TEST REPORT

Report Reference No.......................:	**A15N0166217-SAR**
FCC ID.. :	**2ACWO-MT7**
Compiled by (position+printed name+signature)..:	Test Engineer Kevin Liu
Supervised by (position+printed name+signature)..:	Test Engineer Kevin Liu
Approved by (position+printed name+signature)..:	Manager Andy Zhang
Date of issue....................................:	Nov 28, 2015
Representative Laboratory Name ....:	Shenzhen CTL Electron Technology Co., Ltd.
Address..:	A0402, Block 1, Kefa Industrial District, Huanguan Nan Rd, Xintian community, Guanlan, Baoan, Shenzhen, China
Testing Laboratory Name ....:	Shenzhen Sunway Communication Co., Ltd. Testing Center
Address..:	1/F., Building A, SDG Info Port, Kefeng Road, Hi-Tech Park, Nanshan District, Shenzhen, Guangdong, China
Applicant's name............................:	**AURA TECHNOLOGY LIMTED**
Address..:	FLAT/RM810, Star House, 3 Salisbury Road, Tsimshatsui, Hong Kong
Test specification .... :	
Standard ....:	**ANSI C95.1–1999** **47CFR §2.1093**
TRF Originator..................................:	Shenzhen CTL Electron Technology Co., Ltd.
Master TRF.......................................:	Dated 2012-06

Test item description ....:	TELPAD
Trade Mark ....:	/
Model/Type reference.......................:	MT7
Listed Models ....:	/
Manufacturer ....:	**SHENZHEN KWANG SUNG ELECTRONICS CO.,LTD**
Rating ....:	DC 3.70V
Android Version ....:	Android 4.4.2
Hardware version ....:	V01.00.22
Software version ....:	V01
Device category................................:	Portable Device
Exposure category............................:	General population/uncontrolled environment
EUT Type ....:	Production Unit
Result..:	**PASS**

T E S T R E P O R T

Test Report No. :	A15N0166217-SAR	Nov 28, 2015 Date of issue

Equipment under Test	:	TELPAD
Model /Type	:	MT7
Listed Models	:	/
Applicant	:	**AURA TECHNOLOGY LIMTED**
Address	:	FLAT/RM810, Star House, 3 Salisbury Road, Tsimshatsui, Hong Kong
Manufacturer	:	**SHENZHEN KWANG SUNG ELECTRONICS CO.,LTD**
Address	:	Shitoushan Industrial Zone, Shi Yan Town, Baoan District, Shenzhen, PRC

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.

** Modifited History **

Revison	Description	Issued Data	Remark
Revsion 1.0	Initial Test Report Release	2015-11-28	Andy Zhang

Contents

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 616217 D04 SAR for laptop and Internet Tablets v01r02: SAR Evaluation Considerations for Laptop, Notebook, Netbook and Internet Tablet Computers

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Nov 15, 2015
Testing commenced on	:	Nov 16, 2015
Testing concluded on	:	Nov 20, 2015

2.2. Product Description

The **AURA TECHNOLOGY LIMTED**'s Model: MT7 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	
Name of EUT	TELPAD
Model Number	MT7
FCC ID	2ACWO-MT7
Modilation Type	GMSK for GSM/GPRS and 8PSK for EGPRS;QPSK for WCDMA;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
The EUT is GSM,WCDMA Tablet. the tablet is intended for speech and Multimedia Message Service (MMS) transmission. It is equipped with GPRS/EDGE class 12 for GSM850, PCS1900, WCDMA Band V, 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
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 V
Frequency Range	WCDMA Band V: 826.4~846.6MHz
Type of Modulation	QPSK
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 MT7 are follows:

<Highest Reported standalone SAR Summary>

Classment Class	Frequency Band	Head (Report 1g SAR(W/Kg)	Body-worn (Report 1g SAR(W/Kg)
PCE	GSM 850	0.296	0.597
	GSM1900	0.549	**0.976**
	WCDMA Band V	0.370	0.748
DTS	WIFI2.4G	0.171	**0.619**

The SAR values found for the Telpad are below the maximum recommended levels of 1.6W/Kg as averaged over any 1g tissue accordintg to the ANSI C95.1-1999.
For body worn operation,this devices has been tested and meets FCC RF exposure guidelines when used with any accessory that conrtains no metal and which provides a minimum separation distance of 0mm between this devices and the body of the user.User of other accessories may not ensure compliance with FCC RF exposure guidelines.
The EUT battery must be fully charged and checked periodically during the test to ascertain iniform power output.

<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)
Rear	GSM1900	0.976	PCE	**1.595**
	WIFI2.4G	0.619	DTS	

2.4. Equipment under Test

Power supply system utilised

Power supply voltage	:	○ 120V / 60 Hz	○ 115V / 60Hz	
		○ 12 V DC	○ 24 V DC	
		● Other (specified in blank below)		

DC 3.70 V

2.5. Short description of the Equipment under Test (EUT)

2.4.1 General Description

TELPAD is subscriber equipment in the WCDMA/GSM system. The HSPA/UMTS frequency band is Band V; The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only Band V and GSM850 and PCS1900 bands test data included in this report. The TELPAD implements such functions as RF signal receiving/transmitting, HSPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and SIM card interface. It also provides Bluetooth module to synchronize data between a PC and the TELPAD, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

The EUT battery must be fully charged and checked periodically during the test to ascertain maximum power output.

2.6. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

Battery information:

Capacitance:4100mAh
Nominal Voltage:3.70V

Adapter:

MODEL:JY-05210
INPUT:100-240V～0.3A 50/60Hz 0.3A
OUTPUT: 5.0V DC 2.1A
◇ Shielded ◆ Unshielded

2.7. Note

1. The EUT is a TELPAD with GSM/UMTS/WLAN and Bluetooth function,The functions of the EUT listed as below:

	Test Standards	Reference Report
GSM	FCC Part 22H/ FCC Part 24 E	A15N0166217-GSM
UMTS	FCC Part 22H	A15N0166217-WCDMA
WLAN	FCC Part 15.247	A15N0166217-WLAN
Bluetooth-BR	FCC Part 15.247	A15N0166217-BR
Bluetooth-LE	FCC Part 15.247	A15N0166217-BLE
JBC	FCC Part 15 Subpart B	A15N0166217-JBC
SAR	FCC Per 47 CFR 2.1093(d)	A15N0166217-SAR

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Sunway Communication Co., Ltd. Testing Center
1/F., Building A, SDG Info Port, Kefeng Road, Hi-Tech Park, Nanshan District, Shenzhen, Guangdong, China

3.2. Test Facility

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

CNAS-Lab Code: L6487

The Shenzhen Sunway Communication Co., Ltd. Testing Center has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: Oct 29, 2013. Valid time is until Oct 28, 2016.

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

Test Equipment	Manufacturer	Type/Model	Serial Number	Calibration	
				Last Calibration	Calibration Interval
Data Acquisition Electronics DAEx	SPEAG	DAE4	893	2015/07/07	1
E-field Probe	SPEAG	ES3DV3	3221	2015/01/31	1
System Validation Dipole D900V2	SPEAG	D900V2	1d086	2013/08/09	3
System Validation Dipole 1900V2	SPEAG	D1900V2	5d194	2015/01/07	3
System Validation Dipole 2450V2	SPEAG	D2450V2	955	2015/01/08	3
Network analyzer	Agilent	8753E	US37390562	2015/03/15	1
Universal Radio Communication Tester	R&S	CMU200	112012	2015/10/18	1
Dielectric Probe Kit	Agilent	85070E	US44020288	/	/
Dual Directional Coupler	Agilent	778D	50127	2015/10/18	1
Dual Directional Coupler	Agilent	772D	50348	2015/10/18	1
Attenuator	PE	PE7005-10	E048	2015/10/19	1
Attenuator	PE	PE7005-3	E049	2015/10/19	1
Attenuator	Woken	WK0602-XX	E050	2015/10/19	1
Power meter	Agilent	E4417A	GB41292254	2015/10/18	1
Power Meter	Agilent	E7356A	GB54762536	2015/10/18	1
Power sensor	Agilent	8481H	MY41095360	2015/10/18	1
Power Sensor	Agilent	E9327A	Us40441788	2015/10/18	1
Signal generator	IFR	2032	203002/100	2015/10/18	1
Amplifier	AR	75A250	302205	2015/10/18	1

Note:

1) Per KDB865664D01 requirements for dipole calibration, the test laboratory has adopted three year extended calibration interval. Each measured dipole is expected to evalute with following criteria at least on annual interval.
   a) There is no physical damage on the dipole;
   b) System check with specific dipole is within 10% of calibrated values;
   c) The most recent return-loss results,measued at least annually,deviates by no more than 20% from the previous measurement;
   d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the provious measurement.
2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

4. SAR Measurements System configuration

4.1. SAR Measurement Set-up

The DASY4 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 DASY4 measurement server.

The DASY4 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.

DASY4 software and SEMCAD data evaluation software.

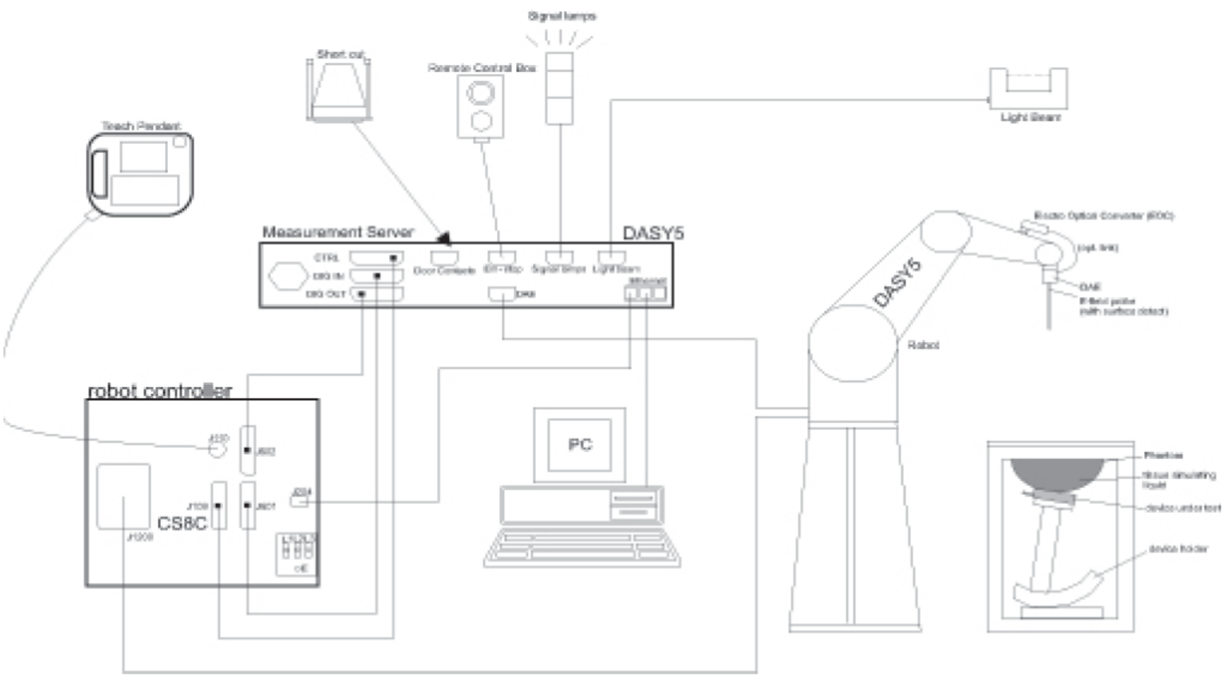
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

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. DASY4 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.

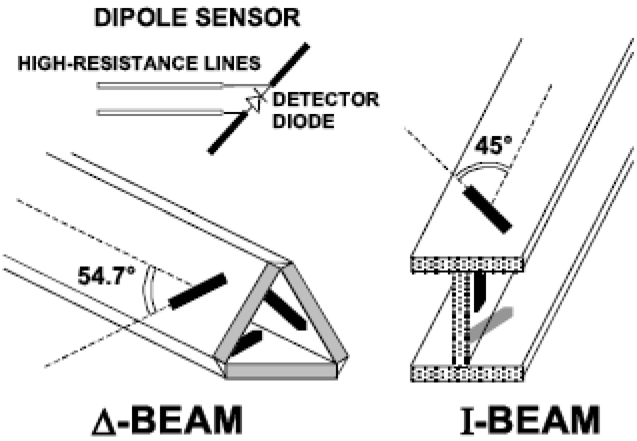
Probe Specification

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

Phantom for compliance testing of handheld andbody-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI isfully compatible with the IEC 62209-2 standard and all known tissuesimulating liquids. ELI has been optimized regarding its performance and can beintegrated into our standard phantom tables. A cover prevents evaporation ofthe liquid. Reference markings on the phantom allow installation of thecomplete setup, including all predefined phantom positions and measurementgrids, by teaching three points. The phantom is compatible with all SPEAGdosimetric probes and dipoles.

ELI 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 DASY4 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 DASY4 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.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 mm ± 1 mm	½·δ·ln(2) mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	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 ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

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>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 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>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 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>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 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>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 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 ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 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 DASY4 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.

Table 1: Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01

Frequency	Maximum Area Scan Resolution (mm) (Δx_{area}, Δy_{area})	Maximum Zoom Scan Resolution (mm) (Δx_{zoom}, Δy_{zoom})	Maximum Zoom Scan Spatial Resolution (mm) $\Delta z_{zoom}(n)$	Minimum Zoom Scan Volume (mm) (x,y,z)
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≥ 22

4.6. Data Storage and Evaluation

Data Storage

The DASY4 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.

