SAR TEST REPORT

Report Reference No.................... :	**JTT20151100309**	
FCC ID.. :	**2AEP7N502**	
Compiled by (position+printed name+signature)..:	File administrators Kevin Liu	kevin . Liu
Supervised by (position+printed name+signature)..:	Project Engineer Kevin Liu	kevin . Liu
Approved by (position+printed name+signature)..:	RF Manager Eric Wang	Eric Wang
Date of issue....................................:	Nov. 18, 2015	
Representative Laboratory Name .:	**SHENZHEN JIETONG INFORMATION TECHNOLOGY CO., LTD**	
Address..:	No.12 Building Shangsha, Innovation & Technology Park, Futian District, Shenzhen, P.R.China	
Testing Laboratory Name ....:	**Shenzhen Academy of Metrology and Quality Inspection**	
Address..:	No.4 TongFa Road, Xili TownNanshan District, Shenzhen, China	
Applicant's name ....:	**HYUNDAI CORPORATION**	
Address..:	140-2, Kye-dong, Chongro-ku, Seoul, South Korea	
Test specification .... :		
Standard ....:	**ANSI C95.1–1999** **47CFR §2.1093**	
TRF Originator.................................:	**SHENZHEN JIETONG INFORMATION TECHNOLOGY CO., LTD**	

Test item description ....:	**Smart Phone**
Trade Mark ....:	NOBLEX
Manufacturer..................................:	**AMER MOBILE CO.,LIMITED**
Model/Type reference.......................:	N502
Listed Models ....:	/
Operation Frequency.........................	GSM 850/PCS1900,WCDMA Band II/V,LTE Band4/7,WLAN2.4G,Bluetooth
Modulation Type	GSM(GMSK,8PSK),WCDMA/HSDPA/HSUPA(QPSK),LTE(QPSK,16QAM),WIFI(DSSS,OFDM),Bluetooth(GFSK,8DPSK,Π/4DQPSK),
Hardware version ....:	E520_WMCK
Software version ....:	NOBLEX_L500C_V01_20150925
Rating ....:	DC 3.70V
Result..:	**PASS**

T E S T R E P O R T

Test Report No. :	JTT20151100309	Nov 18, 2015 Date of issue

Equipment under Test	:	Smart Phone
Model /Type	:	N502
Listed Models	:	N/A
Applicant	:	**Noblex Argentina S.A.**
Address	:	Jaramillo 3670 – CIUDAD AUTONOMA DE BUENOS AIRES – ARGENTINA
Manufacturer	:	**AMER MOBILE CO.,LIMITED**
Address	:	FLAT / RM 1903 ,19/F PODIUM PLAZA 5 HANOI ROAD TSIM SHA TSUI KL HONG KONG.

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

IEEE Std C95.1, 1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 KHz to 300 GHz. It specifies the maximum exposure limit of 1.6 W/kg as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.
IEEE Std 1528™-2013: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.
FCC Part 2.1093 Radiofrequency Radiation Exposure Evaluation:Portable Devices
KDB447498 D01 General RF Exposure Guidance v06 : RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices
KDB648474 D04, Handset SAR v01r03: SAR Evaluation Considerations for Wireless Handsets
KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04 : SAR Measurement Requirements for 100 MHz to 6 GHz
KDB865664 D02 RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations
KDB248227 D01 802.11 Wi-Fi SAR v02r02: SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS
KDB941225 D01 3G SAR Procedures v03r01: 3G SAR MEAUREMENT PROCEDURES
KDB 941225 D06 Hotspot Mode v02r01: SAR EVALUATION PROCEDURES FOR PORTABLE DEVICES WITH WIRELESS ROUTER CAPABILITIES
KDB941225 D05 SAR for LTE Devices v02r04: SAR Evaluation Considerations for LTE Devices

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Oct 20, 2015
Testing commenced on	:	Oct 21,2015
Testing concluded on	:	Oct 24,2015

2.2. Product Description

The **Noblex Argentina S.A.'s** Model: N502 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

General Description	
Model Number	N502
Modilation Type	GMSK for GSM/GPRS and 8PSK for EGPRS;QPSK for WCDMA;QPSK/16QAM for LTE;DSSS/OFDM for WIFI2.4G; GFSK/8DPSK/Π/4DQPSK for Bluetooth
Antenna Type	Internal
Device category	Portable Device
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Rated Vlotage	DC 3.70 Battery
Hotsopt	Supported, power not reduced when Hotspot open
The EUT is GSM,WCDMA,LTE, mobile phone. the mobile phone is intended for speech and Multimedia Message Service (MMS) transmission. It is equipped with GPRS/EDGE class 12 for GSM850, PCS1900, WCDMA Band II, Band V ,LTE Band4, Band7, and Bluetooth, WiFi, and camera functions. For more information see the following datasheet	

Technical Characteristics	
2G	
Support Networks	GSM, GPRS, EDGE
Support Band	GSM850/PCS1900
Frequency	GSM850: 824.2~848.8MHz GSM1900: 1850.2~1909.8MHz
Type of Modulation	GMSK, 8PSK
Antenna Type	Internal Antenna
GPRS/EDGE Class	Class 12
HSDPA UE Category	7
HSUPA UE Category	6
GSM Release Version	R99
GPRS operation mode	Class B
DTM Mode	Not Supported
3G	
Support Networks	WCDMA RMC12.2K,HSDPA,HSUPA
Support Band	WCDMA Band II, Band V
Frequency Range	WCDMA Band II: 1852.4~1907.6MHz WCDMA Band V: 826.4~846.6MHz
Type of Modulation	QPSK
Antenna Type	Internal Antenna
4G	
Support Networks	LTE
Support Band	LTE Band4, Band7
Frequency Range	LTE Band4:1710.7~1754.3MHz LTE Band7:2502.5~2567.5MHz
Type of Modulation	QPSK,16QAM
Antenna Type	Internal Antenna
WiFi	
Support Standards	802.11b, 802.11g, 802.11n
Frequency Range	2412-2462MHz for 11b/g/n(HT20)

	2422-2452MHz for 11n(HT40)
Type of Modulation	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels	11 for 11b/g/n(HT20), 7 for 11n(HT40)
Channel Separation	5MHz
Antenna Type	Internal Antenna
Bluetooth	
Bluetooth Version	V3.0+EDR/V4.0
Frequency Range	2402-2480MHz
Data Rate	1Mbps, 2Mbps, 3Mbps
Modulation	GFSK, π/4 QDPSK, 8DPSK
Quantity of Channels	79/40
Channel Separation	1MHz/2MHz
Antenna Type	Internal Antenna

2.3. Statement of Compliance

The maximum of results of SAR found during testing for N502 are follows:

<Highest Reported standalone SAR Summary>

Classment Class	Frequency Band	Head (Report 1g SAR(W/Kg)	Hotspot (Report 1g SAR(W/Kg)	Body-worn (Report 1g SAR(W/Kg)
PCE	GSM 850	0.246	0.273	0.184
	GSM1900	0.295	**0.788**	0.465
	WCDMA Band V	0.179	0.602	0.602
	WCDMA Band II	0.420	0.639	**0.639**
	LTE Band4	0.244	0.379	0.379
	LTE Band7	**0.589**	0.631	0.631
DTS	WIFI2.4G	0.230	0.034	0.034

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003.

<Highest Reported simultaneous SAR Summary>

Exposure Position	Frequency Band	Reported 1-g SAR (W/kg)	Classment Class	Highest Reported Simultaneous Transmission 1-g SAR (W/kg)
Front	GSM1900	0.788	PCE	**0.821**
	Bluetooth	0.033	DTS	

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Academy of Metrology and Quality Inspection
No.289, 8th Industry Road, Nanshan District, Shenzhen, Guangdong, China

The sites are constructed in conformance with the requirements of ANSI C63.4 (2009) and CISPR Publication 22.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration information:

Shenzhen Academy of Metrology and Quality Inspection
No.4 TongFa Road, Xili TownNanshan District, Shenzhen, China
Test Firm FCC Registration number: 806614
.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	18-25 ° C
Humidity:	40-65 %
Atmospheric pressure:	950-1050mbar

3.4. SAR Limits

FCC Limit (1g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population /Uncontrolled Exposure Environment)	(Occupational /Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

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

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

3.5. Equipments Used during the Test

No.	Equipment	Model No.	Manufacturer	Serial No.	Last Calibration Data	Period
1	SAR test system	TX60L	SPEAG	SB6810	---	---
2	SAR Probe	ES3DV3	SPEAG	SB6810/02	2014.12.19	1year
3	SAR Probe	EX3DV4	SPEAG	SB6810/03	2015.07.24	1year
4	Data Acquisition Equipment	DAE4	SPEAG	SB6810/01	2015.03.09	1year
5	System Validation Dipole,835MHz	D835V2	SPEAG	SB6810/04	2015.09.24	3year
6	System Validation Dipole,1750MHz	D1750V2	SPEAG	SB6810/05	2014.01.09	3year
7	System Validation Dipole,1900MHz	D1900V2	SPEAG	SB10364/02	2015.09.16	3years
8	System Validation Dipole,2450MHz	D2450V2	SPEAG	SB6810/06	2015.09.14	3year
9	System Validation Dipole,2600MHz	D2600V2	SPEAG	SB6810/07	2014.01.13	3year
10	Dielectric Probe Kit	85070E	SPEAG	SB6810/12	---	---
11	Dual-directional coupler,0.10-2.0GHz	778D	Agilent	SB6810/07	---	---
12	Dual-directional coupler,2.00-18GHz	772D	Agilent	SB6810/08		
13	Coaxial attenuator	8491A	Agilent	SB6810/09	---	---
14	Power Amplifier	ZHL42W	Agilent	SB6810/10	---	---
15	Signal Generator	SMR20	R&S	SB3438	2015.01.15	1year
16	Power Meter	NRVD	R&S	SB3437	2015.01.23	1year
17	Call Tester	CMU 200	R&S	SB3441	2015.01.07	1year
18	Network Analyzer	E5071C	Agilent	SB9011/01	2015.04.24	1Year
19	Wideband Radio Communication Tester	CMW500	R&S	SB9054/02	2015.10.29	1Year

4. SAR Measurements System configuration

4.1. 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 2003.

DASY5 software and SEMCAD data evaluation software.

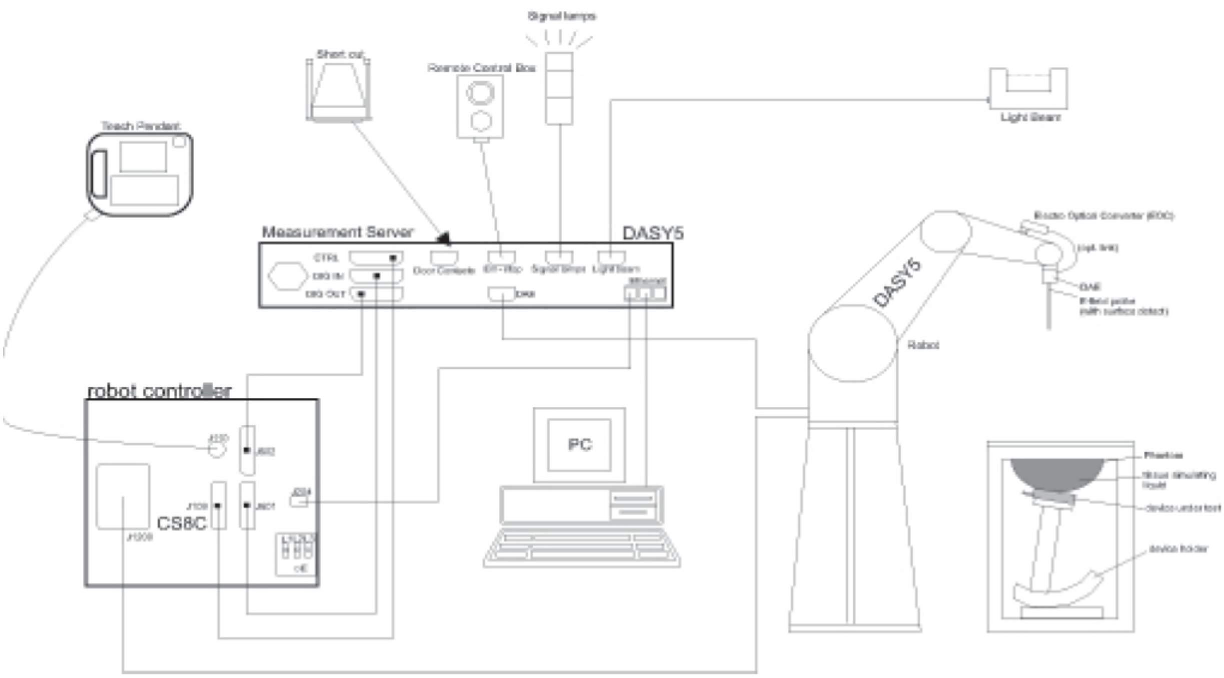
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

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.



4.2. DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe ES3DV3 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

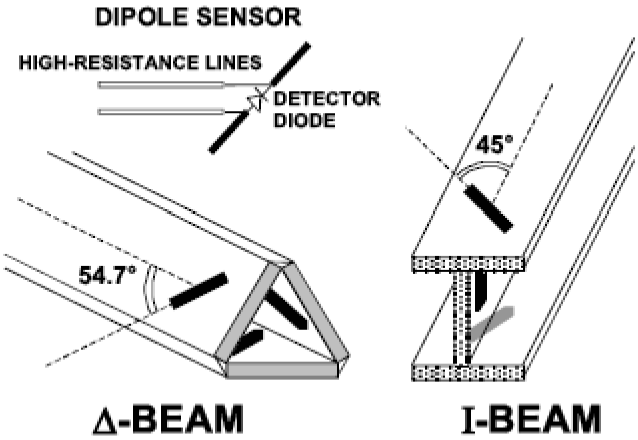
Probe Specification

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 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 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
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



4.3. Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6mm).
System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.

SAM Twin Phantom

4.4. Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the DASY system.
The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

Device holder supplied by SPEAG

4.5. 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 ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot.Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

<table>
<tr><th></th><th>$\leq$ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td>Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 mm ± 1 mm</td><td>$\frac{1}{2} \cdot \delta \cdot \ln(2)$ mm ± 0.5 mm</td></tr>
<tr><td>Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>$\leq$ 2 GHz: $\leq$ 15 mm
2 – 3 GHz: $\leq$ 12 mm</td><td>3 – 4 GHz: $\leq$ 12 mm
4 – 6 GHz: $\leq$ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
</table>

Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

<table>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>$\leq$ 2 GHz: $\leq$ 8 mm
2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*
4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm
4 – 5 GHz: $\leq$ 3 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm
4 – 5 GHz: $\leq$ 2.5 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$ mm</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm
4 – 5 GHz: $\geq$ 25 mm
5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses.The DASY5 system allows evaluations that combine measured data and robot positions, such as: • maximum search • extrapolation • boundary correction • peak search for averaged SAR During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

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 5mm steps.

4.6. 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 ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

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

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

Probe parameters:	- Sensitivity	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- 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 DASY4 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

With Vi = compensated signal of channel i (i = x, y, z)
Ui = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcpi = diode compression point (DASY parameter)

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

$$\text{E}-\text{fieldprobes}: \quad E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$\text{H}-\text{fieldprobes}: \quad H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

With Vi = compensated signal of channel i (i = x, y, z)
Normi = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)2] for E-field Probes
ConvF = sensitivity enhancement in solution
aij = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strength of channel i in V/m
Hi = magnetic field strength of channel i in A/m

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

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

with SAR = local specific absorption rate in mW/g
Etot = 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.

4.7. Tissue Dielectric Parameters for Head and Body Phantoms

The liquid is consisted of water,salt,Glycol,Sugar,Preventol and Cellulose.The liquid has previously been proven to be suited for worst-case.It's satisfying the latest tissue dielectric parameters requirements proposed by the KDB865664.

The composition of the tissue simulating liquid

Ingredient	835MHz		1900MHz		1750 MHz		2450MHz		2600MHz	
(% Weight)	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	41.45	52.5	55.242	69.91	55.782	69.82	62.7	73.2	62.3	72.6
Salt	1.45	1.40	0.306	0.13	0.401	0.12	0.50	0.10	0.20	0.10
Sugar	56	45.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Preventol	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEC	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DGBE	0.00	0.00	44.452	29.96	43.817	30.06	36.8	26.7	37.5	27.3

Target Frequency (MHz)	Head		Body	
	ε_r	$\sigma(S/m)$	ε_r	$\sigma(S/m)$
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

4.8. Tissue equivalent liquid properties

Dielectric performance of Head and Body tissue simulating liquid

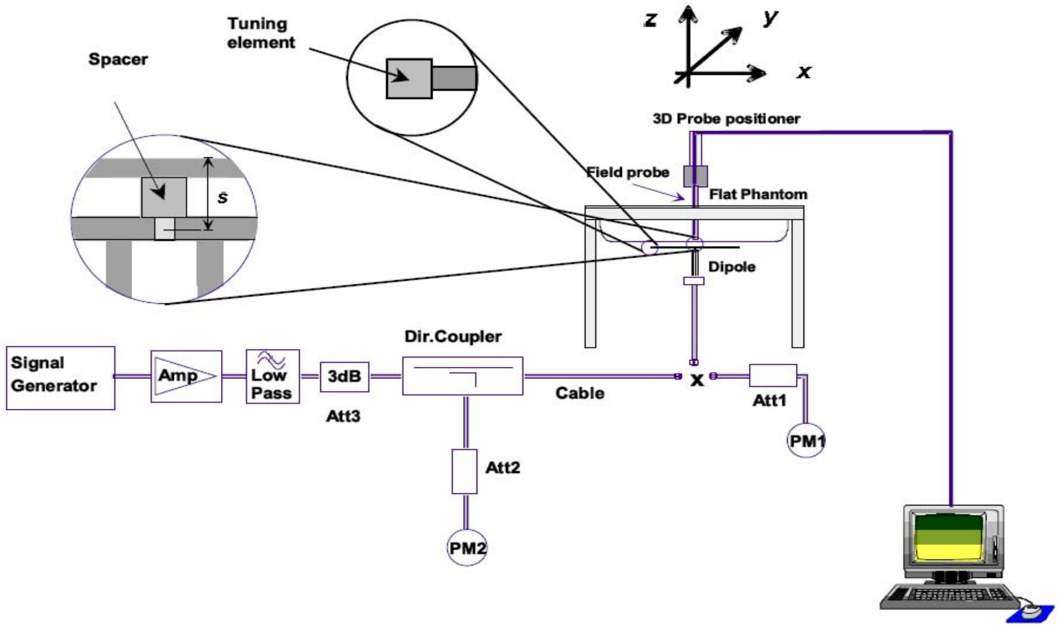
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue				Liquid Temp.	Test Data
		ε_r	σ	ε_r	Dev.	σ	Dev.		
835H	835	0.90	41.5	0.91	1.1	41.3	-0.5	22.3	10/22/2015
1750H	1750	1.37	40.1	1.42	3.6	40.5	1.0	22.8	10/21/2015
1900H	1900	1.40	40.0	1.42	1.4	40.5	1.3	22.6	10/21/2015
2450H	2450	1.80	39.2	1.82	1.1	39.0	-0.5	22.4	10/21/2015
2600H	2600	1.96	39.0	1.94	-1.0	39.1	0.3	22.3	10/24/2015
835B	835	0.97	55.2	0.99	2.1	55.5	0.5	22.6	10/24/2015
1750B	1750	1.49	53.4	1.51	1.3	53.45	0.1	22.4	10/23/2015
1900B	1900	1.52	53.3	1.5	-1.3	53.0	-0.6	22.6	10/23/2015
2450B	2450	1.95	52.7	1.98	1.5	53.1	0.8	22.7	10/24/2015
2600B	2600	2.16	52.5	2.17	0.5	52.6	0.2	22.5	10/24/2015

4.9. System Check

The purpose of the system check is to verify that the system operates within its specifications at the decice test frequency.The system check is simple check of repeatability to make sure that the system works correctly at the time of the compliance test;

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

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.



The output power on dipole port must be calibrated to 24 dBm (250mW) before dipole is connected.

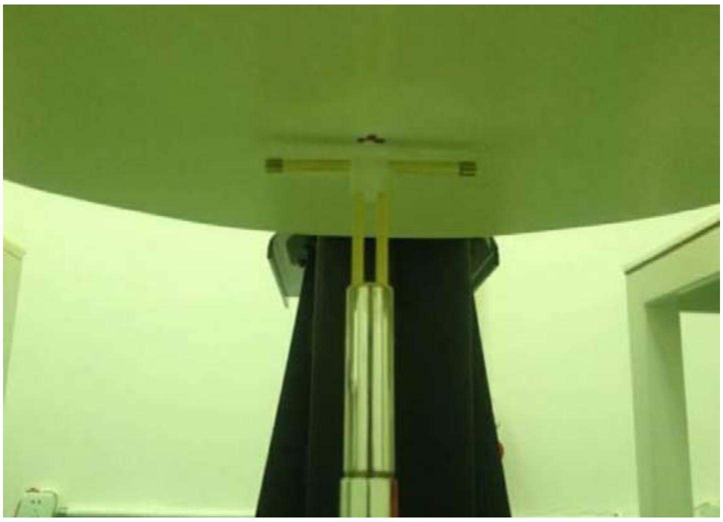


Photo of Dipole Setup

Frequency (MHz)	Description	SAR(1g) W/Kg	SAR(10g) W/Kg	Tissue Temp. (℃)	Date
835 (Head)	Reference	9.45±10% (8.505~10.395)	6.11±10% (5.499~6.721)	NA	10/22/2015
	Measurement	9.24	6.0	22.3	
1750 (Head)	Reference	36.6±10% (32.94~40.26)	19.4±10% (17.46~21.34)	NA	10/21/2015
	Measurement	38.4	20.16	22.8	
1900 (Head)	Reference	40.4±10% (36.36~44.44)	21.0±10% (18.9~23.1)	NA	10/21/2015
	Measurement	39.76	20.08	22.6	
2450 (Head)	Reference	52.7±10% (47.43~57.97)	24.6±10% (22.14~27.06)	NA	10/21/2015
	Measurement	54.4	23.4	22.4	
2600 (Head)	Reference	57.4±10% (51.66~63.14)	25.5±10% (22.95~28.05)	NA	10/24/2015
	Measurement	54.8	25.84	22.3	
835 (Body)	Reference	9.51±10% (8.559~10.461)	6.25±10% (5.625~6.875)	NA	10/24/2015
	Measurement	9.92	6.44	22.6	
1750 (Body)	Reference	37.5±10% (33.75~41.25)	20.1±10% (18.09~22.11)	NA	10/23/2015
	Measurement	38.84	20.88	22.4	
1900 (Body)	Reference	41.2±10% (37.08~45.32)	21.6±10% (19.44~23.76)	NA	10/23/2015
	Measurement	43.6	22.16	22.6	
2450 (Body)	Reference	51.1±10% (45.99~56.21)	23.9±10% (21.51~26.29)	NA	10/24/2015
	Measurement	53.6	25.2	22.7	
2600 (Body)	Reference	54.7±10% (49.23~60.17)	24.3±10% (21.87~26.73)	NA	10/24/2015
	Measurement	56.8	26.04	22.5	

4.10. SAR measurement procedure

The measurement procedures are as follows:

4.10.1 Conducted power measurement
a. For WWAN power measurement, use base station simulator connection with RF cable, at maximum power in each supported wireless interface and frequency band.
b. Read the WWAN RF power level from the base station simulator.
c. For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band.
d. Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power.

