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Report No.: SZEM170600606901

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FCC SAR TEST REPORT

Application No: SZEM1706006069RG
Applicant: Huawei Technologies Co.,Ltd.
Manufacturer: Huawei Technologies Co.,Ltd.
Factory: Huawei Technologies Co.,Ltd.
Product Name: HUAWEI MediaPad T3
Model No.(EUT): KOB-W09
Trade Mark: HUAWEI
FCC ID: QISKOB-W09
Standards: FCC 47CFR §2.1093
Date of Receipt: 2017-06-16
Date of Test: 2017-06-16 to 2017-06-21
Date of Issue: 2017-06-22
Test Result : **PASS ***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:

Derek Yang

Wireless Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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REVISION HISTORY

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2017-06-22		Original



TEST SUMMARY

Frequency Band	Test position	Test mode	Max Report SAR1-g (W/kg)	SAR limit (W/kg)	Verdict
WI-FI (2.4GHz)	Head	802.11b	0.49	1.6	PASS
WI-FI (2.4GHz)	Body	802.11b	1.19	1.6	PASS
WI-FI (5GHz)	Head	802.11a	0.55	1.6	PASS
WI-FI (5GHz)	Body	802.11a	0.76	1.6	PASS

Approved & Released by

Simon Ling

SAR Manager

Tested by

Evan Mi

SAR Engineer



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1 General Information

1.1 Details of Client

Applicant:	Huawei Technologies Co.,Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Manufacturer:	Huawei Technologies Co.,Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Factory:	Huawei Technologies Co.,Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

1.2 Test Location

Company: SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address: No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
Post code: 518057
Telephone: +86 (0) 755 2601 2053
Fax: +86 (0) 755 2671 0594
E-mail: ee.shenzhen@sgs.com



1.3 Test Facility

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

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

- **FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

- **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.



1.4 General Description of EUT

Product Name:	HUAWEI MediaPad T3		
Model No.(EUT):	KOB-W09		
Trade Mark:	HUAWEI		
Product Phase:	production unit		
Device Type :	portable device		
Exposure Category:	uncontrolled environment / general population		
FCC ID:	QISKOB-W09		
SN:	GQE4T17222000001,GQE4T17405000022,GQE4T17607000015		
Hardware Version:	HL1TRTM		
Software Version:	KOB-W09C331B002-log		
Antenna Type:	Inner Antenna		
Device Operating Configurations :			
Modulation Mode:	WIFI: DSSS,OFDM; BT: GFSK, π/4DQPSK,8DPSK		
Frequency Bands:	Band	Tx (MHz)	Rx (MHz)
	WIFI(2.4GHz)	2412-2462	2412-2462
	WIFI(5GHz)	5150-5250	5150-5250
		5250-5350	5250-5350
		5470-5725	5470-5725
		5725-5850	5725-5850
BT	2402-2480	2402-2480	
Battery Information 1#:	Model No.:	HB3080G1EBW	
	Normal Voltage :	3.8V	
	Rated capacity :	4650mAh	
	Manufacturer:	Huawei Technologies Co.,Ltd.	
Battery Information 2#:	Model No.:	HB3080G1EBC	
	Normal Voltage :	3.8V	
	Rated capacity :	4650mAh	
	Manufacturer:	Huawei Technologies Co.,Ltd.	



1.5 Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radiofrequency Radiation Exposure Evaluation: Portable Devices
IEEE Std C95.1 – 1991	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB 248227 D01 v02r02	802.11 Wi-Fi SAR
KDB 616217 D04 v01r02	SAR for laptop and tablets
KDB447498 D01 v06	General RF Exposure Guidance
KDB447498 D03 v01	Supplement C Cross-Reference
KDB 865664 D01 v01r04	SAR Measurement 100 MHz to 6 GHz
KDB 865664 D02 v01r02	RF Exposure Reporting

1.6 RF exposure limits

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

Notes:

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

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

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

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

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

2 SAR Measurements System Configuration

2.1 The SAR Measurement System

This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY5 professional system). A E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation $SAR = \sigma (|E|/2) / \rho$ where σ and ρ are the conductivity and mass density of the tissue-Simulate.

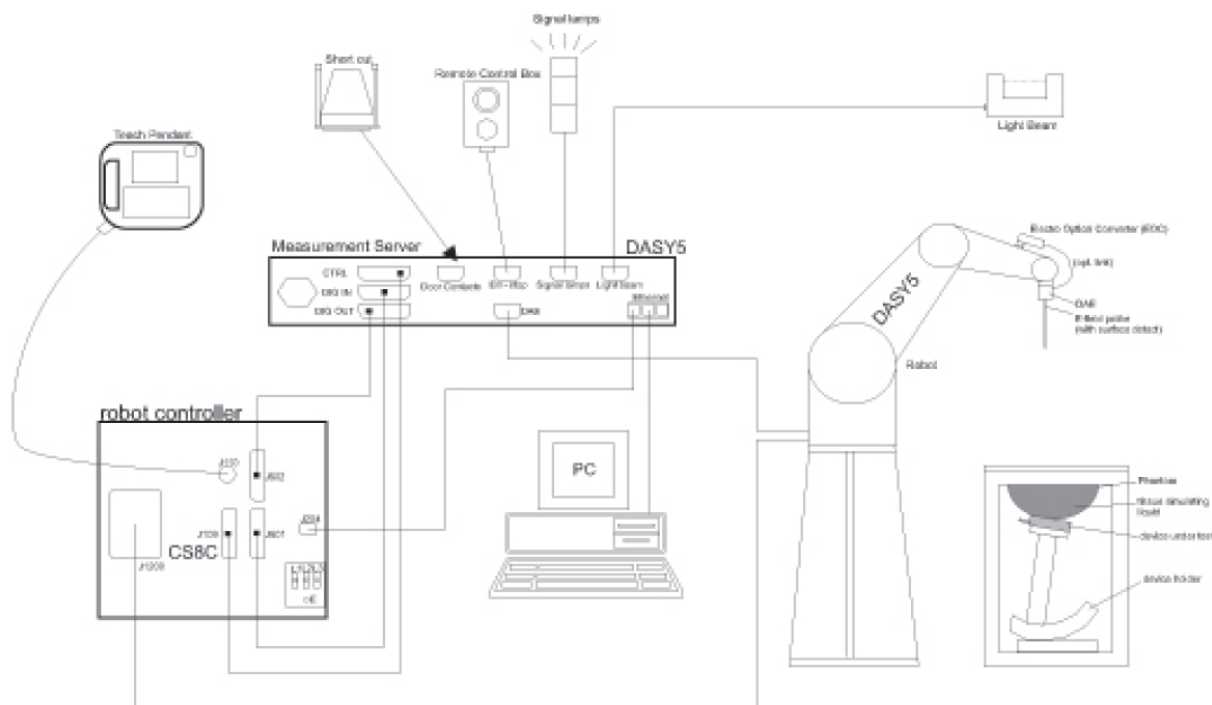
The DASY5 system for performing compliance tests consists of the following items:

A standard high precision 6-axis robot (Stabile RX family) with controller, teach pendant and software .An arm extension for accommodation 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 electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.



F-1. SAR Measurement System Configuration

- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand, right-hand and Body Worn usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validating the proper functioning of the system.

2.2 Isotropic E-field Probe EX3DV4

	Symmetrical design with triangular core 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 > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

2.3 Data Acquisition Electronics (DAE)

Model	DAE3,DAE4	
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.	
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV,400mV)	
Input Offset Voltage	< 5μV (with auto zero)	
Input Bias Current	< 50 f A	
Dimensions	60 x 60 x 68 mm	

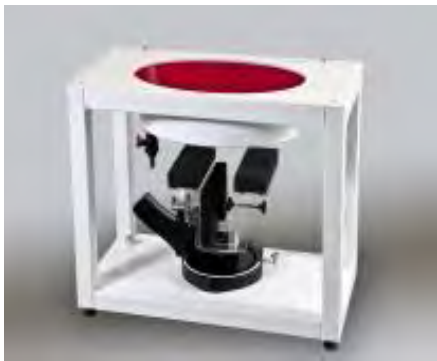
2.4 SAM Twin Phantom

Material	Vynlester, glass fiber reinforced (VE-GF)	
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)	
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)	
Dimensions (incl. Wooden Support)	Length: 1000 mm Width: 500 mm Height: adjustable feet	
Filling Volume	approx. 25 liters	
Wooden Support	SPEAG standard phantom table	

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Twin SAM V5.0 has the same shell geometry and is manufactured from the same material as Twin SAM V4.0, but has reinforced top structure.

2.5 ELI Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)	
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	
Wooden Support	SPEAG standard phantom table	

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure.

2.6 Device Holder for Transmitters



F-2. Device Holder for Transmitters

- The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centres for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.
- The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon=3$ and loss tangent $\delta=0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.



2.7 Measurement procedure

2.7.1 Scanning procedure

Step 1: Power reference measurement

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.

Step 2: Area scan

The SAR distribution at the exposed side of the head was measured at a distance of 4mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm*15mm or 12mm*12mm or 10mm*10mm. Based on the area scan data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Zoom scan

Around this point, a volume of 30mm*30mm*30mm (fine resolution volume scan, zoom scan) was assessed by measuring 5x5x7 points ($\leq 2\text{GHz}$) and 7x7x7 points ($\geq 2\text{GHz}$). On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

The data at the surface was extrapolated, since the centre of the dipoles is 2.0mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. (This can be variable. Refer to the probe specification). The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The volume was integrated with the trapezoidal algorithm. One thousand points were interpolated to calculate the average. All neighbouring volumes were evaluated until no neighboring volume with a higher average value was found.

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements. 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. 1528-2013.



			$\leq 3 \text{ GHz}$	$> 3 \text{ GHz}$
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			$5 \pm 1 \text{ mm}$	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5 \text{ mm}$
Maximum probe angle from probe axis to phantom surface normal at the measurement location			$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$			$\leq 2 \text{ GHz}: \leq 15 \text{ mm}$ $2 - 3 \text{ GHz}: \leq 12 \text{ mm}$	$3 - 4 \text{ GHz}: \leq 12 \text{ mm}$ $4 - 6 \text{ GHz}: \leq 10 \text{ mm}$
			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 $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			$\leq 2 \text{ GHz}: \leq 8 \text{ mm}$ $2 - 3 \text{ GHz}: \leq 5 \text{ mm}^*$	$3 - 4 \text{ GHz}: \leq 5 \text{ mm}^*$ $4 - 6 \text{ GHz}: \leq 4 \text{ mm}^*$
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$		$\leq 5 \text{ mm}$	$3 - 4 \text{ GHz}: \leq 4 \text{ mm}$ $4 - 5 \text{ GHz}: \leq 3 \text{ mm}$ $5 - 6 \text{ GHz}: \leq 2 \text{ mm}$
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	$\leq 4 \text{ mm}$	$3 - 4 \text{ GHz}: \leq 3 \text{ mm}$ $4 - 5 \text{ GHz}: \leq 2.5 \text{ mm}$ $5 - 6 \text{ GHz}: \leq 2 \text{ mm}$
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z		$\geq 30 \text{ mm}$	$3 - 4 \text{ GHz}: \geq 28 \text{ mm}$ $4 - 5 \text{ GHz}: \geq 25 \text{ mm}$ $5 - 6 \text{ GHz}: \geq 22 \text{ mm}$
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 <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is $\leq 1.4 \text{ W/kg}$, $\leq 8 \text{ mm}$, $\leq 7 \text{ mm}$ and $\leq 5 \text{ mm}$ zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power reference measurement (drift)

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The indicated drift is mainly the variation of the DUT's output power and should vary max. $\pm 5 \%$



2.7.2 Data Storage

The DASY 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 “.DAE3”. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated. The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [m W/g], [m W/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

2.7.3 Data Evaluation by SEMCAD

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

Probe parameters:	- Sensitivity	Normi, ai0, ai1, ai2
- Conversion factor	ConvFi	
- Diode compression point	Dcpi	
Device parameters:	- Frequency	f
- Crest factor	cf	
Media parameters:	- Conductivity	ε
- 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 DASY 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:

$$V_i = U_i + U_i^2 \cdot c f / d c p_i$$

With V_i = compensated signal of channel i (i = x, y, z)

U_i = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcp i = diode compression point (DASY parameter)

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

E-field probes:

$$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

H-field probes:



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

With V_i = compensated signal of channel i ($i = x, y, z$)

Normi = sensor sensitivity of channel i ($i = x, y, z$)

[mV/(V/m)²] for E-field Probes

ConvF = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = magnetic field strength of channel i in A/m

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

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

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

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

with SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m

σ = conductivity in [mho/m] or [Siemens/m]

ϵ = equivalent tissue density in g/cm³

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

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

with P_{pwe} = equivalent power density of a plane wave in mW/cm²

E_{tot} = total electric field strength in V/m

H_{tot} = total magnetic field strength in A/m

3 Description of Test Position

3.1 The Head Test Position

3.1.1 SAM Phantom Shape

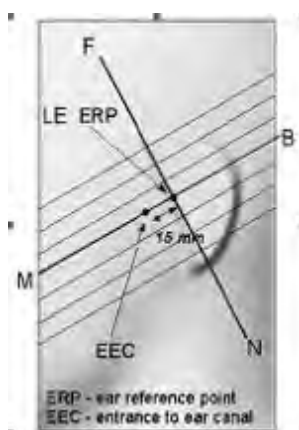


F-3. Front, back, and side views of SAM (model for the phantom shell). Full-head model is for illustration purposes only-procedures in this recommended practice are intended primarily for the phantom setup.

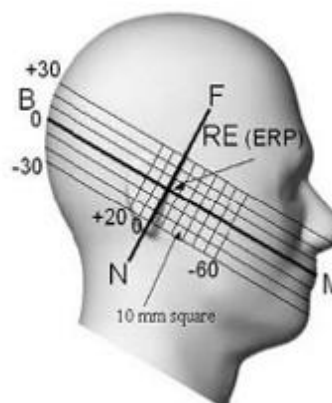
Note: The centre strip including the nose region has a different thickness tolerance.



F-4. Sagittally bisected phantom with extended perimeter (shown placed on its side as used for SAR measurements)

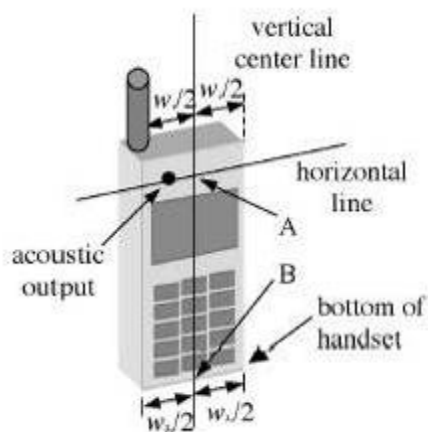


F-5. Close-up side view of phantom, showing the ear region, N-F and B-M lines, and seven cross-sectional plane locations

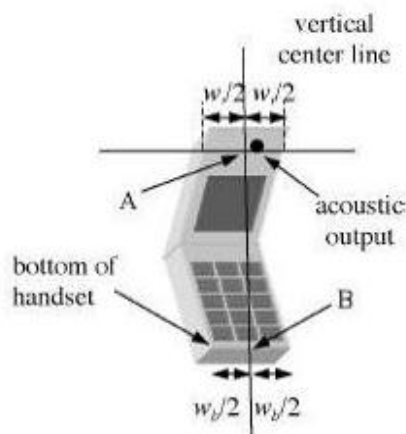


F-6. Side view of the phantom showing relevant markings and seven cross-sectional plane locations

3.1.2 EUT constructions



F-7. Handset vertical and horizontal reference lines—"fixed case"



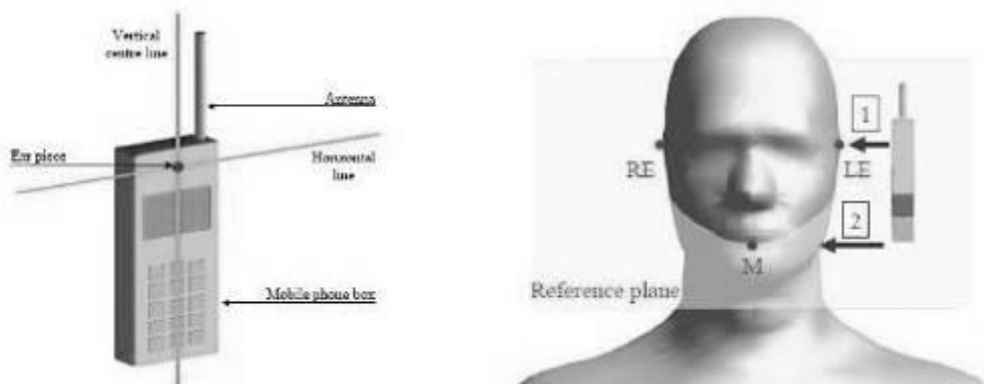
F-8. Handset vertical and horizontal reference lines—"clam-shell case"

3.1.3 Definition of the "cheek" position

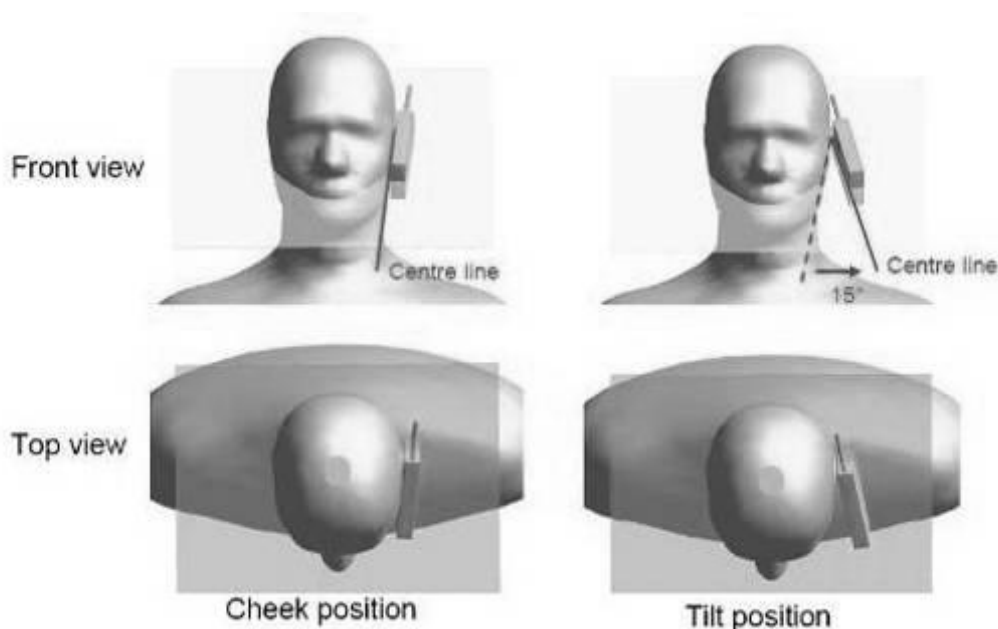
- a) Position the device with the vertical centre line of the body of the device and the horizontal line crossing the centre of the ear piece in a plane parallel to the sagittal plane of the phantom ("initial position"). While maintaining the device in this plane, align the vertical centre line with the reference plane containing the three ear and mouth reference points (M, RE and LE) and align the centre of the ear piece with the line RE-LE.
- b) Translate the mobile phone box towards the phantom with the ear piece aligned with the line LE-RE until telephone touches the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the box until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.

