SAR TEST REPORT

Equipment Under Test	:	MID (MOBILE INTERNET DEVICE)
Model No.	:	N5
Applicant	:	YUKYUNG TECHNOLOGIES INC.
Address of Applicant	:	200-11, Anyang-Dong, Manan-Ku, Anyang-Si, Kyunggi-Do, Korea
FCC ID	:	XBQ-N5
Device Category	:	Portable Device
Exposure Category	:	General Population/Uncontrolled Exposure
Date of Receipt	:	2010-05-17
Date of Test(s)	:	2010-05-19 ~ 2009-05-20
Date of Issue	:	2010-05-25
Max. SAR	:	0.013 W/kg (WCDMA V), 0.042 W/kg (WCDMA II)

Standards:

FCC OET Bulletin 65 supplement C
IEEE 1528, 2003
ANSI/IEEE C95.1, C95.3

In the configuration tested, the EUT complied with the standards specified above.

Remarks:

Tested by	:	**Fred Jeong**	정흥헌	**2010-05-25**
Approved by	:	**Charles Kim**	C. K. Kim	**2010-05-25**

Contents

APPENDIX

1. General Information

1.1 Testing Laboratory

SGS Testing Korea Co., Ltd.
Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040
Telephone : +82 +31 428 5700
FAX : +82 +31 427 2371
Homepage : www.kr.sgs.com/ee

1.2 Details of Manufacturer

Manufacturer : YUKYUNG TECHNOLOGIES INC.
Address : 200-11, Anyang-Dong, Manan-Ku, Anyang-Si, Kyunggi-Do, Korea
Contact Person : DAVID SEO
Phone No. : 82-31-463-6906
Fax No. : 82-31-445-5995

1.3 Version of Report

Version Number	Date	Revision
00	2010-05-25	Initial issue

1.4 Description of EUT(s)

EUT Type	: MID (MOBILE INTERNET DEVICE)
Model	: N5
Serial Number	: N/A
Mode of Operation	: WCDMA V, WCDMA II
Duty Cycle	: WCDMA 100%
Body worn Accessory	: None
Tx Frequency Range	: 826.4 MHz ~ 846.6 MHz (WCDMA V), 1852.4 MHz ~ 1907.6 MHz (WCDMA II)
Conducted Max Power	: 21.82 dBm(WCDMA V), 21.68 dBm(WCDMA II)
Battery Type	: DC 3.7 V (Polymer Lithium Ion Battery)

1.5 Test Environment

Ambient temperature	:	21 ~ 23 ° C
Tissue Simulating Liquid	:	21 ~ 23 ° C
Relative Humidity	:	40 ~ 60 %

1.6 Operation Configuration

The device in WCDMA mode was controlled by using a Communication tester(CMU 200). Communication between the device and the tester was established by air link. Measurements were performed at the lowest, middle and highest channels of the operating band. The EUT was set to maximum power level during all tests and at the beginning of each test the battery was fully charged.

The DASY4 system measures power drift during SAR testing by comparing e-field in the same location at the beginning and at the end of measurement.

1.7 EVALUATION PROCEDURES

- Power Reference Measurement Procedures

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 4 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 2.7 mm for an ET3DV6 probe type).

- The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan.
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1g and 10g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within –2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7x7x7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30x30x30mm contains about 30g of tissue. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

1.8 The SAR Measurement System

A photograph of the SAR measurement System is given in Fig. a. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (Speag Dasy 4 professional system). A Model ET3DV6 1782 E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|2)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant. The DASY4 system for performing compliance tests consists of the following items:

•A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).

•A dosimeter 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 electronics (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.

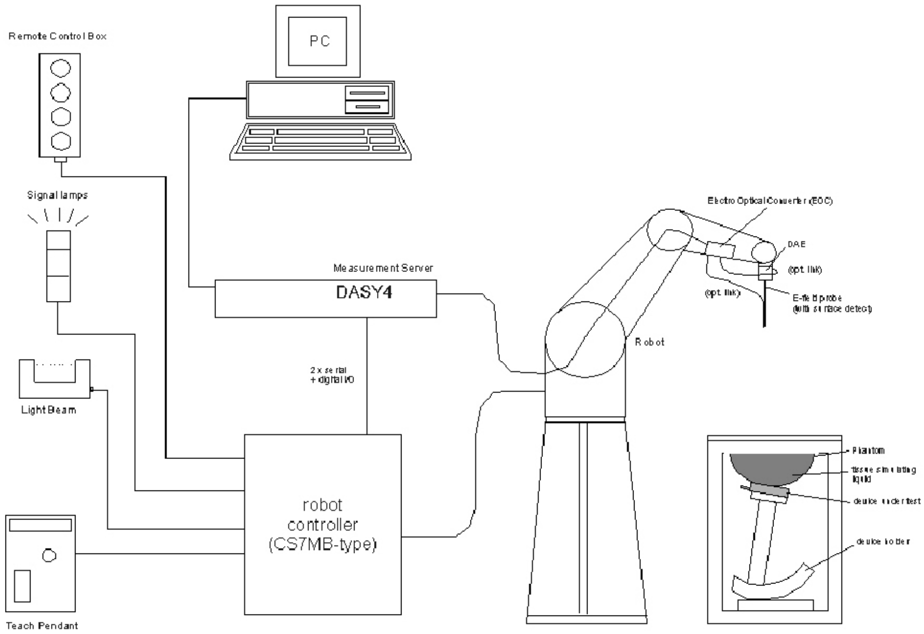


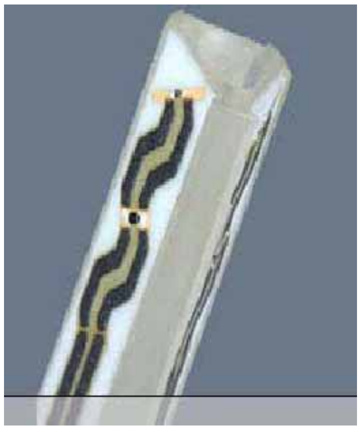
Fig a. The microwave circuit arrangement used for SAR system verification

• The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
• The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
• A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
• A computer operating Windows 2000 or Windows XP.
• DASY4 software.
• Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
• The SAM twin phantom enabling testing body usage.
• The device holder for flat phantom.
• Tissue simulating liquid mixed according to the given recipes.
• Validation dipole kits allowing to validate the proper functioning of the system.

1.9 System Components

ET3DV6 E-Field Probe

Construction	:	Symmetrical design with triangular core 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 simulating tissue (accuracy ± 8%)
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 to probe axis)
Dynamic Range	:	5 µW/g to >100 mW/g; Linearity: ±0.2 dB
Srfce. Detect	:	±0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions	:	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	:	General dosimetry up to 3 GHz Compliance tests of mobile phone



ET3DV6 E-Field Probe

NOTE:

1. The Probe parameters have been calibrated by the SPEAG. Please reference “APPENDIX D” for the Calibration Certification Report.

SAM Phantom

Construction: The SAM 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 ± 0.1 mm

Filling Volume: Approx. 25 liters

SAM Phantom

DEVICE HOLDER

Construction In combination with the Twin SAM PhantomV4.0/V4.0C or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Device Holder

1.10 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 835 MHz and 1900 MHz. The tests for EUT were conducted within 24 hours after each validation. The obtained results from the system accuracy verification are displayed in the table 1. During the tests, the ambient temperature of the laboratory was in the range 20 °C ~ 23 °C, the relative humidity was in the range 40 % ~ 60 % and the liquid depth above the ear reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

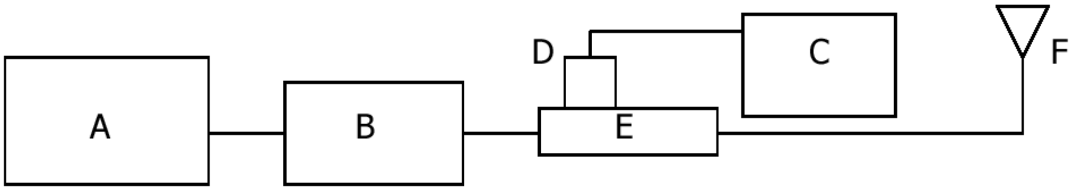


Fig b. The microwave circuit arrangement used for SAR system verification

A. Agilent Model E4421B Signal Generator
B. EMPOWER Model 2001-BBS3Q7ECK Amplifier
C. Agilent Model E4419B Power Meter
D. Agilent Model 9300H Power Sensor
E. Agilent Model 777D/778D Dual directional coupling
F. Reference dipole Antenna

Photo of the dipole Antenna

System Validation Results

Validation Kit	Tissue	Target SAR 1 g from Calibration Certificate (Input Power : 250 mW)	Measured SAR 1 g (Input Power : 250 mW)	Deviation (%)	Date	Liquid Temp. (°C)
D835V2 S/N: 490	835 MHz Brain	2.41 W/kg	**2.42 W/kg**	**0.41**	2010-05-19	22.1
D1900V2 S/N: 5d033	1900 MHz Brain	10.0 W/kg	**10.1 W/kg**	**1.00**	2010-05-19	22.1

Table 1. Results system validation

1.12 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this simulant fluid were measured by using the Agilent Model 85070D Dielectric Probe (rates frequence band 200 MHz to 20 GHz) in conjunction with Agilent E5070B Network Analyzer(300 KHz-3000 MHz) by using a procedure detailed in Section V.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			Permittivity	Conductivity	Simulated Tissue Temp(℃)
835	Head	Measured, 2010-05-19	**41.3**	**0.88**	**22.1**
		Recommended Limits	41.5	0.90	21.0 ~ 23.0
		Deviation(%)	-0.48	-2.22	-
	Body	Measured, 2010-05-19	**53.41**	**0.97**	**22.1**
		Recommended Limits	55.2	0.97	21.0 ~ 23.0
		Deviation(%)	-3.24	0.00	-
1900	Head	Measured, 2010-05-19	**39.2**	**1.46**	**22.1**
		Recommended Limits	40.0	1.40	21.0 ~ 23.0
		Deviation(%)	-2.00	4.29	-
	Body	Measured, 2010-05-19	**51.75**	**1.52**	**22.1**
		Recommended Limits	53.3	1.52	21.0 ~ 23.0
		Deviation(%)	-2.91	0.00	-

The composition of the brain tissue simulating liquid

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	**Frequency (MHz)**									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99^{+}% Pure Sodium Chloride Sugar: 98^{+}% Pure Sucrose
Water: De-ionized, 16 $M\Omega^{+}$ 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