4.10.2 GSM Test Configuration

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a System Simulator (SS) by air link. Using CMU200 the power level is set to “5” for GSM 850, set to “0” for GSM 1900. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslots is 5. the EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslots is 5.

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. GSM voice and GPRS data use GMSK, which is a constant amplitude modulation with minimal peak to average power difference within the time-slot burst. For EDGE, GMSK is used for MCS 1 – MCS 4 and 8-PSK is used for MCS 5 – MCS 9; where 8-PSK has an inherently higher peak-to-average power ratio. The GMSK and 8-PSK EDGE configurations are considered separately for SAR compliance. The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance. The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode.

4.10.3 UMTS Test Configuration

3G SAR Test Reduction Procedure
In the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.3 This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

<u>Output power Verification</u>

Maximum output power is verified on the high, middle and low channels according to procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1’s” for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) are requied in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified.

<u>Head SAR</u>

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure.

Body-Worn Accessory SAR

SAR for body-worn accessory configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreaing code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the handset, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

Handsets with Release 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the “Release 5 HSDPA Data Devices” section of this document, for the highest reported SAR body-worn accessory exposure configuration in 12.2 kbps RMC. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

HSDPA should be configured according to the UE category of a test device.The number of HSDSCH/ HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(βc, βd), and HS-DPCCH power offset parameters (ΔACK, ΔNACK, ΔCQI) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Table 2: Subtests for UMTS Release 5 HSDPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (note 1, note 2)	CM(dB) (note 3)	MPR(dB)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (note 4)	15/15 (note 4)	64	12/15 (note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note1: $\triangle_{ACK}$, $\triangle_{NACK}$ and $\triangle_{CQI}$= 8$\Leftrightarrow$ $A_{hs} = \beta_{hs}/\beta_c$=30/15$\Leftrightarrow$ β_{hs}=30/15*β_c
Note2: CM=1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.
Note3: For subtest 2 the $\beta_c\beta_d$ ratio of 12/15 for the TFC during the measurement period(TF1,TF0) is achieved by setting the signaled gain factors for the reference TFC (TFC1,TF1) to β_c=11/15 and β_d=15/15.

HSUPA Test Configuration

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures in the “Release 6 HSPA Data Devices” section of this document, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn accessory measurements is tested for next to the ear head exposure.

Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in Table 2 and other applicable procedures described in the ‘WCDMA Handset’ and ‘Release 5 HSDPA Data Devices’ sections of this document

Table 3: Sub-Test 5 Setup for Release 6 HSUPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (2) (dB)	MPR (dB)	AG(4) Index	E-TFCI
1	11/15(3)	15/15(3)	64	11/15(3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15(4)	15/15(4)	64	15/15(4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, ΔNACK and Δ_{CQI} = 8 ⇔ $A_{hs} = \beta_{hs}/\beta_c = 30/15$ ⇔ $\beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for βc/βd =12/15, β_{hs}/β_c =24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the βc/βd ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to βc = 10/15 and βd = 15/15.
Note 4: For subtest 5 the βc/βd ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to βc = 14/15 and βd = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Figure 5.1g.
Note 6: βed can not be set directly; it is set by Absolute Grant Value.

4.10.4 LTE Test Configuration

QPSK with 1 RB allocation
Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.8 When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

QPSK with 50% RB allocation
The procedures required for 1 RB allocation in section 4.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.9

QPSK with 100% RB allocation
For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in sections 4.2.1 and 4.2.2 are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

4.10.5 WIFI Test Configuration

The SAR measurement and test reduction procedures are structured according to either the DSSS or OFDM transmission mode configurations used in each standalone frequency band and aggregated band. For devices that operate in exposure configurations that require multiple test positions, additional SAR test reduction may be applied. The maximum output power specified for production units, including tune-up tolerance, are used to determine initial SAR test requirements for the 802.11 transmission modes in a frequency band. SAR is measured using the highest measured maximum output power channel for the initial test configuration. SAR measurement and test reduction for the remaining 802.11 modes and test channels are determined according to measured or specified maximum output power and reported SAR of the initial measurements. The general test reduction and SAR measurement approaches are summarized in the following:
1. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures. Channels with measured maximum output power within ¼ dB are considered to have the same maximum output.
2. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, an “initial test configuration” is first determined for each standalone and aggregated frequency band according to the maximum output power and tune-up tolerance specified for production units.
a. When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is

used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band.
b. SAR is measured for OFDM configurations using the initial test configuration procedures. Additional frequency band specific SAR test reduction may be considered for individual frequency bands
c. Depending on the reported SAR of the highest maximum output power channel tested in the initial test configuration, SAR test reduction may apply to subsequent highest output channels in the initial test configuration to reduce the number of SAR measurements.
3. The Initial test configuration does not apply to DSSS. The 2.4 GHz band SAR test requirements and 802.11b DSSS procedures are used to establish the transmission configurations required for SAR measurement.
4. An “initial test position”is applied to further reduce the number of SAR tests for devices operating in next to the ear, UMPC mini-tablet or hotspot mode exposure configurations that require multiple test positions .
a. SAR is measured for 802.11b according to the 2.4 GHz DSSS procedure using the exposure condition established by the initial test position.
b. SAR is measured for 2.4 GHz and 5 GHz OFDM configurations using the initial test configuration. 802.11b/g/n operating modes are tested independently according to the service requirements in each frequency band. 802.11b/g/n modes are tested on the maximum average output channel.
5. The Initial test position does not apply to devices that require a fixed exposure test position. SAR is measured in a fixed exposure test position for these devices in 802.11b according to the 2.4 GHz DSSS procedure or in 2.4 GHz and 5 GHz OFDM configurations using the initial test configuration procedures .
6. The “subsequent test configuration”procedures are applied to determine if additional SAR measurements are required for the remaining OFDM transmission modes that have not been tested in the initial test configuration. SAR test exclusion is determined according to reported SAR in the initial test configuration and maximum output power specified or measured for these other OFDM configurations.

2.4 GHz SAR Procedures
Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. The SAR test exclusion requirements for 802.11g/n OFDM configurations are described in section 5.2.2.
1. 802.11b DSSS SAR Test Requirements
SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:
a. When the reported SAR of the highest measured maximum output power channel (section 3.1) for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
b. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.
1. 2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements
When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3). SAR is not required for the following 2.4 GHz OFDM conditions.
a. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration
b. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. SAR Test Requirements for OFDM Configurations
When SAR measurement is required for 802.11 a/g/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements.20 In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.
3. OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements
The initial test configuration for 2.4 GHz and 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement

procedures (section 4). When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

a. The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
b. If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
c. If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
d. When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.

After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.

a. Channels with measured maximum output power within ¼ dB of each other are considered to have the same maximum output.
b. When there are multiple test channels with the same measured maximum output power, the channel closest to mid-band frequency is selected for SAR measurement.
c. When there are multiple test channels with the same measured maximum output power and equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

4. Initial Test Configuration Procedures

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2). SAR test reduction of subsequent highest output test channels is based on the reported SAR of the initial test configuration.

For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode.23 For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration. When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

5. Subsequent Test Configuration Procedures

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. The initial test position procedure is applied to next to the ear, UMPC mini-tablet and hotspot mode configurations. When the same maximum output power is specified for multiple transmission modes, the procedures in section 5.3.2 are applied to determine the test configuration. Additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. The subsequent test configuration and SAR measurement procedures are described in the following.

a. When SAR test exclusion provisions of KDB Publication 447498 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and exposure configuration.
b. When the highest reported SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.
c. The number of channels in the initial test configuration and subsequent test configuration can be different due to differences in channel bandwidth. When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel. This step requires additional power measurement to identify the highest maximum output power channel in the subsequent test configuration to determine SAR test reduction.

1). SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.

2). SAR for subsequent highest measured maximum output power channels in the subsequent test configuration is required only when the reported SAR of the preceding higher maximum output power channel(s) in the subsequent test configuration is > 1.2 W/kg or until all required channels are tested.

a) For channels with the same measured maximum output power, SAR should be measured using the channel closest to the center frequency of the larger channel bandwidth channel in the initial test configuration.

d. SAR measurements for the remaining highest specified maximum output power OFDM transmission mode configurations that have not been tested in the initial test configuration (highest maximum output) or subsequent test configuration(s) (subsequent next highest maximum output power) is determined by applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:

1) replace “subsequent test configuration” with “next subsequent test configuration” (i.e., subsequent next highest specified maximum output power configuration)
2) replace “initial test configuration” with “all tested higher output power configurations”

5. TEST CONDITIONS AND RESULTS

5.1. Conducted Power Results

Max Conducted power measurement results and power drift from tune-up tolerance provide by manufacturer:

Conducted Power Measurement Results(GSM 850/1900)

GSM 850		Burst Conducted power (dBm)			/	Average power (dBm)		
		Channel/Frequency(MHz)				Channel/Frequency(MHz)		
		128/824.2	190/836.6	251/848.8		128/824.2	190/836.6	251/848.8
GSM		33.13	33.21	33.24	-9.00dB	24.13	24.21	24.24
GPRS (GMSK)	1TX slot	33.05	33.18	33.22	-9.00dB	24.05	24.18	24.22
	2TX slot	30.37	30.51	30.35	-6.00dB	24.37	24.51	24.35
	3TX slot	28.56	28.65	28.42	-4.26dB	24.30	24.39	24.16
	4TX slot	**27.82**	**27.99**	**27.46**	**-3.00dB**	**24.82**	**24.99**	**24.46**
EGPRS (8PSK)	1TX slot	27.83	27.90	27.85	-9.00dB	18.83	18.90	18.85
	2TX slot	25.40	25.57	25.70	-6.00dB	19.40	19.57	19.70
	3TX slot	23.47	23.44	23.57	-4.26dB	19.21	19.18	19.31
	4TX slot	22.30	22.24	22.61	-3.00dB	19.30	19.24	19.61
GSM 1900		Burst Conducted power (dBm)			/	Average power (dBm)		
		Channel/Frequency(MHz)				Channel/Frequency(MHz)		
		512/ 1850.2	661/ 1880	810/ 1909.8		512/ 1850.2	661/ 1880	810/ 1909.8
GSM		30.02	30.19	30.10	-9.00dB	21.02	21.19	21.10
GPRS (GMSK)	1TX slot	30.05	30.17	30.12	-9.00dB	21.05	21.17	21.12
	2TX slot	27.79	28.03	27.80	-6.00dB	21.79	22.03	21.80
	3TX slot	26.48	26.41	26.49	-4.26dB	22.22	22.15	22.23
	4TX slot	**25.56**	**25.58**	**25.62**	**-3.00dB**	**22.56**	**22.58**	**22.62**
EGPRS (8PSK)	1TX slot	26.00	26.04	25.95	-9.00dB	17.00	17.04	16.95
	2TX slot	24.78	24.69	24.45	-6.00dB	18.78	18.69	18.45
	3TX slot	23.44	23.51	23.80	-4.26dB	19.18	19.25	19.54
	4TX slot	22.56	22.59	22.56	-3.00dB	19.56	19.59	19.56

Notes:

1) Division Factors

To average the power, the division factor is as follows:
1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.00dB
2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.00dB
3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB
4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.00dB

2) According to the conducted power as above, the GPRS measurements are performed with 4Txslots for GPRS850 and GPRS1900.

Conducted Power Measurement Results(WCDMA Band II/V)

Item	band	WCDMA Band II result (dBm)			WCDMA Band V result (dBm)		
		Channel/Frequency(MHz)			Channel/Frequency(MHz)		
	ARFCN	9262/1852.4	9400/1880	9538/1907.6	4132/826.4	4183/836.6	4233/846.6
RMC	12.2kbps RMC	23.21	23.31	23.38	22.84	23.31	23.25
AMR	12.2kbps AMR	22.15	22.23	22.40	21.84	22.33	22.25
HSDPA	Sub - Test 1	21.43	21.51	21.52	21.00	21.63	21.56
	Sub - Test 2	21.41	21.35	21.49	20.93	21.55	21.45
	Sub - Test 3	21.38	21.38	21.44	20.84	21.49	21.34
	Sub - Test 4	20.57	20.65	20.73	19.57	20.11	20.04
HSUPA	Sub - Test 1	20.44	20.55	20.71	19.59	20.09	20.03
	Sub - Test 2	21.55	21.61	21.78	20.60	21.12	21.07
	Sub - Test 3	19.99	20.01	20.16	19.03	19.52	19.46
	Sub - Test 4	20.96	21.06	20.82	19.69	20.55	20.48
	Sub - Test 5	21.55	21.72	21.85	21.65	22.71	22.68

Note : When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤1/2dB higher than the primary mode (RMC12.2kbps) or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

LTE Band4

TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	Average Power [dBm]	
			QPSK	16QAM
1.4 MHz	1710.7	1 RB low	22.48	21.67
		1 RB high	22.46	21.65
		50% RB mid	22.48	21.57
		100% RB	21.55	20.48
	1732.5	1 RB low	22.47	21.59
		1 RB high	22.46	21.62
		50% RB mid	22.45	21.51
		100% RB	21.54	20.44
	1754.3	1 RB low	22.59	21.76
		1 RB high	22.60	21.69
		50% RB mid	22.53	21.41
		100% RB	21.66	20.52
3 MHz	1711.5	1 RB low	22.40	21.67
		1 RB high	22.41	21.66
		50% RB mid	21.56	20.60
		100% RB	21.53	21.49
	1732.5	1 RB low	22.38	21.59
		1 RB high	22.36	21.58
		50% RB mid	21.53	20.54
		100% RB	21.51	20.53
	1753.5	1 RB low	22.56	21.75
		1 RB high	22.59	21.59
		50% RB mid	21.66	20.57
		100% RB	21.55	20.53
5 MHz	1712.	1 RB low	22.55	21.90
		1 RB high	22.54	21.87
		50% RB mid	21.61	20.72
		100% RB	21.56	20.57
	1732.5	1 RB low	22.55	21.84
		1 RB high	22.58	21.76
		50% RB mid	21.54	20.63
		100% RB	21.48	20.49
	1752.5	1 RB low	22.65	21.55
		1 RB high	22.67	21.61
		50% RB mid	21.60	20.63
		100% RB	21.59	20.59
10 MHz	1715.0	1 RB low	22.52	21.77
		1 RB high	22.51	21.73
		50% RB mid	21.55	20.57
		100% RB	21.57	20.56
	1732.5	1 RB low	22.49	21.70
		1 RB high	22.40	21.77
		50% RB mid	21.50	20.45
		100% RB	21.53	20.48
	1750.0	1 RB low	25.54	21.88
		1 RB high	22.43	21.80
		50% RB mid	21.56	20.59
		100% RB	21.50	20.61
15 MHz	1717.5	1 RB low	22.55	21.81
		1 RB high	22.54	21.71
		50% RB mid	22.69	20.62
		100% RB	22.68	20.63
	1732.5	1 RB low	22.53	21.70
		1 RB high	22.44	21.71
		50% RB mid	21.67	20.57
		100% RB	21.66	20.60
	1747.5	1 RB low	22.55	21.78
		1 RB high	22.57	21.79
		50% RB mid	21.68	20.68

		100% RB	21.71	20.65
20 MHz	1720.0	1 RB low	22.70	21.83
		1 RB high	22.49	21.75
		50% RB mid	21.58	20.53
		100% RB	21.57	20.55
	1732.5	1 RB low	22.68	21.78
		1 RB high	22.58	21.76
		50% RB mid	21.53	20.48
		100% RB	21.54	20.51
	1745.0	1 RB low	22.68	21.93
		1 RB high	22.54	21.90
		50% RB mid	21.54	20.59
		100% RB	21.83	20.57

LTE Band7

TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	Average Power [dBm]	
			QPSK	16QAM
5 MHz	2502.5	1 RB low	23.45	22.83
		1 RB high	23.40	22.74
		50% RB mid	22.48	21.71
		100% RB	22.48	21.55
	2535.0	1 RB low	23.48	22.84
		1 RB high	23.39	22.83
		50% RB mid	22.56	21.76
		100% RB	22.52	21.60
	2567.5	1 RB low	23.16	22.19
		1 RB high	23.08	22.04
		50% RB mid	22.18	21.26
		100% RB	22.15	21.22
10 MHz	2505.0	1 RB low	23.45	22.72
		1 RB high	23.42	22.70
		50% RB mid	22.50	21.53
		100% RB	22.50	21.54
	2535.0	1 RB low	23.45	22.74
		1 RB high	23.44	22.79
		50% RB mid	22.55	21.62
		100% RB	22.57	21.60
	2565.0	1 RB low	23.17	22.59
		1 RB high	22.96	22.37
		50% RB mid	22.15	21.23
		100% RB	22.20	21.30
15 MHz	2507.5	1 RB low	23.50	22.74
		1 RB high	23.41	22.64
		50% RB mid	22.54	21.52
		100% RB	22.58	21.56
	2535.0	1 RB low	23.48	22.76
		1 RB high	23.47	22.75
		50% RB mid	22.58	21.57
		100% RB	22.60	21.58
	2562.5	1 RB low	23.30	22.57
		1 RB high	23.04	22.30
		50% RB mid	22.30	21.29
		100% RB	22.33	21.30
20 MHz	2510.0	1 RB low	23.60	22.78
		1 RB high	23.59	22.73
		50% RB mid	22.50	21.46
		100% RB	22.49	21.50
	2535.0	1 RB low	23.65	22.85
		1 RB high	23.57	22.78
		50% RB mid	22.41	21.63
		100% RB	22.56	21.61

	2560.0	1 RB low	23.43	22.74
		1 RB high	23.17	22.47
		50% RB mid	22.26	21.36
		100% RB	22.27	21.30

WLAN

Mode	Channel	Frequency (MHz)	Worst case Data rate of worst case	Conducted Average Output Power (dBm)
802.11b	1	2412	1Mbps	14.13
	6	2437	1Mbps	**14.27**
	11	2462	1Mbps	13.78
802.11g	1	2412	6Mbps	12.65
	6	2437	6Mbps	12.81
	11	2462	6Mbps	12.42
802.11n HT20	1	2412	6.5 Mbps	8.12
	6	2437	6.5 Mbps	9.89
	11	2462	6.5 Mbps	8.57
802.11n HT40	3	2422	13.5 Mbps	9.27
	6	2437	13.5 Mbps	10.62
	9	2452	13.5 Mbps	9.84

Note: SAR is not required for the following 2.4 GHz OFDM conditions as the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Bluetooth

Mode	Channel	Frequency (MHz)	Conducted Average Power (dBm)
BLE-GFSK	0	2402	**-4.45**
	19	2440	-5.98
	39	2480	-5.03
GFSK	0	2402	**1.45**
	39	2441	0.06
	78	2480	0.88
8DPSK	0	2402	1.10
	39	2441	0.01
	78	2480	0.54
π/4DQPSK	0	2402	1.10
	39	2441	0.03
	78	2480	0.55

Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Bluetooth Turn up Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
2	5	2.45	0.5

Per KDB 447498 D01v05r02, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 0.50 which is <= 3, SAR testing is not required.