3.1.4 Definition of the “tilted” position

- Position the device in the “cheek” position described above;
- While maintaining the device in the reference plane described above and pivoting against the ear, move it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.



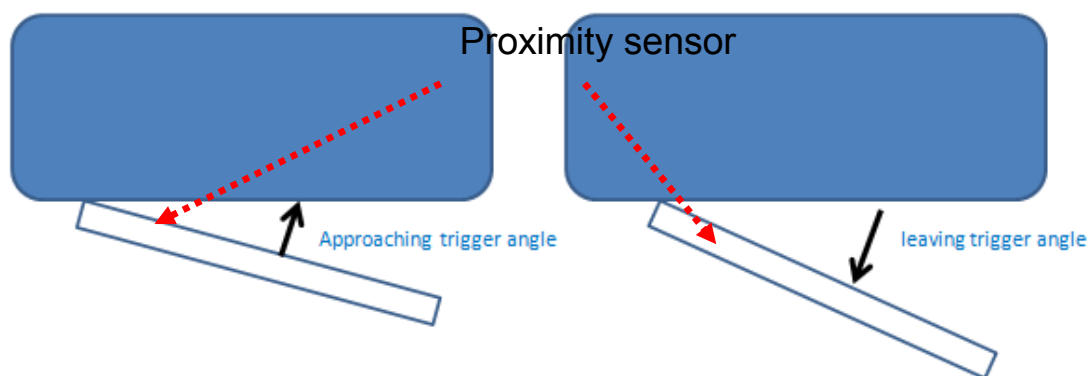
F-9. Definition of the reference lines and points, on the phone and on the phantom and initial position



F-10. “Cheek” and “tilt” positions of the mobile phone on the left side

3.1.5 Proximity Sensor Triggering Test for Head

For Head exposure condition, device tilt angle influences to proximity sensor triggering is determined as below:
Firstly, the DUT was positioned directly touch the SAM phantom (Left& Right hand touch cheek position) for each band. Rotate the DUT around the ear reference point of the phantom in 5° increments until the DUT is 15° or more away from the touch cheek position at 0°
Then the DUT is positioned at 15° or more away from the touch cheek position and moved towards the phantom in 5°increments until the DUT directly touch the SAM phantom at 0°(Left & Right hand touch cheek position).



The DUT is moved towards and away from SAM phantom.

angle between phantom to DUT in degree	0	5	10	15	20	25	30
Condition of Sensor	on	on	on	on	on	on	on

Based on the validation results above, angle tilt coverage can ensure that the proximity sensor is triggered for all the Head test positions(Left/Right Hand Touched cheek, Left/Right Hand tilted 15 °)

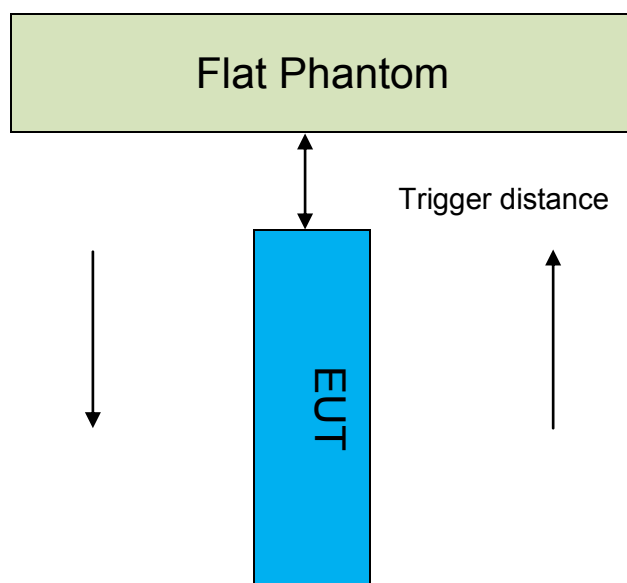
3.2 The Body Test Position

The overall diagonal dimension of the display section of a tablet is > 20 cm, Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. SAR evaluation for the front surface of tablet display screens are generally not necessary. The SAR Exclusion Threshold in KDB 447498 D01 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

3.2.1 Proximity Sensor Triggering Test for body

1) Proximity sensor triggering distances

The Proximity sensor triggering was applied to WIFI. Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed.



Proximity Sensor Triggering Distance(mm)		
Position	Back	Top
Minimum	12	13
Required SAR Test	11	12

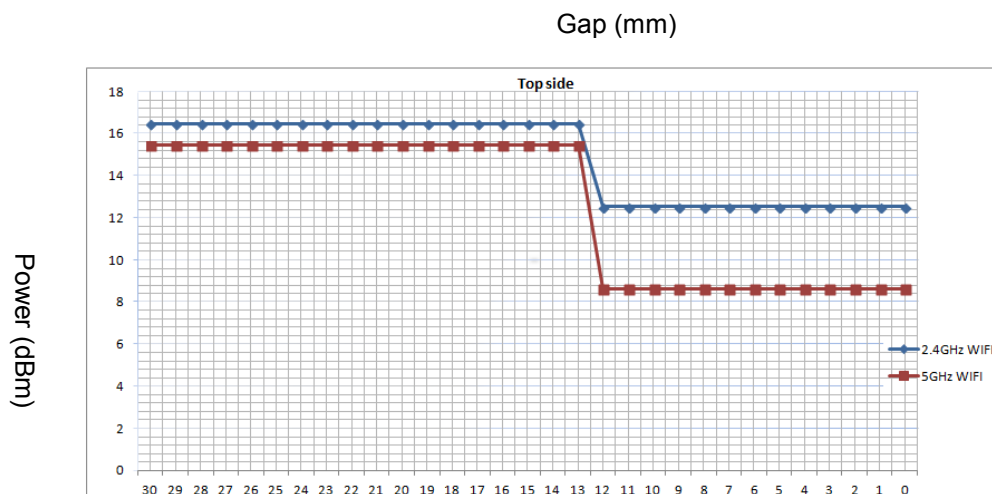
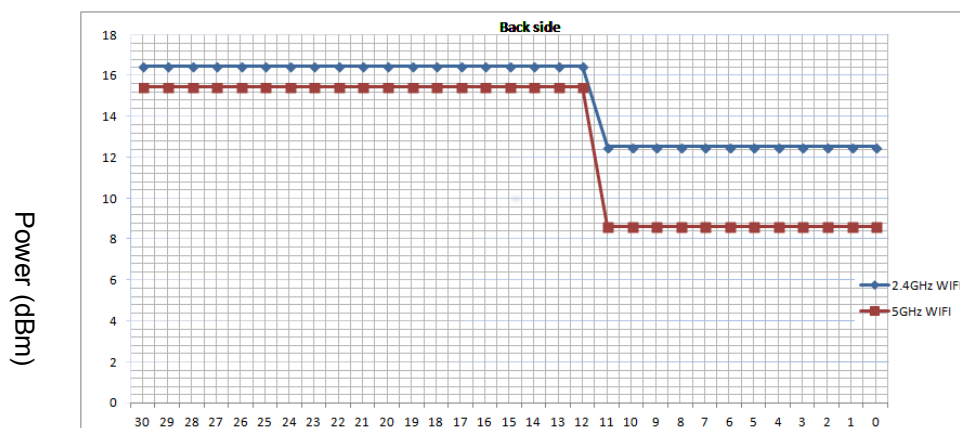


Antenna	Band	Trigger Condition	Body exposure condition
			Power reduction(dB)
WIFI Antenna	2.4GHz	Back side: Close to 12mm Top side: Close to 13mm	4.7
	5GHz	Back side: Close to 12mm Top side: Close to 13mm	7

Note: SAR tests with proximity sensor power reduction are only required for the sides of frequency bands in the table above. For the other sides or other frequency bands of the device, SAR is still tested at the maximum power level with sensor off.

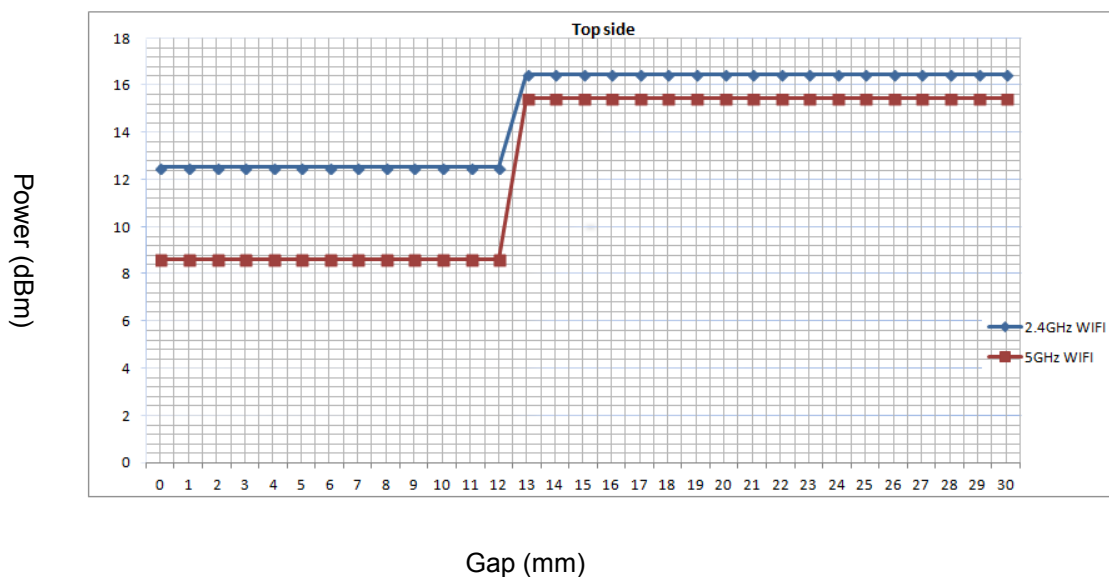
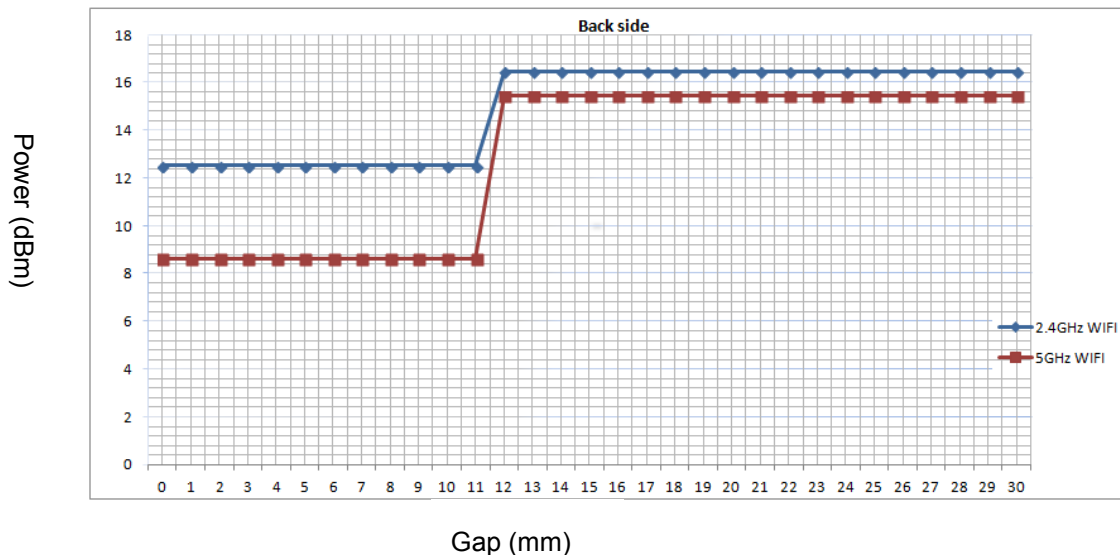
Band/Mode	Ch#	Measured Power(dBm)		Reduction levels(dB)
		Max. Power	Power back-off	
WIFI 2.4GHz	6	16.45	12.52	3.93
WIFI 5GHz	120	15.44	8.61	6.83

● DUT Moving Toward (Trigger) the Phantom





● DUT Moving Away (Release) from the Phantom



2) Proximity sensor coverage

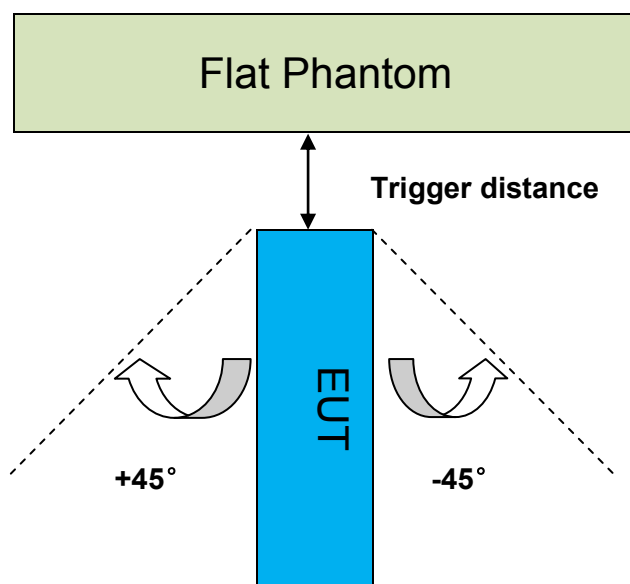
If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”.

The proximity sensor and main antenna use same metallic electrode, so there is no spatial offset.

3) Device tilt angle influences to proximity sensor triggering

The influence of device tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at 13 mm separation.

Rotating the tablet around the edge next to the phantom in $\leq 10^\circ$ increments until the tablet is $\pm 45^\circ$ from the vertical position at 0° , and the maximum output power remains in the reduced mode.



The Sensor Triggering Distance(mm)	
Position	Top
Minimum	13
Required SAR Test	12

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering for Right Side													
Band(MHz)	Minimum trigger distance Per KDB616217\$6.2	Minimum trigger distance at which power reduction was maintained over $\pm 45^\circ$	Power Reduction Status										
			-45°	-35°	-25°	-15°	-5°	0°	5°	15°	25°	35°	45°
WIFI 2.4GHz	13mm	13mm	on	on	on	on	on	on	on	on	on	on	on
WIFI 5GHz	13mm	13mm	on	on	on	on	on	on	on	on	on	on	on



4 SAR System Verification Procedure

4.1 Tissue Simulate Liquid

4.1.1 Recipes for Tissue Simulate Liquid

The following tables give the recipes for tissue simulating liquids to be used in different frequency bands:

Ingredients (% by weight)	Frequency (MHz)				
	750	800-900	1800-2000	2300-2500	2500-2700
Tissue Type	Body	Body	Body	Body	Body
Water	50.3	50.75	70.17	68.53	72.26
Salt (NaCl)	1.60	0.94	0.39	0.1	0.1
Sucrose	47.0	48.21	0	0	0
HEC	0.52	0	0	0	0
Bactericide	0.05	0.10	0	0	0
Tween	0	0	29.44	31.37	27.74
Salt: 99 ⁺ % Pure Sodium Chloride Water: De-ionized, 16 MΩ ⁺ resistivity Tween: Polyoxyethylene (20) sorbitan monolaurate					
Sucrose: 98 ⁺ % Pure Sucrose HEC: Hydroxyethyl Cellulose					
MSL5GHz is composed of the following ingredients: Water: 64-78% Mineral oil: 11-18% Emulsifiers: 9-15% Sodium salt: 2-3%					

Table 1 : Recipe of Tissue Simulate Liquid



4.1.2 Measurement for Tissue Simulate Liquid

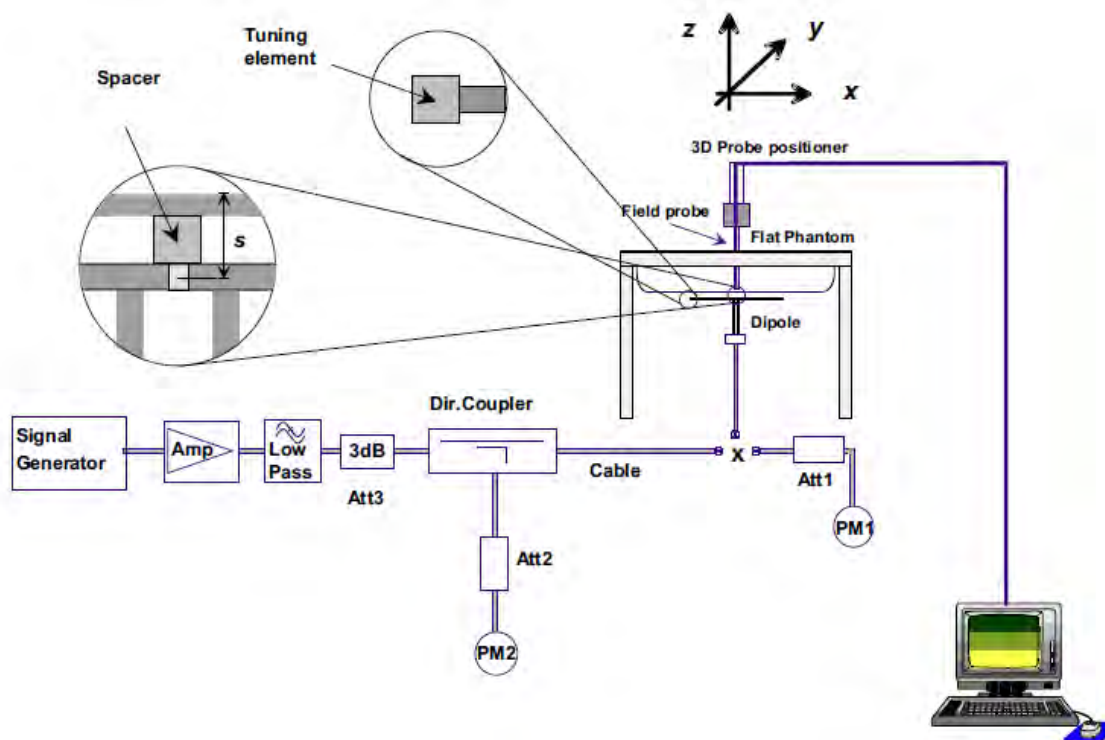
The dielectric properties for this Tissue Simulate Liquids were measured by using the Agilent Model 85070E Dielectric Probe in conjunction with Agilent E5071C Network Analyzer (300 KHz-8500 MHz). The Conductivity (σ) and Permittivity (ρ) are listed in Table 1. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was $22 \pm 2^\circ\text{C}$.

