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TEST REPORT

Report No. ..... :	**CHTEW21050136**	Report verificaiton:
Project No. ..... :	**SHT2105041001EW**	
FCC ID ..... :	**2AZP5-FS28001**	
Applicant's name ..... :	**DUO AMERICA, LLC**	
Address ..... :	8925 NW 26TH ST, DORAL, MIAMI, FL 33172 UNITED STATES OF AMERICA	
Test item description ..... :	**Mobile Phone**	
Trade Mark ..... :	HYUNDAI	
Model/Type reference ..... :	L365	
Listed Model(s) ..... :	-	
Standard ..... :	**FCC 47 CFR Part2.1093** **IEEE Std C95.1, 1999 Edition** **IEEE 1528: 2013**	
Date of receipt of test sample..... :	May 12,2021	
Date of testing..... :	May 12,2021 ~ May 17,2021	
Date of issue..... :	May 24,2021	
Result ..... :	**PASS**	

Compiled by (position+printedname+signature)... :	File administrators:Fanghui Zhu	Fanghui Zhu
Supervised by (position+printedname+signature)... :	Test Engineer: Patrick Qiu	Patrick . Qiu
Approved by (position+printedname+signature)... :	Manager: Hans Hu	Hans Hu

Testing Laboratory Name ..... :	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address ..... :	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

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The test report merely correspond to the test sample.

Contents

1 . Statement of Compliance

Maximum Reported SAR (W/kg @1g)			
RF Exposure Conditions	PCE	DTS	Simultaneous TX
Head	0.296	0.271	0.567
Body-worn(Dist.= 10mm)	1.040	0.243	1.283
Hotspot(Dist.= 10mm)	1.040	0.243	1.283

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2 . Test Standards and Report version

2.1. Test Standards

The tests were performed according to following standards:

FCC 47 Part 2.1093: Radiofrequency radiation exposure evaluation: portable devices.
IEEE Std C95.1, 1999 Edition: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
IEEE Std 1528™-2013: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

FCC published RF exposure KDB procedures:
865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz
865664 D02 RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations
447498 D01 General RF Exposure Guidance v06: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
248227 D01 802 11 Wi-Fi SAR v02r02: SAR Measurement Proceduresfor802.11 a/b/g Transmitters
648474 D04 Handset SAR v01r03: SAR Evaluation Considerations for Wireless Handsets
941225 D01 3G SAR Procedures v03r01: SAR Measurement Procedures for 3G Devices
941225 D05 SAR for LTE Devices v02r05: SAR Evaluation Considerations for LTE Devices
941225 D06 Hotspot Mode v02r01: SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

TCB workshop April, 2019; Page 19, Tissue Simulating Liquids (TSL)

2.2. Report version

Revision No.	Date of issue	Description
N/A	2021-05-14	Original

3. Summary

3.1. Client Information

Applicant:	DUO AMERICA, LLC
Address:	8925 NW 26TH ST, DORAL, MIAMI, FL 33172 UNITED STATES OF AMERICA
Manufacturer:	Shenzhen Water World Co., Ltd.
Address:	No. 602, Block B, Digital Building, Garden City, NO. 1079, Nanhai Road, Shekou Subdistrict, Nanshan District, Shenzhen, Guangdong, China

3.2. Product Description

Main unit	
Name of EUT:	Mobile Phone
Trade Mark:	HYUNDAI
Model No.:	L365
Listed Model(s):	-
Power supply:	DC 3.7V by battery Recharged by DC 5.0V/0.7A
Device Category:	Portable
Product stage:	Production unit
RF Exposure Environment:	General Population/Uncontrolled
HTW test sample No.:	YPHT21050410001
Hardware version:	A356-MB-V0.2
Software version:	HYUNDAI_L365_V1.1.3_20210426
Device Dimension:	Overall (Length x Width x Thickness): x x mm
Ancillary unit	

3.3. RF Specification Description

GSM	
Operation Band:	GSM850 PCS1900
Support Network:	GSM GPRS EGPRS
Operating Mode:	GSM:GMSK GPRS:GMSK EGPRS:8PSK
Device Class:	B
GPRS Multi-Slot Class:	12
EGPRS Multi-Slot Class:	12
Antenna Type:	PIFA
Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No	

WCDMA	
Operation Band:	FDD Band II FDD Band V
Power Class:	Class 3
Operating Mode:	UMTS R7 (Voice & Data) HSDPA HSUPA HSPA+
Antenna Type:	PIFA
LTE	
Operation Band:	FDD Band 2 FDD Band 4 FDD Band 7
Power Class:	Class 3
Operating Mode:	QPSK 16QAM
Antenna Type:	PIFA
Note:EUT supports LTE Band 28B.	
Does this device support Carrier Aggregation (CA)? ☐ Yes ☒ No	
Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No	
Wi-Fi 2.4G	
Operating Mode:	802.11b 802.11g 802.11n(HT20) 802.11n(HT40)
Antenna Type:	PIFA
Does this device 2.4GHz Wi-Fi support hotspot operation? ☒ Yes ☐ No	

Bluetooth	
Bluetooth version:	V4.2
Support function:	EDR
Operating Mode:	GFSK π/4DQPSK 8DPSK
Antenna Type:	PIFA
Does this device support Bluetooth Tethering? ☒ Yes ☐ No	
Bluetooth	
Bluetooth version:	V4.2
Support function:	BLE
Operating Mode:	GFSK
Antenna Type:	PIFA
Does this device support Bluetooth Tethering? ☒ Yes ☐ No	

Remark:

1. *The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power.*
2. *The Test EUT support two SIM card(SIM1,SIM2),so all the tests are performed at each SIM card (SIM1,SIM2) mode, the datum recorded is the worst case for all the mode at SIM1 Card mode.*

3.4. Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China	
Connect information:	Tel: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn	
Qualifications	Type	Accreditation Number
	FCC	762235

3.5. Environmental conditions

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

Ambient temperature	18 °C to 25 °C
Ambient humidity	30%RH to 70%RH
Air Pressure	950-1050mbar

4. Equipments Used during the Test

Used	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date (YY-MM-DD)	Due date (YY-MM-DD)
●	Data Acquisition Electronics DAEx	SPEAG	DAE4	1549	2021/03/23	2022/03/22
●	E-field Probe	SPEAG	EX3DV4	7494	2021/04/09	2022/04/08
●	Universal Radio Communication Tester	R&S	CMW500	137681	2020/06/18	2021/06/17
● Tissue-equivalent liquids Validation						
●	Dielectric Assessment Kit	SPEAG	DAK-3.5	1267	N/A	N/A
○	Dielectric Assessment Kit	SPEAG	DAK-12	1130	N/A	N/A
●	Network analyzer	Keysight	E5071C	MY46733048	2020/10/15	2021/10/14
● System Validation						
○	System Validation Antenna	SPEAG	CLA-150	4024	2021/01/25	2024/01/24
○	System Validation Dipole	SPEAG	D450V3	1102	2021/01/20	2024/01/19
○	System Validation Dipole	SPEAG	D750V3	1180	2021/01/22	2024/01/21
●	System Validation Dipole	SPEAG	D835V2	4d238	2021/01/22	2024/01/21
●	System Validation Dipole	SPEAG	D1750V2	1164	2021/01/22	2024/01/21
●	System Validation Dipole	SPEAG	D1900V2	5d226	2021/01/22	2024/01/21
●	System Validation Dipole	SPEAG	D2450V2	1009	2021/01/25	2024/01/24
●	System Validation Dipole	SPEAG	D2600V2	1150	2021/01/25	2024/01/24
●	System Validation Dipole	SPEAG	D5GHzV2	1273	2021/01/26	2024/01/25
●	Signal Generator	R&S	SMB100A	114360	2020/08/11	2021/08/10
●	Power Viewer for Windows	R&S	N/A	N/A	N/A	N/A
●	Power sensor	R&S	NRP18A	101010	2020/08/11	2021/08/10
●	Power sensor	R&S	NRP18A	101386	2020/06/08	2021/06/07
●	Power Amplifier	BONN	BLWA 0160-2M	1811887	2020/11/12	2021/11/11
●	Dual Directional Coupler	Mini-Circuits	ZHDC-10-62-S+	F975001814	2020/11/12	2021/11/11
●	Attenuator	Mini-Circuits	VAT-3W2+	1819	2020/11/12	2021/11/11
●	Attenuator	Mini-Circuits	VAT-10W2+	1741	2020/11/12	2021/11/11

Note:

1. *The Probe,Dipole and DAE calibration reference to the Appendix B and C.*
2. *Referring to KDB865664 D01, the dipole calibration interval can be extended to 3 years with justifcatio. The dipole are also not physically damaged or repaired during the interval.*

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ⩽ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.

6. SAR Measurements System Configuration

6.1. SAR Measurement Set-up

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

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

A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

A unit to operate the optical surface detector which is connected to the EOC.

The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.

The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003.

DASY5 software and SEMCAD data evaluation software.

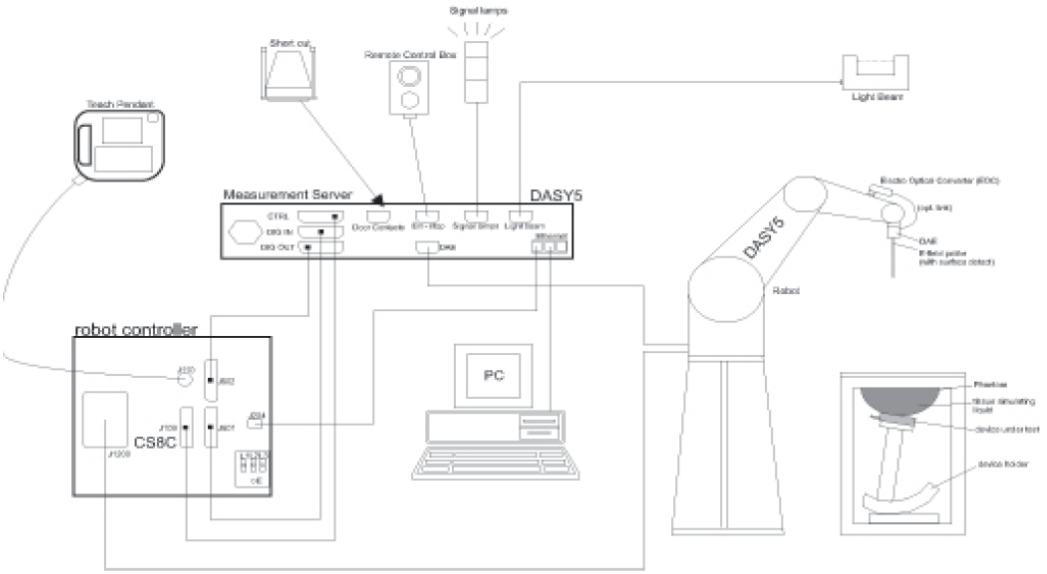
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

The generic twin phantom enabling the testing of left-hand and right-hand usage.

The device holder for handheld Mobile Phones.

Tissue simulating liquid mixed according to the given recipes.

System validation dipoles allowing to validate the proper functioning of the system.



6.2. DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

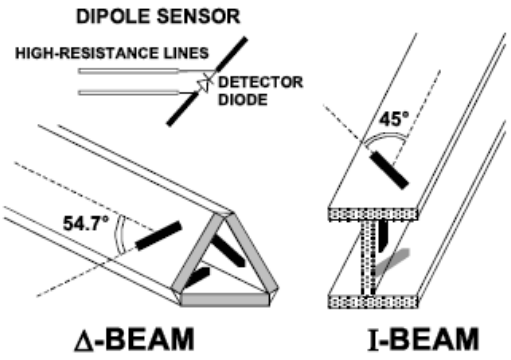
- **Probe Specification**

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	4 MHz to 10 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μW/g to > 100 W/kg; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm
Application	General dosimetry up to 6 GHz Dosimetry in strong gradient fields Compliance tests of Mobile Phones
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

- **Isotropic E-Field Probe**

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

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



6.3. Phantoms

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

SAM-Twin Phantom

6.4. Device Holder

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

Device holder supplied by SPEAG

7. SAR Test Procedure

7.1. Scanning Procedure

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. Measure the local SAR at a test point within 8 mm of the phantom inner surface that is closest to the DUT. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Resolutions per FCC KDB Publication 865664 D01v04

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

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1g and 10g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Resolutions per FCC KDB Publication 865664 D01v04

Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1. The SAR drift shall be kept within ± 5 %.

7.2. Data Storage and Evaluation

Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors),s together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

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

Data Evaluation

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

Probe parameters:	Sensitivity:	Normi, ai0, ai1, ai2
	Conversion factor:	ConvFi
	Diode compression point:	Dcpi
Device parameters:	Frequency:	f
	Crest factor:	cf
Media parameters:	Conductivity:	σ
	Density:	ρ

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

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

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

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

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

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

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

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

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

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

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

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

SAR: local specific absorption rate in W/kg
Etot: total field strength in V/m
σ: conductivity in [mho/m] or [Siemens/m]
ρ: equivalent tissue density in g/cm3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

8. Position of the wireless device in relation to the phantom

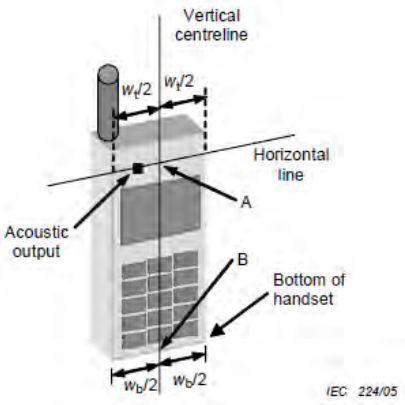
8.1. Head Position

The wireless device define two imaginary lines on the handset, the vertical centreline and the horizontal line, for the handset in vertical orientation as shown in Figures 5a and 5b.

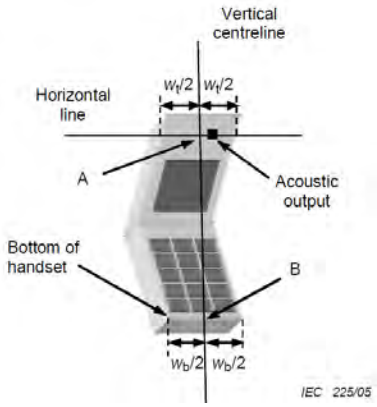
The vertical centreline passes through two points on the front side of the handset: the midpoint of the width W_t of the handset at the level of the acoustic output (point A in Figures 5a and 5b), and the midpoint of the width W_b of the bottom of the handset (point B).

The horizontal line is perpendicular to the vertical centreline and passes through the centre of the acoustic output (see Figures 5a and 5b). The two lines intersect at point A.

Note that for many handsets, point A coincides with the centre of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centreline is not necessarily parallel to the front face of the handset (see Figure 5b), especially for clam-shell handsets, handsets with flip cover pieces, and other irregularly shaped handsets.



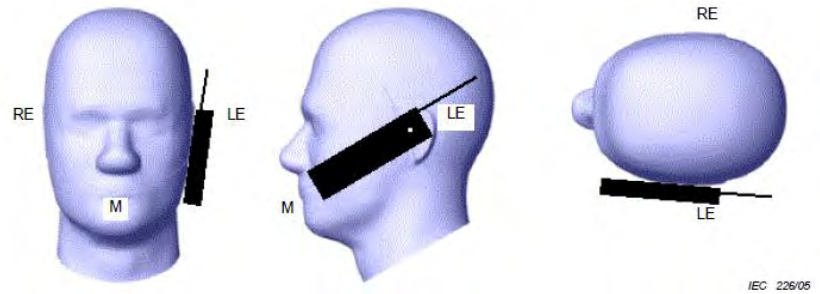
Figures 5a



Figures 5b

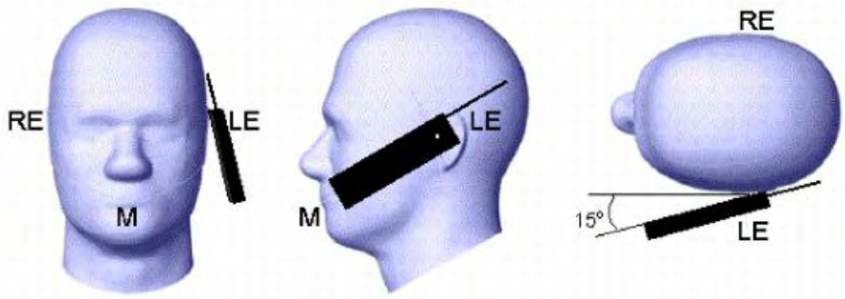
W_t Width of the handset at the level of the acoustic
W_b Width of the bottom of the handset
A Midpoint of the widthwt of the handset at the level of the acoustic output
B Midpoint of the width wb of the bottom of the handset

Cheek position



Picture 2 Cheek position of the wireless device on the left side of SAM

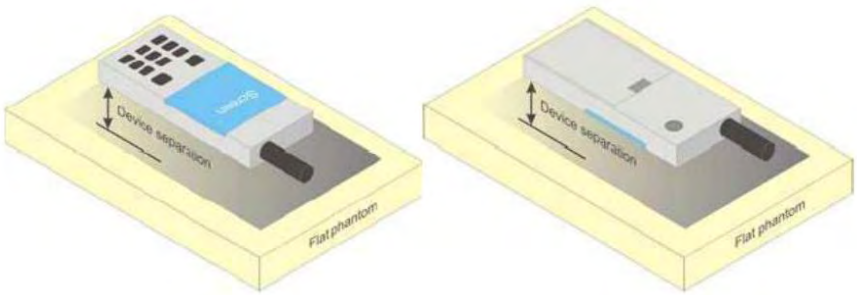
Tilt position



Picture 3 Tilt position of the wireless device on the left side of SAM

8.2. Body Position

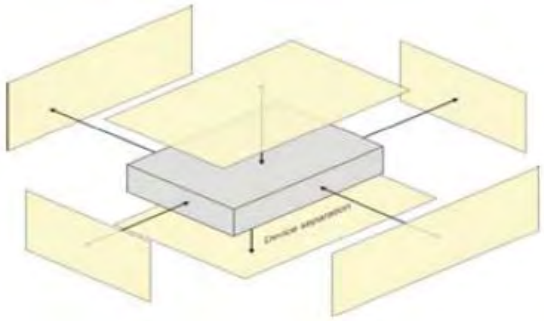
Devices that support transmission while used with body-worn accessories must be tested for body-worn accessory SAR compliance, typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics.
Devices that are designed to operate on the body of users using lanyards and straps or without requiring additional body-worn accessories must be tested for SAR compliance using a conservative minimum test separation distance ≤ 5mm to support compliance.



Picture 4 Test positions for body-worn devices

8.3. Hotspot Mode Exposure conditions

The hotspot mode and body-worn accessory SAR test configurations may overlap for handsets. When the same wireless mode transmission configurations for voice and data are required for SAR measurements, the more conservative configuration with a smaller separation distance should be tested for the overlapping SAR configurations. This typically applies to the back and front surfaces of a handset when SAR is required for both hotspot mode and body-worn accessory exposure conditions. Depending on the form factor and dimensions of a device, the test separation distance used for hotspot mode SAR measurement is either 10 mm or that used in the body-worn accessory configuration, whichever is less for devices with dimension > 9 cm x 5 cm. For smaller devices with dimensions ≤ 9 cm x 5 cm because of a greater potential for next to body use a test separation of ≤ 5 mm must be used.



Picture 5 Test positions for Hotspot Mode

9. Dielectric Property Measurements & System Check

9.1. Tissue Dielectric Parameters

The temperature of the tissue-equivalent medium used during measurement must also be within 18℃ to 25℃ and within ± 2℃ of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3-4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

The dielectric constant (ε_r) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within ± 5% of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for ε_r and σ may be relaxed to ± 10%. This is limited to frequencies ≤ 3 GHz.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Tissue dielectric parameters for Head and Body				
Target Frequency (MHz)	Head		Body	
	ε_r	σ(S/m)	ε_r	σ(S/m)
835	41.5	0.90	55.2	0.97
1750	40.1	1.37	53.4	1.49
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
2600	39.0	1.96	52.5	2.16

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

Dielectric Property Measurements Results:

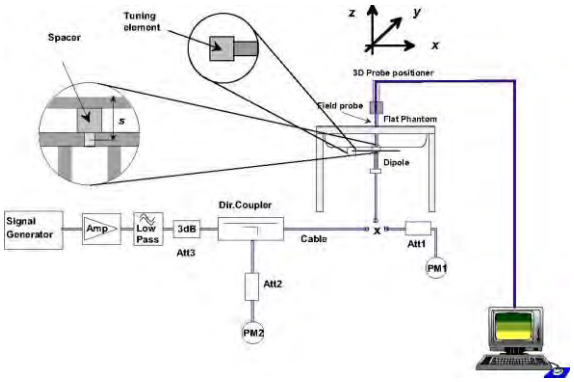
Dielectric performance of Head tissue simulating liquid									
Frequency (MHz)	ε_r		σ(S/m)		Delta (ε_r)	Delta (σ)	Limit	Temp (℃)	Date
	Target	Measured	Target	Measured					
835	41.50	40.38	0.900	0.930	-2.70%	3.36%	±5%	22.3	2021/5/13
1750	40.10	38.31	1.370	1.387	-4.46%	1.24%	±5%	22.8	2021/5/16
1900	40.00	38.11	1.400	1.447	-4.73%	3.36%	±5%	22.6	2021/5/16
2450	39.20	37.57	1.800	1.828	-4.16%	1.56%	±5%	22.4	2021/5/17
2600	39.00	37.34	1.960	1.941	-4.26%	-0.97%	±5%	22.3	2021/5/17

9.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- The results are normalized to 1 W input power.



System Performance Check Setup

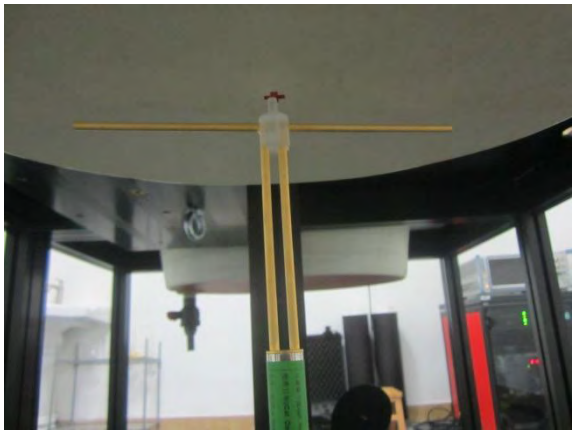


Photo of Dipole Setup

System Check Result:
The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within ±10% of the manufacturer calibrated dipole SAR target.

