty 10g	v_i^2 or v_{eff}
Measurement System								
Probe calibration	$\pm 6.0\%$	Normal	1	1	1	$\pm 6.0\%$	$\pm 6.0\%$	∞
Axial isotropy	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
Hemispherical isotropy	$\pm 9.6\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 0.0\%$	$\pm 0.0\%$	∞
Boundary effects	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Probe linearity	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
System detection limits	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Readout electronics	$\pm 0.3\%$	Normal	1	1	1	$\pm 0.3\%$	$\pm 0.3\%$	∞
Response time	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
Integration time	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
RF ambient conditions	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Probe positioner	$\pm 0.4\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.2\%$	$\pm 0.2\%$	∞
Probe positioning	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
Max. SAR evaluation	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Dipole								
Deviation of experimental dipole	$\pm 5.5\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 3.2\%$	$\pm 3.2\%$	∞
Dipole axis to liquid distance	$\pm 2.0\%$	Rectangular	1	1	1	$\pm 1.2\%$	$\pm 1.2\%$	∞
Power drift	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
Phantom and Set-up								
Phantom uncertainty	$\pm 4.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.3\%$	$\pm 2.3\%$	∞
Liquid conductivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.64	0.43	$\pm 1.8\%$	$\pm 1.2\%$	∞
Liquid conductivity (meas.)	$\pm 2.5\%$	Normal	1	0.64	0.43	$\pm 1.6\%$	$\pm 1.1\%$	∞
Liquid permittivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.6	0.49	$\pm 1.7\%$	$\pm 1.4\%$	∞
Liquid permittivity (meas.)	$\pm 2.5\%$	Normal	1	0.6	0.49	$\pm 1.5\%$	$\pm 1.2\%$	∞
Combined Uncertainty						$\pm 9.5\%$	$\pm 9.2\%$	
Expanded Std. Uncertainty						$\pm 18.9\%$	$\pm 18.4\%$	

Table 8: Measurement uncertainties

6 SAR Test Configuration

6.1 CDMA Test Configuration

6.1.1 CDMA 1x Devices

For SAR test, the maximum power output is very important and essential; it is identical under the measurement uncertainty. It is proper to use typical Test Mode 3(FW RC3, RVS RC3, SO55) as the worst case for SAR test.

Test Parameter setup for maximum RF output power according to section 4.4.5 of 3GPP2;

Parameter	Units	Value
I or	dBm/1.23MHz	-104
PilotE c/I or	dB	-7
TrafficE c /I or	dB	-7.4

SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

SAR for body exposure configurations is measured in RC3 with the DUT configured using TDSO / SO32, to transmit at full rate on FCH with all other code channels disabled. SAR for multiple code channels (FCH + SCHn) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCHn) with FCH at full rate and SCH0 enabled at 9600 bps, using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts.

Body SAR in RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

Test communication setup meet as followings:

Communication standard between mobile station and base station simulator	3GPP2 C.S0011-B
Radio configuration	RC3(Supporting CDMA 1X)
Spreading Rate	SR1
Data Rate	9600bps
Service Options	SO55(Loopback service)
Service Options	SO32(Test Data service)
Multiplex Options	The mobile station does not support this service

6.1.2 CDMA Ev-Do Devices

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev.0 is less than ¼ dB higher than that measured in RC3 (1x RTT), body SAR for Ev-Do is not required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at 153.6 kbps using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev.A is not required when the maximum average output of each channel is less than that measured in Rev.0 or less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev.A using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots should be configured in the downlink for both Rev.0 and Rev.A.

The power reduction in mobile hotspot mode is as following:

Mode(s) of Operation	Reduction of maximum output power (dB)		
	CELL	PCS	AWS
Original Maximum Output Power Setting (dBm)	24	24	24.5
Power Reduction Amount (dB)	2	4.5	3
Reduced Maximum Output Power Setting (dBm)	22.0	19.5	21.5

Table 9: The power reduction in mobile hotspot mode.

Note: The conducted power of these bands is measured with RMS detector.

6.2 WiFi Test Configuration

For the 802.11b/g SAR tests, a communication link is set up with the test mode software for WiFi mode test. The Absolute Radio Frequency Channel Number(ARFCN) is allocated to 1,6and 11 respectively in the case of 2450 MHz.During the test,at the each test frequency channel, theEUT is operated at the RF continuous emission mode.Each channel should be tested at the lowest data rate.

