SAR TEST REPORT

For

MOBILE PHONE

Model Number: IO PRO 3D

FCC ID: 2AQNZ-IOPRO3D

IC: 24153-IOPRO

HVIN : IO PRO 3D

Report Number: WT208001932

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Test report declaration

Applicant	:	ROKIT Corp Limited
Address1 FOR FCC	:	ROK House, Kingswood Business Park, Holyhead Road, Albrighton, Wolverhampton, United Kingdom, WV73AU
Address2 FOR IC	:	ROK House, Kingswood Business Park, Holyhead Road, Albrighton, Wolverhampton, WV73AU, Wolverhampton, WV81RL, United Kingdom Of Great Britain And Northern Ireland
Manufacturer	:	ROKIT Corp Limited
Address	:	ROK House, Kingswood Business Park, Holyhead Road, Albrighton, Wolverhampton, WV73AU, Wolverhampton, WV81RL, United Kingdom Of Great Britain And Northern Ireland
EUT Description	:	MOBILE PHONE
Model No	:	IO PRO 3D
Trade mark	:	ROKiT

FCC ID: 2AQNZ-IOPRO3D; IC ID: 24153-IOPRO ; HVIN : IO PRO 3D

Test Standards:

IEEE Std 1528-2013, KDB941225 D01, KDB941225 D05, KDB941225 D06, KDB941225 D07,KDB447498 D01,KDB648474 D04,KDB248227 D01,KDB 865664 D01,KDB865664 D02,KDB690783 D01

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the compliance of the applicable standards stated above. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results.

The results documented in this report only apply to the tested sample, under the conditions and modes of operation as described herein.

The test report shall not be reproduced in part without written approval of the laboratory.

Project Engineer:	(Liu Zheng)	Date:	Aug.13,2020
Checked by:	(Lin Yixiang)	Date:	Aug.13,2020
Approved by:	(Lin Bin)	Date:	Aug.13,2020

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1. REPORTED SAR SUMMARY

1.1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing are as follows.

Band	Max Reported SAR(W/kg)
	1-g head
CDMABC0	0.207
CDMA BC1	0.362
CDMA BC10	**0.528**
LTE Band 12	0.155
LTE Band 17	0.124

Band	Max Reported SAR(W/kg)	Max Reported SAR(W/kg)	Max Reported SAR(W/kg)
	1-g Body Worn(10mm)	1-g Body Worn(15mm)	10-g extremity (0mm)
CDMABC0	0.231	0.169	0.392
CDMA BC1	**1.167**	0.396	**1.514**
CDMA BC10	0.679	**0.554**	0.388
LTE Band 12	0.169	0.150	0.470
LTE Band 17	0.175	0.163	0.524

Table 1: Summary of test result

Note:

*For body-worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and that positions the handset a minimum of 15mm from the body. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

The device is in compliance with Specific Absorption Rate (SAR) for general population/ uncontrolled exposure limits according to the FCC rule 2.1093 , the ANSI/IEEE C95.1:1992, the NCRP Report Number 86 for uncontrolled environment, according to the Industry Canada Radio Standards Specification RSS-102 for General Population/ Uncontrolled exposure, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013& IEEE Std 1528a-2005.

1.2. RF exposure limits (ICNIRP Guidelines)

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

Table 2: RF exposure limits

The limit applied in this test report is shown in bold letters

Notes:

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

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

*** The Spatial Peak value of the SAR averaged over any 1 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time. Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result if employment or occupation.)

1.3 Ratings and System Details

Product Name:	MOBILE PHONE
Model No.(EUT):	IO PRO 3D
Trade mark:	ROKiT
EUT Supports Radios application:	BT4.0, 2.1+EDR: 2402MHz to 2480MHz WiFi: IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz GPS: 1559MHz to 1610MHz GSM/GPRS/EDGE 850: Tx:824.20 -848.80MHz; Rx: 869.20 – 893.80MHz GSM/GPRS/EDGE 1900: Tx:1850.20 – 1909.80MHz; Rx:1930.20 – 1989.80MHz CDMA BC0: Tx:815-849MHz; Rx:860-894MHz CDMA BC1: Tx:1850-1910MHz; Rx:1930-1990MHz

	CDMA BC10:TX:817.25-823.975MHz, RX:862.25-868.975MHz 1xEVDO BC0: Tx:815-849MHz; Rx:860-894MHz 1xEVDO BC0: Tx:1850-1910MHz; Rx:1930-1990MHz 1xEVDO BC0: TX:817.25-823.975MHz, RX:862.25-868.975MHz WCDMA/HSDPA/HSUPA/HSPA+(Down Link) Band V: Tx:826.40 -846.60MHz; Rx: 871.40 – 891.60MHz WCDMA/HSDPA/HSUPA/HSPA+(Down Link) Band IV: Tx:1710-1755MHz; Rx: 2110-2155MHz WCDMA/HSDPA/HSUPA/HSPA+(Down Link) Band II: Tx:1852.40 – 1907.60MHz; Rx:1932.40 – 1987.60MHz LTE Band 2:TX:1850MHz to 1910MHz RX:1930MHz to 1990MHz. LTE Band 4:TX:1710MHz to 1755MHz RX:2110MHz to 2155MHz. LTE Band 5:TX:824MHz to 849MHz RX:869MHz to 894MHz. LTE Band 12:TX:698MHz to 716MHz RX:729MHz to 746MHz. LTE Band 17:TX:704MHz to 716MHz RX:734MHz to 746MHz.
Power Supply:	DC 5V by USB port
	Li-ion Battery 3.8V, 3850mAh, 14.82Wh
Firmware version:	MOLY.LR12A.R2.MP.V36.9(manufacturer declare)
Hardware version:	V0(manufacturer declare)
USB cable:	100cm(shielded)
Remark	This is a derivative report based on original report WT188005125. This report only updates the model number to IO PRO 3D. All the test data were copied from the original report WT188005125

1.4 Product Function and Intended Use

IO PRO 3D is subscriber equipment in the CDMA/LTE system.
The CDMA frequency band is BC0, BC1 and BC10, all can be used in this report. The LTE frequency band is Band 12, Band 17, all can be used in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSUPA/HSDPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video, MMS service, GPS, AGPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and Micro USIM card interface.

1.5 Test specification(s)

IEEE Std 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate(SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB941225 D01 SAR test for 3G devices v03r01	3G SAR MEAUREMENT PROCEDURES
KDB941225 D05 SAR for LTE Devices v02r05	SAR Evaluation Considerations for LTE Devices
941225 D07 UMPC Mini Tablet v01r02	SAR EVALUATION PROCEDURES FOR UMPC MINI-TABLET DEVICES
KDB941225 D06 Hotspot Mode v02r01	SAR Evaluation Procedures for portable Devices with Wireless Router Capabilities
KDB447498 D01 General RF Exposure Guidance v06	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
KDB 648474 D04 Handset SAR v01r03	SAR Evaluation Considerations for Wireless Handsets.
KDB 248227 D01 802 11 Wi-Fi SAR v02r02	SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04	SAR Measurement Requirements for 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting v01r02	RF Exposure Compliance Reporting and Documentation Considerations
KDB 690783 D01 SAR Listings on Grants v01r03	SAR Listings on Equipment Authorization Grants

1.6 List of Test and Measurement Instruments

No	Equipment	Model No.	Serial No.	Manufacturer	Last Calibration Date	Period
1	SAR test system	TX60L	F08/5AY8A1/A/01 +F08/	SPEAG	NCR	NCR
2	Electronic Data Transmitter	DAE4	876	SPEAG	2018.03.22	1year
3	SAR Probe	EX3DV4	3881	SPEAG	2018.07.14	1year
4	Software	85070	--	Agilent	--	--
5	Software	DASY5	--	SPEAG	--	--
6	System Validation Dipole,835MHz	D835V2	4d141	SPEAG	2015.09.24 2018.09.06	3year
7	System Validation Dipole,1900MHz	D1900V2	5d162	SPEAG	2015.09.16 2018.09.11	3year
8	Dielectric Probe Kit	85070E	MY44300455	Agilent	NCR	NCR
9	Dual-directional coupler,0.10-2.0GHz	778D	MY48220198	Agilent	NCR	NCR
10	Dual-directional coupler,2.00-18GHz	772D	MY46151160	Agilent	NCR	NCR
11	Coaxial attenuator	8491A	MY39266348	Agilent	NCR	NCR
12	Power Amplifier	ZHL42W	81709	MINI-CIRCUITS	NCR	NCR
13	Signal Generator	SMR20	100047	R&S	2018.02.27	1year
14	Power Sensor	NRP-Z21	105057-XP	R&S	2018.06.06	1year
15	Power Sensor	NRP-Z21	105057-XP	R&S	2018.06.06	1year
16	Call Tester	CMU 200	100110	R&S	2017.12.04	1year
17	Network Analyzer	E5071C	MY46109550	Agilent	2018.02.27	1Year
18	Twin Phantom	SAM	TP-1504	SPEAG	NCR	NCR
19	Twin Phantom	SAM	TP-1504	SPEAG	NCR	NCR
20	Wideband Radio Communication Tester	CMW500	125469	R&S	2017.10.31 2018.10.29	1Year
21	Precision Thermometer	--	--	--	2018.08.09	1Year
22	System Validation Dipole,750MHz	D750V3	1103	SPEAG	2017.01.10	3year

Table 3: List of Test and Measurement Equipment

Note: All the test equipments are calibrated once a year, except the dipoles, which are calibrated every three years. Moreover, we have self-calibration every year to the dipoles.

2. GENERAL INFORMATION

2.1. Report information

This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.

The sample/s mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

2.2. Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at NETC Building, No.4 Tongfa Rd., Xili, Nanshan, Shenzhen, China. At the time of testing, Laboratory is accredited by the following organizations:

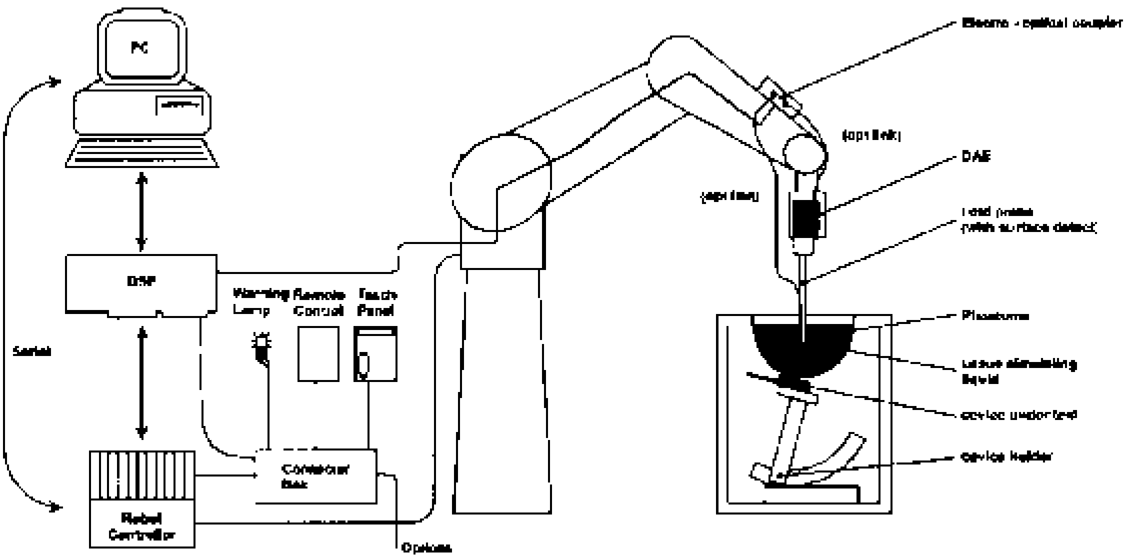
China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579.

The Laboratory is Accredited Testing Laboratory of FCC with Designation number CN1165 and Site registration number 582918.

The Laboratory is registered to perform emission tests with Industry Canada (IC), and the registration number is 11177A.

3. SAR MEASUREMENT SYSTEM CONFIGURATION

3.1. 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 XP.

• 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 checks dipoles allowing validating the proper functioning of the system.
- Test environment
- The DASY5 measurement system is placed at the head end of a room with dimensions:

4.5 x 4 x 3 m³, the SAM phantom is placed in a distance of 1.3 m from the side walls and 1.1m from the rear wall.

Picture 1 of the photo documentation shows a complete view of the test environment.

3.2. Probe description

Isotropic E-Field Probe EX3DV4 for Dosimetric Measurements

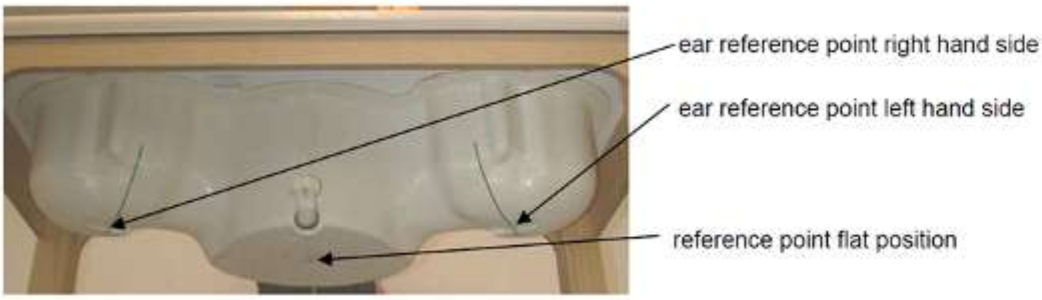
Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	 
Calibration	ISO/IEC 17025 calibration service available.	
Frequency	10 MHz to >6 GHz (dosimetry); Linearity: ± 0.2 dB (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 mW/g; Linearity: ± 0.2 dB (noise: typically<1 μW/g)	
Dimensions	Overall length: 337 mm (Tip: 20mm) Tip length: 2.5 mm (Body: 12mm) Typical distance from probe tip to dipole centers: 1mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for	

	frequencies up to 6 GHz with precision of better 30%.	

3.3. Phantom description

The used SAM Phantom meets the requirements specified in Edition 01-01 of Supplement C to OET Bulletin 65 for Specific Absorption Rate (SAR) measurements.