Head											
Frequency (MHz)	1g SAR			10g SAR			Delta (1g)	Delta (10g)	Limit	Temp (℃)	Date
	Target 1W	Normalize to 1W	Measured 250mW	Target 1W	Normalize to 1W	Measured 250mW					
835	9.39	10.32	2.58	6.14	6.68	1.67	9.90%	8.79%	±10%	22.3	2021/5/13
1750	36.40	39.68	9.92	19.20	20.88	5.22	9.01%	8.75%	±10%	22.8	2021/5/16
1900	39.80	43.20	10.80	20.30	22.16	5.54	8.54%	9.16%	±10%	22.6	2021/5/16
2450	52.00	56.40	14.10	23.90	25.96	6.49	8.46%	8.62%	±10%	22.4	2021/5/17
2600	56.50	59.60	14.90	25.00	26.52	6.63	5.49%	6.08%	±10%	22.3	2021/5/17

Plots of System Performance Check

System Performance Check-Head 835MHz

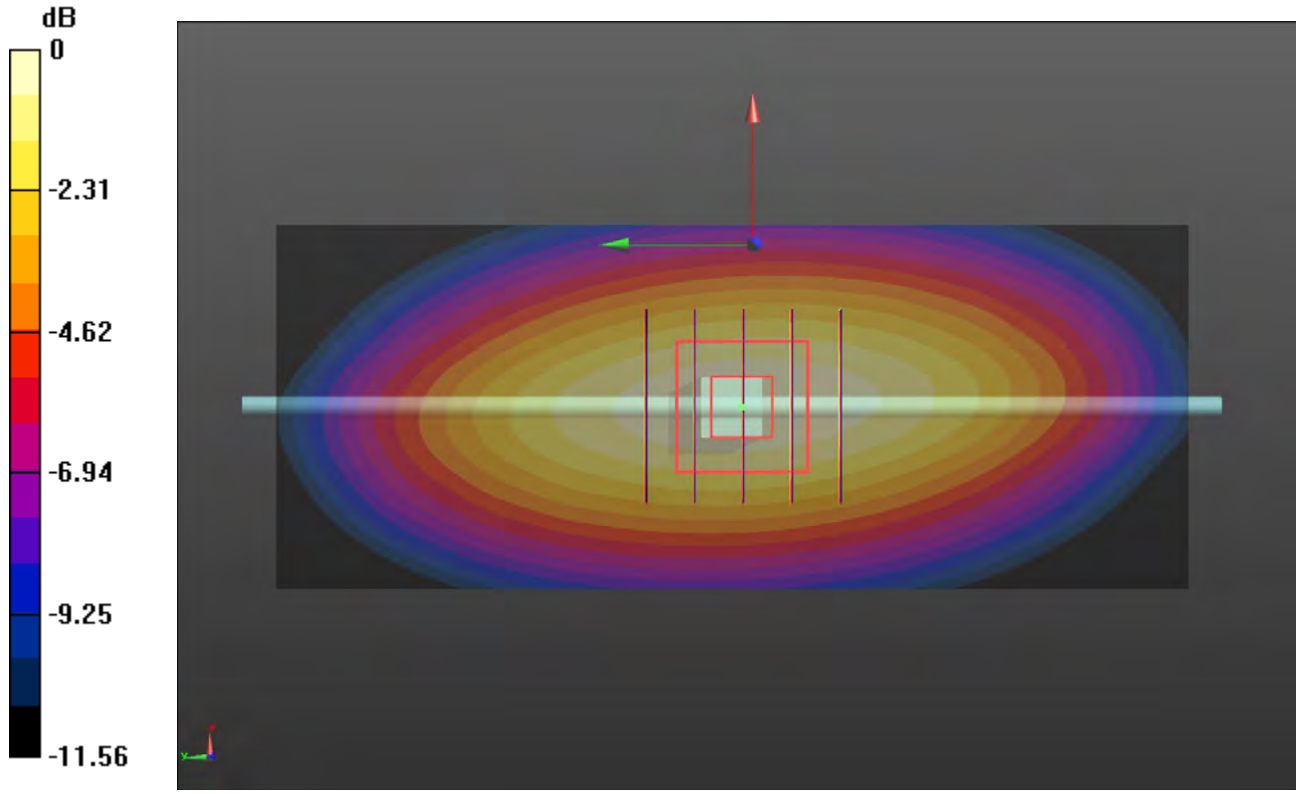
DUT: D835V2; Type: D835V2; Serial: 4d238
Date: 2021-05-13
Communication System: UID 0, CW (0); Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.93 S/m; ε_r = 40.385; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient Temperature:22.5℃;Liquid Temperature:22.3℃;

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(10.41, 10.41, 10.41) @ 835 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=15mm, Pin=250mW/Area Scan (41x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.60 W/kg

Head/d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 62.53 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 4.25 W/kg
SAR(1 g) = 2.6 W/kg; SAR(10 g) = 1.67 W/kg
Maximum value of SAR (measured) = 3.64 W/kg



0 dB = 3.64 W/kg = 5.61 dBW/kg

System Performance Check-Head 1750MHz

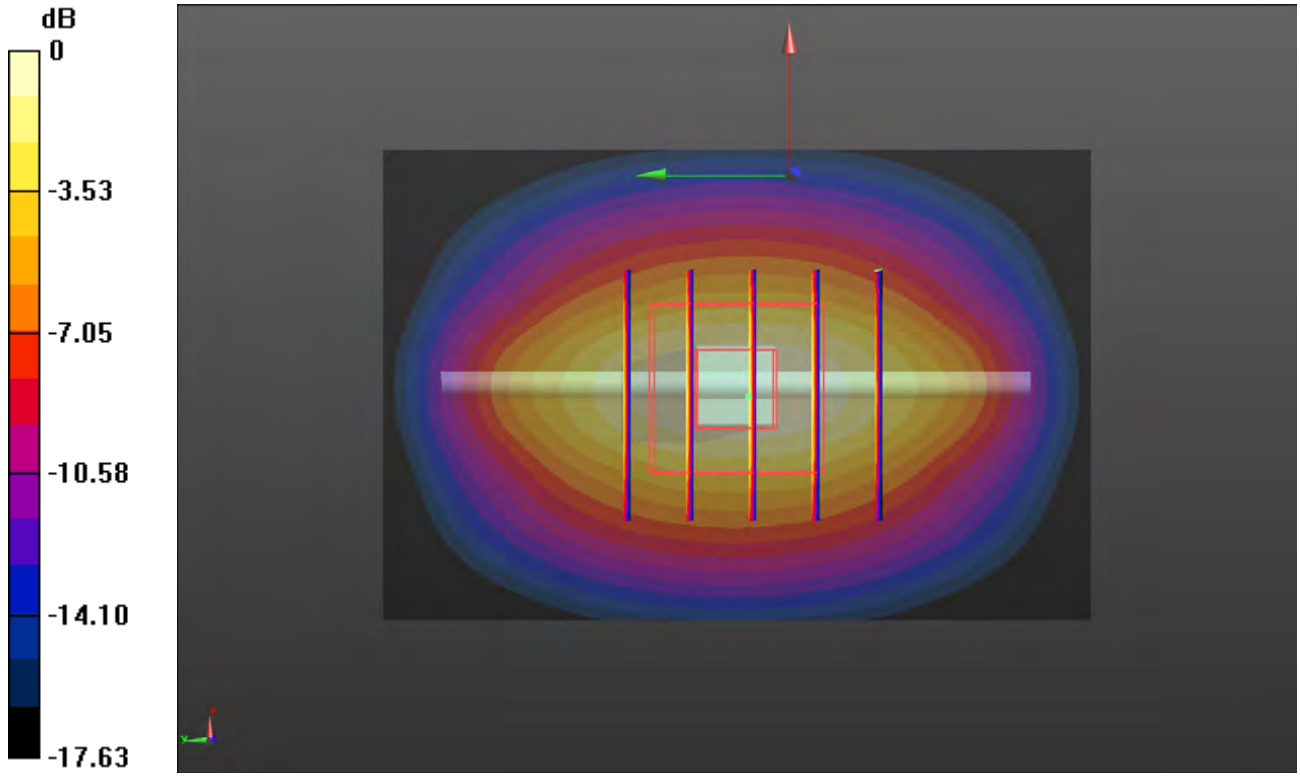
DUT: D1750V2; Type: D1750V2; Serial: 1164
Date: 2021-05-16
Communication System: UID 0, CW (0); Frequency: 1750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1750 MHz; σ = 1.387 S/m; ε_r = 38.31; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient Temperature:22.4℃;Liquid Temperature:22.2℃;

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.88, 8.88, 8.88) @ 1750 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=10mm,Pin=250mW/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 15.5 W/kg

Head/d=10mm,Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 109.0 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 18.6 W/kg
SAR(1 g) = 9.92 W/kg; SAR(10 g) = 5.22 W/kg
Maximum value of SAR (measured) = 15.4 W/kg



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

System Performance Check-Head 1900MHz

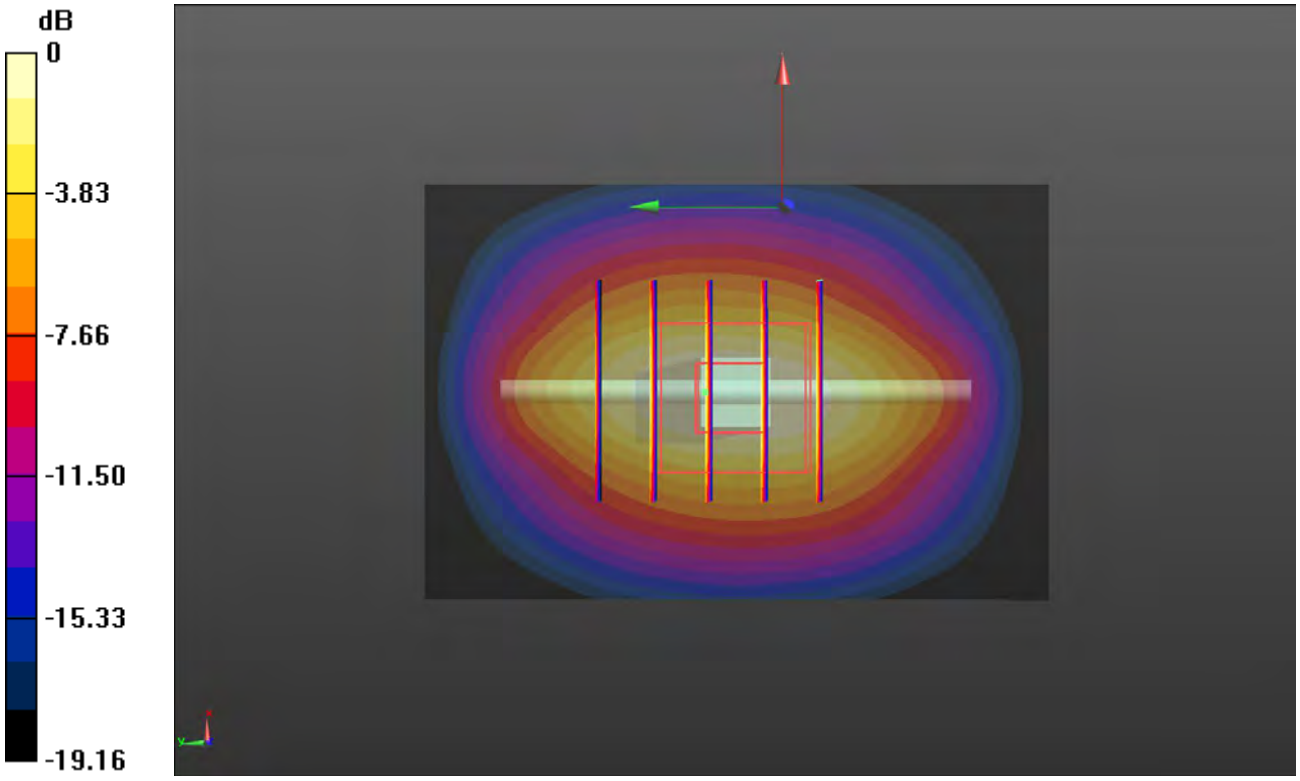
DUT: D1900V2; Type: D1900V2; Serial: 5d226
Date: 2021-05-16
Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.447 S/m; ε_r = 38.114; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient Temperature:22.3℃;Liquid Temperature:22.1℃;

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=10mm,Pin=250mW/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 17.3 W/kg

Head/d=10mm,Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 112.3 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 20.5 W/kg
SAR(1 g) = 10.8 W/kg; SAR(10 g) = 5.54 W/kg
Maximum value of SAR (measured) = 16.7 W/kg



0 dB = 16.7 W/kg = 12.23 dBW/kg

SystemPerformanceCheck-Head 2450MHz

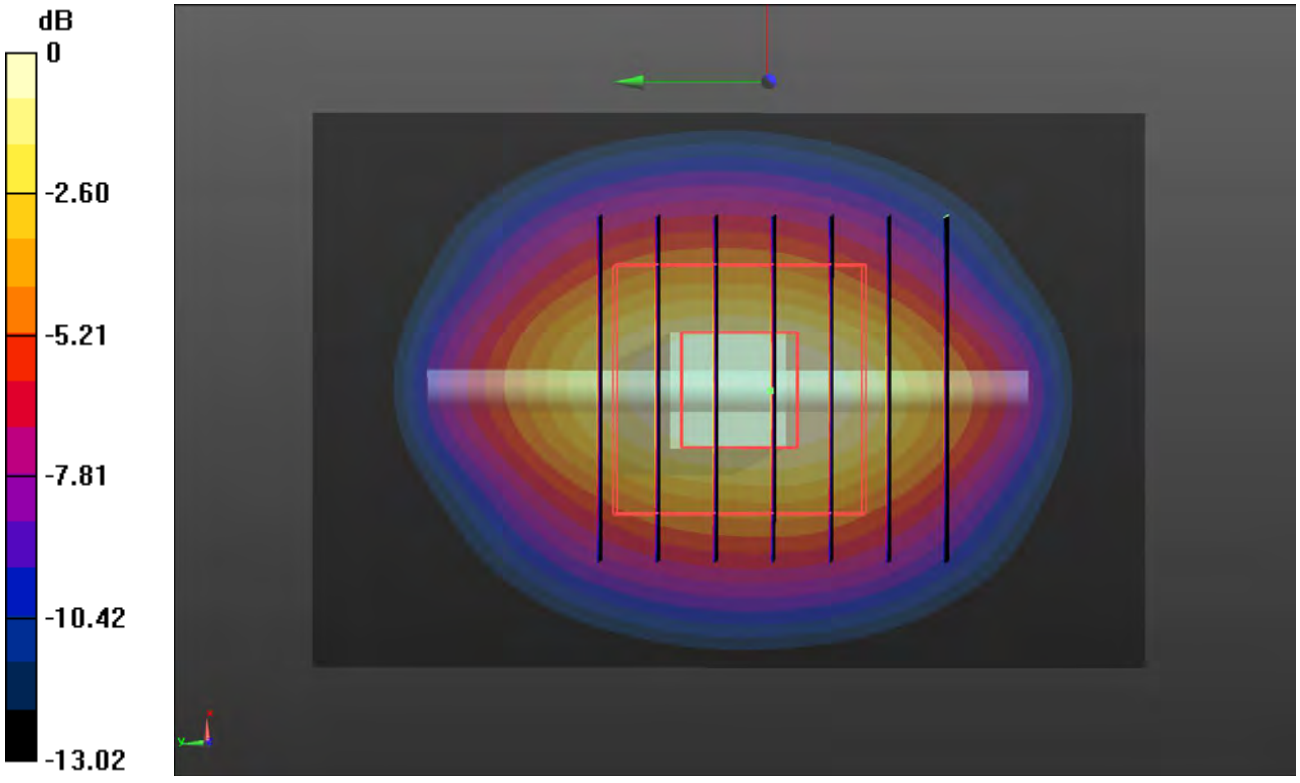
DUT: D2450V2; Type: D2450V2; Serial: 1009
Date: 2021-05-17
Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2450 MHz; σ = 1.828 S/m; ε_r = 37.573; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient Temperature:22.2℃;Liquid Temperature:22.0℃;

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(7.97, 7.97, 7.97) @ 2450 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=10mm,Pin=250mW/Area Scan (41x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 24.6 W/kg

Head/d=10mm,Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 120.2 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 29.9 W/kg
SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.49 W/kg
Maximum value of SAR (measured) = 23.6 W/kg



0 dB = 23.6 W/kg = 13.73 dBW/kg

SystemPerformanceCheck-Head 2600MHz

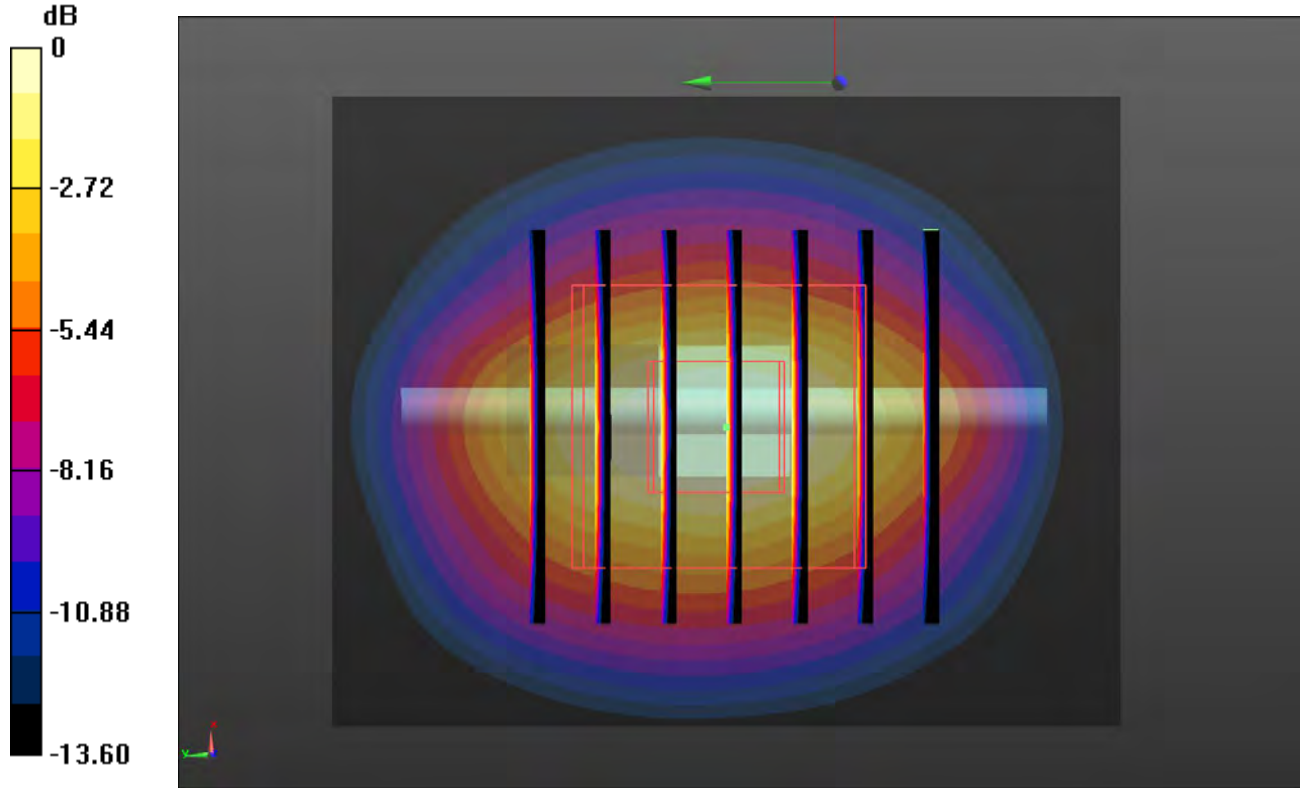
DUT: D2600V2; Type: D2600V2; Serial: 1150
Date: 2021-05-17
Communication System: UID 0, CW (0); Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 1.941 S/m; ε_r = 37.336; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient Temperature:22.3℃;Liquid Temperature:22.1℃;

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(7.68, 7.68, 7.68) @ 2600 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=10mm,Pin=250mW/Area Scan (41x51x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 27.4 W/kg

Head/d=10mm,Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 117.5 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 32.5 W/kg
SAR(1 g) = 14.9 W/kg; SAR(10 g) = 6.63 W/kg
Maximum value of SAR (measured) = 25.9 W/kg



0 dB = 25.9 W/kg = 14.13 dBW/kg

10. SAR Exposure Limits

SAR assessments have been made in line with the requirements of FCC 47 CFR § 2.1093.

Type Exposure	Limit (W/kg)	
	General Population/ Uncontrolled Exposure Environment	Occupational/ Controlled Exposure Environment
Spatial Average SAR (whole body)	0.08	0.4
Spatial Peak SAR (1g cube tissue for head and trunk)	1.6	8.0
Spatial Peak SAR (10g for limb)	4.0	20.0

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

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

11. Conducted Power Measurement Results

11.1. GSM

1. *Per KDB 447498 D01, the maximum output power channel is used for SAR testing and further SAR test reduction.*
2. *Per KDB 941225 D01, considering the possibility of e.g. 3rd party VoIP operation for Head and Body-worn SAR test reduction for GSM and GPRS modes is determined by the source-base time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.*
3. *Per KDB941225 D01, for hotspot SAR test reduction for GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance, For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.*

Mode: GSM850		Burst Average Power (dBm)			Division Factors	Frame-Average Power (dBm)		
		CH128	CH190	CH251		CH128	CH190	CH251
		824.2MHz	836.6MHz	848.8MHz		824.2MHz	836.6MHz	848.8MHz
GSM Voice		32.58	32.58	32.59	-9.03	23.55	23.55	23.56
GPRS (GMSK)	1TXslot	32.48	32.48	32.48	-9.03	23.45	23.45	23.45
	2TXslots	31.22	31.19	31.18	-6.02	25.20	25.17	25.16
	3TXslots	30.02	30.01	29.98	-4.26	25.76	25.75	25.72
	4TXslots	29.00	28.98	29.02	-3.01	25.99	25.97	26.01
EGPRS (8PSK)	1TXslot	28.00	28.02	28.02	-9.03	18.97	18.99	18.99
	2TXslots	25.47	25.51	25.49	-6.02	19.45	19.49	19.47
	3TXslots	24.02	23.97	24.01	-4.26	19.76	19.71	19.75
	4TXslots	22.50	22.49	22.48	-3.01	19.49	19.48	19.47
Mode: PCS1900		**Burst Average Power (dBm)**			Division Factors	**Frame-Average Power (dBm)**		
		CH512	CH661	CH810		CH512	CH661	CH810
		1850.2MHz	1880MHz	1909.8MHz		1850.2MHz	1880MHz	1909.8MHz
GSM Voice		29.60	29.62	29.59	-9.03	20.57	20.59	20.56
GPRS (GMSK)	1TXslot	29.48	29.52	29.50	-9.03	20.45	20.49	20.47
	2TXslots	28.03	27.97	28.00	-6.02	22.01	21.95	21.98
	3TXslots	26.98	27.01	26.99	-4.26	22.72	22.75	22.73
	4TXslots	25.99	26.03	25.99	-3.01	22.98	23.02	22.98
EGPRS (8PSK)	1TXslot	24.99	24.98	25.01	-9.03	15.96	15.95	15.98
	2TXslots	23.99	24.03	23.99	-6.02	17.97	18.01	17.97
	3TXslots	22.98	23.03	23.01	-4.26	18.72	18.77	18.75
	4TXslots	22.00	22.00	21.99	-3.01	18.99	18.99	18.98

Note:

1) Division Factors

To Frame-Average Power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> Burst Average Power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> Burst Average Power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> Burst Average Power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> Burst Average Power divided by (8/4) => -3.01dB

11.2. WCDMA

1. *The following tests were conducted according to the test requirements outlines in 3GPP TS34.121 specification.*
2. *The procedures in KDB 941225 D01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode to determine SAR test exclusion*

A summary of thest setting are illustrated belowe:

HSDPA Setup Configureation:

a) The EUT was connected to base station RS CMU200 referred to the setup configuration
b) The RF path losses were compensated into the measurements
c) A call was established between EUT and base station with following setting:
   i. Set Gain Factors (βc and βd) and parameters were set according to each specific sub-test in the following table, C10.1.4, Quoted from the TS 34.121
   ii. Set RMC 12.2Kbps + HSDPA mode
   iii. Set Cell Power=-86dBm
   iv. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   v. Select HSDPA uplink parameters
   vi. Set Delta ACK, Delta NACK and Delta CQI=8
   vii. Set Ack-Nack repetition Factor to 3
   viii. Set CQI Feedback Cycle (K) to 4ms
   ix. Set CQI repetition factor to 2
   x. Power ctrl mode= all up bits
d) The transmitter maximum output power waw recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1, Note 2)*	**CM** (dB) *(Note 3)*	**MPR** (dB) *(Note 3)*
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 *(Note 4)*	15/15 *(Note 4)*	64	12/15 *(Note 4)*	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

HSUPA Setup Configureation:

a) The EUT was connected to base station RS CMU200 referred to the setup configuration
b) The RF path losses were compensated into the measurements
c) A call was established between EUT and base station with following setting:
   i. Call configs = 5.2b, 5.9b, 5.10b, and 5.13.2B with QPSK
   ii. Set Gain Factors (βc and βd) and parameters (AG index) were set according to each specific sub-test in the following table, C11.1.3, Quoted from the TS 34.121
   iii. Set Cell Power=-86dBm
   iv. Set channel type= 12.2Kbps + HSPA mode
   v. Set UE Target power
   vi. Set Ctrl mode=Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal the target E-TFCI of 75 for Sub-test 1, and other subtest's E-TFCI
d) The transmitter maximum output power waw recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

General Note:

1. Per KDB 941225 D01, SAR for Head / Hotsport / Body-worn Exposure is measured using a 12.2Kbps RMC with TPC bit ocnfigured to all 1s
2. Per KDB 941225 D01 RMC12.2Kbps setting is used to evaluate SAR. If the maximum output power and Tune-up tolerance specified for production units in HSDPA/HSUPA is ≦1/4dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio fo specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC 12.2Kbps and the adjusted SAR is ≦1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA.

Mode		WCDMA Band II			WCDMA Band V		
		Conducted Power (dBm)			Conducted Power (dBm)		
		CH9262	CH9400	CH9538	CH4132	CH4183	CH4233
		1852.4MHz	1880MHz	1907.6MHz	826.4MHz	836.6MHz	846.6MHz
AMR 12.2K		23.46	23.51	23.54	23.43	23.44	23.43
RMC 12.2K		23.50	23.55	23.58	23.47	23.48	23.47
HSDPA	Subtest-1	23.59	23.58	23.50	23.59	23.48	23.60
	Subtest-2	22.68	22.57	22.64	22.54	22.52	22.50
	Subtest-3	21.35	21.30	21.36	21.45	21.38	21.37
	Subtest-4	20.62	20.58	20.50	20.60	20.52	20.62
HSUPA	Subtest-1	21.62	21.56	21.63	21.62	21.68	21.68
	Subtest-2	21.16	21.09	21.03	21.17	21.17	21.08
	Subtest-3	20.11	20.29	20.24	20.28	20.17	20.30
	Subtest-4	19.66	19.66	19.54	19.50	19.53	19.58
	Subtest-5	19.06	19.19	19.07	19.09	19.17	19.10

11.3. LTE

General Note:

1. CMW500 base station simulator was used to setup the connection with EUT; the frequency band, channel,bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUTtransmitting at maximum power and at different configurations which are requested to be reported to FCC, forconducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r03, when a properly configured base station simulator is used for the SAR and powermeasurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r03, start with the largest channel bandwidth and measure SAR for QPSK with 1 RBallocation, using the RB offset and required test channel combination with the highest maximum output power for RBoffsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r03, for QPSK with 100% RB allocation, SAR is not required when the highest maximumoutput power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations andthe highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highestoutput power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also betested.
6. Per KDB 941225 D05v02r03, 16QAM output power for each RB allocation configuration is > not ½ dB higher than thesame configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225D05v02r03, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r03, smaller bandwidth output power for each RB allocation configuration is > not ½ dBhigher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supportedbandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r03, smaller bandwidth SAR testing is not required.