Manufacturing tolerance

GSM Speech

GSM 850 (GMSK) (Burst Average Power)			
Channel	Channel 251	Channel 190	Channel 190
Target (dBm)	32.50	32.50	32.50
Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 (GMSK) (Burst Average Power)			
Channel	Channel 810	Channel 661	Channel 512
Target (dBm)	29.50	29.50	29.50
Tolerance ±(dB)	1.0	1.0	1.0

GSM 850 GPRS (GMSK) (Burst Average Power)				
Channel		251	190	128
1 Txslot	Target (dBm)	32.50	32.50	32.50
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	30.0	30.0	30.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	27.0	27.0	27.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 850 EDGE (8PSK) (Burst Average Power)				
Channel		251	190	128
1 Txslot	Target (dBm)	27.0	27.0	27.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	23.0	23.0	23.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	22.0	22.0	22.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 GPRS (GMSK) (Burst Average Power)				
Channel		810	661	512
1 Txslot	Target (dBm)	29.5	29.5	29.5
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	27.0	27.0	27.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	26.0	26.0	26.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 EDGE (8PSK) (Burst Average Power)				
Channel		810	661	512
1 Txslot	Target (dBm)	26.0	26.0	26.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	24.0	24.0	24.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	23.0	23.0	23.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	22.0	22.0	22.0
	Tolerance ±(dB)	1.0	1.0	1.0

UMTS

UMTS Band V			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	22.5	22.5	22.5
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band V HSDPA(sub-test 1)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0

UMTS Band V HSDPA(sub-test 2)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band V HSDPA(sub-test 3)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band V HSDPA(sub-test 4)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	20.0	20.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band V HSUPA(sub-test 1)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	20.0	20.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band V HSUPA(sub-test 2)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band V HSUPA(sub-test 3)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	20.0	20.0	20.0
Tolerance ±(dB)	1	1	1
UMTS Band V HSUPA(sub-test 4)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	20.0	20.0	20.0
Tolerance ±(dB)	1	1	1
UMTS Band V HSUPA(sub-test 5)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	22.0	22.0	22.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band II			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	22.5	22.5	22.5
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band II HSDPA(sub-test 1)			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	21.0	21.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band II HSDPA(sub-test 2)			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	21.0	21.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band II HSDPA(sub-test 3)			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	21.0	21.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band II HSDPA(sub-test 4)			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	20.0	20.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band II HSUPA(sub-test 1)			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	20.0	20.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band II HSUPA(sub-test 2)			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	21.0	21.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band II HSUPA(sub-test 3)			
Channel	Channel 9262	Channel 9400	Channel 9538

Target (dBm)	20.0	20.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band II HSUPA(sub-test 4)			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	21.0	21.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band II HSUPA(sub-test 5)			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	21.0	21.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0

LTE Band4

LTE Band4 (BW:20MHz)				
Modulation	QPSK		16QAM	
RB size	≤18	>18	≤18	>18
Target (dBm)	22.0	21.0	21.5	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0
LTE Band4 (BW:15MHz)				
Modulation	QPSK		16QAM	
RB size	≤16	>16	≤16	>16
Target (dBm)	22.0	21.0	21.5	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0
LTE Band4 (BW:10MHz)				
Modulation	QPSK		16QAM	
RB size	≤12	>12	≤12	>12
Target (dBm)	22.0	21.0	21.5	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0
LTE Band4 (BW:5MHz)				
Modulation	QPSK		16QAM	
RB size	≤8	>8	≤8	>8
Target (dBm)	22.0	21.0	21.5	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0
LTE Band4 (BW:3MHz)				
Modulation	QPSK		16QAM	
RB size	≤4	>4	≤4	>4
Target (dBm)	22.0	21.0	21.5	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0
LTE Band4 (BW:1.4MHz)				
Modulation	QPSK		16QAM	
RB size	≤5	>5	≤5	>5
Target (dBm)	22.0	21.0	21.5	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0

LTE Band7

LTE Band7 (BW:20MHz)				
Modulation	QPSK		16QAM	
RB size	≤18	>18	≤18	>18
Target (dBm)	23.0	21.5	23.0	21.5
Tolerance ±(dB)	1.0	1.0	1.0	1.0
LTE Band7 (BW:15MHz)				
Modulation	QPSK		16QAM	
RB size	≤16	>16	≤16	>16
Target (dBm)	23.0	21.5	23.0	21.5
Tolerance ±(dB)	1.0	1.0	1.0	1.0
LTE Band7 (BW:10MHz)				
Modulation	QPSK		16QAM	
RB size	≤12	>12	≤12	>12
Target (dBm)	23.0	21.5	23.0	21.5
Tolerance ±(dB)	1.0	1.0	1.0	1.0
LTE Band7 (BW:5MHz)				
Modulation	QPSK		16QAM	
RB size	≤8	>8	≤8	>8

Target (dBm)	23.0	21.5	23.0	21.5
Tolerance ±(dB)	1.0	1.0	1.0	1.0

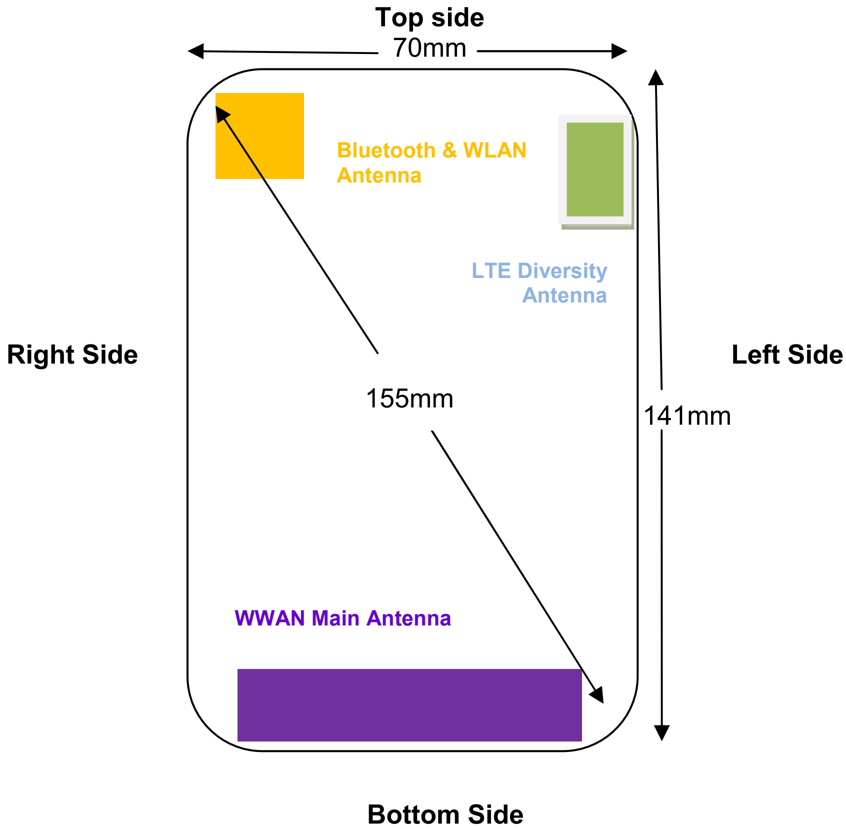
WiFi

802.11b (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13.5	13.5	13.5
Tolerance ±(dB)	1.0	1.0	1.0
802.11g (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13.0	13.0	13.0
Tolerance ±(dB)	1.0	1.0	1.0
802.11n HT20 (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	9.0	9.0	9.0
Tolerance ±(dB)	1.0	1.0	1.0
802.11n HT40 (Average)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	10.0	10.0	10.0
Tolerance ±(dB)	1.0	1.0	1.0

Bluetooth

BLE-GFSK (Average)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	-5.0	-5.0	-5.0
Tolerance ±(dB)	1.0	1.0	1.0
GFSK (Average)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	1.0	1.0	1.0
Tolerance ±(dB)	1.0	1.0	1.0
8DPSK (Average)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	1.0	1.0	1.0
Tolerance ±(dB)	1.0	1.0	1.0
π/4DQPSK (Average)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	1.0	1.0	1.0
Tolerance ±(dB)	1.0	1.0	1.0

5.2. Transmit Antennas and SAR Measurement Position



Back View

Distance of The Antenna to the EUT surface and edge						
Antennas	**Front**	**Back**	**Top Side**	**Bottom Side**	**Left Side**	**Right Side**
WWAN	/	/	>25mm	/	<25mm	<25mm
BT&WLAN	/	/	/	>25mm	>25mm	/

Positions for SAR tests; Hotspot mode						
Antennas	**Front**	**Back**	**Top Side**	**Bottom Side**	**Left Side**	**Right Side**
WWAN	Yes	Yes	No	Yes	Yes	Yes
BT&WLAN	Yes	Yes	Yes	No	No	Yes

General Note: Referring to KDB 941225 D06 v02, When the overall device length and width are ≥9cm*5cm, the test distance is 10mm, SAR must be measured for all sides and surfaces with a transmitting antenna located with 25mm from that surface or edge.

5.3. SAR Measurement Results

5.3.1 SAR Results

SAR Values [GSM 850]

Ch.	Freq. (MHz)	Time slots	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR$_{1-g}$ results(W/kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
190	836.6	GSM	Right Cheek	33.21	33.50	-0.05	1.069	0.23	**0.246**	Plot 1
190	836.6	GSM	Right Tilt	33.21	33.50	-0.04	1.069	0.061	0.065	
190	836.6	GSM	Left Cheek	33.21	33.50	-0.06	1.069	0.208	0.222	
190	836.6	GSM	Left Tilt	33.21	33.50	0.02	1.069	0.07	0.075	
measured / reported SAR numbers - Body (hotspot open, distance 10mm)										
190	836.6	4Txslots	Front	27.99	28.50	0.06	1.125	0.213	0.240	
190	836.6	4Txslots	Back	27.99	28.50	-0.04	1.125	0.243	**0.273**	Plot 2
190	836.6	4Txslots	Left Side	27.99	28.50	-0.12	1.125	0.039	0.044	
190	836.6	4Txslots	Right Side	27.99	28.50	-0.11	1.125	0.147	0.165	
190	836.6	4Txslots	Bottom Side	27.99	28.50	-0.09	1.125	0.239	0.269	
measured / reported SAR numbers – Body worn (distance 10mm)										
190	836.6	GSM	Front	33.21	33.50	0.03	1.069	0.154	0.165	
190	836.6	GSM	Back	33.21	33.50	-0.10	1.069	0.172	0.184	

SAR Values [GSM 1900]

Ch.	Freq. (MHz)	time slots	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR$_{1-g}$ results(W/kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
661	1880.0	GSM	Right Cheek	30.19	30.50	-0.05	1.074	0.251	0.270	
661	1880.0	GSM	Right Tilt	30.19	30.50	-0.09	1.074	0.102	0.110	
661	1880.0	GSM	Left Cheek	30.19	30.50	0.00	1.074	0.275	**0.295**	Plot 3
661	1880.0	GSM	Left Tilt	30.19	30.50	-0.05	1.074	0.061	0.066	
measured / reported SAR numbers – Body (hotspot open, distance 10mm)										
661	1880.0	4Txslots	Front	25.58	26.00	-0.12	1.102	0.715	**0.788**	Plot 4
661	1880.0	4Txslots	Back	25.58	26.00	-0.07	1.102	0.584	0.643	
661	1880.0	4Txslots	Left Side	25.58	26.00	0.13	1.102	0.321	0.354	
661	1880.0	4Txslots	Right Side	25.58	26.00	0.02	1.102	0.190	0.209	
661	1880.0	4Txslots	Bottom Side	25.58	26.00	-0.11	1.102	0.491	0.541	
measured / reported SAR numbers – Body worn (distance 10mm)										
661	1880.0	GSM	Front	30.19	30.50	-0.09	1.074	0.433	0.465	
661	1880.0	GSM	Back	30.19	30.50	-0.06	1.074	0.364	0.391	

SAR Values [WCDMA Band V]

Ch.	Freq. (MHz)	Channel Type	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR$_{1-g}$ results(W/kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
4183	836.6	RMC	Right Cheek	23.31	23.50	-0.11	1.045	0.16	0.167	
4183	836.6	RMC	Right Tilt	23.31	23.50	-0.06	1.045	0.041	0.043	
4183	836.6	RMC	Left Cheek	23.31	23.50	-0.05	1.045	0.171	**0.179**	Plot 5
4183	836.6	RMC	Left Tilt	23.31	23.50	-0.08	1.045	0.041	0.043	
measured / reported SAR numbers - Body (hotspot open, distance 10mm)										
4183	836.6	RMC	Front	23.31	23.50	-0.01	1.045	0.458	0.478	
4183	836.6	RMC	Back	23.31	23.50	0.05	1.045	0.576	**0.602**	Plot 6
4183	836.6	RMC	Left Side	23.31	23.50	-0.09	1.045	0.310	0.324	
4183	836.6	RMC	Right Side	23.31	23.50	-0.04	1.045	0.363	0.379	
4183	836.6	RMC	Bottom Side	23.31	23.50	0.08	1.045	0.055	0.057	
measured / reported SAR numbers – Body worn (distance 10mm)										
4183	836.6	RMC	Front	23.31	23.50	-0.01	1.045	0.458	0.478	
4183	836.6	RMC	Back	23.31	23.50	0.05	1.045	0.576	0.602	

SAR Values [WCDMA Band II]

Ch.	Freq. (MHz)	Channel Type	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR_{1-g} results(W/kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
9400	1880	RMC	Right Cheek	23.31	23.50	-0.11	1.045	0.394	0.412	
9400	1880	RMC	Right Tilt	23.31	23.50	-0.06	1.045	0.133	0.139	
9400	1880	RMC	Left Cheek	23.31	23.50	-0.12	1.045	0.402	**0.420**	Plot 9
9400	1880	RMC	Left Tilt	23.31	23.50	-0.15	1.045	0.081	0.085	
measured / reported SAR numbers - Body (hotspot open, distance 10mm)										
9400	1880	RMC	Front	23.31	23.50	-0.02	1.045	0.612	**0.639**	Plot 10
9400	1880	RMC	Back	23.31	23.50	-0.10	1.045	0.529	0.553	
9400	1880	RMC	Left Side	23.31	23.50	-0.06	1.045	0.310	0.324	
9400	1880	RMC	Right Side	23.31	23.50	-0.06	1.045	0.147	0.154	
9400	1880	RMC	Bottom Side	23.31	23.50	0.11	1.045	0.492	0.514	
measured / reported SAR numbers – Body worn (distance 10mm)										
9400	1880	RMC	Front	23.31	23.50	-0.02	1.045	0.612	0.639	
9400	1880	RMC	Back	23.31	23.50	-0.10	1.045	0.529	0.553	

SAR Values [LTE Band 4]

Ch.	Freq. (MHz)	Channel Type (20M)	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR_{1-g} results(W/kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
20175	1732.5	1RB	Right Cheek	22.68	23.00	-0.11	1.076	0.206	0.222	
20175	1732.5	1RB	Right Tilt	22.68	23.00	-0.06	1.076	0.069	0.074	
20175	1732.5	1RB	Left Cheek	22.68	23.00	-0.12	1.076	0.227	**0.244**	Plot 13
20175	1732.5	1RB	Left Tilt	22.68	23.00	-0.15	1.076	0.048	0.052	
20175	1732.5	50%RB	Right Cheek	21.53	22.00	0.16	1.114	0.198	0.221	
20175	1732.5	50%RB	Right Tilt	21.53	22.00	0.03	1.114	0.051	0.057	
20175	1732.5	50%RB	Left Cheek	21.53	22.00	0.08	1.114	0.206	0.230	
20175	1732.5	50%RB	Left Tilt	21.53	22.00	0.06	1.114	0.039	0.043	
measured / reported SAR numbers - Body (hotspot open, distance 10mm)										
20175	1732.5	1RB	Front	22.68	23.00	-0.02	1.076	0.352	**0.379**	Plot 14
20175	1732.5	1RB	Back	22.68	23.00	-0.10	1.076	0.279	0.300	
20175	1732.5	1RB	Left Side	22.68	23.00	-0.06	1.076	0.110	0.118	
20175	1732.5	1RB	Right Side	22.68	23.00	-0.06	1.076	0.070	0.075	
20175	1732.5	1RB	Bottom Side	22.68	23.00	0.11	1.076	0.296	0.319	
20175	1732.5	50%RB	Front	21.53	22.00	0.16	1.114	0.296	0.330	
20175	1732.5	50%RB	Back	21.53	22.00	0.08	1.114	0.212	0.236	
20175	1732.5	50%RB	Left Side	21.53	22.00	0.04	1.114	0.091	0.101	
20175	1732.5	50%RB	Right Side	21.53	22.00	-0.01	1.114	0.050	0.056	
20175	1732.5	50%RB	Bottom Side	21.53	22.00	-0.16	1.114	0.221	0.246	
measured / reported SAR numbers – Body worn (distance 10mm)										
20175	1732.5	1RB	Front	22.68	23.00	-0.02	1.076	0.352	0.379	
20175	1732.5	1RB	Back	22.68	23.00	-0.10	1.076	0.279	0.300	
20175	1732.5	50%RB	Front	21.53	22.00	0.16	1.114	0.296	0.330	
20175	1732.5	50%RB	Back	21.53	22.00	0.08	1.114	0.212	0.236	

SAR Values [LTE Band 7]

Ch.	Freq. (MHz)	Channel Type (20M)	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR_{1-g} results(W/kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
21100	2535	1RB	Right Cheek	23.65	24.00	-0.11	1.084	0.543	**0.589**	Plot 15
21100	2535	1RB	Right Tilt	23.65	24.00	-0.06	1.084	0.196	0.212	
21100	2535	1RB	Left Cheek	23.65	24.00	-0.12	1.084	0.216	0.234	
21100	2535	1RB	Left Tilt	23.65	24.00	-0.15	1.084	0.09	0.098	
21100	2535	50%RB	Right Cheek	22.41	22.50	0.16	1.021	0.526	0.537	
21100	2535	50%RB	Right Tilt	22.41	22.50	0.18	1.021	0.165	0.168	
21100	2535	50%RB	Left Cheek	22.41	22.50	0.08	1.021	0.188	0.192	
21100	2535	50%RB	Left Tilt	22.41	22.50	0.06	1.021	0.07	0.071	
measured / reported SAR numbers - Body (hotspot open, distance 10mm)										
21100	2535	1RB	Front	23.65	24.00	-0.02	1.084	0.411	0.445	
21100	2535	1RB	Back	23.65	24.00	-0.10	1.084	0.582	**0.631**	Plot 16
21100	2535	1RB	Left Side	23.65	24.00	-0.06	1.084	0.235	0.255	
21100	2535	1RB	Right Side	23.65	24.00	-0.06	1.084	0.136	0.147	
21100	2535	1RB	Bottom Side	23.65	24.00	0.11	1.084	0.521	0.565	
21100	2535	50%RB	Front	22.41	22.50	0.03	1.021	0.352	0.359	
21100	2535	50%RB	Back	22.41	22.50	0.01	1.021	0.531	0.542	
21100	2535	50%RB	Left Side	22.41	22.50	0.12	1.021	0.189	0.193	
21100	2535	50%RB	Right Side	22.41	22.50	0.05	1.021	0.103	0.105	
21100	2535	50%RB	Bottom Side	22.41	22.50	-0.14	1.021	0.475	0.485	
measured / reported SAR numbers – Body worn (distance 10mm)										
21100	2535	1RB	Front	23.65	24.00	-0.02	1.084	0.411	0.445	
21100	2535	1RB	Back	23.65	24.00	-0.10	1.084	0.582	0.631	
21100	2535	50%RB	Front	22.41	22.50	0.03	1.021	0.352	0.359	
21100	2535	50%RB	Back	22.41	22.50	0.01	1.021	0.531	0.542	

SAR Values [WIFI2.4G]

Ch.	Freq. (MHz)	Service	Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Power drift	Scaling Factor	SAR_{1-g} results(W/kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
6	2437	DSSS	Right Cheek	14.27	14.50	0.10	1.054	0.113	0.119	
6	2437	DSSS	Right Tilt	14.27	14.50	-0.05	1.054	0.062	0.065	
6	2437	DSSS	Left Cheek	14.27	14.50	-0.11	1.054	0.218	**0.230**	Plot 17
6	2437	DSSS	Left Tilt	14.27	14.50	-0.08	1.054	0.16	0.169	
measured / reported SAR numbers - Body (hotspot open, distance 10mm)										
6	2437	DSSS	Front	14.27	14.50	-0.17	1.054	0.027	0.028	
6	2437	DSSS	Back	14.27	14.50	-0.03	1.054	0.032	**0.034**	Plot 18
6	2437	DSSS	Right Side	14.27	14.50	-0.06	1.054	0.013	0.014	
6	2437	DSSS	Top Side	14.27	14.50	-0.06	1.054	0.031	0.033	
measured / reported SAR numbers – Body worn (distance 10mm)										
6	2437	DSSS	Front	14.27	14.50	-0.17	1.054	0.027	0.028	
6	2437	DSSS	Back	14.27	14.50	-0.03	1.054	0.032	0.034	

Note:
1. The value with black color is the maximum Reported SAR Value of each test band.
2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is optional for such test configuration(s).
3. Per KDB 941225 D02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/HSUPA output power is < 0.25dBhigher than RMC, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA SAR evaluation can be excluded.
4. Per KDB 941225 D05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation,using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel
5. Per KDB 941225 D05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
6. Per KDB 941225 D05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB

allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
7. Per KDB 941225 D05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r03,16QAM SAR testing is not required.
8. Per KDB 941225 D05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r03, smaller bandwidth SAR testing is not required.
9. Per KDB 248227-SAR is measured using the highest measured maximum output power channel for the initial test configuration.
10. Per KDB 248227- Channels with measured maximum output power within ¼ dB of each other are considered to have the same maximum output, When there are multiple test channels with the same measured maximum output power, the channel closest to mid-band frequency is selected for SAR measurement. And when there are multiple test channels with the same measured maximum output power and equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.
11. Per KDB 248227- When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg. (The highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power was 0.163 W/Kg(0.230*(19.95/28.18)=0.428) So ODFM SAR test is not required.
12. Per KDB 648474 D04, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.

5.3.3 Standalone SAR Test Exclusion Considerations and Estimated SAR

Per KDB447498 requires when the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion;
● (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√ f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
● 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm

Per FCC KD B447498 D01,simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the transmitting antenna in a specific a physical test configuration is ≤1.6 W/Kg.When the sum is greater than the SAR limit,SAR test exclusion is determined by the SAR to peak location separation ratio.

$$\text{Ratio}=\frac{(\text{SAR}_1+\text{SAR}_2)^{1.5}}{(\text{peak location separation,mm})}<0.04$$

Estimated stand alone SAR					
Communication system	Frequency (MHz)	Configuration	Maximum Power (including tune-up tolerance) (dBm)	Separation Distance (mm)	Estimated SAR_{1-g} (W/kg)
Bluetooth*	2450	Head	2	5	0.067
Bluetooth*	2450	Hotspot	2	10	0.033
Bluetooth*	2450	Body Worn	2	10	0.033

Bluetooth*- Including Lower power Bluetooth

5.4. Simultaneous TX SAR Considerations

5.4.1 Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g/n and Bluetooth devices which may simultaneously transmit with the licensed transmitter.
For the DUT,the BT and WiFi modules sharing same antenna,GSM,WCDMA and LTE module sharing a single antenna;

Application Simultaneous Transmission information:

Air-Interface	Band (MHz)	Type	Simultaneous Transmissions	Voice over Digital Transport(Data)
GSM	850	VO	Yes,WLAN or BT/BLE	N/A
	1900	VO		
	GPRS/EDGE	DT	Yes,WLAN or BT/BLE	N/A
WCDMA	Band II /BandV	DT	Yes,WLAN or BT/BLE	N/A
LTE	Band4/Band7/	DT	Yes,WLAN or BT/BLE	N/A
WLAN	2450	DT	Yes,GSM,GPRS,EDGE,UMTS	Yes
BT/BLE	2450	DT	Yes,GSM,GPRS,EDGE,UMTS	N/A
Note:VO-Voice Service only;DT-Digital Transport				

Note: BT and WLAN can be active at the same time, but only with interleaving of packages switched on board level. That means that they don’t transmit at the same time.
BLE-Bluetooth low energy;
BT- Classical Bluetooth

5.4.2 Evaluation of Simultaneous SAR

Head Exposure Conditions

Simultaneous transmission SAR for WiFi and WWAN

Test Position	GSM850 Reported SAR_{1-g} (W/Kg)	GSM1900 Reported SAR_{1-g} (W/Kg)	WCDMA Band V Reported SAR_{1-g} (W/Kg)	WCDMA Band II Reported SAR_{1-g} (W/Kg)	LTE Band 4 Reported SAR_{1-g} (W/Kg)	LTE Band 7 Reported SAR_{1-g} (W/Kg)	WiFi Reported SAR_{1-g} (W/Kg)	MAX. ΣSAR_{1-g} (W/Kg)	SAR_{1-g} Limit (W/Kg)	Peak location separation ratio	Simut. Meas. Required
Right Cheek	0.246	0.270	0.167	0.412	0.222	0.589	0.119	**0.708**	1.6	no	no
Right Tilt	0.065	0.110	0.043	0.139	0.074	0.212	0.065	0.277	1.6	no	no
Left Cheek	0.222	0.295	0.179	0.420	0.244	0.234	0.230	0.650	1.6	no	no
Left Tilt	0.075	0.066	0.043	0.085	0.052	0.098	0.169	0.267	1.6	no	no