1.13 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (“SAR”) in Section 4.2 of “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” ANSI/IEEE C95.3–2003, Copyright 2003 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in “Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields,” NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

(1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube). Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

(2) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.(Table .4)

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

Table .4 RF exposure limits

2. Instruments List

Maunfacturer	Device	Type	Serial Number	Due date of Calibration
Stäubli	Robot	RX90BL	F03/5W05A1/A/01	N/A
Schmid& Partner Engineering AG	Dosimetric E-Field Probe	ET3DV6	1782	April 28, 2011
Schmid& Partner Engineering AG	835 MHz System Validation Dipole	D835V2	490	August 24, 2010
Schmid& Partner Engineering AG	1900 MHz System Validation Dipole	D1900V2	5d033	August 25, 2010
Schmid& Partner Engineering AG	Data acquisition Electronics	DAE3	567	December 09, 2010
Schmid& Partner Engineering AG	Software	DASY 4 V4.7	-	N/A
Schmid& Partner Engineering AG	Phantom	SAM Phantom V4.0	TP-1299 TP-1300	N/A
Agilent	Network Analyzer	E5070B	MY42100282	March 31, 2011
Agilent	Dielectric Probe Kit	85070D	2184	N/A
Agilent	Power Meter	E4419B	GB43311126	September 28, 2010
Agilent	Power Sensor	E9300H	MY41495307	September 29, 2010
			MY41495308	September 29, 2010
Agilent	Signal Generator	E4421B	MY43350132	September 29, 2010
Empower RF Systems	Power Amplifier	2001-BBS3Q7ECK	1032 D/C 0336	March 31, 2011
Agilent	Dual Directional Coupler	777D 778D	50128 50454	September 28, 2010
Microlab	LP Filter	LA-15N LA-30N	N/A	September 28, 2010
R&S	Mobile Test Unit	CMU 200	107279	March 31, 2011

3.Summary of Results

FCC 3G Measurement Procedures

Maximum output power is verified on the Low, Middle and High channels according to the section 5.2 of 3GPP TS 34.121 and the KDB 941225 procedure.

Band	Mode	Channel	Frequency(MHz)	Conducted Power(dBm)
WCDMA V (RMC)	RMC	4132	826.4	**21.82**
	RMC	4182	836.4	**21.80**
	RMC	4233	846.6	**21.79**
WCDMA V (HSDPA Active)	Sub-test 1	4132	826.4	21.78
		4182	836.4	21.73
		4233	846.6	21.76
	Sub-test 2	4132	826.4	21.75
		4182	836.4	21.70
		4233	846.6	21.71
	Sub-test 3	4132	826.4	21.73
		4182	836.4	21.69
		4233	846.6	21.68
	Sub-test 4	4132	826.4	21.73
		4182	836.4	21.68
		4233	846.6	21.66

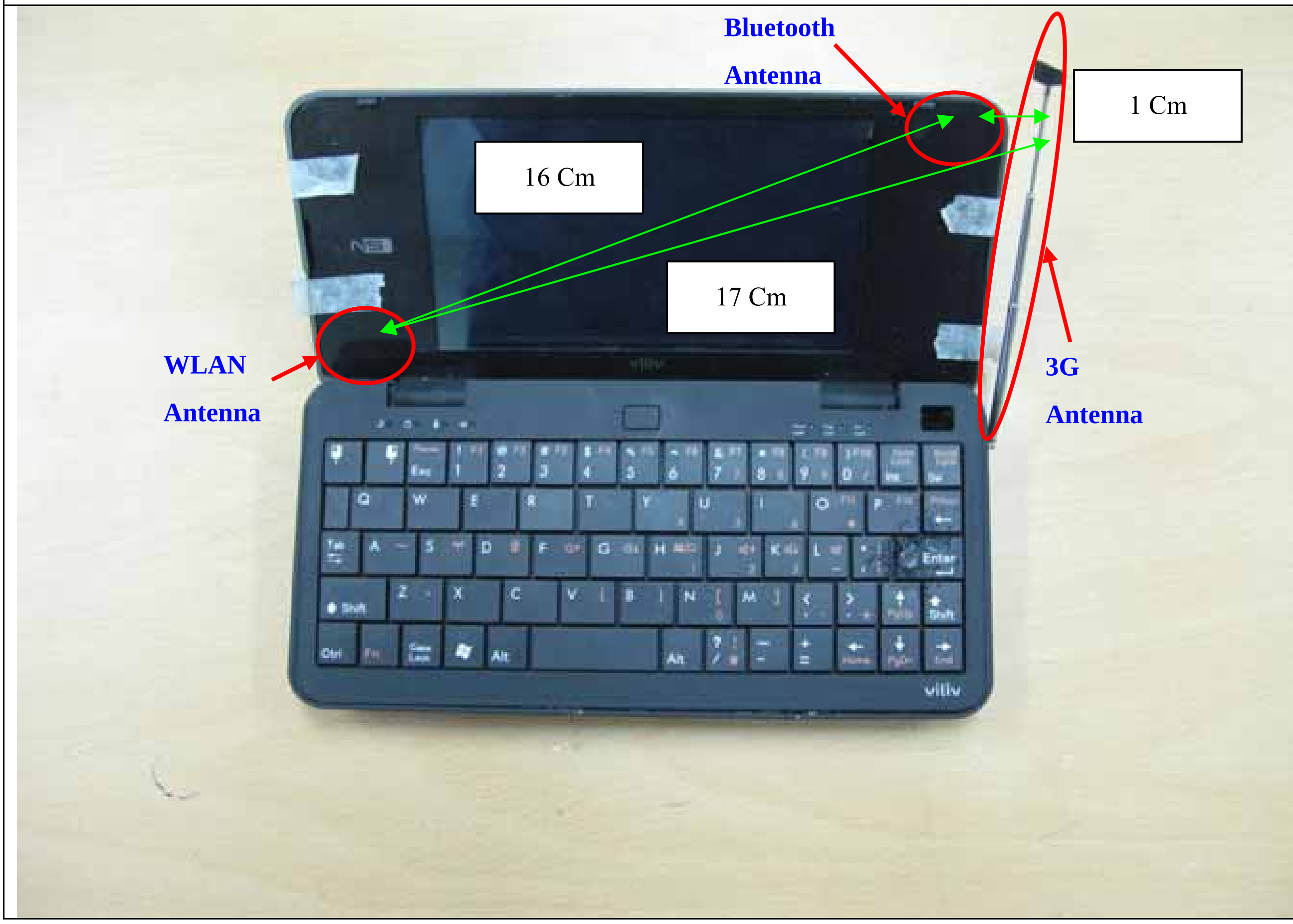
Band		βc	βd	△ACK, △NACK, △CQI	**MPR**
WCDMA V (HSDPA Active)	Sub-test 1	2	15	8	0
	Sub-test 2	12	15	8	0
	Sub-test 3	15	8	8	0.5
	Sub-test 4	15	4	8	0.5

Band	Mode	Channel	Frequency(MHz)	Conducted Power(dBm)
WCDMA II (RMC)	RMC	9262	1852.4	**21.65**
	RMC	9400	1880.0	**21.68**
	RMC	9538	1907.6	**21.66**
WCDMA II (HSDPA Active)	Sub-test 1	9262	1852.4	21.64
		9400	1880.0	21.66
		9538	1907.6	21.63
	Sub-test 2	9262	1852.4	21.59
		9400	1880.0	21.65
		9538	1907.6	21.62
	Sub-test 3	9262	1852.4	21.57
		9400	1880.0	21.63
		9538	1907.6	21.61
	Sub-test 4	9262	1852.4	21.56
		9400	1880.0	21.61
		9538	1907.6	21.60

Band		βc	βd	△ACK, △NACK, △CQI	**MPR**
WCDMA II (HSDPA Active)	Sub-test 1	2	15	8	0
	Sub-test 2	12	15	8	0
	Sub-test 3	15	8	8	0.5
	Sub-test 4	15	4	8	0.5

KDB 447498 & KDB616217 RF Exposure Assessments

ANT Location



Bluetooth-to-User = 80 mm, WLAN-to-User = 25 mm, 3G Antenna-to-User = 10 mm

WLAN-to-3G Antenna = 170 mm, WLAN-to-Bluetooth = 160 mm, 3G Antenna-to-Bluetooth = 10 mm

A. Individual SAR evaluation (Max)

- 802.11b at WLAN = 0.015 W/kg
- WCDMA V at 3G Antenna = 0.013 W/kg
- WCDMA II at 3G Antenna = 0.042 W/kg
- Individual SAR for Bluetooth is not required.

B. Individual output power

- Bluetooth output power = 2.07 mW
- WLAN output power = 74.99 mW
- WCDMA V output power = 152.05 mW
- WCDMA II output power = 147.23 mW

C. Simultaneously SAR consideration

Mode (f)	P (dBm)	P (mW)	Stand-alone SAR
WCDMA	21.82	152.05	Yes
802.11 b/g (2437)	18.75	74.99	Yes
Bluetooth (BDR)	3.17	2.07	No

(Measured time-averaging power value with power meter)

Mode pair	D_{xy} (cm)	The sum of all 1g SAR	Simultaneous Tx SAR	Notes
WCDMA & 802.11 b/g	17	0.042 + 0.015 = **0.057**	No	d_{xy} > 5 cm, the sum of all 1g SAR < 1.6 W/kg

** All of antennas in this device is not operated simultaneously

Ambient Temperature (°C)	22.1
Liquid Temperature (°C)	22.1
Date	2010-05-19

WCDMA V Body SAR

Test Mode	EUT Position	Traffic Channel		Power Drift(dB)	1 g SAR (W/kg)	1 g SAR Limits (W/kg)
		Frequency (MHz)	Channel			
RMC	Normal Antenna (a)	836.4	4182	0.186	**0.013**	1.6
	Antenna 1 step (b)	836.4	4182	-0.180	0.00359	
	Antenna 2 step (c)	836.4	4182	0.144	0.00813	
	Horizontal Antenna (d)	836.4	4182	-0.088	0.00598	
	Vertical Antenna (e)	836.4	4182	-0.153	0.00522	

<Note>

1. WCDMA RMC mode was tested under RMC 12.2 kbps configured in Test Loop Mode 1.
2. Body SAR is not measured in HSDPA mode because the maximum average output of each RF channel with HSDPA active is not at least 1/4 dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is not above 75 % of the SAR limit.
3. Justification for reduced test configuration : Per FCC/OET Bulletin 65 Supplement C [July 2001], if the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channel is optional for such test configurations.
4. (a), (b), (c), (d), (e) : These test positions are shown the below set up pictures. Please refer to the pictures.