The phantom consists of a fibreglass shell integrated in a wooden table. It allows left-hand and right-hand head as well as body-worn measurements with a maximum liquid depth of 18 cm in head position and 22 cm in planar position (body measurements). The thickness of the Phantom shell is 2 mm +/- 0.1 mm.



ELI4 Phantom

Shell Thickness	2mm+/- 0.2mm
Filling Volume	Approximately 30 liters
Measurement Areas	Flat phantom
The ELI4 phantom is in intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6GHz. ELI4 is fully compatible with the	

lastest draft of the standard IEC 62209-2 and all known tissue simulating liquids.

The phantom shell material is resistant to all ingredients used in the tissue-equivalent liquid recipes. The shell of the phantom including ear spacers is constructed from low permittivity and low loss material, with a relative permittivity≤5 and a loss tangent ≤0.05.

3.4. Device holder description

The DASY5 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used.

Larger DUT's (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values.

Therefore those devices are normally only tested at the flat part of the SAM.

4. SAR MEASUREMENT PROCEDURE

4.1. Scanning procedure

- The DASY5 installation includes predefined files with recommended procedures for measurements and system check. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.
- The reference and drift measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT's output power and should vary max. +/- 5 %.
- The surface check measurement tests the optical surface detection system of the DASY5

system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

● The area scan measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strenth is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid spacing for head measurements is 15 mm in x- and y- dimension(≤ 2GHz)，12 mm in x- and y- dimension(2-4 GHz) and 10mm in x- and y- dimension(4-6GHz). If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation.

Results of this coarse scan are shown in Appendix B.

● A "zoom scan" measures the field in a volume around the 2D peak SAR value acquired in the previous "coarse" scan. This is a fine grid with maximum scan spatial resolution: Δxzoom, Δyzoom ≤2GHZ≤ 8 mm, 2-4GHz - ≤ 5 mm and 4-6 GHz-≤ 4 mm; Δzzoom ≤ 3GHz - ≤ 5 mm, 3-4 GHz- ≤ 4 mm and 4-6GHz-≤2mm where the robot additionally moves the probe along the z-axis away from the bottom of the Phantom. DASY5 is also able to perform repeated zoom scans if more than 1 peak is found during area scan. Test results relevant for the specified standard (see chapter 1.5.) are shown in table form in chapter 3.2.

● A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2mm steps. This measurement shows the continuity of the liquid and can – depending in the field strength- also show the liquid depth. A z-axis scan of the measurement with maximum SAR value is shown in Appendix B.

The following table summarizes the area scan and zoom scan resolutions per FCC KDB 865664D01:

Frequency	Maximum Area Scan resolution (Δxarea,Δyarea)	Maximum Zoom Scan spatial resolution(Δxzoom Δyzoom)	Maximum Zoom Scan spatial resolution			Minimum zoom scan volume (x,y,z)
			Uniform Grid	Graded Grad		
			Δzzoom(n)	Δzzoom(1)	Δzzoom(n>1)	
≤2GHz	≤15mm	≤8mm	≤5mm	≤4mm	≤1.5*Δzzoom(n-1)	≥30mm
2-3GHz	≤12mm	≤5mm	≤5mm	≤4mm	≤1.5*Δzzoom(n-1)	≥30mm
3-4GHz	≤10mm	≤5mm	≤4mm	≤3mm	≤1.5*Δzzoom(n-1)	≥28mm
4-5GHz	≤10mm	≤4mm	≤3mm	≤2.5mm	≤1.5*Δzzoom(n-1)	≥25mm
5-6GHz	≤10mm	≤4mm	≤2mm	≤2mm	≤1.5*Δzzoom(n-1)	≥22mm

Spatial Peak SAR Evaluation

- The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The bases of the evaluation are the SAR values measured at the points of the fine cube grid consisting of 5 x 5 x 7 points (with 8mm horizontal resolution) or 7 x 7 x 7 points (with 5mm horizontal resolution).
- The algorithm that finds the maximal averaged volume is separated into three different stages.
- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting 'Graph Evaluated'.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid

was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.

- All neighboring volumes are evaluated until no neigh boring volume with a higher average value is found.
- Extrapolation
- The extrapolation is based on a least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

- The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].
- Volume Averaging
- At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.
- Advanced Extrapolation
- DASY5 uses the advanced extrapolation option which is able to compansate boundary effects on E-field probes.

4.1.1. Data Storage and Evaluation

Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension DAE4. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

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

Data Evaluation by SEMCAD

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

Probe parameters: - Sensitivity Normi, ai0, ai1, ai2

- Conversion factor ConvFi

- Diode compression point Dcpi

Device parameters: - Frequency f

- Crest factor cf

Media parameters: - Conductivity 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:

$$Vi = Ui + Ui2 \bullet cf/dcpi$$

with Vi = compensated signal of channel i (i = x, y, z)

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

cf = crest factor of exciting field (DASY parameter)

dcpi = diode compression point (DASY parameter)

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

E-field probes: $E_i = (V_i / Norm_i \bullet ConvF)^{1/2}$

H-field probes: $H_i = (V_i)^{1/2} \bullet (a_{i0} + a_{i1}f + a_{i2}f^2)/f$

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

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

[mV/(V/m)2] for E-field Probes

ConvF = sensitivity enhancement in solution

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

f = carrier frequency [GHz]

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

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

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

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

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

$SAR = (E_{tot}^2 \bullet \sigma) / (\rho \bullet 1000)$

with SAR = local specific absorption rate in mW/g

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

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

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. The power flow density is calculated assuming the excitation field to be a free space field.

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

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

Etot = total electric field strength in V/m

Htot = total magnetic field strength in A/m

5. SYSTEM VERIFICATION PROCEDURE

5.1. Tissue Verification

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ±5% of the target values.

The following materials are used for producing the tissue-equivalent materials

Ingredients(% of weight)	Body Tissue	
Frequency Band(MHz)	835	1900
Water	52.4	69.91
Salt(NaCl)	1.40	0.13
Sugar	45.0	0.0
HEC	1.0	0.0
Bactericide	0.1	0.0
Triton X-100	0.0	0.0
DGBE	0.0	29.96

Table 4 : Tissue Dielectric Properties

Salt: 99+% Pure Sodium Chloride; Sugar”98+% Pure Sucrose; Water: De-ionized, 16MΩ+ resistivity

HEC: Hydroxyethyl Cellulose; DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100(ultra pure): Polyethylene glycol mono[4-(1,1,3,3-tetramethylbutyl)phenyl]ether

Head & Body Tissue-equivalent liquid measurements:

Used Target Frequency	Measured Frequency(MHz)	Target Tissue		Measured Tissue		Liquid Temp	Test Date
		εr (+/-5%)	σ(S/m) (+/-5%)	εr	σ (S/m)		
750MHz Head	704	41.9 (37.81~44.00)	0.89 (0.85~0.93)	42.2	0.86	22°C	2018.09.05
	707.5	41.9 (37.81~44.00)	0.89 (0.85~0.93)	42.1	0.86		
	709	41.9 (37.81~44.00)	0.89 (0.85~0.93)	42.1	0.86		
	710	41.9 (37.81~44.00)	0.89 (0.85~0.93)	42.1	0.86		
	711	41.9 (37.81~44.00)	0.89 (0.85~0.93)	42.1	0.86		
	711	41.9 (37.81~44.00)	0.89 (0.85~0.93)	42.1	0.86		
835MHz Head	817.9	41.5 (39.43~43.58)	0.90 (0.86~0.95)	41.7	0.86	22°C	2018.09.06
	820.5	41.5 (39.43~43.58)	0.90 (0.86~0.95)	41.6	0.86		
	823.1	41.5 (39.43~43.58)	0.90 (0.86~0.95)	41.6	0.87		
	824.7	41.5 (39.43~43.58)	0.90 (0.86~0.95)	41.6	0.87		
	836.5	41.5 (39.43~43.58)	0.90 (0.86~0.95)	41.5	0.88		
	848.3	41.5 (39.43~43.58)	0.90 (0.86~0.95)	41.4	0.89		
1900MHz Head	1851.25	40.0 (38.00~42.00)	1.40 (1.33~1.47)	39.45	1.42	22°C	2018.09.07
	1880.0	40.0 (38.00~42.00)	1.40 (1.33~1.47)	39.62	1.44		
	1908.75	40.0 (38.00~42.00)	1.40 (1.33~1.47)	39.71	1.46		
ε_r= Relative permittivity, σ= Conductivity							

Used Target Frequency	Measured Frequency(MHz)	Target Tissue		Measured Tissue		Liquid Temp	Test Date
		εr (+/-5%)	σ(S/m) (+/-5%)	εr	σ (S/m)		
750MHz Body	704	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.7	0.92	22°C	2018.09.05
	707.5	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.4	0.92		
	709	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.5	0.92		
	710	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.5	0.92		
	711	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.5	0.92		
	711	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.5	0.92		
835MHz Body	817.9	55.2 (52.44~57.96)	0.97 (0.92~1.02)	55.99	0.94	22°C	2018.09.06
	820.5	55.2 (52.44~57.96)	0.97 (0.92~1.02)	55.94	0.95		
	823.1	55.2 (52.44~57.96)	0.97 (0.92~1.02)	55.93	0.95		
	824.7	55.2 (52.44~57.96)	0.97 (0.92~1.02)	55.92	0.95		
	836.5	55.2 (52.44~57.96)	0.97 (0.92~1.02)	55.87	0.96		
	848.3	55.2 (52.44~57.96)	0.97 (0.92~1.02)	55.84	0.97		
1900MHz Body	1851.25	53.3 (50.64~55.97)	1.52 (1.44~1.60)	54.6	1.50	22°C	2018.09.07
	1880.0	53.3 (50.64~55.97)	1.52 (1.44~1.60)	54.3	1.52		
	1908.75	53.3 (50.64~55.97)	1.52 (1.44~1.60)	54.0	1.54		
ε_r= Relative permittivity, σ= Conductivity							

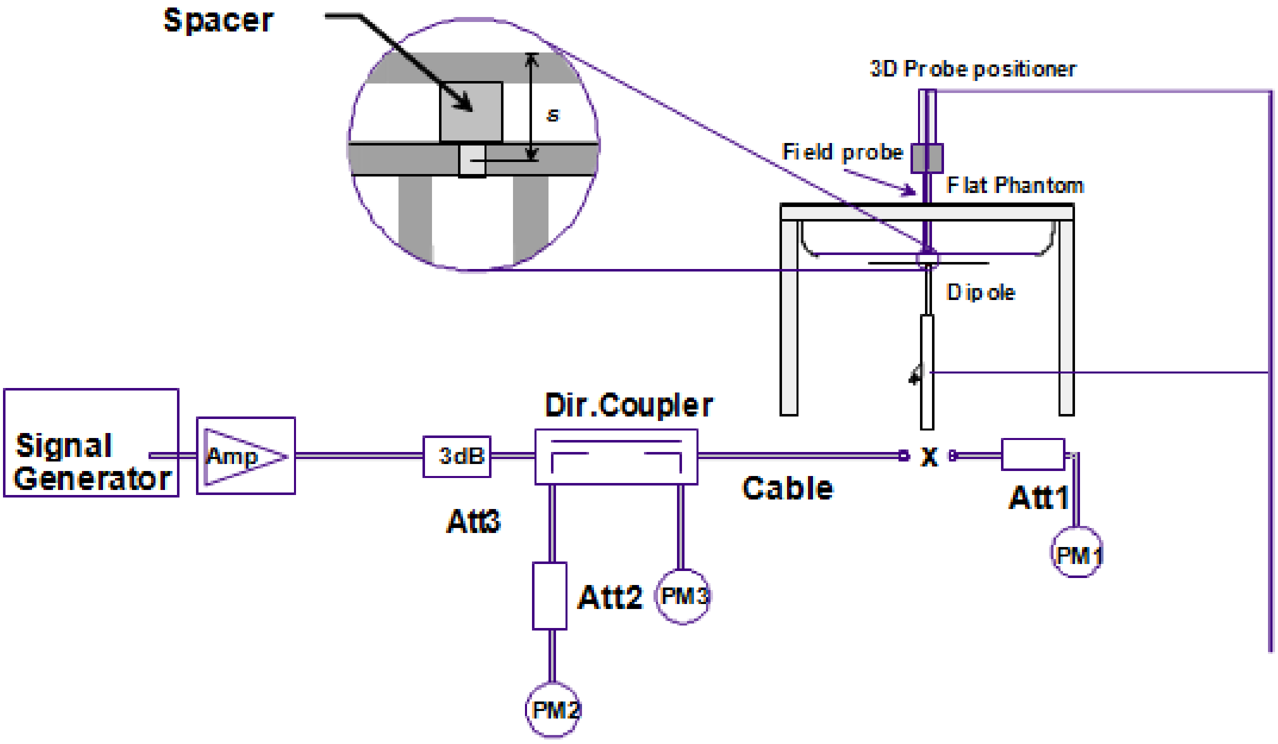
Used Target Frequency	Measured Frequency(MHz)	Target Tissue		Measured Tissue		Liquid Temp	Test Date
		εr (+/-5%)	σ(S/m) (+/-5%)	εr	σ (S/m)		
750MHz extremity	704	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.6	0.93	22°C	2018.11.01
	707.5	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.3	0.93		
	709	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.4	0.93		
	710	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.4	0.93		
	711	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.4	0.93		
	711	55.5 (52.73~58.28)	0.96 (0.91~1.01)	54.4	0.92		
835MHz extremity	817.9	55.2 (52.44~57.96)	0.97 (0.92~1.02)	56.09	0.93	22°C	2018.11.01
	820.5	55.2 (52.44~57.96)	0.97 (0.92~1.02)	56.05	0.94		
	823.1	55.2 (52.44~57.96)	0.97 (0.92~1.02)	56.02	0.94		
	824.7	55.2 (52.44~57.96)	0.97 (0.92~1.02)	55.99	0.94		
	836.5	55.2 (52.44~57.96)	0.97 (0.92~1.02)	55.95	0.94		
	848.3	55.2 (52.44~57.96)	0.97 (0.92~1.02)	55.92	0.95		
1900MHz extremity	1851.25	53.3 (50.64~55.97)	1.52 (1.44~1.60)	54.6	1.47	22°C	2018.11.01
	1880.0	53.3 (50.64~55.97)	1.52 (1.44~1.60)	54.3	1.49		
	1908.75	53.3 (50.64~55.97)	1.52 (1.44~1.60)	54.0	1.51		
ε_r= Relative permittivity, σ= Conductivity							

System checking, Body Tissue-equivalent liquid:

System Check	Target SAR (1W) (+/-10%)		Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (W/kg)	10-g (W/kg)	1-g (W/kg)	10-g (W/kg)		
D750V2 Head	8.29 (7.5~9.1)	5.53 (5.0~6.1)	8.16	5.36	22°C	2018.09.05
D835V2 Head	9.45 (8.51~10.40)	6.11 (5.50~6.72)	9.80	6.32	22°C	2018.09.06
D1900V2 Head	40.4 (36.36~44.44)	21.0 (18.90~23.10)	39.56	20.68	22°C	2018.09.07
D750V2 Body	8.89 (8.0~9.8)	5.97 (5.4~6.6)	8.56	6.12	22°C	2018.09.05
D835V2 Body	9.51 (8.6~10.5)	6.25 (5.6~7.2)	8.72	6.36	22°C	2018.09.06
D1900V2 Body	41.2 (37.1~45.3)	21.6 (19.4~23.8)	40.84	21.2	22°C	2018.09.07
D750V2 extremity	8.89 (8.0~9.8)	5.97 (5.4~6.6)	8.64	6.16	22°C	2018.11.01
D835V2 extremity	9.74 (8.8~10.7)	6.54 (5.9~7.2)	8.84	5.96	22°C	2018.11.01
D1900V2 extremity	40.3 (36.3~44.3)	21.7 (19.5~23.9)	41.00	21.68	22°C	2018.11.01

System Checking

The manufacturer calibrates the probes annually. A system check measurement was made following the determination of the dielectric parameters of the tissue-equivalent liquid, using the dipole validation kit. A power level of 250mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom.