Simultaneous transmission SAR for Bluetooth and WWAN

Test Position	GSM850 Reported SAR_{1-g} (W/Kg)	GSM1900 Reported SAR_{1-g} (W/Kg)	WCDMA Band V Reported SAR_{1-g} (W/Kg)	WCDMA Band II Reported SAR_{1-g} (W/Kg)	LTE Band 4 Reported SAR_{1-g} (W/Kg)	LTE Band 7 Reported SAR_{1-g} (W/Kg)	Bluetooth Estimated SAR_{1-g} (W/Kg)	MAX. ΣSAR_{1-g} (W/Kg)	SAR_{1-g} Limit (W/Kg)	Peak location separation ratio	Simut. Meas. Required
Right Cheek	0.246	0.270	0.167	0.412	0.222	0.589	0.067	**0.656**	1.6	no	no
Right Tilt	0.065	0.110	0.043	0.139	0.074	0.212	0.067	0.279	1.6	no	no
Left Cheek	0.222	0.295	0.179	0.420	0.244	0.234	0.067	0.487	1.6	no	no
Left Tilt	0.075	0.066	0.043	0.085	0.052	0.098	0.067	0.165	1.6	no	no

Body Exposure Conditions

Simultaneous transmission SAR for WiFi and WWAN

Test Position	GSM850 Reported SAR_{1-g} (W/Kg)	GSM1900 Reported SAR_{1-g} (W/Kg)	WCDMA Band V Reported SAR_{1-g} (W/Kg)	WCDMA Band II Reported SAR_{1-g} (W/Kg)	LTE Band 4 Reported SAR_{1-g} (W/Kg)	LTE Band 7 Reported SAR_{1-g} (W/Kg)	WiFi Reported SAR_{1-g} (W/Kg)	MAX. ΣSAR_{1-g} (W/Kg)	SAR_{1-g} Limit (W/Kg)	Peak location separation ratio	Simut. Meas. Required
Front	0.240	0.788	0.478	0.639	0.379	0.445	0.028	**0.816**	1.6	no	no
Back	0.273	0.643	0.602	0.553	0.300	0.631	0.034	0.677	1.6	no	no
Left Side	0.044	0.354	0.324	0.324	0.118	0.255	/	0.354	1.6	no	no
Right Side	0.165	0.209	0.379	0.154	0.075	0.147	0.014	0.393	1.6	no	no
Top Side	/	/	/	/	/	/	0.033	0.033	1.6	no	no
Bottom Side	0.269	0.541	0.057	0.514	0.319	0.565	/	0.565	1.6	no	no

Simultaneous transmission SAR for Bluetooth and WWAN

Test Position	GSM850 Reported SAR_{1-g} (W/Kg)	GSM1900 Reported SAR_{1-g} (W/Kg)	WCDMA Band V Reported SAR_{1-g} (W/Kg)	WCDMA Band II Reported SAR_{1-g} (W/Kg)	LTE Band 4 Reported SAR_{1-g} (W/Kg)	LTE Band 7 Reported SAR_{1-g} (W/Kg)	Bluetooth Estimated SAR_{1-g} (W/Kg)	MAX. ΣSAR_{1-g} (W/Kg)	SAR_{1-g} Limit (W/Kg)	Peak location separation ratio	Simut. Meas. Required
Front	0.240	**0.788**	0.478	**0.639**	**0.379**	0.445	0.033	**0.821**	1.6	no	no
Back	**0.273**	0.643	**0.602**	0.553	0.300	**0.631**	0.033	0.676	1.6	no	no
Left Side	0.044	0.354	0.324	0.324	0.118	0.255	0.033	0.387	1.6	no	no
Right Side	0.165	0.209	0.379	0.154	0.075	0.147	0.033	0.412	1.6	no	no
Top Side	/	/	/	/	/	/	0.033	0.033	1.6	no	no
Bottom Side	0.269	0.541	0.057	0.514	0.319	0.565	0.033	0.598	1.6	no	no

Note:
1. The WiFi and BT share same antenna, so cannot transmit at same time.
2. The value with block color is the maximum values of standalone
3. The value with blue color is the maximum values of $\sum SAR_{1-g}$

5.5. SAR Measurement Variability

According to KDB865664, Repeated measurements are required only when the measured SAR is ≥ 0.80 W/kg. If the measured SAR value of the initial repeated measurement is < 1.45 W/kg with ≤ 20% variation, only one repeated measurement is required to reaffirm that the results are not expected to have substantial variations, which may introduce significant compliance concerns. A second repeated measurement is required only if the measured result for the initial repeated measurement is within 10% of the SAR limit and vary by more than 20%, which are often related to device and measurement setup difficulties. The following procedures are applied to determine if repeated measurements are required. The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.19 The repeated measurement results must be clearly identified in the SAR report. All measured SAR, including the repeated results, must be considered to determine compliance and for reporting according to KDB 690783.Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

1) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
2) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20

5.6. General description of test procedures

1. The DUT is tested using CMU 200 communications testers as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power.
2. Test positions as described in the tables above are in accordance with the specified test standard.
3. Tests in body position were performed in that configuration, which generates the highest time based averaged output power (see conducted power results).
4. Tests in head position with GSM were performed in voice mode with 1 timeslot unless GPRS/EGPRS/DTM function allows parallel voice and data traffic on 2 or more timeslots.
5. UMTS was tested in RMC mode with 12.2 kbit/s and TPC bits set to ‘all 1’.

6. WiFi was tested in 802.11b/g/n mode with 1 Mbit/s and 6 Mbit/s. According to KDB 248227 the SAR testing for 802.11g/n is not required since When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
7. Required WiFi test channels were selected according to KDB 248227
8. According to FCC KDB pub 248227 D01, Channels with measured maximum output power within ¼ dB of each other are considered to have the same maximum output, When there are multiple test channels with the same measured maximum output power, the channel closest to mid-band frequency is selected for SAR measurement and when there are multiple test channels with the same measured maximum output power and equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.
9. According to FCC KDB pub 941225 D06 this device has been tested with 10 mm distance to the phantom for operation in WiFi hot spot mode.
10. Per FCC KDB pub 941225 D06 the edges with antennas within 2.5 cm are required to be evaluated for SAR to cover WiFi hot spot function.
11. According to IEEE 1528 the SAR test shall be performed at middle channel. Testing of top and bottom channel is optional.
12. According to KDB 447498 D01 testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
    - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
    - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
    - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
13. IEEE 1528-2003 require the middle channel to be tested first. This generally applies to wireless devices that are designed to operate in technologies with tight tolerances for maximum output power variations across channels in the band. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.
14. Per KDB648474 D04 require when the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is < 1.2 W/kg.
15. Per KDB648474 D04 require when the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, using the same wireless mode test configuration for voice and data, such as UMTS, LTE and Wi-Fi, and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface)
16. 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g SAR > 1.2 W/kg.
17. Per KDB648474 D04 require for phablet SAR test considerations，For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.
18. 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g SAR > 1.2 W/kg.

5.7. Measurement Uncertainty (300MHz-3GHz)

Not required as SAR measurement uncertainty analysis is required in SAR reports only when the highest measured SAR in a frequency band is ≥ 1.5 W/kg for 1-g SAR accoridng to KDB865664D01.

5.8. System Check Results

SystemPerformanceCheck-D835 for Head

Date: 2015.10.22

DUT: Dipole 835 MHz D835V2; Type: D835V2 SN:4d141;

Communication System: CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.91 mho/m; εr = 41.3; ρ = 1000 kg/m3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: ES3DV3 - SN3203; ConvF(6.55, 6.55, 6.55); Calibrated: 2014.12.19.;

Sensor-Surface: 4mm (Mechanical Surface Detection)

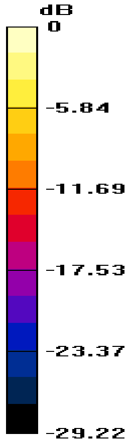
Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

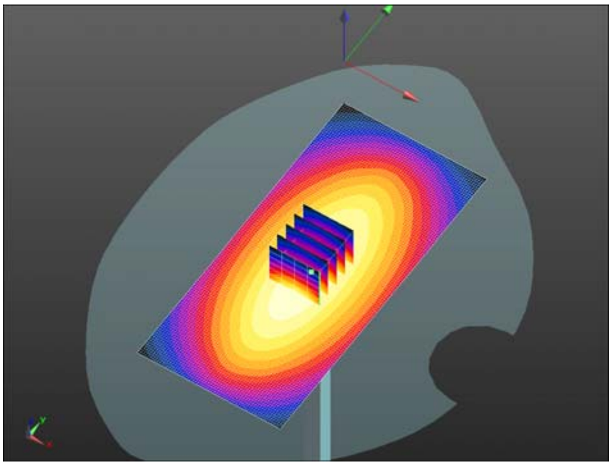
Phantom: SAM 1; Type: QD000P40CC; Serial: TP:1504

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Head/Dipole835 /Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 52.933 V/m; Power Drift = -0.01 dB
Fast SAR: SAR(1 g) = 2.32 mW/g; SAR(10 g) = 1.52 mW/g
Maximum value of SAR (interpolated) = 2.51 W/kg

Head/Dipole835 /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.933 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.527 mW/g
SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.5 mW/g
Maximum value of SAR (measured) = 2.50 W/kg





0 dB = 2.51 W/kg = 7.98 dB W/kg

SystemPerformanceCheck-D835 for Body

Date: 2015.10.24

DUT: Dipole 835 MHz D835V2; Type: D835V2 SN:4d141;

Communication System: CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; εr = 55.5; ρ = 1000 kg/m3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: ES3DV3 - SN3203; ConvF(6.2, 6.2, 6.2); Calibrated: 2014.12.19.;

Sensor-Surface: 4mm (Mechanical Surface Detection)

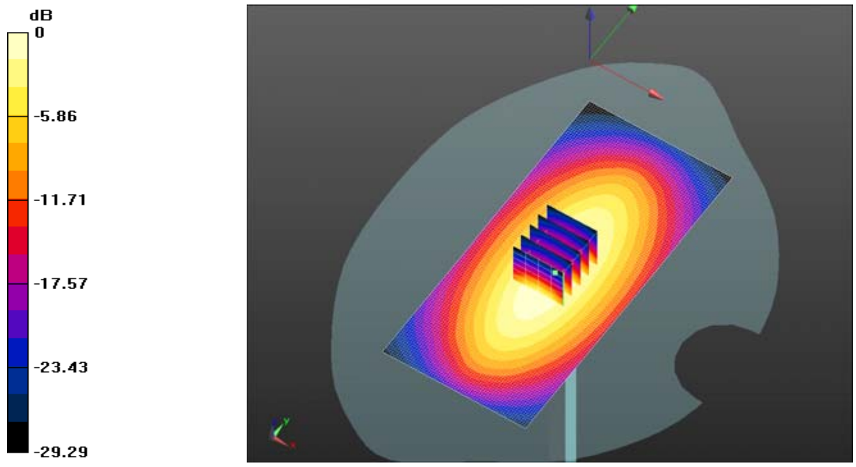
Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Phantom: SAM 1; Type: QD000P40CC; Serial: TP:1504

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Body/Dipole835/Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 55.902 V/m; Power Drift = -0.52 dB
Fast SAR: SAR(1 g) = 2.55 mW/g; SAR(10 g) = 1.67 mW/g
Maximum value of SAR (interpolated) = 2.76 W/kg

Body/Dipole835/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 55.902 V/m; Power Drift = -0.52 dB
Peak SAR (extrapolated) = 3.791 mW/g
SAR(1 g) = 2.48 mW/g; SAR(10 g) = 1.61 mW/g
Maximum value of SAR (measured) = 2.69 W/kg



0 dB = 2.76 W/kg = 8.82 dB W/kg

SystemPerformanceCheck-D1750 for Head

Date: 2015.10.21

DUT: Dipole 1750 MHz D1750V2; Type: D1750V2 SN:1108;

Communication System: CW; Communication System Band: D1750 (1750.0 MHz); Frequency: 1750 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1750 MHz; σ = 1.42 mho/m; εr = 40.5; ρ = 1000 kg/m3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: ES3DV3 - SN3203; ConvF(5.2, 5.2, 5.2); Calibrated: 2014.12.19.;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Phantom: SAM 1; Type: QD000P40CC; Serial: TP:1504

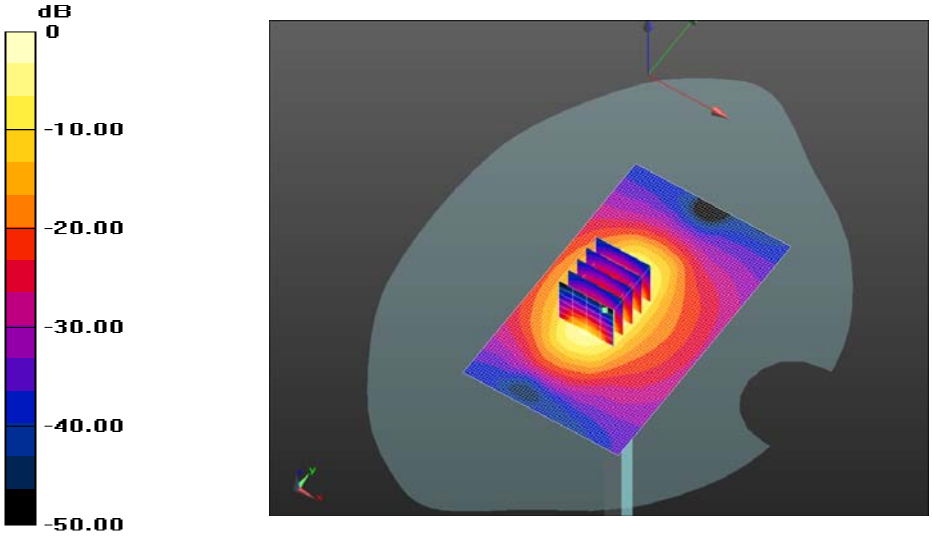
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Head/Dipole1750MHz/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 87.103 V/m; Power Drift = 0.04 dB
Fast SAR: SAR(1 g) = 9.69 mW/g; SAR(10 g) = 5.02 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 11.9 W/kg

Head/Dipole1750MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 87.103 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 16.962 mW/g
SAR(1 g) = 9.6 mW/g; SAR(10 g) = 5.04 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 10.8 W/kg



0 dB = 11.9 W/kg = 21.51 dB W/kg

SystemPerformanceCheck-D1750 for Body

Date: 2015.10.23

DUT: Dipole 1750 MHz D1750V2; Type: D1750V2 SN:1108;

Communication System: CW; Communication System Band: D1750 (1750.0 MHz); Frequency: 1750 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1750 MHz; σ = 1.51 mho/m; εr = 53.45; ρ = 1000 kg/m3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: ES3DV3 - SN3203; ConvF(4.88, 4.88, 4.88); Calibrated: 2014.12.19.;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Phantom: SAM 1; Type: QD000P40CC; Serial: TP:1504

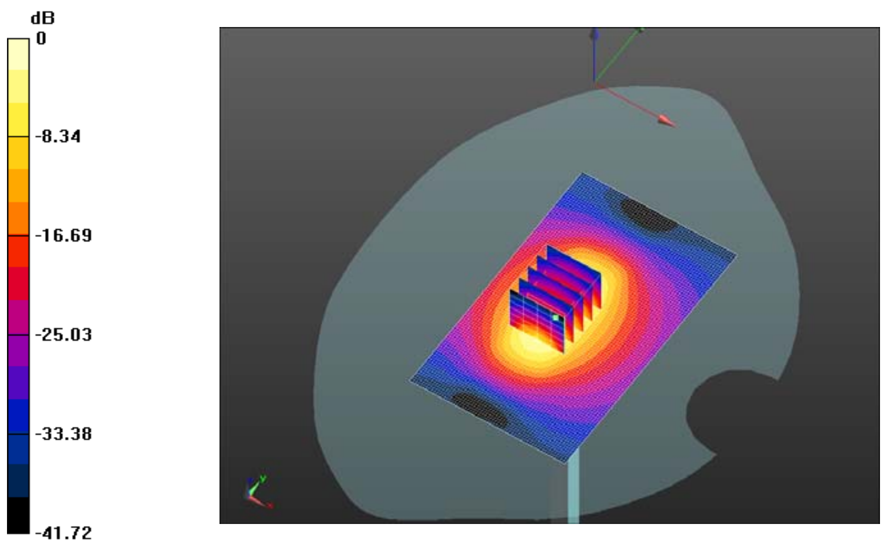
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Body/Dipole1750MHz/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 89.117 V/m; Power Drift = 0.05 dB
Fast SAR: SAR(1 g) = 9.86 mW/g; SAR(10 g) = 5.16 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 12.0 W/kg

Body/Dipole1750MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 89.117 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 16.474 mW/g
SAR(1 g) = 9.71 mW/g; SAR(10 g) = 5.22 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 10.9 W/kg



0 dB = 12.0 W/kg = 21.58 dB W/kg

SystemPerformanceCheck-D1900 for Head

Date: 2015.10.21

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2 SN:5d162;

Communication System: CW; Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.42 mho/m; εr = 40.5; ρ = 1000 kg/m3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: ES3DV4 - SN3881; ConvF(7.96, 7.96, 7.96); Calibrated: 2015.07.24.;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Phantom: SAM 1; Type: QD000P40CC; Serial: TP:1504

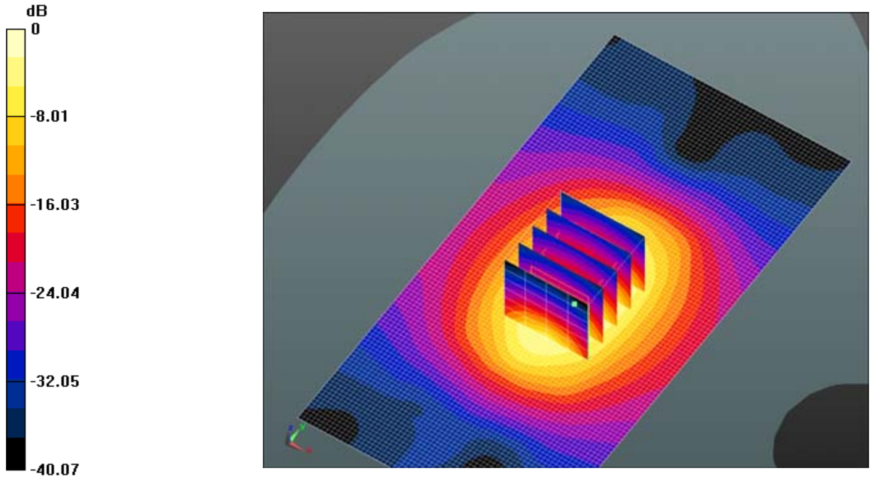
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Head/Dipole1900 /Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Reference Value = 87.529 V/m; Power Drift = 0.06 dB
Fast SAR: SAR(1 g) = 10 mW/g; SAR(10 g) = 5.27 mW/g
Maximum value of SAR (interpolated) = 11.5 W/kg

Head/Dipole1900 /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 87.529 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 19.113 mW/g
SAR(1 g) = 9.94 mW/g; SAR(10 g) = 5.02 mW/g
Maximum value of SAR (measured) = 11.1 W/kg



0 dB = 11.5 W/kg = 21.24 dB W/kg

SystemPerformanceCheck-D1900 for Body

Date: 2015.10.23

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2 SN:5d162;

Communication System: CW; Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.5 mho/m; εr = 53.0; ρ = 1000 kg/m3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: ES3DV4 - SN3881; ConvF(7.6, 7.6, 7.6); Calibrated: 2015.07.24.;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Phantom: SAM 1; Type: QD000P40CC; Serial: TP:1504

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

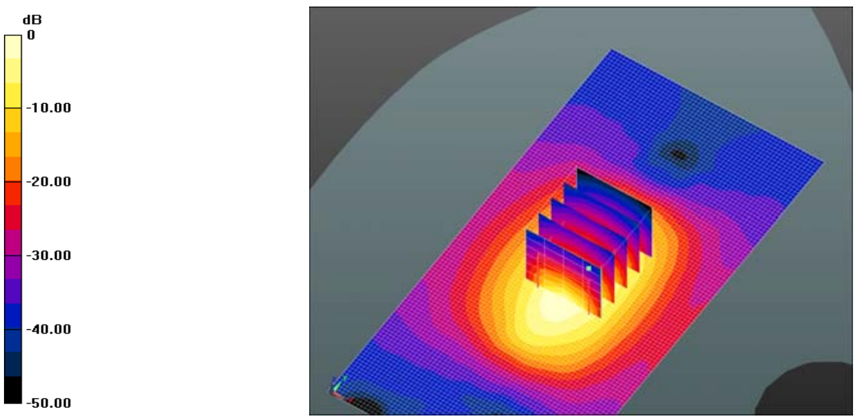
Body/Dipole1900/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Reference Value = 87.333 V/m; Power Drift = 0.06 dB
Fast SAR: SAR(1 g) = 11 mW/g; SAR(10 g) = 5.38 mW/g
Maximum value of SAR (interpolated) = 13.0 W/kg

Body/Dipole1900/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 87.333 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 21.434 mW/g
SAR(1 g) = 10.9 mW/g; SAR(10 g) = 5.54 mW/g

Maximum value of SAR (measured) = 12.7 W/kg



0 dB = 13.0 W/kg = 22.31 dB W/kg

SystemPerformanceCheck-D2450 for Head

Date: 2015.10.21

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2 SN:818;

Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.82 mho/m; εr = 39.0; ρ = 1000 kg/m3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: ES3DV3 - SN3203; ConvF(4.55, 4.55, 4.55); Calibrated: 2014.12.19.;

Sensor-Surface: 4mm (Mechanical Surface Detection)

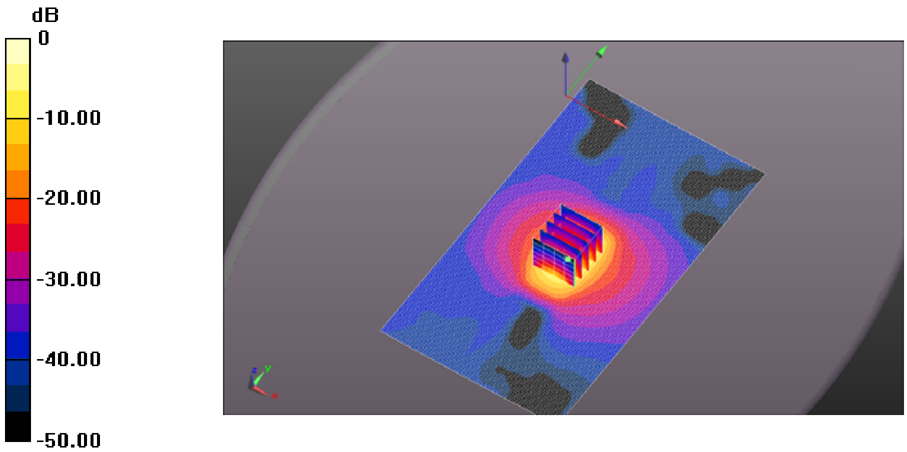
Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:xxxx

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Head/Dipole2450 /Area Scan (91x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 94.311 V/m; Power Drift = -0.32 dB
Fast SAR: SAR(1 g) = 13.9 mW/g; SAR(10 g) = 5.91 mW/g
Maximum value of SAR (interpolated) = 17.6 W/kg