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 DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

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:

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

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

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

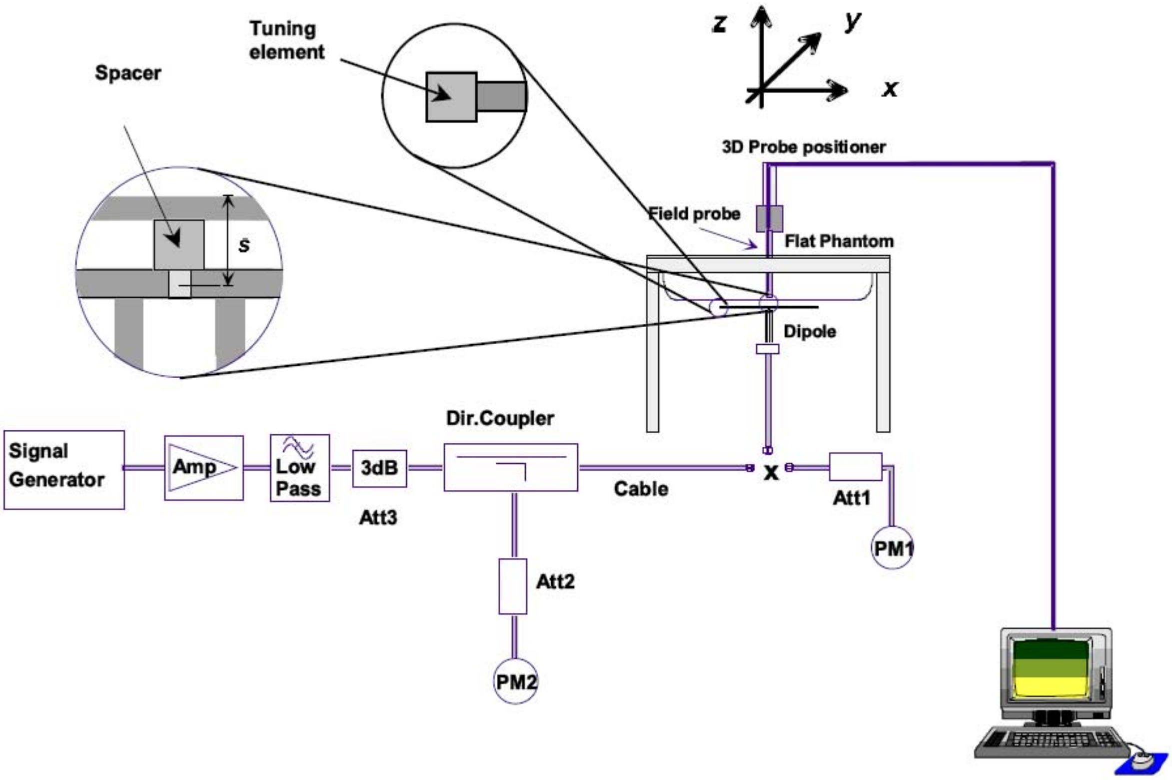
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue				Liquid Temp.	Test Data
		ε_r	σ	ε_r	Dev.	σ	Dev.		
900H	900	0.97	41.5	0.97	0%	42.09	-1.5%	22.3	11/16/2015
1900H	1900	1.40	40.0	1.41	0.71%	40.29	-0.7%	22.6	11/19/2015
2450H	2450	1.80	39.2	1.83	1.7%	38.19	2.6%	22.4	11/20/2015
900B	900	1.05	55.0	1.01	-3.8%	54.69	0.5%	22.6	11/16/2015
1900B	1900	1.52	53.3	1.54	1.3%	53.69	-0.8%	22.6	11/19/2015
2450B	2450	1.95	52.7	1.90	-2.6%	50.59	4.0%	22.7	11/20/2015

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.

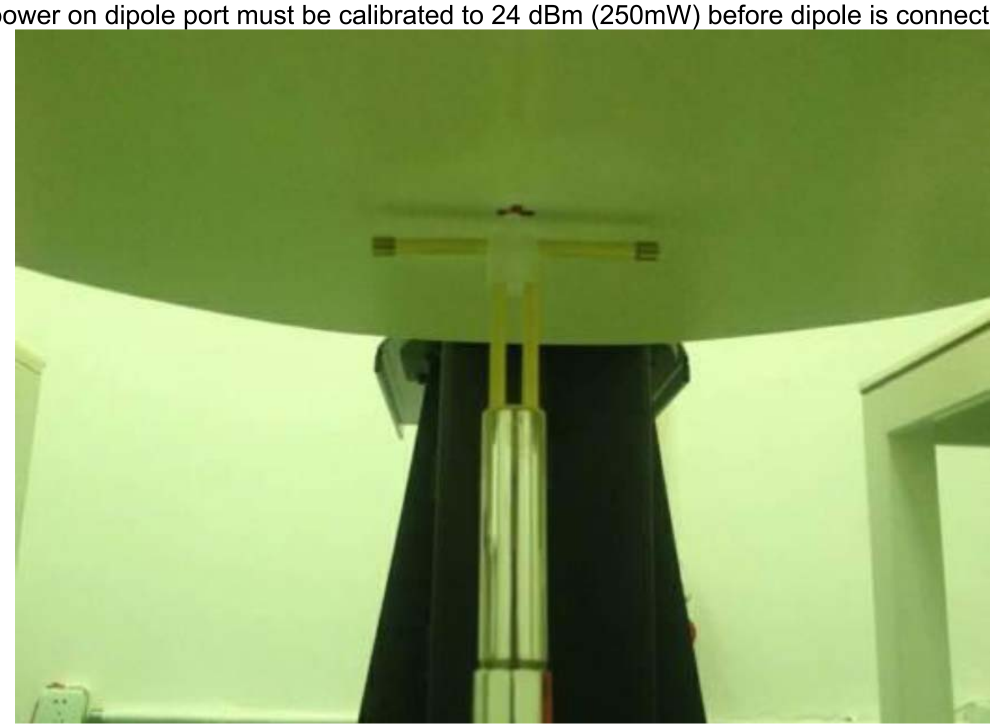


Photo of Dipole Setup

Mixture Type	Frequency (MHz)	Power	SAR_{1g} (W/Kg)	SAR_{10g} (W/Kg)	Drift	1W Target		Difference percentage		Liquid Temp	Date
						SAR_{1g} (W/Kg)	SAR_{10g} (W/Kg)	1g	10g		
Head	900	250 mW	2.61	1.71	-0.06	10.7	6.87	-2.43	-0.44	22.0	11/16/2015
		Normalize to 1 Watt	10.44	6.84							
Body	900	250 mW	2.59	1.71	-0.05	10.7	6.94	-3.18	-1.44	22.0	11/16/2015
		Normalize to 1 Watt	10.36	6.84							
Head	1900	250 mW	9.81	5.03	-0.08	40.6	21.3	-3.35	-5.54	22.0	11/19/2015
		Normalize to 1 Watt	39.24	20.12							
Body	1900	250 mW	9.67	4.93	-0.01	40.1	21.3	-3.54	-7.41	22.0	11/19/2015
		Normalize to 1 Watt	38.68	19.72							
Head	2450	250 mW	13.0	5.90	-0.06	52.4	24.4	-0.76	-3.28	22.0	11/20/2015
		Normalize to 1 Watt	52.0	23.60							
Body	2450	250 mW	12.4	5.74	-0.02	53.7	25.0	-7.64	-8.16	22.0	11/20/2015
		Normalize to 1 Watt	49.6	22.96							

4.10. SAR measurement procedure

4.10.1 Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in Picture 11.1.

Step 1: The tests described in 11.2 shall be performed at the channel that is closest to the centre of the transmit frequency band (f_c) for:

a). all device positions (cheek and tilt, for both left and right sides of the SAM phantom;

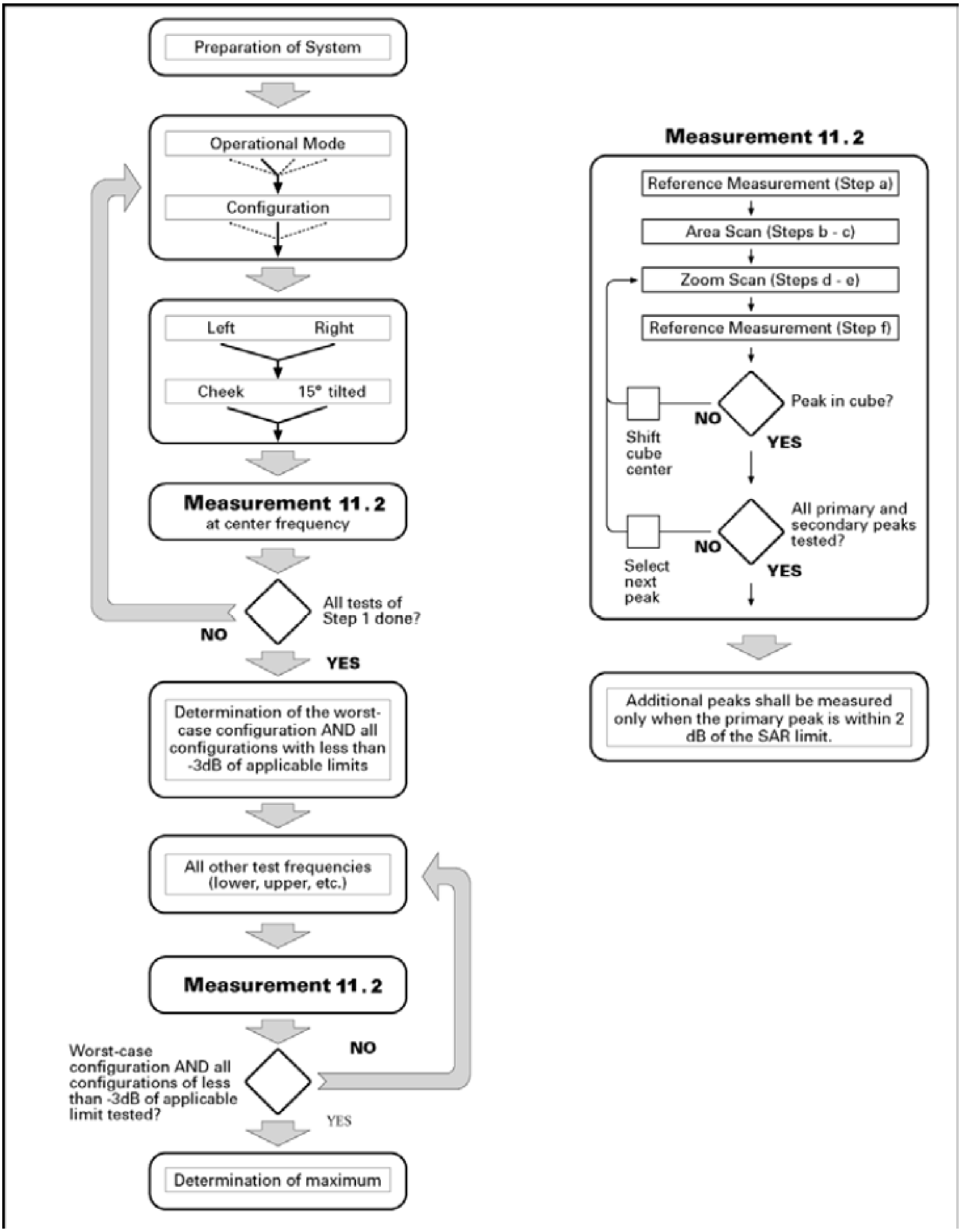
b). all configurations for each device position in a), e.g., antenna extended and retracted, and

c). all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

If more than three frequencies need to be tested according to 11.1 (i.e., $N_c > 3$), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

Step 2: For the condition providing highest peak spatial-average SAR determined in Step 1, perform all tests described in 11.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

Step 3: Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.



Picture 10.1 Block diagram of the tests to be performed

4.10.2 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2003. The results should be documented as part of the system validation records and may be requested to support test results when all the measurement parameters in the following table are not satisfied.

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">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 colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 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 ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 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>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 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>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 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 draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 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>

4.11. SAR measurement procedure

The measurement procedures are as follows:

4.11.1 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.

4.11.2 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.

4.11.3 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.

<u>Body-Worn Accessory SAR</u>

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.

<u>Handsets with Release 5 HSDPA</u>

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⇔ A_{hs} = β_{hs}/β_c=30/15⇔ 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} = β_{hs}/β_c = 30/15 ⇔ β_{hs}= 30/15 *β_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.

4.11.4 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”

4.12. Power Reduction

The product without any power reduction.

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)

SIM1								
GSM 850		Burst Conducted power (dBm) Channel/Frequency(MHz)			/	Average power (dBm) Channel/Frequency(MHz)		
		128/824.2	190/836.6	251/848.8		128/824.2	190/836.6	251/848.8
GSM		32.25	32.58	32.01	-9.03dB	23.22	23.55	22.98
GPRS (GMSK)	1TX slot	32.22	32.56	32.01	-9.03dB	23.19	23.53	22.98
	2TX slot	30.51	30.77	30.26	-6.02dB	24.49	24.75	24.24
	3TX slot	28.12	28.44	28.04	-4.26dB	23.86	24.18	23.78
	4TX slot	27.56	27.81	27.43	**-3.01dB**	**24.55**	**24.80**	**24.42**
EGPRS (8PSK)	1TX slot	27.16	27.33	27.82	-9.03dB	18.13	18.30	18.79
	2TX slot	26.55	26.69	26.98	-6.02dB	20.53	20.67	20.96
	3TX slot	25.31	25.46	25.77	-4.26dB	21.05	21.20	21.51
	4TX slot	24.86	24.92	25.13	**-3.01dB**	21.85	21.91	22.12
GSM 1900		Burst Conducted power (dBm) Channel/Frequency(MHz)			/	Average power (dBm) Channel/Frequency(MHz)		
		512/ 1850.2	661/ 1880	810/ 1909.8		512/ 1850.2	661/ 1880	810/ 1909.8
GSM		29.86	30.12	29.63	-9.03dB	20.83	21.09	20.60
GPRS (GMSK)	1TX slot	29.82	30.09	29.62	-9.03dB	20.79	21.06	20.59
	2TX slot	28.66	29.01	28.45	-6.02dB	22.64	22.99	22.43
	3TX slot	27.31	27.55	27.11	-4.26dB	23.05	23.29	22.85
	4TX slot	26.78	26.97	26.32	**-3.01dB**	**23.77**	**23.96**	**23.31**
EGPRS (8PSK)	1TX slot	26.98	27.12	26.85	-9.03dB	17.95	18.09	17.82
	2TX slot	26.01	26.30	25.77	-6.02dB	19.99	20.28	19.75
	3TX slot	25.12	25.41	24.96	-4.26dB	20.86	21.15	20.70
	4TX slot	24.65	24.72	24.27	**-3.01dB**	21.64	21.71	21.26
SIM2								
GSM 850		Burst Conducted power (dBm) Channel/Frequency(MHz)			/	Average power (dBm) Channel/Frequency(MHz)		
		128/824.2	190/836.6	251/848.8		128/824.2	190/836.6	251/848.8
GSM		32.16	32.41	31.98	-9.03dB	23.13	23.38	22.95
GPRS (GMSK)	1TX slot	32.12	32.41	31.95	-9.03dB	23.09	23.38	22.92
	2TX slot	30.44	30.72	30.21	-6.02dB	24.42	24.70	24.19
	3TX slot	28.08	28.36	28.00	-4.26dB	23.82	24.10	23.74
	4TX slot	27.55	27.74	27.42	**-3.01dB**	**24.54**	**24.73**	**24.41**
EGPRS (8PSK)	1TX slot	27.13	27.29	27.79	-9.03dB	18.10	18.26	18.76
	2TX slot	26.51	26.62	26.93	-6.02dB	20.49	20.60	20.91
	3TX slot	25.26	25.38	25.71	-4.26dB	21.00	21.12	21.45
	4TX slot	24.82	24.90	25.11	**-3.01dB**	21.81	21.89	22.10
GSM 1900		Burst Conducted power (dBm) Channel/Frequency(MHz)			/	Burst Conducted power (dBm) Channel/Frequency(MHz)		
		512/ 1850.2	661/ 1880	810/ 1909.8		512/ 1850.2	661/ 1880	810/ 1909.8
GSM		29.86	30.08	29.58	-9.03dB	20.83	21.05	20.55
GPRS (GMSK)	1TX slot	29.85	30.04	29.51	-9.03dB	20.82	21.01	20.48
	2TX slot	28.63	28.97	28.40	-6.02dB	22.61	22.95	22.38
	3TX slot	27.28	27.52	27.06	-4.26dB	23.02	23.26	22.80
	4TX slot	26.74	26.94	26.32	**-3.01dB**	**23.73**	**23.93**	**23.31**
EGPRS (8PSK)	1TX slot	26.95	27.10	26.77	-9.03dB	17.92	18.07	17.74
	2TX slot	25.99	26.27	25.75	-6.02dB	19.97	20.25	19.73
	3TX slot	25.12	25.36	24.91	-4.26dB	20.86	21.10	20.65
	4TX slot	24.63	24.69	24.22	**-3.01dB**	21.62	21.68	21.21

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) => -9.03dB
2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB
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) => -3.01dB

2. According to the conducted power as above, the GPRS measurements are performed with 4Txslots for GPRS850 and GPRS1900.
3. We tested SIM1 for SAR.