Measurement for Tissue Simulate Liquid							
Tissue Type	Measured Frequency (MHz)	Target Tissue ($\pm 5\%$)		Measured Tissue		Liquid Temp. ($^\circ\text{C}$)	Measured Date
		ϵ_r	$\sigma(\text{S/m})$	ϵ_r	$\sigma(\text{S/m})$		
2450 Head	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	39.15	1.824	22	2017/6/20
2450 Body	2450	52.70 (50.07~55.34)	1.95 (1.85~2.05)	52.708	2.013	22	2017/6/16
5250 Head	5250	35.9 (34.11~37.70)	4.71 (4.47~4.95)	35.566	4.629	22.2	2017/6/21
5250 Body	5250	48.9 (46.46~51.35)	5.36 (5.09~5.63)	49.336	5.417	22.2	2017/6/16
5600 Head	5600	35.5 (33.73~37.28)	5.07 (4.82~5.32)	34.894	5.096	22.2	2017/6/21
5600 Body	5600	48.5 (46.08~50.93)	5.77 (5.48~6.06)	48.507	5.798	22.2	2017/6/16
5750 Head	5750	35.4 (35.63~37.17)	5.22 (4.96~5.48)	34.522	5.277	22.2	2017/6/21
5750 Body	5750	48.3 (45.89~50.72)	5.94 (5.64~6.24)	47.941	5.989	22.2	2017/6/16

Table 2 : Measurement result of Tissue electric parameters

4.2 SAR System Validation

The microwave circuit arrangement for system verification is sketched in F-3. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within $\pm 10\%$ from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the table 5 (A power level of 250mw was input to the dipole antenna for below 5GHz, A power level of 100mw was input to the dipole antenna for 5GHz). During the tests, the ambient temperature of the laboratory was in the range $22\pm 2^{\circ}\text{C}$, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



F-11. the microwave circuit arrangement used for SAR system verification



4.2.1 Justification for Extended SAR Dipole Calibrations

1) Referring to KDB865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

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

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



4.2.2 Summary System Validation Result(s)

		Measured SAR 250mW	Measured SAR (normalized to 1w)	Target SAR (normalized to 1w) (±10%)	Liquid Temp. (°C)	Measured Date
		1-g (W/kg)	1-g (W/kg)	1-g(W/kg)		
D2450V2	Head	13.5	54	53.1 (47.79~58.41)	22	2017/6/20
	Body	13	52	51.0 (45.9~56.1)	22	2017/6/16
Validation Kit		Measured SAR 100mW	Measured SAR (normalized to 1w)	Target SAR (normalized to 1w) (±10%)	Liquid Temp. (°C)	Measured Date
		1-g (W/kg)	1-g (W/kg)	1-g(W/kg)		
D5GHzV2	Head(5.25GHz)	6.96	69.6	76.6 (68.94~84.26)	22.2	2017/6/21
	Body(5.25GHz)	7.86	78.6	75.6 (68.04~83.16)	22.2	2017/6/16
	Head(5.6GHz)	7.65	76.5	80.4 (72.36~88.44)	22.2	2017/6/21
	Body(5.6GHz)	8.4	84	81.1 (72.99~89.21)	22.2	2017/6/16
	Head(5.75GHz)	7.74	77.4	80 (72~88)	22.2	2017/6/21
	Body(5.75GHz)	7.05	70.5	74.8 (67.32~82.28)	22.2	2017/6/16

Table 3 : SAR System Validation Result

4.2.3 Detailed System Validation Results

Please see the Appendix A

5 Test results and Measurement Data

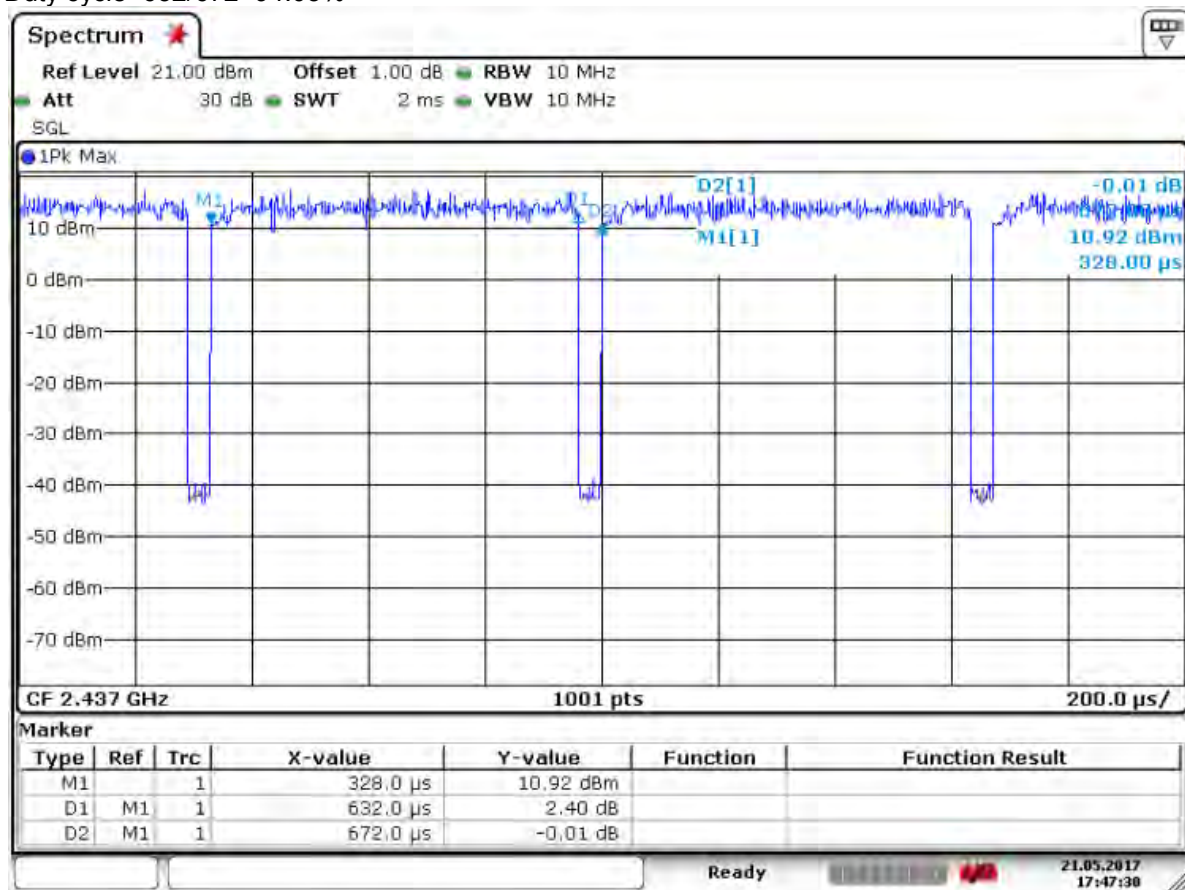
5.1 Operation Configurations

5.1.1 WiFi Test Configuration

A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement.

- 2.4G WIFI

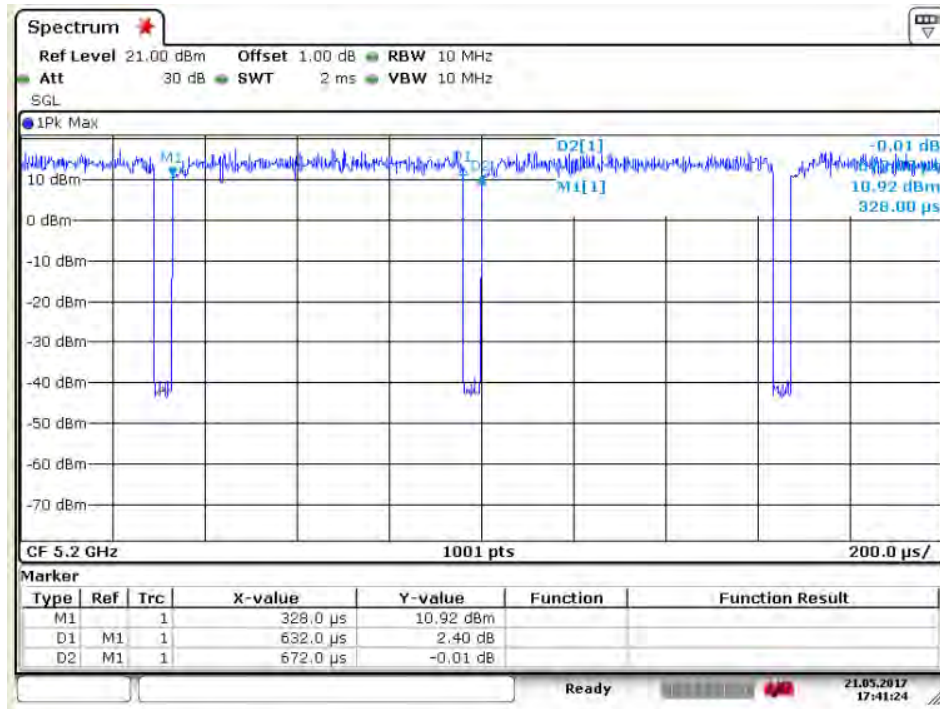
Duty cycle=632/672=94.05%





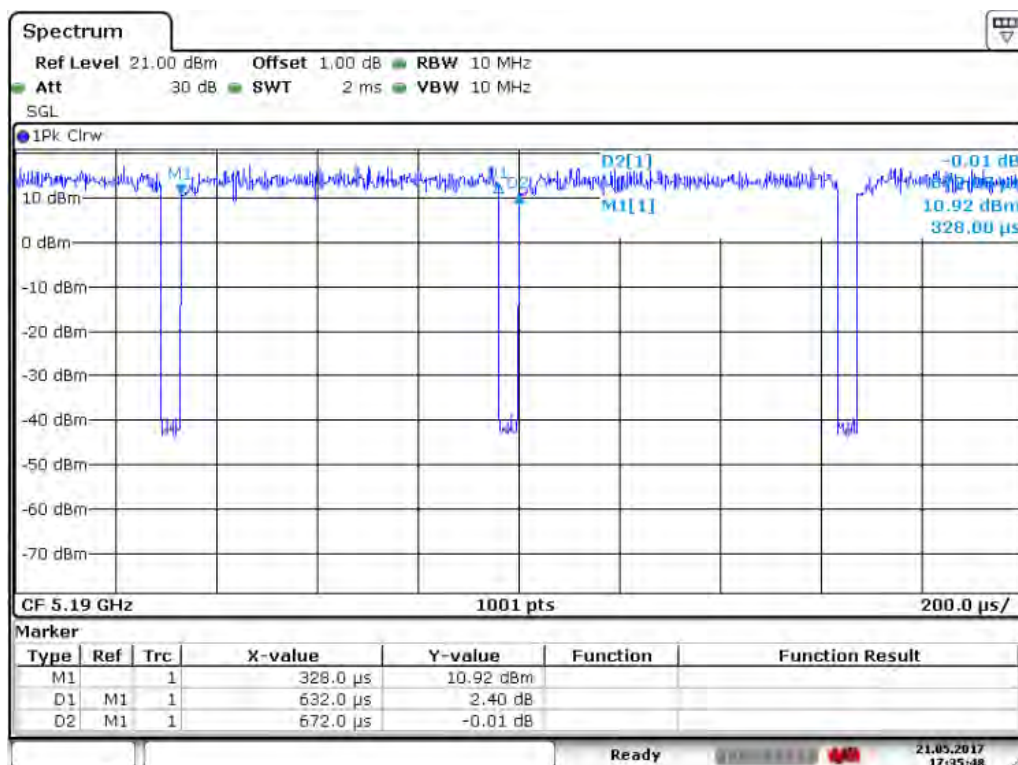
● 5G WIFI 802.11a

Duty cycle=632/672=94.05%



● 5G WIFI 802.11nHT40

Duty cycle=632/672=94.05%





5.1.1.1 Initial Test Position SAR Test Reduction Procedure

DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures. The initial test position procedure is described in the following:

- 1) . When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).
- 2) . When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.
- 3) . For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested. a) Additional power measurements may be required for this step, which should be limited to those necessary for identifying the subsequent highest output power channels.

5.1.1.2 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. SAR test reduction for subsequent highest output test channels is determined according to *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. 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 subsequent next highest measured output power channel(s) in the initial test configuration until *reported* SAR is ≤ 1.2 W/kg or all required channels are tested.

5.1.1.3 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, 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.

- 1) . 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.
- 2) . 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.
- 3) . 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.

- a) SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.
 - b) 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. i) 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.
- 4) . 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 recursively applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:
- a) replace "subsequent test configuration" with "next subsequent test configuration" (i.e., subsequent next highest specified maximum output power configuration)
 - b) replace "initial test configuration" with "all tested higher output power configurations"

5.1.1.4 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 following.

- **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:

- 1) . When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 2) . 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.

- **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, including sub-sections). SAR is not required for the following 2.4 GHz OFDM conditions.

- 1) . When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
- 2) . 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.



5.1.1.5 WiFi 5G SAR Test Procedures

5.1.1.5.1 U-NII-1 and U-NII-2A Bands

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following:

- 1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest *reported* SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.
- 2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest *reported* SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.
- 3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest *reported* SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

5.1.1.5.2 U-NII-2C and U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures.

When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.



5.1.1.5.3 OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements

The initial test configuration for 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. 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.

- 1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
- 2) 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.
- 3) 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.
- 4) 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.
 - The channel closest to mid-band frequency is selected for SAR measurement.
 - For channels with 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.

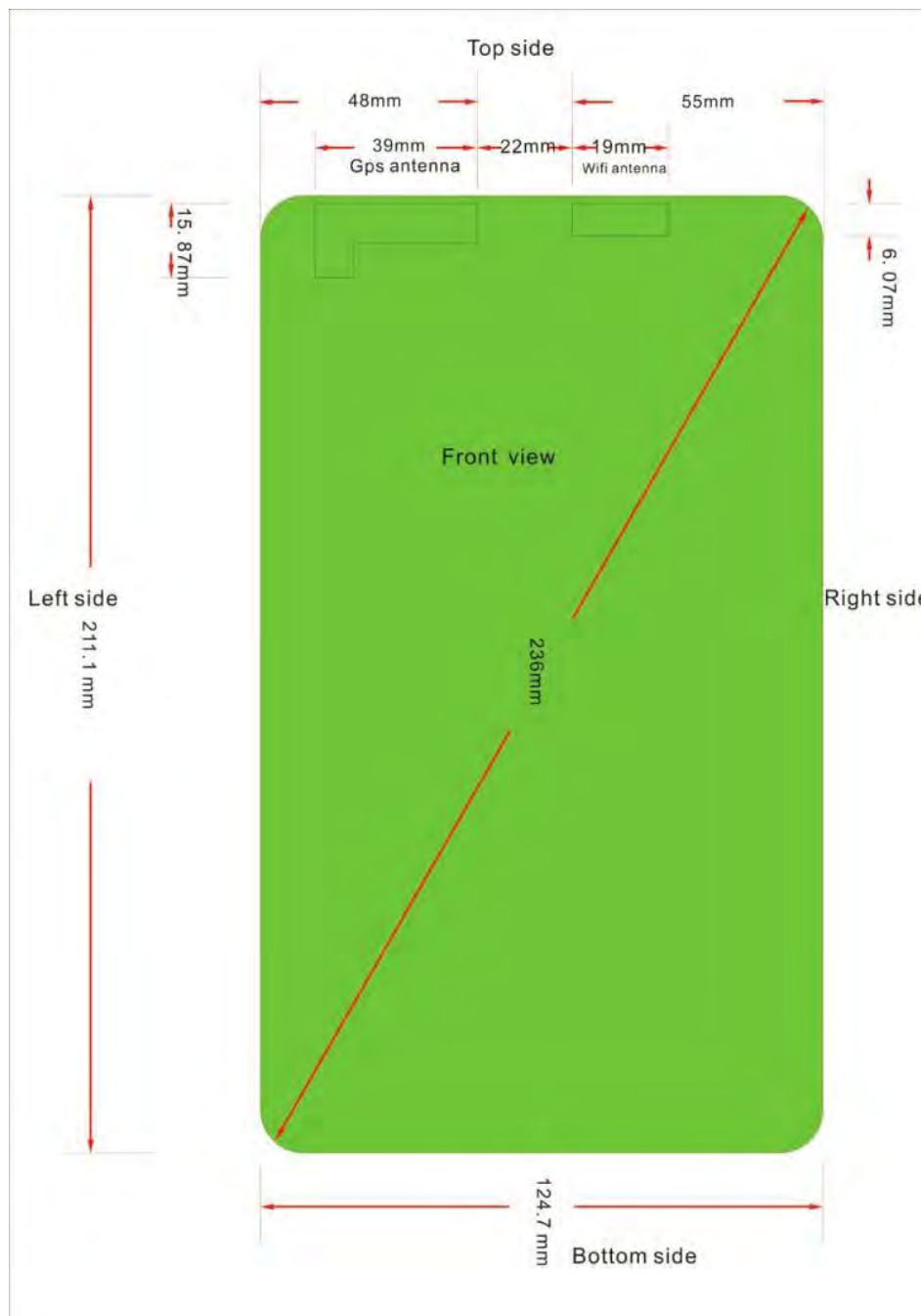
5.1.1.5.4 SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 a/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. 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.

5.1.1.5.5 MIMO SAR Considerations

Per KDB 248227D01v02, simultaneous transmission provisions in KDB Publication 447498 should be used to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1-g SAR single transmission SAR measurement is <1.6W/kg, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

5.1.2 DUT Antenna Locations



5.1.3 EUT side for SAR Testing

According to the distance between WIFI antenna and the sides of the EUT we can draw the conclusion that:

EUT Sides for SAR Testing						
Mode	Front	Back	Left	Right	Top	Bottom
2.4GHz/5GHz Wi-Fi	No	Yes	No	No	Yes	No

Table 4: EUT Sides for SAR Testing



5.1.4 Stand-alone SAR test evaluation

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

Freq. Band	Frequency (GHz)	Position	Average Power		Test Separation (mm)	Calculate Value	Exclusion Threshold	Exclusion (Y/N)
			dBm	mW				
Wi-Fi	2.450	Body	17	50.1	0	17.6	3	N
	5	Body	16	39.8	0	12.5	3	N
BT	2.450	Body	9	7.9	0	2.5	3	Y

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$$
for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ 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 is applied to determine SAR test exclusion.