Head/Dipole2450 /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 94.311 V/m; Power Drift = -0.32 dB
Peak SAR (extrapolated) = 33.836 mW/g
SAR(1 g) = 13.6 mW/g; SAR(10 g) = 5.85 mW/g
Maximum value of SAR (measured) = 15.4 W/kg



0 dB = 17.6 W/kg = 24.93 dB W/kg

SystemPerformanceCheck-D2450 for Body

Date: 2015.10.24

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2 SN:818;
Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; εr = 53.1; ρ = 1000 kg/m3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: ES3DV3 - SN3203; ConvF(4.47, 4.47, 4.47); Calibrated: 2014.12.19.;

Sensor-Surface: 4mm (Mechanical Surface Detection)

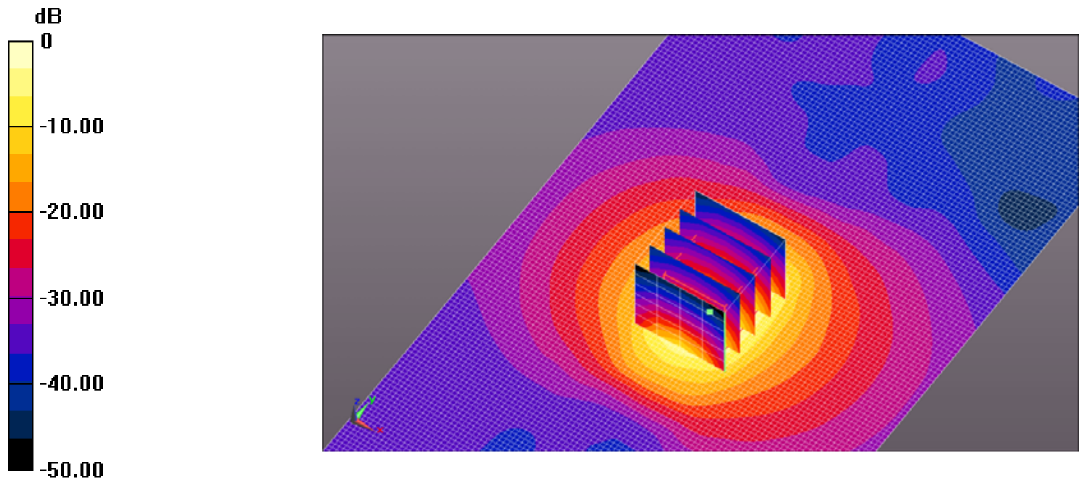
Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:xxxx

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Body/Dipole2450/Area Scan (91x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 92.292 V/m; Power Drift = 0.01 dB
Fast SAR: SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.21 mW/g
Maximum value of SAR (interpolated) = 17.3 W/kg

Body/Dipole2450/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 92.292 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 33.353 mW/g
SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.3 mW/g
Maximum value of SAR (measured) = 16.9 W/kg



0 dB = 17.3 W/kg = 24.78 dB W/kg

SystemPerformanceCheck-D2600 for Head

Date: 2015.10.24

DUT: Dipole 2600 MHz D2600V2; Type: D2600V2 SN:1074;
Communication System: CW; Communication System Band: D2600 (2600.0 MHz); Frequency: 2600 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 1.94 mho/m; εr = 39.1; ρ = 1000 kg/m3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: EX3DV4 - SN3881; ConvF(6.91, 6.91, 6.91); Calibrated: 2014.11.06.;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Phantom: SAM 1; Type: QD000P40CC; Serial: TP:1504

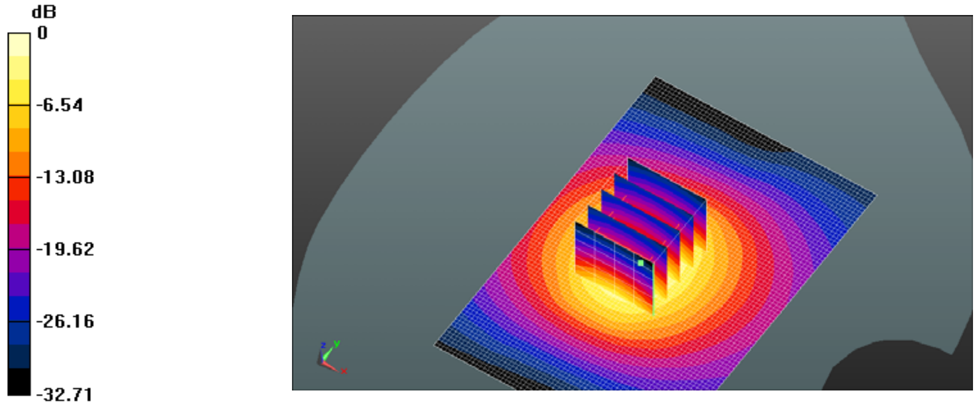
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Head/Dipole2600MHz /Area Scan (61x91x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 87.436 V/m; Power Drift = 0.03 dB
Fast SAR: SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.69 mW/g

Maximum value of SAR (interpolated) = 16.4 W/kg

Head/Dipole2600MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 87.436 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 30.725 mW/g
SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.46 mW/g

Maximum value of SAR (measured) = 15.1 W/kg



0 dB = 16.4 W/kg = 24.31 dB W/kg

SystemPerformanceCheck-D2600 for Body

Date: 2015.10.24

DUT: Dipole 2600 MHz D2600V2; Type: D2600V2 SN:1074;

Communication System: CW; Communication System Band: D2600 (2600.0 MHz); Frequency: 2600 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 2.17 mho/m; εr = 52.6; ρ = 1000 kg/m3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: EX3DV4 - SN3881; ConvF(7.19, 7.19, 7.19); Calibrated: 2014.11.06.;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Phantom: SAM 1; Type: QD000P40CC; Serial: TP:1504

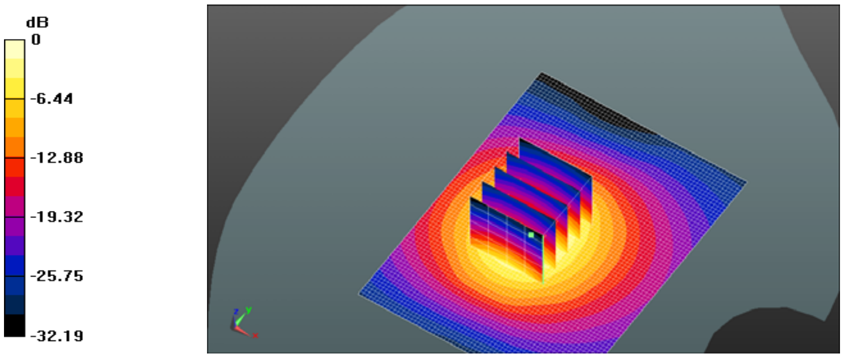
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Body/Dipole2600MHz/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 94.322 V/m; Power Drift = -0.28 dB
Fast SAR: SAR(1 g) = 14.3 mW/g; SAR(10 g) = 6.83 mW/g

Maximum value of SAR (interpolated) = 18.2 W/kg

Body/Dipole2600MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 94.322 V/m; Power Drift = -0.28 dB
Peak SAR (extrapolated) = 33.740 mW/g
SAR(1 g) = 14.2 mW/g; SAR(10 g) = 6.51 mW/g

Maximum value of SAR (measured) = 16.7 W/kg



0 dB = 18.2 W/kg = 25.18 dB W/kg

5.9. SAR Test Graph Results

SAR plots for **the highest measured SAR** in each exposure configuration, wireless mode and frequency band combination according to FCC KDB 865664 D02

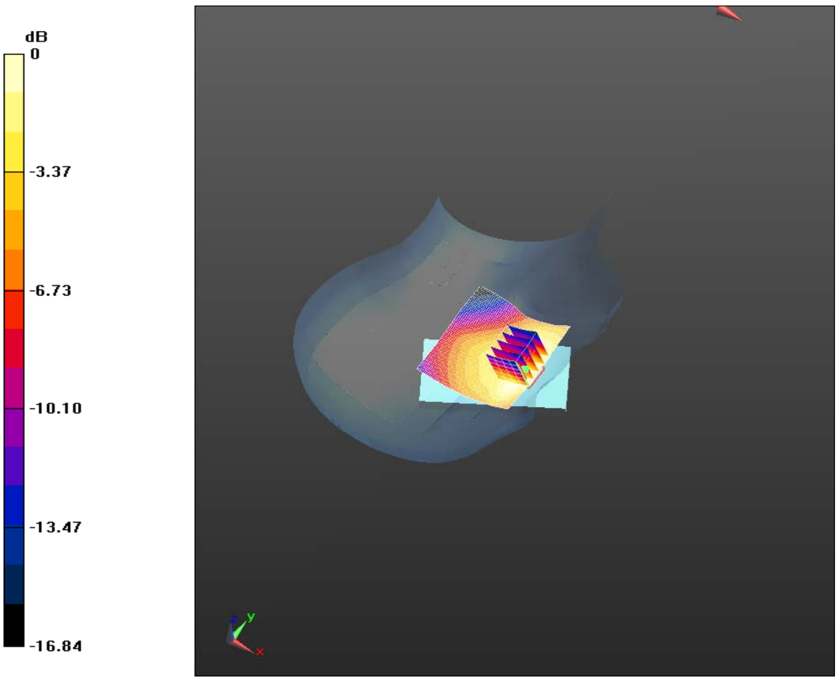
#1
Date: 2015.10.22.
GSM850 Head Right Cheek Mid
Medium: HSL900
Communication System: Generic GSM; Communication System Band: GSM 850 (824.0 - 849.0 MHz); Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.91 mho/m; ε_r = 41.3; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(6.55, 6.55, 6.55); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

GSM 850_Right Cheek/Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 7.536 V/m; Power Drift = -0.02 dB
Fast SAR: SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.143 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.232 W/kg

GSM 850_Right Cheek/Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.536 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.314 mW/g
SAR(1 g) = 0.230 mW/g; SAR(10 g) = 0.162 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.258 W/kg



0 dB = 0.232 W/kg = -12.68 dB W/kg

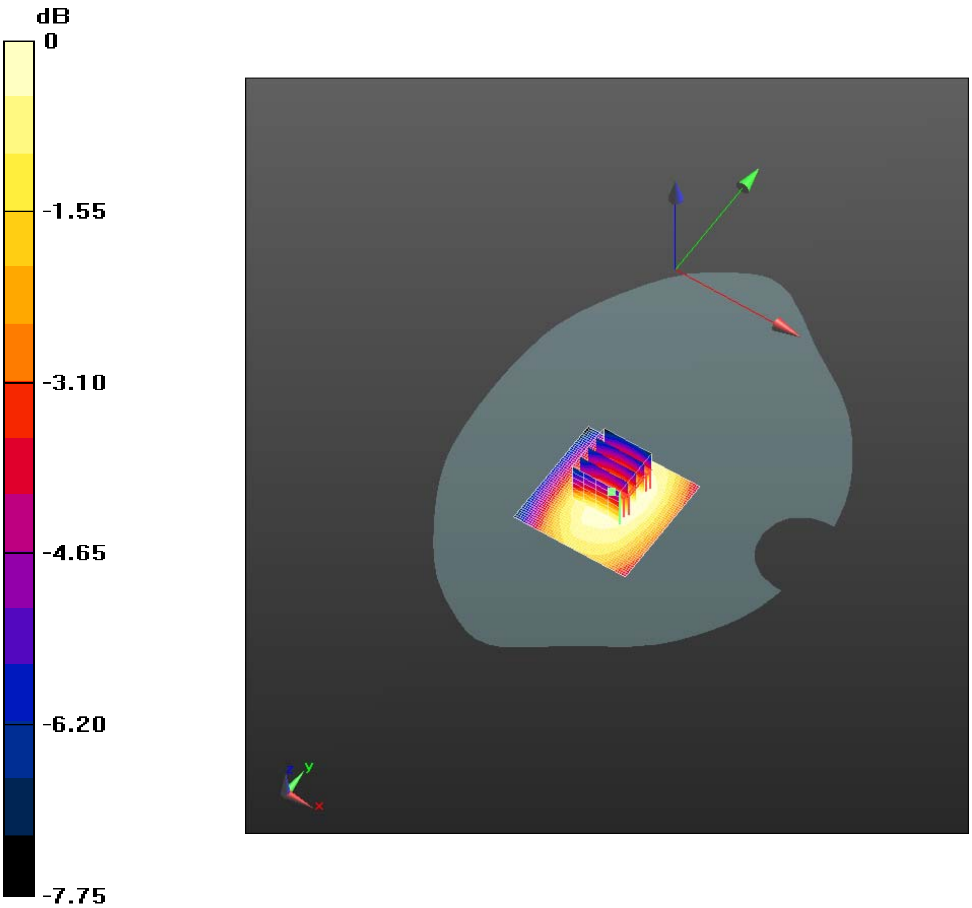
#2
Date:2015.10.24.
GPRS850 Body Hotspot Back Side Mid
Medium: MSL900
Communication System: GPRS2 Tx slots; Communication System Band: GSM 850 (824.0 - 849.0 MHz); Frequency: 836.6 MHz;Duty Cycle: 1:4.1
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.99 mho/m; ε_r = 55.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(6.2, 6.2, 6.2); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

GPRS 850_Facedown/Mid 10mm/Area Scan (51x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 15.307 V/m; Power Drift = -0.02 dB
Fast SAR: SAR(1 g) = 0.241 mW/g; SAR(10 g) = 0.171 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.252 W/kg

GPRS 850_Facedown/Mid 10mm/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.307 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.302 mW/g
SAR(1 g) = 0.243 mW/g; SAR(10 g) = 0.189 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.253 W/kg

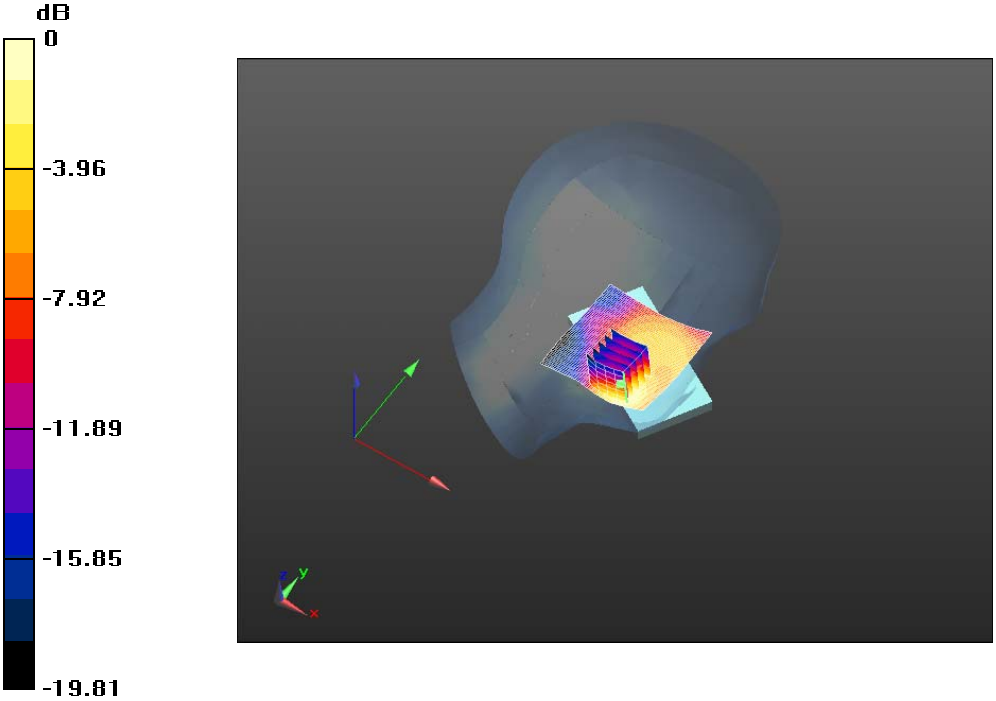


0 dB = 0.252 W/kg = -11.96 dB W/kg

#3
Date:2015.10.21.
GSM1900 Head Left Cheek Mid
Medium: HSL1900
Communication System: Generic GSM; Communication System Band: PCS 1900 (1850.0 - 1910.0 MHz); Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.42 mho/m; ε_r = 40.5; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(5.2, 5.2, 5.2); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

1900_Left GSM Head/1900 GSM Cheek-Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 2.409 V/m; Power Drift = -0.15 dB
Fast SAR: SAR(1 g) = 0.277 mW/g; SAR(10 g) = 0.157 mW/g
Maximum value of SAR (interpolated) = 0.313 W/kg

1900_Left GSM Head/1900 GSM Cheek-Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.409 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.530 mW/g
SAR(1 g) = 0.275 mW/g; SAR(10 g) = 0.145 mW/g
Maximum value of SAR (measured) = 0.303 W/kg

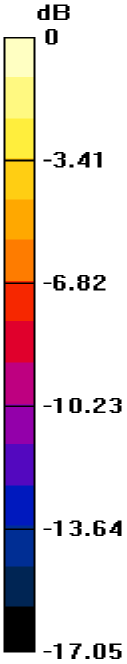


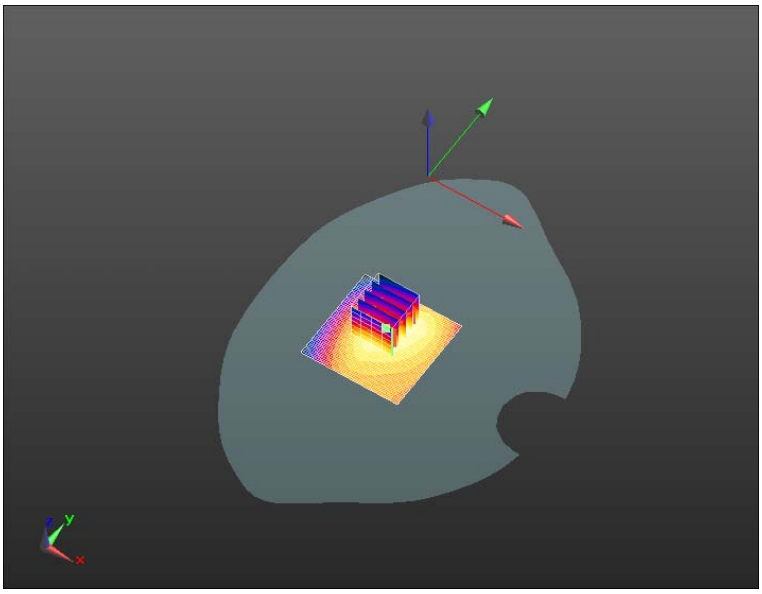
0 dB = 0.313 W/kg = -10.10 dB W/kg

#4
Date:2015.10.23.
GSM1900 Body Hotspot Front Side Low
Medium: MSL1900
Communication System: GPRS 2 Tx slots; Communication System Band: PCS 1900 (1850.0 - 1910.0 MHz); Frequency: 1850.2 MHz;Duty Cycle: 1:4.1
Medium parameters used: f = 1850.2 MHz; σ = 1.50 mho/m; ε_r = 53.0; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(4.88, 4.88, 4.88); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

GPRS1900 Flat/GPRS1900 Faceup-Low 10mm/Area Scan (51x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 21.343 V/m; Power Drift = 0.10 dB
Fast SAR: SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.631 mW/g
Maximum value of SAR (interpolated) = 1.19 W/kg

GPRS1900 Flat/GPRS1900 Faceup-Low 10mm/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.343 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 1.841 mW/g
SAR(1 g) = 0.715 mW/g; SAR(10 g) = 0.517 mW/g
Maximum value of SAR (measured) = 1.15 W/kg





0 dB = 1.19 W/kg = 1.54 dB W/kg

#5
Date:2015.10.21.
WCDMA BAND V Head Left Cheek Mid
Medium: HSL900
Communication System: UMTS-FDD; Communication System Band: Band 5, UTRA/FDD (824.0 - 849.0 MHz); Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.91 mho/m; ε_r = 41.3; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(6.55, 6.55, 6.55); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

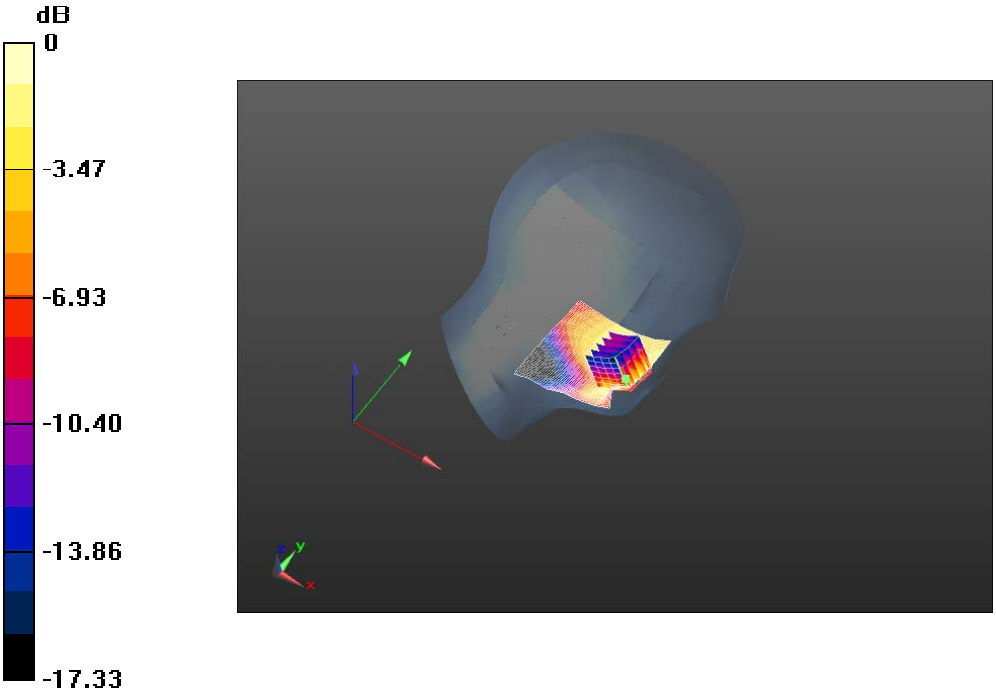
UMTS Band 5_left head cheek/Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 4.108 V/m; Power Drift = -0.11 dB
Fast SAR: SAR(1 g) = 0.176 mW/g; SAR(10 g) = 0.112 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.193 W/kg

UMTS Band 5_left head cheek/Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.108 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.224 mW/g
SAR(1 g) = 0.171 mW/g; SAR(10 g) = 0.117 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.213 W/kg