Conducted Power Measurement Results(UMTS Band V)

SIM1				
Item	**band**	**UMTS Band V result (dBm)**		
	ARFCN	**Channel/Frequency(MHz)**		
		4132/826.4	4183/836.6	4233/846.6
WCDMA Band V	12.2kbps RMC	23.12	23.25	23.04
	64kbps RMC	23.01	23.10	22.93
	144kbps RMC	22.82	23.02	22.70
	384kbps RMC	22.65	22.89	22.56
HSDPA	Sub - Test 1	22.97	23.08	22.85
	Sub - Test 2	20.69	20.94	20.37
	Sub - Test 3	20.81	21.13	20.50
	Sub - Test 4	22.72	23.02	22.66
HSUPA	Sub - Test 1	22.56	23.00	22.43
	Sub - Test 2	20.38	20.74	20.19
	Sub - Test 3	20.49	20.96	20.32
	Sub - Test 4	21.37	21.53	21.14
	Sub - Test 5	22.51	23.00	22.62

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.

WiFi2450

Mode	Data rate (Mbps)	Conducted Average Power (dBm)		
		Channel/Frequency (MHz)		
		1/2412	**6/2437**	**11/2462**
IEEE 802.11b	1	15.33	15.09	14.59
	2	15.20	14.91	14.33
	5.5	15.06	14.78	14.18
	11	14.98	14.59	14.05
IEEE 802.11g	6	10.44	10.44	9.48
	9	10.31	10.33	9.33
	12	10.24	10.25	9.25
	18	10.12	10.11	9.11
	24	10.07	10.05	9.02
	36	9.97	10.00	8.91
	48	9.86	9.89	8.78
	54	9.70	9.73	8.70
IEEE 802.11n HT20	MCS0	10.93	10.75	10.01
	MCS1	10.84	10.62	9.88
	MCS2	10.71	10.49	9.76
	MCS3	10.54	10.33	9.63
	MCS4	10.42	10.17	9.50
	MCS5	10.29	10.05	9.32
	MCS6	10.21	9.99	9.19
	MCS7	10.04	9.86	9.03
		3/2422	**6/2437**	**9/2452**
IEEE 802.11n HT40	MCS0	10.79	10.69	10.32
	MCS1	10.62	10.55	10.22
	MCS2	10.47	10.34	10.09
	MCS3	10.33	10.16	10.01
	MCS4	10.18	10.04	9.86
	MCS5	10.05	9.95	9.74
	MCS6	9.99	9.81	9.44
	MCS7	9.76	9.68	9.25

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	-4.65
	19	2440	-3.70
	39	2480	-3.98
GFSK	0	2402	3.95
	39	2441	4.23
	78	2480	4.66
8DPSK	0	2402	3.47
	39	2441	3.88
	78	2480	3.88
π/4DQPSK	0	2402	3.47
	39	2441	3.89
	78	2480	3.85

Manufacturing tolerance

GSM Speech

GSM 850 (GMSK) (Burst Average Power)			
Channel	Channel 128	Channel 190	Channel 251
Target (dBm)	32.0	32.0	32.0
Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 (GMSK) (Burst Average Power)			
Channel	Channel 512	Channel 661	Channel 810
Target (dBm)	29.5	29.5	29.5
Tolerance ±(dB)	1.0	1.0	1.0

GSM 850 GPRS (GMSK) (Burst Average Power)				
Channel		Channel 128	Channel 190	Channel 251
1 Txslot	Target (dBm)	32.0	32.0	32.0
	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		Channel 128	Channel 190	Channel 251
1 Txslot	Target (dBm)	27.0	27.0	27.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	26.0	26.0	26.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	24.0	24.0	24.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 GPRS (GMSK) (Burst Average Power)				
Channel		Channel 512	Channel 661	Channel 810
1 Txslot	Target (dBm)	29.5	29.5	29.5
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	27.0	27.0	27.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	26.0	26.0	26.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 EDGE (8PSK) (Burst Average Power)				
Channel		Channel 512	Channel 661	Channel 810
1 Txslot	Target (dBm)	27.0	27.0	27.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	26.0	26.0	26.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	24.0	24.0	24.0
	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)	22.5	22.5	22.5
Tolerance ±(dB)	1.0	1.0	1.0

UMTS Band V HSDPA(sub-test 2)			
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 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)	22.5	22.5	22.5
Tolerance ±(dB)	1.0	1.0	1.0
UMTS Band V HSUPA(sub-test 1)			
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 HSUPA(sub-test 2)			
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 3)			
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 4)			
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 5)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	22.5	22.5	22.5
Tolerance ±(dB)	1.0	1.0	1.0

WiFi2450

802.11b (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.5	14.5	14.5
Tolerance ±(dB)	1.0	1.0	1.0
802.11g (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	9.5	9.5	9.5
Tolerance ±(dB)	1.0	1.0	1.0
802.11n HT20 (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	9.5	9.5	9.5
Tolerance ±(dB)	1.0	1.0	1.0
802.11n HT40 (Average)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	9.5	9.5	9.5
Tolerance ±(dB)	1.0	1.0	1.0

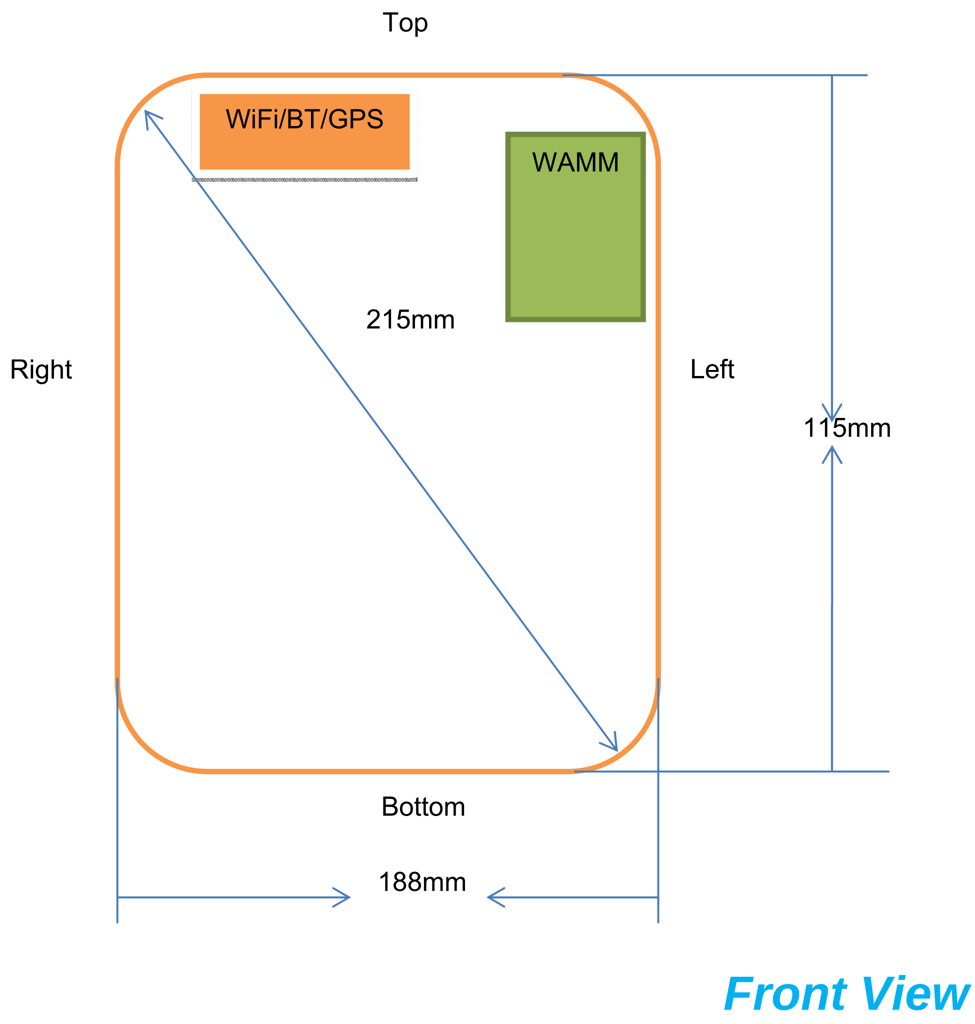
Bluetooth

BLE-GFSK (Average)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	-4.0	-4.0	-4.0
Tolerance ±(dB)	1.0	1.0	1.0
GFSK (Average)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	4.0	4.0	4.0
Tolerance ±(dB)	1.0	1.0	1.0
8DPSK (Average)			
Channel	Channel 0	Channel 39	Channel 78

Target (dBm)	3.0	3.0	3.0
Tolerance ±(dB)	1.0	1.0	1.0
π/4DQPSK (Average)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	3.0	3.0	3.0
Tolerance ±(dB)	1.0	1.0	1.0

5.2. Transmit Antennas and SAR Measurement Position

5.2.1 Transmit Antenna Separation Distances



Antenna information:

WWAN Main Antenna	GSM/UMTS TX/RX
WiFi/GPS/BT Antenna	WLAN/BT TX/RX

The distance TX antenna and positions (mm)						
Antenna	**Front**	**Rear**	**Left**	**Right**	**Top**	**Bottom**
WWAN	<5	<5	<5	100	11	135
WiFi/BT	<5	<5	75	13	<5	173

5.3. Test Configuration

The product can support GSM/UMTS/WiFi/BT function, according to following picture 1 showed that the diagonal dimension(21.7cm>20cm) and antenna position of the DUT.So accroding to KDB 616217 and KDB447498 for SAR testing.

Head Configuration

Measurements were made in “check“ and “title“ positions on both the left hand and right hand sides of the phantom

The positions used in the measurements were according to IEEE 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“.

Body-worn Configuration

The overall diagonal dimension of the display section of a tablet is 21 cm > 20 cm, Per FCC KDB 616217 Section 4.3 Tablet host platform test requirements, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. Exposures from antennas through the front (top) surface of the display section of a full-size tablet, away from the edges, are generally limited to the user’s hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary, except for tablets that are designed to require continuous operations with the hand(s) next to the antenna(s).
Per KDB616217D04, the antennas in tablets are typically located near the back (bottom) surface and/ or along the edges of the devices; therefore, SAR evaluation is required for this configurations. Exposure from antennas through the front (top) surface of the display section of a full-size tablet, away from the edges, are generally limited to the user’ hands. Exposure to hands for typical consurner transmitters used in tablets are not exceed to exceed the extremity SAR limits; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary, except for tablets that are designed to require continuous operations with the hand(s) next to the antenna(s).

- Test Position 1: The rear surface of the EUT towards the bottom of the flat phantom;
- Test Position 2: The left surface of the EUT towards the bottom of the flat phantom;
- Test Position 3: The right surface of the EUT towards the bottom of the flat phantom;
- Test Position 4: The top surface of the EUT towards the bottom of the flat phantom;
- Test Position 5: The bottom surface of the EUT towards the bottom of the flat phantom;

5.3.1 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.
The 1-g SAR test exclusion threshold 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, where

- 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

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.
At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following;
a) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
b) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

Table 5.2.3.1 Standalone SAR test exclusion considerations

Standalone SAR test exclusion considerations							
Communication system	Frequency (MHz)	Configuration	Maximum Average Power (dBm)	Separation Distance (mm)	Calculation Result	SAR Exclusion Thresholds	Standalone SAR Exclusion
GSM 850	850	Head	23.97	5	46.0	3.0	no
		Rear	24.99	5	58.1	3.0	no
		Left	24.99	5	58.1	3.0	no
		Right	24.99	100	24.99 dBm	26.49 dBm	yes
		Bottom	24.99	135	24.99 dBm	28.09 dBm	yes
		Top	24.99	11	26.4	3.0	no
GSM 1900	1900	Head	21.47	5	38.7	3.0	no
		Rear	23.99	5	69.1	3.0	no
		Left	23.99	5	69.1	3.0	no
		Right	23.99	100	23.99 dBm	27.84 dBm	yes
		Bottom	23.99	135	23.99 dBm	29.82 dBm	yes
		Top	23.99	11	31.4	3.0	no
UMTS Band V	850	Head	23.50	5	41.3	3.0	no
		Rear	23.50	5	41.3	3.0	no
		Left	23.50	5	41.3	3.0	no
		Right	23.50	100	23.50 dBm	26.49 dBm	yes
		Bottom	23.50	135	23.50 mW	28.09 dBm	yes
		Top	23.50	11	18.8	3.0	no

Remark:
1. WiFi 2450 and Bluetooth Standalone SAR Test Exclusion Considerations for another table per KDB248227 D01.
2. Maximum average power including tune-up tolerance;
3. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion
4. Body as body use distance is 0mm from manufacturer declaration of user manual.

Standalone SAR test exclusion considerations							
Communication system	Frequency (MHz)	Configuration	Maximum Average Power (dBm)	Separation Distance (mm)	Calculation Result	SAR Exclusion Thresholds	Standalone SAR Exclusion
IEEE 802.11b	2450	Head	15.50	5	11.1	3.0	no
		Rear	15.50	5	11.1	3.0	no
		Left	15.50	75	15.50 dBm	25.39 dBm	yes
		Right	15.50	13	4.3	3.0	no
		Bottom	15.50	173	15.50 dBm	31.22 dBm	yes
		Top	15.50	5	11.1	3.0	no
IEEE 802.11g	2450	Head	10.50	5	3.5	3.0	no
		Rear	10.50	5	3.5	3.0	no
		Left	10.50	75	10.50 dBm	25.39 dBm	yes
		Right	10.50	13	1.4	3.0	yes
		Bottom	10.50	173	10.50 dBm	31.22 dBm	yes
		Top	10.50	5	3.5	3.0	no
IEEE 802.11n HT20	2450	Head	10.50	5	3.5	3.0	no
		Rear	10.50	5	3.5	3.0	no
		Left	10.50	75	10.50 dBm	25.39 dBm	yes
		Right	10.50	13	1.4	3.0	yes
		Bottom	10.50	173	10.50 dBm	31.22 dBm	yes
		Top	10.50	5	3.5	3.0	no
IEEE 802.11n HT40	2450	Head	10.50	5	3.5	3.0	no
		Rear	10.50	5	3.5	3.0	no
		Left	10.50	75	10.50 dBm	25.39 dBm	yes
		Right	10.50	13	1.4	3.0	yes
		Bottom	10.50	173	10.50 dBm	31.22 dBm	yes
		Top	10.50	5	3.5	3.0	no
Bluetooth*	2450	Head	5.00	5	1.0	3.0	yes
		Rear	5.00	5	1.0	3.0	yes
		Left	5.00	75	5.00 dBm	25.39 dBm	yes
		Right	5.00	13	0.4	3.0	yes
		Bottom	5.00	173	5.00 dBm	31.22 dBm	yes
		Top	5.00	5	1.0	3.0	yes

Remark:
1. Maximum average power including tune-up tolerance;
2. Bluetooth including BLE and classical Bluetooth;
3. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion
4. Body including Hotspot mode as body use distance is 10mm from manufacturer declaration of user manual.
5. Per KDB 648474, if overall diagonal dimension of the display section of a tablet lager than 20 cm, no need consider Hotspot mode.