5.2 Measurement of RF conducted Power

5.2.1 Conducted Power Of WIFI and BT

2450MHz Wi-Fi-sensor on						
Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune up	Average Power (dBm)	SAR Test
802.11b	1	2412	1	12.8	12.55	NO
	6	2437		12.8	12.52	NO
	11	2462		12.8	12.57	Yes
802.11g	1	2412	6	12.8	12.4	NO
	6	2437		12.8	12.51	NO
	11	2462		12.8	12.45	NO
802.11n HT20	1	2412	6.5	12.8	12.48	NO
	6	2437		12.8	12.49	NO
	11	2462		12.8	12.47	NO
2450MHz Wi-Fi-sensor off						
Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune up	Average Power (dBm)	SAR Test
802.11b	1	2412	1	12.8	12.39	NO
	6	2437		17.0	16.45	Yes
	11	2462		12.8	12.51	NO
802.11g	1	2412	6	12.8	12.05	NO
	6	2437		17.0	15.97	NO
	11	2462		12.8	12.06	NO
802.11n HT20	1	2412	6.5	12.8	12.11	NO
	6	2437		17.0	15.95	NO
	11	2462		12.8	12.16	NO



5GHz Wi-Fi-sensor on							
Band(GHz)	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune up	Average Power (dBm)	SAR Test
5.2	802.11a	36	5180	6	9	8.27	NO
		40	5200		9	8.18	NO
		44	5220		9	8.11	NO
		48	5240		9	8.09	NO
	802.11n HT20	36	5180	6.5	9	8.26	NO
		40	5200		9	8.12	NO
		44	5220		9	8.05	NO
		48	5240		9	8.14	NO
	802.11n HT40	38	5190	13.5	9	8.76	NO
		46	5230		9	8.71	NO

5GHz Wi-Fi-sensor on							
Band(GHz)	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune up	Average Power (dBm)	SAR Test
5.3	802.11a	52	5260	6	9	8.12	NO
		56	5280		9	8.08	NO
		60	5300		9	8.02	NO
		64	5320		9	8.15	NO
	802.11n HT20	52	5260	6.5	9	8.17	NO
		56	5280		9	8.14	NO
		60	5300		9	8.04	NO
		64	5320		9	8.01	NO
	802.11n HT40	54	5270	13.5	9	8.75	NO
		62	5310		9	8.78	Yes



5GHz Wi-Fi-sensor on							
Band(GHz)	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune up	Average Power (dBm)	SAR Test
5.5	802.11a	100	5500	6	9	8.91	NO
		104	5520		9	8.71	NO
		108	5540		9	8.41	NO
		112	5560		9	8.24	NO
		116	5580		9	8.12	NO
		120	5600		9	8.21	NO
		124	5620		9	8.41	NO
		128	5640		9	8.43	NO
		132	5660		9	8.48	NO
		136	5680		9	8.55	NO
		140	5700		9	8.42	NO
	802.11n HT20	100	5500	6.5	9	8.84	NO
		104	5520		9	8.68	NO
		108	5540		9	8.41	NO
		112	5560		9	8.21	NO
		116	5580		9	8.18	NO
		120	5600		9	8.23	NO
		124	5620		9	8.38	NO
		128	5640		9	8.51	NO
		132	5660		9	8.43	NO
		136	5680		9	8.49	NO
		140	5700		9	8.36	NO
	802.11n HT40	102	5510	13.5	9	8.96	Yes
		110	5550		9	8.84	NO
		118	5590		9	8.78	NO
		126	5630		9	8.91	NO
		134	5670		9	8.88	NO

5GHz Wi-Fi-sensor on							
Band(GHz)	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune up	Average Power (dBm)	SAR Test
5.8	802.11a	149	5745	6	9	8.31	NO
		153	5765		9	8.34	NO
		157	5785		9	8.21	NO
		161	5805		9	8.26	NO
		165	5825		9	8.43	NO
	802.11n HT20	149	5745	6.5	9	8.24	NO
		153	5765		9	8.22	NO
		157	5785		9	8.25	NO
		161	5805		9	8.26	NO
		165	5825		9	8.42	NO
	802.11n HT40	151	5755	13.5	9	8.83	Yes
		159	5795		9	8.71	NO



5GHz Wi-Fi-sensor off							
Band(GHz)	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune up	Average Power (dBm)	SAR Test
5.2	802.11a	36	5180	6	13	12.36	NO
		40	5200		16	15.08	NO
		44	5220		16	15.05	NO
		48	5240		16	14.91	NO
	802.11n HT20	36	5180	6.5	13	12.34	NO
		40	5200		16	15.07	NO
		44	5220		16	15.04	NO
		48	5240		16	14.94	NO
	802.11n HT40	38	5190	13.5	9	8.26	NO
		46	5230		15.5	13.92	NO

5GHz Wi-Fi-sensor off							
Band(GHz)	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune up	Average Power (dBm)	SAR Test
5.3	802.11a	52	5260	6	16	14.99	NO
		56	5280		16	15	Yes
		60	5300		16	14.94	NO
		64	5320		14	13.21	NO
	802.11n HT20	52	5260	6.5	16	14.98	NO
		56	5280		16	15.04	NO
		60	5300		16	14.97	NO
		64	5320		14	13.23	NO
	802.11n HT40	54	5270	13.5	15.5	14.01	NO
		62	5310		9	8.18	NO



5GHz Wi-Fi-sensor off							
Band(GHz)	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune up	Average Power (dBm)	SAR Test
5.5	802.11a	100	5500	6	16	15.57	Yes
		104	5520		16	15.45	NO
		108	5540		16	15.3	NO
		112	5560		16	15.18	NO
		116	5580		16	14.94	NO
		120	5600		16	15.04	NO
		124	5620		16	15.15	NO
		128	5640		16	15.21	NO
		132	5660		16	15.21	NO
		136	5680		16	15.15	NO
		140	5700		15	14.23	NO
	802.11n HT20	100	5500	6.5	16	15.59	NO
		104	5520		16	15.43	NO
		108	5540		16	15.29	NO
		112	5560		16	15.23	NO
		116	5580		16	14.98	NO
		120	5600		16	15.15	NO
		124	5620		16	15.18	NO
		128	5640		16	15.29	NO
		132	5660		16	15.21	NO
		136	5680		16	15.19	NO
		140	5700		15	14.26	NO
	802.11n HT40	102	5510	13.5	15	13.83	NO
		110	5550		15.5	14.24	NO
		118	5590		15.5	13.95	NO
		126	5630		15.5	14.05	NO
		134	5670		15.5	13.97	NO

5GHz Wi-Fi-sensor off							
Band(GHz)	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune up	Average Power (dBm)	SAR Test
5.8	802.11a	149	5745	6	16	15.01	NO
		153	5765		16	14.97	NO
		157	5785		16	14.9	NO
		161	5805		16	14.98	NO
		165	5825		16	15.18	Yes
	802.11n HT20	149	5745	6.5	16	14.97	NO
		153	5765		16	14.92	NO
		157	5785		16	14.91	NO
		161	5805		16	15.02	NO
		165	5825		16	15.22	NO
	802.11n HT40	151	5755	13.5	15.5	13.68	NO
		159	5795		15.5	13.81	NO

Table 5 : Conducted Power Of WIFI.



BT		Average Conducted Power(dBm)			
Band	Channel	GFSK	$\pi/4$ DQPSK	8DPSK	Tune up
BT	0	7.01	7.00	7.26	9
	39	7.64	7.57	7.90	
	78	8.09	8.09	8.38	

Table 6 : Conducted Power Of BT.



5.3 Measurement of SAR Data

5.3.1 SAR Result Of 2.4GHz WIFI

Test position	Test mode	Test Ch./Frequency	Duty Cycle	Duty Cycle Scaled factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp.	SAR limit (W/kg)
Head Test data with Sensor on												
Left touch cheek	802.11b	11/2462	94.05%	1.063	0.441	0.13	12.57	12.8	1.054	0.494	22	1.6
Left tilted 15 degree	802.11b	11/2462	94.05%	1.063	0.306	0.07	12.57	12.8	1.054	0.343	22	1.6
Right touch cheek	802.11b	11/2462	94.05%	1.063	0.225	0.03	12.57	12.8	1.054	0.252	22	1.6
Right tilted 15 degree	802.11b	11/2462	94.05%	1.063	0.2	-0.07	12.57	12.8	1.054	0.224	22	1.6
Head Test data with Battery 2# Sensor on												
Left touch cheek	802.11b	11/2462	94.05%	1.063	0.363	0.06	12.57	12.8	1.054	0.407	22	1.6
Body Test data with Sensor on(Separate 0mm)												
Back side	802.11b	11/2462	94.05%	1.063	1.06	0.11	12.57	12.8	1.054	1.188	22	1.6
Back side	802.11b	1/2412	94.05%	1.063	1.03	0.02	12.55	12.8	1.059	1.160	22	1.6
Top side	802.11b	11/2462	94.05%	1.063	0.258	0.116	12.57	12.8	1.054	0.289	22	1.6
Back side-repeated	802.11b	11/2462	94.05%	1.063	1.05	0.05	12.57	12.8	1.054	1.177	22	1.6
Body Test data at worst case with battery 2# Sensor on(Separate 0mm)												
Back side	802.11b	11/2462	94.05%	1.063	1.04	0.01	12.55	12.8	1.059	1.171	22	1.6
Body Test data with Sensor off												
Back side-11mm	802.11b	6/2437	94.05%	1.063	0.232	-0.01	16.45	17	1.135	0.280	22	1.6
Top side-12mm	802.11b	6/2437	94.05%	1.063	0.0997	-0.09	16.45	17	1.135	0.120	22	1.6
Body Test data at worst case with battery 2# Sensor off												
Back side-11mm	802.11b	6/2437	94.05%	1.063	0.251	0.16	16.45	17	1.135	0.303	22	1.6

Table 7: SAR of 2.4GHz WIFI.

Note:

- 1) The maximum Scaled SAR value is marked in bold. Graph Results refer to Appendix B
- 2) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).



Test Position	Channel/ Frequency	Measured SAR (1g)	1 st Repeated	Ratio	2 nd Repeated	3 rd Repeated
	(MHz)		SAR (1g)		SAR (1g)	SAR (1g)
Back side	11/2462	1.06	1.05	1.01	N/A	N/A
1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was performed 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 ($\sim 10\%$ 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						



5.3.2 SAR Result Of 5GHz WIFI(U-NII-2A)

Test position	Test mode	Test Ch./Freq.	Duty Cycle	Duty Cycle Scaled factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp.	SAR limit (W/kg)
Head Test data with Sensor on												
Left touch cheek	802.11n HT40	62/5310	94.05%	1.063	0.237	0.04	8.78	9	1.052	0.265	22.2	1.6
Left tilted 15 degree	802.11n HT40	62/5310	94.05%	1.063	0.254	-0.2	8.78	9	1.052	0.284	22.2	1.6
Right touch cheek	802.11n HT40	62/5310	94.05%	1.063	0.2	0.08	8.78	9	1.052	0.224	22.2	1.6
Right tilted 15 degree	802.11n HT40	62/5310	94.05%	1.063	0.219	-0.07	8.78	9	1.052	0.245	22.2	1.6
Head Test data with Battery 2# Sensor on												
Left tilted 15 degree	802.11n HT40	62/5310	94.05%	1.063	0.349	-0.02	8.78	9	1.052	0.390	22.2	1.6
Body Test data with Sensor on(Separate 0mm)												
Back side	802.11n HT40	62/5310	94.05%	1.063	0.383	0.12	8.78	9	1.052	0.428	22.2	1.6
Top side	802.11n HT40	62/5310	94.05%	1.063	0.401	-0.11	8.78	9	1.052	0.449	22.2	1.6
Body Test data at worst case with battery2# Sensor on(Separate 0mm)												
Top side	802.11n HT40	62/5310	94.05%	1.063	0.471	0.07	8.78	9	1.052	0.527	22.2	1.6
Body Test data with Sensor off												
Back side-11mm	802.11a	56/5280	94.05%	1.063	0.173	0.19	15	16	1.259	0.232	22.2	1.6
Top side-12mm	802.11a	56/5280	94.05%	1.063	0.371	-0.04	15	16	1.259	0.497	22.2	1.6
Body Test data at worst case with battery2# Sensor off												
Top side-12mm	802.11a	56/5280	94.05%	1.063	0.435	0.01	15	16	1.259	0.582	22.2	1.6

Table 8: SAR of 5GHz WIFI(U-NII-2A).

Note:

- 1) The maximum Scaled SAR value is marked in bold. Graph Results refer to Appendix B
- 2) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).



5.3.3 SAR Result Of 5GHz WIFI(U-NII-2C)

Test position	Test mode	Test Ch./Freq.	Duty Cycle	Duty Cycle Scaled factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp.	SAR limit (W/kg)
Head Test data with Sensor on												
Left touch cheek	802.11n HT40	102/5510	94.05%	1.063	0.303	0.08	8.96	9	1.009	0.325	22.2	1.6
Left tilted 15 degree	802.11n HT40	102/5510	94.05%	1.063	0.316	0.01	8.96	9	1.009	0.339	22.2	1.6
Right touch cheek	802.11n HT40	102/5510	94.05%	1.063	0.241	-0.02	8.96	9	1.009	0.259	22.2	1.6
Right tilted 15 degree	802.11n HT40	102/5510	94.05%	1.063	0.3	0.04	8.96	9	1.009	0.322	22.2	1.6
Head Test data with Battery 2# Sensor on												
Left tilted 15 degree	802.11n HT40	102/5510	94.05%	1.063	0.471	-0.12	8.96	9	1.009	0.505	22.2	1.6
Body Test data with Sensor on(Separate 0mm)												
Back side	802.11n HT40	102/5510	94.05%	1.063	0.314	-0.04	8.96	9	1.009	0.337	22.2	1.6
Top side	802.11n HT40	102/5510	94.05%	1.063	0.323	0.01	8.96	9	1.009	0.347	22.2	1.6
Body Test data with battery2# Sensor on(Separate 0mm)												
Top side	802.11n HT40	102/5510	94.05%	1.063	0.419	-0.19	8.96	9	1.009	0.450	22.2	1.6
Body Test data with Sensor off												
Back side-11mm	802.11a	100/5500	94.05%	1.063	0.129	-0.07	15.57	16	1.104	0.151	22.2	1.6
Top side-12mm	802.11a	100/5500	94.05%	1.063	0.316	-0.08	15.57	16	1.104	0.371	22.2	1.6
Body Test data with battery2# Sensor off												
Top side-12mm	802.11a	100/5500	94.05%	1.063	0.419	-0.01	15.57	16	1.104	0.492	22.2	1.6

Table 9: SAR of 5GHz WIFI(U-NII-2C).

Note:

- 1) The maximum Scaled SAR value is marked in bold. Graph Results refer to Appendix B
- 2) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).



5.3.4 SAR Result Of 5GHz WIFI(U-NII-3)

Test position	Test mode	Test Ch./Freq.	Duty Cycle	Duty Cycle Scaled factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp.	SAR limit (W/kg)
Head Test data with Sensor on												
Left touch cheek	802.11n HT40	151/5755	94.05%	1.063	0.331	0.08	8.83	9	1.040	0.366	22.2	1.6
Left tilted 15 degree	802.11n HT40	151/5755	94.05%	1.063	0.336	0.08	8.83	9	1.040	0.372	22.2	1.6
Right touch cheek	802.11n HT40	151/5755	94.05%	1.063	0.277	0.09	8.83	9	1.040	0.306	22.2	1.6
Right tilted 15 degree	802.11n HT40	151/5755	94.05%	1.063	0.328	0.07	8.83	9	1.040	0.363	22.2	1.6
Head Test data with Battery 2# Sensor on												
Left tilted 15 degree	802.11n HT40	151/5755	94.05%	1.063	0.497	0.07	8.83	9	1.040	0.550	22.2	1.6
Body Test data with Sensor on(Separate 0mm)												
Back side	802.11n HT40	151/5755	94.05%	1.063	0.349	0.01	8.83	9	1.040	0.386	22.2	1.6
Top side	802.11n HT40	151/5755	94.05%	1.063	0.383	0.04	8.83	9	1.040	0.423	22.2	1.6
Body Test data with battery2# Sensor on(Separate 0mm)												
Top side	802.11n HT40	151/5755	94.05%	1.063	0.527	-0.03	8.83	9	1.040	0.583	22.2	1.6
Body Test data with Sensor off												
Back side-11mm	802.11a	165/5825	94.05%	1.063	0.178	-0.08	15.18	16	1.208	0.229	22.2	1.6
Top side-12mm	802.11a	165/5825	94.05%	1.063	0.452	0.03	15.18	16	1.208	0.580	22.2	1.6
Body Test data with battery2# Sensor off												
Top side-12mm	802.11a	165/5825	94.05%	1.063	0.591	-0.07	15.18	16	1.208	0.759	22.2	1.6

Table 10: SAR of 5GHz WIFI(U-NII-3).

Note:

- 1) The maximum Scaled SAR value is marked in bold. Graph Results refer to Appendix B
- 2) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).



5.4 Multiple Transmitter Evaluation

5.4.1 Simultaneous SAR test evaluation

1) Simultaneous Transmission

NO.	Simultaneous Transmission Configuration	Body
1	2.4GHz/5GHz WiFi +BT (They share the same antenna and cannot transmit at the same time by design.)	NO



6 Equipment list

Test Platform		SPEAG DASY5 Professional				
Location		SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch				
Description		SAR Test System (Frequency range 300MHz-6GHz)				
Software Reference		DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)				
Hardware Reference						
Equipment		Manufacturer	Model	Serial Number	Calibration Date	Due date of calibration
☒	Robot	Staubli	RX90L	F03/5V32A1/A01	NCR	NCR
☒	Twin Phantom	SPEAG	SAM 1	TP-1283	NCR	NCR
☐	Twin Phantom	SPEAG	SAM 2	1913	NCR	NCR
☒	Flat Phantom	SPEAG	ELI 5.0	1128	NCR	NCR
☒	DAE	SPEAG	DAE3	569	2016-12-09	2017-12-08
☒	E-Field Probe	SPEAG	EX3DV4	3789	2017-01-13	2018-01-12
☐	Validation Kits	SPEAG	D750V3	1160	2016-06-22	2019-06-21
☐	Validation Kits	SPEAG	D835V2	4d105	2016-12-08	2019-12-07
☐	Validation Kits	SPEAG	D1750V2	1149	2016-06-23	2019-06-22
☐	Validation Kits	SPEAG	D1900V2	5d028	2016-12-07	2019-12-06
☒	Validation Kits	SPEAG	D2450V2	733	2016-12-07	2019-12-06
☒	Validation Kits	SPEAG	D5GHzV2	1165	2016-12-13	2019-12-12
☒	Agilent Network Analyzer	Agilent	E5071C	MY46523590	2017-03-06	2018-03-05
☒	Dielectric Probe Kit	Agilent	85070E	US01440210	NCR	NCR
☐	Universal Radio Communication Tester	R&S	CMW500	103990	2017-03-06	2018-03-05
☒	RF Bi-Directional Coupler	Agilent	86205-60001	MY31400031	NCR	NCR
☒	Signal Generator	Agilent	N5171B	MY53050736	2017-03-06	2018-03-05
☒	Preamplifier	Mini-Circuits	ZHL-42W	15542	NCR	NCR
☒	Power Meter	Agilent	E4416A	GB41292095	2017-03-06	2018-03-05
☒	Power Sensor	Agilent	8481H	MY41091234	2017-03-05	2018-03-04
☒	Power Sensor	R&S	NRP-Z92	100025	2017-03-06	2018-03-05
☒	Attenuator	SHX	TS2-3dB	30704	NCR	NCR
☒	Coaxial low pass filter	Mini-Circuits	VLF-2500(+)	NA	NCR	NCR
☒	Coaxial low pass filter	Microlab Fxr	LA-F13	NA	NCR	NCR
☒	50 Ω coaxial load	Mini-Circuits	KARN-50+	00850	NCR	NCR
☒	DC POWER SUPPLY	SAKO	SK1730SL 5A	NA	NCR	NCR
☒	Speed reading thermometer	MingGao	T809	NA	2017-03-08	2018-03-07
☒	Humidity and Temperature Indicator	KIMTOKA	KIMTOKA	NA	2017-03-08	2018-03-07



7 Measurement Uncertainty

Measurements and results are all in compliance with the standards listed in this report. All measurements and results are recorded and maintained at the laboratory performing the tests and measurement uncertainties are taken into account when comparing measurements to pass/ fail criteria. The Expanded uncertainty (95% CONFIDENCE INTERVAL) is 21.84%.