0 dB = 0.193 W/kg = -14.27 dB W/kg

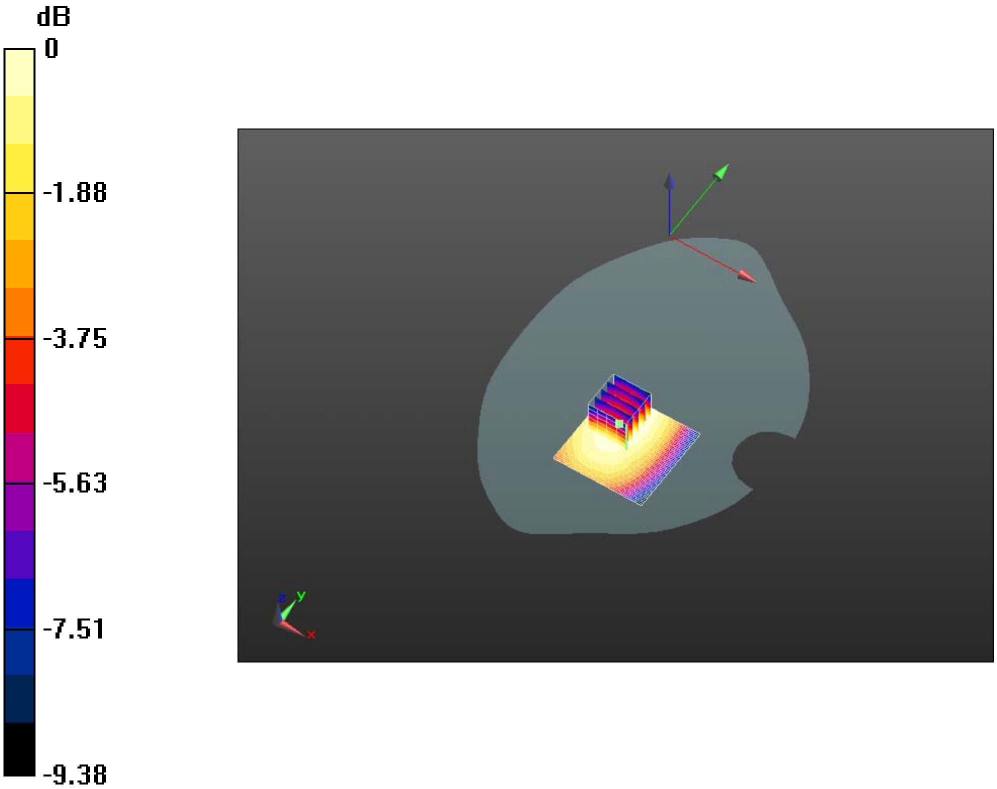
#6
Date:2015.10.24.
WCDMA BAND V Body Hotspot Back Side Mid
Medium: MSL900
Communication System: UMTS-FDD; Communication System Band: Band 5, UTRA/FDD (824.0 - 849.0 MHz); Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.99 mho/m; ε_r = 55.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(6.2, 6.2, 6.2); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

UMTS Band 5_body Facedown/Mid 10mm/Area Scan (51x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 23.187 V/m; Power Drift = 0.01 dB
Fast SAR: SAR(1 g) = 0.575 mW/g; SAR(10 g) = 0.406 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.602 W/kg

UMTS Band 5_body Facedown/Mid 10mm/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.187 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.694 mW/g
SAR(1 g) = 0.576 mW/g; SAR(10 g) = 0.455 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.601 W/kg

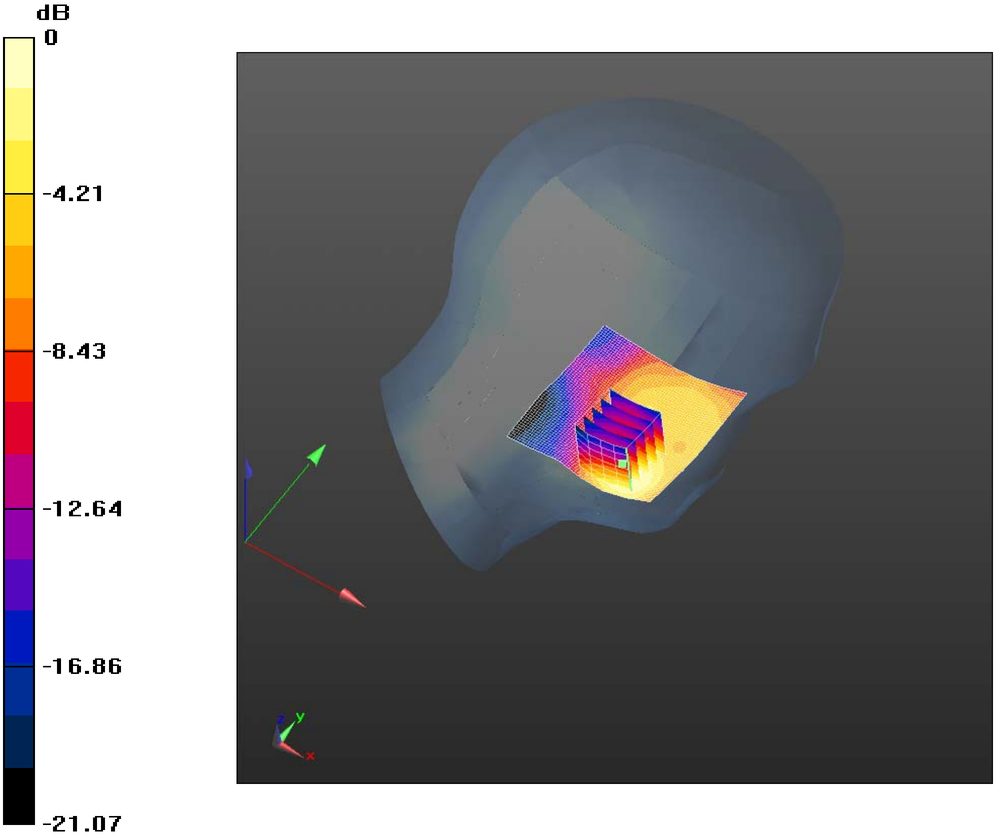


0 dB = 0.602 W/kg = -4.41 dB W/kg

#7
Date:2015.10.21.
WCDMA BAND II Head Left Cheek Mid
Medium: HSL1900
Communication System: UMTS-FDD; Communication System Band: Band 2, UTRA/FDD (1850.0 - 1910.0 MHz); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.42 mho/m; ε_r = 40.5; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(5.2, 5.2, 5.2); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

UMTS Band 2_left head cheek/Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 3.500 V/m; Power Drift = 0.13 dB
Fast SAR: SAR(1 g) = 0.392 mW/g; SAR(10 g) = 0.224 mW/g
Maximum value of SAR (interpolated) = 0.441 W/kg

UMTS Band 2_left head cheek/Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.500 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.798 mW/g
SAR(1 g) = 0.402 mW/g; SAR(10 g) = 0.207 mW/g
Maximum value of SAR (measured) = 0.444 W/kg



0 dB = 0.441 W/kg = -7.10 dB W/kg

#8

Date:2015.10.23.

WCDMA BAND II Body Hotspot Front Side Low

Medium: MSL1900

Communication System: UMTS-FDD; Communication System Band: Band 2, UTRA/FDD (1850.0 - 1910.0 MHz); Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.5 mho/m; ε_r = 53.0; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(4.88, 4.88, 4.88); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

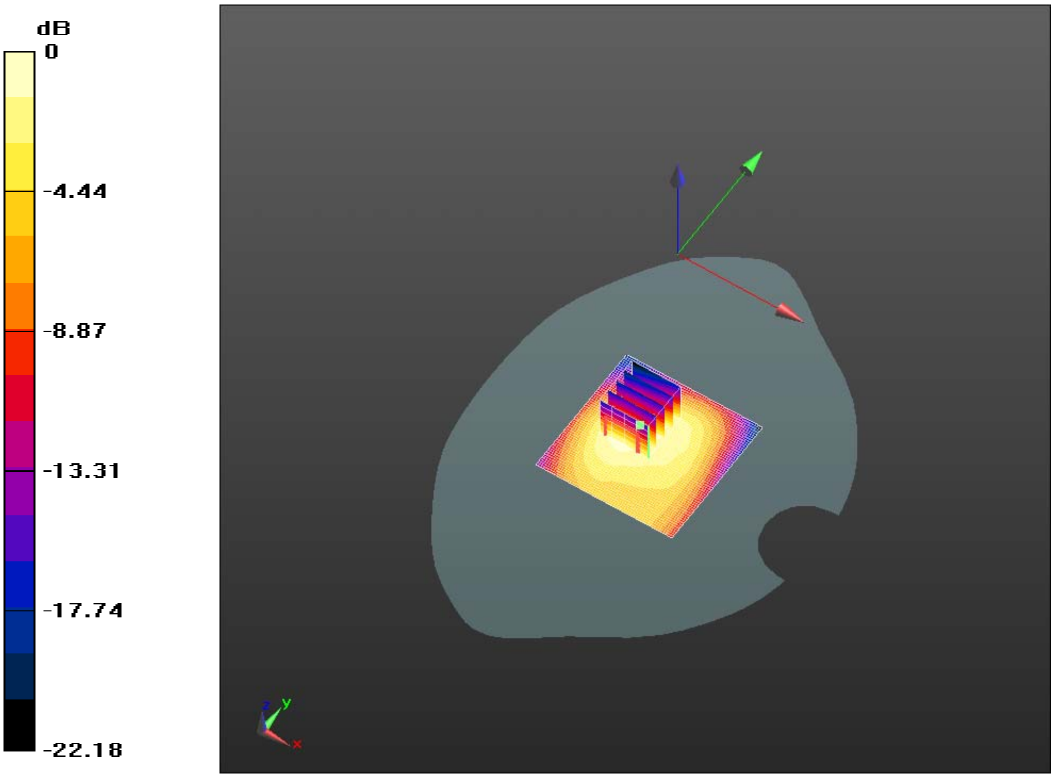
UMTS Band 2_body Faceup/Low10mm/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 19.035 V/m; Power Drift = -0.05 dB
Fast SAR: SAR(1 g) = 0.807 mW/g; SAR(10 g) = 0.471 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.896 W/kg

UMTS Band 2_body Faceup/Low10mm/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.035 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.456 mW/g
SAR(1 g) = 0.612 mW/g; SAR(10 g) = 0.461 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.833 W/kg



0 dB = 0.896 W/kg = -0.96 dB W/kg

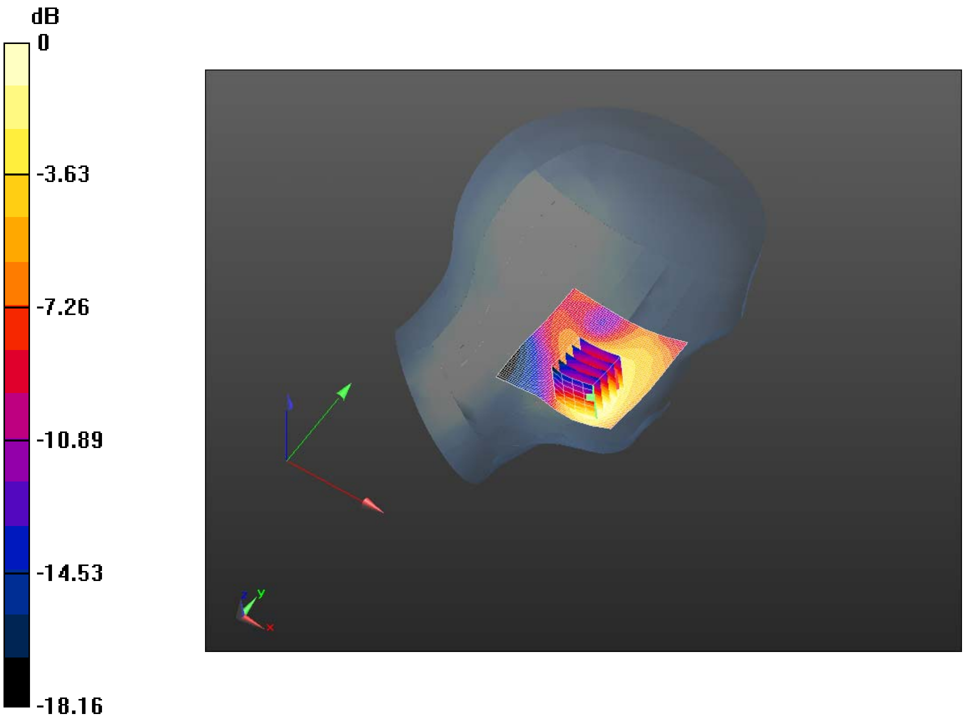
#9
Date:2015.10.21.
LTE Band4 Head Left Cheek Mid
Medium: HSL1750
Communication System: LTE-FDD(FCC); Communication System Band: Band4(20MHz) ;
Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1732.5 MHz; σ = 1.42 mho/m; ε_r = 40.5; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(5.2, 5.2, 5.2); Calibrated: 2014.12.19.;
Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

LTE Band4 Left Side/Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 6.171 V/m; Power Drift = 0.13 dB
Fast SAR: SAR(1 g) = 0.275 mW/g; SAR(10 g) = 0.167 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.299 W/kg

LTE Band4 Left Side/Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.171 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.484 mW/g
SAR(1 g) = 0.277 mW/g; SAR(10 g) = 0.158 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.300 W/kg



0 dB = 0.299 W/kg = -10.49 dB W/kg

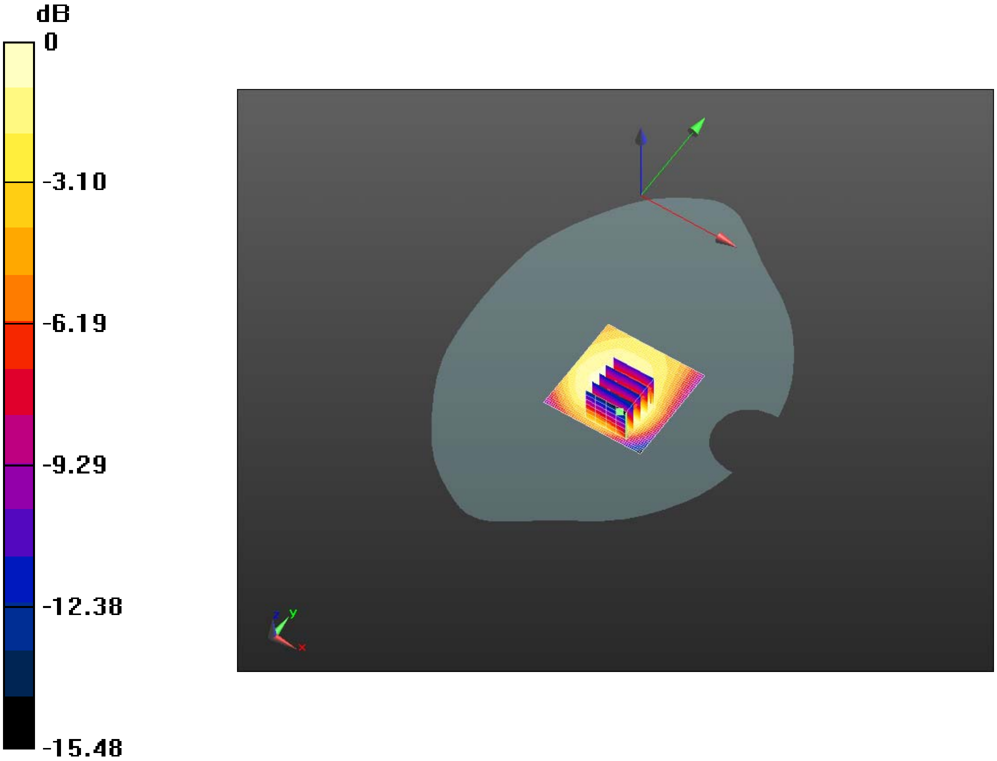
#10
Date:2015.10.23.
LTE Band4 Body Hotspot Front Side Mid
Medium: MSL1750
Communication System: LTE-FDD(FCC); Communication System Band: Band4(20MHz) ;
Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1732.5 MHz; σ = 1.51 mho/m; ε_r = 53.45; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(4.88, 4.88, 4.88); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

LTE Band4 Fornt/Front Mid 10mm/Area Scan (51x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 14.373 V/m; Power Drift = 0.01 dB
Fast SAR: SAR(1 g) = 0.343 mW/g; SAR(10 g) = 0.212 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.374 W/kg

LTE Band4 Fornt/Front Mid 10mm/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.373 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.619 mW/g
SAR(1 g) = 0.352 mW/g; SAR(10 g) = 0.201 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.370 W/kg



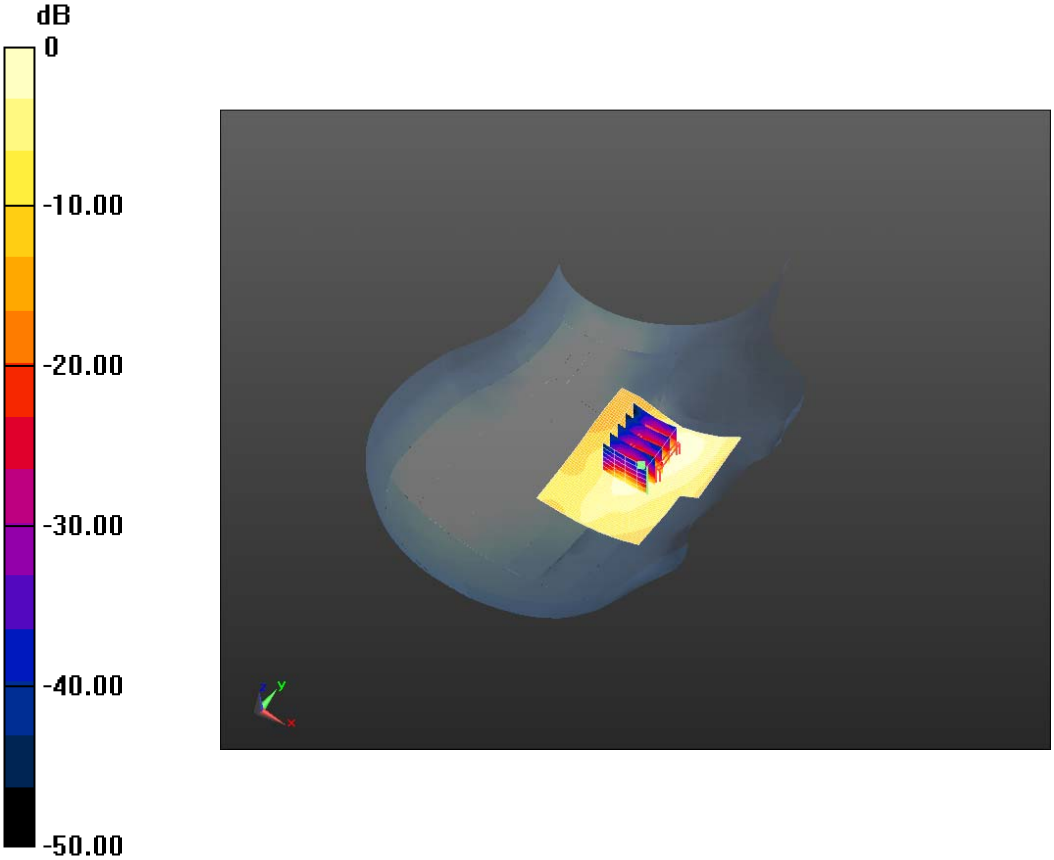
0 dB = 0.374 W/kg = -8.53 dB W/kg

#11
Date:2015.10.24.
LTE Band7 Head Right Cheek Mid
Medium: HSL2600
Communication System: LTE-FDD(CE); Communication System Band: Band7(20MHz); Frequency: 2535 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2535 MHz; σ = 1.94 mho/m; ε_r = 39.1; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.19, 7.19, 7.19); Calibrated: 2014.11.03.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Head Right/Cheek Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 8.309 V/m; Power Drift = 0.17 dB
Fast SAR: SAR(1 g) = 0.501 mW/g; SAR(10 g) = 0.269 mW/g

Maximum value of SAR (interpolated) = 0.918 W/kg

Head Right/Cheek Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.309 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 1.558 mW/g
SAR(1 g) = 0.543 mW/g; SAR(10 g) = 0.290 mW/g
Maximum value of SAR (measured) = 0.929 W/kg



0 dB = 0.918 W/kg = -0.74 dB W/kg

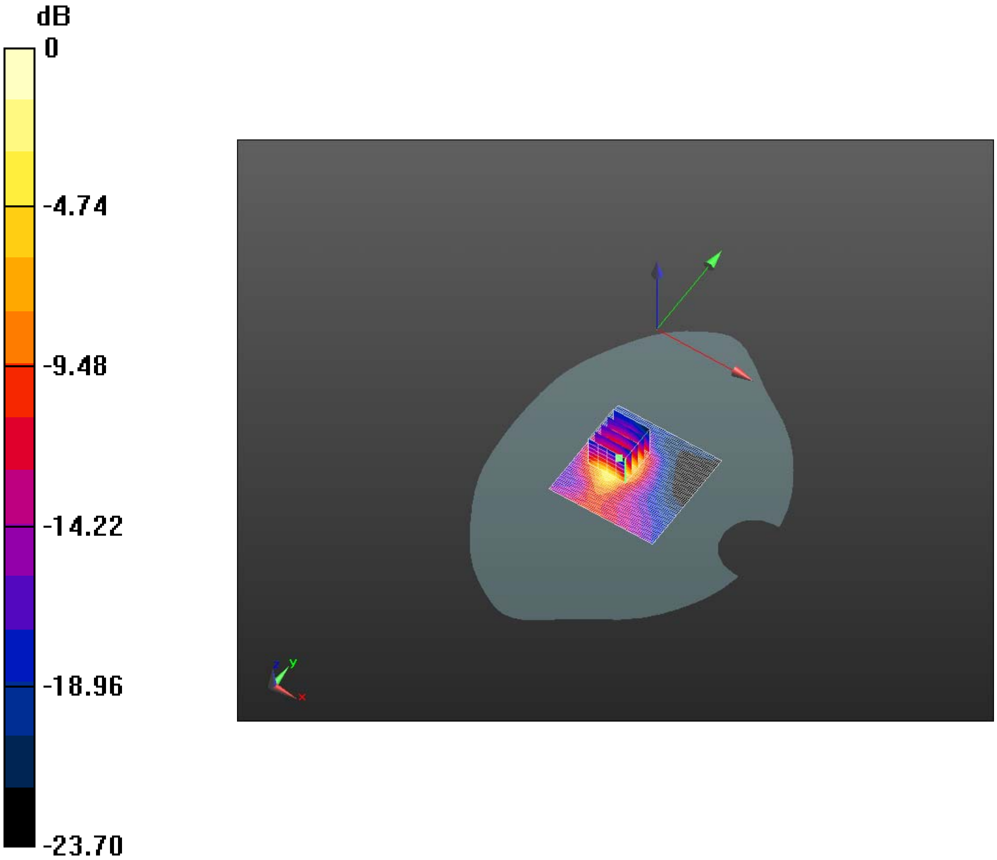
#12
Date:2015.10.24.
LTE Band7 Body Hotspot Back Side Mid
Medium: MSL2600
Communication System: LTE-FDD(CE); Communication System Band: Band7(20MHz); Frequency: 2535 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2535 MHz; σ = 2.77 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.19, 7.19, 7.19); Calibrated: 2014.11.03.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