The system checking results (dielectric parameters and SAR values) are given in the table below.

The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows system check results for all frequency bands and tissue liquids used during the tests (Graphic Plot(s)see Appendix A).

6. SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

6.1. SAR measurement variability

Per KDB865664 D01 SAR measurement 100MHz to 6GHz v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurement 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 <0.80 W/kg; step2) through 4) do not apply.
2) When the original highest measured SAR is ≥0.8 W/kg , repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is >1.20 or when the original or repeated measurement is ≥1.45 W/kg(~10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is >1.20.

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

6.2. SAR measurement uncertainty

Per KDB865664 D01 SAR Measurement 100MHz to 6GHz v01r03, when the highest measured 1-g SAR within a frequency band is <1.5W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2003 is not required in SAR reports submitted for equipment approval. The equivalent ratio(1.5/1.6) is applied to extremity and occupational exposure conditions.

7. Test Configuration

The DUT is tested using a CMU 200 or E5515C communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power.

Test positions as described in the tables above are in accordance with the specified test standard.

CDMA Configuration and Testing

1)CDMA 1xRTT Handsets Head SAR

SAR for next to the ear head exposure is measured in RC3 with the handset configured to transmit at full rate in SO55. The 3G SAR test reduction procedure is applied to RC1 with RC3 as the primary mode. Otherwise, SAR is required for the channel with maximum measured output in RC1 using the head exposure configuration that results in the highest reported SAR in RC3. CDMA 1xRTT Handsets Body-worn SAR Body-worn SAR is measured in RC3 with the handset configured in TDSO/SO32 to transmit at full rate on FCH only with all other code channels disabled. The 3G SAR test reduction procedure is applied to the multiple code channel configuration (FCH + SCHn), with FCH only as the primary mode. Otherwise, SAR is required for multiple code channel configuration (FCH + SCHn), with FCH at full rate and SCH0 enabled at 9600 bps, using the highest reported SAR configuration for FCH only. The 3G SAR test reduction procedure is applied to body-worn SAR in RC1 with RC3 as the primary mode. Otherwise, SAR is required for RC1, with SO55 and full rate, using the highest reported SAR configuration for body-worn exposure in RC3.

2)Handsets with built-in EV-DO

The 3G SAR test reduction procedure is applied to EV-DO Rev. 0 with 1xRTT RC3 as the primary mode to determine body-worn test requirements. Otherwise, body-worn SAR is required for Rev. 0, at 153.6 kbps, using the highest reported SAR configuration for body-worn exposure in RC3. The 3G SAR test reduction procedure is applied separately to Rev. A and Rev. B, with Rev. 0 as the primary mode to determine body-worn SAR test requirements. When SAR is not required for Rev. 0, the 3G SAR test reduction is applied with 1xRTT RC3 as the primary mode. Otherwise, SAR is required for Rev. A or Rev. B, with a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 and 3 Physical Layer configurations, using the highest reported SAR configuration for body-worn exposure in Rev. 0 or

RC3, as appropriate. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with ACK Channel transmitting in all slots is configured in the downlink for Rev. 0, Rev. A and Rev. B.

3)EV-DO Data Devices

SAR is measured using the F/R TAP configurations required for Rev. 0, Rev. A and Rev. B. The AT is tested with a Reverse Data Channel rate of 153.6 kbps in Subtype 0/1 Physical Layer configurations. A Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots are used for Subtype 2 and 3. FTAP, FETAP and FMCTAP are all configured with a Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with ACK Channel transmitting in all slots. AT power control is in “All Bits Up” conditions for the TAP / ETAP / MCTAP. Body-worn and other body SAR are measured using Subtype 0/1 Physical Layer configurations for Rev. 0. The 3G SAR test reduction procedure is applied to Rev. A, Subtype 2 Physical layer configuration, with Rev. 0 as the primary mode. Otherwise, SAR is measured for Rev. A using the highest reported SAR configuration for body-worn exposure in Rev. 0. SAR is required for Rev. B, Subtype 3; it is measured by applying both the “test 2” and “test 3” configurations used for power measurement. EV-DO Data Devices Support 1xRTT

The 3G SAR test reduction procedure is applied to 1xRTT RC3 and RC1 with EV-DO Rev. 0, Rev. A and Rev. B as the respective primary modes. Otherwise, the “CDMA 1xRTT Handsets Body-worn SAR” procedures are applied.

1x-Advanced SAR Guidance

The 3G SAR test reduction procedure is applied to 1x-Advanced with 1xRTT RC3 as the primary mode. When SAR measurement is required, the 1x-Advanced power measurement configurations are used. The 1x Advanced SAR procedures are applied separately to head, body-worn and other exposure conditions.

LTE Test Configuration

SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02r05. The CMW500 WideBand Radio Communication Tester was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing.SAR test were performed with the same number of RB and RB offsets transmitting on all TTI frames (Maximum TTI)

1) Spectrum Plots for RB configurations

A properly configured base station simulator was used for LTE output power measurements and SAR testing. Therefore, spectrum plots for RB configurations were not required to be included in this report.

2) MPR

When MPR is implemented permanently within the UE, regardless of network requirements, only those RB configurations allowed by 3GPP for the channel bandwidth and modulation combinations may be tested with MPR active. Configurations with RB allocations less than the RB thresholds required by 3GPP must be tested without MPR.

The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101:

Maximun Power Reduction(MRP) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth(N_{RB})						MPR(dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	＞5	＞4	＞8	＞12	＞16	＞18	⩽1
16 QAM	⩽5	⩽4	⩽8	⩽12	⩽16	⩽18	⩽1
16 QAM	＞5	＞4	＞8	＞12	＞16	＞18	⩽2

Configuration of special subframe (lengths of DwPTS/GP/UpPTS)

<table>
<tr><td rowspan="3">Special subframe configuration</td><td colspan="3">Normal cyclic prefix in downlink</td><td colspan="3">Extended cyclic prefix in downlink</td></tr>
<tr><td>DwPTS</td><td colspan="2">UpPTS</td><td>DwPTS</td><td colspan="2">UpPTS</td></tr>
<tr><td></td><td>Normal cyclic prefix in uplink</td><td>Extended cyclic prefix in uplink</td><td></td><td>Normal cyclic prefix in uplink</td><td>Extended cyclic prefix in uplink</td></tr>
<tr><td>0</td><td>6592 T_s</td><td rowspan="5">2192 T_s</td><td rowspan="5">2560 T_s</td><td>7680 T_s</td><td rowspan="4">2192 T_s</td><td rowspan="4">2560 T_s</td></tr>
<tr><td>1</td><td>19760 T_s</td><td>20480 T_s</td></tr>
<tr><td>2</td><td>21952 T_s</td><td>23040 T_s</td></tr>
<tr><td>3</td><td>24144 T_s</td><td>25600 T_s</td></tr>
<tr><td>4</td><td>26336 T_s</td><td>7680 T_s</td><td>4384 T_s</td><td>5120 T_s</td></tr>
</table>

5	6592 T_s	4384 T_s	5120 T_s	20480 T_s		
6	19760 T_s			23040 T_s		
7	21952 T_s			12800 T_s		
8	24144 T_s			-	-	-
9	13168 T_s			-	-	-

Uplink-downlink configurations

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Calculated Duty Cycle = Extended cyclic prefix in uplink x (Ts) x # of S + # of U

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:

Calculated Duty Cycle = 5120 x [1/(15000 x 2048)] x 2 + 6 ms = 63.33%

Where Ts = 1/(15000 x 2048) seconds

3) A-MPR

A-MPR(Additional MPR) has been disabled for all SAR tests by using Network Signalling Value of “NS_01”on the base station simulator.

4) LTE procedures for SAR testing

A) Largest channel bandwidth standalone SAR test requirements

i) QPSK with 1 RB allocation

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

ii) QPSK with 50% RB allocation

The procedures required for 1 RB allocation in i) are applied to measure the SAR for QPSK with 50% RB allocation.

iii) QPSK with 100% RB allocation

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

iv) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

B) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

8. MEASUREMENT RESULTS

Result: Passed

Date of testing	:	2018.09.05~2018.09.07; 2018.11.01
Ambient temperature	:	20℃~22℃
Relative humidity	:	50~68%

8.1. Conducted Power

For the measurements a Rohde & Schwarz Radio Communication Tester CMU 200 was used.

SAR drift measured at the same position in liquid before and after each SAR test.

Note: CMU200 measures GSM peak and average output power for active timeslots. For SAR the time based average power is relevant. The difference in between depends on the duty cycle of the TDMA signal:

No. of Timeslots	1	2	3	4
Duty Cycle	1:8.3	1:4.1	1:2.77	1:2.08
Time based avg. power compared to slotted avg. power	-9.19dB	-6.13dB	-4.42dB	-3.18dB

The signalling modes differ as follows:

Mode	Coding scheme	Modulation
GPRS	CS1 to CS4	GMSK
EDGE	MCS1 to MCS4	GMSK
EDGE	MCS5 to MCS9	8PSK

Apart from modulation change (GMSK/8PSK) coding schemes differ in code rate without influence on the RF signal. Therefore one coding scheme per mode was selected for conducted power measurements.

CDMA BC0 Conducted Power Measurement Results

CDMA BC0	Conducted Power (dBm)		
	1013CH	384CH	777CH
·1xRTT RC1+SO55	**25.40**	**25.45**	**25.39**
1xRTT RC3+SO55	25.08	25.21	25.18
1xRTT RC3+SO32 (FCH)	25.07	25.13	25.16
1xRTT RC3+SO32 (SCH)	25.26	25.13	25.18
1xEVDO Rev.0 RTAP 153.6	25.01	25.15	25.19
1xEVDO Rev.A RETAP 4096	25.11	25.12	25.13
RC8+SO75 (1X)	25.08	25.11	25.18

CDMA BC1 Conducted Power Measurement Results

CDMA BC1	Conducted Power (dBm)		
	25CH	600CH	1175CH
·1xRTT RC1+SO55	**24.80**	**24.89**	**24.86**
1xRTT RC3+SO55	24.68	24.82	24.81
1xRTT RC3+SO32 (FCH)	24.67	24.74	24.77
1xRTT RC3+SO32 (SCH)	24.76	24.74	24.73
1xEVDO Rev.0 RTAP 153.6	24.77	24.77	24.75
1xEVDO Rev.A RETAP 4096	24.68	24.72	24.71
RC8+SO75 (1X)	24.70	24.84	24.81

CDMA BC10 Conducted Power Measurement Results

CDMA BC10	Conducted Power (dBm)		
	476CH	580CH	684CH
·1xRTT RC1+SO55	**24.81**	**24.85**	**24.80**
1xRTT RC3+SO55	24.78	24.81	24.88
1xRTT RC3+SO32 (FCH)	24.77	24.79	24.80
1xRTT RC3+SO32 (SCH)	24.66	24.74	24.83
1xEVDO Rev.0 RTAP 153.6	24.60	24.67	24.60
1xEVDO Rev.A RETAP 4096	24.57	24.64	24.68
RC8+SO75 (1X)	24.69	24.66	24.64

Conducted power measurements of LTE Band 12

Bandwidth	Modulation	RB size	RB offset	Channel 23017	Channel 23095	Channel 23173
1.4MHz	QPSK	1	0	23.66	23.62	23.72
		1	3	23.69	23.70	23.72
		1	5	23.71	23.60	23.74
		3	0	23.73	23.73	23.80
		3	2	23.76	23.74	23.80
		3	3	23.77	23.73	23.80
		6	0	22.69	22.69	22.79
	16QAM	1	0	22.93	22.96	23.17
		1	3	23.18	23.14	23.42
		1	5	23.00	22.98	23.20
		3	0	22.88	22.97	22.94
		3	2	22.91	22.98	22.97
		3	3	22.95	22.92	22.95
		6	0	21.82	21.64	21.77