Ambient Temperature (°C)	22.1
Liquid Temperature (°C)	22.1
Date	2010-05-19

WCDMA II Body SAR

Test Mode	EUT Position	Traffic Channel		Power Drift(dB)	1 g SAR (W/kg)	1 g SAR Limits (W/kg)
		Frequency (MHz)	Channel			
RMC	Normal Antenna (a)	1880.0	9400	0.162	**0.042**	1.6
	Antenna 1 step (b)	1880.0	9400	0.145	0.020	
	Antenna 2 step (c)	1880.0	9400	0.025	0.015	
	Horizontal Antenna (d)	1880.0	9400	0.128	0.031	
	Vertical Antenna (e)	1880.0	9400	0.162	0.042	

<Note>

1. WCDMA RMC mode was tested under RMC 12.2 kbps configured in Test Loop Mode 1.
2. Body SAR is not measured in HSDPA mode because the maximum average output of each RF channel with HSDPA active is not at least 1/4 dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is not above 75 % of the SAR limit.
3. Justification for reduced test configuration : Per FCC/OET Bulletin 65 Supplement C [July 2001], if the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channel is optional for such test configurations.
4. (a), (b), (c), (d), (e) : These test positions are shown the below set up pictures. Please refer to the pictures.

Appendix

List

Appendix A	Photographs	- EUT - Test Setup
Appendix B	DASY4 Report (Plots of the SAR Measurements)	- 850 MHz, 1900 MHz Validation Test - WCDMA V Test - WCDMA II Test
Appendix C	Uncertainty Analysis	
Appendix D	Calibration Certificate	- PROBE - DAE - DIPOLE

Appendix A

EUT Photographs

Front View of EUT

Rear View of EUT

Right View of EUT

Left View of EUT

Top View of EUT

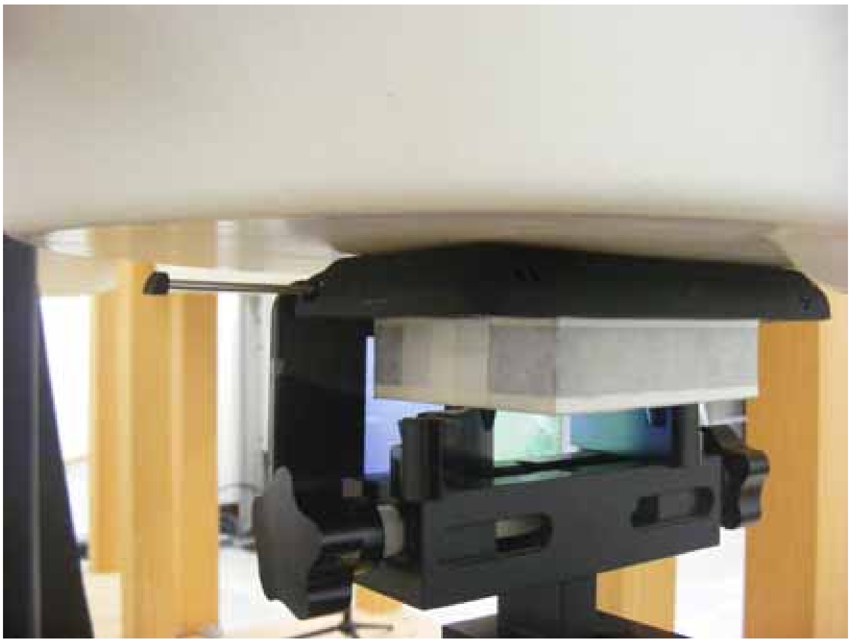
Bottom View of EUT

Display open View of EUT

Test Setup Photographs

(a) Normal Antenna

(b) Antenna 1 step



(c) Antenna 2 step

(d) Horizontal Antenna

(e) Vertical Antenna

Appendix B

Test Plot - DASY4 Report

835 MHz Validation Test

Test Laboratory: SGS Testing Korea
File Name: Validation850.da4

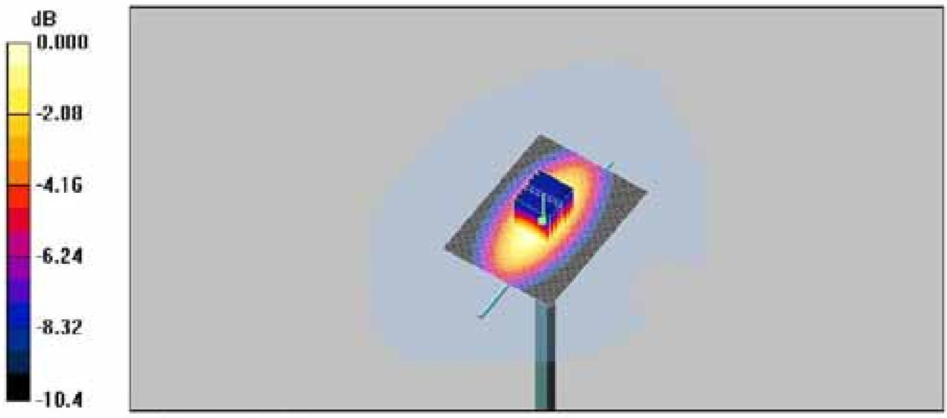
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:490
Program Name: Validation 835

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; $\sigma = 0.882$ mho/m; $\varepsilon_r = 41.3$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(6.26, 6.26, 6.26); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

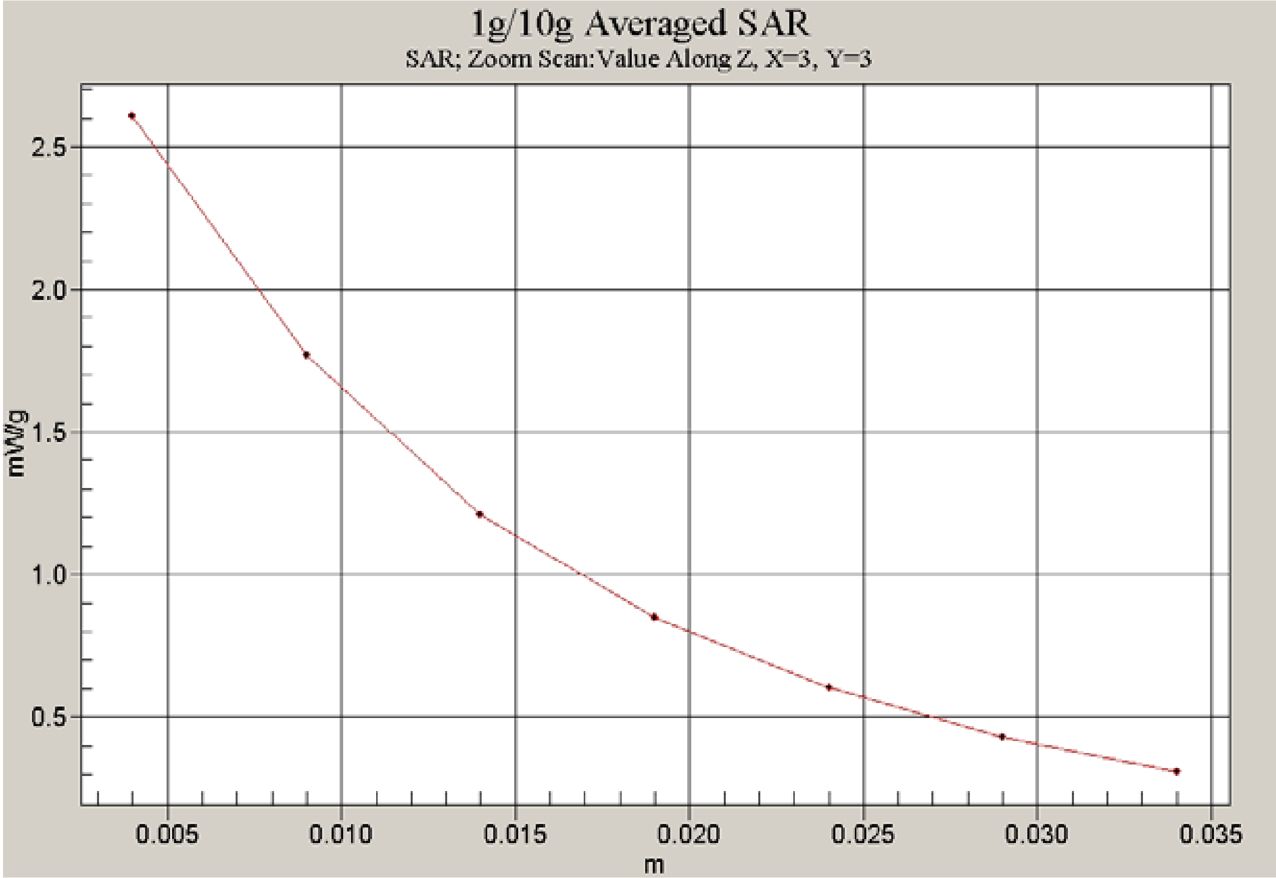
Validation 835/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.60 mW/g

Validation 835/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.1 V/m; Power Drift = -0.017 dB
Peak SAR (extrapolated) = 3.53 W/kg
SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.59 mW/g
Maximum value of SAR (measured) = 2.61 mW/g



0 dB = 2.61mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=3, Y=3
mW/g
2.5
2.0
1.5
1.0
0.5
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

1900 MHz Validation Test

Test Laboratory: SGS Testing Korea
File Name: Validation1900.da4

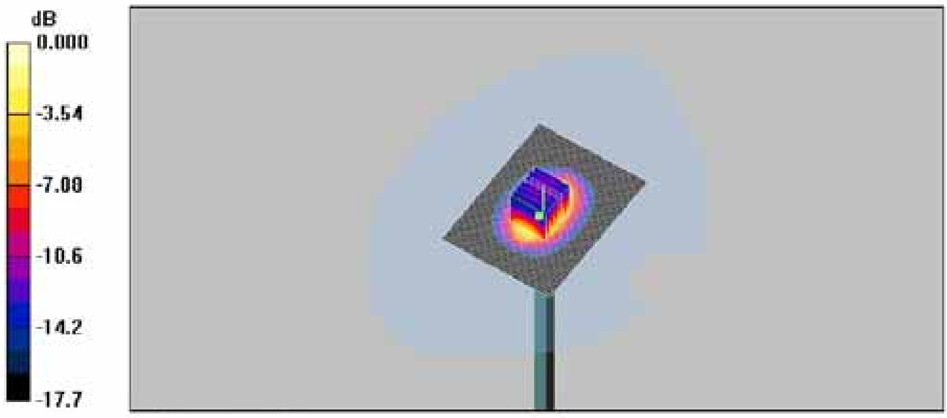
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d033
Program Name: Validation1900