A	b1	c	d	e = f(d,k)	g	i = C*g/e	k
Uncertainty Component	Section in P1528	Tol (%)	Prob . Dist.	Div.	Ci (1g)	1g ui (%)	Vi (Veff)
Probe calibration	E.2.1	6.7	N	1	1	6.70	∞
Axial isotropy	E.2.2	0.5	R	$\sqrt{3}$	$(1 - p)^{1/2}$	0.20	∞
hemispherical isotropy	E.2.2	2.6	R	$\sqrt{3}$	$\sqrt{p}$	1.06	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	0.58	∞
Linearity	E.2.4	0.6	R	$\sqrt{3}$	1	0.35	∞
System detection limit	E.2.5	0.25	R	$\sqrt{3}$	1	0.14	∞
Readout electronics	E.2.6	0.3	N	1	1	0.30	∞
Response time	E.2.7	0	R	$\sqrt{3}$	1	0.00	∞
Integration time	E.2.8	2.6	R	$\sqrt{3}$	1	1.50	∞
RF ambient Condition –Noise	E.6.1	3	R	$\sqrt{3}$	1	1.73	∞
RF ambient Condition - reflections	E.6.1	3	R	$\sqrt{3}$	1	1.73	∞
Probe positioning- mechanical tolerance	E.6.2	1.5	R	$\sqrt{3}$	1	0.87	∞
Probe positioning- with respect to phantom	E.6.3	2.9	R	$\sqrt{3}$	1	1.67	∞
Max. SAR evaluation	E.5.2	1	R	$\sqrt{3}$	1	0.58	∞
Test sample positioning	E.4.2	3.7	N	1	1	3.70	9
Device holder uncertainty	E.4.1	3.6	N	1	1	3.60	∞
Output power variation –SAR drift measurement	6.6.2	5	R	$\sqrt{3}$	1	2.89	∞
Phantom uncertainty (shape and thickness tolerances)	E.3.1	4	R	$\sqrt{3}$	1	2.31	∞
Liquid conductivity - deviation from target values	E.3.2	5	R	$\sqrt{3}$	0.64	1.85	∞
Liquid conductivity - measurement uncertainty	E.3.2	5.78	N	1	0.64	3.68	5
Liquid permittivity - deviation from target values	E.3.3	5	R	$\sqrt{3}$	0.6	1.73	∞
Liquid permittivity - measurement uncertainty	E.3.3	0.62	N	1	0.6	0.372	5



Combined standard uncertainty				RSS		10.92	430
Expanded uncertainty (95% CONFIDENCE INTERVAL)				K=2		21.84	

Table 11 : Measurement Uncertainty

8 Calibration certificate

Please see the Appendix C

9 Photographs

Please see the Appendix D



Appendix A: Detailed System Validation Results

Appendix B: Detailed Test Results

Appendix C: Calibration certificate

Appendix D: Photographs

---END---



Appendix A

Detailed System Validation Results

1. System Performance Check for Head
System Performance Check 2450MHz Head
System Performance Check 5250MHz Head
System Performance Check 5600MHz Head
System Performance Check 5750MHz Head
2. System Performance Check for Body
System Performance Check 2450MHz Body
System Performance Check 5250MHz Body
System Performance Check 5600MHz Body
System Performance Check 5750MHz Body

Test Laboratory: SGS-SAR Lab

System Performance Check 2450MHz Head

DUT: D2450V2; Type: D2450V2; Serial: 733

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL2450; Medium parameters used: $f = 2450$ MHz; $\sigma = 1.824$ S/m; $\epsilon_r = 39.15$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(6.85, 6.85, 6.85); Calibrated: 2017-01-13;
- Sensor-Surface: 2mm (Mechanical Surface Detection), $z = -2.0, 31.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (9x14x1): Measurement grid: $dx=12$ mm, $dy=12$ mm

Maximum value of SAR (measured) = 14.0 W/kg

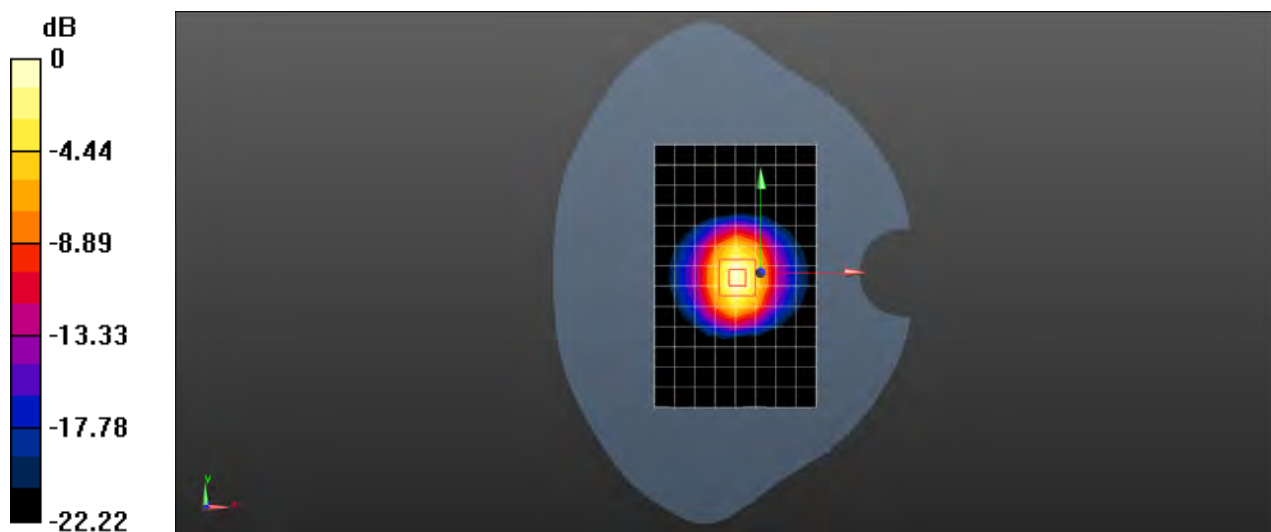
Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 86.79 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 28.7 W/kg

SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.22 W/kg

Maximum value of SAR (measured) = 15.4 W/kg



0 dB = 15.4 W/kg = 11.88 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check 2450MHz Body

DUT: D2450V2; Type: D2450V2; Serial: 733

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1

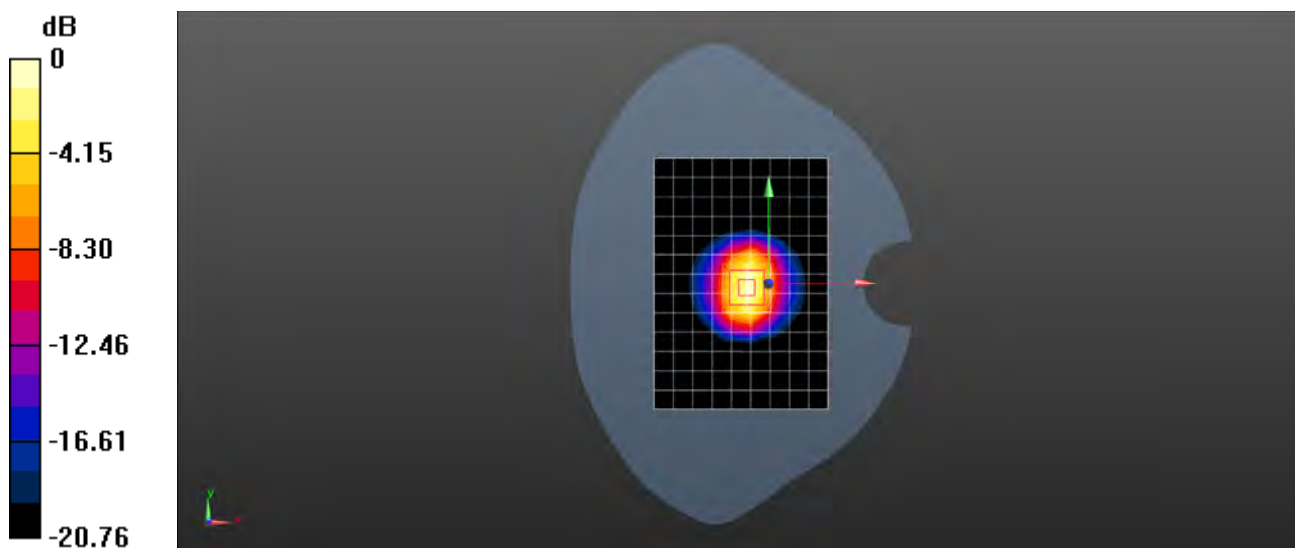
Medium: MSL2450; Medium parameters used: $f = 2450$ MHz; $\sigma = 2.013$ S/m; $\epsilon_r = 52.708$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(6.98, 6.98, 6.98); Calibrated: 2017-01-13;
- Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (10x14x1): Measurement grid: $dx=12$ mm, $dy=12$ mm
Maximum value of SAR (measured) = 13.9 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:
 $dx=5$ mm, $dy=5$ mm, $dz=5$ mm
Reference Value = 79.86 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 26.2 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 6.1 W/kg
Maximum value of SAR (measured) = 15.0 W/kg



0 dB = 15.0 W/kg = 11.76 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check D5.25GHz Head

DUT: D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5250 MHz; Duty Cycle: 1:1

Medium: HSL5GHz; Medium parameters used: $f = 5250$ MHz; $\sigma = 4.629$ S/m; $\epsilon_r = 35.566$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(5, 5, 5); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 25.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5250 MHz/Area Scan (10x10x1): Measurement grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (measured) = 12.0 W/kg

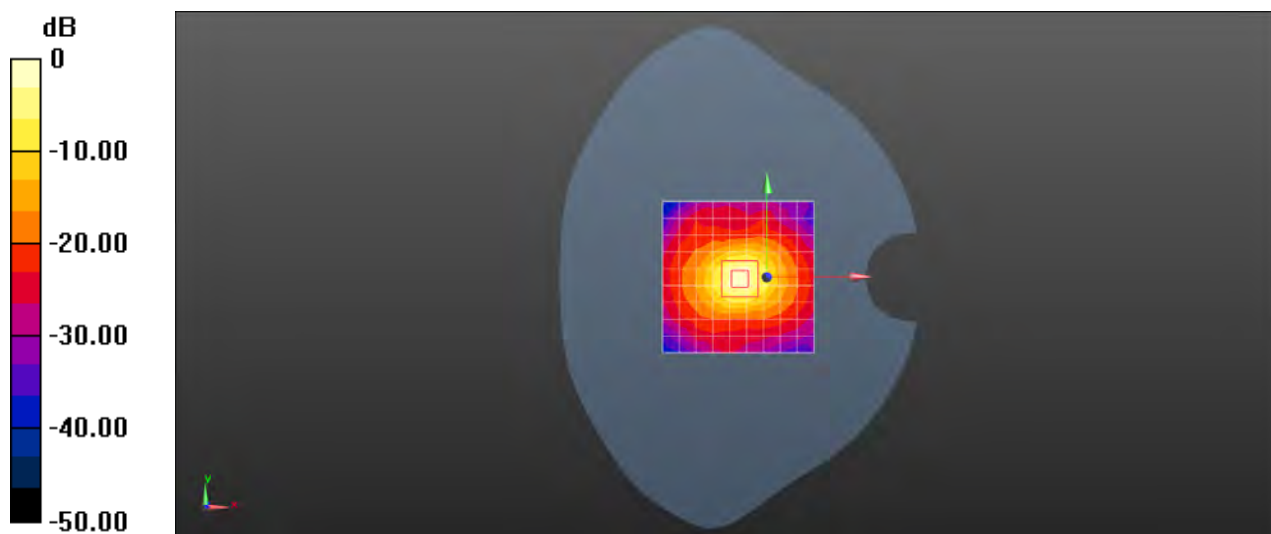
Body/d=10mm, Pin=100mW, f=5250 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 66.58 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 28.8 W/kg

SAR(1 g) = 6.96 W/kg; SAR(10 g) = 1.98 W/kg

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



0 dB = 16.4 W/kg = 12.15 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check D5.25GHz Body

DUT: D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5250 MHz; Duty Cycle: 1:1

Medium: MSL5GHz; Medium parameters used: $f = 5250$ MHz; $\sigma = 5.417$ S/m; $\epsilon_r = 49.336$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(4.64, 4.64, 4.64); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 25.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: ELI V5.0; Type: ELI; Serial: 1128
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5250 MHz/Area Scan (10x10x1): Measurement grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (measured) = 21.0 W/kg

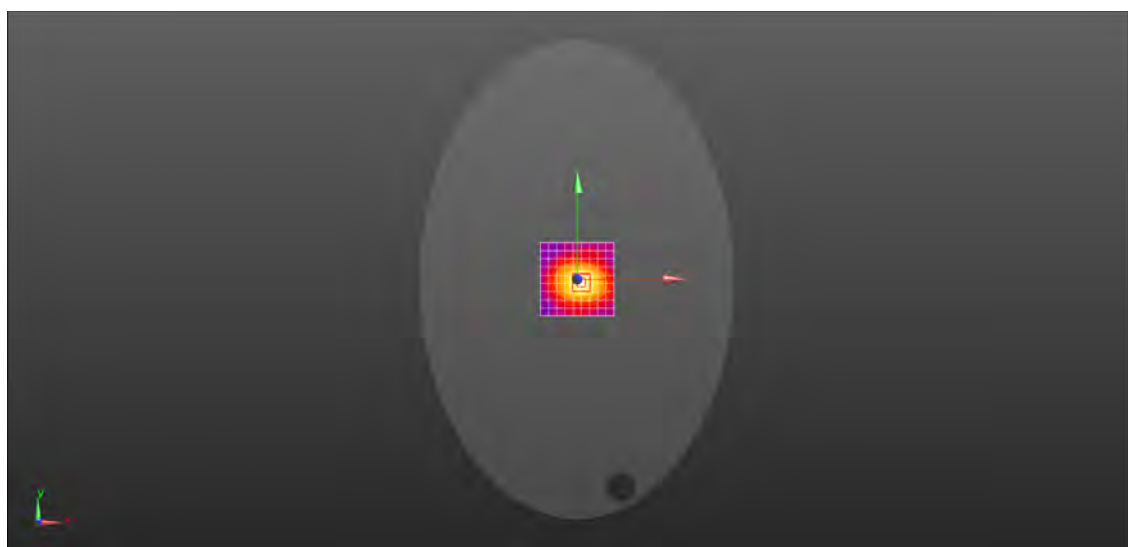
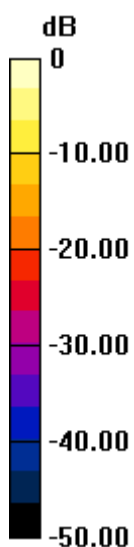
Body/d=10mm, Pin=100mW, f=5250 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 53.24 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 34.4 W/kg

SAR(1 g) = 7.86 W/kg; SAR(10 g) = 2.19 W/kg

Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 19.3 W/kg = 12.86 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check D5.6GHz Head

DUT: D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: HSL5GHz; Medium parameters used: $f = 5600$ MHz; $\sigma = 5.096$ S/m; $\epsilon_r = 34.894$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(4.48, 4.48, 4.48); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 25.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5600 MHz/Area Scan (10x10x1): Measurement grid:

$dx=10$ mm, $dy=10$ mm

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

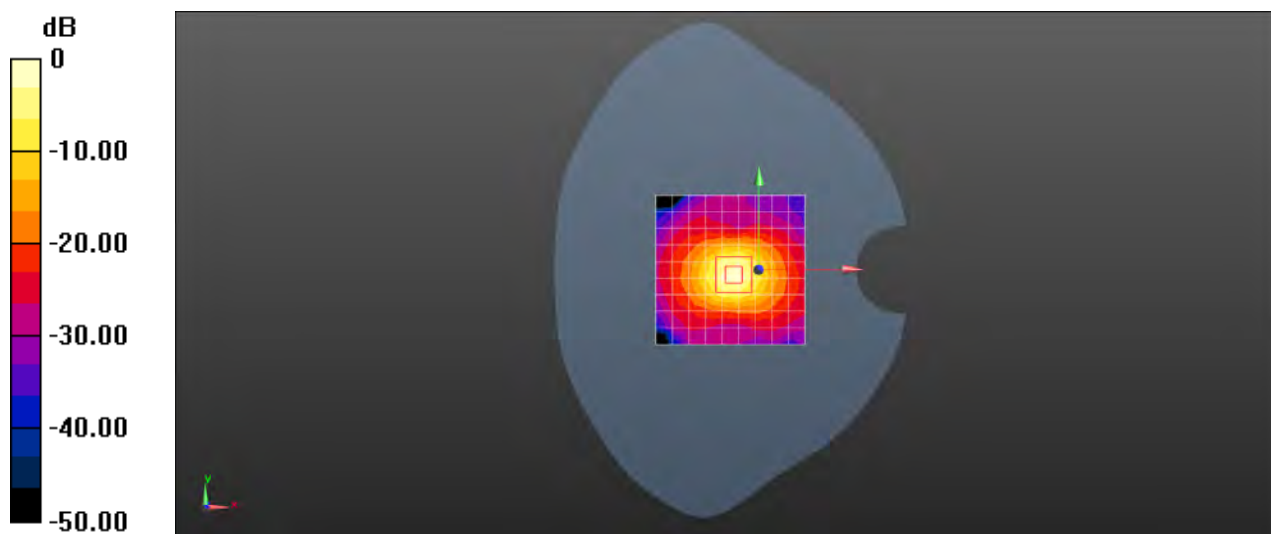
Body/d=10mm, Pin=100mW, f=5600 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 63.24 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 34.7 W/kg

SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.16 W/kg

Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.2 W/kg = 12.83 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check D5.6GHz Body

DUT: D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: MSL5GHz; Medium parameters used: $f = 5600$ MHz; $\sigma = 5.798$ S/m; $\epsilon_r = 48.507$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(3.86, 3.86, 3.86); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 25.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: ELI V5.0; Type: ELI; Serial: 1128
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5600 MHz/Area Scan (10x10x1): Measurement grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (measured) = 23.0 W/kg