802.11b/g operating modes are tested independently according to the service requirements in each frquency band. 802.11b/g modes are tested on channel 1,6,11; however,if output power reduction is necessary for channels 1 and/or 11 to meet restricted band requirements the highest output channel closest to each of these channels must be tested instead.

SAR is not required for 802.11g channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.

Mode	GHz	Channel	Turbo Channel	"Default Test Channels"		UNII
				\$15.247		
				802.11b	802.11g	
802.11 b/g	2.412	1		√	∇	
	2.437	6	6	√	∇	
	2.462	11		√	∇	

802.11 Test Channels per FCC Requirements

7 SAR Measurement Results

7.1 Conducted power measurements

For the measurements a Rohde & Schwarz Radio Communication Tester CMU 200 was used. SAR drift measured at the same position in liquid before and after each SAR test as below 7.2 chapter.

7.1.1 Conducted power measurements CDMA800

CDMA&EVDO 800		Average Power (dBm)		
		1013CH	384CH	777CH
RC1	SO55	24.43	24.61	24.69
RC3	SO55	24.42	24.48	24.71
	TDSO32 (FCH)	24.35	24.50	24.68
	TDSO32 (FCH+SCH)	24.38	24.40	24.61
Rev 0	RTAP 153.6	23.77	23.74	24.05
Rev A	RETAP 4096	23.85	23.88	24.24

Table 10: Test results conducted power measurement CDMA 800MHz(Hotspot disable)

CDMA&EVDO 800		Average Power (dBm)		
		1013CH	384CH	777CH
RC1	SO55	22.32	22.41	22.53
RC3	SO55	22.30	22.36	22.53
	TDSO32 (FCH)	22.35	22.45	22.56
	TDSO32 (FCH+SCH)	22.31	22.48	22.46
Rev 0	RTAP 153.6	21.91	21.96	21.86
Rev A	RETAP 4096	22.02	22.10	22.16

Table 11: Test results conducted power measurement CDMA 800MHz(Hotspot activated)

Note: The conducted power of CDMA800 is measured with RMS detector.

7.1.2 Conducted power measurements CDMA1700

CDMA&EVDO AWS		Average Power (dBm)		
		25CH	450CH	850CH
RC1	SO55	24.64	24.46	24.81
RC3	SO55	24.60	24.46	24.78
	TDSO32 (FCH)	24.55	24.32	24.82
	TDSO32 (FCH+SCH)	24.62	24.32	24.70
Rev 0	RTAP 153.6	24.23	23.98	24.34
Rev A	RETAP 4096	24.31	24.10	24.50

Table 12: Test results conducted power measurement CDMA 1700MHz(Hotspot disable)

CDMA&EVDO AWS		Average Power (dBm)		
		25CH	450CH	850CH
RC1	SO55	21.73	21.45	21.84
RC3	SO55	21.55	21.59	21.71
	TDSO32 (FCH)	21.43	21.55	21.81
	TDSO32 (FCH+SCH)	21.51	21.49	21.74
Rev 0	RTAP 153.6	21.03	21.15	21.14
Rev A	RETAP 4096	21.18	21.17	21.28

Table 13: Test results conducted power measurement CDMA 1700MHz(Hotspot activated)

Note: The conducted power of CDMA1700 is measured with RMS detector.

7.1.3 Conducted power measurements CDMA1900

CDMA&EVDO1900		Average Power (dBm)		
		25CH	600CH	1175CH
RC1	SO55	24.44	24.50	24.40
RC3	SO55	24.44	24.40	24.38
	TDSO32 (FCH)	24.45	24.42	24.31
	TDSO32 (FCH+SCH)	24.56	24.44	24.33
Rev 0	RTAP 153.6	24.01	23.90	23.84
Rev A	RETAP 4096	24.15	24.06	23.92

Table 14: Test results conducted power measurement CDMA 1900MHz(Hotspot disable)

CDMA&EVDO1900		Average Power (dBm)		
		25CH	600CH	1175CH
RC1	SO55	19.88	19.99	20.01
RC3	SO55	19.95	19.97	19.92
	TDSO32 (FCH)	19.84	19.95	19.95
	TDSO32 (FCH+SCH)	19.95	19.87	19.90
Rev 0	RTAP 153.6	19.48	19.56	19.48
Rev A	RETAP 4096	19.64	19.74	19.66

Table 15: Test results conducted power measurement CDMA 1900MHz(Hotspot activated)

Note: The conducted power of CDMA1900 is measured with RMS detector.