5.4. Evaluation of Simultaneous SAR

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
UMTS	BandV	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				

Remark:
1. 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.
2. BLE-Bluetooth low energy;
3. BT- Classical Bluetooth

5.4.2 Estimated Standalone 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 (GHz)	Configuration	distance (mm)	P_{pk} (including tune tune-up tolerance (dBm)	P_{pk} (including tune tune-up tolerance (mW)	$\text{estimated}_{1\text{-g}}$ (W/Kg)
Bluetooth*	2.45	Head	5	5.00	3.162	0.132
Bluetooth*	2.45	Rear	5	5.00	3.162	0.132
Bluetooth*	2.45	Left	13	5.00	3.162	0.051
Bluetooth*	2.45	Top	5	5.00	3.162	0.132

Remark:
1. Maximum average power including tune-up tolerance;
2. Bluetooth including BLE and classical Bluetooth;
3. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

5.4.3 Evaluation of Simultaneous SAR

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB 447498D01 General RF Exposure Guidance v05.

reported SAR WWAN and WiFi 2.4GHz, ΣSAR evaluation, SPLSR$_i$						
Frequency band	Position	SAR$_{1-gmax}$ /W/kg		ΣSAR <1.6 W/Kg	Distance R$_i$, mm	Ratio ≤ 0.040
		WWAN	WiFi			
GSM 850	right cheek	0.086	**0.171**	0.549		
	right tilt	0.116	0.151	0.449		
	left cheek	**0.296**	0.081	0.630		
	left tilt	0.244	0.068	0.521		
	rear side 0mm	**0.597**	**0.619**	1.595		
	right side 0mm	/	0.367	/		
	left side 0mm	0.506	/	/		
	bottom side 0mm	/	/	/		
	top side 0mm	0.423	0.598	1.196		
GSM 1900	right cheek	0.378	**0.171**	0.549		
	right tilt	0.298	0.151	0.449		
	left cheek	**0.549**	0.081	**0.630**		
	left tilt	0.453	0.068	0.521		
	rear side 0mm	**0.976**	**0.619**	**1.595**		
	right side 0mm	/	0.367	/		
	left side 0mm	0.923	/	/		
	bottom side 0mm	/	/	/		
	top side 0mm	0.751	0.598	1.349		
UMTS Band V	right cheek	0.184	**0.171**	0.355		
	right tilt	0.165	0.151	0.316		
	left cheek	**0.370**	0.081	0.451		
	left tilt	0.334	0.068	0.402		
	rear side 0mm	**0.748**	**0.619**	1.367		
	right side 0mm	/	0.367	/		
	left side 0mm	0.724	/	/		
	bottom side 0mm	/	/	/		
	top side 0mm	0.543	0.598	1.141		

reported SAR WWAN and WiFi 2.4GHz, ΣSAR evaluation, SPLSR$_i$						
Frequency band	Position	SAR$_{1-gmax}$ /W/kg		ΣSAR <1.6 W/Kg	Distance R$_i$, mm	Ratio ≤ 0.040
		WWAN	BT			
GSM 850	right cheek	0.086	0.132	0.218		
	right tilt	0.116	0.132	0.248		
	left cheek	**0.296**	0.132	0.428		
	left tilt	0.244	0.132	0.376		
	rear side 0mm	**0.597**	0.132	0.729		
	right side 0mm	/	0.051	/		
	left side 0mm	0.506	/	/		
	bottom side 0mm	/	/	/		
	top side 0mm	0.423	0.132	0.555		
GSM 1900	right cheek	0.378	0.132	0.510		
	right tilt	0.298	0.132	0.430		
	left cheek	**0.549**	0.132	0.681		
	left tilt	0.453	0.132	0.585		
	rear side 0mm	**0.976**	0.132	1.108		
	right side 0mm	/	0.051	/		
	left side 0mm	0.923	/	/		
	bottom side 0mm	/	/	/		
	top side 0mm	0.751	0.132	0.883		
UMTS Band V	right cheek	0.184	0.132	0.316		
	right tilt	0.165	0.132	0.297		
	left cheek	**0.370**	0.132	0.502		
	left tilt	0.334	0.132	0.466		
	rear side 0mm	**0.748**	0.132	0.880		
	right side 0mm	/	0.051	/		
	left side 0mm	0.724	/	/		
	bottom side 0mm	/	/	/		
	top side 0mm	0.543	0.132	0.675		

Remark:
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 $\sum SAR_{1-g}$

Conclusion:
ΣSAR < 1.6 W/Kg, no need consider SAR-to-(peak-locations spacing) ratio (SPLSRi) , therefore simultaneous transmissions SAR measurement with the enlarged zoom scan measurement and volume scan postprocessing procedures is not required.

5.4.4 SAR peak location separation

Not required as ΣSAR < 1.6 W/Kg.

5.5. SAR Measurement Results

The calculated SAR is obtained by the following formula:

$$\text{Reported SAR}=\text{Measured SAR}*10^{(Ptarget-Pmeasured))/10}$$
$$\text{Scaling factor}=10^{(Ptarget-Pmeasured))/10}$$
$$\text{Reported SAR}= \text{Measured SAR}* \text{Scaling factor}$$

Where P_{target} is the power of manufacturing upper limit;
$P_{measured}$ is the measured power;
Measured SAR is measured SAR at measured power which including power drift)
Reported SAR which including Power Drift and Scaling factor

Duty Cycle

Test Mode	Duty Cycle
Speech for GSM850/1900	1:8
GPRS850/1900	1:2
UMTS	1:1
WiFi2450	1:1

Table 1: SAR Values [GSM850]

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										
190	836.6	Voice	Right/Cheek	33.00	32.58	-0.12	1.10	0.078	0.086	
190	836.6	Voice	Right/Tilt	33.00	32.58	-0.09	1.10	0.105	0.116	
190	836.6	Voice	Left/Cheek	33.00	32.58	0.06	1.10	**0.269**	**0.296**	Plot 1
190	836.6	Voice	Left/Tilt	33.00	32.58	-0.14	1.10	0.222	0.244	
measured / reported SAR numbers - Body (distance 0mm)										
190	836.6	4TX slot	Rear	28.00	27.81	-0.05	1.05	**0.569**	**0.597**	Plot 2
190	836.6	4TX slot	Left	28.00	27.81	-0.09	1.05	0.482	0.506	
190	836.6	4TX slot	Top	28.00	27.81	0.02	1.05	0.403	0.423	

Table 2: SAR Values [GSM1900]

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										
661	1880.0	Voice	Right/Cheek	30.50	30.08	-0.06	1.10	0.344	0.378	
661	1880.0	Voice	Right/Tilt	30.50	30.08	-0.13	1.10	0.271	0.298	
661	1880.0	Voice	Left/Cheek	30.50	30.08	-0.02	1.10	**0.499**	**0.549**	Plot 3
661	1880.0	Voice	Left/Tilt	30.50	30.08	0.15	1.10	0.412	0.453	
measured / reported SAR numbers - Body (distance 0mm)										
512	1850.2	4TX slot	Rear	27.00	26.78	-0.14	1.05	0.863	0.906	
661	1880.0	4TX slot	Rear	27.00	26.94	0.07	1.01	**0.966**	**0.976**	Plot 4
661	**1880.0**	**4TX slot**	Rear	**27.00**	**26.94**	**-0.02**	**1.01**	**0.948**	**0.957**	**Repeated**
810	1908.8	4TX slot	Rear	27.00	26.32	-0.01	1.17	0.811	0.949	
512	1850.2	4TX slot	Left	27.00	26.78	0.04	1.05	0.808	0.848	
661	1880.0	4TX slot	Left	27.00	26.94	0.06	1.01	0.914	0.923	
810	1908.8	4TX slot	Left	27.00	26.32	0.16	1.17	0.775	0.907	
190	836.6	4TX slot	Top	27.00	26.94	0.08	1.01	0.744	0.751	

Table 3 SAR Measurement Variability Results [GSM1900]

Test Position	Channel/ Frequency (MHz)	Measured SAR_{1-g}	1st Repeated SAR_{1-g}	Ratio	2nd Repeated SAR_{1-g}	3rd Repeated SAR_{1-g}
Rear	661/1880.0	0.966	0.948	0.98	N/A	N/A

Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg
5) According to the FCC KDB 865664, repeated SAR at the highest SAR measurement;

Table 4: SAR Values [UMTS Band V (WCDMA/HSDPA/HSUPA]

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										
4183	836.6	RMC 12.2	Right/Cheek	23.50	23.25	-0.02	1.06	0.174	0.184	
4183	836.6	RMC 12.2	Right/Tilt	23.50	23.25	0.05	1.06	0.156	0.165	
4183	836.6	RMC 12.2	Left/Cheek	23.50	23.25	0.01	1.06	**0.349**	**0.370**	Plot 5
4183	836.6	RMC 12.2	Left/Tilt	23.50	23.25	-0.14	1.06	0.315	0.334	
measured / reported SAR numbers - Body (distance 0mm)										
4183	836.6	4TX slot	Rear	23.50	23.25	-0.06	1.06	**0.706**	**0.748**	Plot 6
4183	836.6	4TX slot	Left	23.50	23.25	-0.11	1.06	0.683	0.724	
4183	836.6	4TX slot	Top	23.50	23.25	0.13	1.06	0.512	0.543	

Table 5: SAR Values [WiFi 802.11b/g/n]

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										
1	2412	DSSS	Right/Cheek	15.50	15.09	-0.07	1.10	**0.155**	**0.171**	Plot 7
1	2412	DSSS	Right/Tilt	15.50	15.09	0.04	1.10	0.137	0.151	
1	2412	DSSS	Left/Cheek	15.50	15.09	-0.12	1.10	0.074	0.081	
1	2412	DSSS	Left/Tilt	15.50	15.09	-0.03	1.10	0.062	0.068	
measured / reported SAR numbers - Body (hotspot open, distance 10mm)										
1	2412	DSSS	Rear	15.50	15.09	0.08	1.10	**0.563**	**0.619**	Plot 8
1	2412	DSSS	Right	15.50	15.09	0.02	1.10	0.334	0.367	
1	2412	DSSS	Top	15.50	15.09	0.02	1.10	0.544	0.598	

Note:
1.According to KDB447498,When the 1-g SAR for the mid-band channel,or the channel with highest output power satidfy the following conditions,testing of the other channels in the band is not required.
≤0.8W/Kg and transmission band ≤100MHz;
≤0.6W/Kg and 100MHz ≤transmission band ≤200MHz;
≤ 0.4W/Kg and transmission band >200MHz
2.Accoding to KDB 248227,Each channel should be tested at the lowest data rate in each mode.

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, 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 IEEE 1528 the SAR test shall be performed at middle channel. Testing of top and bottom channel is optional.
10. 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
11. IEEE 1528-2013 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.
12. 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.
13. Per KDB616217D04, the antennas in tablets are typically located near the back (bottom) surface and/ or along the edges of the devices; therefore, SAR evaluation is required for this configurations. Exposure from antennas through the front (top) surface of the display section of a full-size tablet, away from the edges, are generally limited to the user' hands. Exposure to hands for typical consurner transmitters used in tablets are not exceed to exceed the extremity SAR limits; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary, except for tablets that are designed to require continuous operations with the hand(s) next to the antenna(s).

14. Per KDB616217D04, the hotspot mode SAR procedures (KDB 941225 D06) for handsets and UMPC mini-tablets procedures generally do not apply to the full-size tablet devices described in this documents. The standalone and simultaneous transmission SAR tests required for tablets are more conservative than the hotspot mode use configurations; therefore, additional testing for hotspot SAR is not required when the procedures in this documents are applied.

5.7. SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) 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).
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.

5.8. 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.

5.9. System Check Results

System Performance Check at 900 MHz Head

DUT: Dipole 900 MHz; Type: D900V2; Serial: 1d086

Date/Time: 11/16/2015 AM

Communication System: CW; Frequency: 900 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 900 MHz; σ = 0.97 S/m ; ε_r = 42.09 ; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 – SN3221; ConvF(6.13,6.13, 6.13); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x121x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 2.88 W/Kg

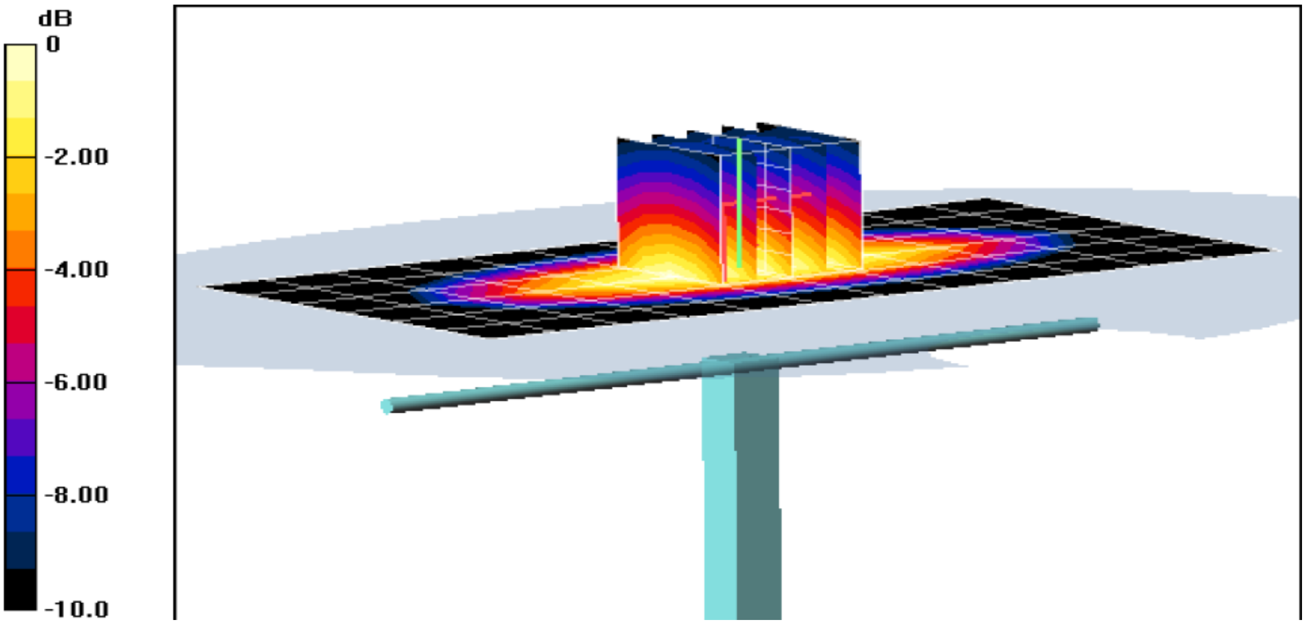
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 52.994 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 3.556 W/Kg