Bandwidth	Modulation	RB size	RB offset	Channel 23025	Channel 23095	Channel 23165
3MHz	QPSK	1	0	23.48	23.62	23.73
		1	7	23.74	23.70	23.70
		1	14	23.56	23.57	23.79
		8	0	22.55	22.62	22.77
		8	4	22.57	22.67	22.82
		8	7	22.58	22.70	22.79
		15	0	22.61	22.60	22.79
	16QAM	1	0	22.81	23.09	23.03
		1	7	23.13	23.35	23.33
		1	14	22.93	23.10	23.12
		8	0	21.63	21.67	21.73
		8	4	21.73	21.69	21.81
		8	7	21.67	21.68	21.77
		15	0	21.55	21.67	21.78

Bandwidth	Modulation	RB size	RB offset	Channel 23035	Channel 23095	Channel 23155
5MHz	QPSK	1	0	23.31	23.53	23.69
		1	12	23.70	23.77	23.79
		1	24	23.11	23.22	23.13
		12	0	22.77	22.63	22.65
		12	6	22.68	22.72	22.75
		12	13	22.87	22.74	22.56
		25	0	22.80	22.69	22.57
	16QAM	1	0	22.78	22.98	22.98
		1	13	23.11	23.25	23.13
		1	24	22.92	23.06	23.12
		12	0	21.80	21.70	21.66
		12	6	21.75	21.77	21.76
		12	13	21.88	21.82	21.57
		25	0	21.82	21.74	21.64

Bandwidth	Modulation	RB size	RB offset	Channel 23060	Channel 23095	Channel 23130
10MHz	QPSK	1	0	23.41	23.50	23.61
		1	24	**23.88**	**23.89**	**23.87**
		1	49	23.59	23.61	23.77
		25	0	22.77	22.63	22.65
		25	12	22.68	22.72	22.75
		25	25	22.87	22.74	22.56
		50	0	22.80	22.69	22.57
	16QAM	1	0	22.78	22.98	22.98
		1	24	23.11	23.25	23.13
		1	49	22.92	23.06	23.12
		25	0	21.80	21.70	21.66
		25	12	21.75	21.77	21.76
		25	25	21.88	21.82	21.57
		50	0	21.82	21.74	21.64

Conducted power measurements of LTE Band 17

Bandwidth	Modulation	RB size	RB offset	Channel 23755	Channel 23790	Channel 23825
5MHz	QPSK	1	0	23.68	23.66	23.67
		1	12	23.77	23.74	23.71
		1	24	23.71	22.78	23.66
		12	0	22.86	22.66	22.99
		12	6	23.28	22.77	23.29
		12	13	21.96	21.80	22.99
		25	0	21.68	21.66	23.67
	16QAM	1	0	22.62	23.69	22.89
		1	13	22.83	23.80	22.81
		1	24	22.64	23.76	22.75
		12	0	21.76	22.95	22.03
		12	6	21.91	23.35	21.98
		12	13	21.73	23.11	21.89
		25	0	22.73	22.89	22.88

Bandwidth	Modulation	RB size	RB offset	Channel 23790	Channel 23790	Channel 23790
10MHz	QPSK	1	0	23.64	23.63	23.69
		1	24	**23.74**	**23.84**	**23.84**
		1	49	23.73	23.78	23.87
		25	0	22.70	22.68	22.74
		25	12	22.78	22.82	22.80
		25	25	22.63	22.64	22.63
		50	0	22.64	22.60	22.68
	16QAM	1	0	22.98	23.13	23.05
		1	24	23.17	23.34	23.13
		1	49	23.04	23.24	23.17
		25	0	21.73	21.74	21.74
		25	12	21.76	21.85	21.80
		25	25	21.68	21.69	21.63
		50	0	21.64	21.66	21.67

SAR measurement Results

General Notes:

1) Per KDB447498 D01v06, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.
2) Per KDB447498 D01v06, 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 2.0W/kg, for 1-g or 10-g respectively, when the transmission band is ≤100MHz. When the maximum output power variation across the required test channels is >1/2 dB, instead of the middle channel, the highest output power channel must be used.
3) Per KDB865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measure SAR is ≥0.8W/kg; if the deviation among the repeated measurement is ≤20%, and the measured SAR<1.45W/kg, only one repeated measurement is required.
4) Per KDB 941225 D06 Hotspot Mode SAR v02:r01, the DUT dimension is bigger than 9cm*5cm, so 10mm is chosen as the test separation distance for Hotspot mode. When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.
5) Per KDB648474 D04v01r03, SAR is evaluated without a headset connected to the device. When the standalone reported body-worn SAR is ≤1.2W/kg, no additional SAR evaluations using a headset are required.
6) Per KDB865664 D02v01r02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; plots are also required when the measured SAR is >1.5W/kg, or >7.0W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan plots-processing (refer to appendix B for details).

WLAN Notes

Per KDB 248227 D01v02r02, for all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Per KDB 248227 D01v02r02, for 802.11g/n SAR testing is required. 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.

Per KDB 248227 D01v02r02, for OFDM transmission configurations in the 2.4 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11g/n mode is used for SAR measurement, on the highest measured output power channel for each frequency band.

8.2. CDMA BC0 SAR results

Head Exposure Condition

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC0	1xRTT RC1+SO55	Left Cheek	384	836.52	25.45	25.50	1.012	0.149	0.151
CDMA BC0	1xRTT RC1+SO55	Left Tilted	384	836.52	25.45	25.50	1.012	0.046	0.047
CDMA BC0	**1xRTT RC1+SO55**	**Right Cheek**	**384**	**836.52**	**25.45**	**25.50**	**1.012**	**0.205**	**0.207**
CDMA BC0	1xRTT RC1+SO55	Right Tilted	384	836.52	25.45	25.50	1.012	0.057	0.058

Body Hotspot Exposure Condition (Separation Distance is 1.0 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC0	**1xRTT RC1+SO55**	**Front Side**	**384**	**836.52**	**25.45**	**25.50**	**1.012**	**0.228**	**0.231**
CDMA BC0	1xRTT RC1+SO55	Back Side	384	836.52	25.45	25.50	1.012	0.219	0.222
CDMA BC0	1xRTT RC1+SO55	Left Side	384	836.52	25.45	25.50	1.012	0.032	0.032
CDMA BC0	1xRTT RC1+SO55	Right Side	384	836.52	25.45	25.50	1.012	0.160	0.162
CDMA BC0	1xRTT RC1+SO55	Bottom Side	384	836.52	25.45	25.50	1.012	0.201	0.203

Extremity Hotspot Exposure Condition (Separation Distance is 0 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC0	**1xRTT RC1+SO55**	**Front Side**	**384**	**836.52**	**25.45**	**25.50**	**1.012**	**0.387**	**0.392**
CDMA BC0	1xRTT RC1+SO55	Back Side	384	836.52	25.45	25.50	1.012	0.302	0.306
CDMA BC0	1xRTT RC1+SO55	Left Side	384	836.52	25.45	25.50	1.012	0.034	0.034
CDMA BC0	1xRTT RC1+SO55	Right Side	384	836.52	25.45	25.50	1.012	0.214	0.217
CDMA BC0	1xRTT RC1+SO55	Bottom Side	384	836.52	25.45	25.50	1.012	0.264	0.267

Body-worn Exposure Condition (Separation Distance is 1.5 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC0	**1xRTT RC1+SO55**	**Front Side**	**384**	**836.52**	**25.45**	**25.50**	**1.012**	**0.167**	**0.169**
CDMA BC0	1xRTT RC1+SO55	Back Side	384	836.52	25.45	25.50	1.012	0.155	0.157

8.1. CDMA BC1 SAR results

Head Exposure Condition

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC1	**1xRTT RC1+SO55**	**Left Cheek**	**600**	**1880**	**24.89**	**24.90**	**1.002**	**0.361**	**0.362**
CDMA BC1	1xRTT RC1+SO55	Left Tilted	600	1880	24.89	24.90	1.002	0.048	0.048
CDMA BC1	1xRTT RC1+SO55	Right Cheek	600	1880	24.89	24.90	1.002	0.229	0.230
CDMA BC1	1xRTT RC1+SO55	Right Tilted	600	1880	24.89	24.90	1.002	0.033	0.033

Body Hotspot Exposure Condition (Separation Distance is 1.0 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC1	1xRTT RC1+SO55	Front Side	600	1880	24.89	24.90	1.002	0.703	0.705
CDMA BC1	1xRTT RC1+SO55	Back Side	600	1880	24.89	24.90	1.002	0.068	0.068
CDMA BC1	1xRTT RC1+SO55	Left Side	600	1880	24.89	24.90	1.002	0.031	0.031
CDMA BC1	1xRTT RC1+SO55	Right Side	600	1880	24.89	24.90	1.002	1.060	1.062
CDMA BC1	1xRTT RC1+SO55	Bottom Side	600	1880	24.89	24.90	1.002	0.081	0.081
CDMA BC1	**1xRTT RC1+SO55**	**Bottom Side**	**600**	**1880**	**24.80**	**24.90**	**1.023**	**1.140**	**1.167**
CDMA BC1	1xRTT RC1+SO55	Bottom Side	600	1880	24.86	24.90	1.009	1.030	1.040

Extremity Hotspot Exposure Condition (Separation Distance is 0 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC1	1xRTT RC1+SO55	Front Side	600	1880	24.89	24.90	1.002	1.045	1.047
CDMA BC1	1xRTT RC1+SO55	Back Side	600	1880	24.89	24.90	1.002	0.351	0.352
CDMA BC1	1xRTT RC1+SO55	Left Side	600	1880	24.89	24.90	1.002	0.168	0.168
CDMA BC1	1xRTT RC1+SO55	Right Side	600	1880	24.89	24.90	1.002	1.355	1.358
CDMA BC1	1xRTT RC1+SO55	Bottom Side	600	1880	24.89	24.90	1.002	0.188	0.188
CDMA BC1	**1xRTT RC1+SO55**	**Bottom Side**	**600**	**1880**	**24.80**	**24.90**	**1.023**	**1.480**	**1.514**
CDMA BC1	1xRTT RC1+SO55	Bottom Side	600	1880	24.86	24.90	1.009	1.245	1.256

Body-worn Exposure Condition (Separation Distance is 1.5 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC1	**1xRTT RC1+SO55**	**Front Side**	**600**	**1880**	**24.89**	**24.90**	**1.002**	**0.395**	**0.396**
CDMA BC1	1xRTT RC1+SO55	Back Side	600	1880	24.89	24.90	1.002	0.304	0.305

8.1. CDMA BC10 SAR results

Head Exposure Condition

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC10	1xRTT RC1+SO55	Left Cheek	580	820.5	24.85	24.90	1.012	0.405	0.410
CDMA BC10	1xRTT RC1+SO55	Left Tilted	580	820.5	24.85	24.90	1.012	0.046	0.047
CDMA BC10	**1xRTT RC1+SO55**	**Right Cheek**	**580**	**820.5**	**24.85**	**24.90**	**1.012**	**0.522**	**0.528**
CDMA BC10	1xRTT RC1+SO55	Right Tilted	580	820.5	24.85	24.90	1.012	0.057	0.058

Body Hotspot Exposure Condition (Separation Distance is 1.0 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC10	1xRTT RC1+SO55	Front Side	580	820.5	24.85	24.90	1.012	0.654	0.662
CDMA BC10	1xRTT RC1+SO55	Back Side	580	820.5	24.85	24.90	1.012	0.588	0.595
CDMA BC10	1xRTT RC1+SO55	Left Side	580	820.5	24.85	24.90	1.012	0.025	0.025
CDMA BC10	1xRTT RC1+SO55	Right Side	580	820.5	24.85	24.90	1.012	0.339	0.343
CDMA BC10	**1xRTT RC1+SO55**	**Bottom Side**	**580**	**820.5**	**24.85**	**24.90**	**1.012**	**0.671**	**0.679**

Extremity Hotspot Exposure Condition (Separation Distance is 0 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC10	1xRTT RC1+SO55	Front Side	580	820.5	24.85	24.90	1.012	0.308	0.312
CDMA BC10	1xRTT RC1+SO55	Back Side	580	820.5	24.85	24.90	1.012	0.289	0.292
CDMA BC10	1xRTT RC1+SO55	Left Side	580	820.5	24.85	24.90	1.012	0.021	0.021
CDMA BC10	1xRTT RC1+SO55	Right Side	580	820.5	24.85	24.90	1.012	0.117	0.118
CDMA BC10	**1xRTT RC1+SO55**	**Bottom Side**	**580**	**820.5**	**24.85**	**24.90**	**1.012**	**0.383**	**0.388**

Body-worn Exposure Condition (Separation Distance is 1.5 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC10	**1xRTT RC1+SO55**	**Front Side**	**580**	**836.52**	**24.85**	**24.90**	**1.012**	**0.548**	**0.554**
CDMA BC10	1xRTT RC1+SO55	Back Side	580	836.52	24.85	24.90	1.012	0.529	0.535

8.1. LTE Band 12 SAR results

Head Exposure Condition

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
LTE Band12	10M QPSK (1#25)	Left Cheek	23095	707.5	23.89	23.90	1.002	0.120	0.120
LTE Band12	10M QPSK (1#25)	Left Tilted	23095	707.5	23.89	23.90	1.002	0.027	0.027
LTE Band12	**10M QPSK (1#25)**	**Right Cheek**	**23095**	**707.5**	**23.89**	**23.90**	**1.002**	**0.155**	**0.155**
LTE Band12	10M QPSK (1#25)	Right Tilted	23095	707.5	23.89	23.90	1.002	0.033	0.033
50%RB									
LTE Band 12	10M QPSK (1#25)	Right Cheek	23095	707.5	23.89	23.90	1.002	0.146	0.146

Body Hotspot Exposure Condition (Separation Distance is 1.0 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
LTE Band12	10M QPSK (1#25)	Front Side	23095	707.5	23.89	23.90	1.002	0.137	0.137
LTE Band12	**10M QPSK (1#25)**	**Back Side**	**23095**	**707.5**	**23.89**	**23.90**	**1.002**	**0.169**	**0.169**
LTE Band12	10M QPSK (1#25)	Left Side	23095	707.5	23.89	23.90	1.002	0.019	0.019
LTE Band12	10M QPSK (1#25)	Right Side	23095	707.5	23.89	23.90	1.002	0.052	0.052
LTE Band12	10M QPSK (1#25)	Bottom Side	23095	707.5	23.89	23.90	1.002	0.159	0.159
50%RB									
LTE Band12	10M QPSK (RB50#0)	Back Side	23095	707.5	23.89	23.90	1.002	0.163	0.163