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.46 mho/m; ε_r = 39.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(5.04, 5.04, 5.04); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

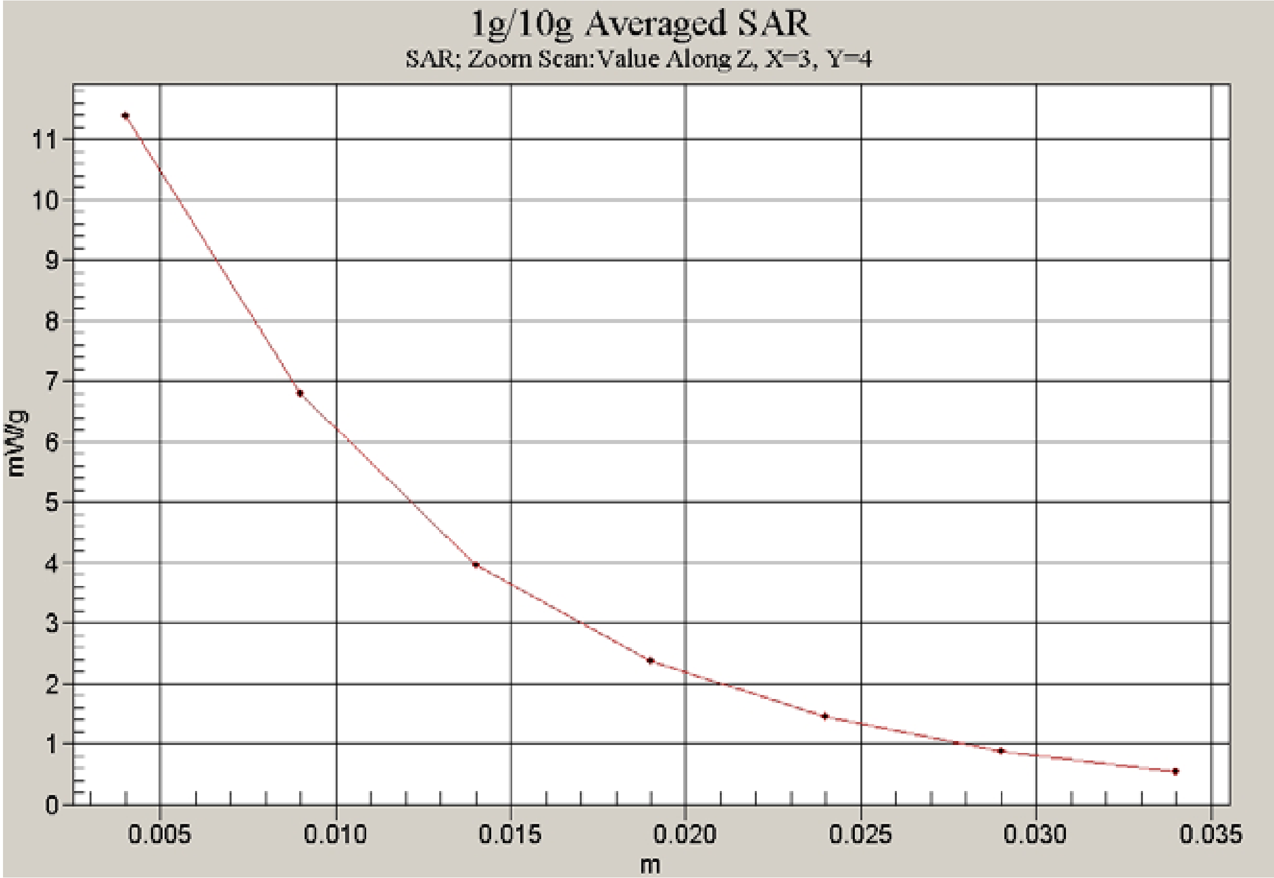
Validation1900/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.7 mW/g

Validation1900/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.1 V/m; Power Drift = -0.027 dB
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.4 mW/g
Maximum value of SAR (measured) = 11.4 mW/g



0 dB = 11.4mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=3, Y=4
mW/g
0
1
2
3
4
5
6
7
8
9
10
11
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

WCDMA V Body SAR Test

Test Laboratory: SGS Testing Korea
File Name: WCDMA V_Normal Ant..da4

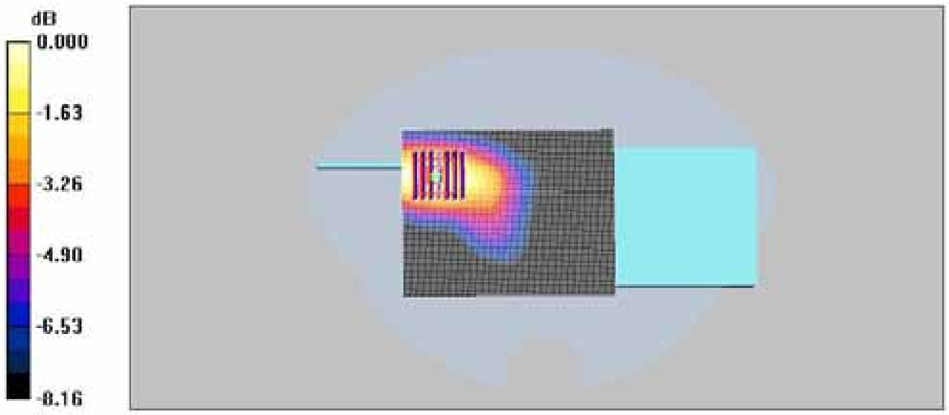
DUT: N5; Type: MID; Serial: N/A
Program Name: WCDMA V_Body

Communication System: WCDMA V; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma = 0.975$ mho/m; $\varepsilon_r = 53.4$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(6.11, 6.11, 6.11); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

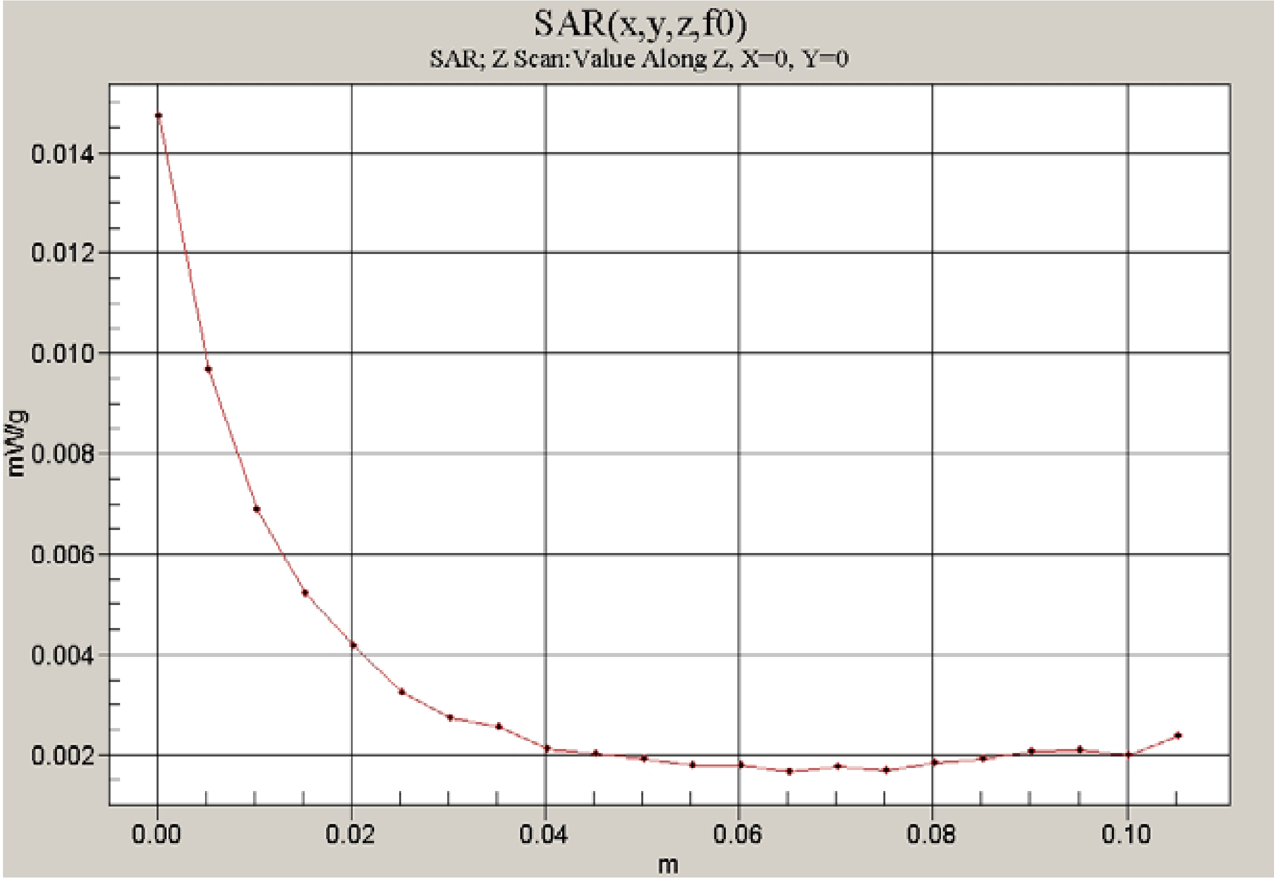
WCDMA V_Mid_Normal Ant./Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.015 mW/g

WCDMA V_Mid_Normal Ant./Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.50 V/m; Power Drift = 0.186 dB
Peak SAR (extrapolated) = 0.019 W/kg
SAR(1 g) = 0.013 mW/g; SAR(10 g) = 0.00912 mW/g
Maximum value of SAR (measured) = 0.014 mW/g



0 dB = 0.014mW/g

Z Scan


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.00
0.02
0.04
0.06
0.08
0.10
m