7.2 SAR measurement Result

7.2.1 SAR measurement Result of CDMA800

Test Position of Head	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Left Hand Touched	RC3 SO55	384/836.52	0.536	0.394	-0.020	24.48	21.4°C
Left Hand Tilted 15°	RC3 SO55	384/836.52	0.416	0.319	0.030		21.4°C
Right Hand Touched	RC3 SO55	384/836.52	0.587	0.435	-0.003		21.4°C
Right Hand Tilted 15°	RC3 SO55	384/836.52	0.430	0.326	0.060		21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Right Hand Touched	RC3 SO55	384/836.52	0.630	0.465	-0.090	24.48	21.4°C

Table 16: Test results head SAR CDMA800

Test Position of Body with 15mm	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Towards Phantom	RC3 SO32	384/836.52	0.580	0.433	0.040	24.50	21.4°C
Towards Ground	RC3 SO32	1013/824.7	1.000	0.742	0.030	24.35	21.4°C
Towards Ground	RC3 SO32	384/836.52	0.917	0.676	-0.040	24.50	21.4°C
Towards Ground	RC3 SO32	777/848.31	0.796	0.586	0.070	24.68	21.4°C
Towards Ground	EVDO Rev.0	1013/824.7	0.923	0.675	-0.001	23.77	21.4°C
Towards Ground	EVDO Rev.A	1013/824.7	1.070	0.776	0.110	23.85	21.4°C
Towards Ground with Headset	RC3 SO55	1013/824.7	0.712	0.527	-0.050	24.42	21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Towards Ground	EVDO Rev.A	1013/824.7	1.130	0.773	-0.009	23.85	21.4°C

Table 17: Test results body worn SAR CDMA800

Test Position of Body with 10mm	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Towards Phantom	EVDO Rev.0	384/836.52	0.383	0.285	0.004	21.96	21.4°C
Towards Ground	EVDO Rev.0	384/836.52	0.673	0.467	-0.100		21.4°C
Left edge	EVDO Rev.0	384/836.52	0.415	0.286	-0.030		21.4°C
Right edge	EVDO Rev.0	384/836.52	0.524	0.358	0.070		21.4°C
Bottom edge	EVDO Rev.0	384/836.52	0.112	0.070	0.004		21.4°C
Towards Ground	EVDO Rev.A	384/836.52	0.770	0.557	0.090	22.10	21.4°C
Towards Ground	RC3 SO32	384/836.52	0.692	0.513	0.060	22.45	21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Towards Ground	EVDO Rev.A	384/836.52	0.834	0.619	-0.190	22.10	21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh) with hotspot mode closed							
Towards Ground	EVDO Rev.A	384/836.52	1.180	0.852	-0.160	23.88	21.4°C

Table 18: Test results Hotspot SAR CDMA800

7.2.2 SAR measurement Result of CDMA1700

Test Position of Head	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Left Hand Touched	RC3 SO55	450/1732.5	0.561	0.340	-0.110	24.46	21.4°C
Left Hand Tilted 15°	RC3 SO55	450/1732.5	0.412	0.257	-0.001		21.4°C
Right Hand Touched	RC3 SO55	450/1732.5	0.635	0.388	-0.170		21.4°C
Right Hand Tilted 15°	RC3 SO55	450/1732.5	0.339	0.211	-0.040		21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Right Hand Touched	RC3 SO55	450/1732.5	0.679	0.424	-0.040	24.46	21.4°C

Table 19: Test results head SAR CDMA1700

Test Position of Body with 15mm	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Towards Phantom	RC3 SO32	450/1732.5	0.417	0.258	-0.140	24.32	21.4°C
Towards Ground	RC3 SO32	25/1711.25	0.841	0.530	-0.120	24.55	21.4°C
Towards Ground	RC3 SO32	450/1732.5	0.944	0.584	-0.060	24.32	21.4°C
Towards Ground	RC3 SO32	850/1752.5	0.968	0.588	0.030	24.82	21.4°C
Towards Ground	EVDO Rev.0	850/1752.5	0.906	0.562	0.020	24.34	21.4°C
Towards Ground	EVDO Rev.A	850/1752.5	1.020	0.634	-0.080	24.50	21.4°C
Towards Ground with Headset	RC3 SO55	850/1752.5	0.942	0.579	-0.040	24.78	21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Towards Ground	EVDO Rev.A	850/1752.5	0.948	0.598	0.150	24.50	21.4°C