According to April 2015 TCB workshop, SAR test exclusion can be applied for testing overlapping LTE bands as follows:

a) The maximum output power, including tolerance, for the smaller band must be ⩽ the larger band to qualify for the SAR test exclusion.
b) The channel bandwidth and other operating parameters for the smaller band must be fully supported by the larger band.
   - LTE Band 2 (1850-1910 MHz) is covered by LTE Band 25 (1850-1915 MHz)
   - LTE Band 4 (1710-1755 MHz) is covered by LTE Band 66 (1710-1780 MHz)
   - LTE Band 5 (824-849 MHz) is covered by LTE Band 26 (814-849 MHz)
   - LTE Band 17 (704-716 MHz) is covered by LTE Band 12 (699-716 MHz)

LTE-FDD Band 2				Conducted Power(dBm)		
Band-width	Modulation	RB allocation	RB offset	18607	18900	19193
				1850.7MHz	1880MHz	1909.3MHz
1.4MHz	QPSK	1	0	22.11	22.15	22.12
			2	21.14	21.17	21.15
			5	22.10	22.14	22.09
		3	0	21.15	21.19	21.16
			1	22.12	22.11	22.09
			3	21.17	21.19	21.17
		6	0	21.99	22.04	21.99
	16QAM	1	0	20.91	20.93	20.90
			2	22.00	22.02	22.00
			5	20.93	20.96	20.91
		3	0	21.99	22.05	22.02
			1	20.91	20.95	20.92
			3	21.16	21.21	21.15
		6	0	20.00	20.04	20.01
Band-width	Modulation	RB allocation	RB offset	18615	18900	19185
				1851.5MHz	1880MHz	1908.5MHz
3MHz	QPSK	1	0	22.09	22.12	22.10
			8	21.18	21.20	21.18
			14	22.07	22.12	22.08
		8	0	21.19	21.23	21.19
			4	22.09	22.13	22.10
			7	21.17	21.20	21.17
		15	0	21.44	21.47	21.43
	16QAM	1	0	20.29	20.32	20.30
			8	21.39	21.40	21.40
			14	20.28	20.32	20.28
		8	0	21.40	21.43	21.41
			4	20.30	20.32	20.32
			7	21.36	21.41	21.38
		15	0	20.27	20.33	20.26

LTE-FDD Band 2				Conducted Power(dBm)		
Band-width	Modulation	RB allocation	RB offset	18625	18900	19175
				1852.5MHz	1880MHz	1907.5MHz
5MHz	QPSK	1	0	22.08	22.10	22.07
			12	22.09	22.13	22.10
			24	22.07	22.10	22.08
		12	0	21.44	21.47	21.45
			7	21.45	21.49	21.46
			13	21.45	21.50	21.43
		25	0	21.42	21.46	21.43
	16QAM	1	0	21.17	21.20	21.18
			12	21.19	21.23	21.18
			24	21.17	21.20	21.18
		12	0	20.37	20.40	20.38
			7	20.35	20.39	20.34
			13	20.34	20.41	20.35
		25	0	20.31	20.34	20.31
Band-width	Modulation	RB allocation	RB offset	18650	18900	19150
				1855MHz	1880MHz	1905MHz
10MHz	QPSK	1	0	22.09	22.13	22.09
			24	22.09	22.13	22.09
			49	22.08	22.11	22.08
		25	0	21.40	21.44	21.41
			24	21.41	21.46	21.43
			49	21.41	21.46	21.43
		50	0	21.43	21.46	21.42
	16QAM	1	0	21.18	21.20	21.18
			24	21.18	21.22	21.17
			49	21.16	21.19	21.17
		25	0	20.36	20.39	20.37
			24	20.38	20.40	20.37
			49	20.34	20.38	20.35
		50	0	20.32	20.35	20.31

LTE-FDD Band 2				Conducted Power(dBm)		
Band-width	Modulation	RB allocation	RB offset	18675	18900	19125
				1857.5MHz	1880MHz	1902.5MHz
15MHz	QPSK	1	0	22.10	22.13	22.11
			38	22.08	22.14	22.08
			74	22.11	22.14	22.12
		38	0	21.44	21.49	21.46
			18	21.41	21.46	21.40
			37	21.43	21.47	21.44
		75	0	21.34	21.38	21.35
	16QAM	1	0	21.19	21.22	21.20
			38	21.18	21.23	21.18
			74	21.17	21.20	21.18
		38	0	20.32	20.36	20.33
			18	20.36	20.39	20.35
			37	20.34	20.36	20.34
		75	0	20.27	20.32	20.28
Band-width	Modulation	RB allocation	RB offset	18700	18900	19100
				1860MHz	1880MHz	1900MHz
20MHz	QPSK	1	0	22.12	22.15	22.13
			49	22.10	22.14	22.11
			99	22.07	22.13	22.08
		50	0	21.44	21.47	21.45
			25	21.43	21.47	21.44
			50	21.44	21.50	21.36
		100	0	21.37	21.43	21.36
	16QAM	1	0	21.20	21.23	21.21
			49	21.20	21.22	21.18
			99	21.17	21.22	21.19
		50	0	20.39	20.42	20.40
			25	20.38	20.42	20.39
			50	20.32	20.38	20.33
		100	0	20.26	20.32	20.25

LTE-FDD Band 4				Conducted Power(dBm)		
Band-width	Modulation	RB allocation	RB offset	19957	20175	20393
				1710.7MHz	1732.5MHz	1754.3MHz
1.4MHz	QPSK	1	0	21.81	21.82	21.75
			2	21.79	21.85	21.75
			5	21.80	21.86	21.78
		3	0	21.68	21.76	21.68
			1	21.69	21.73	21.66
			3	21.68	21.75	21.65
		6	0	20.85	20.92	20.81
	16QAM	1	0	20.26	20.30	20.23
			2	20.24	20.30	20.22
			5	20.23	20.28	20.21
		3	0	20.00	20.06	19.98
			1	20.02	20.07	19.97
			3	20.00	20.04	19.96
		6	0	19.09	19.15	19.07
Band-width	Modulation	RB allocation	RB offset	19965	20175	20385
				1711.5MHz	1732.5MHz	1753.5MHz
3MHz	QPSK	1	0	21.78	21.84	21.76
			8	21.76	21.83	21.74
			14	21.78	21.83	21.76
		8	0	21.09	21.14	21.07
			4	21.08	21.11	21.06
			7	21.13	21.18	21.09
		15	0	21.05	21.12	21.04
	16QAM	1	0	20.26	20.31	20.23
			8	20.28	20.34	20.25
			14	20.27	20.31	20.24
		8	0	19.39	19.43	19.38
			4	19.37	19.43	19.34
			7	19.38	19.43	19.36
		15	0	19.36	19.44	19.32

LTE-FDD Band 4				Conducted Power(dBm)		
Band-width	Modulation	RB allocation	RB offset	19975	20175	20375
				1712.5MHz	1732.5MHz	1752.5MHz
5MHz	QPSK	1	0	21.77	21.81	21.73
			12	21.78	21.84	21.76
			24	21.76	21.81	21.74
		12	0	21.13	21.18	21.11
			7	21.14	21.20	21.12
			13	21.14	21.21	21.09
		25	0	21.11	21.17	21.09
	16QAM	1	0	20.26	20.31	20.24
			12	20.28	20.34	20.24
			24	20.26	20.31	20.24
		12	0	19.46	19.51	19.44
			7	19.44	19.50	19.40
			13	19.43	19.52	19.41
		25	0	19.40	19.45	19.37
Band-width	Modulation	RB allocation	RB offset	20000	20175	20350
				1715MHz	1732.5MHz	1750MHz
10MHz	QPSK	1	0	21.78	21.84	21.75
			24	21.78	21.84	21.75
			49	21.77	21.82	21.74
		25	0	21.09	21.15	21.07
			24	21.10	21.17	21.09
			49	21.10	21.17	21.09
		50	0	21.12	21.17	21.08
	16QAM	1	0	20.27	20.31	20.24
			24	20.27	20.33	20.23
			49	20.25	20.30	20.23
		25	0	19.45	19.50	19.43
			24	19.47	19.51	19.43
			49	19.43	19.49	19.41
		50	0	19.41	19.46	19.37

LTE-FDD Band 4				Conducted Power(dBm)		
Band-width	Modulation	RB allocation	RB offset	20025	20175	20325
				1717.5MHz	1732.5MHz	1747.5MHz
15MHz	QPSK	1	0	21.79	21.84	21.77
			38	21.77	21.85	21.74
			74	21.80	21.85	21.78
		38	0	21.13	21.20	21.12
			18	21.10	21.17	21.06
			37	21.12	21.18	21.10
		75	0	21.03	21.09	21.01
	16QAM	1	0	20.28	20.33	20.26
			38	20.27	20.34	20.24
			74	20.26	20.31	20.24
		38	0	19.41	19.47	19.39
			18	19.45	19.50	19.41
			37	19.43	19.47	19.40
		75	0	19.36	19.43	19.34
Band-width	Modulation	RB allocation	RB offset	20050	20175	20300
				1720MHz	1732.5MHz	1745MHz
20MHz	QPSK	1	0	21.81	21.86	21.79
			49	21.79	21.85	21.77
			99	21.76	21.84	21.74
		50	0	21.13	21.18	21.11
			25	21.12	21.18	21.10
			50	21.13	21.21	21.02
		100	0	21.06	21.14	21.02
	16QAM	1	0	20.29	20.34	20.27
			49	20.29	20.33	20.24
			99	20.26	20.33	20.25
		50	0	19.48	19.53	19.46
			25	19.47	19.53	19.45
			50	19.41	19.49	19.39
		100	0	19.35	19.43	19.31

LTE-FDD Band 7				Conducted Power(dBm)		
Band-width	Modulation	RB allocation	RB offset	20775	21100	21425
				2502.5MHz	2535MHz	2567.5MHz
5MHz	QPSK	1	0	23.00	23.00	23.01
			12	23.00	23.05	22.99
			24	22.98	23.05	23.00
		12	0	21.89	21.90	21.82
			7	21.89	21.93	21.89
			13	21.86	21.88	21.82
		25	0	21.88	21.96	21.84
	16QAM	1	0	22.01	22.03	22.03
			12	22.02	22.07	22.03
			24	21.97	22.01	21.96
		12	0	20.76	20.77	20.64
			7	20.68	20.74	20.66
			13	20.67	20.72	20.66
		25	0	20.73	20.77	20.69
Band-width	Modulation	RB allocation	RB offset	20800	21100	21400
				2505MHz	2535MHz	2565MHz
10MHz	QPSK	1	0	22.99	22.99	22.96
			24	23.04	23.02	22.95
			49	23.04	23.06	22.98
		25	0	21.90	21.94	21.81
			24	21.91	21.91	21.85
			49	21.84	21.88	21.85
		50	0	21.90	21.90	21.84
	16QAM	1	0	22.02	22.04	22.01
			24	22.05	22.06	22.00
			49	22.01	22.05	22.00
		25	0	20.86	20.89	20.87
			24	20.92	20.93	20.90
			49	20.86	20.87	20.83
		50	0	20.88	20.91	20.86

LTE-FDD Band 7				Conducted Power(dBm)		
Band-width	Modulation	RB allocation	RB offset	20825	21100	21375
				2507.5MHz	2535MHz	2562.5MHz
15MHz	QPSK	1	0	23.02	23.04	22.98
			38	22.97	23.07	23.00
			74	22.99	23.04	22.98
		38	0	21.87	21.87	21.84
			18	21.86	21.92	21.86
			37	21.82	21.91	21.84
		75	0	21.88	21.94	21.88
	16QAM	1	0	22.00	22.04	22.03
			38	22.03	22.07	22.03
			74	22.01	22.04	22.01
		38	0	20.94	20.96	20.83
			18	20.88	20.93	20.85
			37	20.87	20.91	20.84
		75	0	20.91	20.93	20.85
Band-width	Modulation	RB allocation	RB offset	20850	21100	21350
				2510MHz	2535MHz	2560MHz
20MHz	QPSK	1	0	23.03	23.08	23.03
			49	23.02	23.10	23.06
			99	23.00	23.08	23.01
		50	0	21.86	21.89	21.90
			25	21.88	21.93	21.88
			50	22.06	22.09	22.04
		100	0	21.91	21.97	21.90
	16QAM	1	0	22.01	22.04	22.00
			49	22.03	22.09	22.04
			99	22.04	22.06	22.01
		50	0	20.87	20.94	20.87
			25	20.90	20.94	20.87
			50	20.88	20.94	20.85
		100	0	20.90	20.96	20.99

11.4. Wi-Fi

For 2.4GHz Wi-Fi SAR testing, highest average RF output power channel for the lowest data rate for 802.11b were for SAR evaluation.

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

SAR testing is not required for OFDM mode(s) 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.

Wi-Fi 2.4G				
Mode	Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Conducted Average Power (dBm)
802.11b	1	2412	19.78	15.35
	6	2437	18.04	15.53
	11	2462	19.00	15.93
802.11g	1	2412	19.24	16.10
	6	2437	19.85	16.50
	11	2462	19.32	16.06
802.11n (HT20)	1	2412	19.22	15.52
	6	2437	19.41	15.86
	11	2462	19.35	15.37

11.5. Bluetooth

Bluetooth			
Mode	Channel	Frequency (MHz)	Conducted Peak Power (dBm)
GFSK	0	2402	8.35
	39	2441	7.30
	78	2480	6.91
π/4QPSK	0	2402	7.89
	39	2441	7.61
	78	2480	7.60
8DPSK	0	2402	7.34
	39	2441	7.13
	78	2480	7.16
BLE	0	2402	1.33
	19	2440	0.92
	39	2480	0.43

12. Maximum Tune-up Limit

GSM		
Mode	Maximum Tune-up (dBm)	
	GSM850	PCS1900
GSM (GMSK, 1Tx Slot)	33.00	30.00
GPRS (GMSK, 1Tx Slot)	33.00	30.00
GPRS (GMSK, 2Tx Slots)	32.00	28.50
GPRS (GMSK, 3Tx Slots)	30.50	27.50
GPRS (GMSK, 4Tx Slots)	29.50	26.50
EGPRS (8PSK, 1Tx Slot)	28.50	25.50
EGPRS (8PSK, 2Tx Slots)	27.50	24.50
EGPRS (8PSK, 3Tx Slots)	25.00	24.00
EGPRS (8PSK, 4Tx Slots)	23.50	23.00

WCDMA		
Mode	Maximum Tune-up (dBm)	
	FDD Band II	FDD Band V
AMR 12.2Kbps	24	24
RMC 12.2Kbps	24	24
HSDPA Subtest-1	24	24
HSDPA Subtest-2	23	23
HSDPA Subtest-3	22	22
HSDPA Subtest-4	22	22
HSUPA Subtest-1	22	22
HSUPA Subtest-2	22	22
HSUPA Subtest-3	21	21
HSUPA Subtest-4	21	21
HSUPA Subtest-5	20	20

LTE				
Fequency Band	Band-width(MHz)	Modulation	RB allocation	Maximum Tune-up (dBm)
FDD Band 2	1.4	QPSK	1	22.50
			3	22.50
			6	21.50
		16QAM	1	21.50
			3	21.00
			6	20.50
	3	QPSK	1	22.50
			8	21.50
			15	21.50
		16QAM	1	21.50
			8	20.50
			15	20.50
	5	QPSK	1	22.50
			12	21.50
			25	21.50
		16QAM	1	21.50
			12	20.50
			25	20.50
	10	QPSK	1	22.50
			25	21.50
			50	21.50
		16QAM	1	21.50
			25	20.50
			50	20.50
	15	QPSK	1	22.50
			38	21.50
			75	21.50
		16QAM	1	21.50
			38	20.50
			75	20.50
	20	QPSK	1	22.50
			50	21.50
			100	21.50
		16QAM	1	21.50
			50	20.50
			100	20.50

LTE				
Fequency Band	Band-width(MHz)	Modulation	RB allocation	Maximum Tune-up (dBm)
FDD Band 4	1.4	QPSK	1	22.00
			3	22.00
			6	21.00
		16QAM	1	20.50
			3	20.50
			6	19.50
	3	QPSK	1	22.00
			8	21.50
			15	21.50
		16QAM	1	20.50
			8	19.50
			15	19.50
	5	QPSK	1	22.00
			12	21.50
			25	21.50
		16QAM	1	20.50
			12	20.00
			25	19.50
	10	QPSK	1	22.00
			25	21.50
			50	21.50
		16QAM	1	20.50
			25	20.00
			50	19.50
	15	QPSK	1	22.00
			38	21.50
			75	21.50
		16QAM	1	20.50
			38	19.50
			75	19.50
	20	QPSK	1	22.00
			50	21.50
			100	21.50
		16QAM	1	20.50
			50	20.00
			100	19.50

LTE				
Fequency Band	Band-width(MHz)	Modulation	RB allocation	Maximum Tune-up (dBm)
FDD Band 7	5	QPSK	1	23.50
			12	22.00
			25	22.00
		16QAM	1	22.50
			12	21.00
			25	21.00
	10	QPSK	1	23.50
			25	22.00
			50	22.00
		16QAM	1	22.50
			25	21.00
			50	21.00
	15	QPSK	1	23.50
			38	22.00
			75	22.00
		16QAM	1	22.50
			38	21.00
			75	21.00
	20	QPSK	1	23.50
			50	22.50
			100	22.00
		16QAM	1	22.50
			50	21.00
			100	21.00

Wi-Fi 2.4G		
Mode	Channel	Maximum Tune-up (dBm) Conducted Average Power
802.11b	1	15.50
	6	16.00
	11	16.00
802.11g	1	16.50
	6	16.50
	11	16.50
802.11n(HT20)	1	16.00
	6	16.00
	11	15.50

Bluetooth		
Mode	Channel	Maximum Tune-up (dBm) Conducted Average Power
GFSK	0	8.50
	39	7.50
	78	7.00
π/4 QPSK	0	8.00
	39	8.00
	78	8.00
8DPSK	0	7.50
	39	7.50
	78	7.50
BLE	0	1.50
	19	1.00
	39	0.50

Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100MHz to 6GHz at test separation distances ≦50mm are determined by:

[(max. Power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] * [√f(GHz)] ≦3.0 for 1-g SAR

Band/Mode	F(GHz)	Position	Separation Distance (mm)	Exclusion Thresholds	SAR test exclusion
Bluetooth	2.45	Head	0	2.2	0.295
		Body	10	1.1	0.148

Per KDB 447498 D01, when the minimum test separation distance is <5mm, a distance of 5mm is applied to determine SAR test exclusion.

The test exclusion thereshold is ≦3, SAR testing is not required.

13. Antenna Location

Distance of the Antenna to the EUT surface/edge(mm)						
Antenna	Rear	Front	Top side	Bottom side	Right side	Left side
WWAN	＜25mm	＜25mm	>25mm	＜25mm	＜25mm	＜25mm
Wi-Fi/BT	＜25mm	＜25mm	＜25mm	>25mm	>25mm	＜25mm

Positions for SAR tests; Hotspot mode						
Antenna	Rear	Front	Top side	Bottom side	Right side	Left side
WWAN	Yes	Yes	No	Yes	Yes	Yes
Wi-Fi/BT	Yes	Yes	Yes	No	No	Yes

General note:
Referring to KDB941225 D06, when the overall device length and width are >9cm*5cm, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

14. Measured and Reported SAR Results

SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for WWAN = Measured SAR *Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi and Bluetooth = Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 648474 D04 Handset SAR:

With headset attached, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset. Additional 1-g SAR testing at 5 mm is not required when hotspot mode 10-g extremity SAR is not required for the surfaces and edges; since all 1-g reported SAR < 1.2 W/kg.

KDB 941225 D01 SAR test for 3G SAR Test Reduction Procedure:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

GSM Guidance

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Please refer to section 9. for GSM power verification.
SAR is not required for EDGE (8PSK) mode because the maximum output power and tune-up limit is ≤ 1/4dB higher than GPRS/EDGE (GMSK) or the adjusted SAR of the highest reported SAR of GPRS/EDGE (GMSK) is ≤ 1.2W/kg.

W-CDMA Guidance

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC (Head) and other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC (Body-Worn Accessory) as the primary mode.
SAR measurement is not required for the HSDPA, HSUPA, DC-HSDPA and HSPA+. When primary mode and the adjusted SAR is ≤ 1.2 W/kg and secondary mode is ≤ ¼ dB higher than the primary mode

KDB 941225 D05 SAR for LTE Devices:

SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
- Testing for 16-QAM and 64-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.

- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

KDB 248227 D01 SAR meas for 802.11:

When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for the initial test position is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions,when the reported SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

14.1. Head SAR

GSM850										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
GPRS (4Tx slots)	Left Cheek	128	824.2	32.58	33.00	1.100	-	-	-	-
		190	836.6	32.58	33.00	1.100	-0.06	0.201	0.221	-
		251	848.8	32.59	33.00	1.100	-	-		-
	Left Tilt	128	824.2	32.58	33.00	1.100	-	-	-	-
		190	836.6	32.58	33.00	1.100	0.08	0.160	0.176	-
		251	848.8	32.59	33.00	1.100	-	-	-	-
	Right Cheek	128	824.2	32.58	33.00	1.100	-	-	-	-
		190	836.6	32.58	33.00	1.100	0.13	0.213	0.235	1
		251	848.8	32.59	33.00	1.100	-	-	-	-
	Right Tilt	128	824.2	32.58	33.00	1.100	-	-	-	-
		190	836.6	32.58	33.00	1.100	-0.14	0.163	0.179	-
		251	848.8	32.59	33.00	1.100	-	-	-	-

PCS1900										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
GPRS (4Tx slots)	Left Cheek	512	1850.2	29.60	30.00	1.100	-	-	-	-
		661	1880	29.62	30.00	1.090	0.16	0.229	0.250	2
		810	1909.8	29.59	30.00	1.100	-	-	-	-
	Left Tilt	512	1850.2	29.60	30.00	1.100	-	-	-	-
		661	1880	29.62	30.00	1.090	0.11	0.170	0.186	-
		810	1909.8	29.59	30.00	1.100	-	-	-	-
	Right Cheek	512	1850.2	29.60	30.00	1.100	-	-	-	-
		661	1880	29.62	30.00	1.090	-0.08	0.210	0.229	-
		810	1909.8	29.59	30.00	1.100	-	-	-	-
	Right Tilt	512	1850.2	29.60	30.00	1.100	-	-	-	-
		661	1880	29.62	30.00	1.090	-0.10	0.160	0.175	-
		810	1909.8	29.59	30.00	1.100	-	-	-	-

WCDMA Band II										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
RMC 12.2K	Left Cheek	9262	1852.4	23.50	24.00	1.120	-	-	-	-
		9400	1880	23.55	24.00	1.110	0.09	0.267	0.296	3
		9538	1907.6	23.58	24.00	1.100	-	-	-	-
	Left Tilt	9262	1852.4	23.50	24.00	1.120	-	-	-	-
		9400	1880	23.55	24.00	1.110	0.05	0.215	0.238	-
		9538	1907.6	23.58	24.00	1.100	-	-	-	-
	Right Cheek	9262	1852.4	23.50	24.00	1.120	-	-	-	-
		9400	1880	23.55	24.00	1.110	-0.15	0.255	0.282	-
		9538	1907.6	23.58	24.00	1.100	-	-	-	-
	Right Tilt	9262	1852.4	23.50	24.00	1.120	-	-	-	-
		9400	1880	23.55	24.00	1.110	-0.05	0.195	0.216	-
		9538	1907.6	23.58	24.00	1.100	-	-	-	-

WCDMA Band V										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
RMC 12.2K	Left Cheek	4132	826.4	23.47	24.00	1.130	-	-	-	-
		4183	836.6	23.48	24.00	1.130	0.16	0.213	0.240	-
		4233	846.6	23.47	24.00	1.130	-	-	-	-
	Left Tilt	4132	826.4	23.47	24.00	1.130	-	-	-	-
		4183	836.6	23.48	24.00	1.130	-0.05	0.172	0.194	-
		4233	846.6	23.47	24.00	1.130	-	-	-	-
	Right Cheek	4132	826.4	23.47	24.00	1.130	-	-	-	-
		4183	836.6	23.48	24.00	1.130	0.12	0.225	0.254	4
		4233	846.6	23.47	24.00	1.130	-	-	-	-
	Right Tilt	4132	826.4	23.47	24.00	1.130	-	-	-	-
		4183	836.6	23.48	24.00	1.130	0.10	0.185	0.209	-
		4233	846.6	23.47	24.00	1.130	-	-	-	-

LTE Band 2										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
20M QPSK 1RB	Left Cheek	18700	1860	22.12	22.50	1.090	-	-	-	-
		18900	1880	22.15	22.50	1.080	0.19	0.217	0.235	5
		19100	1900	22.13	22.50	1.090	-	-	-	-
	Left Tilt	18700	1860	22.12	22.50	1.090	-	-	-	-
		18900	1880	22.15	22.50	1.080	-0.21	0.166	0.180	-
		19100	1900	22.13	22.50	1.090	-	-	-	-
	Right Cheek	18700	1860	22.12	22.50	1.090	-	-	-	-
		18900	1880	22.15	22.50	1.080	-0.09	0.205	0.222	-
		19100	1900	22.13	22.50	1.090	-	-	-	-
	Right Tilt	18700	1860	22.12	22.50	1.090	-	-	-	-
		18900	1880	22.15	22.50	1.080	0.11	0.163	0.177	-
		19100	1900	22.13	22.50	1.090	-	-	-	-
20M QPSK 50RB	Left Cheek	18700	1860	21.44	21.50	1.010	-	-	-	-
		18900	1880	21.50	21.50	1.010	0.17	0.126	0.127	-
		19100	1900	21.36	21.50	1.010	-	-	-	-
	Left Tilt	18700	1860	21.44	21.50	1.010	-	-	-	-
		18900	1880	21.50	21.50	1.010	-0.09	0.110	0.111	-
		19100	1900	21.36	21.50	1.010	-	-	-	-
	Right Cheek	18700	1860	21.44	21.50	1.010	-	-	-	-
		18900	1880	21.50	21.50	1.010	-0.08	0.116	0.117	-
		19100	1900	21.36	21.50	1.010	-	-	-	-
	Right Tilt	18700	1860	21.44	21.50	1.010	-	-	-	-
		18900	1880	21.50	21.50	1.010	0.06	0.068	0.068	-
		19100	1900	21.36	21.50	1.010	-	-	-	-