Body/Back Mid 10mm 2/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 7.082 V/m; Power Drift = -0.09 dB
Fast SAR: SAR(1 g) = 0.763 mW/g; SAR(10 g) = 0.344 mW/g

Maximum value of SAR (interpolated) = 1.44 W/kg

Body/Back Mid 10mm 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.082 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 2.592 mW/g
SAR(1 g) = 0.582 mW/g; SAR(10 g) = 0.335 mW/g

Maximum value of SAR (measured) = 1.33 W/kg



0 dB = 1.44 W/kg = 3.17 dB W/kg

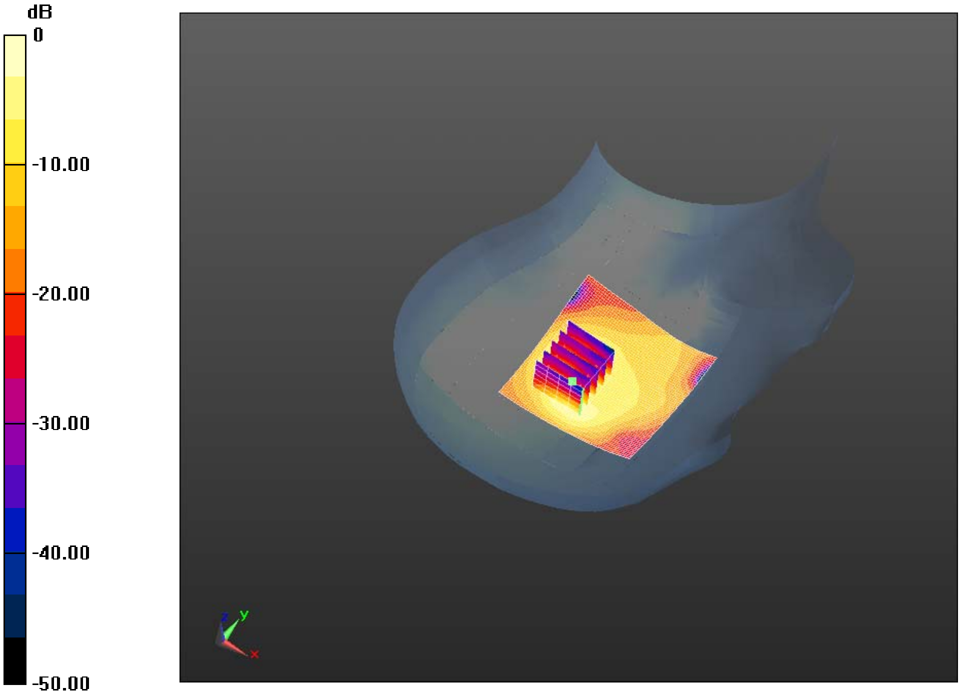
#13
Date:2015.10.21.
WiFi Head Right Cheek Mid
Medium: HSL2450
Communication System: 802.11b WiFi 2.4GHz(DSSS,1Mbps); Communication System Band: 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.82 mho/m; ε_r = 39.0; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(4.55, 4.55, 4.55); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

802.11b-rightHead/right Cheek-Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 8.737 V/m; Power Drift = -0.14 dB
Fast SAR: SAR(1 g) = 0.187 mW/g; SAR(10 g) = 0.083 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.235 W/kg

802.11b-rightHead/right Cheek-Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.737 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 0.681 mW/g
SAR(1 g) = 0.218 mW/g; SAR(10 g) = 0.082 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.243 W/kg



0 dB = 0.235 W/kg = -12.57 dB W/kg

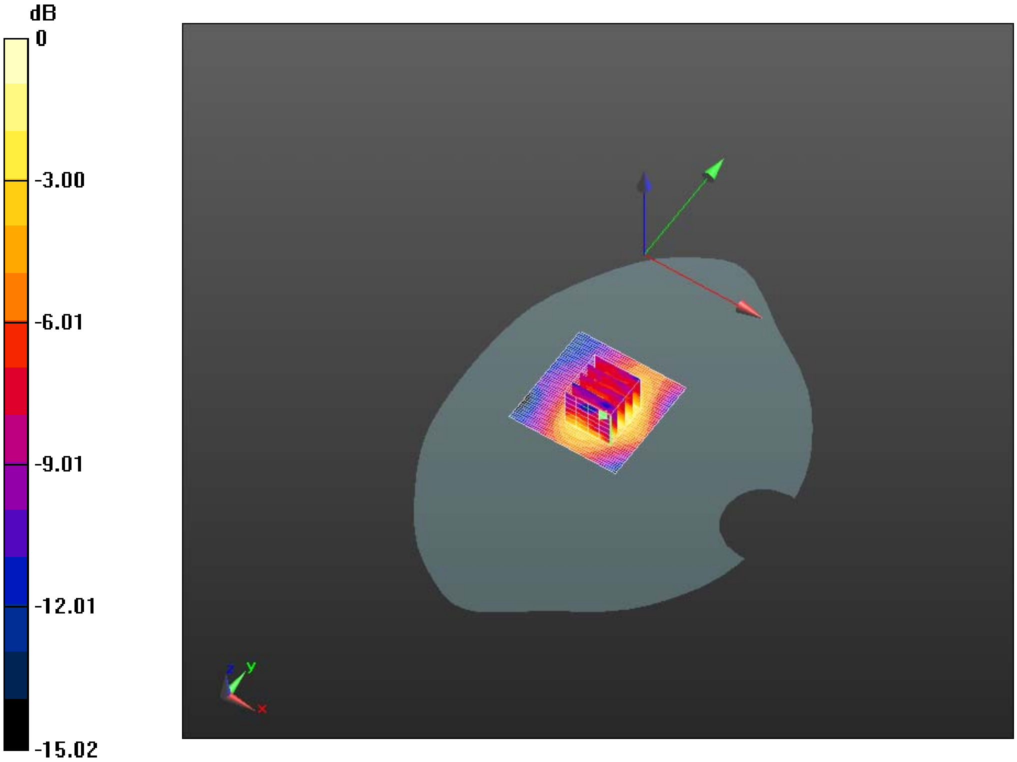
#14
Date:2015.10.24.
Wi-Fi Body Hotspot Back Side Mid
Medium: MSL2450
Communication System: 802.11b WiFi 2.4GHz(DSSS,1Mbps); Communication System Band: 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.98 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:Probe: ES3DV3 - SN3203; ConvF(4.47, 4.47, 4.47); Calibrated: 2014.12.19.; Electronics: DAE4 Sn876; Calibrated: 2015.03.09.

802.11b-10mm/Facedown-Mid 10mm/Area Scan (51x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 1.908 V/m; Power Drift = 0.05 dB
Fast SAR: SAR(1 g) = 0.032 mW/g; SAR(10 g) = 0.016 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.0359 W/kg

802.11b-10mm/Facedown-Mid 10mm/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.908 V/m; Power Drift = 0.05dB
Peak SAR (extrapolated) = 0.064 mW/g
SAR(1 g) = 0.032 mW/g; SAR(10 g) = 0.017 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0352 W/kg



0 dB = 0.0359 W/kg = -28.91 dB W/kg

6. Calibration Certificate

6.1. Probe Calibration Certificate

OET

June 26, 2013

Acceptable Conditions for SAR Measurements Using Probes and Dipoles Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to Support FCC Equipment Certification

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MITT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
   a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
      i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
      ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
   b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
   c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
   d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
   e) The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC.
   f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.

3) The SPEAG-TMC agreement includes specific protocols identified in the following to ensure the quality of calibration services provided by TMC under this SPEAG-TMC Dual-Logo calibration agreement are equivalent to the calibration services provided by SPEAG. TMC shall, upon request, provide copies of documentation to the FCC to substantiate program implementation.
   a) The Inter-laboratory Calibration Evaluation (ILCE) stated in the TMC QA protocol shall be performed between SPEAG and TMC at least once every 12 months. The ILCE acceptance criteria defined in the TMC QA protocol shall be satisfied for the TMC, SPEAG and FCC agreements to remain valid.
   b) Check of Calibration Certificate (CCC) shall be performed by SPEAG for all calibrations performed by TMC. Written confirmation from SPEAG is required for TMC to issue calibration certificates under the SPEAG-TMC Dual-Logo calibration program. Quarterly reports for all calibrations performed by TMC under the program are also issued by SPEAG.
   c) The calibration equipment and measurement system used by TMC shall be verified before each calibration service according to the specific reference SAR probes, dipoles, and DAE calibrated by SPEAG. The results shall be reproducible and within the defined acceptance criteria specified in the TMC QA protocol before each actual calibration can commence. TMC shall maintain records of the measurement and calibration system verification results for all calibrations.
   d) Quality Check of Calibration (QCC) certificates shall be performed by SPEAG at least once every 12 months. SPEAG shall visit TMC facilities to verify the laboratory, equipment, applied procedures and plausibility of randomly selected certificates.
4) A copy of this document, to be updated annually, shall be provided to TMC clients that accept calibration services according to the SPEAG-TMC Dual-Logo calibration program, which should be presented to a TCB (*Telecommunication Certification Body*), to facilitate FCC equipment approval.
5) TMC shall address any questions raised by its clients or TCBs relating to the SPEAG-TMC Dual-Logo calibration program and inform the FCC and SPEAG of any critical issues.

Change Note: Revised on June 26 to clarify the applicability of PMR and Bundled probe calibrations according to the requirements of KDB 865664.

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

CALIBRATION
No. L0570

Client AUDEN Certificate No: Z14-97164

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3203
Calibration Procedure(s)	TMC-OS-E-02-195 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	December 19, 2014

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101547	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101548	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Reference10dBAttenuator	18N50W-10dB	13-Mar-14(TMC,No.JZ14-1103)	Mar-16
Reference20dBAttenuator	18N50W-20dB	13-Mar-14(TMC,No.JZ14-1104)	Mar-16
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG,No.EX3-3617_Aug14)	Aug-15
DAE4	SN 1331	23-Jan-14 (SPEAG, DAE4-1331_Jan14)	Jan -15
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-14 (CTTL, No.J14X02145)	Jun-15
Network Analyzer E5071C	MY46110673	15-Feb-14 (TMC, No.JZ14-781)	Feb-15

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: December 20, 2014

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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,D	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 θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

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 300MHz to 3GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: 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 (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *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≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued 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±50MHz to±100MHz.
- *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.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
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E-mail: cttl@chinattl.com Http://www.chinattl.cn

Probe ES3DV3

SN: 3203

Calibrated: December 19, 2014

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY/EASY – Parameters of Probe: ES3DV3 - SN: 3203

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu V/(V/m)^2$)[A]	1.39	1.37	1.19	±10.8%
DCP(mV)[B]	103.9	100.8	104.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	298.4	±2.3%
		Y	0.0	0.0	1.0		292.8	
		Z	0.0	0.0	1.0		272.7	

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 Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 5 and Page 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY – Parameters of Probe: ES3DV3 - SN: 3203

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
900	41.5	0.97	6.55	6.55	6.55	0.32	1.66	±12%
1810	40.0	1.40	5.20	5.20	5.20	0.67	1.27	±12%
2450	39.2	1.80	4.55	4.55	4.55	0.90	1.10	±12%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
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E-mail: cttl@chinattl.com Http://www.chinattl.cn

DASY/EASY – Parameters of Probe: ES3DV3 - SN: 3203

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
900	55.0	1.05	6.20	6.20	6.20	0.55	1.38	±12%
1810	53.3	1.52	4.88	4.88	4.88	0.46	1.60	±12%
2450	52.7	1.95	4.47	4.47	4.47	0.59	1.55	±12%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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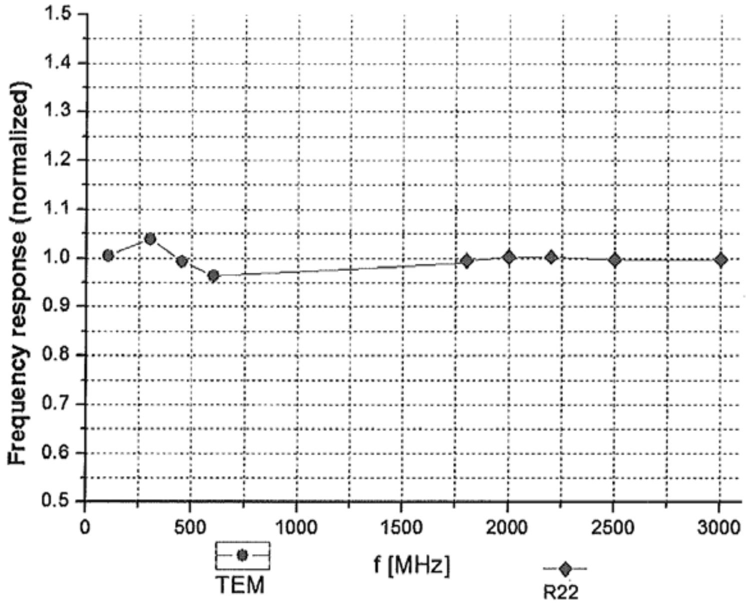
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.5% (k=2)

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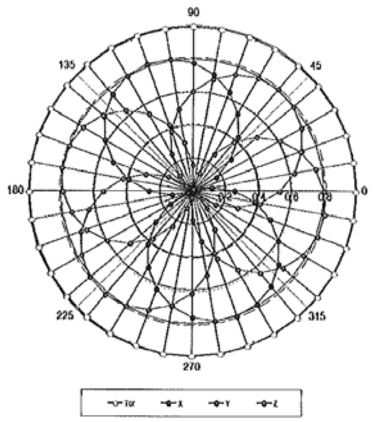
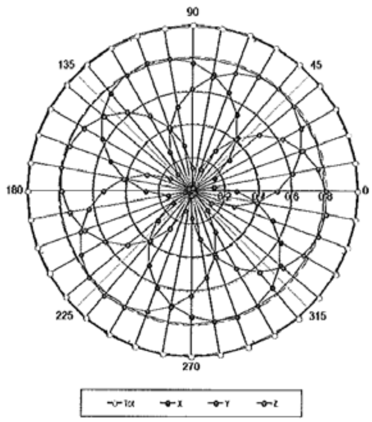
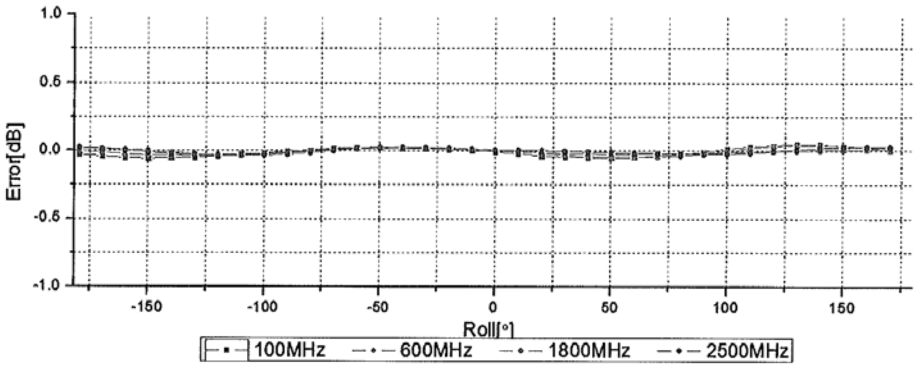
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±0.9% (k=2)

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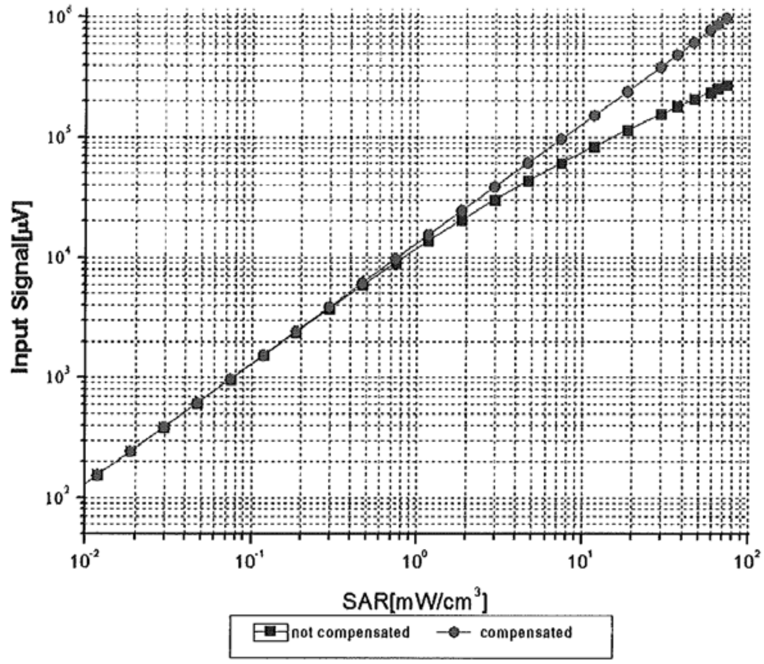
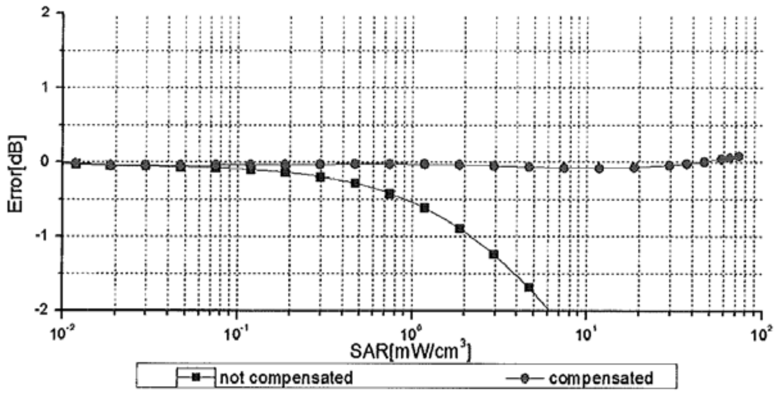
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (k=2)

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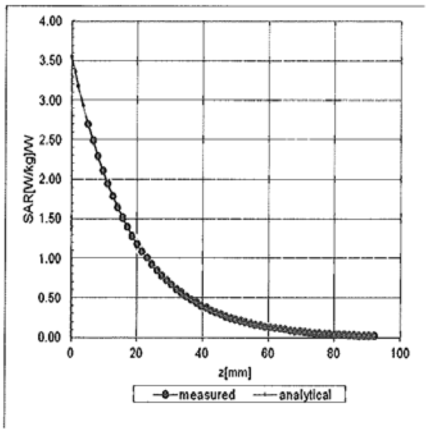
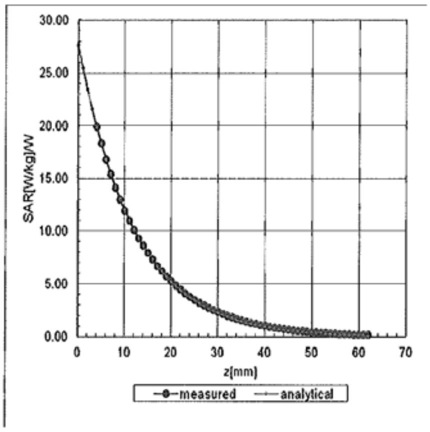
E-mail: cttl@chinattl.com Http://www.chinattl.cn

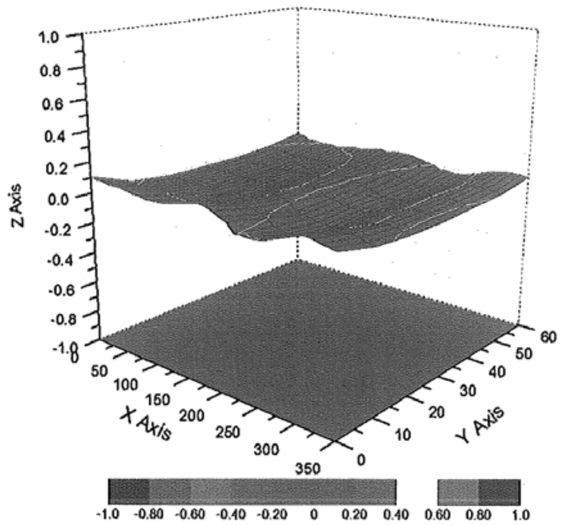
Conversion Factor Assessment

f=900 MHz, WGLS R9(H_convF) **f=1810 MHz, WGLS R22(H_convF)**





Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

DASY/EASY – Parameters of Probe: ES3DV3 - SN: 3203

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	175.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	4mm
Probe Tip to Sensor X Calibration Point	2mm
Probe Tip to Sensor Y Calibration Point	2mm
Probe Tip to Sensor Z Calibration Point	2mm
Recommended Measurement Distance from Surface	3mm

6.2. Probe Calibration Certificate

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

CALIBRATION No. L0570

Client SMQ Certificate No: Z15-97095

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3881

Calibration Procedure(s) FD-Z11-2-004-01
Calibration Procedures for Dosimetric E-field Probes

Calibration date: July 24, 2015

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Power sensor NRP-Z91	101547	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Power sensor NRP-Z91	101548	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Reference10dBAttenuator	18N50W-10dB	13-Mar-14(TMC,No.JZ14-1103)	Mar-16
Reference20dBAttenuator	18N50W-20dB	13-Mar-14(TMC,No.JZ14-1104)	Mar-16
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG,No.EX3-3617_Aug14)	Aug-15
DAE4	SN 777	17-Sep-14 (SPEAG, DAE4-777_Sep14)	Sep -15
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-15 (CTTL, No.J15X04255)	Jun-16
Network Analyzer E5071C	MY46110673	03-Feb-15 (CTTL, No.J15X00728)	Feb-16

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: July 25, 2015

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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,D	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 θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

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 300MHz to 3GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: 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 (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *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≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued 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±50MHz to±100MHz.
- *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.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Probe EX3DV4

SN: 3881

Calibrated: July 24, 2015

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3881

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu V/(V/m)^2$)[A]	0.18	0.38	0.50	±10.8%
DCP(mV)[B]	95.9	104.3	102.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	98.5	±2.9%
		Y	0.0	0.0	1.0		172.5	
		Z	0.0	0.0	1.0		195.3	

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 Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 5 and Page 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3881

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
835	41.5	0.90	9.66	9.66	9.66	0.16	1.26	±12%
1900	40.0	1.40	7.96	7.96	7.96	0.18	1.34	±12%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3881