Test Laboratory: SGS Testing Korea
File Name: WCDMA V_Ant 1 Step..da4

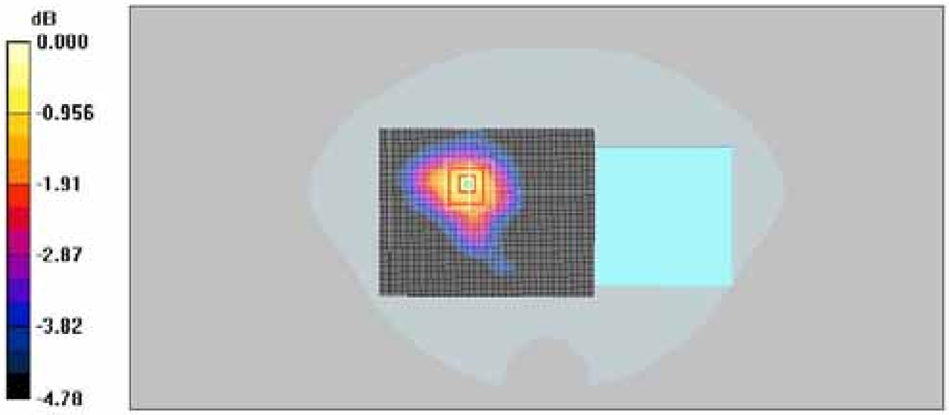
DUT: N5; Type: MID; Serial: N/A
Program Name: WCDMA V_Body

Communication System: WCDMA V; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma = 0.975$ mho/m; $\varepsilon_r = 53.4$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(6.11, 6.11, 6.11); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WCDMA V_Mid_Ant 1 Step/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.004 mW/g

WCDMA V_Mid_Ant 1 Step/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.976 V/m; Power Drift = -0.180 dB
Peak SAR (extrapolated) = 0.005 W/kg
SAR(1 g) = 0.00359 mW/g; SAR(10 g) = 0.00275 mW/g
Maximum value of SAR (measured) = 0.004 mW/g



0 dB = 0.004mW/g

Test Laboratory: SGS Testing Korea
File Name: WCDMA V_Ant 2 Step..da4

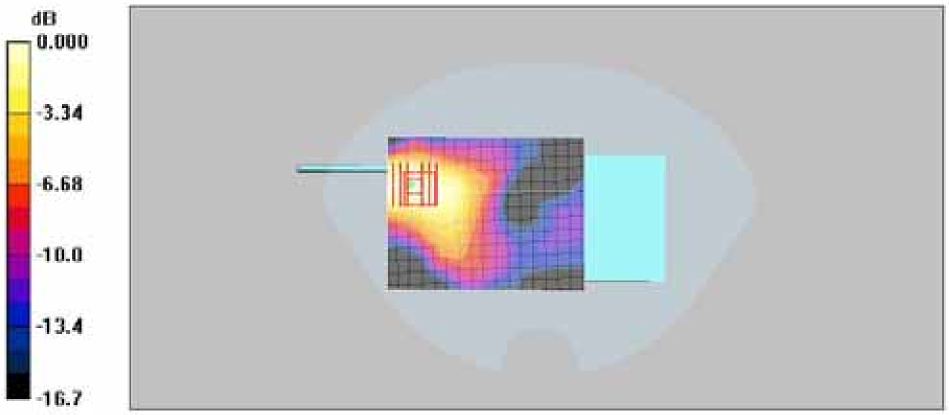
DUT: N5; Type: MID; Serial: N/A
Program Name: WCDMA V_Body

Communication System: WCDMA V; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.975 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(6.11, 6.11, 6.11); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WCDMA V_Mid_Ant 2 Step/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.009 mW/g

WCDMA V_Mid_Ant 2 Step/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.637 V/m; Power Drift = 0.144 dB
Peak SAR (extrapolated) = 0.013 W/kg
SAR(1 g) = 0.00813 mW/g; SAR(10 g) = 0.00517 mW/g
Maximum value of SAR (measured) = 0.009 mW/g



0 dB = 0.009mW/g

Test Laboratory: SGS Testing Korea
File Name: WCDMA V_Horizontal Ant.da4

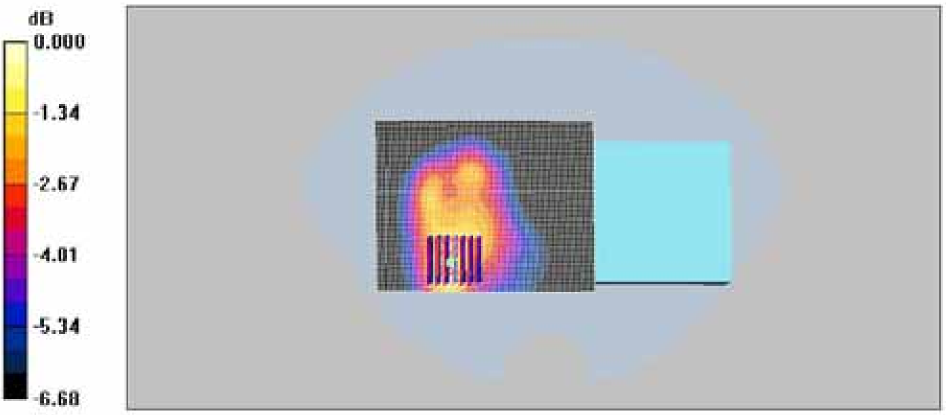
DUT: N5; Type: MID; Serial: N/A
Program Name: WCDMA V_Body

Communication System: WCDMA V; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.975 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(6.11, 6.11, 6.11); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WCDMA V_Mid_Horizontal Ant./Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.006 mW/g

WCDMA V_Mid_Horizontal Ant./Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.27 V/m; Power Drift = -0.088 dB
Peak SAR (extrapolated) = 0.009 W/kg
SAR(1 g) = 0.00598 mW/g; SAR(10 g) = 0.00437 mW/g
Maximum value of SAR (measured) = 0.007 mW/g



0 dB = 0.007mW/g

Test Laboratory: SGS Testing Korea
File Name: WCDMA V_Vertical Ant..da4

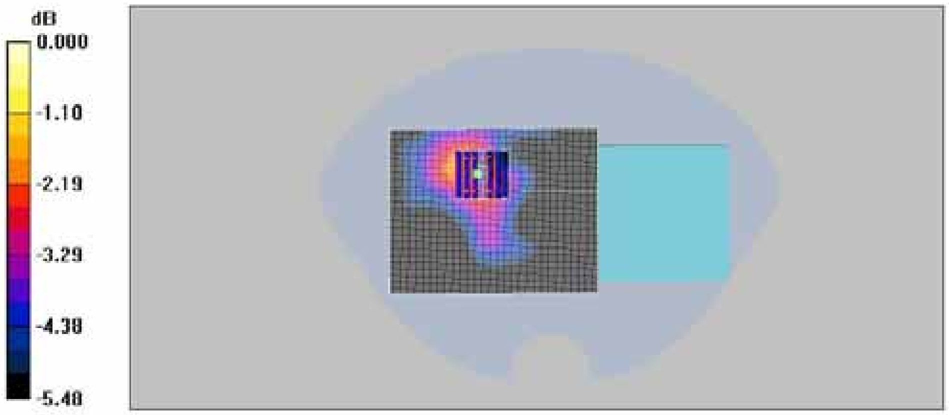
DUT: N5; Type: MID; Serial: N/A
Program Name: WCDMA V_Body

Communication System: WCDMA V; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.975 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(6.11, 6.11, 6.11); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WCDMA V_Mid_Vertical Ant./Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.005 mW/g

WCDMA V_Mid_Vertical Ant./Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.19 V/m; Power Drift = -0.153 dB
Peak SAR (extrapolated) = 0.009 W/kg
SAR(1 g) = 0.00522 mW/g; SAR(10 g) = 0.00356 mW/g
Maximum value of SAR (measured) = 0.006 mW/g



0 dB = 0.006mW/g

WCDMA II Body SAR Test

Test Laboratory: SGS Testing Korea
File Name: WCDMA II_Normal Ant..da4

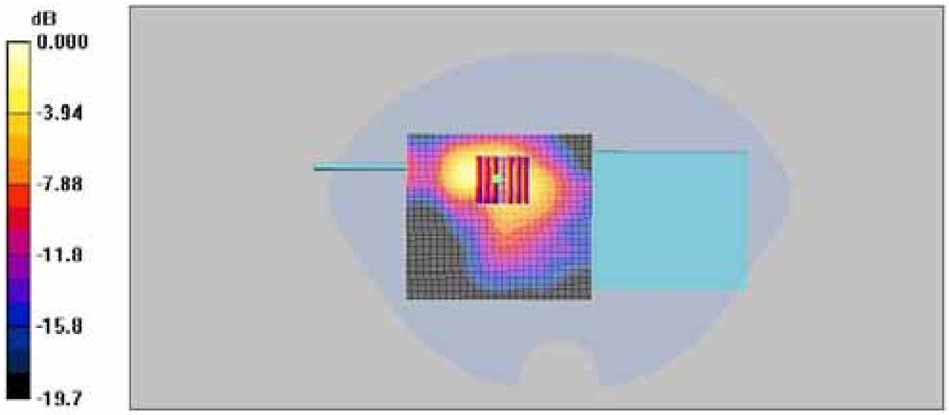
DUT: N5; Type: MID; Serial: N/A
Program Name: WCDMA II_Body

Communication System: W-CDMA II; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.5 mho/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(4.46, 4.46, 4.46); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