SAR(1 g) = 2.61 W/Kg; SAR(10 g) = 1.71 W/Kg

Maximum value of SAR (measured) = 2.80 W/Kg



0 dB = 2.80 W/Kg = 4.47 dB W/Kg

System Performance Check 900MHz Head 250mW

System Performance Check at 900 MHz Body

DUT: Dipole 900 MHz; Type: D900V2; Serial: 1d086

Date/Time: 11/16/2015 AM

Communication System: CW; Frequency: 900 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 900 MHz; σ = 1.01 S/m; ε_r = 54.69; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 – SN3221; ConvF(6.16,6.16, 6.16); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: ETL v4.0;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x121x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 3.27 W/Kg

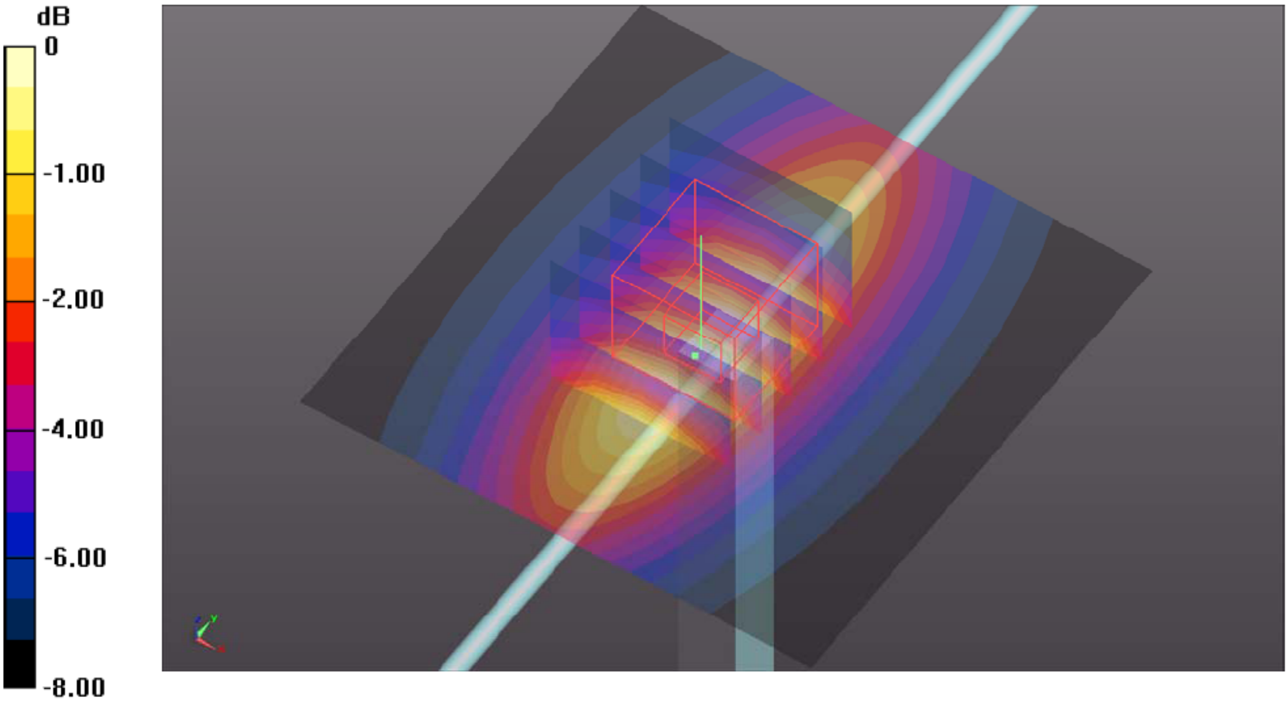
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 55.572 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 3.785 W/Kg

SAR(1 g) = 2.59 W/Kg; SAR(10 g) = 1.71 W/Kg

Maximum value of SAR (measured) = 3.26 W/Kg



0 dB = 3.26 W/Kg = 5.13 dB W/Kg

System Performance Check 900MHz Body 250mW

System Performance Check at 1900 MHz Head

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d194

Date/Time: 11/19/2015 PM

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1900 MHz; σ = 1.41 S/m; ε_r = 40.29; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 – SN3221; ConvF(5.20,5.20, 5.20); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x121x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 11.2 W/Kg

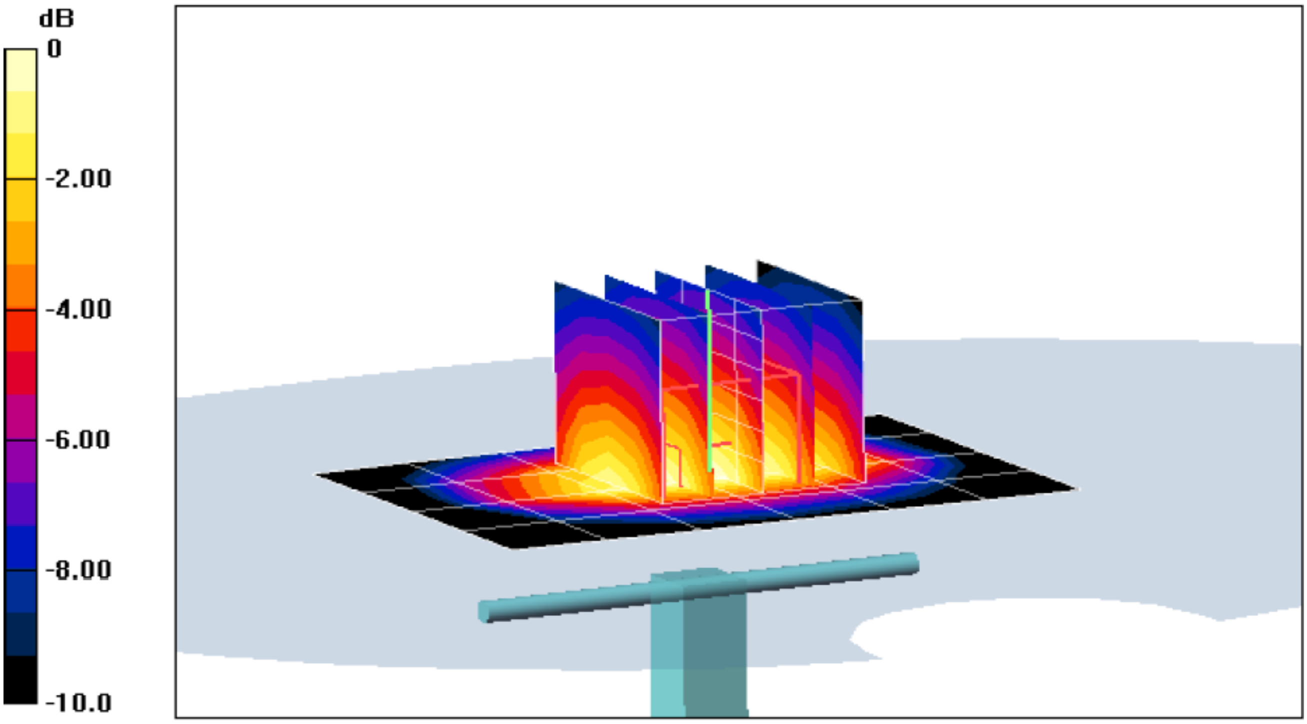
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 94.924 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 18.12 W/Kg

SAR(1 g) = 9.81 W/Kg; SAR(10 g) = 5.03 W/Kg

Maximum value of SAR (measured) = 11.0 W/Kg



0 dB = 11.0 W/Kg = 10.41 dB W/Kg

System Performance Check 1900MHz Head 250mW

System Performance Check at 1900 MHz Body

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d194

Date/Time: 11/19/2015 PM

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1900 MHz; σ = 1.54 S/m; ε_r = 53.69; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 – SN3221; ConvF(4.79,4.79, 4.79); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: ETL v4.0;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x121x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 14.8 W/Kg

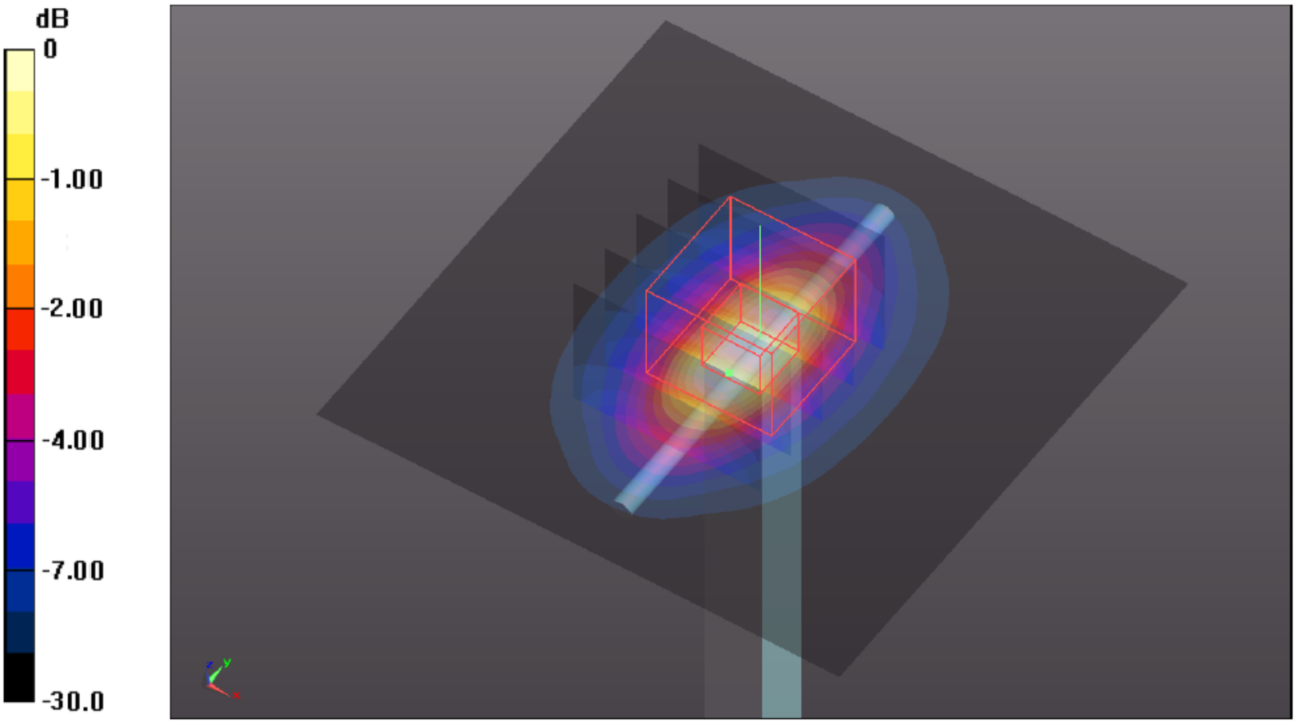
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 97.23 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 18.422 W/Kg

SAR(1 g) = 9.67 W/Kg; SAR(10 g) = 4.93 W/Kg

Maximum value of SAR (measured) = 14.5 W/Kg



0 dB = 14.5 W/Kg = 11.61 dB W/Kg

System Performance Check 1900MHz Body 250mW

System Performance Check at 2450 MHz Head

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 955

Date/Time: 11/20/2015 PM

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2450 MHz; σ = 1.83 S/m; ε_r = 38.19; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 – SN3221; ConvF(4.50, 4.50, 4.50); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x121x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 14.8 W/Kg

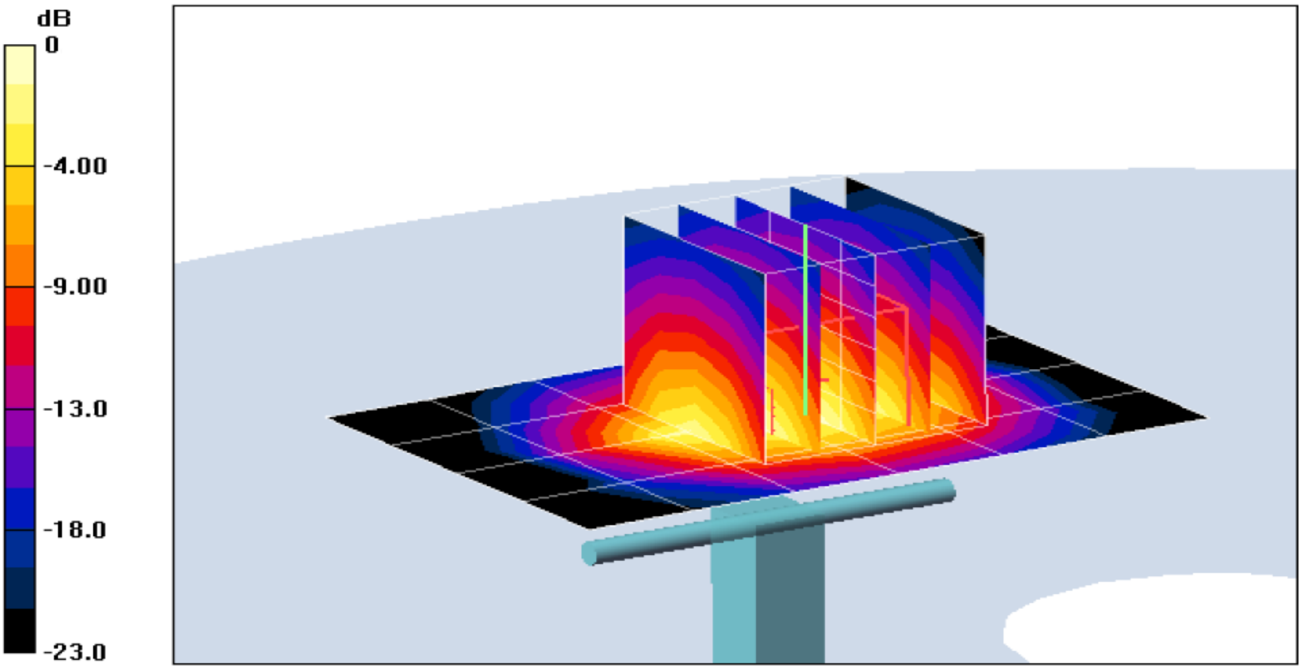
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 90.733 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 27.98 W/Kg

SAR(1 g) = 13.0 W/Kg; SAR(10 g) = 5.90 W/Kg

Maximum value of SAR (measured) = 14.6 W/Kg



0 dB = 14.6 W/Kg = 11.64 dB W/Kg

System Performance Check 2450MHz Head 250mW

System Performance Check at 2450 MHz Body

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 955

Date/Time: 11/20/2015 PM

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2450 MHz; σ = 1.90 S/m; ε_r = 50.59; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 – SN3221; ConvF(4.49,4.49, 4.49); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: ETL v4.0;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x121x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 19.62 W/Kg