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
835	55.2	0.97	9.45	9.45	9.45	0.16	1.39	±12%
1900	53.3	1.52	7.60	7.60	7.60	0.15	1.60	±12%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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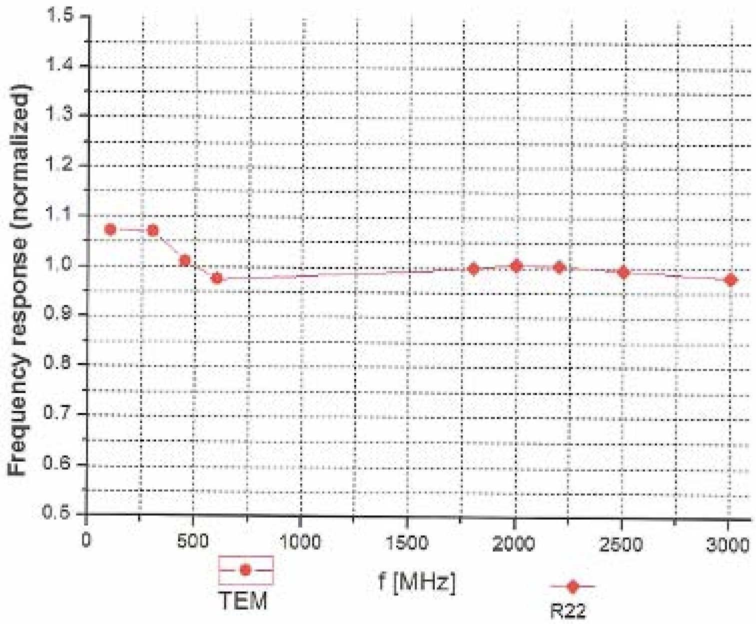
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.5% (k=2)

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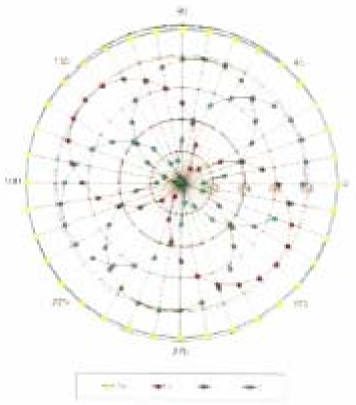
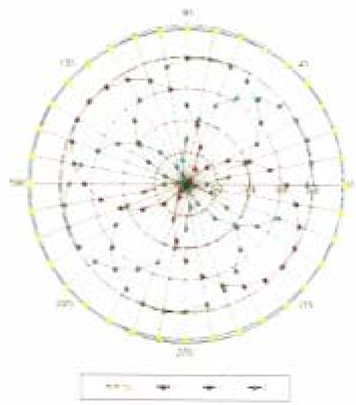
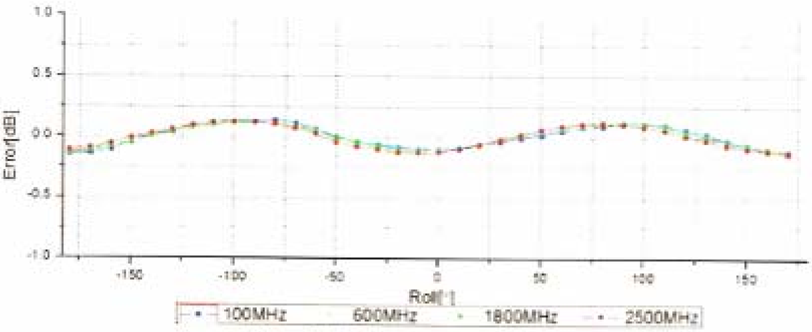
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±0.9% (k=2)

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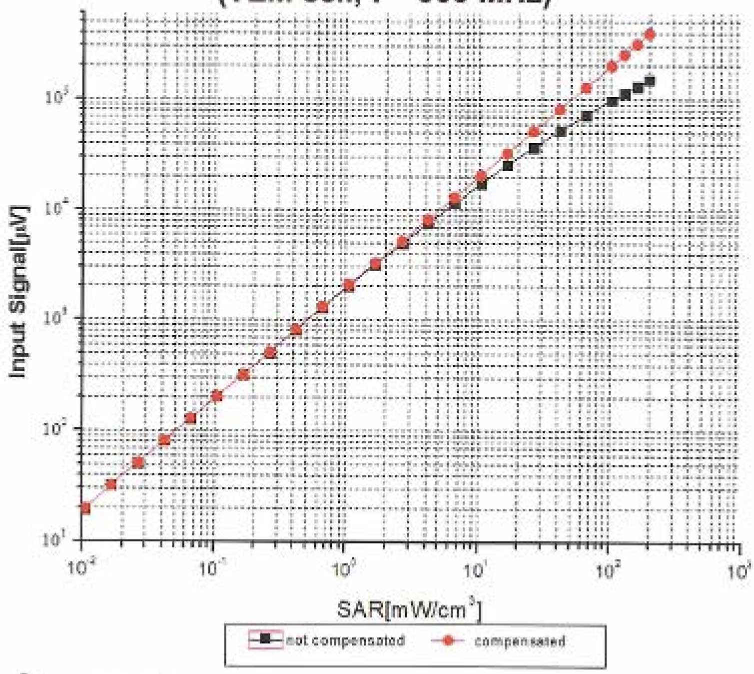
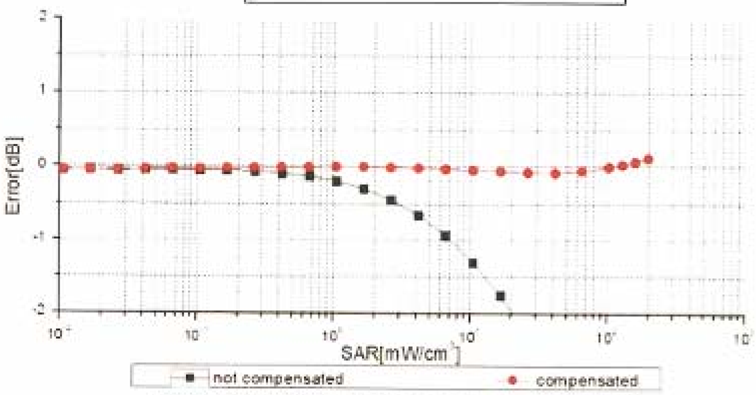
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (k=2)

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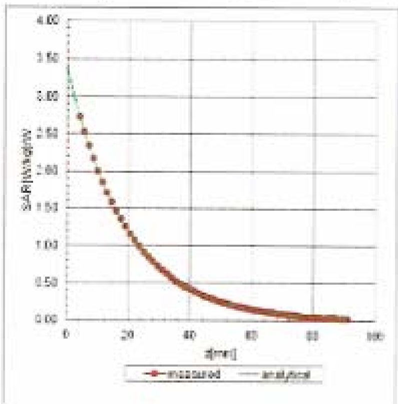
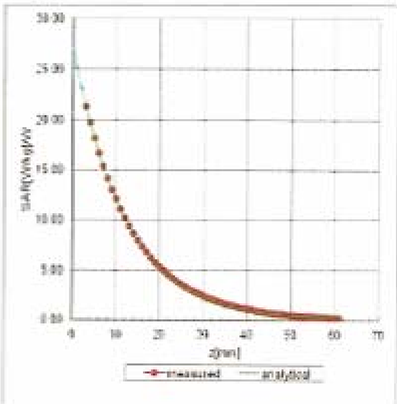
Conversion Factor Assessment

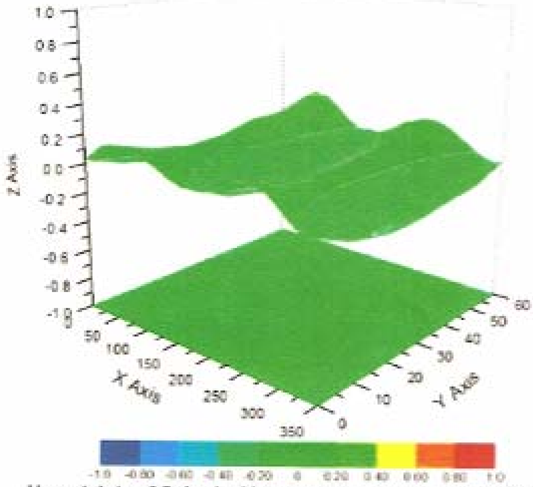
f=835 MHz, WGLS R9(H_convF)



f=1900 MHz, WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3881

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	170.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

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CALIBRATION
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E-mail: cttl@chinattl.com Http://www.chinattl.cn

Client AUDEN Certificate No: Z14-97117

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3881
Calibration Procedure(s)	TMC-OS-E-02-195 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	November 06, 2014

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101547	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101548	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Reference10dBAttenuator	BT0520	12-Dec-12(TMC,No.JZ12-867)	Dec-14
Reference20dBAttenuator	BT0267	12-Dec-12(TMC,No.JZ12-866)	Dec-14
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG,No.EX3-3617_Aug14)	Aug-15
DAE4	SN 1331	23-Jan-14 (SPEAG, DAE4-1331_Jan14)	Jan -15
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-14 (CTTL, No.J14X02145)	Jun-15
Network Analyzer E5071C	MY46110673	15-Feb-14 (TMC, No.JZ14-781)	Feb-15

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: November 07, 2014

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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,D	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 θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

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 300MHz to 3GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: 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 (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *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≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued 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±50MHz to±100MHz.
- *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.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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Probe EX3DV4

SN: 3881

Calibrated: November 06, 2014

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY – Parameters of Probe: EX3DV4 - SN: 3881

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)[A]	0.18	0.39	0.51	±10.8%
DCP(mV)[B]	96.3	101.9	102.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	93.5	±3.0%
		Y	0.0	0.0	1.0		160.6	
		Z	0.0	0.0	1.0		183.4	

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 Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 5 and Page 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY – Parameters of Probe: EX3DV4 - SN: 3881

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	9.88	9.88	9.88	0.33	0.81	±12%
2600	39.0	1.96	6.91	6.91	6.91	0.50	0.77	±12%
5300	35.9	4.76	5.22	5.22	5.22	0.52	0.70	±13%
5500	35.6	4.96	4.69	4.69	4.69	0.45	0.73	±13%
5600	35.5	5.07	4.43	4.43	4.43	0.57	0.61	±13%
5800	35.3	5.27	4.20	4.20	4.20	0.56	0.56	±13%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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DASY – Parameters of Probe: EX3DV4 - SN: 3881

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	55.5	0.96	9.56	9.56	9.56	0.15	1.49	±12%
2600	52.5	2.16	7.19	7.19	7.19	0.41	0.90	±12%
5300	48.9	5.42	4.61	4.61	4.61	0.45	1.11	±13%
5500	48.6	5.65	4.22	4.22	4.22	0.43	1.27	±13%
5600	48.5	5.77	4.13	4.13	4.13	0.43	1.36	±13%
5800	48.2	6.00	4.21	4.21	4.21	0.45	1.48	±13%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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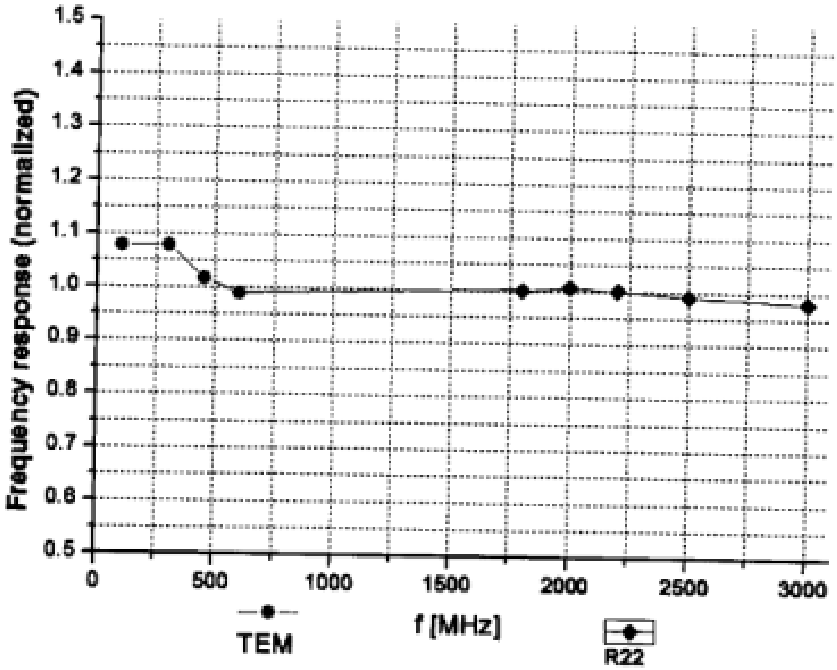
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.5% (k=2)

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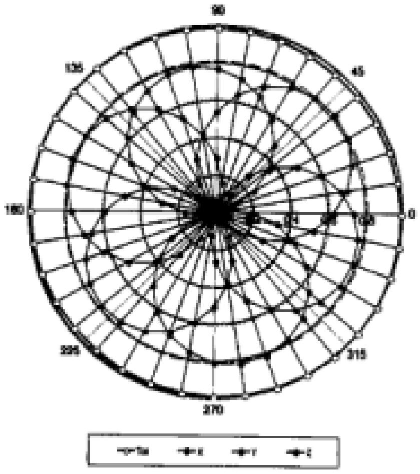
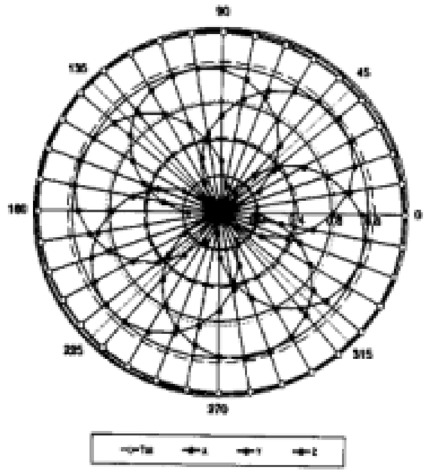
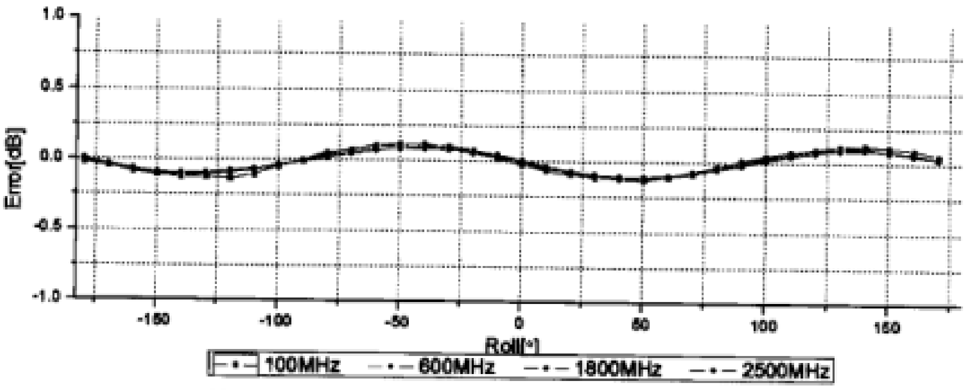
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM **f=1800 MHz, R22**







Uncertainty of Axial Isotropy Assessment: ±0.9% (k=2)

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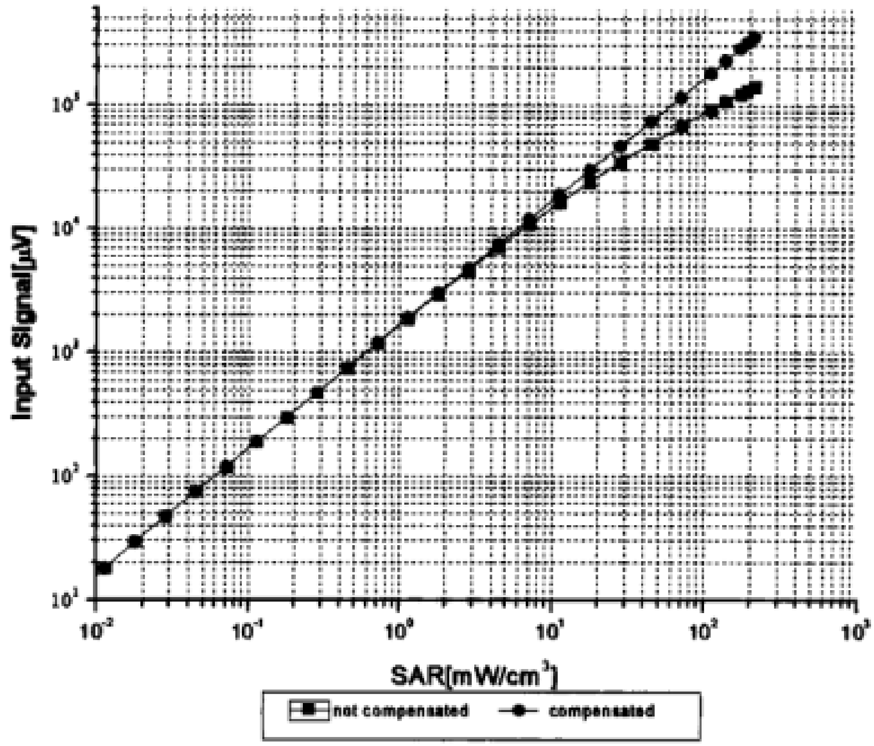
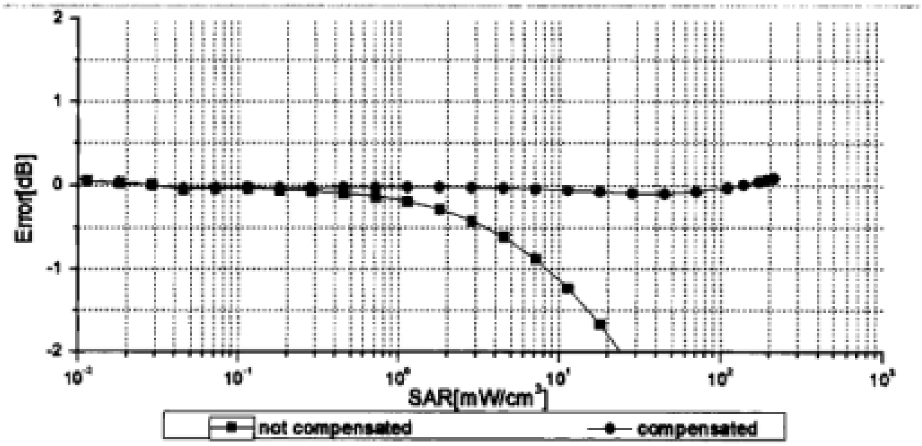
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (k=2)

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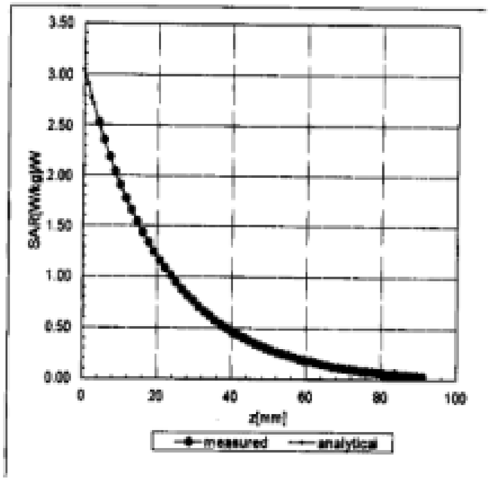
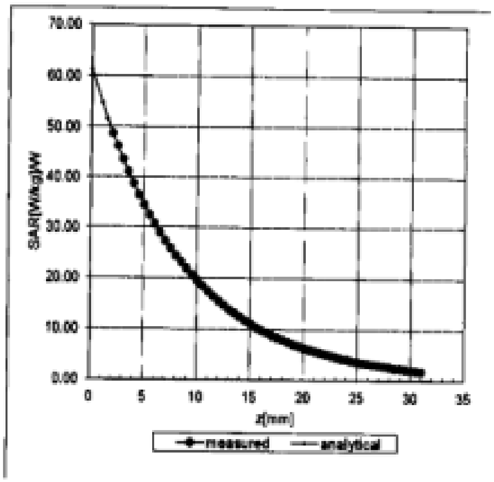
Conversion Factor Assessment

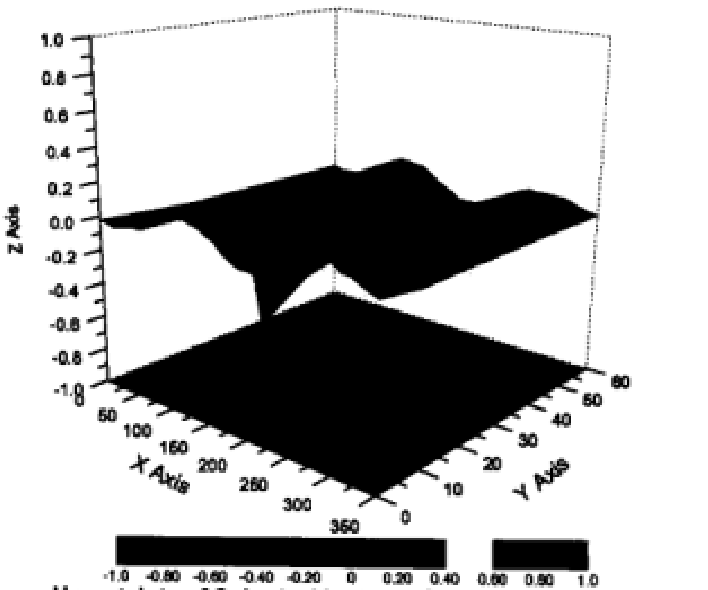
f=750 MHz, WGLS R9(H_convF)



f=2600 MHz, WGLS R26(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

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DASY - Parameters of Probe: EX3DV4 - SN: 3881

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	170.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	2mm

6.3. D835V2 Dipole Calibration Certificate

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CALIBRATION
No. L0570

Client SMQ Certificate No: Z15-97116

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d141

Calibration Procedure(s) FD-Z11-2-003-01
Calibration Procedures for dipole validation kits

Calibration date: September 24, 2015

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Power sensor NRP-Z91	101547	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Reference Probe EX3DV4	SN 3846	24-Sep-14(SPEAG,No.EX3-3846_Sep14)	Sep-15
DAE4	SN 910	16-Jun-15(SPEAG,No.DAE4-910_Jun15)	Jun-16
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	02-Feb-15 (CTTL, No.J15X00729)	Feb-16
Network Analyzer E5071C	MY46110673	03-Feb-15 (CTTL, No.J15X00728)	Feb-16

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: September 29, 2015

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
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 300MHz to 3GHz)", February 2005
c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

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.

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%.

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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
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	42.0 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.33 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.45 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.51 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.11 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.0 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.39 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.51 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.57 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.25 mW /g ± 20.4 % (k=2)**