Extremity Hotspot Exposure Condition (Separation Distance is 0 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
LTE Band12	10M QPSK (1#25)	Front Side	23095	707.5	23.89	23.90	1.002	0.437	0.438
LTE Band12	**10M QPSK (1#25)**	**Back Side**	**23095**	**707.5**	**23.89**	**23.90**	**1.002**	**0.469**	**0.470**
LTE Band12	10M QPSK (1#25)	Left Side	23095	707.5	23.89	23.90	1.002	0.119	0.119
LTE Band12	10M QPSK (1#25)	Right Side	23095	707.5	23.89	23.90	1.002	0.152	0.152
LTE	10M	Bottom	23095	707.5	23.89	23.90	1.002	0.259	0.260

Band12	QPSK (1#25)	Side							
50%RB									
LTE Band12	10M QPSK (RB50#0)	Back Side	23095	707.5	23.89	23.90	1.002	0.244	0.244

Body-worn Exposure Condition (Separation Distance is 1.5 cm)

Band	**Mode**	**Test Position**	**Ch.**	**Freq. (MHz)**	**Burst Average Power (dBm)**	**Tune-Up Limit (dBm)**	**Scaling Factor**	**Measured SAR (W/kg)**	**Reported SAR (W/kg)**
LTE Band12	10M QPSK (RB50#0)	Front Side	23095	707.5	23.89	23.90	1.002	0.116	0.116
LTE Band12	**10M QPSK (RB50#0)**	**Back Side**	**23095**	**707.5**	**23.89**	**23.90**	**1.002**	**0.150**	**0.150**
50%RB									
LTE Band12	10M QPSK (RB50#0)	Back Side	23095	707.5	23.89	23.90	1.002	0.148	0.148

8.1. LTE Band 17SAR results

Head Exposure Condition

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
LTE Band 17	10M QPSK (1#25)	Left Cheek	23790	710	23.84	24.00	1.038	0.082	0.085
LTE Band 17	10M QPSK (1#25)	Left Tilted	23790	710	23.84	24.00	1.038	0.019	0.020
LTE Band 17	**10M QPSK (1#25)**	**Right Cheek**	**23790**	**710**	**23.84**	**24.00**	**1.038**	**0.119**	**0.124**
LTE Band 17	10M QPSK (1#25)	Right Tilted	23790	710	23.84	24.00	1.038	0.025	0.026
50%RB									
LTE Band 17	10M QPSK (1#25)	Right Cheek	23790	710	23.84	24.00	1.038	0.108	0.112

Body Hotspot Exposure Condition (Separation Distance is 1.0 cm)

Band	**Mode**	**Test Position**	**Ch.**	**Freq. (MHz)**	**Burst Average Power (dBm)**	**Tune-Up Limit (dBm)**	**Scaling Factor**	**Measured SAR (W/kg)**	**Reported SAR (W/kg)**
LTE Band 17	10M QPSK (1#25)	Front Side	23790	710	23.84	24.00	1.038	0.142	0.147
LTE Band 17	**10M QPSK (1#25)**	**Back Side**	**23790**	**710**	**23.84**	**24.00**	**1.038**	**0.169**	**0.175**
LTE	10M	Left	23790	710	23.84	24.00	1.038	0.039	0.040

Band 17	QPSK (1#25)	Side							
LTE Band 17	10M QPSK (1#25)	Right Side	23790	710	23.84	24.00	1.038	0.157	0.163
LTE Band 17	10M QPSK (1#25)	Bottom Side	23790	710	23.84	24.00	1.038	0.139	0.144
50%RB									
LTE Band 17	10M QPSK (1#25)	Back Side	23790	710	23.84	24.00	1.038	0.163	0.169

Extremity Hotspot Exposure Condition (Separation Distance is 0 cm)

Band	**Mode**	**Test Position**	**Ch.**	**Freq. (MHz)**	**Burst Average Power (dBm)**	**Tune-Up Limit (dBm)**	**Scaling Factor**	**Measured SAR (W/kg)**	**Reported SAR (W/kg)**
LTE Band 17	10M QPSK (1#25)	Front Side	23790	710	23.84	24.00	1.038	0.442	0.459
LTE Band 17	**10M QPSK (1#25)**	**Back Side**	**23790**	**710**	**23.84**	**24.00**	**1.038**	**0.505**	**0.524**
LTE Band 17	10M QPSK (1#25)	Left Side	23790	710	23.84	24.00	1.038	0.231	0.240
LTE Band 17	10M QPSK (1#25)	Right Side	23790	710	23.84	24.00	1.038	0.351	0.364
LTE Band 17	10M QPSK (1#25)	Bottom Side	23790	710	23.84	24.00	1.038	0.232	0.241
50%RB									
LTE Band 17	10M QPSK (1#25)	Back Side	23790	710	23.84	24.00	1.038	0.463	0.481

Body-worn Exposure Condition (Separation Distance is 1.5 cm)

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
LTE Band 17	10M QPSK (1#25)	Front Side	23790	710	23.84	24.00	1.038	0.146	0.152
LTE Band 17	**10M QPSK (1#25)**	**Back Side**	**23790**	**710**	**23.84**	**24.00**	**1.038**	**0.157**	**0.163**
50%RB									
LTE Band 17	10M QPSK (1#25)	Back Side	23790	710	23.84	24.00	1.038	0.151	0.157

8.2. Repeated SAR results

Remark:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR<1.45W/kg, only one repeated measurement is required.

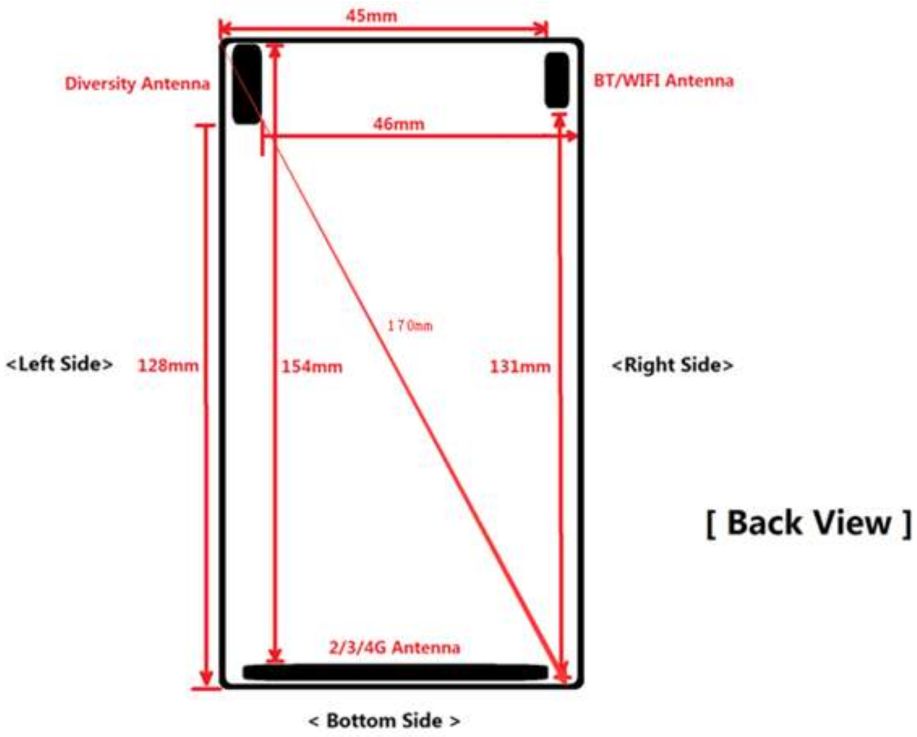
3. The ratio is the difference in percentage between original and repeated measured SAR.

4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
CDMA BC1	1xRTT RC1+SO55	Bottom Side	600	1880	24.80	24.90	1.023	1.101	1.126

9. EXPOSURE POSITIONS CONSIDERATION

9.1. Multiple Transmitter Evaluation



Mode	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
Main Antenna	YES	YES	YES	YES	NO	YES

9.2. Stand-alone SAR test exclusion

FCC Stand-alone SAR test can be found on report No.: EED32K00215411

IC Stand-alone SAR test can be found on report No.: EED32K00215511

9.3. Simultaneous Transmission Possibilities

FCC Simultaneous transmission calculation can be found on report No.: EED32K00215411

IC Simultaneous transmission calculation can be found on report No.: EED32K00215511

Appendix A. System Check Plots

(Pls see Appendix A)

Appendix B. MEASUREMENT SCANS

(Pls see Appendix B)

AppendixC RELEVANT PAGES FROM PROBE CALIBRATION REPORT(S)

(Pls see Appendix C)

Appendix D. RELEVANT PAGES FROM DAE&DIPOLE VALIDATION KIT REPORT(S)

(Pls see Appendix D)

APPENDIX A: SYSTEM CHECKING SCANS

SystemPerformanceCheck-D750 for Head

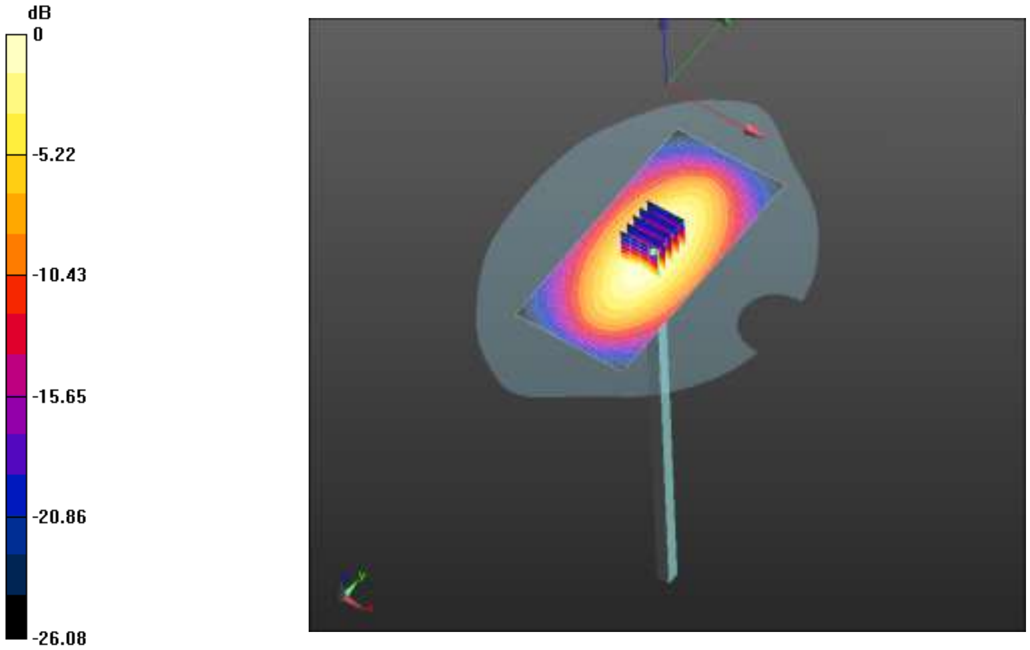
Date:
2018.09.05.

Medium: HSL750

Communication System: CW; Communication System Band: D750 (750.0 MHz); Frequency: 750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 750 MHz; σ = 0.84 mho/m; ε_r = 41.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Head/Dipole750 2/Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 49.533 V/m; Power Drift = -0.07 dB
Fast SAR: SAR(1 g) = 2.06 mW/g; SAR(10 g) = 1.37 mW/g
Maximum value of SAR (interpolated) = 2.22 W/kg
Head/Dipole750 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 49.533 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 3.017 mW/g
SAR(1 g) = 2.04 mW/g; SAR(10 g) = 1.34 mW/g
Maximum value of SAR (measured) = 2.20 W/kg



0 dB = 2.22 W/kg = 6.94 dB W/kg

SystemPerformanceCheck-D750 for Body

Date:
2018.09.05.

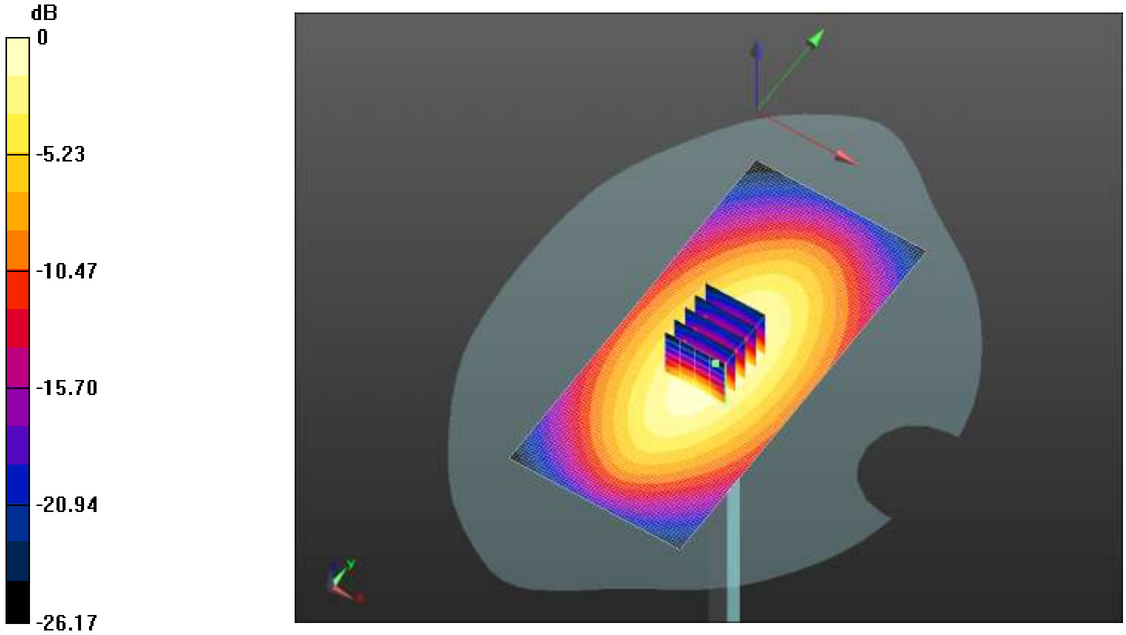
Medium: MSL750

Communication System: CW; Communication System Band: D750 (750.0 MHz); Frequency: 750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 750 MHz; σ = 0.93 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.;
Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Dipole835 6/Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 48.689 V/m; Power Drift = 0.01 dB
Fast SAR: SAR(1 g) = 2.12 mW/g; SAR(10 g) = 1.42 mW/g
Maximum value of SAR (interpolated) = 2.28 W/kg

Body/Dipole835 6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 48.689 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.865 mW/g
SAR(1 g) = 2.14 mW/g; SAR(10 g) = 1.53 mW/g
Maximum value of SAR (measured) = 2.28 W/kg



0 dB = 2.28 W/kg = 7.14 dB W/kg

SystemPerformanceCheck-D835 for Head

Date:
2018.09.06.