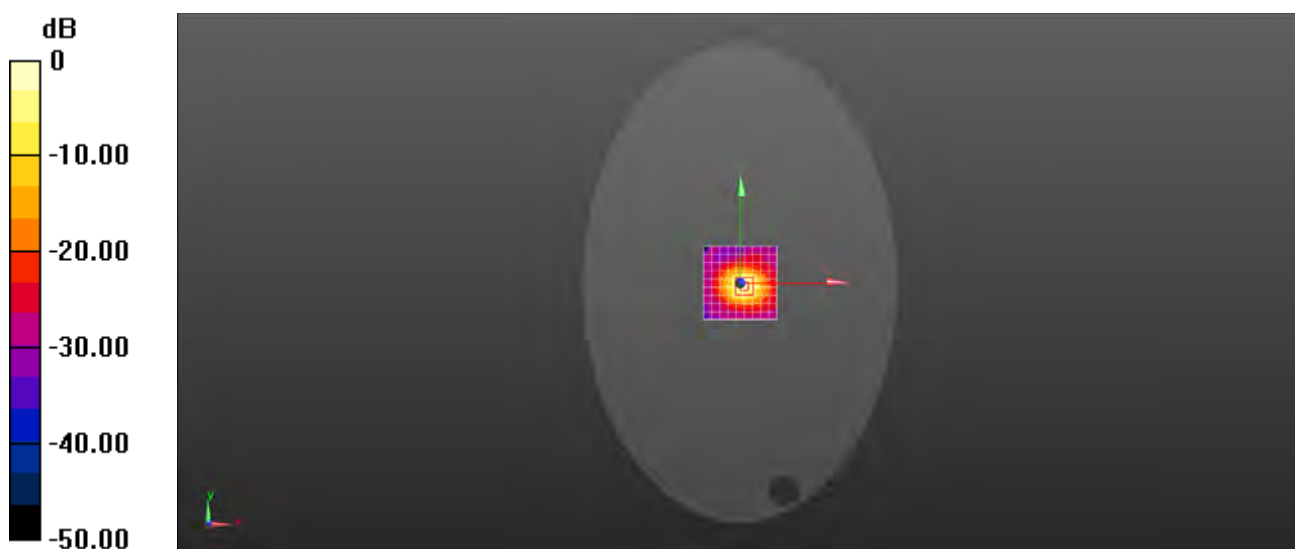
Body/d=10mm, Pin=100mW, f=5600 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 54.37 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 39.3 W/kg

SAR(1 g) = 8.4 W/kg; SAR(10 g) = 2.32 W/kg

Maximum value of SAR (measured) = 21.0 W/kg



0 dB = 21.0 W/kg = 13.22 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check D5.75GHz Head

DUT: D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5750 MHz; Duty Cycle: 1:1

Medium: HSL5GHz; Medium parameters used: $f = 5750$ MHz; $\sigma = 5.277$ S/m; $\epsilon_r = 34.522$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(4.68, 4.68, 4.68); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 25.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5750 MHz/Area Scan (10x10x1): Measurement grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (measured) = 17.7 W/kg

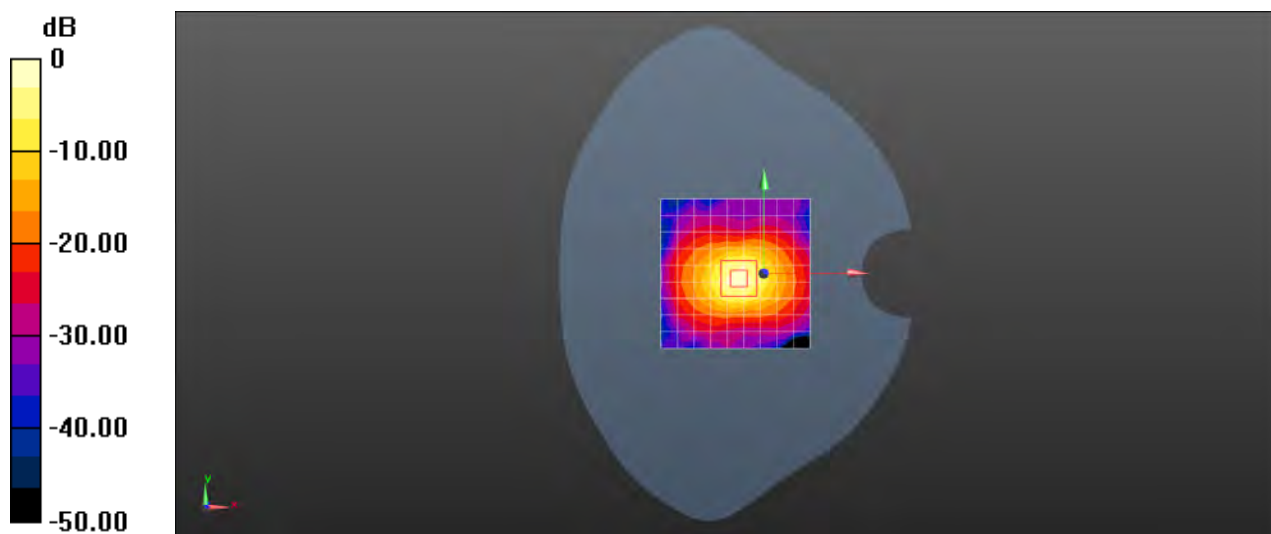
Body/d=10mm, Pin=100mW, f=5750 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 62.31 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 35.2 W/kg

SAR(1 g) = 7.74 W/kg; SAR(10 g) = 2.21 W/kg

Maximum value of SAR (measured) = 18.9 W/kg



0 dB = 18.9 W/kg = 12.76 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check D5.75GHz Body

DUT: D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5750 MHz; Duty Cycle: 1:1

Medium: MSL5GHz; Medium parameters used: $f = 5750$ MHz; $\sigma = 5.989$ S/m; $\epsilon_r = 47.941$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(4.27, 4.27, 4.27); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 25.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: ELI V5.0; Type: ELI; Serial: 1128
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5750 MHz/Area Scan (10x10x1): Measurement grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (measured) = 19.0 W/kg

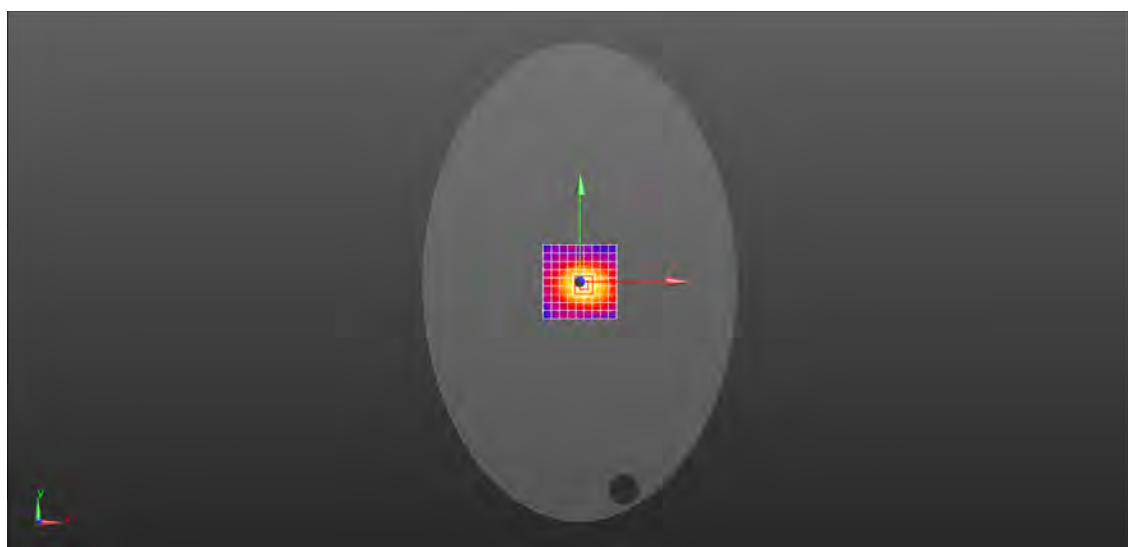
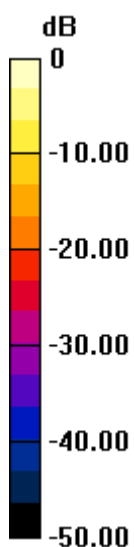
Body/d=10mm, Pin=100mW, f=5750 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 51.32 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 32.6 W/kg

SAR(1 g) = 7.05 W/kg; SAR(10 g) = 1.95 W/kg

Maximum value of SAR (measured) = 17.6 W/kg



0 dB = 17.6 W/kg = 12.46 dBW/kg



Appendix B

Detailed Test Results

1. WIFI
WIFI for Head& Body

Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11b 11CH Left touch cheek

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17607000015

Communication System: UID 0, WI-FI(2.4GHz) (0); Frequency: 2462 MHz;Duty Cycle: 1:1

Medium: HSL2450;Medium parameters used: $f = 2462$ MHz; $\sigma = 1.827$ S/m; $\epsilon_r = 39.036$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(6.85, 6.85, 6.85); Calibrated: 2017-01-13;
- Sensor-Surface: 2mm (Mechanical Surface Detection), $z = -2.0, 31.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (13x9x1): Measurement grid: $dx=12$ mm, $dy=12$ mm
Maximum value of SAR (measured) = 0.674 W/kg

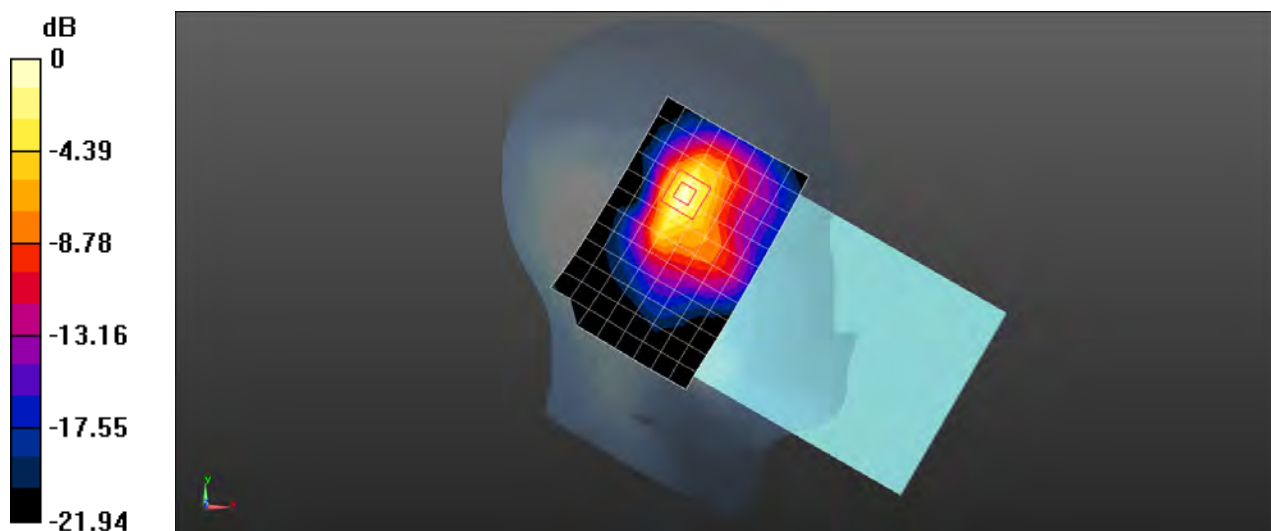
Configuration/Head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 10.11 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 1.03 W/kg

SAR(1 g) = 0.441 W/kg; SAR(10 g) = 0.192 W/kg

Maximum value of SAR (measured) = 0.686 W/kg



0 dB = 0.686 W/kg = -1.64 dBW/kg

Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11b 11CH Back side 0mm

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17222000001

Communication System: UID 0, WI-FI(2.4GHz) (0); Frequency: 2462 MHz;Duty Cycle: 1:1

Medium: MSL2450;Medium parameters used: $f = 2462$ MHz; $\sigma = 2.015$ S/m; $\epsilon_r = 52.682$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(6.98, 6.98, 6.98); Calibrated: 2017-01-13;
- Sensor-Surface: 2mm (Mechanical Surface Detection), $z = -2.0, 31.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (9x6x1): Measurement grid: $dx=12$ mm, $dy=12$ mm

Maximum value of SAR (measured) = 1.46 W/kg

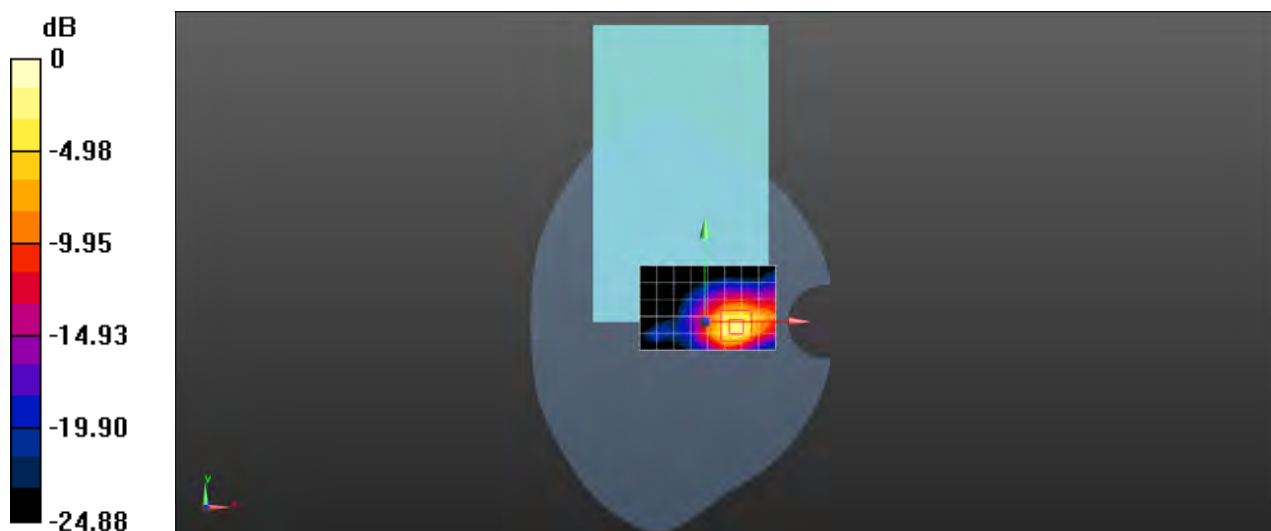
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 8.769 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 3.02 W/kg

SAR(1 g) = 1.06 W/kg; SAR(10 g) = 0.418 W/kg

Maximum value of SAR (measured) = 2.22 W/kg



0 dB = 2.22 W/kg = 3.46 dBW/kg

Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11b 6CH Back side 11mm

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17405000022

Communication System: UID 0, WI-FI(2.4GHz) (0); Frequency: 2437 MHz; Duty Cycle: 1:1

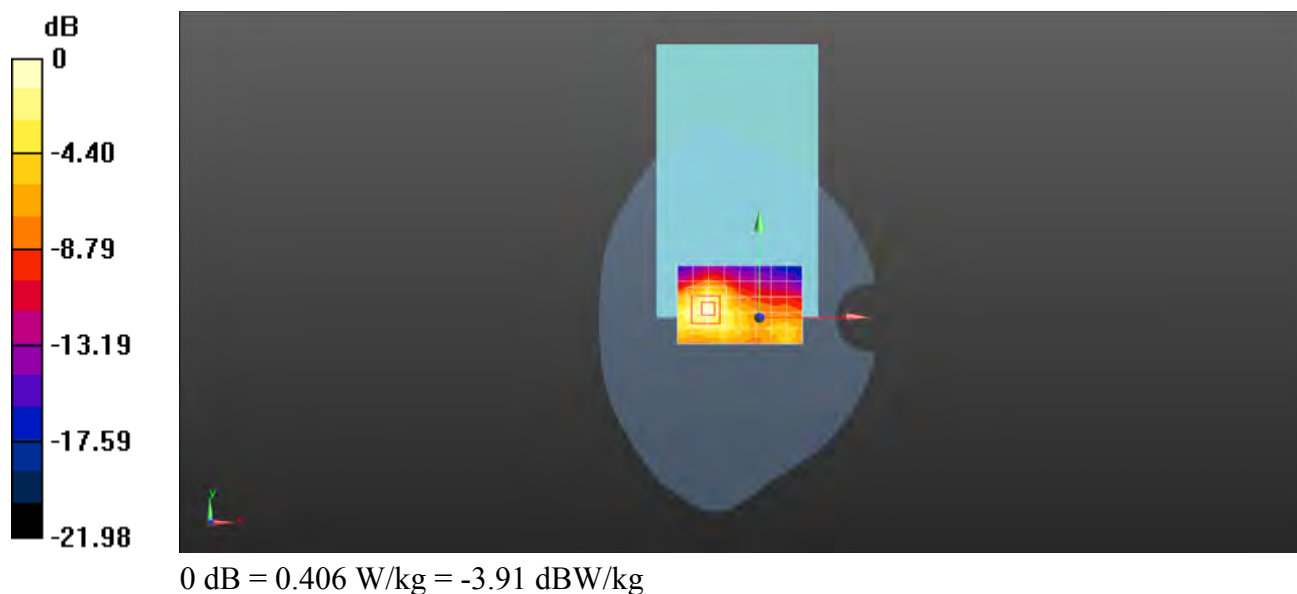
Medium: MSL2450; Medium parameters used: $f = 2437$ MHz; $\sigma = 1.999$ S/m; $\epsilon_r = 52.757$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(6.98, 6.98, 6.98); Calibrated: 2017-01-13;
- Sensor-Surface: 2mm (Mechanical Surface Detection), $z = -2.0, 31.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (9x6x1): Measurement grid: $dx=12$ mm, $dy=12$ mm
Maximum value of SAR (measured) = 0.387 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm
Reference Value = 7.557 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 0.517 W/kg
SAR(1 g) = 0.251 W/kg; SAR(10 g) = 0.121 W/kg
Maximum value of SAR (measured) = 0.406 W/kg



Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11n HT40 62CH Left tilted 15 degree with Battery 2#

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17405000022

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5310 MHz; Duty Cycle: 1:1

Medium: HSL5GHz; Medium parameters used: $f = 5310 \text{ MHz}$; $\sigma = 4.708 \text{ S/m}$; $\epsilon_r = 35.454$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(5, 5, 5); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 23.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (15x10x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
Maximum value of SAR (measured) = 0.742 W/kg

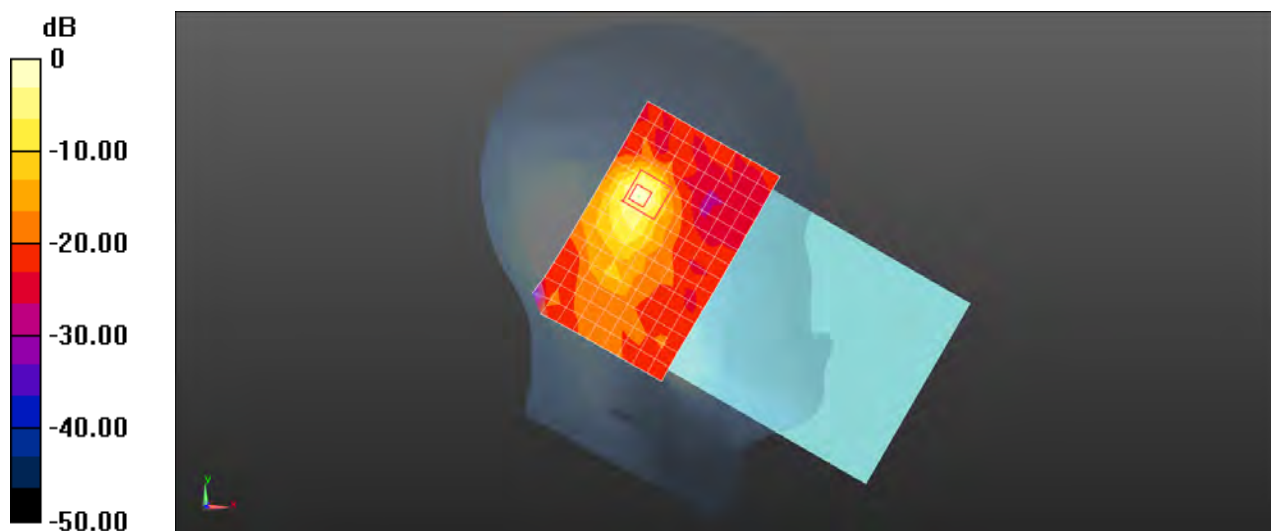
Configuration/Head/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 4.630 V/m ; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.51 W/kg