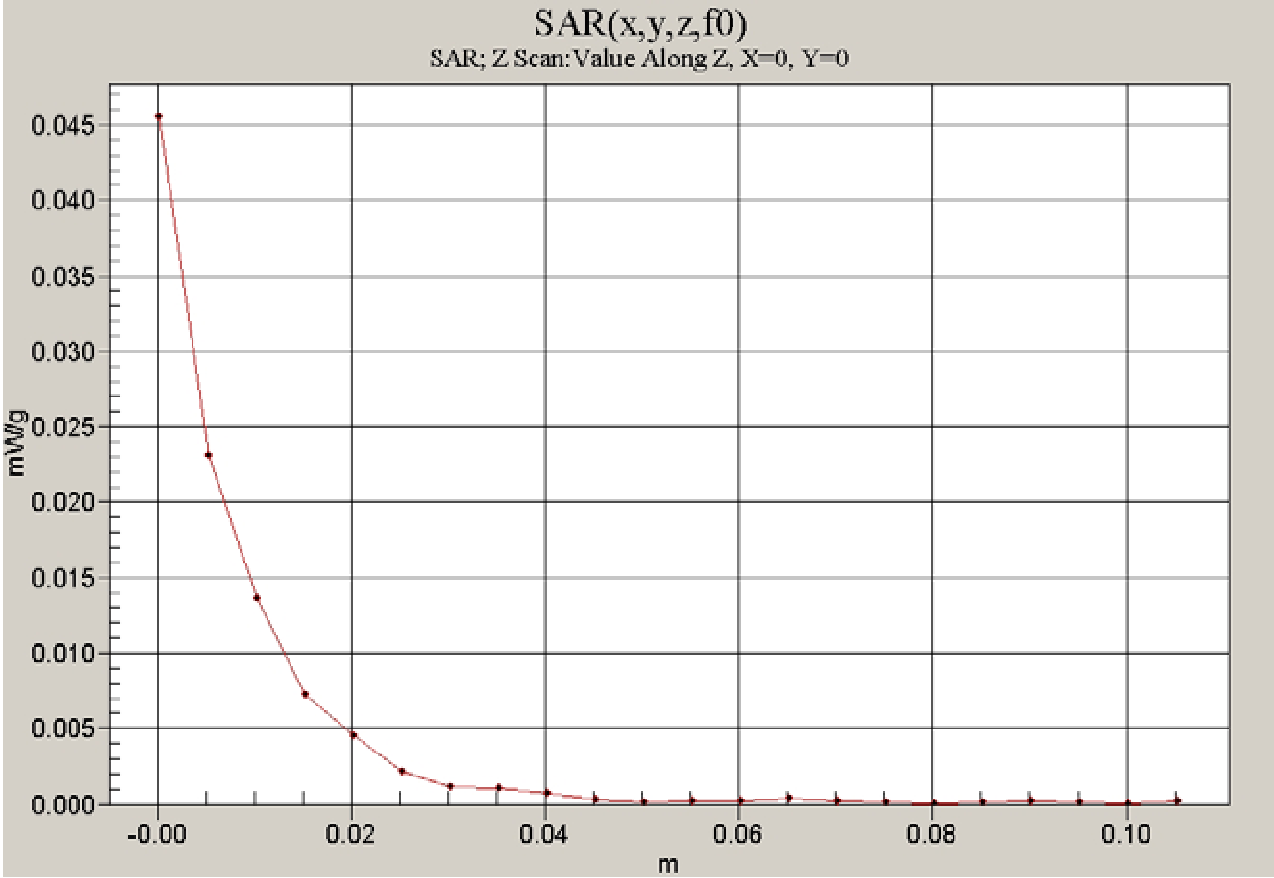
WCDMA II_Mid_Normal Ant./Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.046 mW/g

WCDMA II_Mid_Normal Ant./Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.58 V/m; Power Drift = 0.162 dB
Peak SAR (extrapolated) = 0.075 W/kg
SAR(1 g) = 0.042 mW/g; SAR(10 g) = 0.022 mW/g
Maximum value of SAR (measured) = 0.048 mW/g



0 dB = 0.048mW/g

Z Scan


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
-0.00
0.02
0.04
0.06
0.08
0.10
m

Test Laboratory: SGS Testing Korea
File Name: WCDMA II_Ant 1 Step..da4

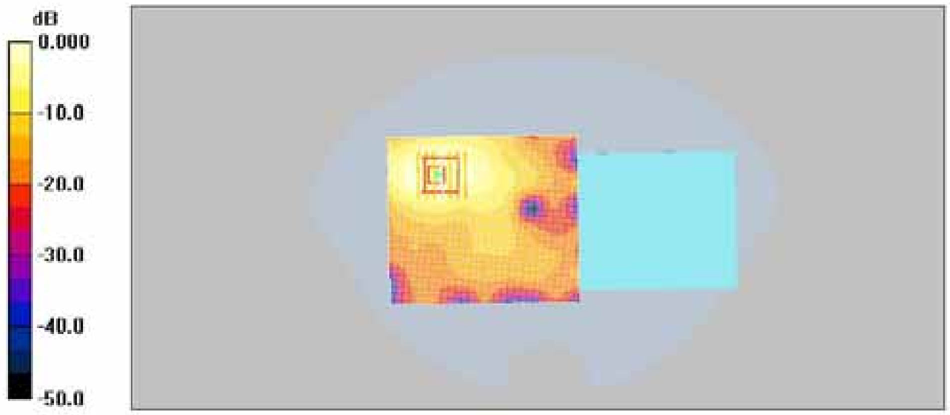
DUT: N5; Type: MID; Serial: N/A
Program Name: WCDMA II_Body

Communication System: W-CDMA II; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.5 mho/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(4.46, 4.46, 4.46); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WCDMA II_Mid_Ant 1 Step/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.022 mW/g

WCDMA II_Mid_Ant 1 Step/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.268 V/m; Power Drift = 0.145 dB
Peak SAR (extrapolated) = 0.033 W/kg
SAR(1 g) = 0.020 mW/g; SAR(10 g) = 0.011 mW/g
Maximum value of SAR (measured) = 0.022 mW/g



0 dB = 0.022mW/g

Test Laboratory: SGS Testing Korea
File Name: WCDMA II_Ant 2 Step..da4

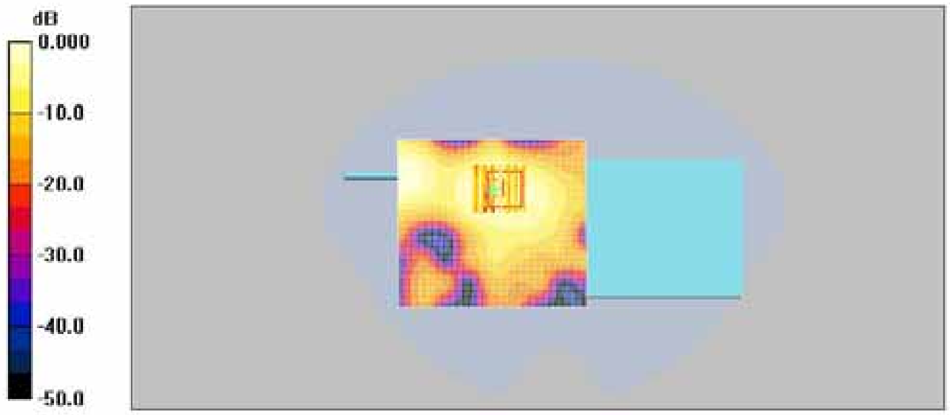
DUT: N5; Type: MID; Serial: N/A
Program Name: WCDMA II_Body

Communication System: W-CDMA II; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.5 mho/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(4.46, 4.46, 4.46); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WCDMA II_Mid_Ant 2 Step/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.019 mW/g

WCDMA II_Mid_Ant 2 Step/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.20 V/m; Power Drift = 0.025 dB
Peak SAR (extrapolated) = 0.026 W/kg
SAR(1 g) = 0.015 mW/g; SAR(10 g) = 0.00795 mW/g
Maximum value of SAR (measured) = 0.018 mW/g



0 dB = 0.018mW/g

Test Laboratory: SGS Testing Korea
File Name: WCDMA II_Horizontal Ant..da4

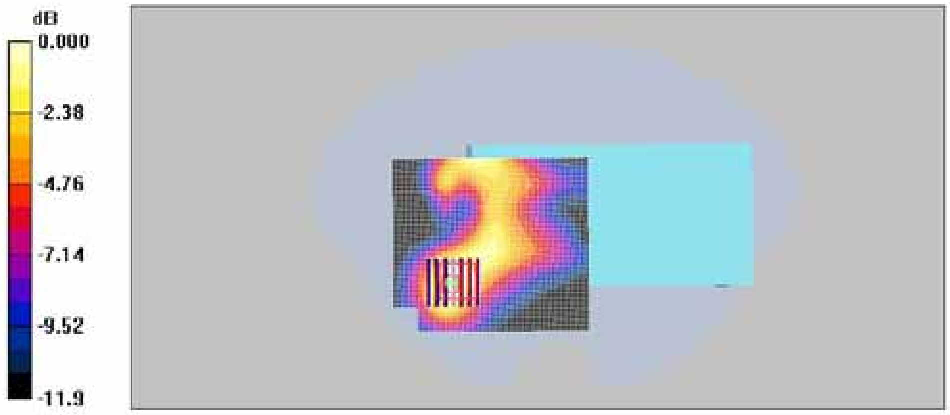
DUT: N5; Type: MID; Serial: N/A
Program Name: WCDMA II_Body

Communication System: W-CDMA II; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.5 mho/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(4.46, 4.46, 4.46); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WCDMA II_Mid_Horizontal Ant./Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.036 mW/g

WCDMA II_Mid_Horizontal Ant./Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.70 V/m; Power Drift = 0.128 dB
Peak SAR (extrapolated) = 0.044 W/kg
SAR(1 g) = 0.031 mW/g; SAR(10 g) = 0.019 mW/g
Maximum value of SAR (measured) = 0.034 mW/g



0 dB = 0.034mW/g

Test Laboratory: SGS Testing Korea
File Name: WCDMA II_Vertical Ant..da4

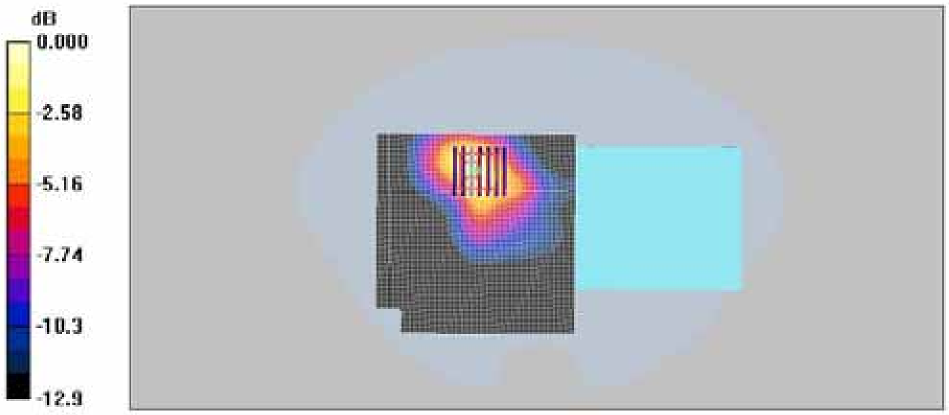
DUT: N5; Type: MID; Serial: N/A
Program Name: WCDMA II_Body

Communication System: W-CDMA II; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.5 mho/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(4.46, 4.46, 4.46); Calibrated: 2010-04-28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2009-12-09
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WCDMA II_Mid_Vertical Ant./Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.043 mW/g

WCDMA II_Mid_Vertical Ant./Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.74 V/m; Power Drift = 0.189 dB
Peak SAR (extrapolated) = 0.072 W/kg
SAR(1 g) = 0.042 mW/g; SAR(10 g) = 0.022 mW/g
Maximum value of SAR (measured) = 0.048 mW/g