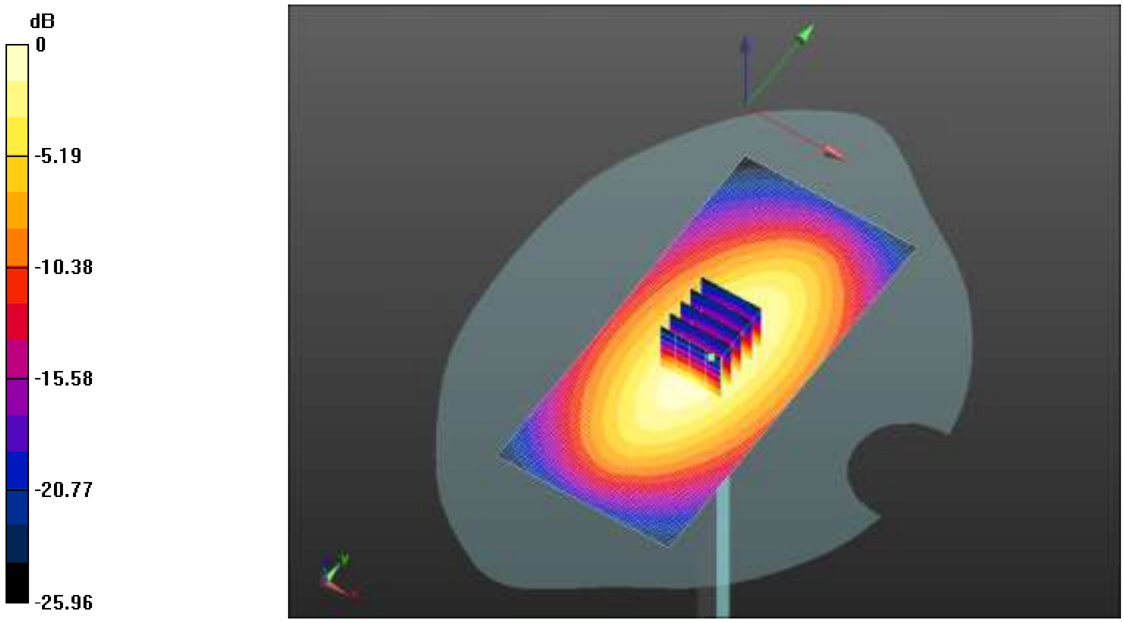
Medium: HSL835

Communication System: CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 41.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.47, 9.47, 9.47); Calibrated: 2018.07.14.;
Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Head/Dipole835/Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 54.453 V/m; Power Drift = -0.11 dB
Fast SAR: SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.62 mW/g
Maximum value of SAR (interpolated) = 2.61 W/kg

Head/Dipole835/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 54.453 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 3.753 mW/g
SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.58 mW/g
Maximum value of SAR (measured) = 2.64 W/kg



0 dB = 2.61 W/kg = 8.33 dB W/kg

SystemPerformanceCheck-D835 for Body

Date:2018.09.06.

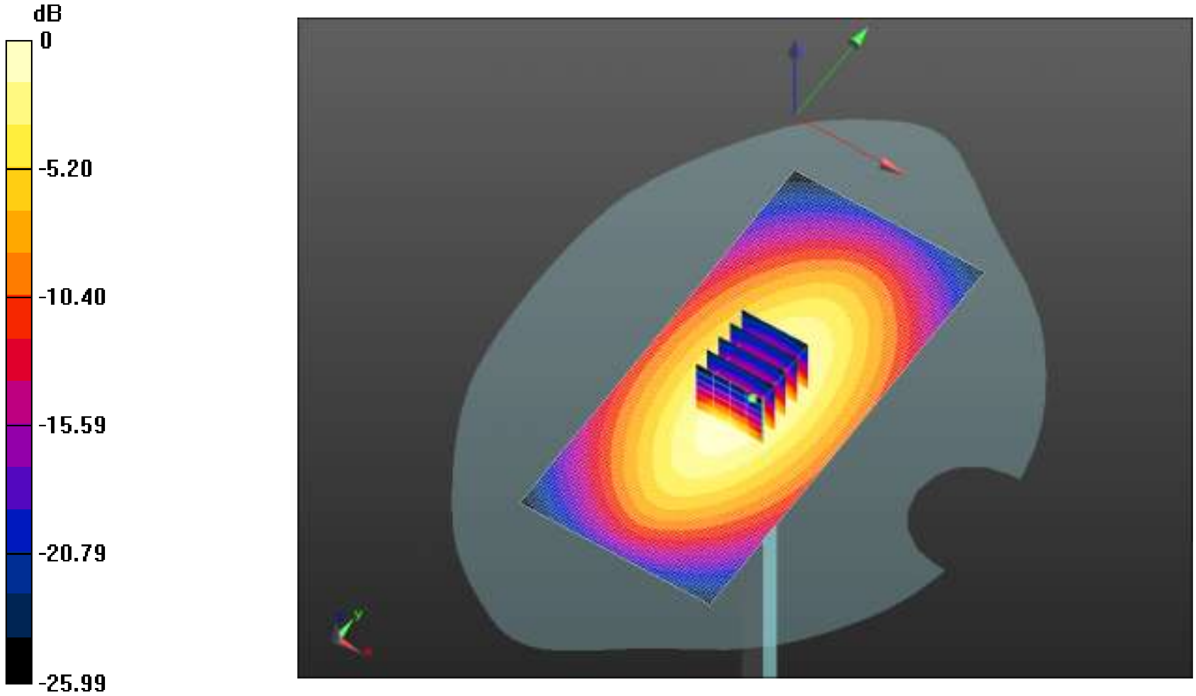
Medium: MSL835

Communication System: CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.96 mho/m; ε_r = 55.87; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.57, 9.57, 9.57); Calibrated: 2018.07.14.;
Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Dipole835/Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 48.690 V/m; Power Drift = -0.11 dB
Fast SAR: SAR(1 g) = 2.19 mW/g; SAR(10 g) = 1.5 mW/g
Maximum value of SAR (interpolated) = 2.24 W/kg

Body/Dipole835/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 48.690 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 2.789 mW/g
SAR(1 g) = 2.18 mW/g; SAR(10 g) = 1.59 mW/g
Maximum value of SAR (measured) = 2.22 W/kg



0 dB = 2.24 W/kg = 7.01 dB W/kg

SystemPerformanceCheck-D1900 for Head

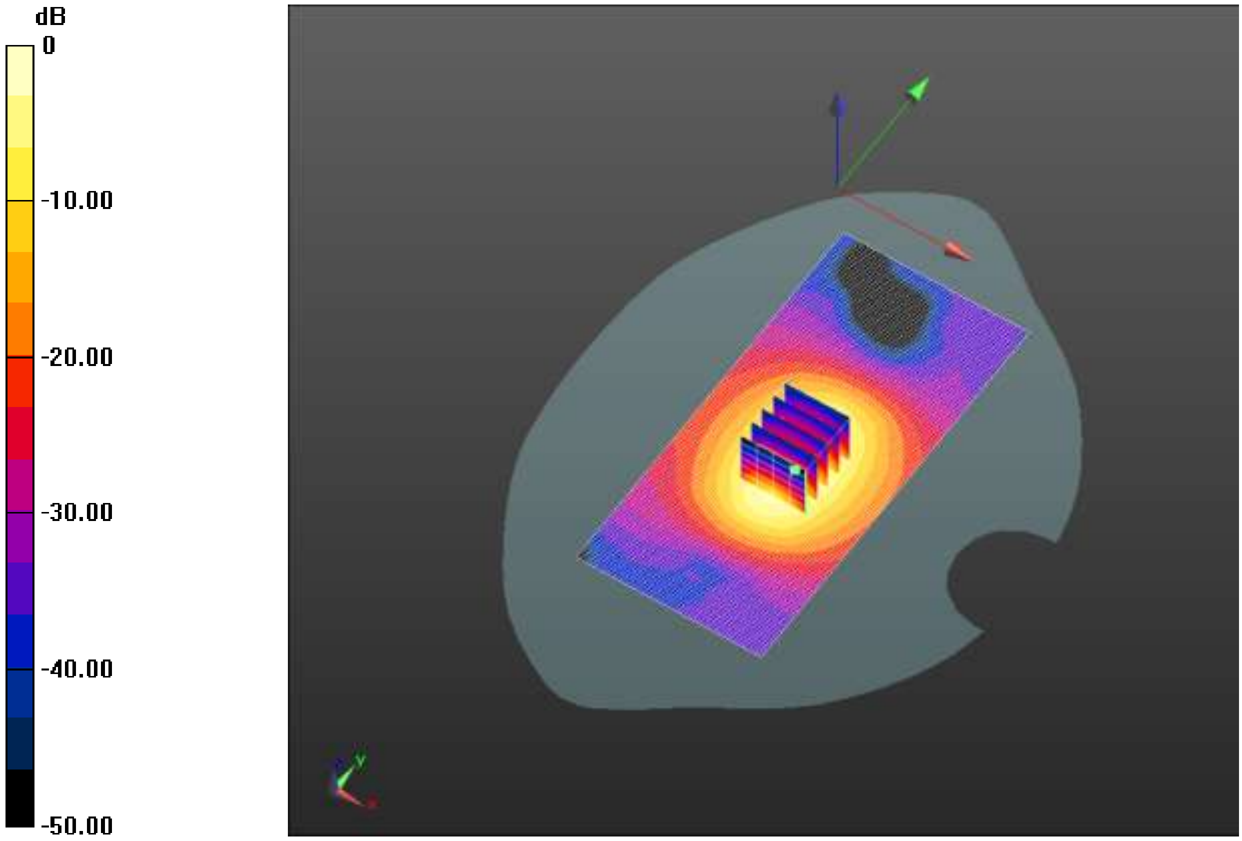
Date:2018.09.07.

Medium: HSL1900

Communication System: CW; Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.45 mho/m; ε_r = 39.75; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.92, 7.92, 7.92); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Head/Dipole1900/Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 88.035 V/m; Power Drift = -0.07 dB
Fast SAR: SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.45 mW/g
Maximum value of SAR (interpolated) = 11.6 W/kg
Head/Dipole1900/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 88.035 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 18.284 mW/g
SAR(1 g) = 9.89 mW/g; SAR(10 g) = 5.17 mW/g
Maximum value of SAR (measured) = 11.0 W/kg



0 dB = 11.6 W/kg = 21.29 dB W/kg

SystemPerformanceCheck-D1900 for Body

Date:2018.09.07.

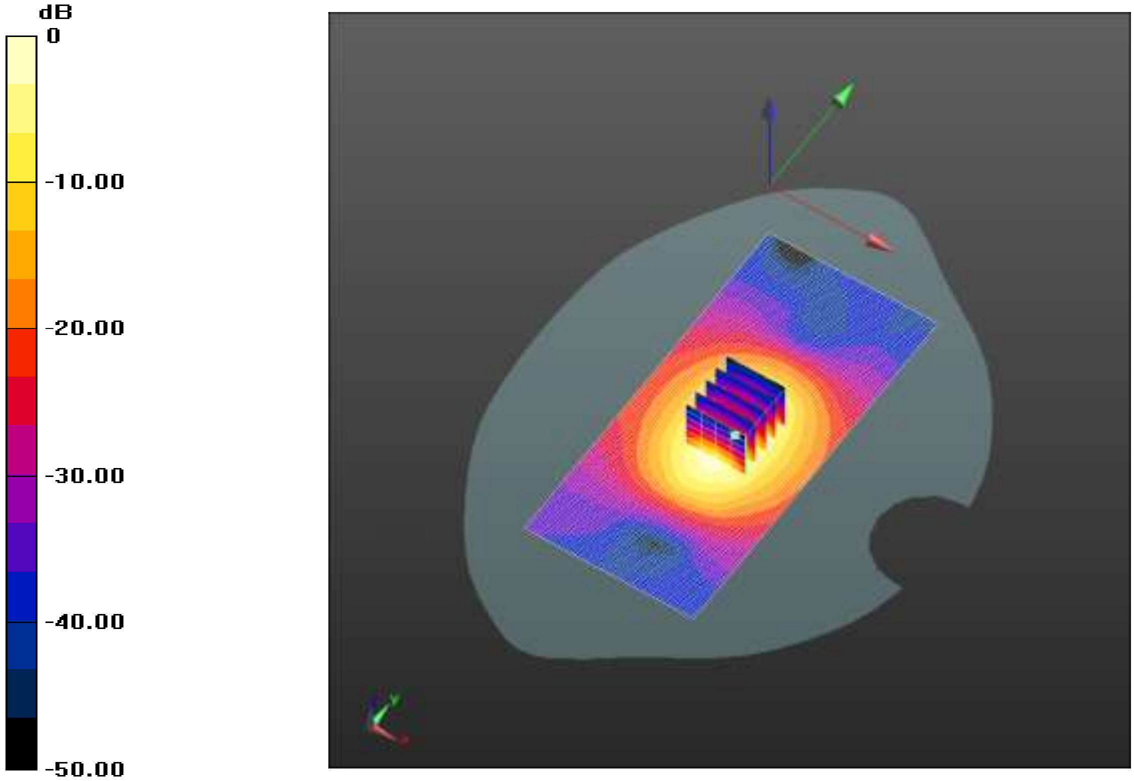
DUT: Dipole 1900 MHz D1900V2; Type: D1900V2 SN:5d162;

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

Medium parameters used: f = 1900 MHz; σ = 1.54 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.64, 7.64, 7.64); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Dipole1900/Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 88.213 V/m; Power Drift = 0.03 dB
Fast SAR: SAR(1 g) = 10.23 mW/g; SAR(10 g) = 5.49 mW/g
Maximum value of SAR (interpolated) = 11.6 W/kg
Body/Dipole1900 /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 88.213 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 18.814 mW/g
SAR(1 g) = 10.21 mW/g; SAR(10 g) = 5.32 mW/g
Maximum value of SAR (measured) = 11.6 W/kg



0 dB = 11.7 W/kg = 21.37 dB W/kg

SystemPerformanceCheck-D750 for Body

Date:2018.11.01.