LTE Band 4										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
20M QPSK 1RB	Left Cheek	20050	1720	21.81	22.00	1.170	-	-	-	-
		20175	1732.5	21.86	22.00	1.160	0.12	0.121	0.140	6
		20300	1745	21.79	22.00	1.180	-	-	-	-
	Left Tilt	20050	1720	21.81	22.00	1.170	-	-	-	-
		20175	1732.5	21.86	22.00	1.160	0.00	0.090	0.105	-
		20300	1745	21.79	22.00	1.180	-	-	-	-
	Right Cheek	20050	1720	21.81	22.00	1.170	-	-	-	-
		20175	1732.5	21.86	22.00	1.160	-0.06	0.106	0.123	-
		20300	1745	21.79	22.00	1.180	-	-	-	-
	Right Tilt	20050	1720	21.81	22.00	1.170	-	-	-	-
		20175	1732.5	21.86	22.00	1.160	0.03	0.062	0.071	-
		20300	1745	21.79	22.00	1.180	-	-	-	-
20M QPSK 50RB	Left Cheek	20050	1720	21.13	21.50	1.090	-	-	-	-
		20175	1732.5	21.21	21.50	1.080	0.17	0.126	0.136	-
		20300	1745	21.02	21.50	1.090	-	-	-	-
	Left Tilt	20050	1720	21.13	21.50	1.090	-	-	-	-
		20175	1732.5	21.21	21.50	1.080	-0.19	0.096	0.104	-
		20300	1745	21.02	21.50	1.090	-	-	-	-
	Right Cheek	20050	1720	21.13	21.50	1.090	-	-	-	-
		20175	1732.5	21.21	21.50	1.080	-0.08	0.119	0.128	-
		20300	1745	21.02	21.50	1.090	-	-	-	-
	Right Tilt	20050	1720	21.13	21.50	1.090	-	-	-	-
		20175	1732.5	21.21	21.50	1.080	0.10	0.095	0.102	-
		20300	1745	21.02	21.50	1.090	-	-	-	-

LTE Band 7										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
20M QPSK 1RB	Left Cheek	20850	2510	23.02	23.50	1.110	-	-	-	-
		21100	2535	23.10	23.50	1.100	0.13	0.237	0.261	7
		21350	2560	23.06	23.50	1.110	-	-	-	-
	Left Tilt	20850	2510	23.02	23.50	1.110	-	-	-	-
		21100	2535	23.10	23.50	1.100	0.01	0.184	0.203	-
		21350	2560	23.06	23.50	1.110	-	-	-	-
	Right Cheek	20850	2510	23.02	23.50	1.110	-	-	-	-
		21100	2535	23.10	23.50	1.100	-0.06	0.214	0.236	-
		21350	2560	23.06	23.50	1.110	-	-	-	-
	Right Tilt	20850	2510	23.02	23.50	1.110	-	-	-	-
		21100	2535	23.10	23.50	1.100	0.05	0.161	0.177	-
		21350	2560	23.06	23.50	1.110	-	-	-	-
20M QPSK 50RB	Left Cheek	20850	2510	22.06	22.50	1.110	-	-	-	-
		21100	2535	22.09	22.50	1.100	0.17	0.126	0.138	-
		21350	2560	22.04	22.50	1.110	-	-	-	-
	Left Tilt	20850	2510	22.06	22.50	1.110	-	-	-	-
		21100	2535	22.09	22.50	1.100	-0.05	0.110	0.121	-
		21350	2560	22.04	22.50	1.110	-	-	-	-
	Right Cheek	20850	2510	22.06	22.50	1.110	-	-	-	-
		21100	2535	22.09	22.50	1.100	0.04	0.116	0.128	-
		21350	2560	22.04	22.50	1.110	-	-	-	-
	Right Tilt	20850	2510	22.06	22.50	1.110	-	-	-	-
		21100	2535	22.09	22.50	1.100	-0.08	0.093	0.102	-
		21350	2560	22.04	22.50	1.110	-	-	-	-

Wi-Fi 2.4G												
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune-up limit (dBm)	Tune-up scaling factor	Duty Cycle	Duty Cycle Scaling Factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz									
802.11b	Left Cheek	1	2412	15.35	16.60	1.330	98.96%	1.01	-	-	-	-
		6	2437	15.53	16.60	1.280	98.96%	1.01	-	-	-	
		11	2462	15.93	16.60	1.170	98.96%	1.01	-0.03	0.229	0.271	8
	Left Tilt	1	2412	15.35	16.60	1.330	98.96%	1.01	-	-	-	-
		6	2437	15.53	16.60	1.280	98.96%	1.01	-	-	-	-
		11	2462	15.93	16.60	1.170	98.96%	1.01	0.04	0.194	0.229	-
	Right Cheek	1	2412	15.35	16.60	1.330	98.96%	1.01	-	-	-	-
		6	2437	15.53	16.60	1.280	98.96%	1.01	-	-	-	-
		11	2462	15.93	16.60	1.170	98.96%	1.01	0.02	0.208	0.246	-
	Right Tilt	1	2412	15.35	16.60	1.330	98.96%	1.01	-	-	-	-
		6	2437	15.53	16.60	1.280	98.96%	1.01	-	-	-	-
		11	2462	15.93	16.60	1.170	98.96%	1.01	-0.02	0.181	0.214	-

14.2. Body SAR

GSM850										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
GPRS (4Tx slots)	Front	128	824.2	29.00	29.50	1.120	-	-	-	-
		190	836.6	28.98	29.50	1.130	-0.04	0.354	0.399	-
		251	848.8	29.02	29.50	1.120	-	-	-	-
	Rear	128	824.2	29.00	29.50	1.120	-	-	-	-
		190	836.6	28.98	29.50	1.130	0.09	0.536	0.604	9
		251	848.8	29.02	29.50	1.120	-	-	-	-

PCS1900										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
GPRS (4Tx slots)	Front	512	1850.2	25.99	26.50	1.120	-	-	-	-
		661	1880	26.03	26.50	1.110	0.05	0.395	0.440	-
		810	1909.8	25.99	26.50	1.120	-	-	-	-
	Rear	512	1850.2	25.99	26.50	1.120	-	-	-	-
		661	1880	26.03	26.50	1.110	-0.07	0.605	0.674	10
		810	1909.8	25.99	26.50	1.120	-	-	-	-

WCDMA Band II										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
RMC 12.2Kbps	Front	9262	1852.4	23.50	24.00	1.120	-	-	-	-
		9400	1880	23.55	24.00	1.110	0.07	0.642	0.712	-
		9538	1907.6	23.58	24.00	1.100	-	-	-	-
	Rear	9262	1852.4	23.50	24.00	1.120	0.12	0.916	1.030	-
		9400	1880	23.55	24.00	1.110	0.17	0.936	1.040	11
		9538	1907.6	23.58	24.00	1.100	0.13	0.931	1.030	-

WCDMA Band V										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
RMC 12.2Kbps	Front	4132	826.4	23.47	24.00	1.130	-	-	-	-
		4183	836.6	23.48	24.00	1.130	-0.02	0.608	0.685	-
		4233	846.6	23.47	24.00	1.130	-	-	-	-
	Rear	4132	826.4	23.47	24.00	1.130	0.07	0.836	0.945	-
		4183	836.6	23.48	24.00	1.130	0.04	0.854	0.963	12
		4233	846.6	23.47	24.00	1.130	0.02	0.842	0.951	-

LTE Band 2										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
20M QPSK 1RB	Front	18700	1860	22.12	22.50	1.090	-	-	-	-
		18900	1880	22.15	22.50	1.080	-0.06	0.483	0.524	-
		19100	1900	22.13	22.50	1.090	-	-	-	-
	Rear	18700	1860	22.12	22.50	1.090	-	-	-	-
		18900	1880	22.15	22.50	1.080	0.12	0.732	0.793	13
		19100	1900	22.13	22.50	1.090	-	-	-	-
20M QPSK 50RB	Front	18700	1860	21.44	21.50	1.010	-	-	-	-
		18900	1880	21.50	21.50	1.010	-0.01	0.296	0.298	-
		19100	1900	21.36	21.50	1.010	-	-	-	-
	Rear	18700	1860	21.44	21.50	1.010	-	-	-	-
		18900	1880	21.50	21.50	1.010	0.09	0.523	0.527	-
		19100	1900	21.36	21.50	1.010	-	-	-	-

LTE Band 4										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
20M QPSK 1RB	Front	20050	1720	21.81	22.00	1.170	-	-	-	-
		20175	1732.5	21.86	22.00	1.160	0.03	0.308	0.357	-
		20300	1745	21.79	22.00	1.180	-	-	-	-
	Rear	20050	1720	21.81	22.00	1.170	-	-	-	-
		20175	1732.5	21.86	22.00	1.160	0.11	0.661	0.766	14
		20300	1745	21.79	22.00	1.180	-	-	-	-
20M QPSK 50RB	Front	20050	1720	21.13	21.50	1.090	-	-	-	-
		20175	1732.5	21.21	21.50	1.080	-0.01	0.173	0.186	-
		20300	1745	21.02	21.50	1.090	-	-	-	-
	Rear	20050	1720	21.13	21.50	1.090	-	-	-	-
		20175	1732.5	21.21	21.50	1.080	0.08	0.473	0.509	-
		20300	1745	21.02	21.50	1.090	-	-	-	-

LTE Band 7										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
20M QPSK 1RB	Front	20850	2510	23.03	23.50	1.110	-	-	-	-
		21100	2535	23.08	23.50	1.100	-0.01	0.302	0.333	-
		21350	2560	23.03	23.50	1.110	-	-	-	-
	Rear	20850	2510	23.03	23.50	1.110	-	-	-	-
		21100	2535	23.08	23.50	1.100	0.03	0.491	0.541	15
		21350	2560	23.03	23.50	1.110	-	-	-	-
20M QPSK 50RB	Front	20850	2510	22.06	22.50	1.110	-	-	-	-
		21100	2535	22.09	22.50	1.100	-0.01	0.213	0.234	-
		21350	2560	22.04	22.50	1.110	-	-	-	-
	Rear	20850	2510	22.06	22.50	1.110	-	-	-	-
		21100	2535	22.09	22.50	1.100	0.02	0.351	0.386	-
		21350	2560	22.04	22.50	1.110	-	-	-	-

Wi-Fi 2.4G												
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune-up limit (dBm)	Tune-up scaling factor	Duty Cycle	Duty Cycle Scaling Factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz									
802.11b	Front	1	2412	15.35	16.50	1.300	98.96%	1.01	-	-	-	-
		6	2437	15.53	16.50	1.250	98.96%	1.01	-	-	-	-
		11	2462	15.93	16.50	1.140	98.96%	1.01	0.180	0.130	0.150	-
	Rear	1	2412	15.35	16.50	1.300	98.96%	1.01	-	-	-	-
		6	2437	15.53	16.50	1.250	98.96%	1.01	-	-	-	-
		11	2462	15.93	16.50	1.140	98.96%	1.01	-0.19	0.211	0.243	16

14.3. Hotspot SAR

GSM850										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
GPRS (4Tx slots)	Front	128	824.2	29.00	29.50	1.120	-	-	-	-
		190	836.6	28.98	29.50	1.130	-0.04	0.354	0.399	-
		251	848.8	29.02	29.50	1.120	-	-	-	-
	Rear	128	824.2	29.00	29.50	1.120	-	-	-	-
		190	836.6	28.98	29.50	1.130	0.09	0.536	0.604	9
		251	848.8	29.02	29.50	1.120	-	-	-	-
	Left	251	848.8	29.02	29.50	1.130	-0.05	0.236	0.266	-
	Right	251	848.8	29.02	29.50	1.130	0.03	0.171	0.193	-
	Top	251	848.8	29.02	29.50	1.130	-	-	-	-
	Bottom	251	848.8	29.02	29.50	1.130	0.12	0.306	0.344	-

PCS1900										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
GPRS (4Tx slots)	Front	512	1850.2	25.99	26.50	1.120	-	-	-	-
		661	1880	26.03	26.50	1.110	0.05	0.395	0.440	-
		810	1909.8	25.99	26.50	1.120	-	-	-	-
	Rear	512	1850.2	25.99	26.50	1.120	-	-	-	-
		661	1880	26.03	26.50	1.110	-0.07	0.605	0.674	10
		810	1909.8	25.99	26.50	1.120	-	-	-	-
	Left	810	1909.8	25.99	26.50	1.110	0.03	0.263	0.294	-
	Right	810	1909.8	25.99	26.50	1.110	0.02	0.201	0.224	-
	Top	810	1909.8	25.99	26.50	1.110	-	-	-	-
	Bottom	810	1909.8	25.99	26.50	1.110	-0.07	0.345	0.384	-

WCDMA Band II										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
RMC 12.2K	Front	9262	1852.4	23.50	24.00	1.120	-	-	-	-
		9400	1880	23.55	24.00	1.110	0.07	0.642	0.712	-
		9538	1907.6	23.58	24.00	1.100	-	-	-	-
	Rear	9262	1852.4	23.50	24.00	1.120	0.12	0.916	1.030	-
		9400	1880	23.55	24.00	1.110	0.17	0.936	1.040	11
		9538	1907.6	23.58	24.00	1.100	0.13	0.931	1.030	-
	Left	9538	1907.6	23.58	24.00	1.110	-0.13	0.444	0.492	-
	Right	9538	1907.6	23.58	24.00	1.110	0.12	0.504	0.559	-
	Top	9538	1907.6	23.58	24.00	1.110	-	-	-	-
	Bottom	9538	1907.6	23.58	24.00	1.110	0.09	0.484	0.537	-

WCDMA Band V										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
RMC 12.2K	Front	4132	826.4	23.47	24.00	1.130	-	-	-	-
		4183	836.6	23.48	24.00	1.130	-0.02	0.608	0.685	-
		4233	846.6	23.47	24.00	1.130	-	-	-	-
	Rear	4132	826.4	23.47	24.00	1.130	0.07	0.836	0.945	-
		4183	836.6	23.48	24.00	1.130	0.04	0.854	0.963	12
		4233	846.6	23.47	24.00	1.130	0.02	0.842	0.951	-
	Left	4183	836.6	23.48	24.00	1.130	0.07	0.405	0.456	-
	Right	4183	836.6	23.48	24.00	1.130	-0.04	0.377	0.425	-
	Top	4183	836.6	23.48	24.00	1.130	-	-	-	-
	Bottom	4183	836.6	23.48	24.00	1.130	-0.01	0.487	0.549	-

LTE Band 2										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
20M QPSK 1RB	Front	18700	1860	22.12	22.50	1.090	-	-	-	-
		18900	1880	22.15	22.50	1.080	-0.06	0.483	0.524	-
		19100	1900	22.13	22.50	1.090	-	-	-	-
	Rear	18700	1860	22.12	22.50	1.090	-	-	-	-
		18900	1880	22.15	22.50	1.080	0.12	0.732	0.793	13
		19100	1900	22.13	22.50	1.090	-	-	-	-
	Left	18700	1860	22.15	22.50	1.080	-0.07	0.322	0.349	-
	Right	18700	1860	22.15	22.50	1.080	0.04	0.233	0.253	-
	Top	18700	1860	22.15	22.50	1.080	-	-	-	-
	Bottom	18700	1860	22.15	22.50	1.080	0.16	0.417	0.452	-
20M QPSK 50RB	Front	18700	1860	21.44	21.50	1.010	-	-	-	-
		18900	1880	21.50	21.50	1.010	-0.01	0.296	0.298	-
		19100	1900	21.36	21.50	1.010	-	-	-	-
	Rear	18700	1860	21.44	21.50	1.010	-	-	-	-
		18900	1880	21.50	21.50	1.010	0.09	0.523	0.527	-
		19100	1900	21.36	21.50	1.010	-	-	-	-
	Left	18900	1880	21.50	21.50	1.010	-0.02	0.285	0.287	-
	Right	18900	1880	21.50	21.50	1.010	-0.02	0.174	0.175	-
	Top	18900	1880	21.50	21.50	1.010	-	-	-	-
	Bottom	18900	1880	21.50	21.50	1.010	0.10	0.239	0.241	-

LTE Band 4										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
20M QPSK 1RB	Front	20050	1720	21.81	22.50	1.170	-	-	-	-
		20175	1732.5	21.86	22.50	1.160	0.03	0.308	0.357	-
		20300	1745	21.79	22.50	1.180	-	-	-	-
	Rear	20050	1720	21.81	22.50	1.170	-	-	-	-
		20175	1732.5	21.86	22.50	1.160	0.11	0.661	0.766	14
		20300	1745	21.79	22.50	1.180	-	-	-	-
	Left	20175	1732.5	21.86	22.50	1.160	-0.08	0.227	0.263	-
	Right	20175	1732.5	21.86	22.50	1.160	0.01	0.153	0.178	-
	Top	20175	1732.5	21.86	22.50	1.160	-	-	-	-
	Bottom	20175	1732.5	21.86	22.50	1.160	0.04	0.236	0.273	-
20M QPSK 50RB	Front	20050	1720	21.13	21.50	1.090	-	-	-	-
		20175	1732.5	21.18	21.50	1.080	-0.01	0.173	0.186	-
		20300	1745	21.11	21.50	1.090	-	-	-	-
	Rear	20050	1720	21.13	21.50	1.090	-	-	-	-
		20175	1732.5	21.18	21.50	1.080	0.08	0.473	0.509	-
		20300	1745	21.11	21.50	1.090	-	-	-	-
	Left	20050	1720	21.18	21.50	1.080	-0.06	0.257	0.277	-
	Right	20050	1720	21.18	21.50	1.080	0.01	0.204	0.220	-
	Top	20050	1720	21.18	21.50	1.080	-	-	-	-
	Bottom	20050	1720	21.18	21.50	1.080	0.02	0.169	0.182	-

LTE Band 7										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz							
20M QPSK 1RB	Front	20850	2510	23.03	23.50	1.110	-	-	-	-
		21100	2535	23.08	23.50	1.100	-0.01	0.302	0.333	-
		21350	2560	23.03	23.50	1.110	-	-	-	-
	Rear	20850	2510	23.03	23.50	1.110	-	-	-	-
		21100	2535	23.08	23.50	1.100	0.03	0.491	0.541	15
		21350	2560	23.03	23.50	1.110	-	-	-	-
	Left	21350	2560	23.08	23.50	1.100	-0.01	0.233	0.256	-
	Right	21350	2560	23.08	23.50	1.100	0.01	0.206	0.227	-
	Top	21350	2560	23.08	23.50	1.100	-	-	-	-
	Bottom	21350	2560	23.08	23.50	1.100	0.01	0.254	0.280	-
20M QPSK 50RB	Front	20850	2510	22.06	22.50	1.110	-	-	-	-
		21100	2535	22.09	22.50	1.100	-0.01	0.213	0.234	-
		21350	2560	22.04	22.50	1.110	-	-	-	-
	Rear	20850	2510	22.06	22.50	1.110	-	-	-	-
		21100	2535	22.09	22.50	1.100	0.02	0.351	0.386	-
		21350	2560	22.04	22.50	1.110	-	-	-	-
	Left	21100	2535	22.09	22.50	1.100	-0.01	0.191	0.210	-
	Right	21100	2535	22.09	22.50	1.100	0.01	0.081	0.089	-
	Top	21100	2535	22.09	22.50	1.100	-	-	-	-
	Bottom	21100	2535	22.09	22.50	1.100	0.03	0.200	0.220	-

Wi-Fi 2.4G												
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune-up limit (dBm)	Tune-up scaling factor	Duty Cycle	Duty Cycle Scaling Factor	Power Drift (dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz									
802.11b	Front	1	2412	15.35	16.50	1.300	98.96%	1.01	-	-	-	-
		6	2437	15.53	16.50	1.250	98.96%	1.01	-	-	-	-
		11	2462	15.93	16.50	1.140	98.96%	1.01	0.180	0.130	0.150	-
	Rear	1	2412	15.35	16.50	1.300	98.96%	1.01	-	-	-	-
		6	2437	15.53	16.50	1.250	98.96%	1.01	-	-	-	-
		11	2462	15.93	16.50	1.140	98.96%	1.01	-0.19	0.211	0.243	16
	Left	11	2462	15.93	16.50	1.140	98.96%	1.01	-0.12	0.046	0.052	-
	Right	11	2462	15.93	16.50	1.140	98.96%	1.01	-	-	-	-
	Top	11	2462	15.93	16.50	1.140	98.96%	1.01	0.16	0.109	0.124	-
	Bottom	11	2462	15.93	16.50	1.140	98.96%	1.01	-	-	-	-

SAR Test Data Plots to the Appendix A.

15. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is <0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).

4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Band	Test Position	Frequency		Highest Measured SAR (W/kg)	First Repeated		Second Repeated	
		CH	MHz		Measured SAR(W/kg)	Largest to Smallest SAR Ratio	Measured SAR(W/kg)	Largest to Smallest SAR Ratio
WCDMA Band II	Rear	9400	1880	0.936	0.918	1.02	N/A	N/A
WCDMA Band V	Rear	4183	836.6	0.854	0.839	1.02	N/A	N/A

16. Simultaneous Transmission analysis

No.	Simultaneous Transmission Configurations	Head	Body-worn	Hotspot	Note
1	GSM(voice) + Bluetooth (data)	Yes	Yes		
2	GSM(voice) + WLAN (data)	Yes	Yes		
3	WCDMA(voice) + Bluetooth (data)	Yes	Yes		
4	WCDMA(voice) + WLAN (data)	Yes	Yes		
5	GPRS (data) + Bluetooth (data)	Yes	Yes	NA	
6	GPRS (data) + WLAN (data)	Yes	Yes	Yes	
7	WCDMA (data) + Bluetooth (data)	Yes	Yes	NA	
8	WCDMA (data) + WLAN (data)	Yes	Yes	Yes	
9	LTE + Bluetooth (data)	Yes	Yes	NA	
10	LTE + WLAN (data)	Yes	Yes	Yes	

General note:

1. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. EUT will choose either GSM or WCDMA LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
3. The reported SAR summation is calculated based on the same configuration and test position
4. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below
   a) [(max. Power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] * [√f(GHz)/x]W/kg for test separation distances ≦50mm; whetn x=7.5 for 1-g SAR, and x=18.75 for 10-g SAR.
   b) When the minimum separation distance is <5mm, the distance is used 5mm to determine SAR test exclusion
   c) 0.4 W/kg for 1-g SAR and 1.0W/kg for 10-g SAR, when the test separation distances is >50mm.