SAR(1 g) = 0.349 W/kg ; SAR(10 g) = 0.090 W/kg

Maximum value of SAR (measured) = 0.893 W/kg



$0 \text{ dB} = 0.893 \text{ W/kg} = -0.49 \text{ dBW/kg}$

Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11n HT40 62CH Top side 0mm

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17405000022

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5310 MHz; Duty Cycle: 1:1

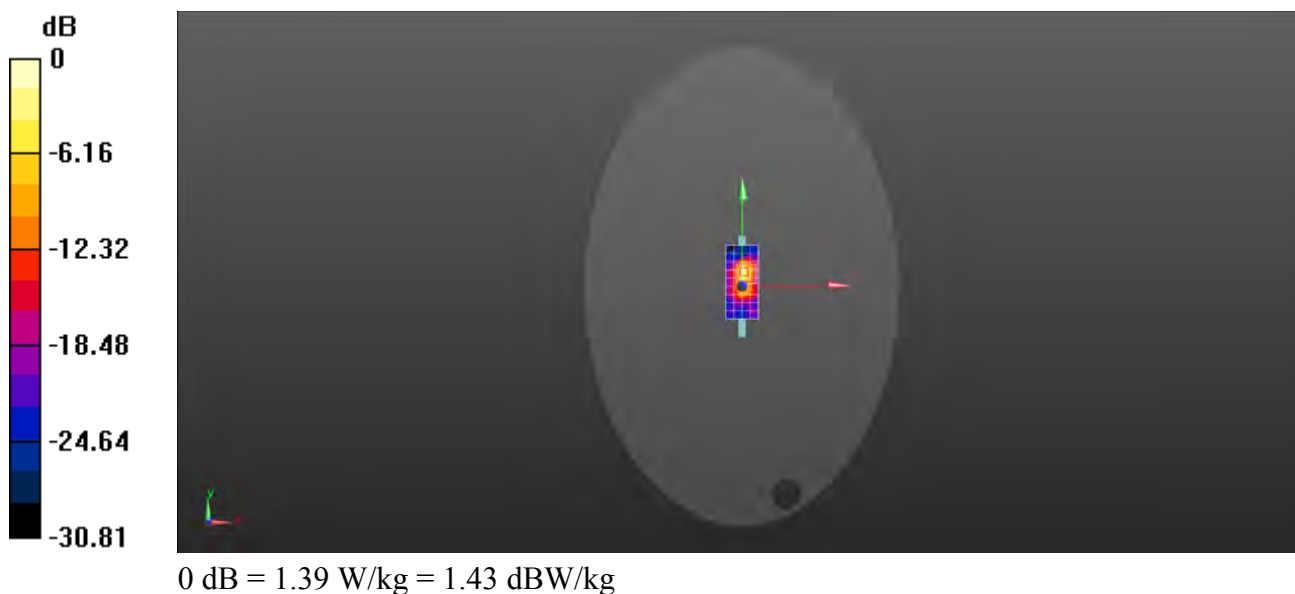
Medium: MSL5G; Medium parameters used: $f = 5310$ MHz; $\sigma = 5.523$ S/m; $\epsilon_r = 49.185$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(4.64, 4.64, 4.64); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 23.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: ELI V5.0; Type: ELI; Serial: 1128
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (5x10x1): Measurement grid: $dx=10$ mm, $dy=10$ mm
Maximum value of SAR (measured) = 1.11 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm
Reference Value = 4.597 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 2.62 W/kg
SAR(1 g) = 0.471 W/kg; SAR(10 g) = 0.101 W/kg
Maximum value of SAR (measured) = 1.39 W/kg



Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11a 56CH Top side 12mm

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17405000022

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5280 MHz; Duty Cycle: 1:1

Medium: MSL5G; Medium parameters used: $f = 5280$ MHz; $\sigma = 5.452$ S/m; $\epsilon_r = 49.243$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(4.64, 4.64, 4.64); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 23.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: ELI V5.0; Type: ELI; Serial: 1128
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (5x10x1): Measurement grid: $dx=10$ mm, $dy=10$ mm
Maximum value of SAR (measured) = 0.928 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm
Reference Value = 6.710 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.71 W/kg
SAR(1 g) = 0.435 W/kg; SAR(10 g) = 0.152 W/kg
Maximum value of SAR (measured) = 1.04 W/kg



Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11n HT40 102CH Left tilted 15 degree with Battery 2#

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17405000022

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5510 MHz; Duty Cycle: 1:1

Medium: HSL5GHz; Medium parameters used: $f = 5510 \text{ MHz}$; $\sigma = 4.936 \text{ S/m}$; $\epsilon_r = 35.076$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(4.48, 4.48, 4.48); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 23.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (15x10x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
Maximum value of SAR (measured) = 1.19 W/kg

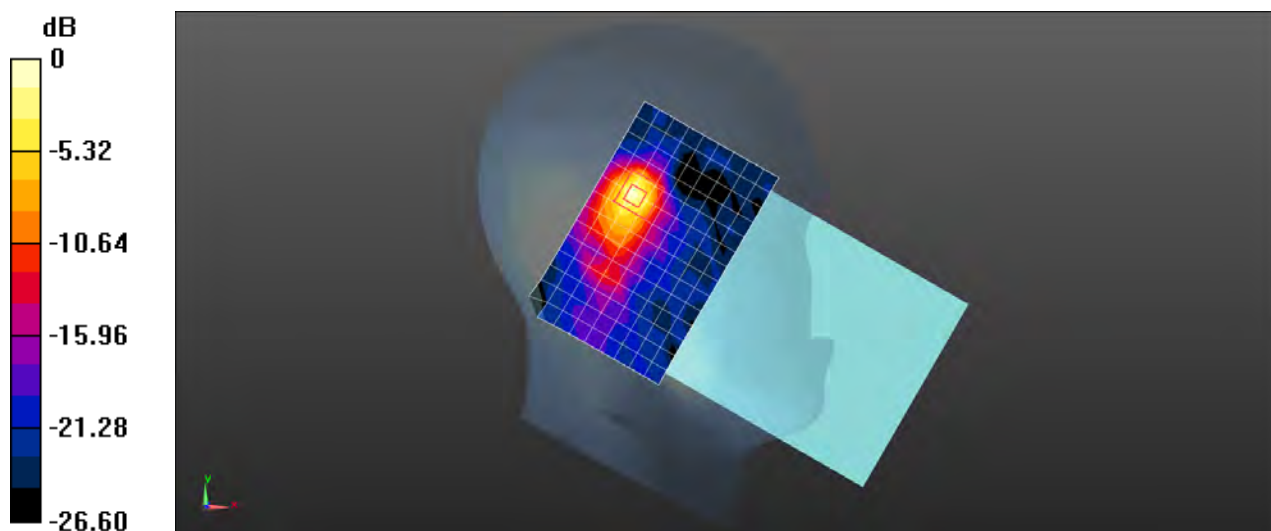
Configuration/Head/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 4.026 V/m ; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 2.10 W/kg

SAR(1 g) = 0.471 W/kg ; SAR(10 g) = 0.127 W/kg

Maximum value of SAR (measured) = 1.14 W/kg



0 dB = $1.14 \text{ W/kg} = 0.57 \text{ dBW/kg}$

Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11n HT40 102CH Top side 0mm

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17405000022

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5510 MHz; Duty Cycle: 1:1

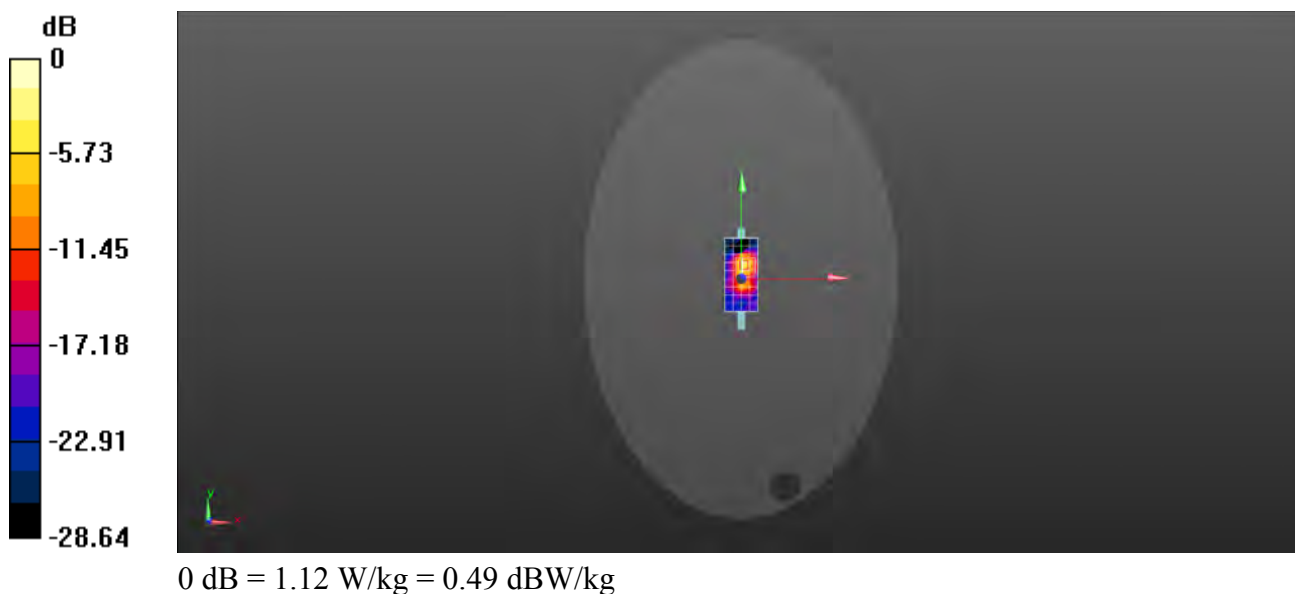
Medium: MSL5G; Medium parameters used: $f = 5510$ MHz; $\sigma = 5.715$ S/m; $\epsilon_r = 48.591$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(3.86, 3.86, 3.86); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 23.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: ELI V5.0; Type: ELI; Serial: 1128
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (5x10x1): Measurement grid: $dx=10$ mm, $dy=10$ mm
Maximum value of SAR (measured) = 0.804 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm
Reference Value = 4.608 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 2.98 W/kg
SAR(1 g) = 0.419 W/kg; SAR(10 g) = 0.094 W/kg
Maximum value of SAR (measured) = 1.12 W/kg



Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11a 100CH Top side 12mm

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17405000022

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5500 MHz; Duty Cycle: 1:1

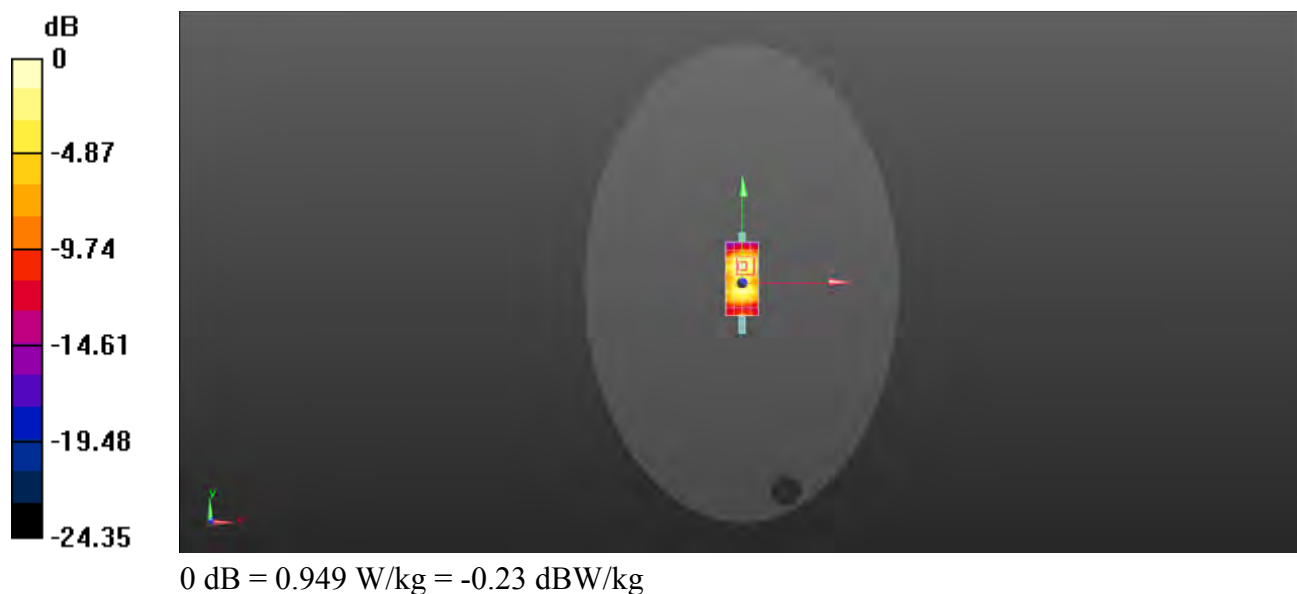
Medium: MSL5G; Medium parameters used: $f = 5500$ MHz; $\sigma = 5.697$ S/m; $\epsilon_r = 48.664$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(3.86, 3.86, 3.86); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 23.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: ELI V5.0; Type: ELI; Serial: 1128
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (5x10x1): Measurement grid: $dx=10$ mm, $dy=10$ mm
Maximum value of SAR (measured) = 0.941 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm
Reference Value = 6.874 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 2.03 W/kg
SAR(1 g) = 0.419 W/kg; SAR(10 g) = 0.149 W/kg
Maximum value of SAR (measured) = 0.949 W/kg



Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11n HT40 151CH Left tilted 15 degree with Battery 2#

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17405000022

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5755 MHz; Duty Cycle: 1:1

Medium: HSL5GHz; Medium parameters used: $f = 5755$ MHz; $\sigma = 5.291$ S/m; $\epsilon_r = 34.492$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(4.68, 4.68, 4.68); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 23.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (15x10x1): Measurement grid: $dx=10$ mm, $dy=10$ mm
Maximum value of SAR (measured) = 1.34 W/kg

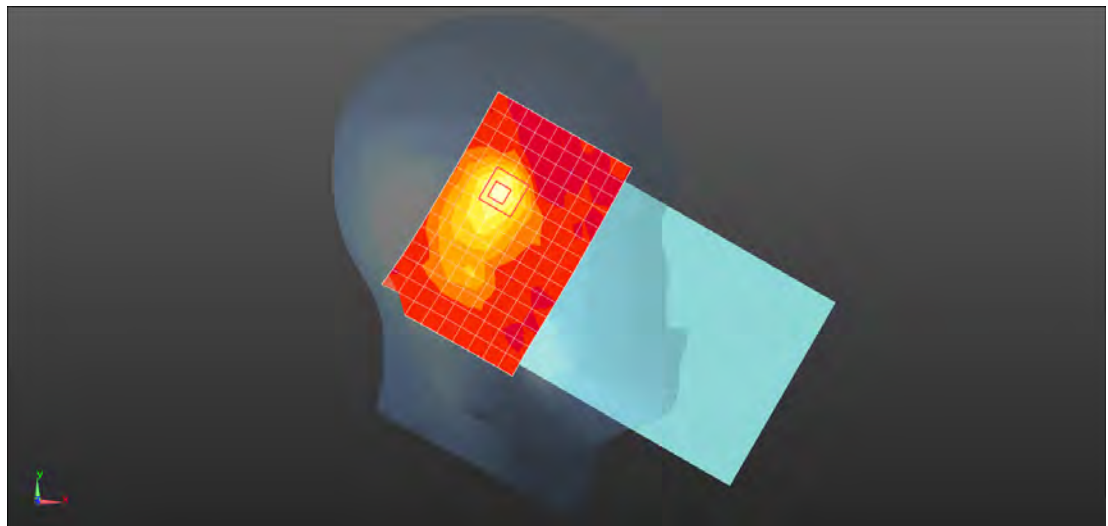
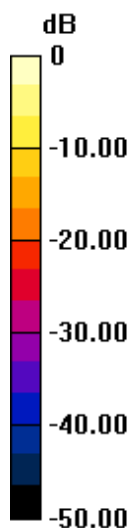
Configuration/Head/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 4.342 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 2.33 W/kg

SAR(1 g) = 0.497 W/kg; SAR(10 g) = 0.127 W/kg

Maximum value of SAR (measured) = 1.29 W/kg



0 dB = 1.29 W/kg = 1.11 dBW/kg

Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11n HT40 151CH Top side 0mm

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17405000022

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5755 MHz; Duty Cycle: 1:1

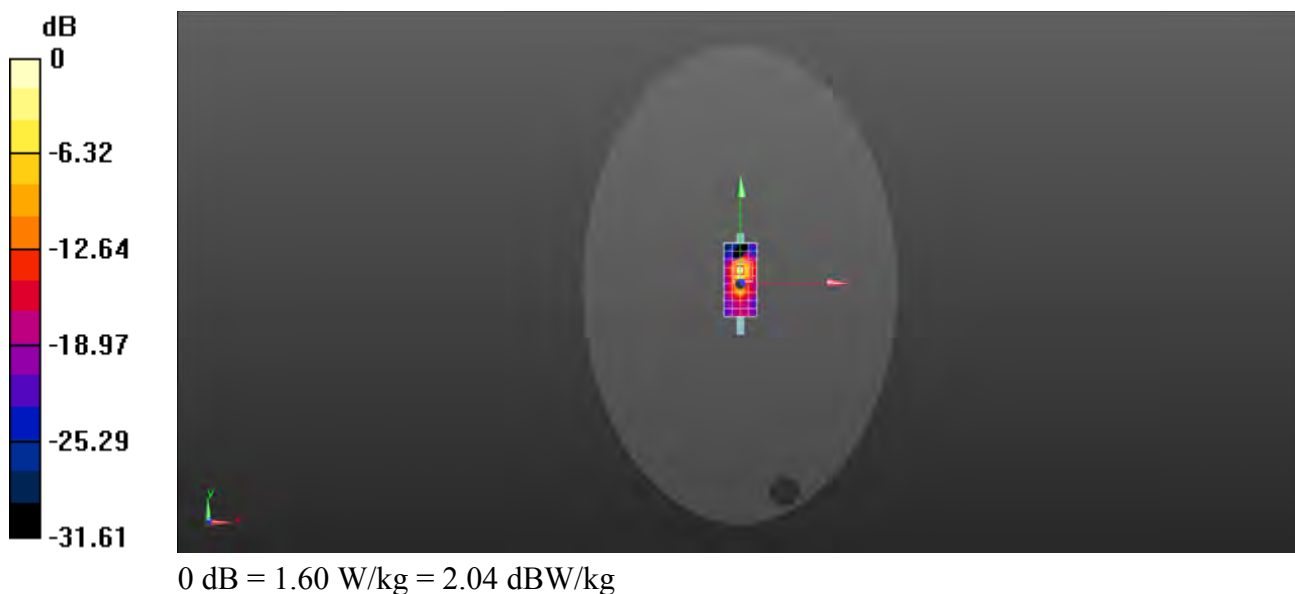
Medium: MSL5G; Medium parameters used: $f = 5755$ MHz; $\sigma = 6.017$ S/m; $\epsilon_r = 47.913$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(4.27, 4.27, 4.27); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 23.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: ELI V5.0; Type: ELI; Serial: 1128
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (5x10x1): Measurement grid: $dx=10$ mm, $dy=10$ mm
Maximum value of SAR (measured) = 1.57 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm
Reference Value = 4.233 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.97 W/kg
SAR(1 g) = 0.527 W/kg; SAR(10 g) = 0.117 W/kg
Maximum value of SAR (measured) = 1.60 W/kg