0 dB = 0.048mW/g

Appendix C

Uncertainty Analysis

a	b	c	d	e = f(d,k)	g	i = cxg/e	k
Uncertainty Component	Section in P1528	Tol (%)	Prob . Dist.	Div.	Ci (1g)	1g ui (%)	Vi (Veff)
Probe calibration	E.2.1	6.3	N	1	1	6.30	∞
Axial isotropy	E.2.2	0.5	R	1.73	0.71	0.20	∞
hemispherical isotropy	E.2.2	2.6	R	1.73	0.71	1.06	∞
Boundary effect	E.2.3	0.8	R	1.73	1	0.46	∞
Linearity	E.2.4	0.6	R	1.73	1	0.35	∞
System detection limit	E.2.5	0.25	R	1.73	1	0.14	∞
Readout electronics	E.2.6	0.3	N	1	1	0.30	∞
Response time	E.2.7	0	R	1.73	1	0.00	∞
Integration time	E.2.8	2.6	R	1.73	1	1.50	∞
RF ambient Condition - Noise	E.6.1	3	R	1.73	1	1.73	∞
RF ambient Condition - reflections	E.6.1	3	R	1.73	1	1.73	∞
Probe positioning - mechanical tolerance	E.6.2	1.5	R	1.73	1	0.87	∞
Probe positioning - with respect to phantom	E.6.3	2.9	R	1.73	1	1.67	∞
Max. SAR evaluation	E.5.2	1	R	1.73	1	0.58	∞
Test sample positioning	E.4.2	2.3	N	1	1	2.30	9
Device holder uncertainty	E.4.1	3.6	N	1	1	3.60	∞
Output power variation - SAR drift measurement	6.62	5	R	1.73	1	2.89	∞
Phantom uncertainty (shape and thickness tolerances)	E.3.1	4	R	1.73	1	2.31	∞
Liquid conductivity - deviation from target values	E.3.2	5	R	1.73	0.64	1.85	∞
Liquid conductivity - measurement uncertainty	E.3.2	1.2	N	1	0.64	0.77	5
Liquid permittivity - deviation from target values	E.3.3	5	R	1.73	0.6	1.73	∞
Liquid permittivity - measurement uncertainty	E.3.3	1.1	N	1	0.6	0.66	5
Combined standard uncertainty				RSS		9.63	2754
Expanded uncertainty (95% CONFIDENCE INTERVAL)				K=2		19.27	

Appendix D

Calibration Certificate

- PROBE
- DAE
- 835 MHz, 1900 MHz DIPOLE

- PROBE Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-KES (Dymstec)**

Certificate No: **ET3-1782_Apr10**

CALIBRATION CERTIFICATE

Object: ET3DV6 - SN:1782

Calibration procedure(s): QA CAL-01.v6, QA CAL-12.v6, QA CAL-23.v3 and QA CAL-25.v2
Calibration procedure for dosimetric E-field probes

Calibration date: April 28, 2010

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 28, 2010

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: ET3-1782_Apr10 Page 1 of 11

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

ilac-MRA

SWISS CALIBRATION

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ET3DV6

SN:1782

Manufactured:	April 15, 2003
Last calibrated:	April 30, 2009
Modified:	April 27, 2010
Recalibrated:	April 28, 2010

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1782

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	2.01	1.74	1.86	± 10.1%
DCP (mV)[B]	93.9	96.4	91.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300.0	± 1.5%
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).

[B] Numerical linearization parameter: uncertainty not required.

[E] Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

DASY - Parameters of Probe: ET3DV6 SN:1782

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	43.5 ± 5%	0.87 ± 5%	6.67	6.67	6.67	0.19	2.19 ± 13.3%
835	± 50 / ± 100	41.9 ± 5%	0.89 ± 5%	6.26	6.26	6.26	0.51	2.05 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	5.30	5.30	5.30	0.53	2.60 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	5.04	5.04	5.04	0.69	2.24 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	4.48	4.48	4.48	0.99	1.71 ± 11.0%

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

DASY - Parameters of Probe: ET3DV6 SN:1782

Calibration Parameter Determined in Body Tissue Simulating Media

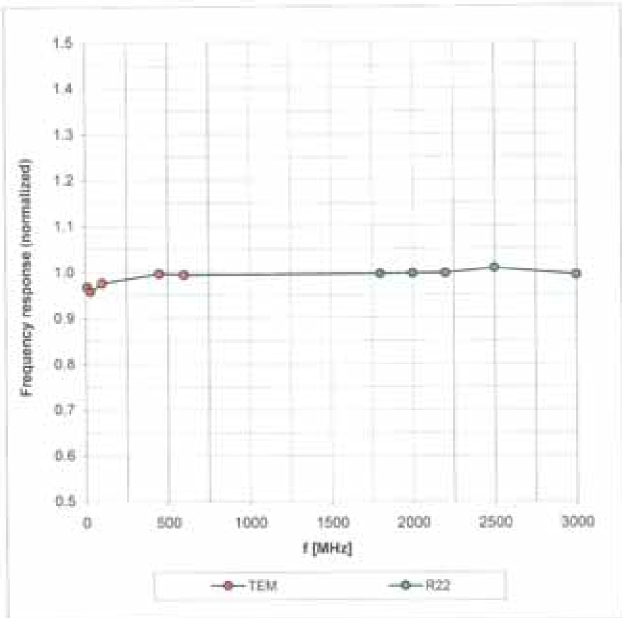
f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	56.7 ± 5%	0.94 ± 5%	7.53	7.53	7.53	0.15	2.33 ± 13.3%
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	6.11	6.11	6.11	0.42	2.40 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	4.68	4.68	4.68	0.63	3.03 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.46	4.46	4.46	0.85	2.44 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	4.07	4.07	4.07	0.99	1.40 ± 11.0%

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1782 April 28, 2010

Frequency Response of E-Field

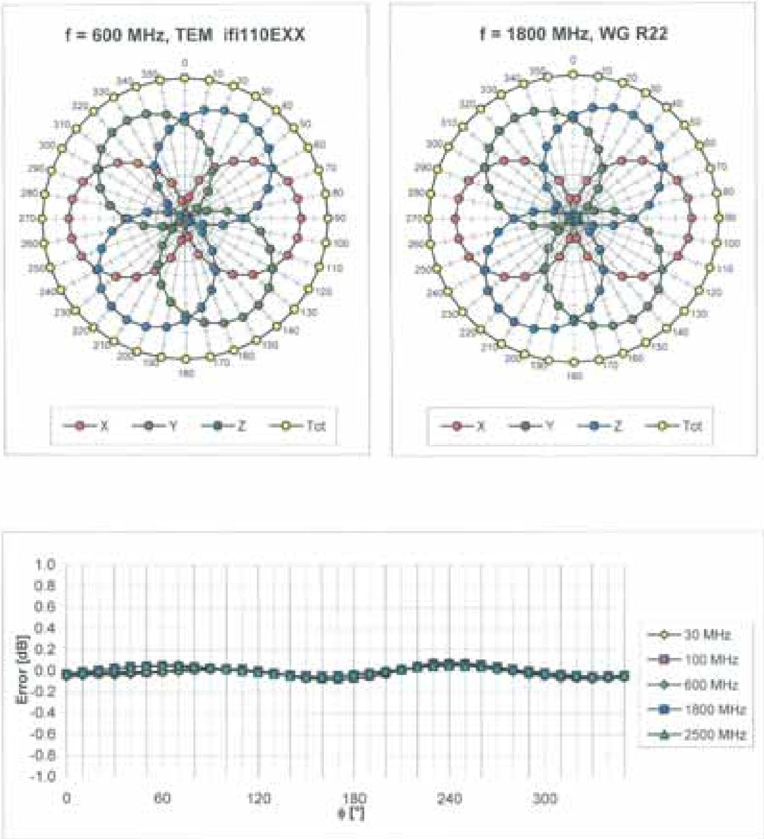
(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

ET3DV6 SN:1782 April 28, 2010

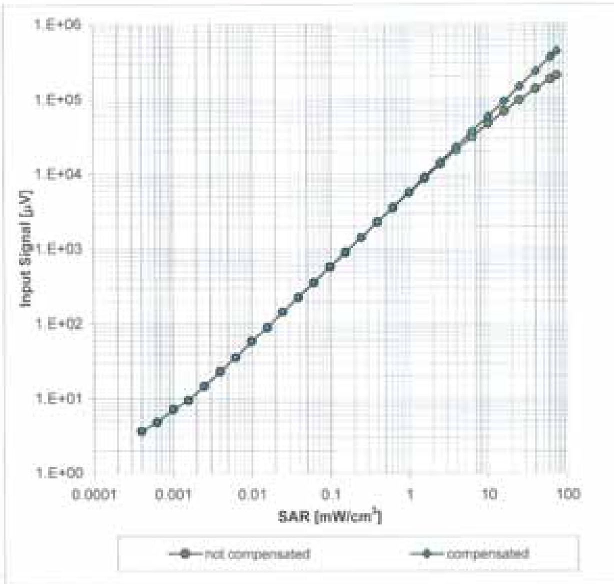
Receiving Pattern (ϕ), $\vartheta = 0°$

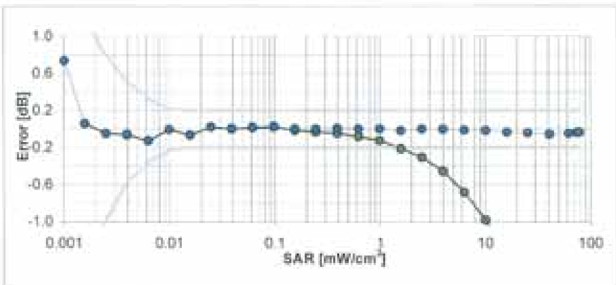


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)

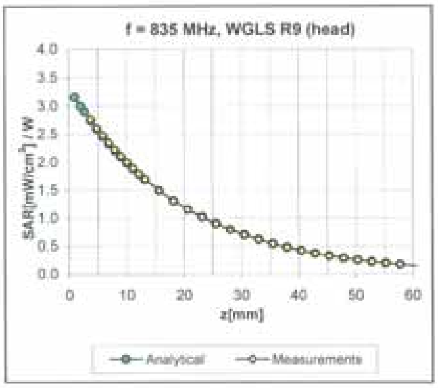


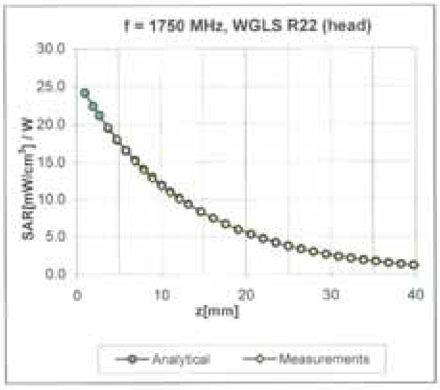


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ET3DV6 SN:1782 April 28, 2010

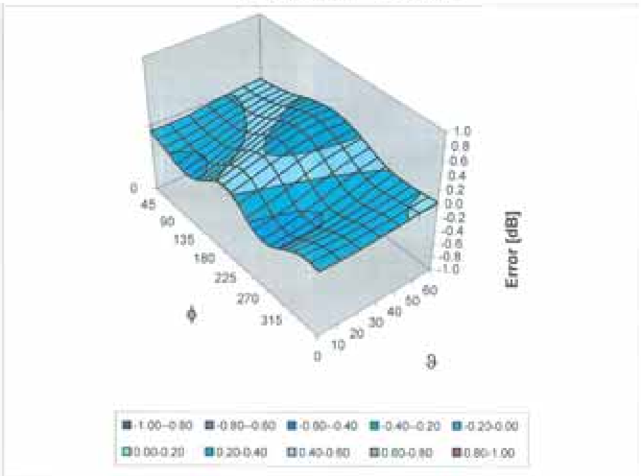
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

-DAE Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client SGS KES

Certificate No: DAE3-567_Dec09

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 567
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	December 9, 2009

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	1-Oct-09 (No: 9055)	Oct-10
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	05-Jun-09 (in house check)	In house check: Jun-10

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	R&D Director	i.V.