Bluetooth Max power	Exposure position	Head	Body-worn
	Test separation	0mm	10mm
8.50dBm	Estimated SAR (W/kg)	0.295	0.148

16.1. Head

PCE+ WLAN DTS					
WWAN Band		Exposure Position	Standalone SAR (W/kg)		Σ 1-g SAR
			PCE	WLAN DTS	(W/kg)
GSM	GSM850	Left Cheek	0.221	0.271	0.492
		Left Tilted	0.176	0.229	0.405
		Right Cheek	0.235	0.246	0.481
		Right Tilted	0.179	0.214	0.393
	PCS1900	Left Cheek	0.250	0.271	0.521
		Left Tilted	0.186	0.229	0.415
		Right Cheek	0.229	0.246	0.475
		Right Tilted	0.175	0.214	0.389
WCDMA	Band II	Left Cheek	0.296	0.271	**0.567**
		Left Tilted	0.238	0.229	0.467
		Right Cheek	0.282	0.246	0.528
		Right Tilted	0.216	0.214	0.430
	Band V	Left Cheek	0.240	0.271	0.511
		Left Tilted	0.194	0.229	0.423
		Right Cheek	0.254	0.246	0.500
		Right Tilted	0.209	0.214	0.423
LTE	B2 1RB	Left Cheek	0.235	0.271	0.506
		Left Tilted	0.180	0.229	0.409
		Right Cheek	0.222	0.246	0.468
		Right Tilted	0.177	0.214	0.391
	B2 50RB	Left Cheek	0.127	0.271	0.398
		Left Tilted	0.111	0.229	0.340
		Right Cheek	0.117	0.246	0.363
		Right Tilted	0.068	0.214	0.282
	B4 1RB	Left Cheek	0.140	0.271	0.411
		Left Tilted	0.105	0.229	0.334
		Right Cheek	0.123	0.246	0.369
		Right Tilted	0.071	0.214	0.285
	B4 50RB	Left Cheek	0.136	0.271	0.407
		Left Tilted	0.104	0.229	0.333
		Right Cheek	0.128	0.246	0.374
		Right Tilted	0.102	0.214	0.316

	B7 1RB	Left Cheek	0.261	0.271	0.532
		Left Tilted	0.203	0.229	0.432
		Right Cheek	0.236	0.246	0.482
		Right Tilted	0.177	0.214	0.391
	B7 50RB	Left Cheek	0.138	0.271	0.409
		Left Tilted	0.121	0.229	0.350
		Right Cheek	0.128	0.246	0.374
		Right Tilted	0.102	0.214	0.316

PCE+ BT					
WWAN Band		Exposure Position	Standalone SAR (W/kg)		Σ 1-g SAR
			WWAN	BT	(W/kg)
GSM	GSM850	Left Cheek	0.221	0.295	0.516
		Left Tilted	0.176	0.295	0.471
		Right Cheek	0.235	0.295	0.530
		Right Tilted	0.179	0.295	0.474
	PCS1900	Left Cheek	0.250	0.295	0.545
		Left Tilted	0.186	0.295	0.481
		Right Cheek	0.229	0.295	0.524
		Right Tilted	0.175	0.295	0.470
WCDMA	Band II	Left Cheek	0.296	0.295	**0.591**
		Left Tilted	0.238	0.295	0.533
		Right Cheek	0.282	0.295	0.577
		Right Tilted	0.216	0.295	0.511
	Band V	Left Cheek	0.240	0.295	0.535
		Left Tilted	0.194	0.295	0.489
		Right Cheek	0.254	0.295	0.549
		Right Tilted	0.209	0.295	0.504
LTE	B2 1RB	Left Cheek	0.235	0.295	0.530
		Left Tilted	0.180	0.295	0.475
		Right Cheek	0.222	0.295	0.517
		Right Tilted	0.177	0.295	0.472
	B2 50RB	Left Cheek	0.127	0.295	0.422
		Left Tilted	0.111	0.295	0.406
		Right Cheek	0.117	0.295	0.412
		Right Tilted	0.068	0.295	0.363
	B4 1RB	Left Cheek	0.140	0.295	0.435
		Left Tilted	0.105	0.295	0.400
		Right Cheek	0.123	0.295	0.418
		Right Tilted	0.071	0.295	0.366
	B4 50RB	Left Cheek	0.136	0.295	0.431
		Left Tilted	0.104	0.295	0.399
		Right Cheek	0.128	0.295	0.423
		Right Tilted	0.102	0.295	0.397

	B7 1RB	Left Cheek	0.261	0.295	0.556
		Left Tilted	0.203	0.295	0.498
		Right Cheek	0.236	0.295	0.531
		Right Tilted	0.177	0.295	0.472
	B7 50RB	Left Cheek	0.138	0.295	0.433
		Left Tilted	0.121	0.295	0.416
		Right Cheek	0.128	0.295	0.423
		Right Tilted	0.102	0.295	0.397

16.2. Body-worn

PCE + WLAN DTS					
WWAN Band		Exposure Position	Standalone SAR (W/kg)		Σ 1-g SAR
			PCE	WLAN DTS	(W/kg)
GSM	GSM850	Front	0.399	0.150	0.549
		Rear	0.604	0.243	0.847
	PCS1900	Front	0.440	0.150	0.590
		Rear	0.674	0.243	0.917
WCDMA	Band II	Front	0.712	0.150	0.862
		Rear	1.040	0.243	**1.283**
	Band V	Front	0.685	0.150	0.835
		Rear	0.963	0.243	1.206
LTE	B2 1RB	Front	0.524	0.150	0.674
		Rear	0.793	0.243	1.036
	B2 50RB	Front	0.298	0.150	0.448
		Rear	0.527	0.243	0.770
	B4 1RB	Front	0.357	0.150	0.507
		Rear	0.766	0.243	1.009
	B4 50RB	Front	0.186	0.150	0.336
		Rear	0.509	0.243	0.752
	B7 1RB	Front	0.333	0.150	0.483
		Rear	0.514	0.243	0.757
	B7 50RB	Front	0.234	0.150	0.384
		Rear	0.386	0.243	0.629

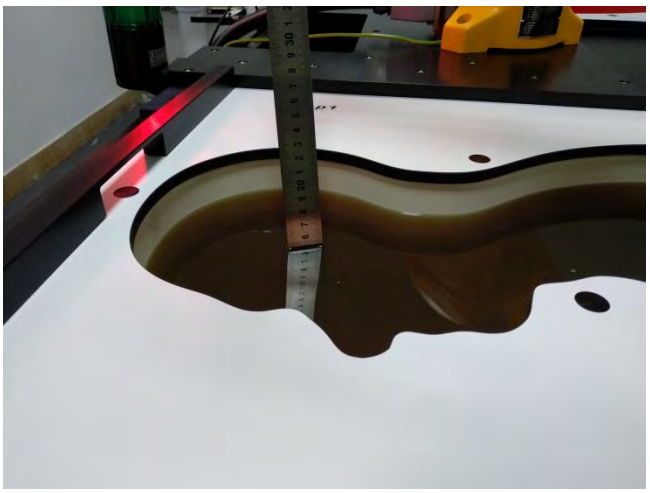
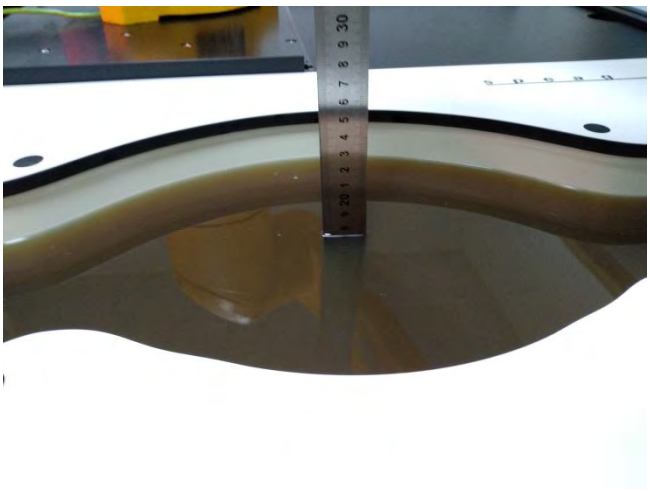
PCE + Bluetooth					
WWAN Band		Exposure Position	Standalone SAR (W/kg)		Σ 1-g SAR
			PCE	Bluetooth	(W/kg)
GSM	GSM850	Front	0.399	0.148	0.547
		Rear	0.604	0.148	0.752
	PCS1900	Front	0.440	0.148	0.588
		Rear	0.674	0.148	0.822
WCDMA	Band II	Front	0.712	0.148	0.860
		Rear	1.040	0.148	**1.188**
	Band V	Front	0.685	0.148	0.833
		Rear	0.963	0.148	1.111
LTE	B2 1RB	Front	0.524	0.148	0.672
		Rear	0.793	0.148	0.941
	B2 50RB	Front	0.298	0.148	0.446
		Rear	0.527	0.148	0.675
	B4 1RB	Front	0.357	0.148	0.505
		Rear	0.766	0.148	0.914
	B4 50RB	Front	0.186	0.148	0.334
		Rear	0.509	0.148	0.657
	B7 1RB	Front	0.333	0.148	0.481
		Rear	0.514	0.148	0.662
	B7 50RB	Front	0.234	0.148	0.382
		Rear	0.386	0.148	0.534

16.3. Hotspot

PCE + WLAN DTS					
WWAN Band		Exposure Position	Standalone SAR (W/kg)		Σ 1-g SAR
			PCE	WLAN DTS	(W/kg)
GSM	GSM850	Front	0.399	0.150	0.549
		Rear	0.604	0.243	0.847
		Left side	0.266	0.052	0.318
		Right side	0.193	0.000	0.193
		Top side	0.000	0.124	0.124
		Bottom side	0.344	0.000	0.344
	PCS1900	Front	0.440	0.150	0.590
		Rear	0.674	0.243	0.917
		Left side	0.294	0.052	0.346
		Right side	0.224	0.000	0.224
		Top side	0.000	0.124	0.124
		Bottom side	0.384	0.000	0.384
WCDMA	Band II	Front	0.712	0.150	0.862
		Rear	1.040	0.243	**1.283**
		Left side	0.492	0.052	0.544
		Right side	0.559	0.000	0.559
		Top side	0.000	0.124	0.124
		Bottom side	0.537	0.000	0.537
	Band V	Front	0.685	0.150	0.835
		Rear	0.963	0.243	1.206
		Left side	0.456	0.052	0.508
		Right side	0.425	0.000	0.425
		Top side	0.000	0.124	0.124
		Bottom side	0.549	0.000	0.549

LTE	B2 1RB	Front	0.524	0.150	0.674
		Rear	0.793	0.243	1.036
		Left side	0.349	0.052	0.401
		Right side	0.253	0.000	0.253
		Top side	0.000	0.124	0.124
		Bottom side	0.452	0.000	0.452
	B2 50RB	Front	0.298	0.150	0.448
		Rear	0.527	0.243	0.770
		Left side	0.287	0.052	0.339
		Right side	0.175	0.000	0.175
		Top side	0.000	0.124	0.124
		Bottom side	0.241	0.000	0.241
	B4 1RB	Front	0.357	0.150	0.507
		Rear	0.766	0.243	1.009
		Left side	0.263	0.052	0.315
		Right side	0.178	0.000	0.178
		Top side	0.000	0.124	0.124
		Bottom side	0.273	0.000	0.273
	B4 50RB	Front	0.186	0.150	0.336
		Rear	0.509	0.243	0.752
		Left side	0.277	0.052	0.329
		Right side	0.220	0.000	0.220
		Top side	0.000	0.124	0.124
		Bottom side	0.182	0.000	0.182
	B7 1RB	Front	0.333	0.150	0.483
		Rear	0.541	0.243	0.784
		Left side	0.256	0.052	0.308
		Right side	0.227	0.000	0.227
		Top side	0.000	0.124	0.124
		Bottom side	0.280	0.000	0.280
	B7 50RB	Front	0.234	0.150	0.384
		Rear	0.386	0.243	0.629
		Left side	0.210	0.052	0.262
		Right side	0.089	0.000	0.089
		Top side	0.000	0.124	0.124
		Bottom side	0.220	0.000	0.220

17. TestSetup Photos

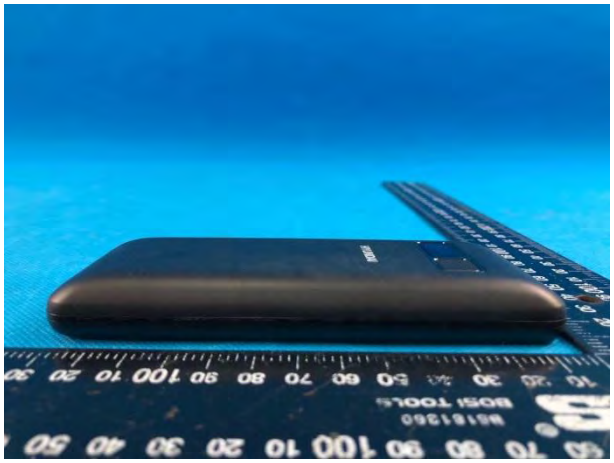
	
Liquid depth in the Head phantom	Liquid depth in the Body phantom
	
Left Head Touch	Right Head Touch
	
Left Head Tilt (15^{o})	Right Head Tilt (15^{o})

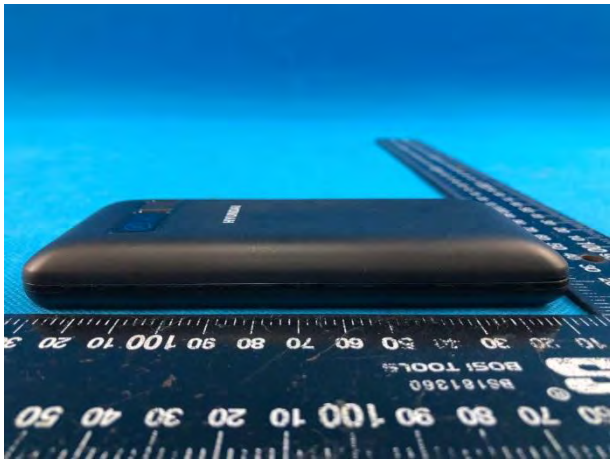
	
Body-worn Front (10mm)	Body-worn Rear(10mm)
	
Front (10mm)	Rear (10mm)
	
Left Side (10mm)	Right Side (10mm)

	
Top Side (10mm)	Bottom Side (10mm)

18. External and Internal Photos of the EUT


HYUNDAI





---------End of Report----------

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/13/2021

GSM850-Head

Communication System: Customer System; Frequency:836.6 MHz;Duty Cycle:1:8.3
Medium parameters used (interpolated): f=836.6 MHz; σ=0.91S/m; εr=41.48; ρ=1000 kg/m3
Phantom section: Right Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(10.41, 10.41, 10.41) @ 836.6 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.260 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.151 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.236 W/kg
SAR(1 g) = 0.213 W/kg; SAR(10 g) = 0.180 W/kg
Maximum value of SAR (measured) = 0.217 W/kg

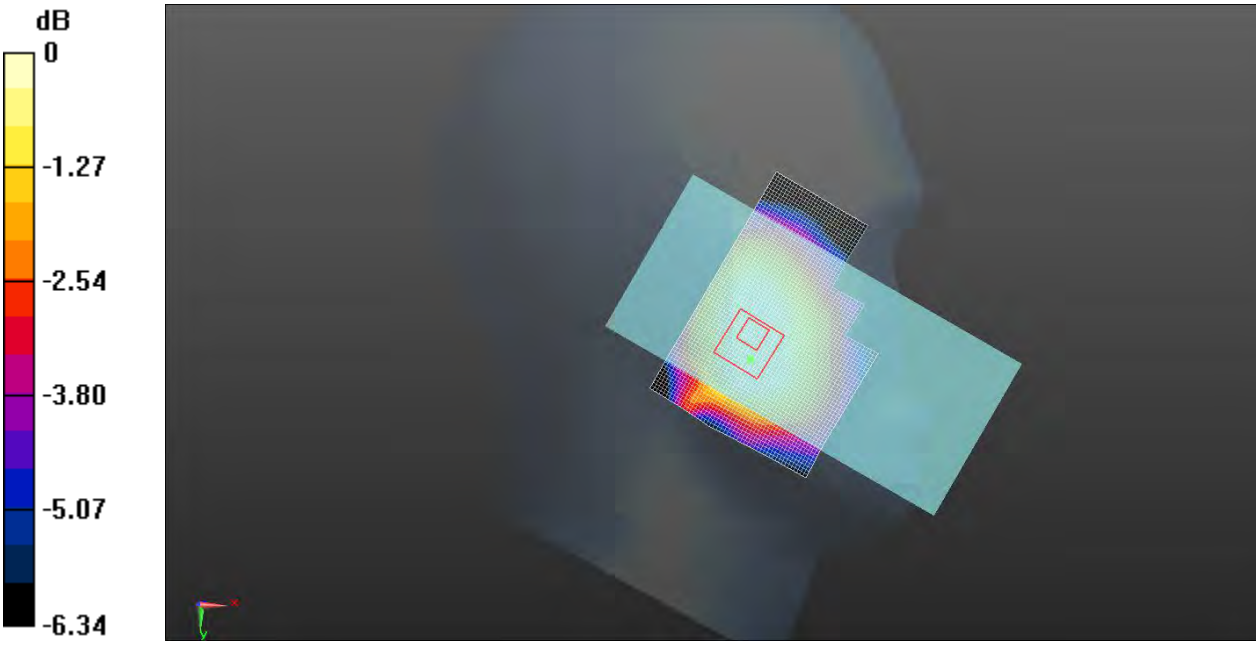


Figure 1: GSM850_GSM Voice

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/16/2021

GSM1900-Head

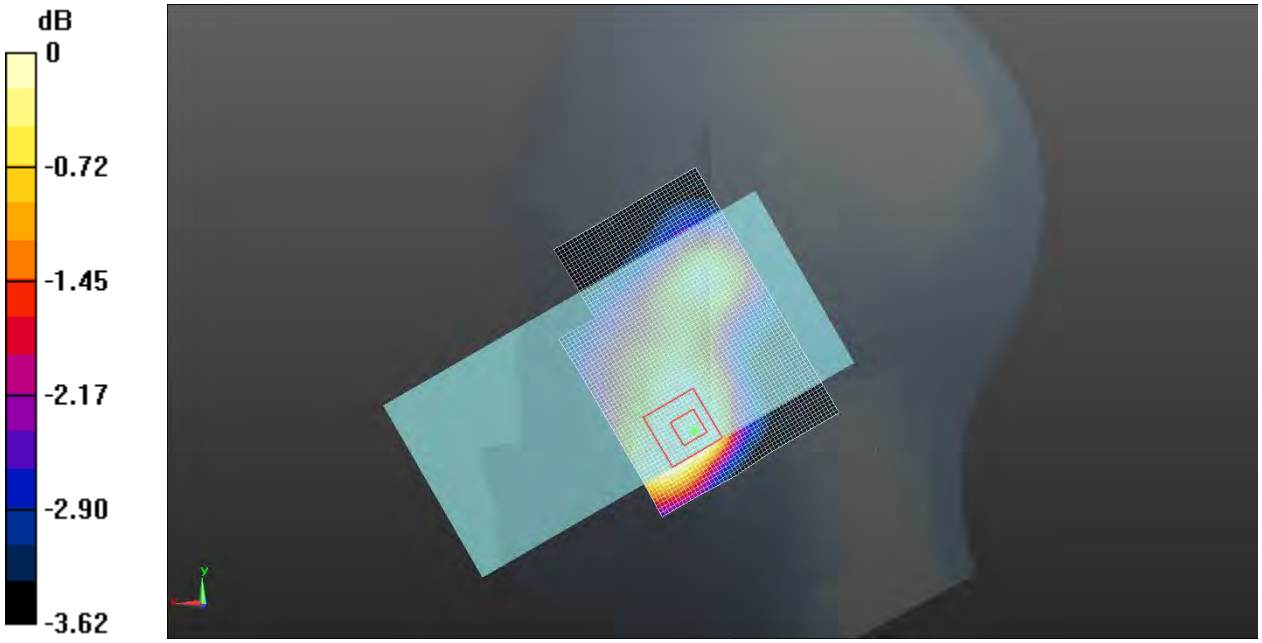
Communication System: GSM1900; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1880 MHz; σ = 1.405 mho/m; εr = 39.62; ρ = 1000 kg/m3
Phantom section: Left Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1880 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.279 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.937 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 0.254 W/kg
SAR(1 g) = 0.229 W/kg; SAR(10 g) = 0.193 W/kg
Maximum value of SAR (measured) = 0.233 W/kg



0 dB = 0.221 W/kg = -6.56 dBW/kg

Figure 2: GSM1900_GSM Voice_Left Cheek

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/16/2021

WCDMA Band II-Head

Communication System: W1900; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1880 MHz; σ = 1.36 mho/m; εr = 39.8; ρ = 1000 kg/m3
Phantom section: Left Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1880 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.328 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.520 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.292 W/kg
SAR(1 g) = 0.267 W/kg; SAR(10 g) = 0.224 W/kg
Maximum value of SAR (measured) = 0.270 W/kg

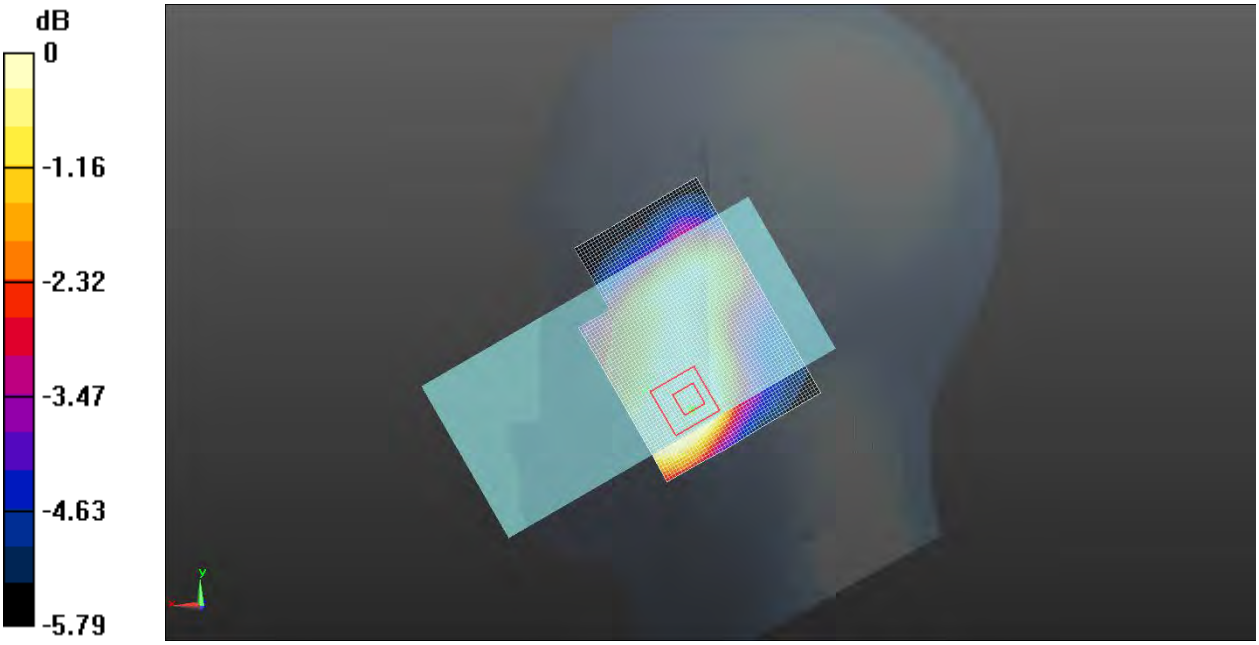


Figure 3: WCDMA Band II_RCM _Left Check

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/13/2021

WCDMA Band V-Head

Communication System: W850; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 837 MHz; σ = 0.898 mho/m; εr = 41.4; ρ = 1000 kg/m3
Phantom section: Right Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1880 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.290 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.572 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.254 W/kg
SAR(1 g) = 0.225 W/kg; SAR(10 g) = 0.188 W/kg
Maximum value of SAR (measured) = 0.232 W/kg

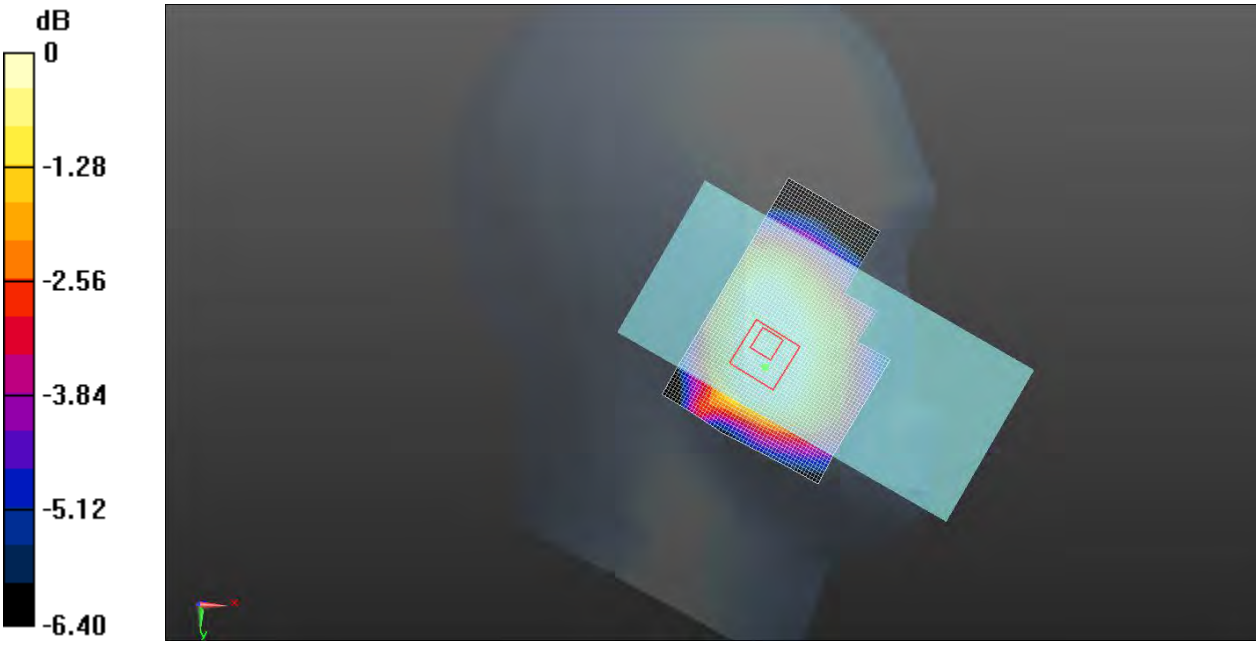


Figure 4: WCDMA Band V

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/16/2021

LTE Band 2-Head

Communication System: Customer System; Frequency: 1880.0 MHz;Duty Cycle:1:1
Medium parameters used (interpolated): f =1880.0 MHz; σ = 1.41 mho/m; ε = 40.01; ρ=1000 kg/m3
Phantom section: Left Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.216 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.015 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 0.238 W/kg
SAR(1 g) = 0.217 W/kg; SAR(10 g) = 0.187 W/kg
Maximum value of SAR (measured) = 0.224 W/kg