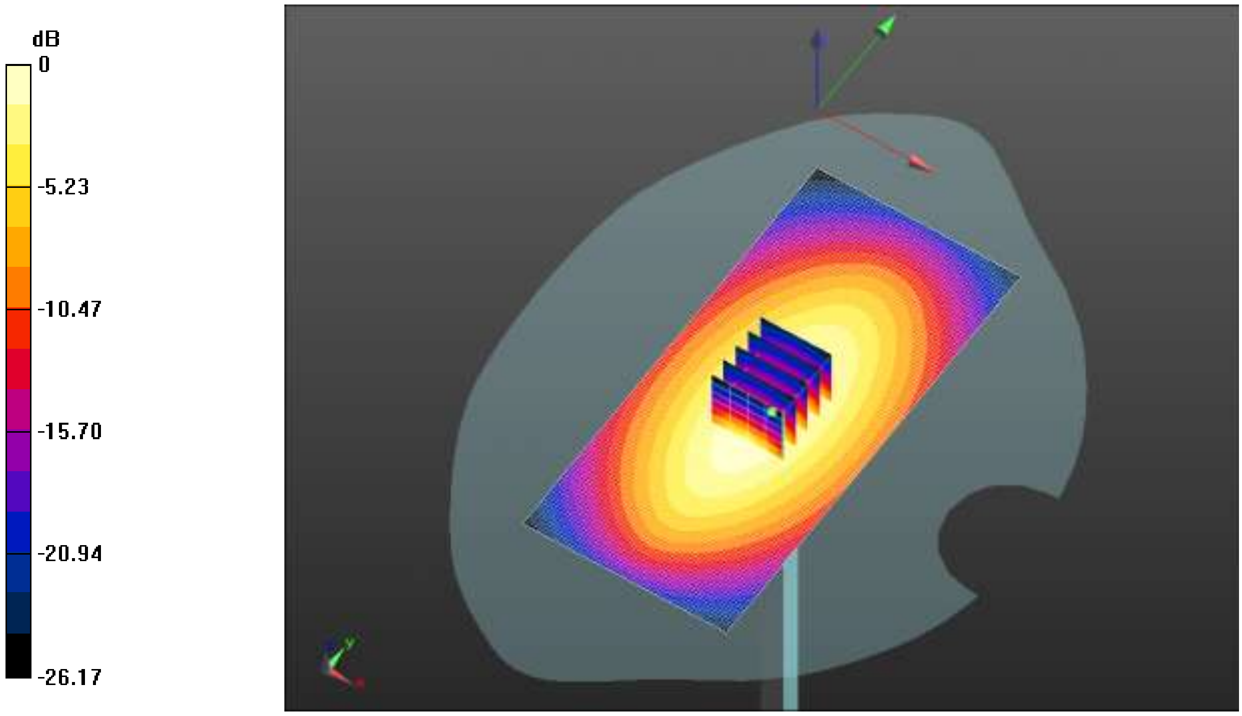
Medium: MSL750

Communication System: CW; Communication System Band: D750 (750.0 MHz); Frequency: 750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 750 MHz; σ = 0.93 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Dipole835 6/Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 47.611 V/m; Power Drift = 0.01 dB
Fast SAR: SAR(1 g) = 2.10 mW/g; SAR(10 g) = 1.41 mW/g
Maximum value of SAR (interpolated) = 2.24 W/kg

Body/Dipole835 6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 47.611 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.865 mW/g
SAR(1 g) = 2.16 mW/g; SAR(10 g) = 1.54 mW/g
Maximum value of SAR (measured) = 2.24 W/kg



0 dB = 2.24 W/kg = 7.11 dB W/kg

SystemPerformanceCheck-D835 for Body

Date:
2018.11.01.

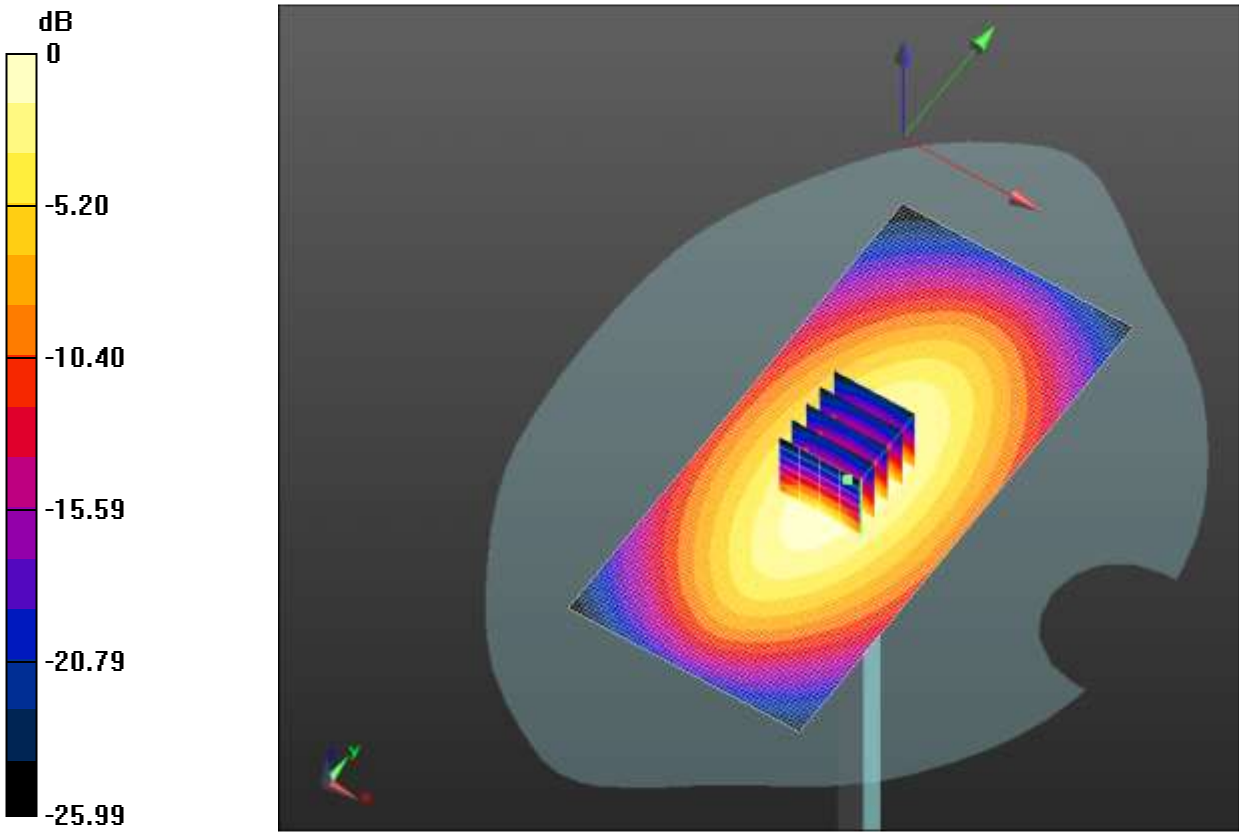
Medium: MSL835

Communication System: CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.92 mho/m; ε_r = 55.81; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.57, 9.57, 9.57); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Dipole835/Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 48.330 V/m; Power Drift = -0.11 dB
Fast SAR: SAR(1 g) = 2.11 mW/g; SAR(10 g) = 1.44 mW/g
Maximum value of SAR (interpolated) = 2.21 W/kg

Body/Dipole835/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 48.330 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 2.789 mW/g
SAR(1 g) = 2.21 mW/g; SAR(10 g) = 1.49 mW/g
Maximum value of SAR (measured) = 2.21 W/kg



0 dB = 2.21 W/kg = 6.98 dB W/kg

SystemPerformanceCheck-D1900 for Body

Date:2018.11.01.

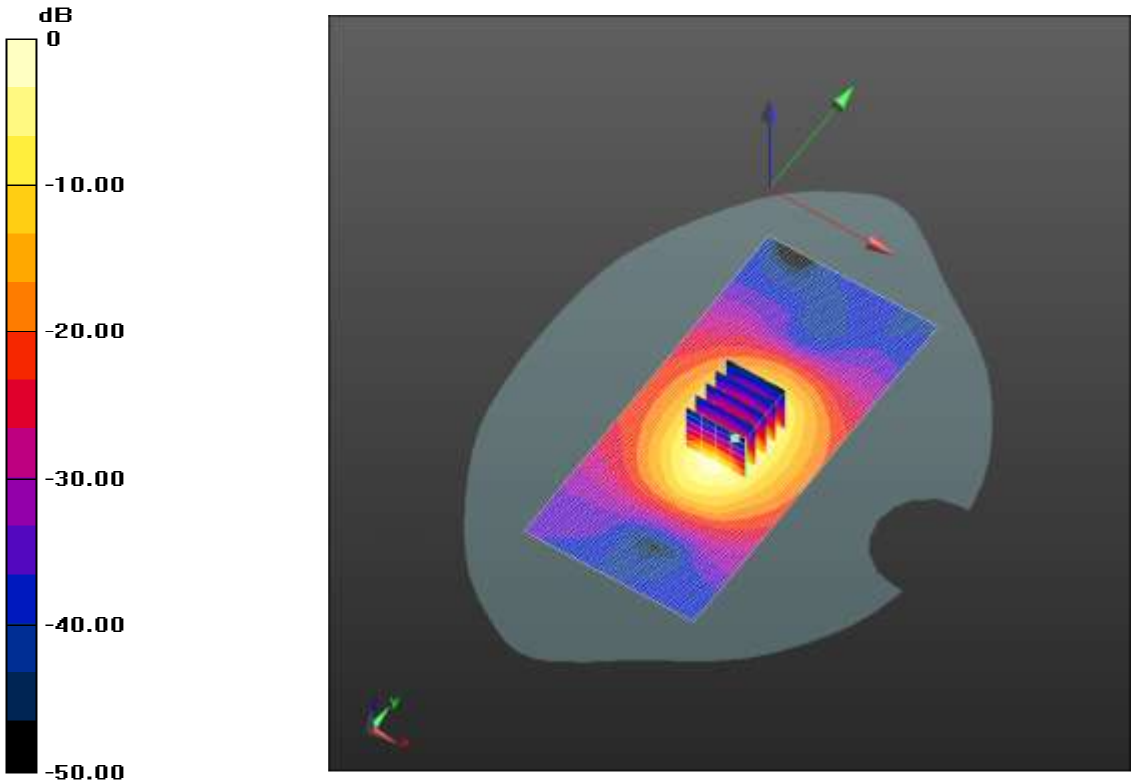
DUT: Dipole 1900 MHz D1900V2; Type: D1900V2 SN:5d162;

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

Medium parameters used: f = 1900 MHz; σ = 1.51 mho/m; ε_r = 54.22; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.64, 7.64, 7.64); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Dipole1900/Area Scan (61x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 88.789 V/m; Power Drift = 0.03 dB
Fast SAR: SAR(1 g) = 10.20 mW/g; SAR(10 g) = 5.44 mW/g
Maximum value of SAR (interpolated) = 11.6 W/kg
Body/Dipole1900 /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 88.789 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 18.811 mW/g
SAR(1 g) = 10.25 mW/g; SAR(10 g) = 5.42 mW/g
Maximum value of SAR (measured) = 11.7 W/kg



0 dB = 11.7 W/kg = 21.37 dB W/kg

Appendix B. MEASUREMENT SCANS

Date:
2018.09.06

EVDO BC0 Head Right Cheek Mid

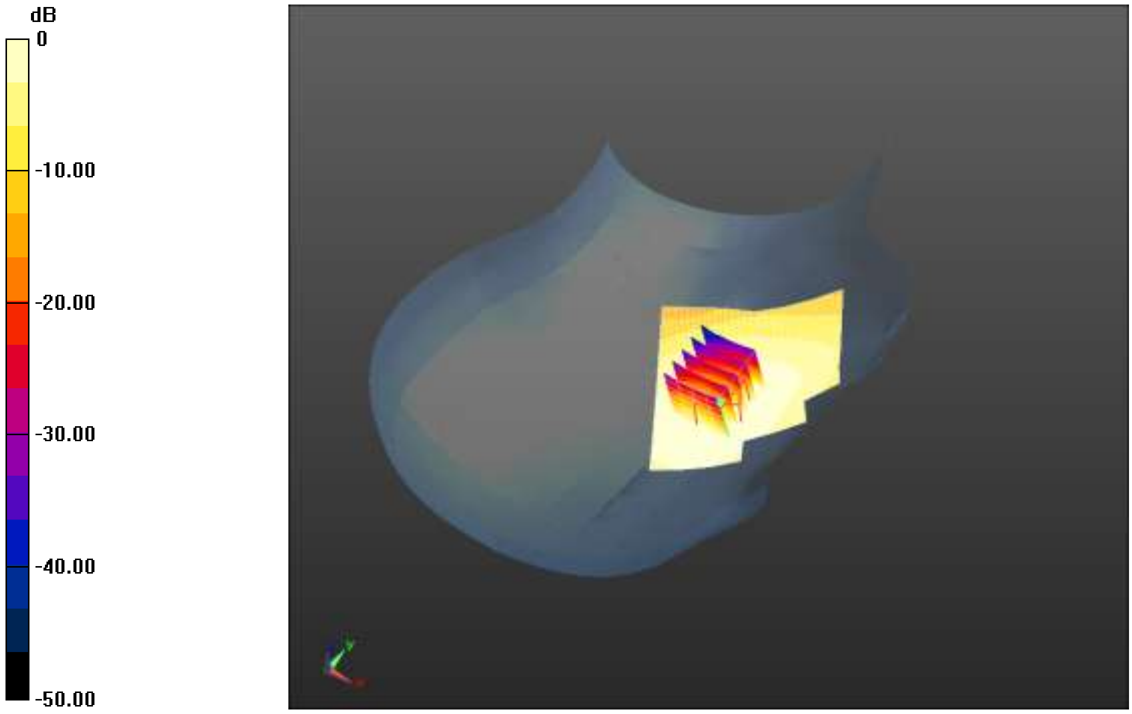
Medium: MSL900

Communication System: CDMA 1X ; Communication System Band: EVDO BC0; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; σ = 1.01 mho/m; ε_r = 55.859; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.57, 9.57, 9.57); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