Table 20: Test results body worn SAR CDMA1700

Test Position of Body with 10mm	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Towards Phantom	EVDO Rev.0	450/1732.5	0.311	0.188	0.010	21.15	21.4°C
Towards Ground	EVDO Rev.0	450/1732.5	0.783	0.464	-0.170		21.4°C
Left edge	EVDO Rev.0	450/1732.5	0.236	0.134	0.050		21.4°C
Right edge	EVDO Rev.0	450/1732.5	0.108	0.065	0.180		21.4°C
Bottom edge	EVDO Rev.0	450/1732.5	0.402	0.224	0.040		21.4°C
Towards Ground	EVDO Rev.A	450/1732.5	0.910	0.525	-0.006	21.17	21.4°C
Towards Ground	RC3 SO32	450/1732.5	0.824	0.487	0.070	21.55	21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Towards Ground	EVDO Rev.A	450/1732.5	0.931	0.564	0.170	21.17	21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh) with hotspot mode closed							
Towards Ground	EVDO Rev.A	450/1732.5	1.910	1.140	0.160	24.10	21.4°C

Table 21: Test results Hotspot SAR CDMA1700

7.2.3 SAR measurement Result of CDMA1900

Test Position of Head	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Left Hand Touched	RC3 SO55	25/1851.25	0.732	0.439	0.040	24.44	21.4°C
Left Hand Touched	RC3 SO55	600/1880	0.887	0.520	-0.150	24.40	21.4°C
Left Hand Touched	RC3 SO55	1175/1908.75	0.727	0.421	0.070	24.38	21.4°C
Left Hand Tilted 15°	RC3 SO55	600/1880	0.335	0.214	-0.080	24.40	21.4°C
Right Hand Touched	RC3 SO55	600/1880	0.523	0.342	-0.090		21.4°C
Right Hand Tilted 15°	RC3 SO55	600/1880	0.302	0.187	0.040		21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Left Hand Touched	RC3 SO55	600/1880	0.900	0.531	-0.140	24.40	21.4°C

Table 22: Test results head SAR CDMA1900

Test Position of Body with 15mm	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Towards Phantom	RC3 SO32	600/1880	0.438	0.280	0.050	24.42	21.4°C
Towards Ground	RC3 SO32	25/1851.25	1.150	0.674	-0.180	24.45	21.4°C
Towards Ground	RC3 SO32	600/1880	1.240	0.717	0.060	24.42	21.4°C
Towards Ground	RC3 SO32	1175/1908.75	1.150	0.642	-0.080	24.31	21.4°C
Towards Ground	EVDO Rev.0	600/1880	1.080	0.633	-0.070	23.90	21.4°C
Towards Ground	EVDO Rev.A	600/1880	1.290	0.710	-0.080	24.06	21.4°C
Towards Ground with Headset	RC3 SO55	600/1880	1.160	0.681	0.030	24.40	21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Towards Ground	EVDO Rev.A	600/1880	1.330	0.799	0.020	24.06	21.4°C

Table 23: Test results body worn SAR CDMA1900

Test Position of Body with 10mm	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Towards Phantom	EVDO Rev.0	600/1880	0.203	0.129	-0.050	19.56	21.4°C
Towards Ground	EVDO Rev.0	25/1851.25	0.732	0.412	-0.150	19.48	21.4°C
Towards Ground	EVDO Rev.0	600/1880	0.872	0.461	0.030	19.56	21.4°C
Towards Ground	EVDO Rev.0	1175/1908.75	0.860	0.446	0.100	19.48	21.4°C
Left edge	EVDO Rev.0	600/1880	0.326	0.181	-0.130	19.56	21.4°C
Right edge	EVDO Rev.0	600/1880	0.044	0.028	0.130		21.4°C
Bottom edge	EVDO Rev.0	600/1880	0.437	0.240	-0.080		21.4°C
Towards Ground	EVDO Rev.A	600/1880	0.955	0.476	-0.009	19.74	21.4°C
Towards Ground	RC3 SO32	600/1880	0.902	0.480	0.090	19.95	21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Towards Ground	EVDO Rev.A	600/1880	0.982	0.537	-0.110	19.74	21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh) with hotspot mode closed							
Towards Ground	EVDO Rev.A	600/1880	2.540	1.360	0.130	24.06	21.4°C