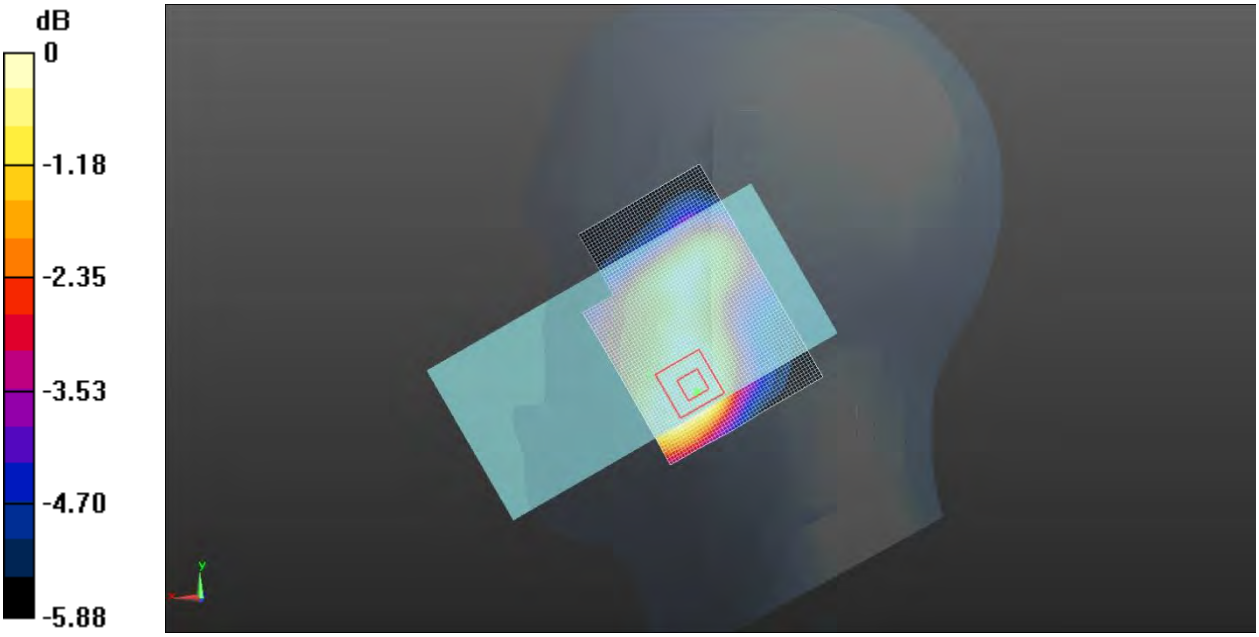


Figure 5: LTE Band 2_QPSK _ Left Check

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/16/2021

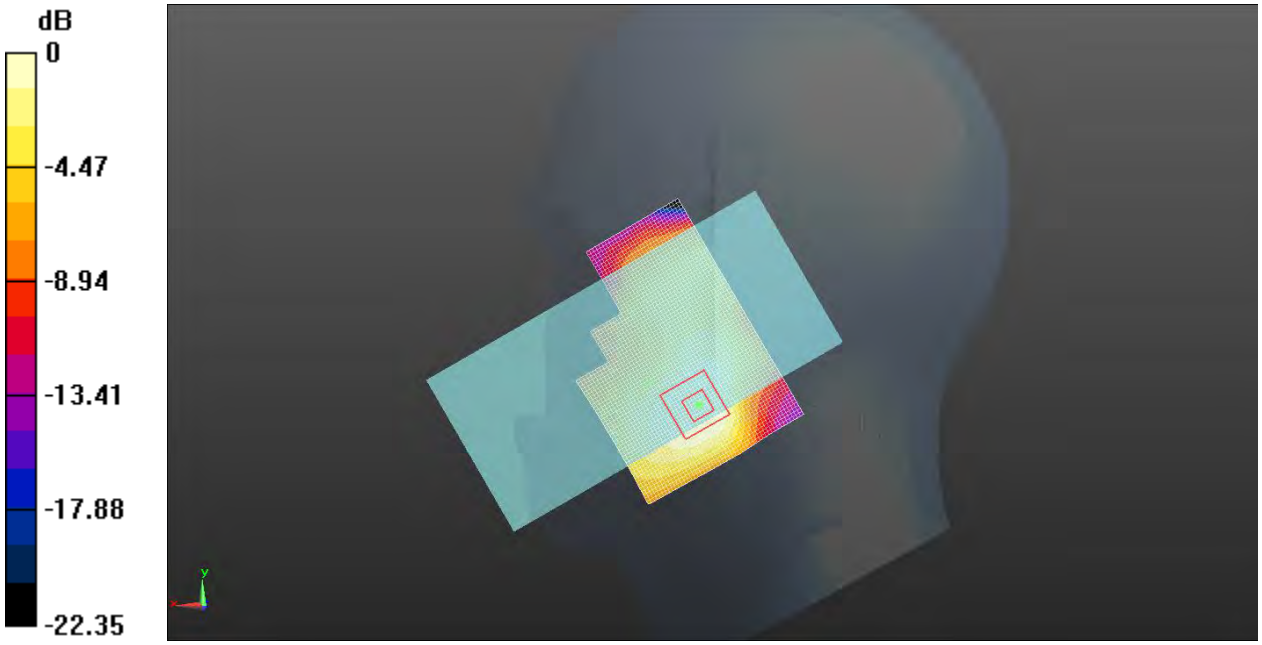
LTE Band 4-Head

Communication System: LTE B4; Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1732.5 MHz; σ = 1.34 mho/m; εr = 41.5; ρ = 1000 kg/m3
Phantom section: Left Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (51x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.180 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.216 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.185 W/kg
SAR(1 g) = 0.121 W/kg; SAR(10 g) = 0.074 W/kg
Maximum value of SAR (measured) = 0.133 W/kg



0 dB = 0.113 W/kg = -9.47 dBW/kg

Figure 6: LTE Band 4_QPSK

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/17/2021

LTE Band 7-Head

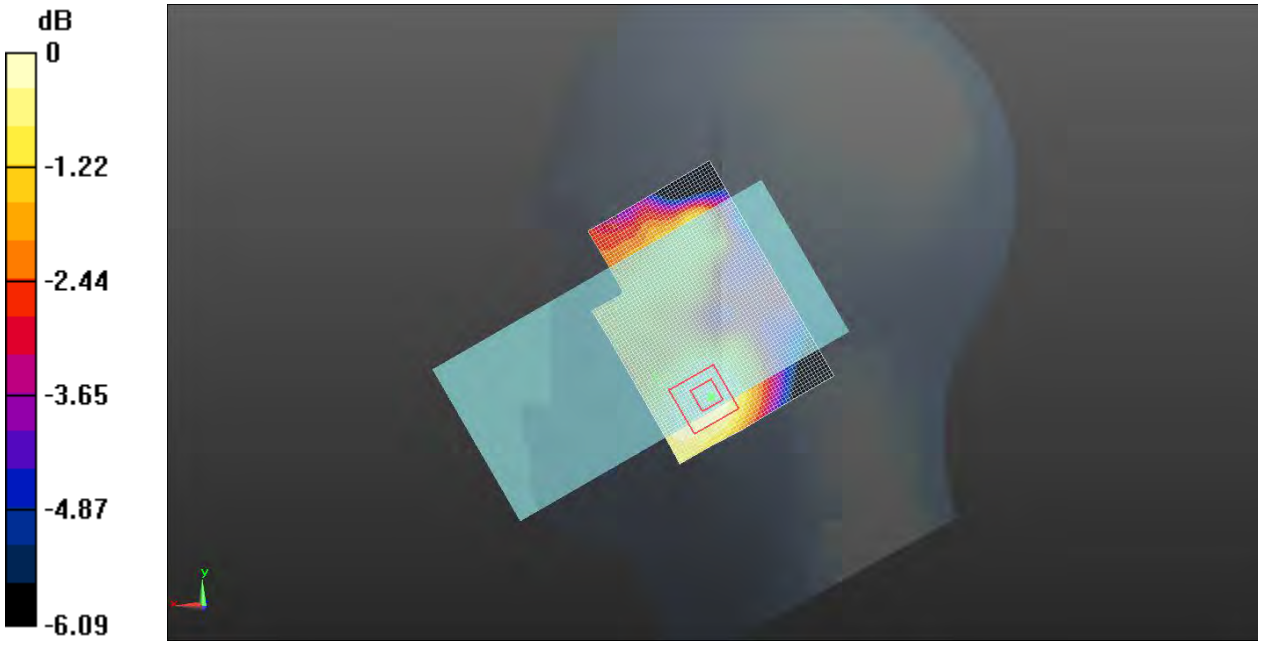
Communication System: Customer System; Frequency:2535 MHz;Duty Cycle:1:1
Medium parameters used (interpolated): f=2535 MHz; σ=1.77S/m; εr=39.37; ρ=1000 kg/m3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.252 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.054 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.337 W/kg
SAR(1 g) = 0.237 W/kg; SAR(10 g) = 0.206 W/kg
Maximum value of SAR (measured) = 0.256 W/kg



0 dB = 0.137 W/kg = -8.63 dBW/kg

Figure 7: LTE Band 7_QPSK

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/17/2021

WLAN2.4G-Head

Communication System: 802.11; Frequency: 2472 MHz;
Medium parameters used: f = 2472 MHz; σ = 1.89 mho/m; εr = 37.2; ρ = 1000 kg/m3
Phantom section: Left Section:
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.335 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.175 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.367 W/kg
SAR(1 g) = 0.229 W/kg; SAR(10 g) = 0.139 W/kg
Maximum value of SAR (measured) = 0.249 W/kg

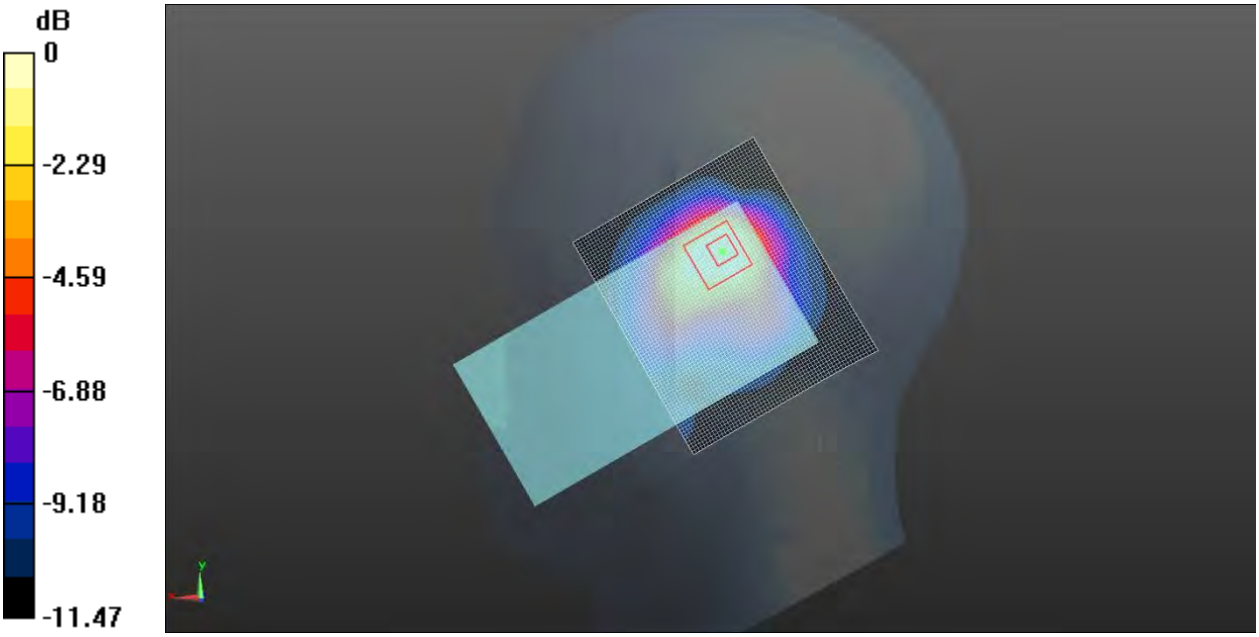


Figure 8: WLAN

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/13/2021

GSM850-Body

Communication System: GSM 850; Frequency: 836.6 MHz;
Medium parameters used (interpolated): f =836.6 MHz; σ = 0.965 mho/m; εr = 55.94; ρ = 1000 kg/m3;
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.796 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.13 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.883 W/kg
SAR(1 g) = 0.536 W/kg; SAR(10 g) = 0.313 W/kg
Maximum value of SAR (measured) = 0.582 W/kg

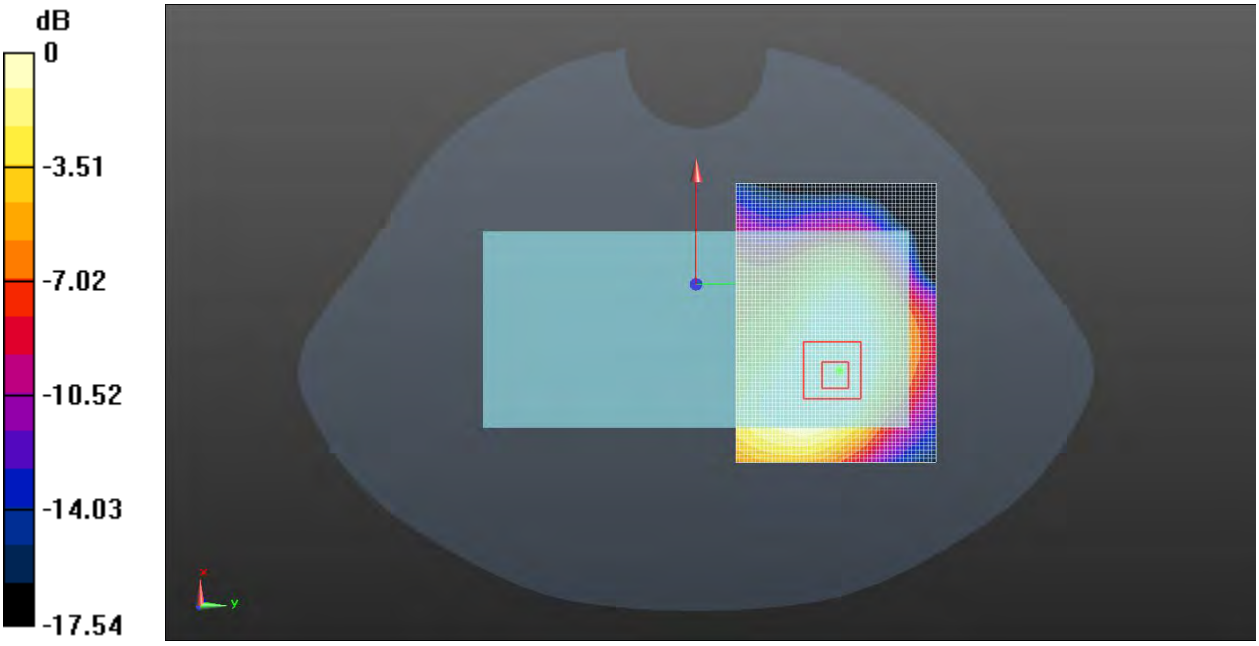


Figure 9: GSM850

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/16/2021

GSM1900-Body

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1880 MHz; σ = 1.558 mho/m; εr = 52.99; ρ = 1000 kg/m3
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.851 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.49 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.941 W/kg
SAR(1 g) = 0.605 W/kg; SAR(10 g) = 0.367 W/kg
Maximum value of SAR (measured) = 0.658 W/kg

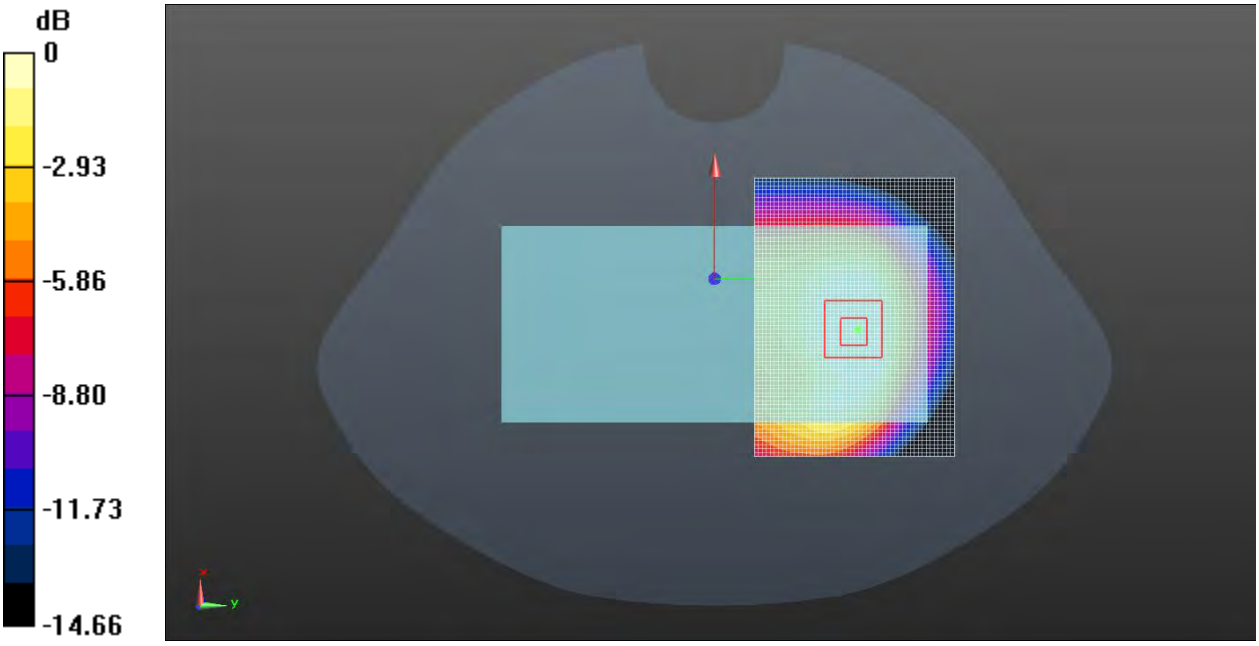


Figure 10: GSM1900

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/16/2021

WCDMA Band II-Body

Communication System: W1900; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1880 MHz; σ = 1.48 mho/m; εr = 52.9; ρ = 1000 kg/m3
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.48 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.31 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 1.64 W/kg
SAR(1 g) = 0.936 W/kg; SAR(10 g) = 0.499 W/kg
Maximum value of SAR (measured) = 1.05 W/kg

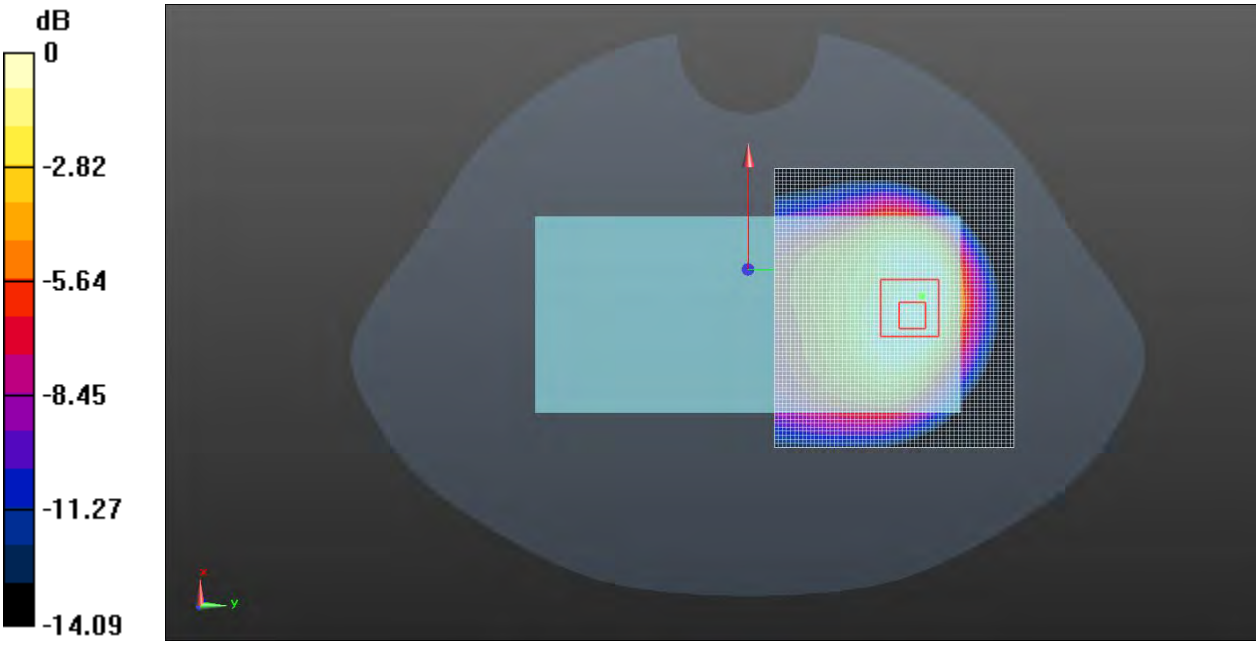


Figure 11: WCDMA Band II_RCM

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/13/2021
WCDMA Band V-Body

Communication System: W850; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium parameters used: f = 837 MHz; σ = 1.01 mho/m; εr = 55.5; ρ = 1000 kg/m3
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.16 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.38 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.854 W/kg; SAR(10 g) = 0.537 W/kg
Maximum value of SAR (measured) = 0.825 W/kg

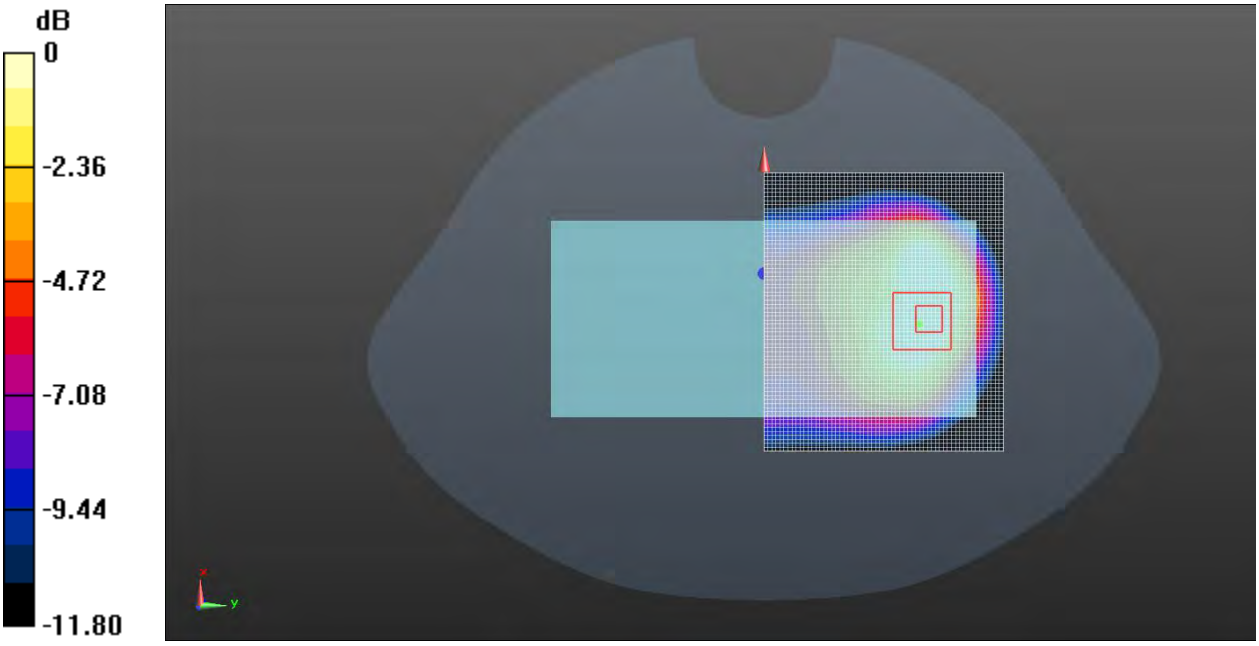


Figure 12: WCDMA Band V_RCM _ Rear side_0mm

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/16/2021

LTE Band 2-Body

Communication System: Customer System; Frequency: 1880.0 MHz;Duty Cycle:1:1
Medium parameters used (interpolated): f =1880.0 MHz; σ = 1.41 mho/m; ε = 40.01; ρ=1000 kg/m3
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.17 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.56 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 1.37 W/kg
SAR(1 g) = 0.732 W/kg; SAR(10 g) = 0.390 W/kg
Maximum value of SAR (measured) = 0.989 W/kg