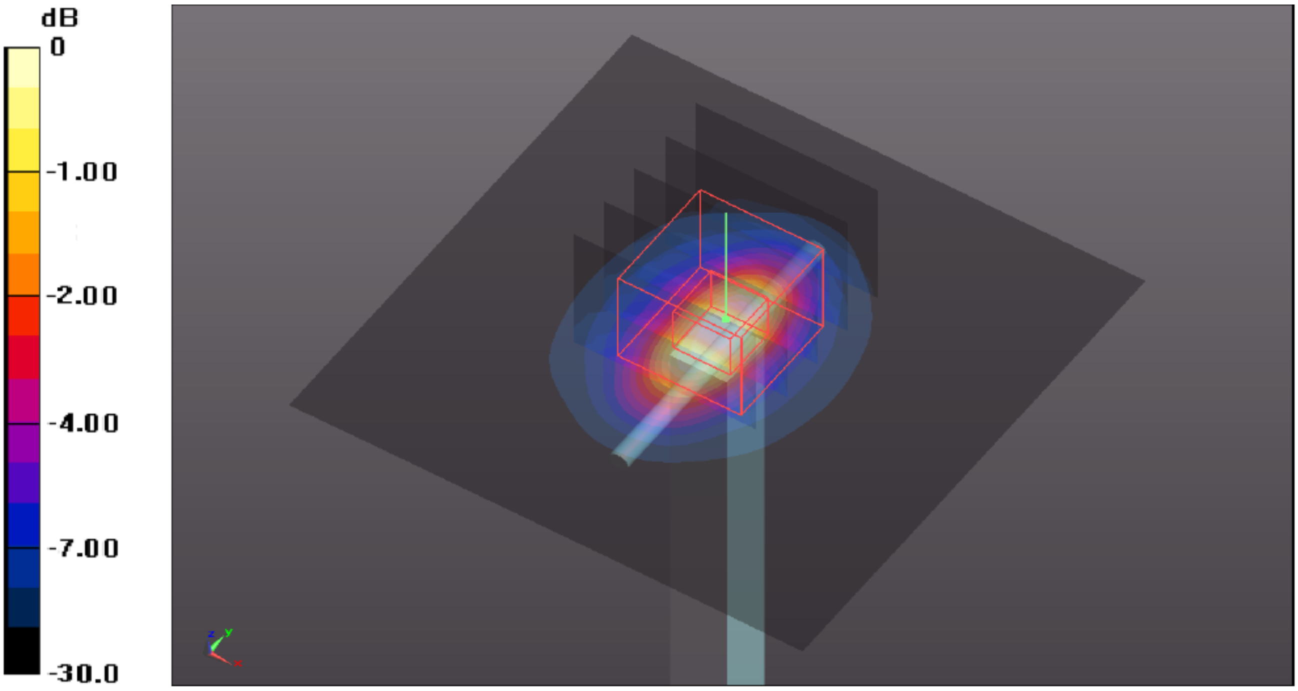
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 99.74 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 25.66 W/Kg

SAR(1 g) = 12.4 W/Kg; SAR(10 g) = 5.74 W/Kg

Maximum value of SAR (measured) = 18.69 W/Kg



0 dB = 18.69 W/Kg = 12.72 dB W/Kg

System Performance Check 2450MHz Body 250mW

5.10. 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*

GSM850 Left Head Cheek Middle Channel

Communication System: Customer System; Frequency: 836.6 MHz;Duty Cycle:1:8

Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.99 S/m; ε_r = 43.13; ρ = 1000 kg/m^3

Phantom section : Head Section

Probe: ES3DV3 – SN3221; ConvF(6.13,6.13, 6.13); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (101x131x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) =0.332 W/Kg

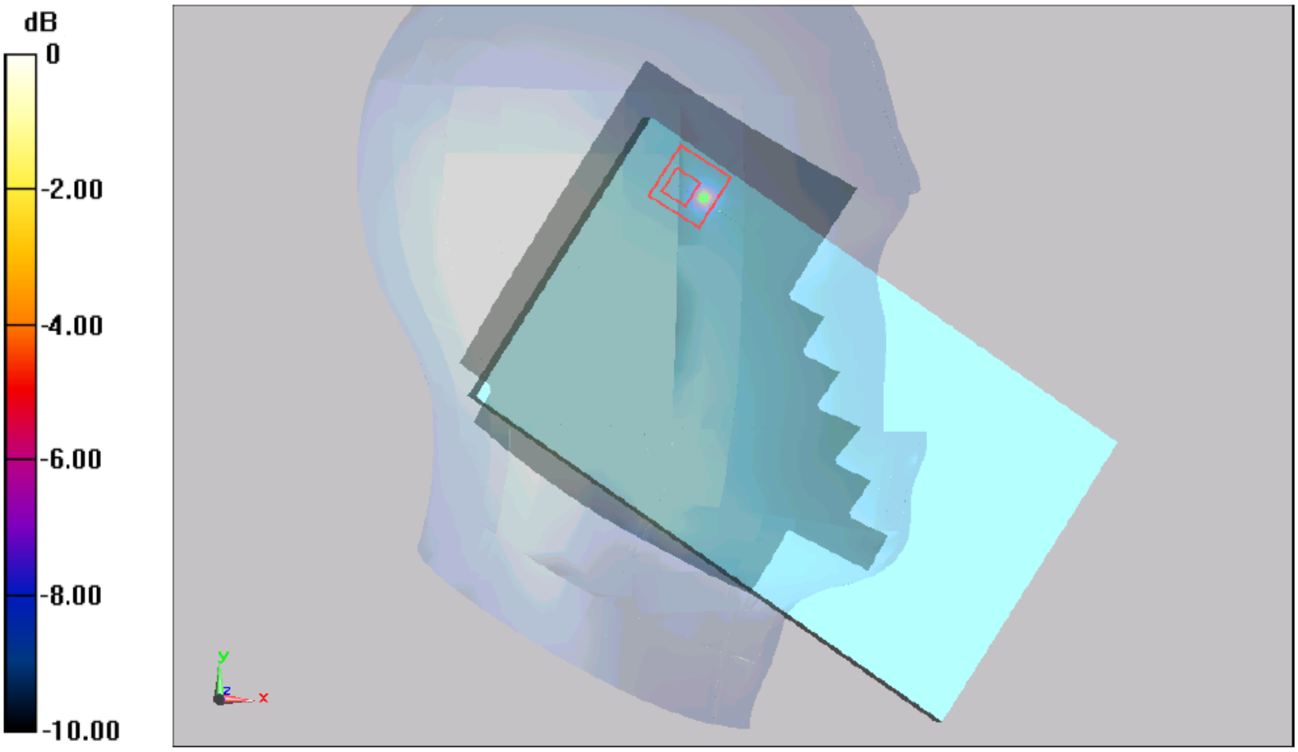
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 32.165 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.550 W/Kg

SAR(1 g) = 0.269 W/Kg; SAR(10 g) = 0.112 W/Kg

Maximum value of SAR (measured) = 0.314 W/Kg



0 dB = 0.314 W/Kg = -5.03 dB W/Kg

Plot 1: Left Head Cheek (GSM850)

GSM850 (GPRS 4TX) Body Middle Channel Rear Side

Communication System: Customer System; Frequency: 836.6 MHz;Duty Cycle:1:2

Medium parameters used (interpolated): f = 836.6 MHz; σ = 1.03 S/m; ε_r = 54.25; ρ = 1000 kg/m^3

Phantom section: Body- worn

Probe: ES3DV3 – SN3221; ConvF(6.16,6.16, 6.16); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: ETL v4.0;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (131x181x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.884 W/kg

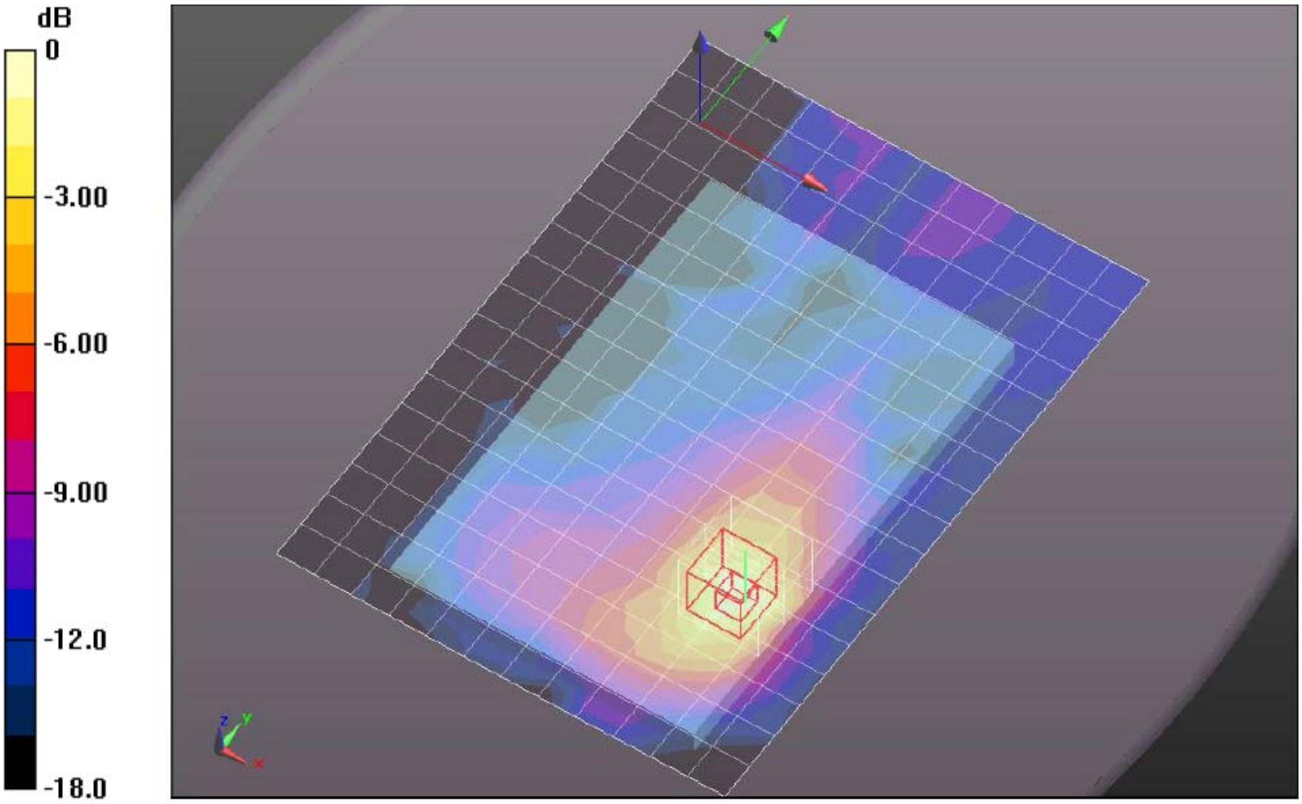
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.66 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.986 W/Kg

SAR(1 g) = 0.569 W/Kg; SAR(10 g) = 0.388 W/Kg

Maximum value of SAR (measured) = 0.812 W/Kg



0dB = 0.812 W/kg = -0.91 dBW/kg

Plot 2: Body Rear Side (GSM850 (GPRS 4TX))

GSM1900 Left Head Cheek Middle Channel

Communication System: Customer System; Frequency: 1880.0 MHz;Duty Cycle:1:8

Medium parameters used (interpolated): f = 1880.0 MHz; σ = 1.41 S/m; ε_r = 40.29; ρ = 1000 kg/m^3

Phantom section : Head Section

Probe: ES3DV3 – SN3221; ConvF(5.20,5.20, 5.20); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (101x131x1): Measurement grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) =0.590 W/Kg

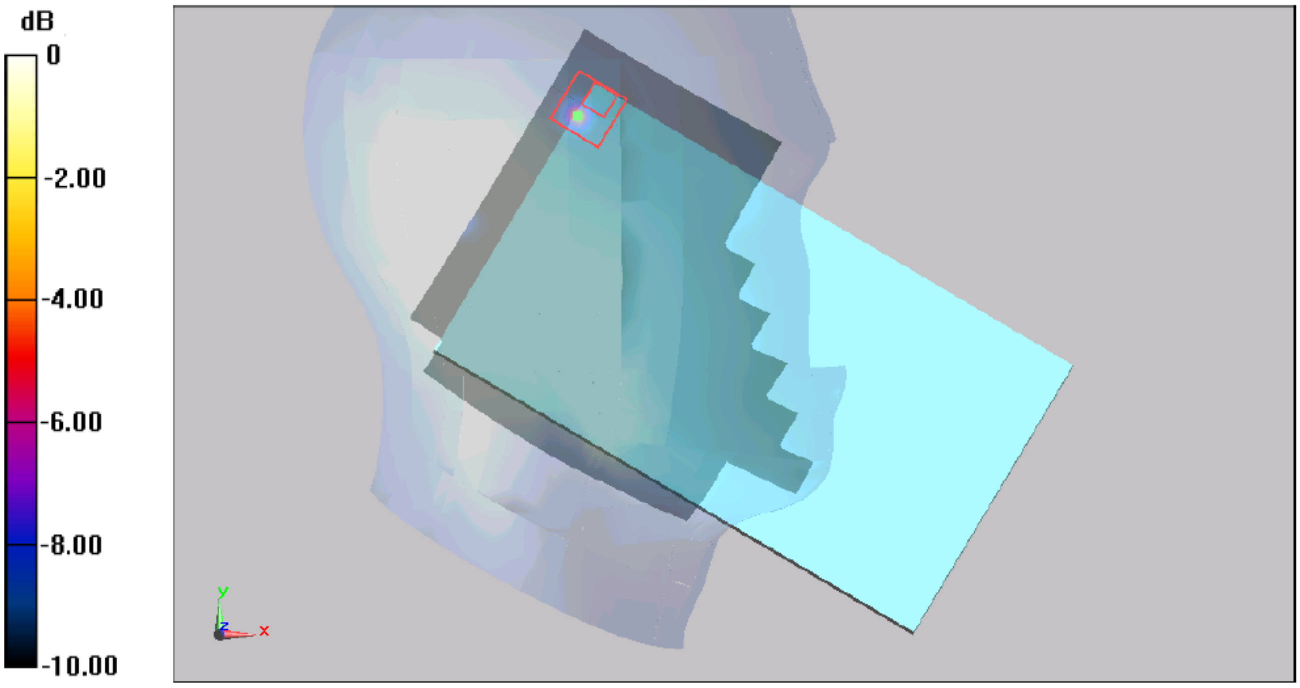
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.255 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.814 W/Kg

SAR(1 g) = 0.499 W/Kg; SAR(10 g) = 0.227 W/Kg

Maximum value of SAR (measured) = 0.600 W/Kg



0 dB = 0.600 W/Kg = -2.22 dB W/Kg

Plot 3: Left Head Cheek (GSM1900)

GSM1900 (GPRS 4TX) Body Middle Channel

Communication System: Customer System; Frequency: 1880.0 MHz;Duty Cycle:1:2

Medium parameters used (interpolated): f = 1880.0 MHz; σ =1.54 S/m; ε_r = 53.69; ρ = 1000 kg/m^3

Phantom section: Body- worn

Probe: ES3DV3 – SN3221; ConvF(4.79,4.79, 4.79); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: ETL v4.0;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (131x181x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 1.234 W/kg