Table 24: Test results Hotspot SAR CDMA1900

Note:

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

- 3) Per KDB941225 D01-Head SAR was tested with RC3+SO55, RC1+SO55 was not required since the average output power was not more than 0.25dB than the RC3+SO55 powers.
- 4) Per KDB941225 D06,for the antenna-to-edge distance is greater than 2.5 cm,so the top side does not need to be tested.
- 5) The value test with hotspot mode closed is provided solely for purposes of confirming compliant power reduction operation and do not represent maximum SAR values of the product.

7.2.4 SAR measurement Result of WiFi

Test Position of Head	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Left Hand Touched	802.11b	1/2412	0.087	0.055	-0.100	15.45	21.4°C
Left Hand Tilted 15°	802.11b	1/2412	0.075	0.045	0.160		21.4°C
Right Hand Touched	802.11b	1/2412	0.172	0.089	0.170		21.4°C
Right Hand Tilted 15°	802.11b	1/2412	0.096	0.046	0.140		21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Right Hand Touched	802.11b	1/2412	0.167	0.085	0.170	15.45	21.4°C

Table 25: Test results head SAR WiFi 2450 MHz

Test Position of Body with 15mm	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Towards Phantom	802.11b	1/2412	0.027	0.018	-0.160	15.45	21.4°C
Towards Ground	802.11b	1/2412	0.041	0.029	-0.120		21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Towards Ground	802.11b	1/2412	0.036	0.014	0.100	15.45	21.4°C

Table 26: Test results body SAR WiFi 2450 MHz

Test Position of Body with 10mm	Test Mode	Test channel /Frequency	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Liquid Temp.
			1-g	10-g			
Towards Phantom	802.11b	1/2412	0.041	0.027	-0.080	15.45	21.4°C
Towards Ground	802.11b	1/2412	0.066	0.043	0.120		21.4°C
Left edge	802.11b	1/2412	0.052	0.031	-0.180		21.4°C
Top edge	802.11b	1/2412	0.040	0.025	-0.090		21.4°C
Test Worst position with battery SN: UBDC204XXAS00908 (1500mAh)							
Towards Ground	802.11b	1/2412	0.057	0.025	0.003	15.45	21.4°C

Table 27: Test results Hotspot SAR WiFi 2450 MHz

Note: 1) The maximum SAR value of each test band is shown in **bold** letters.

2) Per KDB447498 D01,the SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit (< 0.8 W/kg), testing at the high and low channels is optional.

3) Per KDB941225 D06,for the antenna-to-edge distance is greater than 2.5 cm,so the Bottom and Right side do not need to be tested.

7.3 Multiple Transmitter Evaluation

The closest distance between BT/WiFi antenna and main antenna is 6.9cm > 5cm, and the location of the antennas inside mobile phone is shown as below picture:



The output power of BT antenna is as following:

BT 2450MHz	Average Conducted Power (dBm)		
	0CH	39CH	78CH
	6.35	7.26	7.34

Table 28: Test results conducted power measurement BT 2450 MHz

The output power of WiFi antenna is as following:

Wi-Fi 2450MHz	Channel	Average Power (dBm) for Data Rates (Mbps)							
		1	2	5.5	11	/	/	/	/
802.11b	1	15.45	15.42	15.37	15.36	/	/	/	/
	6	15.18	15.15	15.11	15.13	/	/	/	/
	11	14.96	14.95	14.91	14.89	/	/	/	/
802.11g	Channel	6	9	12	18	24	36	48	54
	1	14.52	14.49	14.48	14.49	14.44	14.41	14.37	14.33
	6	14.43	14.39	14.41	14.38	14.26	14.21	14.25	14.23
	11	14.12	14.09	14.11	14.09	14.08	14.03	13.99	13.95
802.11n (HT20)	Channel	6.5	13	19.5	26	39	52	58.5	65
	1	11.91	11.89	11.85	11.87	11.78	11.75	11.71	11.76
	6	11.75	11.72	11.77	11.73	11.69	11.65	11.58	11.55
	11	11.49	11.45	11.43	11.47	11.38	11.31	11.29	11.28

Table 29: Test results conducted power measurement WiFi 2450 MHz

Note: The conducted power of WiFi is measured with RMS detector.