Test Laboratory: SGS-SAR Lab

KOB-W09 WIFI 802.11a 165CH Top side 12mm

DUT: KOB-W09; Type: Tablet; Serial: GQE4T17405000022

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5825 MHz; Duty Cycle: 1:1

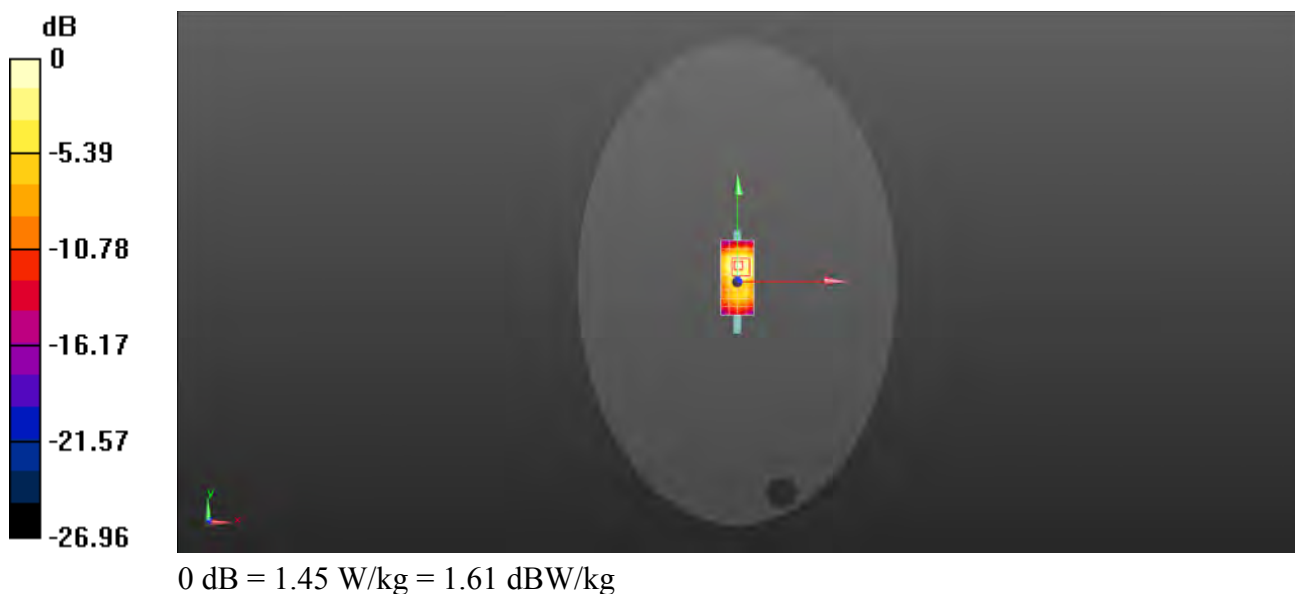
Medium: MSL5G; Medium parameters used: $f = 5825$ MHz; $\sigma = 6.078$ S/m; $\epsilon_r = 48.021$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(4.27, 4.27, 4.27); Calibrated: 2017-01-13;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = -2.0, 23.0$
- Electronics: DAE4 Sn1374; Calibrated: 2016-08-23
- Phantom: ELI V5.0; Type: ELI; Serial: 1128
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (5x10x1): Measurement grid: $dx=10$ mm, $dy=10$ mm
Maximum value of SAR (measured) = 1.40 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm
Reference Value = 5.977 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 2.38 W/kg
SAR(1 g) = 0.591 W/kg; SAR(10 g) = 0.216 W/kg
Maximum value of SAR (measured) = 1.45 W/kg





Appendix C

Calibration certificate

1. Dipole
D2450V2 - SN 733(2016-12-07)
D5GHzV2 - SN 1165(2016-12-13)
2. DAE
DAE4 - SN 1374(2016-08-23)
3. Probe
EX3DV4 - SN 3789(2017-01-13)



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Client

SGS(Boce)

Certificate No: Z16-97242

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 733**

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

Calibration date: **December 7, 2016**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Reference Probe EX3DV4	SN 7433	26-Sep-16(SPEAG,No.EX3-7433_Sep16)	Sep-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

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

Issued: December 11, 2016

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



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Glossary:

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

Calibration is Performed According to the Following Standards:

- 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
- 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
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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



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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.4 $\pm$ 6 %	1.81 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	53.1 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.22 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.9 mW / g $\pm$ 20.4 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	53.1 $\pm$ 6 %	1.94 mho/m $\pm$ 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	51.0 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.85 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	23.5 mW / g $\pm$ 20.4 % (k=2)



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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.9\Omega + 4.11j\Omega$
Return Loss	- 26.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$49.7\Omega + 5.90j\Omega$
Return Loss	- 24.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.257 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 11.07.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 733

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.809$ S/m; $\epsilon_r = 39.42$; $\rho = 1000$ kg/m³

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.45, 7.45, 7.45); Calibrated: 9/26/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

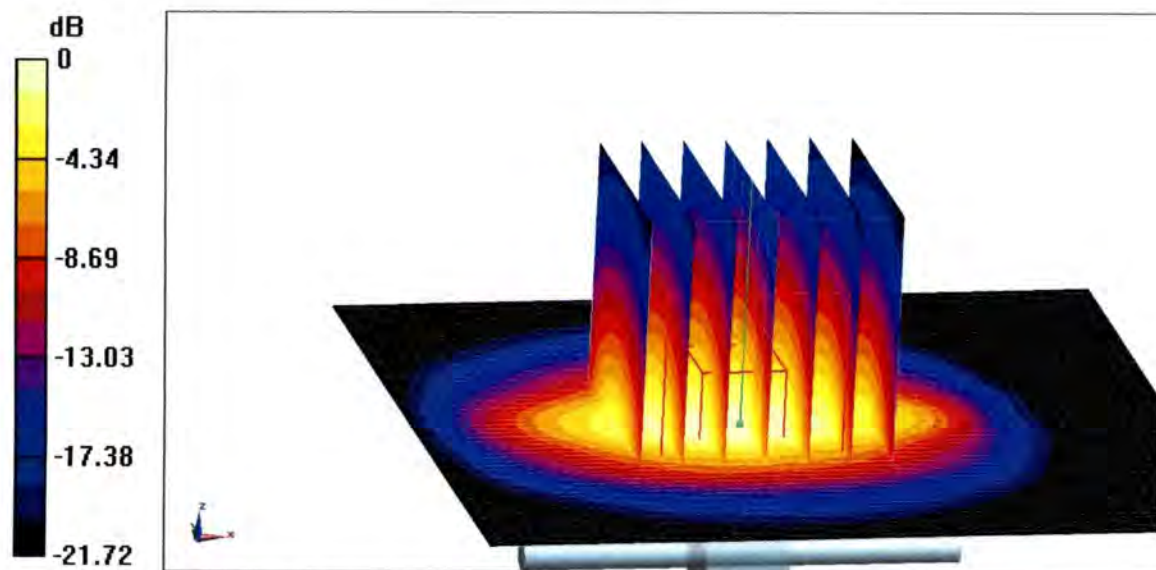
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.8 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.22 W/kg

Maximum value of SAR (measured) = 20.4 W/kg



0 dB = 20.4 W/kg = 13.10 dBW/kg

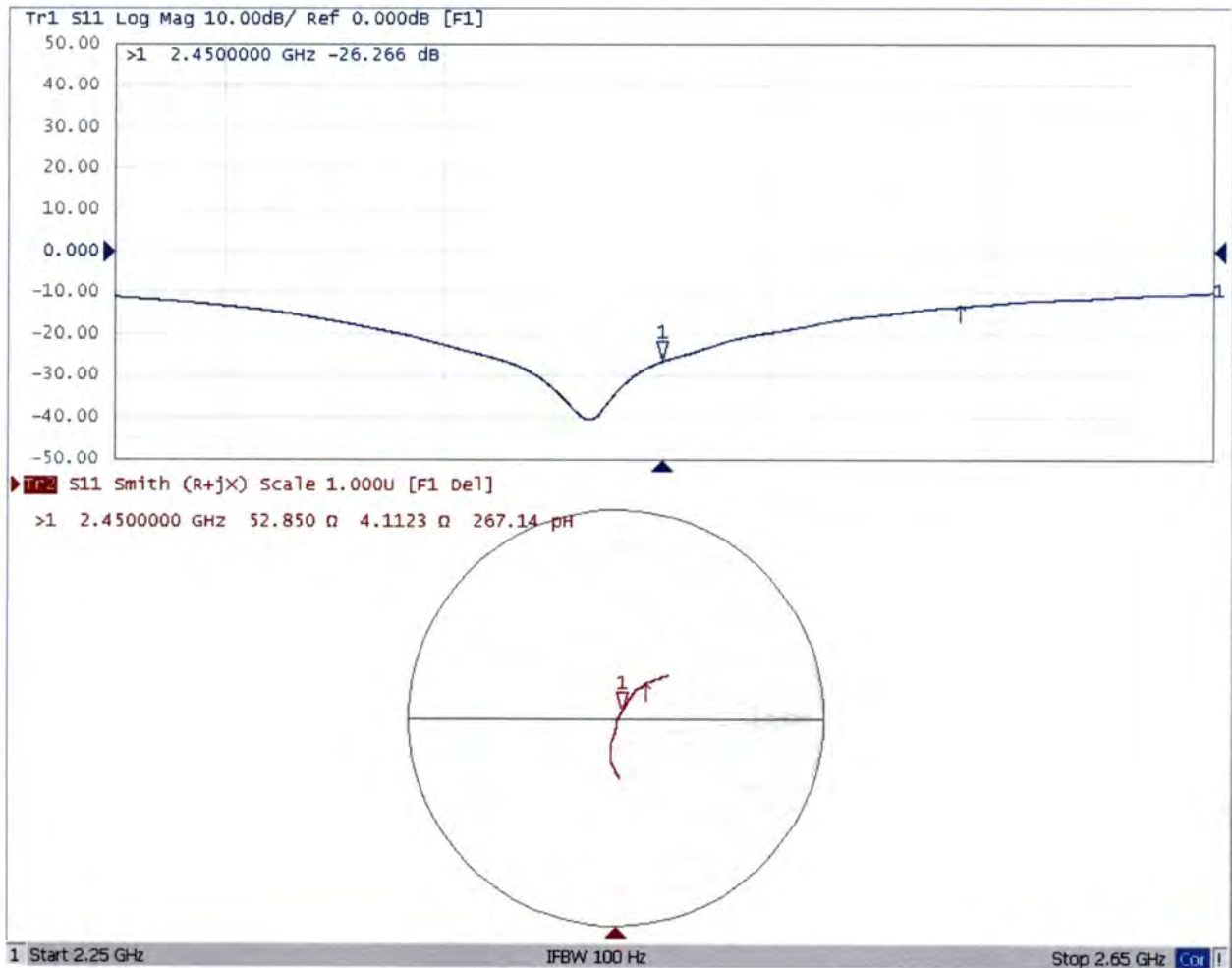


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Impedance Measurement Plot for Head TSL





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DASY5 Validation Report for Body TSL

Date: 12.07.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 733

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.943$ S/m; $\epsilon_r = 53.12$; $\rho = 1000$ kg/m³

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.46, 7.46, 7.46); Calibrated: 9/26/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

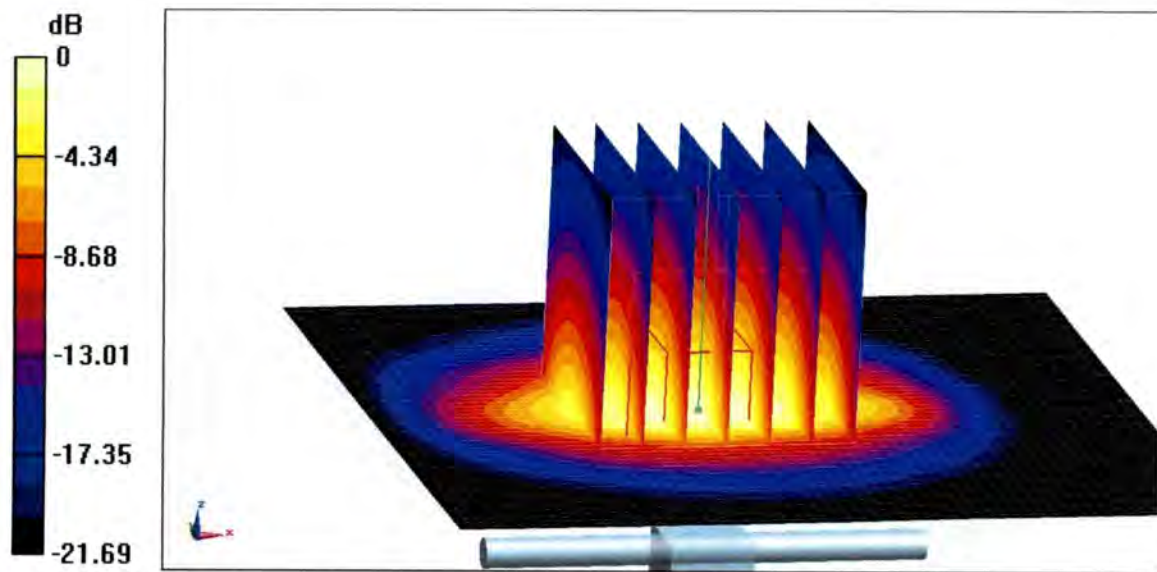
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.60 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 26.0 W/kg

SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.85 W/kg

Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.2 W/kg = 12.83 dBW/kg



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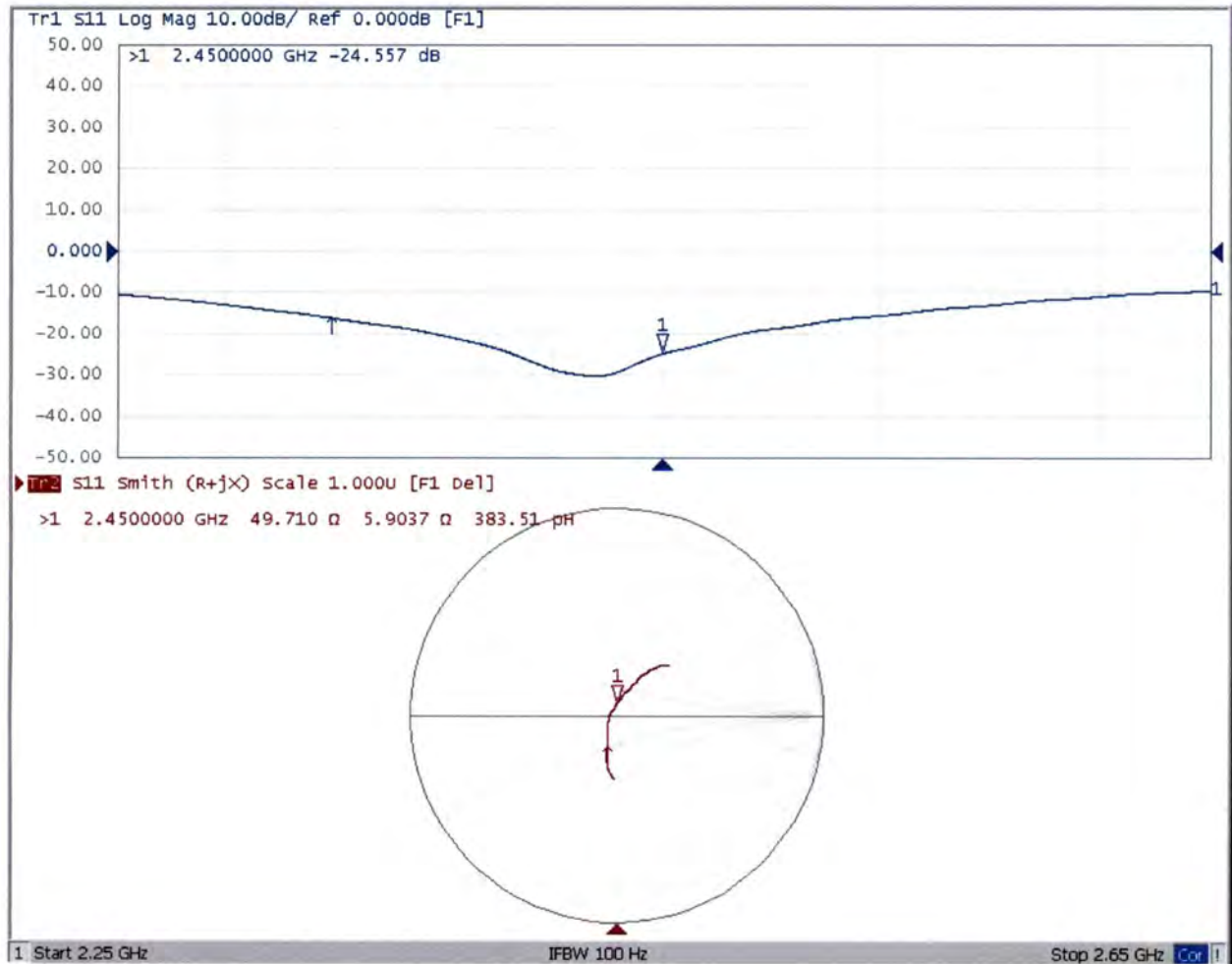
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Impedance Measurement Plot for Body TSL





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Client

SGS(Boce)

Certificate No: Z16-97244

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1165**

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

Calibration date: **December 13, 2016**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
ReferenceProbe EX3DV4	SN 7307	19-Feb-16(SPEAG,No.EX3-7307_Feb16)	Feb-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
NetworkAnalyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

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

Issued: December 15, 2016

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



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Glossary:

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

Calibration is Performed According to the Following Standards:

- 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
- 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
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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