Issued: December 9, 2009

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.546 ± 0.1% (k=2)	404.281 ± 0.1% (k=2)	404.334 ± 0.1% (k=2)
Low Range	3.96697 ± 0.7% (k=2)	3.97066 ± 0.7% (k=2)	3.95911 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	7.5 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200002.8	-1.89	-0.00
Channel X	+ Input	19998.11	-1.59	-0.01
Channel X	- Input	-19992.89	7.71	-0.04
Channel Y	+ Input	199957.5	-46.16	-0.02
Channel Y	+ Input	19992.42	-7.98	-0.04
Channel Y	- Input	-19994.34	4.96	-0.02
Channel Z	+ Input	199931.6	-61.88	-0.03
Channel Z	+ Input	19990.70	-8.50	-0.04
Channel Z	- Input	-19992.89	-0.04	-0.04

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.7	0.61	0.03
Channel X	+ Input	199.14	-0.86	-0.43
Channel X	- Input	-200.82	-0.72	0.36
Channel Y	+ Input	2000.0	-0.11	-0.01
Channel Y	+ Input	198.97	-1.13	-0.56
Channel Y	- Input	-201.08	-1.18	0.59
Channel Z	+ Input	1999.4	-0.87	-0.04
Channel Z	+ Input	198.62	-1.48	-0.74
Channel Z	- Input	-201.26	-1.36	0.68

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	3.98	2.30
	- 200	-0.74	-2.83
Channel Y	200	-0.27	-0.39
	- 200	-0.32	-0.95
Channel Z	200	4.97	4.65
	- 200	-6.07	-6.68

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	1.57	-1.52
Channel Y	200	3.06	-	3.39
Channel Z	200	3.26	-0.28	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16355	16407
Channel Y	16166	16176
Channel Z	15925	16100

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.19	-1.19	0.58	0.37
Channel Y	-0.59	-1.52	0.73	0.36
Channel Z	-1.05	-2.18	-0.05	0.34

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	203.2
Channel Y	0.1999	202.8
Channel Z	0.1999	201.0

8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9

- 835 MHz Dipole Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client SGS KES (Dymstec)

Certificate No: D835V2-490_Aug09

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 490
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	August 24, 2009
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	M Meili
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 26, 2009

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "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", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.2 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature during test	(22.2 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.41 mW / g
SAR normalized	normalized to 1W	9.64 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**9.63 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 mW / g
SAR normalized	normalized to 1W	6.32 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**6.31 mW /g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.6 Ω - 5.6 jΩ
Return Loss	- 25.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.380 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 19, 2003

DASY5 Validation Report for Head TSL

Date/Time: 24.08.2009 12:36:38

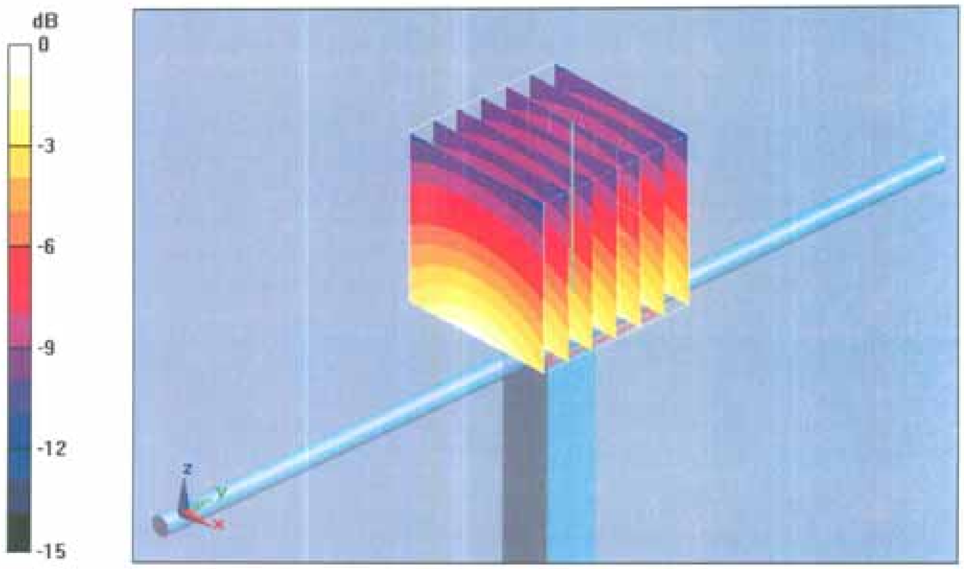
Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:490

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL 900 MHz
Medium parameters used: f = 835 MHz; $\sigma = 0.9$ mho/m; $\varepsilon_r = 41.3$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

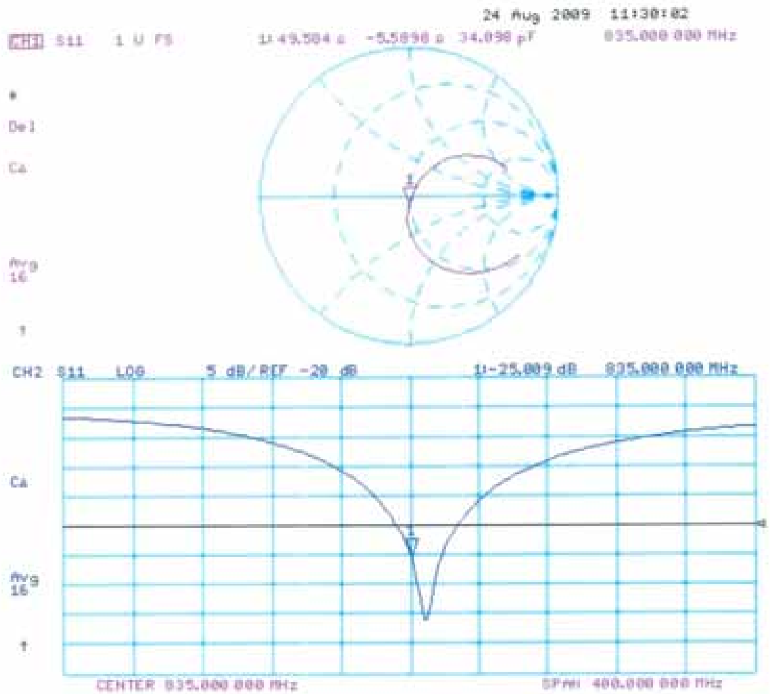
- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin=250mW; dip=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.5 V/m; Power Drift = 0.00948 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.58 mW/g
Maximum value of SAR (measured) = 2.82 mW/g



0 dB = 2.82mW/g

Impedance Measurement Plot for Head TSL



- 1900 MHz Dipole Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS KES (Dymstec)**

Certificate No: **D1900V2-5d033-Aug09**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d033
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	August 25, 2009
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 26, 2009

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "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", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.8 ± 6 %	1.45 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	250 mW input power	10.0 mW / g
SAR normalized	normalized to 1W	40.0 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**39.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.21 mW / g
SAR normalized	normalized to 1W	20.8 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**20.7 mW / g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.3 Ω + 2.7 jΩ
Return Loss	- 30.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.205 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 17, 2003

DASY5 Validation Report for Head TSL

Date/Time: 25.08.2009 11:37:38

Test Laboratory: SPEAG, Zurich, Switzerland

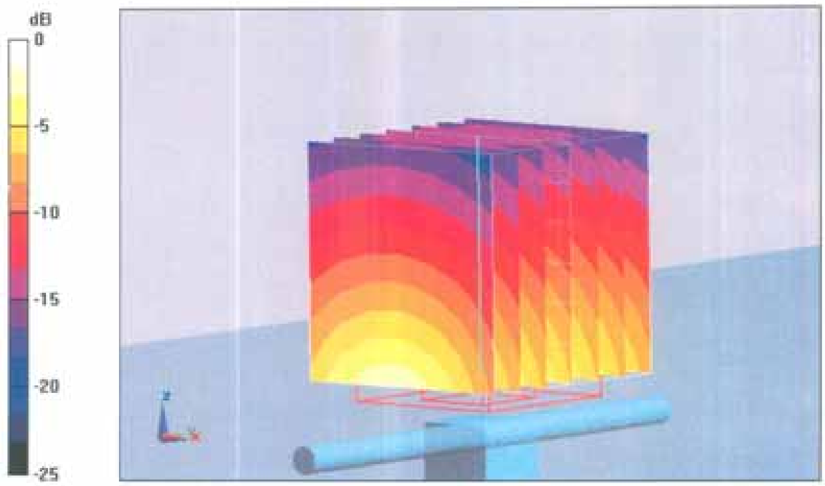
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d033

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 1900 MHz; σ = 1.45 mho/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; dip = 10 mm/Zoom Scan (dist=3.0 mm, probe 0deg) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96 V/m; Power Drift = 0.015 dB
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 10 mW/g; SAR(10 g) = 5.21 mW/g
Maximum value of SAR (measured) = 12.5 mW/g



0 dB = 12.5mW/g

Impedance Measurement Plot for Head TSL