7.3.1 Stand-alone SAR

According to the output power measurement results and the distance between WiFi/BT antenna and CDMA antenna we can draw the conclusion that:

- 1) stand-alone SAR evaluation is not required for BT, because the output power of BT unlicensed is $7.34 \text{ dBm} \leq 2P_{\text{Ref}} (13.8\text{dBm})$, and its antenna(s) is $6.9 \text{ cm} > 5 \text{ cm}$ from main antenna.
- 2) Stand-alone SAR evaluation is required for WiFi, because the output power of WiFi unlicensed transmitter is $15.45\text{dBm} \geq 24\text{mW} (13.8\text{dBm})$.

7.3.2 Simultaneous SAR

Simultaneous Transmission Possibilities				
Simultaneous Tx Combination	Configuration	Head	Body-Worn	Hotspot
1	CDMA 1X Voice	Yes	Yes	No
2	CDMA 1X DATA	No	Yes	No
3	EVDO DATA	No	Yes	No
5	WLAN VoIP	Yes	Yes	No
6	WLAN Data	Yes	Yes	No
7	BT Data	No	Yes	No
8	CDMA 1X Voice + BT	No	Yes	No
9	CDMA 1X DATA + BT	No	Yes	No
10	EVDO DATA + BT	No	Yes	No
11	CDMA 1X Voice + WLAN	Yes	Yes	No
12	CDMA 1X DATA + WLAN	No	Yes	Yes
13	EVDO DATA + WLAN	No	Yes	Yes

Note:

- 1) This mode doesn't support simultaneous voice and data in CDMA or CDMA&EVDO.
- 2) This mode doesn't support simultaneous BT and WiFi, because they share the same antenna.

7.3.3 SAR Summation Scenario

Test Position	GSM&WCDMA SAR _{Max}			WiFi SAR _{Max}	Σ1-g SAR _{max}
	CDMA800	CDMA1700	CDMA1900		
Head SAR (W/kg)					
Left Hand Touched	0.536	0.561	0.900	0.087	0.987
Left Hand Tilted 15°	0.416	0.412	0.335	0.075	0.491
Right Hand Touched	0.630	0.679	0.523	0.172	0.851
Right Hand Tilted 15°	0.430	0.339	0.302	0.096	0.526
Body-Worn SAR (W/kg)					
Towards Phantom	0.580	0.417	0.438	0.027	0.607
Towards Ground	1.130	1.020	1.330	0.041	1.371
Hotspot SAR (W/kg)					
Towards Phantom	0.383	0.311	0.203	0.041	0.424
Towards Ground	0.834	0.931	0.982	0.066	1.048
Left edge	0.415	0.236	0.326	0.052	0.467
Right edge	0.524	0.108	0.044	0.000	0.524
Top edge	0.000	0.000	0.000	0.040	0.040
Bottom edge	0.112	0.402	0.437	0.000	0.437

Note:

For the transmitters requiring stand-alone SAR testing(GSM/WCDMA and WiFi),the KDB guidelines direct that if the sum of the 1-g SAR measured for the simultaneously transmitting antennas is less than the SAR limit, SAR evaluation for simultaneous transmission is not required.

Simultaneous Transmission SAR evaluation is not required for CDMA& BT,because stand-alone SAR are not required for BT and the sum of 1-g SAR_{max} is 1.33 W/kg < 1.6 W/kg for all simultaneous transmitting antennas.

Simultaneous Transmission SAR evaluation is not required for WiFi and CDMA, because the sum of the 1g SAR_{max} is 1.371W/kg < 1.6W/kg for WiFi and CDMA

Simultaneous Transmission SAR evaluation is not required for BT and WiFi, because the sum of the 1g SAR_{max} is 0.172W/kg < 1.6 W/kg for BT and WiFi

Appendix A. System Check Plots

(Pls See Appendix A.)

Appendix B. SAR Measurement Plots

(Pls See Appendix B.)

Appendix C. Calibration Certificate

(Pls See Appendix C.)

Appendix D. Photo documentation

(Pls See Appendix D.)

End