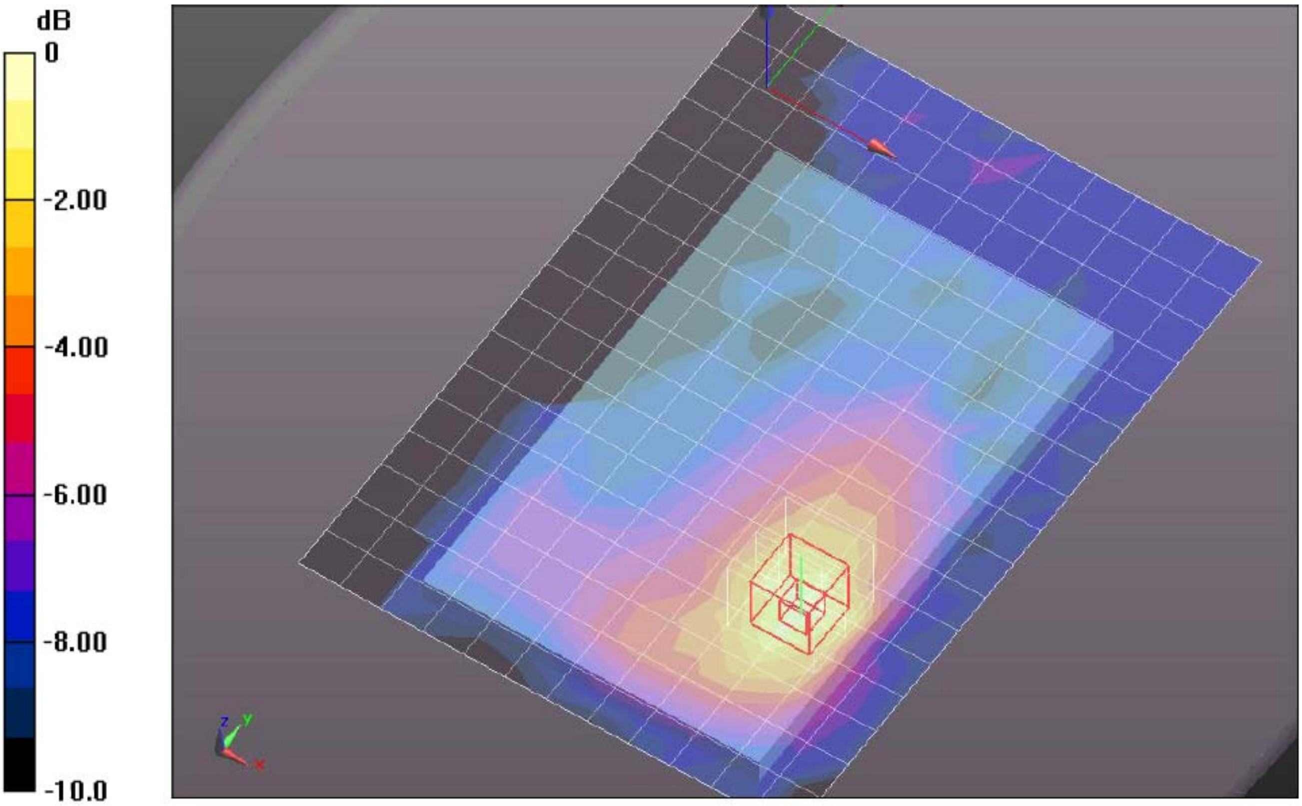
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.297 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 1.880 W/Kg

SAR(1 g) = 0.966 W/Kg; SAR(10 g) = 0.484 W/Kg

Maximum value of SAR (measured) = 1.310 W/Kg



0dB = 1.310 W/kg = 1.17 dBW/kg

Plot 4: Body Rear Side (GSM1900 (GPRS 4TX))

UMTS Band V Right Head Cheek Middle Channel

Communication System: Customer System; Frequency: 836.6 MHz;Duty Cycle:1:1

Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.99 S/m; ε_r = 43.13; ρ = 1000 kg/m^3

Phantom section : Right Section

Probe: ES3DV3 – SN3221; ConvF(6.13,6.13, 6.13); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (101x131x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) =0.420 W/Kg

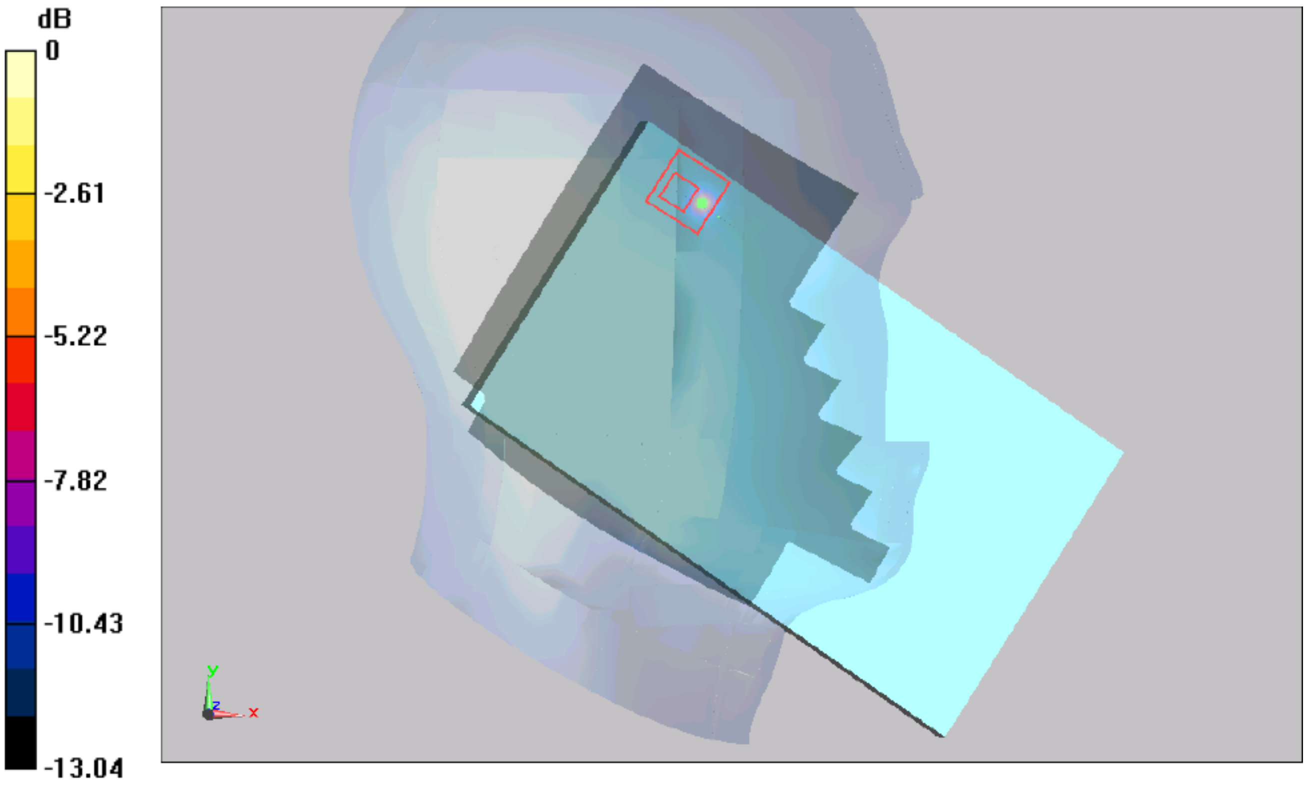
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.130 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.528 W/Kg

SAR(1 g) = 0.349 W/Kg; SAR(10 g) = 0.244 W/Kg

Maximum value of SAR (measured) = 0.420 W/Kg



0 dB = 0.420 W/Kg = -3.77 dB W/Kg

Plot 5: Right Head Cheek (UMTS Band V)

UMTS(WCDMA/HSDPA/HSUPA) Band V Body Middle Channel

Communication System: Customer System; Frequency: 836.6 MHz;Duty Cycle:1:1

Medium parameters used (interpolated): f = 836.6 MHz; σ = 1.03 S/m; ε_r = 54.25; ρ = 1000 kg/m^3

Phantom section: Body- worn

Probe: ES3DV3 – SN3221; ConvF(6.16,6.16, 6.16); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: ETL v4.0;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (111x161x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.835 W/kg

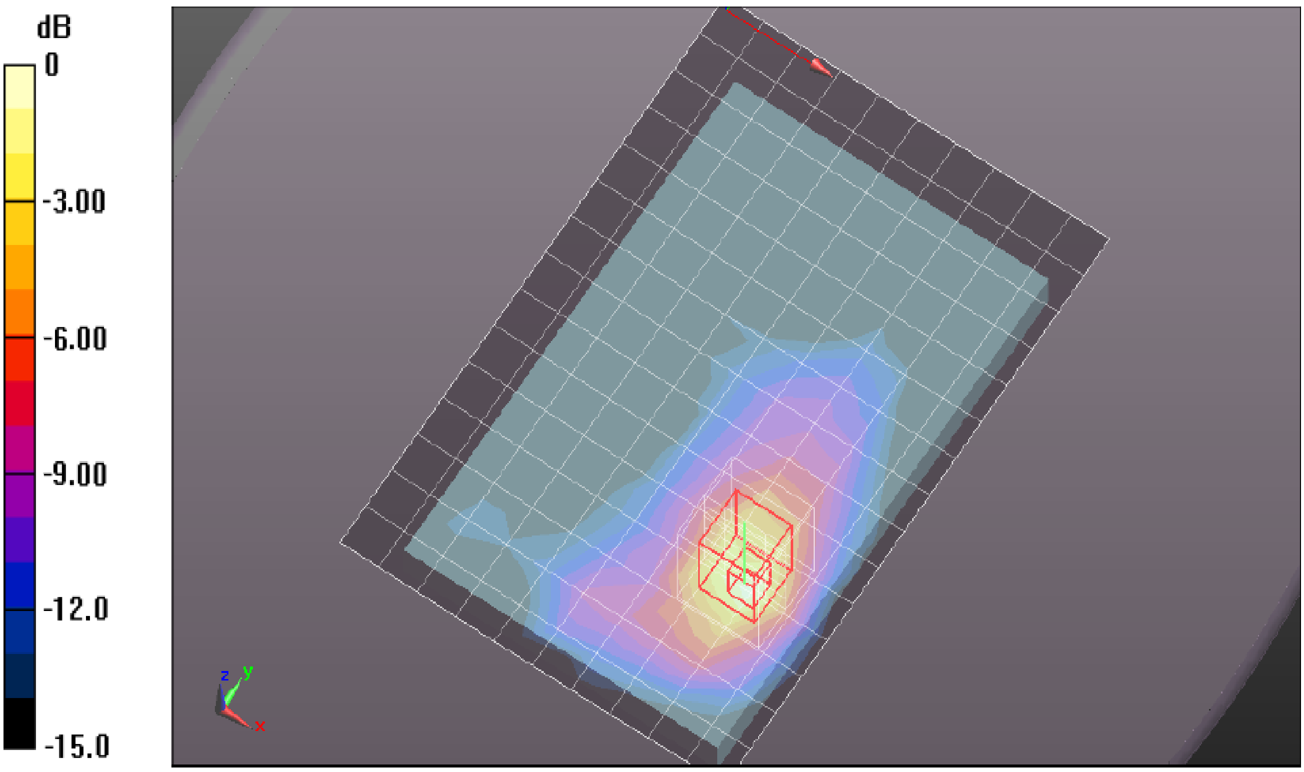
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.28 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.26 W/Kg

SAR(1 g) = 0.706 W/Kg; SAR(10 g) = 0.361 W/Kg

Maximum value of SAR (measured) = 1.080 W/Kg



0dB = 1.080 W/kg = 0.33 dBW/kg

Plot 6: Body Rear Side (UMTS(WCDMA/HSDPA/HSUPA) Band V)

WiFi2450 Right Head Cheek Low Channel (WiFi2450 Low Channel-Channel 1-2412MHz (1Mbps))

Communication System: Customer System; Frequency: 2412.0 MHz;Duty Cycle:1:1

Medium parameters used (interpolated): f = 2412.0 MHz; σ = 1.81 S/m; ε_r = 38.66; ρ = 1000 kg/m^3

Phantom section : Head Section

Probe: ES3DV3 – SN3221; ConvF(4.50, 4.50, 4.50); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (101x131x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) =0.212 W/Kg

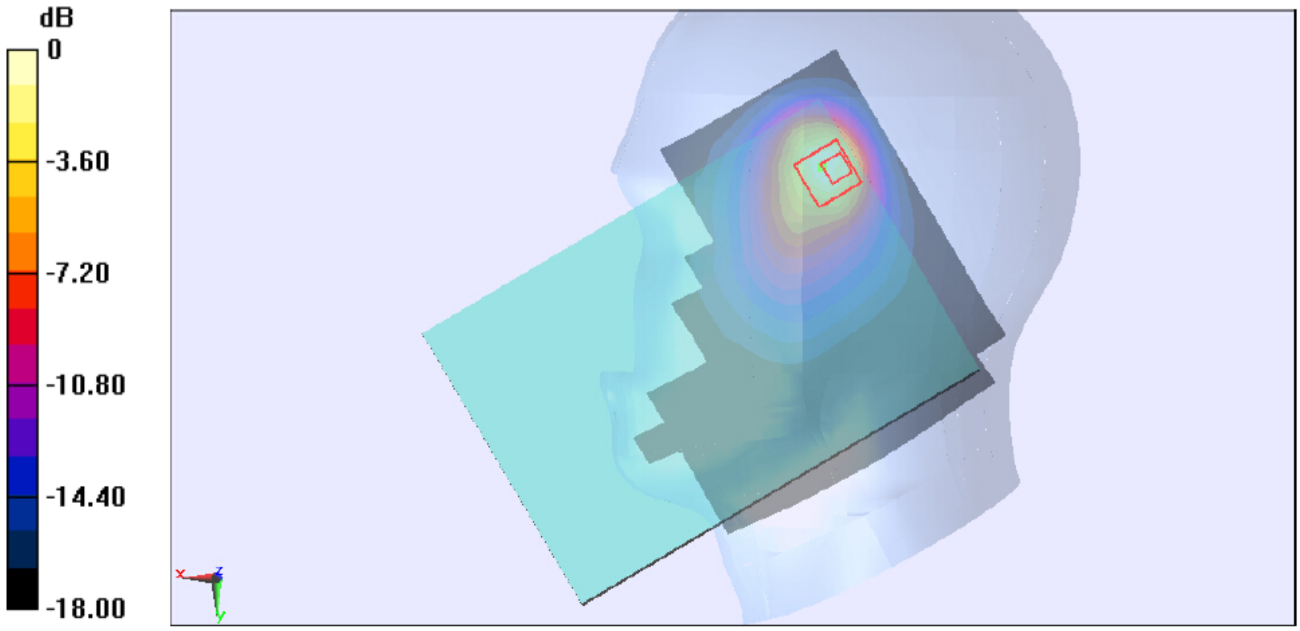
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.92 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.208 W/Kg

SAR(1 g) = 0.155 W/Kg; SAR(10 g) = 0.097 W/Kg

Maximum value of SAR (measured) = 0.220 W/Kg



0 dB = 0.220 W/Kg = -6.58 dB W/Kg

Plot 7: Right Head Cheek (WiFi2450 Low Channel-Channel 1-2412MHz (1Mbps))

WiFi2450 Body Low Channel (WiFi2450 Low Channel-Channel 1-2412MHz (1Mbps))

Communication System: Customer System; Frequency: 2412 MHz;Duty Cycle:1:1

Medium parameters used (interpolated): f = 2412 MHz; σ =1.92 S/m; ε_r = 51.88; ρ = 1000 kg/m^3