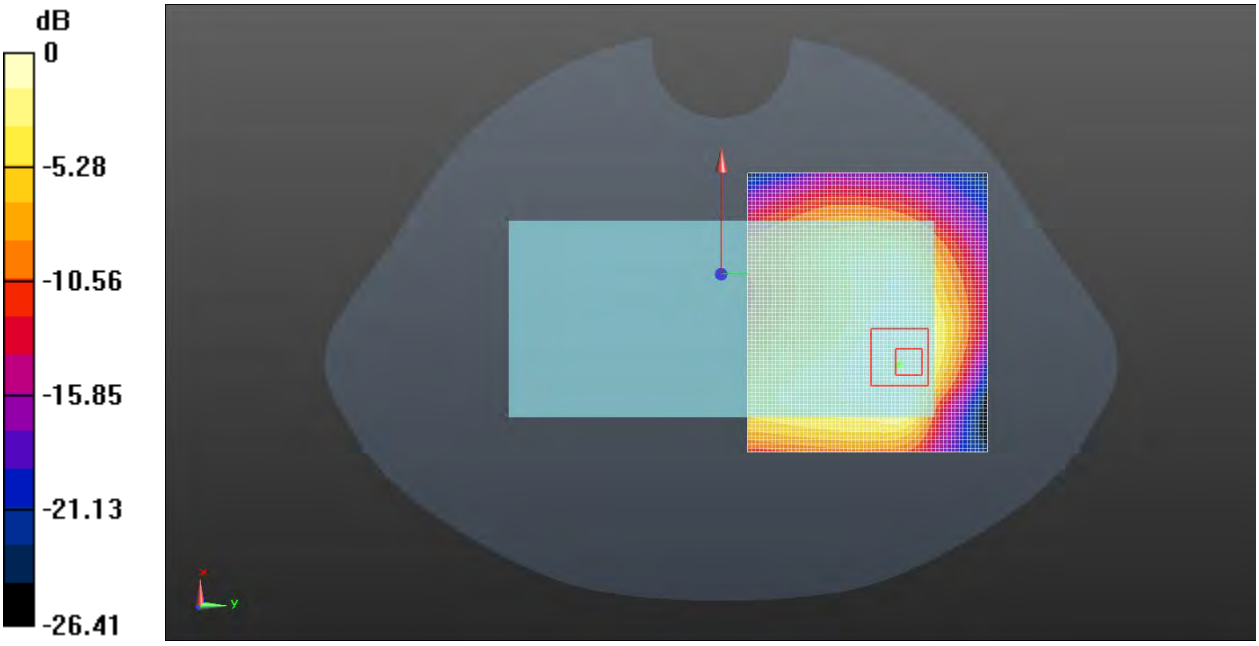


Figure 13: LTE Band 2_QPSK

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/16/2021

LTE Band 4-Body

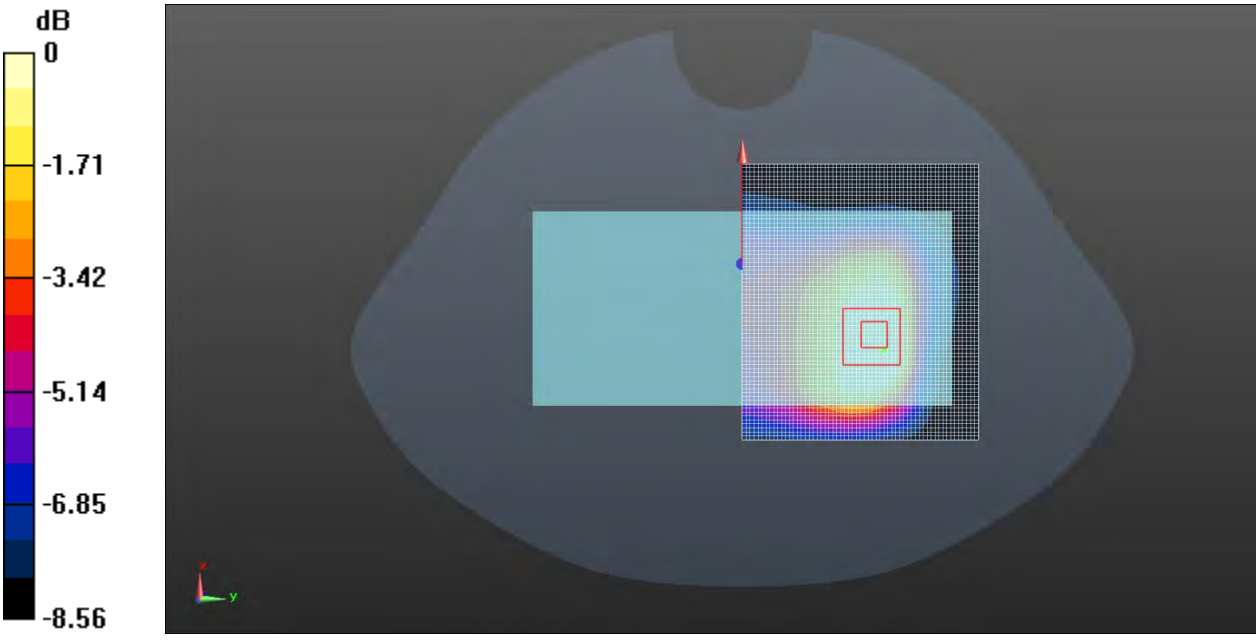
Communication System: LTE B4; Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1732.5 MHz; σ = 1.34 mho/m; εr = 41.5; ρ = 1000 kg/m3
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (51x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.750 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.75 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 1.35 W/kg
SAR(1 g) = 0.661 W/kg; SAR(10 g) = 0.374 W/kg

Maximum value of SAR (measured) = 0.713 W/kg



0 dB = 0.790 W/kg = -1.02 dBW/kg

Figure 14: LTE Band 4_QPSK

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 5/17/2021

LTE Band 7-Body

Communication System: Customer System; Frequency:2535 MHz;Duty Cycle:1:1
Medium parameters used (interpolated): f=2535 MHz; σ=1.77S/m; εr=39.37; ρ=1000 kg/m3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.722 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.76 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.799 W/kg
SAR(1 g) = 0.491 W/kg; SAR(10 g) = 0.294 W/kg
Maximum value of SAR (measured) = 0.528 W/kg

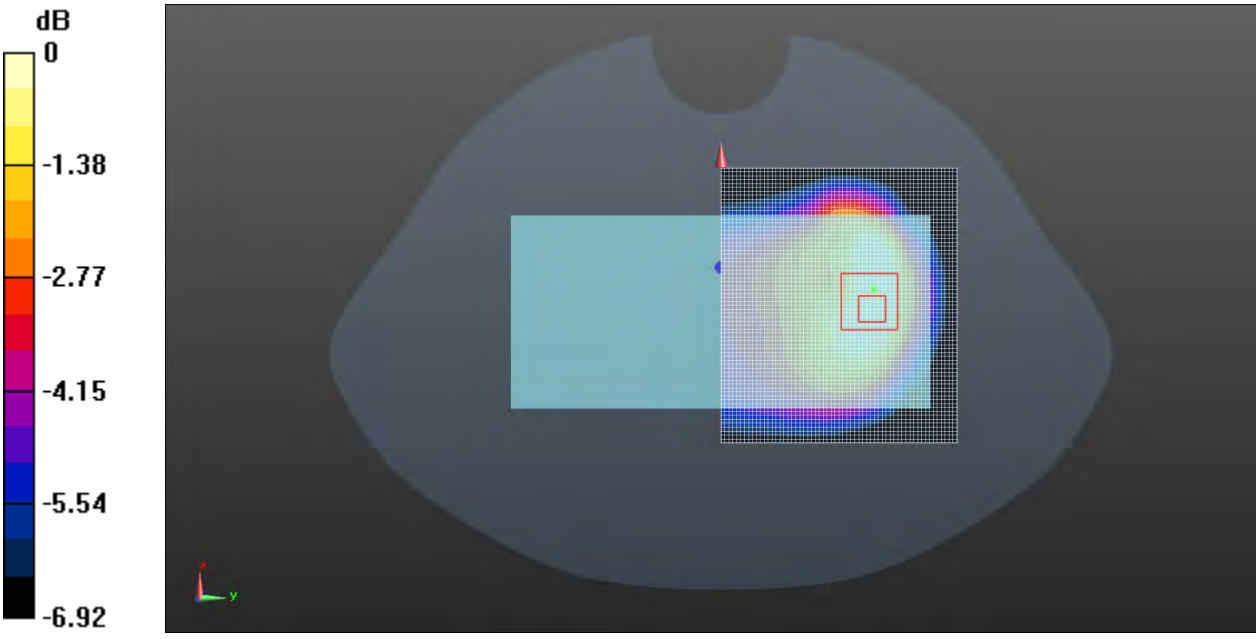


Figure 15: LTE Band 7 _QPSK _ Rear side

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: : 5/17/2021

WLAN2.4G-Body

Communication System: 802.11; Frequency: 2472 MHz;
Medium parameters used: f = 2472 MHz; σ = 1.89 mho/m; εr = 37.2; ρ = 1000 kg/m3
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.55, 8.55, 8.55) @ 1900 MHz; Calibrated: 4/9/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/23/2021
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.374 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.444 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 0.452 W/kg
SAR(1 g) = 0.211 W/kg; SAR(10 g) = 0.110 W/kg
Maximum value of SAR (measured) = 0.223 W/kg

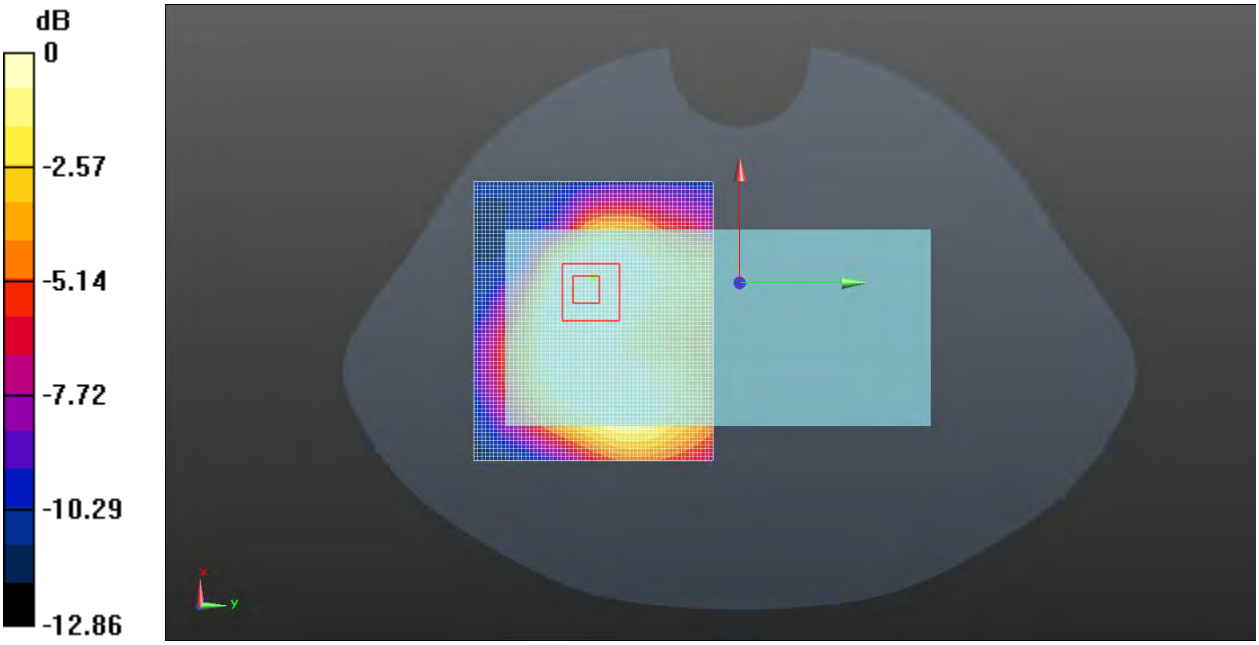


Figure 16: WLAN 2.4G_ Rear side_0mm

1.1.1. DAE4 Calibration Certificate

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
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E-mail: cttl@chinattl.com Http://www.chinattl.cn

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client : HTW Certificate No: Z21-60063

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1549
Calibration Procedure(s)	FF-Z11-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	March 23, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	16-Jun-20 (CTTL, No.J20X04342)	Jun-21

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: March 25, 2021

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

In Collaboration with
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Glossary:

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

Methods Applied and Interpretation of Parameters:

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

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

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV
Low Range: 1LSB = 61nV , full range = -1.....+3mV

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

Calibration Factors	X	Y	Z
High Range	406.327 ± 0.15% (k=2)	406.003 ± 0.15% (k=2)	406.159 ± 0.15% (k=2)
Low Range	3.98410 ± 0.7% (k=2)	3.99112 ± 0.7% (k=2)	3.99200 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	19° ± 1 °

1.2. Probe Calibration Certificate

In Collaboration with
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CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
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中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client HTW Certificate No: Z21-60064

CALIBRATION CERTIFICATE

Object EX3DV4 - SN : 7494

Calibration Procedure(s) FF-Z11-004-02
Calibration Procedures for Dosimetric E-field Probes

Calibration date: April 09, 2021

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	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101547	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101548	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 7307	29-May-20(SPEAG, No.EX3-7307_May20)	May-21
DAE4	SN 1555	25-Aug-20(SPEAG, No.DAE4-1555_Aug20)	Aug-21

Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052605	23-Jun-20(CTTL, No.J20X04343)	Jun-21
Network Analyzer E5071C	MY46110673	21-Jan-21(CTTL, No.J20X00515)	Jan-22

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: April 11, 2021

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

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

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

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

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

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7494

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm(μV/(V/m)²)[A]	0.41	0.47	0.41	±10.0%
DCP(mV)[B]	98.9	100.2	99.0	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (*k*=2)
0	CW	X	0.0	0.0	1.0	0.00	151.2	±2.0%
		Y	0.0	0.0	1.0		164.8	
		Z	0.0	0.0	1.0		151.0	

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

[A] The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7494

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	10.70	10.70	10.70	0.40	0.75	±12.1%
835	41.5	0.90	10.41	10.41	10.41	0.13	1.39	±12.1%
1750	40.1	1.37	8.88	8.88	8.88	0.20	1.14	±12.1%
1900	40.0	1.40	8.55	8.55	8.55	0.22	1.08	±12.1%
2000	40.0	1.40	8.60	8.60	8.60	0.17	1.28	±12.1%
2300	39.5	1.67	8.30	8.30	8.30	0.62	0.62	±12.1%
2450	39.2	1.80	7.97	7.97	7.97	0.48	0.74	±12.1%
2600	39.0	1.96	7.68	7.68	7.68	0.40	0.85	±12.1%
5250	35.9	4.71	5.65	5.65	5.65	0.45	1.35	±13.3%
5600	35.5	5.07	4.95	4.95	4.95	0.55	1.35	±13.3%
5750	35.4	5.22	4.86	4.86	4.86	0.50	1.50	±13.3%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

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

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

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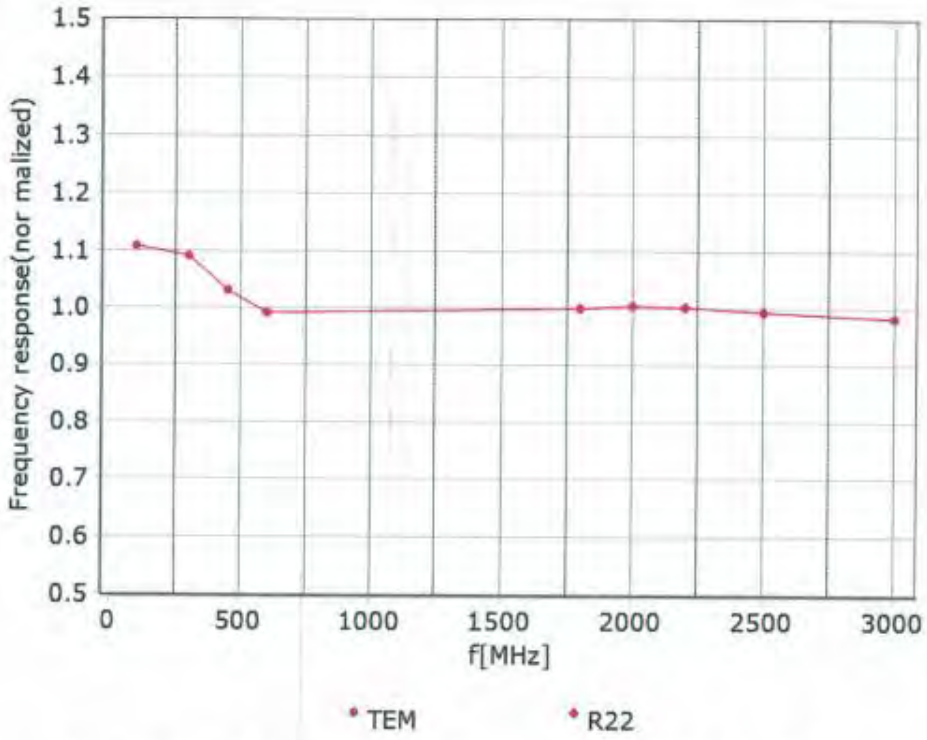
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)

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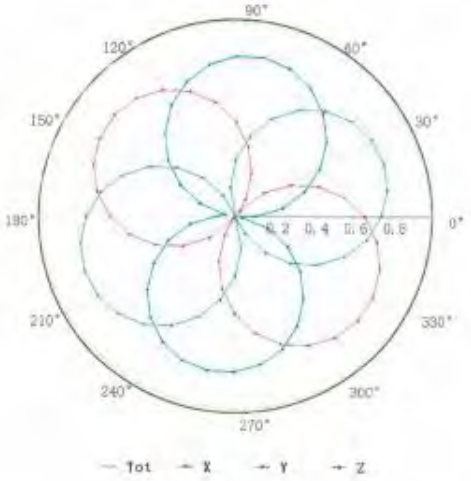
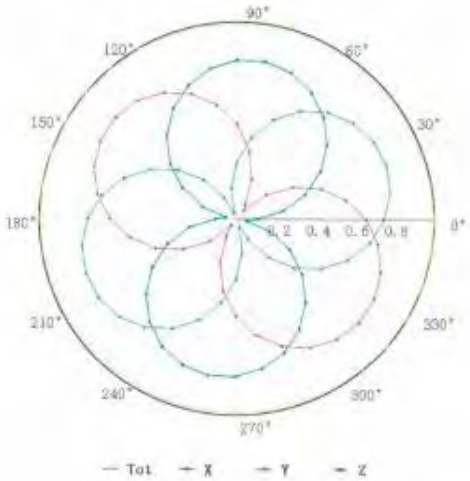
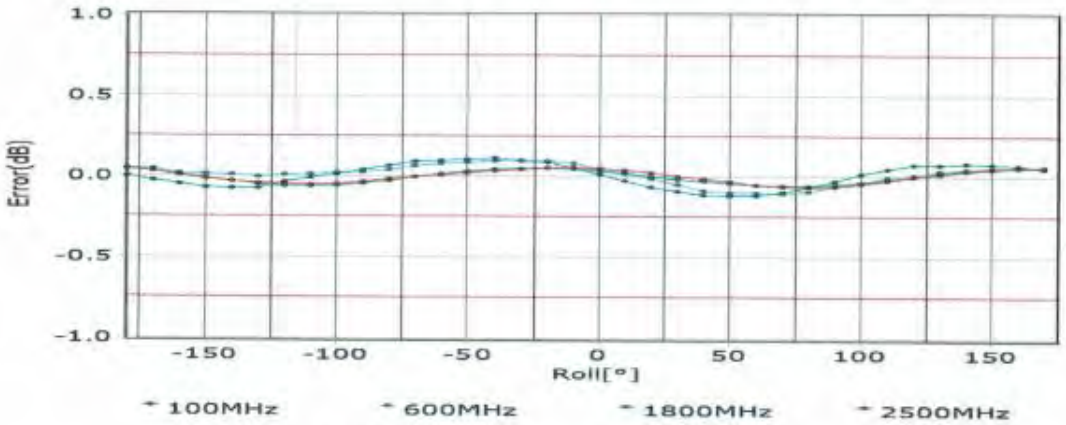
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±1.2% (*k*=2)

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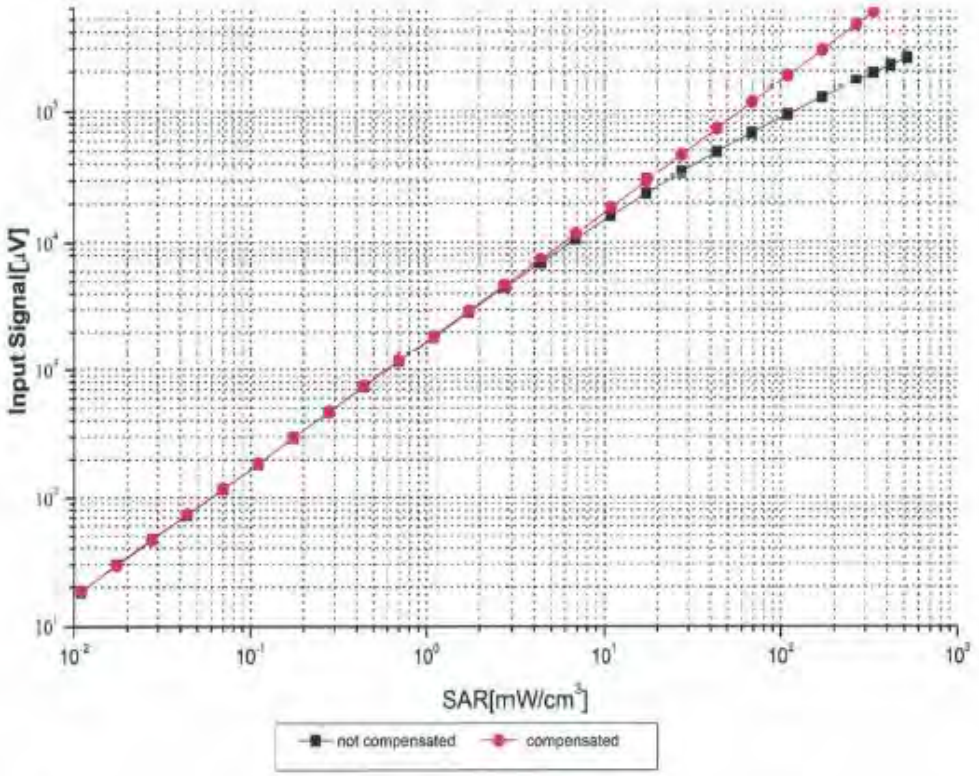
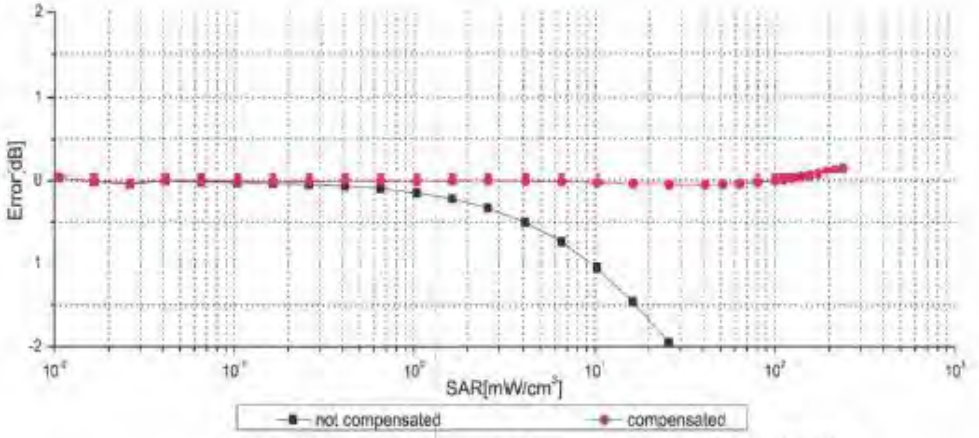
Dynamic Range f(SAR$_{head}$)
(TEM cell, f = 900 MHz)





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

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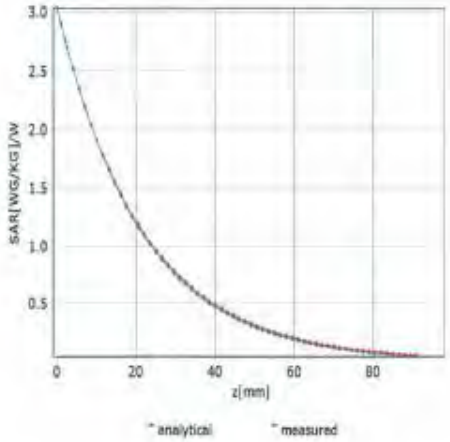
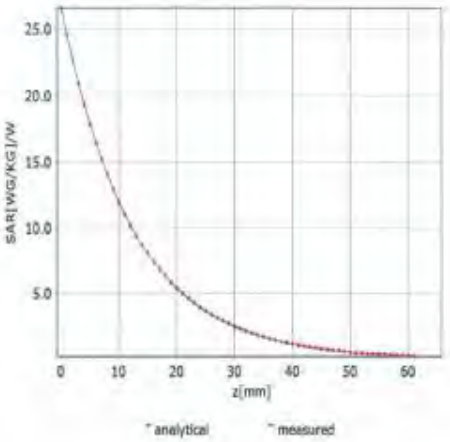
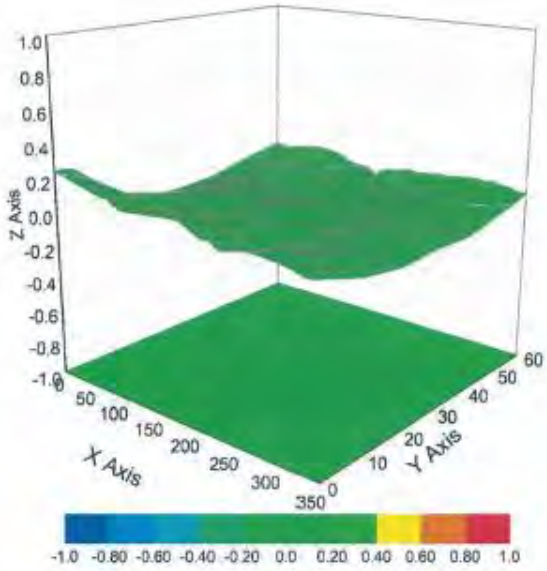
Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF) **f=1750 MHz,WGLS R22(H_convF)**





Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7494

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	22.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

1.1. D835V2 Dipole Calibration Certificate

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CNAS L0570

Client HTW Certificate No: Z21-60017

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d238
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	January 22, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 7600	30-Nov-20(CTTL-SPEAG,No.Z20-60421)	Nov-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: January 29, 2021

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) 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
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) 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	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.3 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.39 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.52 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.14 W/kg ± 18.7 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.5Ω- 3.95jΩ
Return Loss	-27.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.298 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. 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: 01.22.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d238

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.885 S/m; ε_r = 41.32; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7600; ConvF(10.88, 10.88, 10.88) @ 835 MHz; Calibrated: 2020-11-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

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

Reference Value = 58.12 V/m; Power Drift = -0.01 dB

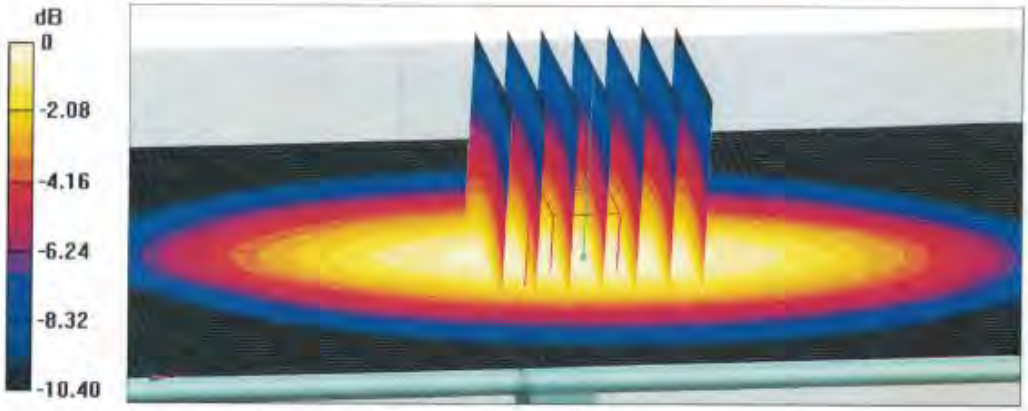
Peak SAR (extrapolated) = 3.58 W/kg

SAR(1 g) = 2.32 W/kg; SAR(10 g) = 1.52 W/kg

Smallest distance from peaks to all points 3 dB below = 19.8 mm

Ratio of SAR at M2 to SAR at M1 = 64.9%

Maximum value of SAR (measured) = 3.14 W/kg



0 dB = 3.14 W/kg = 4.97 dBW/kg

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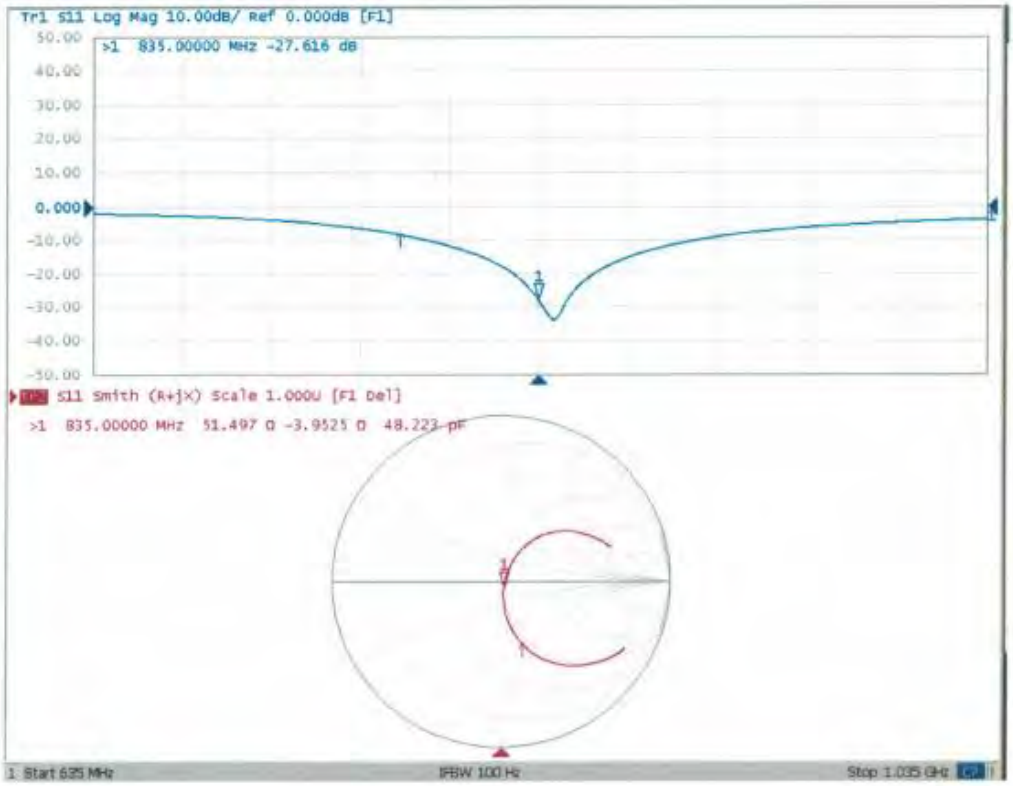
Impedance Measurement Plot for Head TSL



Extended Dipole Calibrations

Referring to KDB865664 D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

Head-835						
Date of measurement	Return-loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary impedance (ohm)	Delta (ohm)
2021/1/22	-27.6		51.5		-3.95	

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 5ohm of prior calibration. Therefore the verification result should support extended calibration.

1.2. D1750V2 Dipole Calibration Certificate

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CNAS L0570

Client HTW Certificate No: Z21-60018

CALIBRATION CERTIFICATE

Object D1750V2 - SN: 1164

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

Calibration date: January 22, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 7600	30-Nov-20(CTTL-SPEAG,No.Z20-60421)	Nov-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: January 29, 2021

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) 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
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) 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	V52.10.4
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	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.8 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	—	—

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.4 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.80 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.2 W/kg ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.9Ω- 3.86jΩ
Return Loss	- 28.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.124 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. 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

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DASY5 Validation Report for Head TSL Date: 01.22.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1164

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1750 MHz; σ = 1.374 S/m; ε_r = 39.78; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7600; ConvF(9.01, 9.01, 9.01) @ 1750 MHz; Calibrated: 2020-11-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.29 V/m; Power Drift = -0.03 dB

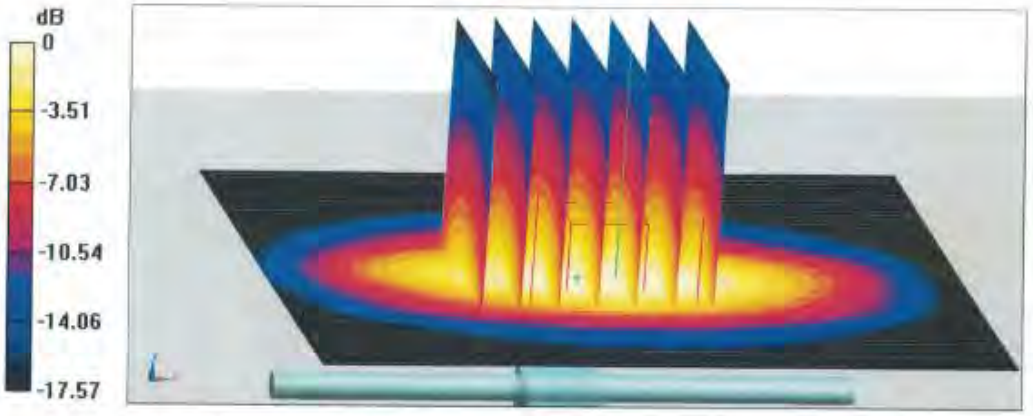
Peak SAR (extrapolated) = 17.4 W/kg

SAR(1 g) = 9.13 W/kg; SAR(10 g) = 4.8 W/kg

Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 52.7%

Maximum value of SAR (measured) = 14.3 W/kg



0 dB = 14.3 W/kg = 11.55 dBW/kg

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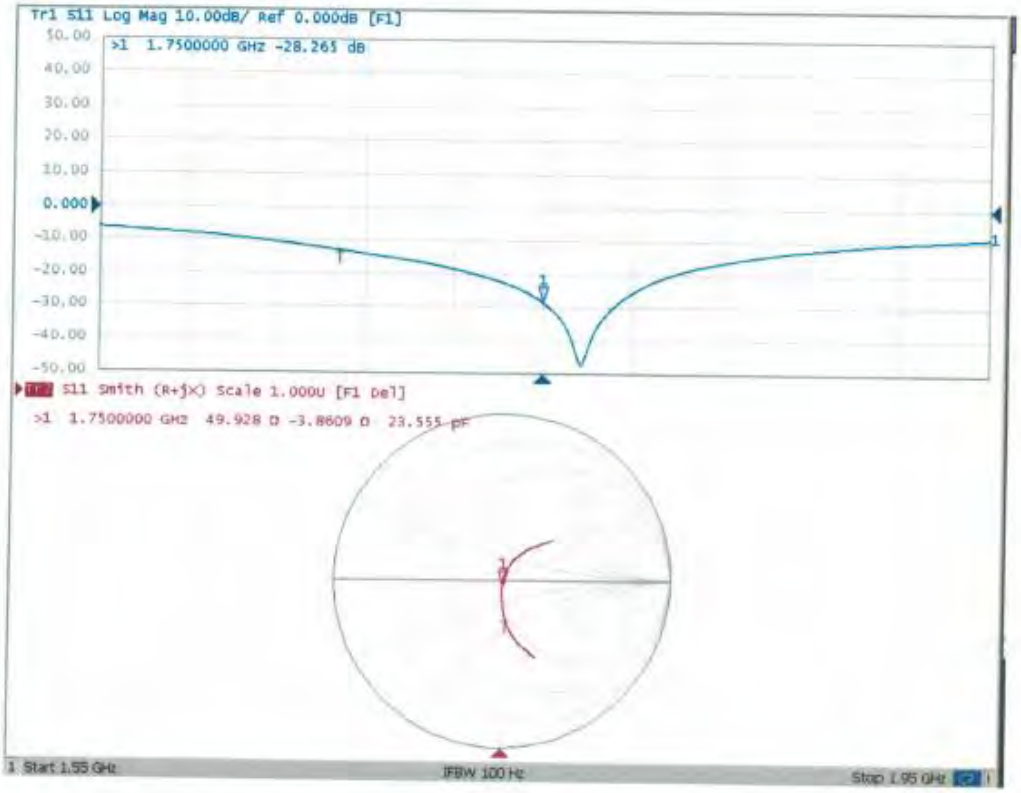
Impedance Measurement Plot for Head TSL



Extended Dipole Calibrations

Referring to KDB865664 D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

Head-1750						
Date of measurement	Return-loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary impedance (ohm)	Delta (ohm)
2021/1/22	-28.3		49.9		-3.86	

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 5ohm of prior calibration. Therefore the verification result should support extended calibration.

1.3. D1900V2 Dipole Calibration Certificate

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CNAS L0570

Client HTW Certificate No: Z21-60019

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d226
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	January 22, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 7600	30-Nov-20(CTTL-SPEAG,No.Z20-60421)	Nov-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: January 29, 2021

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lossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) 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
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) 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	V52.10.4
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	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.1 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.8 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.3 W/kg ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.5Ω+ 7.88jΩ
Return Loss	- 21.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.102 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. 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

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DASY5 Validation Report for Head TSL Date: 01.22.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d226

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 40.06; ρ = 1000 kg/m^3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7600; ConvF(8.7, 8.7, 8.7) @ 1900 MHz; Calibrated: 2020-11-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.77 V/m; Power Drift = -0.06 dB

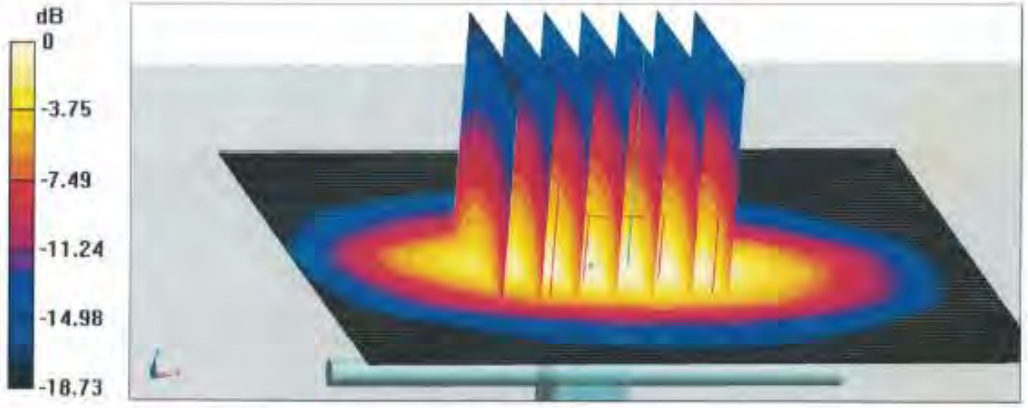
Peak SAR (extrapolated) = 19.0 W/kg

SAR(1 g) = 9.85 W/kg; SAR(10 g) = 5.05 W/kg

Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 52.1%

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



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

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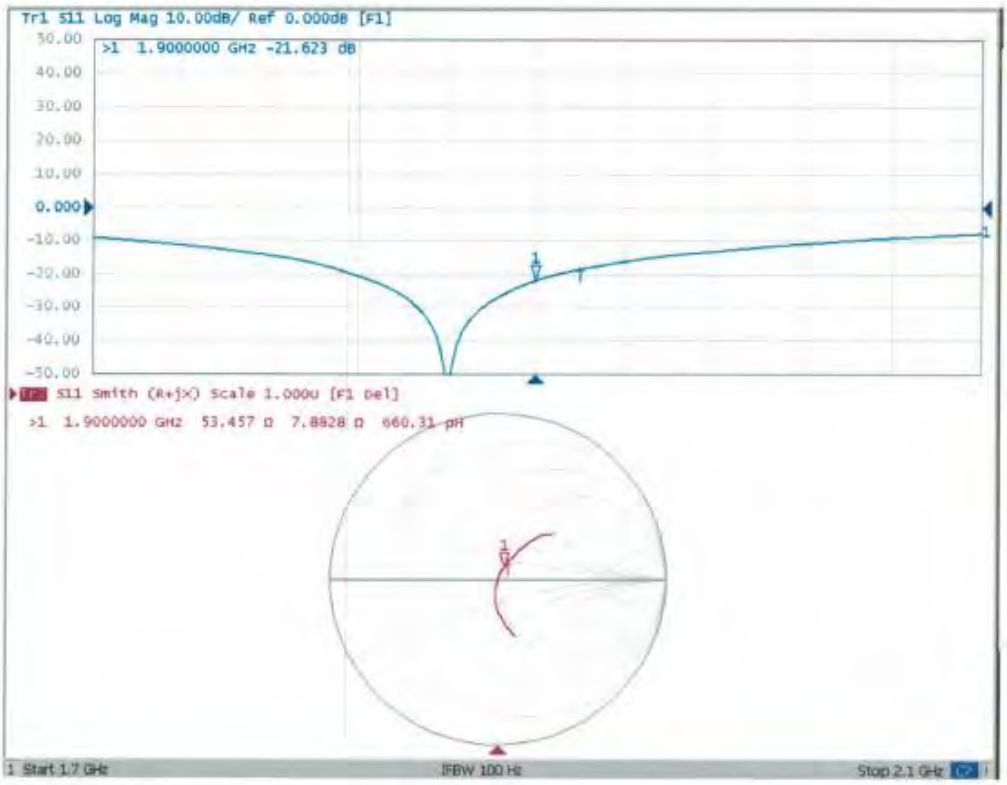
Impedance Measurement Plot for Head TSL



Extended Dipole Calibrations

Referring to KDB865664 D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

Head-1900						
Date of measurement	Return-loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary impedance (ohm)	Delta (ohm)
2021/1/22	-21.6		53.5		7.88	

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 5ohm of prior calibration. Therefore the verification result should support extended calibration.

1.4. D2450V2 Dipole Calibration Certificate

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CNAS L0570

Client HTW Certificate No: Z21-60020

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 1009
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	January 25, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 7600	30-Nov-20(CTTL-SPEAG,No.Z20-60421)	Nov-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: January 29, 2021

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) 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
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) 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	V52.10.4
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 ± 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 ± 0.2) °C	39.5 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.0 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 18.7 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.9Ω+ 2.04jΩ
Return Loss	- 27.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.064 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. 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: 01.25.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 1009

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

Medium parameters used: f = 2450 MHz; σ = 1.81 S/m; ε_r = 39.52; ρ = 1000 kg/m^3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7600; ConvF(7.79, 7.79, 7.79) @ 2450 MHz; Calibrated: 2020-11-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

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

Reference Value = 102.7 V/m; Power Drift = -0.06 dB

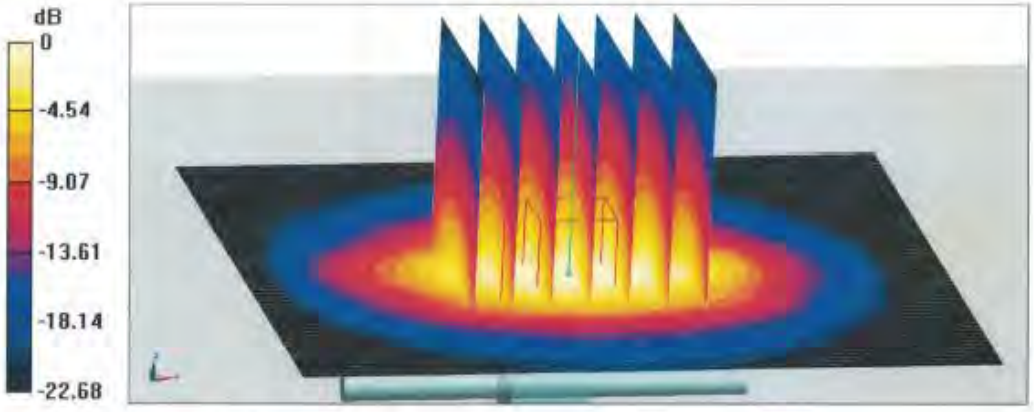
Peak SAR (extrapolated) = 27.2 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 5.97 W/kg

Smallest distance from peaks to all points 3 dB below = 9.5 mm

Ratio of SAR at M2 to SAR at M1 = 47.2%

Maximum value of SAR (measured) = 22.0 W/kg



0 dB = 22.0 W/kg = 13.42 dBW/kg

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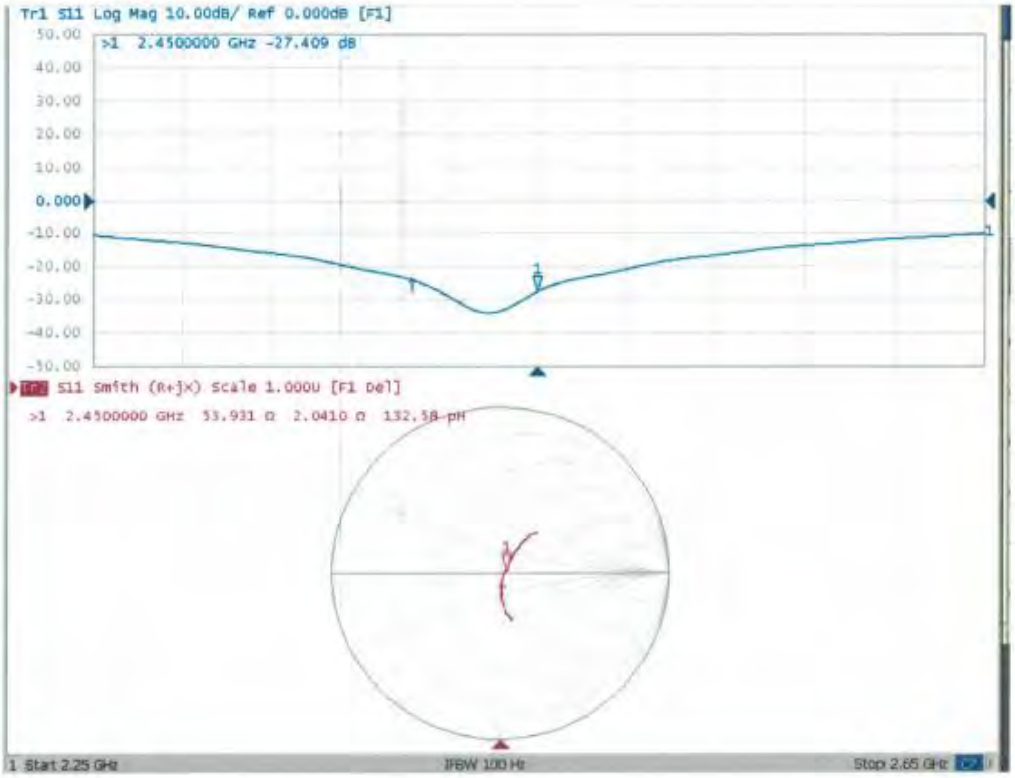
Impedance Measurement Plot for Head TSL



Extended Dipole Calibrations

Referring to KDB865664 D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

Head-2450						
Date of measurement	Return-loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary impedance (ohm)	Delta (ohm)
2021/1/25	-27.4		53.9		2.04	

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 5ohm of prior calibration. Therefore the verification result should support extended calibration.

1.5. D2600V2 Dipole Calibration Certificate

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Client HTW Certificate No: Z21-60021

CALIBRATION CERTIFICATE

Object	D2600V2 - SN: 1150
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	January 25, 2021

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	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
Reference Probe EX3DV4	SN 7600	30-Nov-20(CTTL-SPEAG,No.Z20-60421)	Nov-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
Network Analyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: January 29, 2021

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 / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) 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
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) 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	V52.10.4
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	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.7 ± 6 %	1.97 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**56.5 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.0 W/kg ± 18.7 % (*k*=2)**

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Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.5Ω- 6.58jΩ
Return Loss	- 23.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.047 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. 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

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DASY5 Validation Report for Head TSL Date: 01.25.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1150

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 1.966 S/m; ε_r = 39.65; ρ = 1000 kg/m^3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7600; ConvF(7.67, 7.67, 7.67) @ 2600 MHz; Calibrated: 2020-11-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

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

Reference Value = 104.6 V/m; Power Drift = -0.03 dB

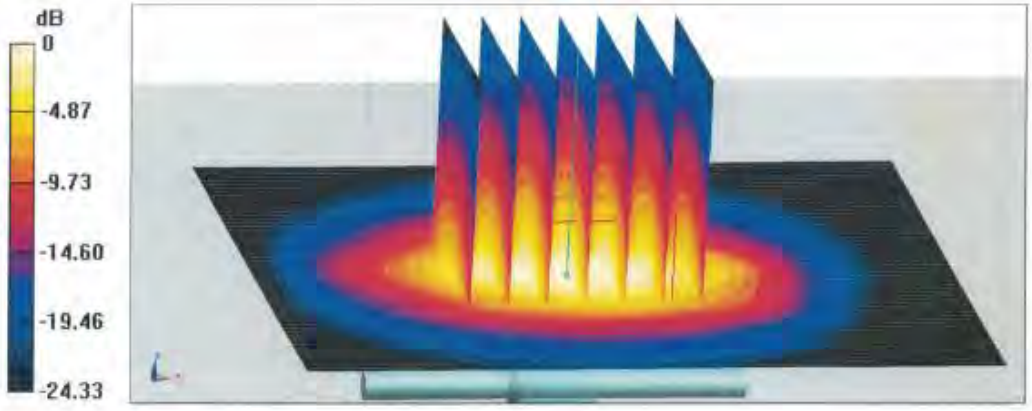
Peak SAR (extrapolated) = 31.1 W/kg

SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.24 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 45.3%

Maximum value of SAR (measured) = 24.6 W/kg



0 dB = 24.6 W/kg = 13.91 dBW/kg

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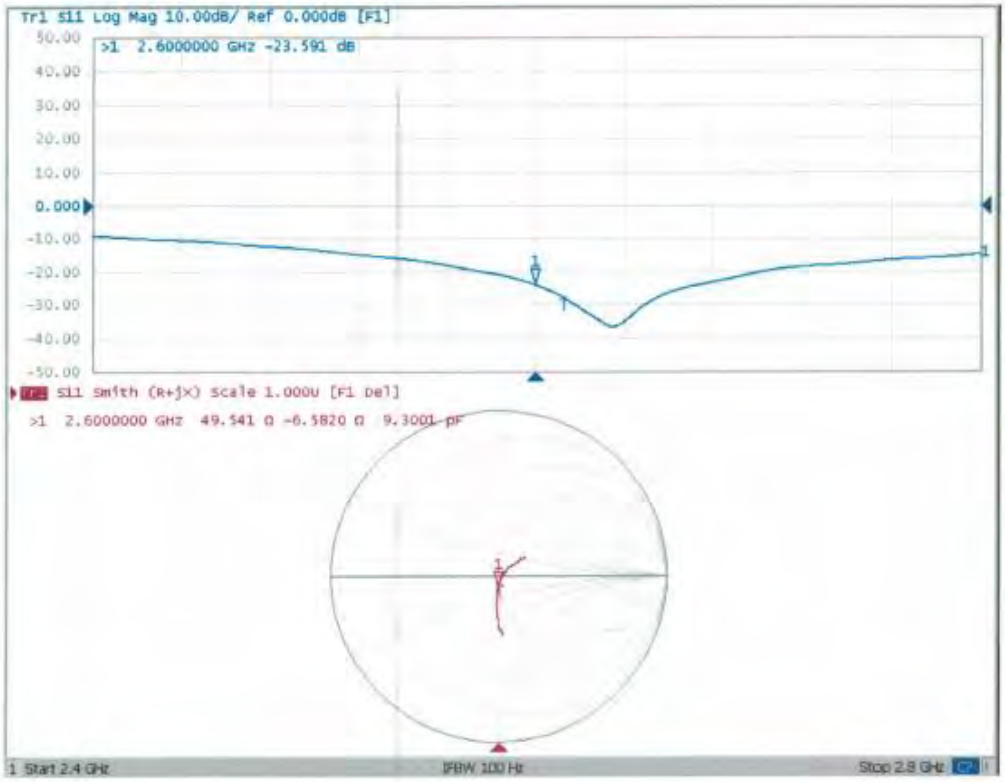
Impedance Measurement Plot for Head TSL



Extended Dipole Calibrations

Referring to KDB865664 D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

Head-2600						
Date of measurement	Return-loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary impedance (ohm)	Delta (ohm)
2021/1/25	-23.6		49.5		-6.58	

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 5ohm of prior calibration. Therefore the verification result should support extended calibration.