Phantom section: Body- worn

DASY5 Configuration:

Probe: ES3DV3 – SN3221; ConvF(4.49,4.49, 4.49); Calibrated: 01/31/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 SN893; Calibrated: 07/07/2015;

Phantom: ETL v4.0;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (111x131x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.620 W/kg

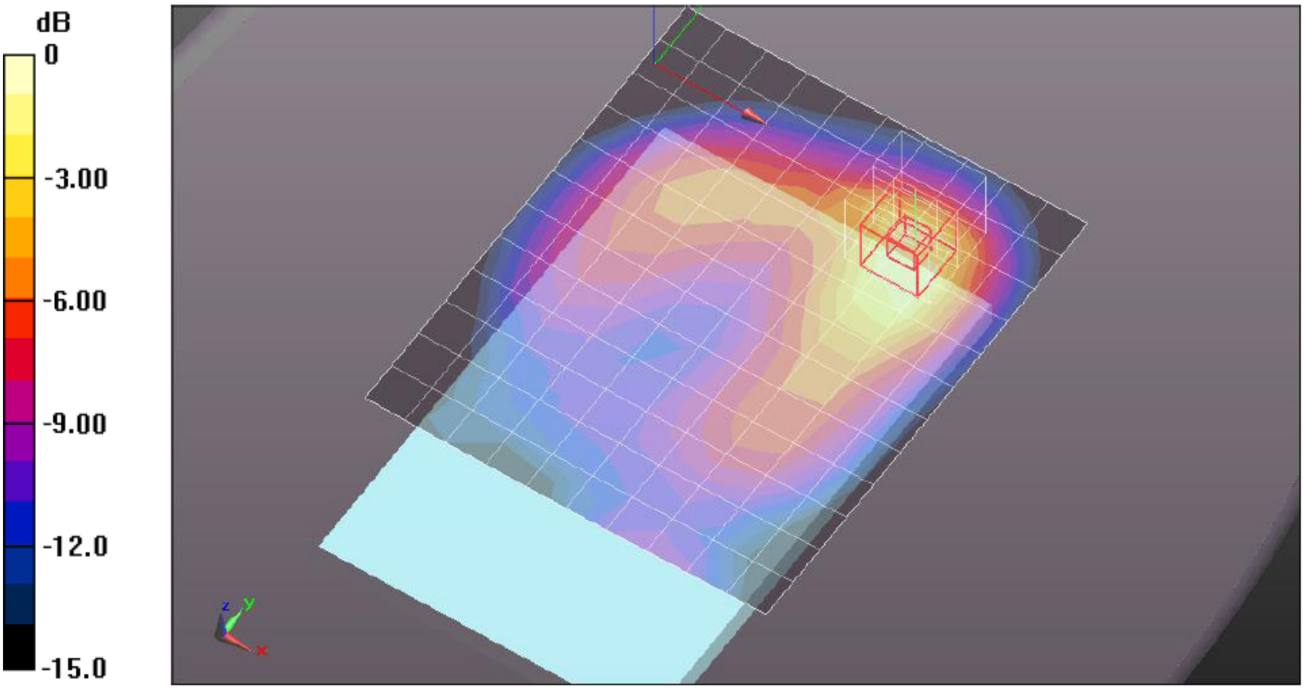
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 40.154 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.849 W/Kg

SAR(1 g) = 0.563 W/Kg; SAR(10 g) = 0.321 W/Kg

Maximum value of SAR (measured) = 0.680 W/Kg



0dB = 0.680 W/kg = -1.67 dBW/kg

Plot 8: Body Rear Side (WiFi2450 Low Channel-Channel 1-2412MHz (1Mbps))

6. Calibration Certificate

6.1. Probe Calibration Ceriticate

TTL In Collaboration with speag CALIBRATION LABORATORY

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

ilac-MRA CNAS CALIBRATION No. L0570

Client GCCT Certificate No: Z15-97014

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3221

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

Calibration date: January 31, 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-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 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-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	[signature]
Reviewed by:	Qi Dianyuan	SAR Project Leader	[signature]
Approved by:	Lu Bingsong	Deputy Director of the laboratory	[signature]

Issued: February 02, 2015

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

Probe ES3DV3

SN: 3221

Calibrated: January 31, 2015

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY/EASY – Parameters of Probe: ES3DV3 - SN: 3221

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)[A]	1.08	1.39	1.06	±10.8%
DCP(mV)[B]	103.1	100.5	103.7	

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	261.1	±2.6%
		Y	0.0	0.0	1.0		292.6	
		Z	0.0	0.0	1.0		262.2	

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: 3221

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	6.36	6.36	6.36	0.41	1.42	±12%
835	41.5	0.90	6.25	6.25	6.25	0.41	1.47	±12%
900	41.5	0.97	6.13	6.13	6.13	0.35	1.63	±12%
1750	40.1	1.37	5.33	5.33	5.33	0.46	1.55	±12%
1900	40.0	1.40	5.20	5.20	5.20	0.71	1.25	±12%
2000	40.0	1.40	5.12	5.12	5.12	0.70	1.25	±12%
2300	39.5	1.67	4.77	4.77	4.77	0.59	1.45	±12%
2450	39.2	1.80	4.50	4.50	4.50	0.85	1.16	±12%
2600	39.0	1.96	4.35	4.35	4.35	0.76	1.26	±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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DASY/EASY – Parameters of Probe: ES3DV3 - SN: 3221

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	6.28	6.28	6.28	0.38	1.63	±12%
835	55.2	0.97	6.29	6.29	6.29	0.44	1.54	±12%
900	55.0	1.05	6.16	6.16	6.16	0.49	1.45	±12%
1750	53.4	1.49	5.00	5.00	5.00	0.61	1.34	±12%
1900	53.3	1.52	4.79	4.79	4.79	0.61	1.36	±12%
2000	53.3	1.52	4.75	4.75	4.75	0.48	1.62	±12%
2300	52.9	1.81	4.65	4.65	4.65	0.63	1.48	±12%
2450	52.7	1.95	4.49	4.49	4.49	0.88	1.16	±12%
2600	52.5	2.16	4.37	4.37	4.37	0.71	1.32	±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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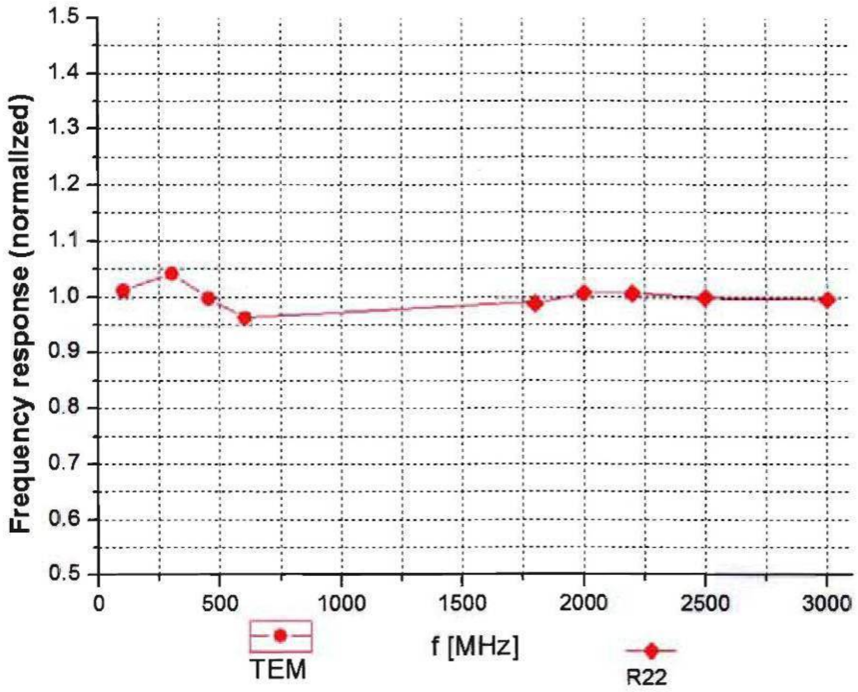
Frequency Response of E-Field

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



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

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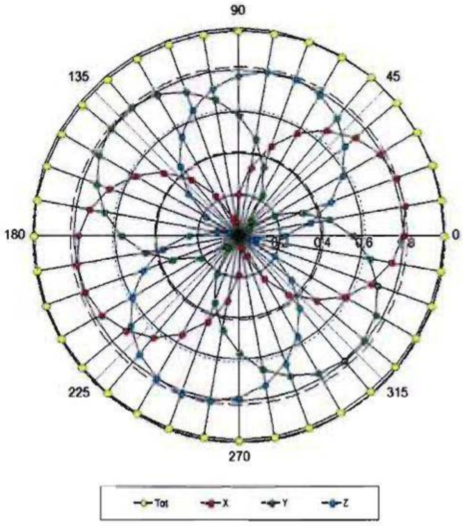
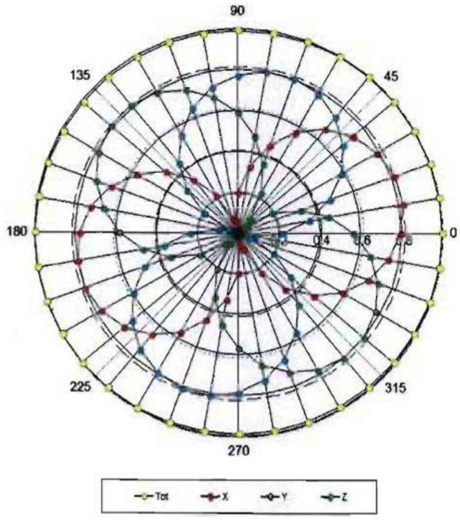
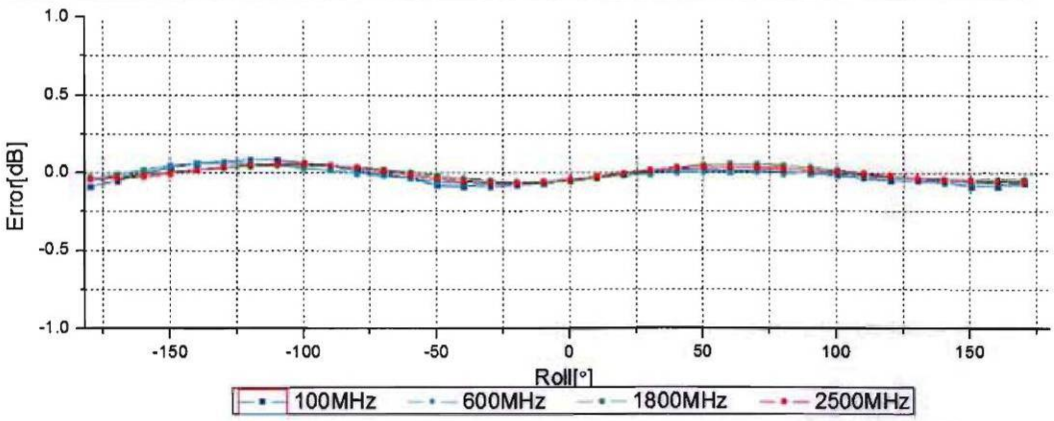
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





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

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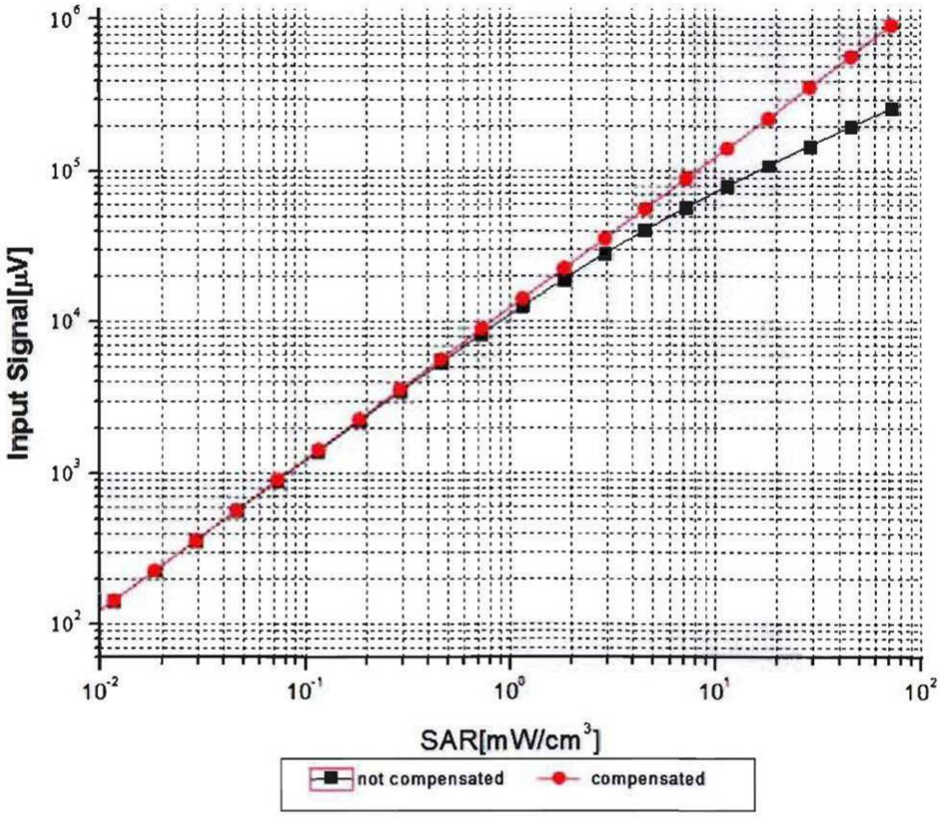
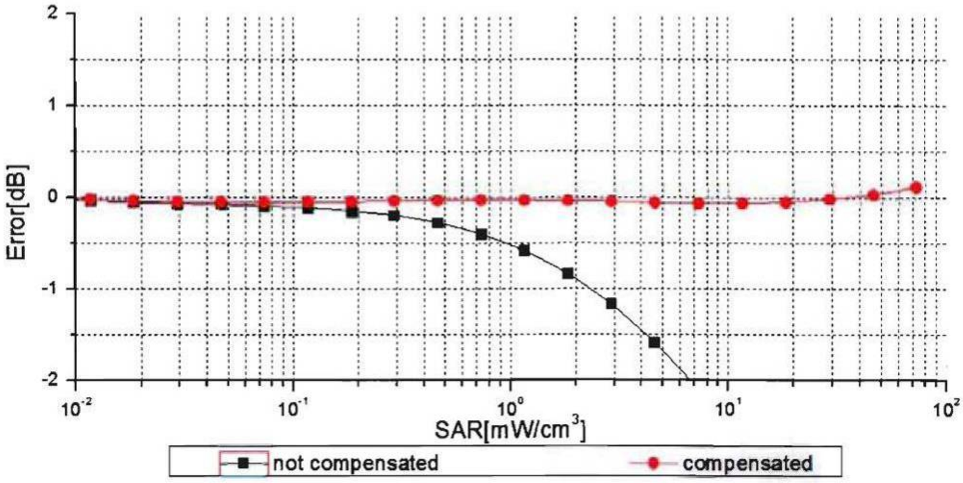
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





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