EVDO BCo-Right Cheek/Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 9.207 V/m; Power Drift = -0.08 dB
Fast SAR: SAR(1 g) = 0.200 mW/g; SAR(10 g) = 0.137 mW/g
Maximum value of SAR (interpolated) = 0.213 W/kg

EVDO BCo-Right Cheek/Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.207 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.251 mW/g
SAR(1 g) = 0.205 mW/g; SAR(10 g) = 0.160 mW/g
Maximum value of SAR (measured) = 0.215 W/kg



0 dB = 0.213 W/kg = -13.42 dB W/kg

Date:
2018.09.06

EVDO BC0 Body Front Side Mid 15mm

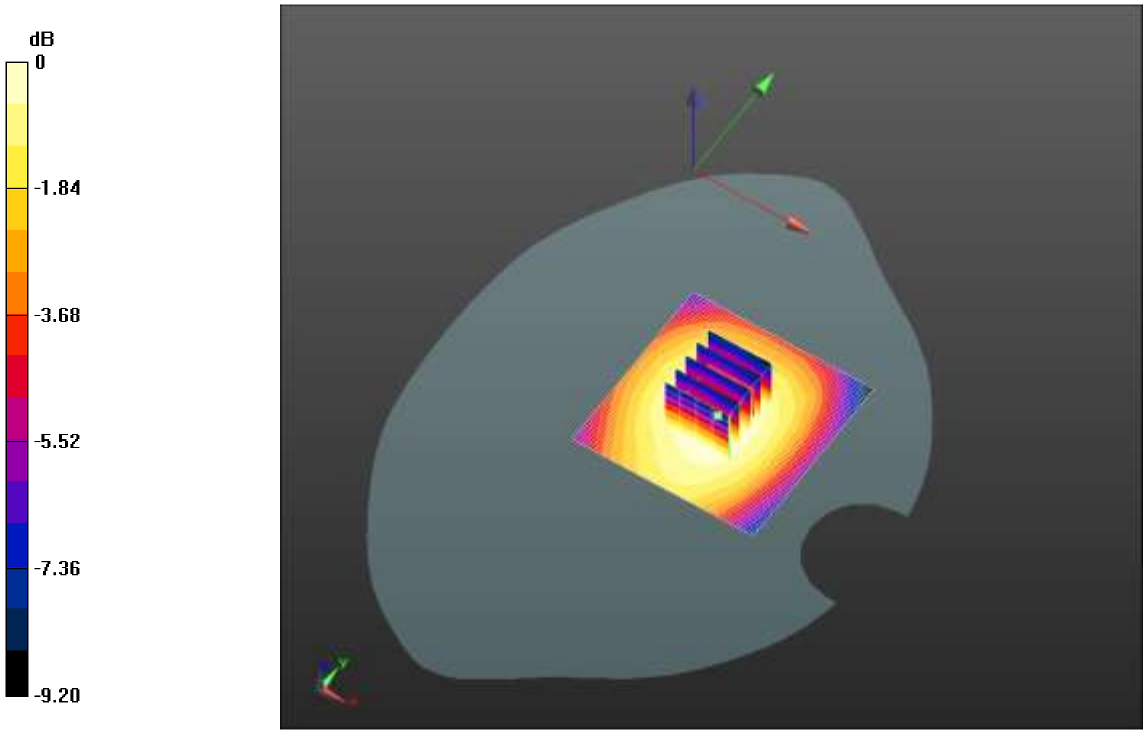
Medium: MSL900

Communication System: CDMA 1X ; Communication System Band: EVDO BC0; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; σ = 1.01 mho/m; ε_r = 55.859; ρ = 1000 kg/m[3]
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.57, 9.57, 9.57); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

EVDO BC0-Faceup/Mid 2/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 11.809 V/m; Power Drift = 0.03 dB
Fast SAR: SAR(1 g) = 0.166 mW/g; SAR(10 g) = 0.117 mW/g
Maximum value of SAR (interpolated) = 0.175 W/kg

EVDO BC0-Faceup/Mid 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.809 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.213 mW/g
SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.126 mW/g
Maximum value of SAR (measured) = 0.175 W/kg



0 dB = 0.175 W/kg = -15.14 dB W/kg

Date:
2018.09.06

EVDO BC0 Body Front Side Mid 10mm

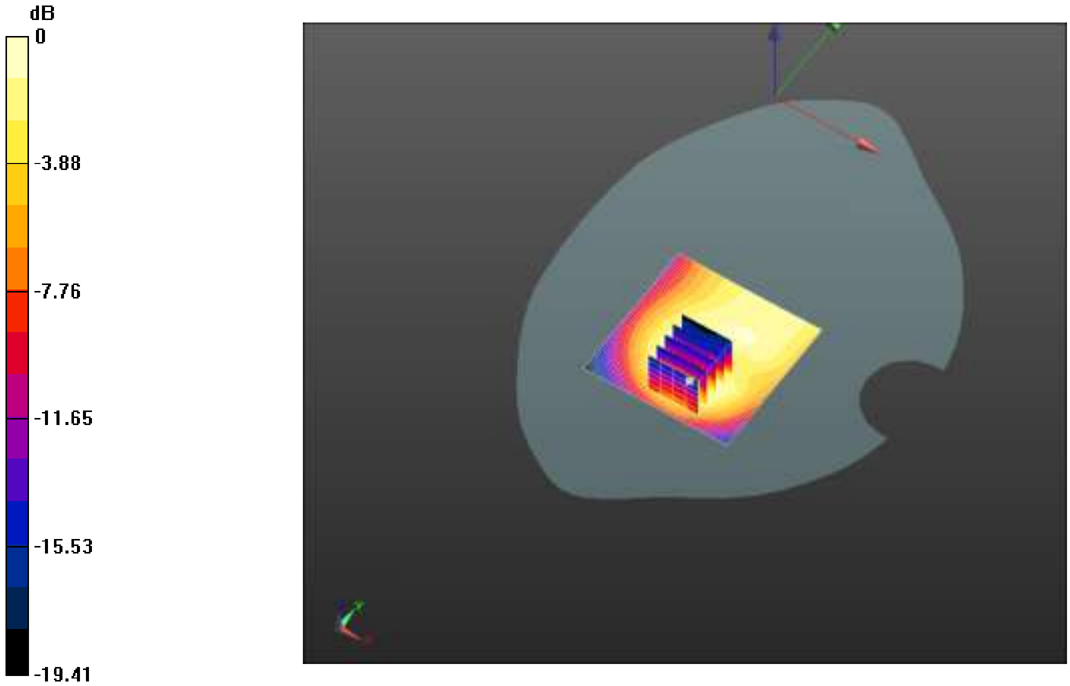
Medium: MSL900

Communication System: CDMA 1X ; Communication System Band: EVDO BC0; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; σ = 1.01 mho/m; ε_r = 55.859; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.57, 9.57, 9.57); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

EVDO BC0-Faceup/Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 9.207 V/m; Power Drift = -0.15 dB
Fast SAR: SAR(1 g) = 0.233 mW/g; SAR(10 g) = 0.150 mW/g
Maximum value of SAR (interpolated) = 0.248 W/kg

EVDO BC0-Faceup/Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.207 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.387 mW/g
SAR(1 g) = 0.228 mW/g; SAR(10 g) = 0.133 mW/g
Maximum value of SAR (measured) = 0.249 W/kg



0 dB = 0.248 W/kg = -12.10 dB W/kg

Date:
2018.09.07.

EVDO BC1 Head Left Cheek Mid

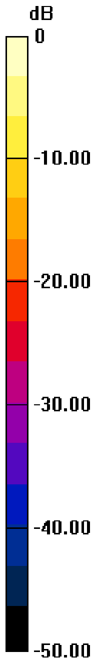
Medium: HSL1800

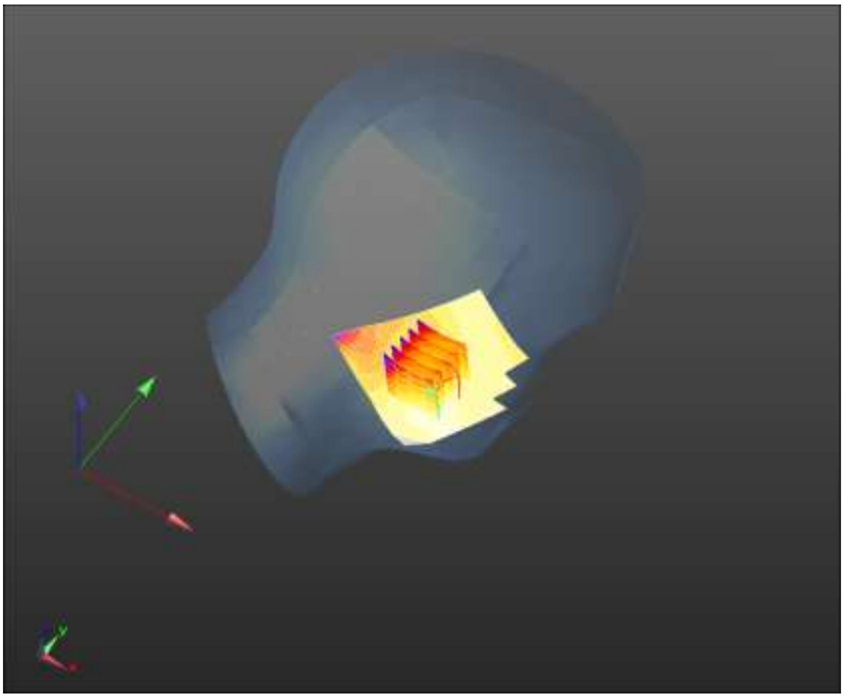
Communication System: CDMA 1X ; Communication System Band: EVDO BC1; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.45 mho/m; ε_r = 39.74; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.92, 7.92, 7.92); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

EVDO BC1-Left Cheek/Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 12.733 V/m; Power Drift = -0.08 dB
Fast SAR: SAR(1 g) = 0.374 mW/g; SAR(10 g) = 0.212 mW/g
Maximum value of SAR (interpolated) = 0.426 W/kg

EVDO BC1-Left Cheek/Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.733 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.543 mW/g
SAR(1 g) = 0.361 mW/g; SAR(10 g) = 0.227 mW/g
Maximum value of SAR (measured) = 0.392 W/kg





0 dB = 0.426 W/kg = -7.41 dB W/kg

Date:
2018.09.07.

EVDO BC1 Body Front Side Mid 15mm

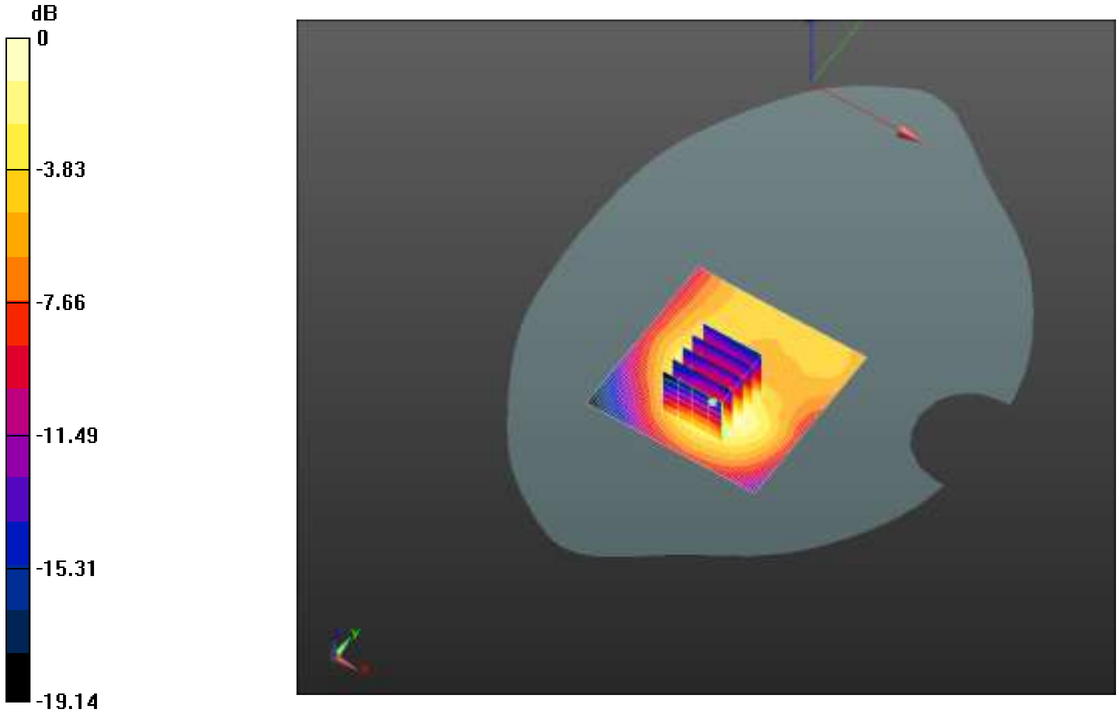
Medium: MSL1800

Communication System: CDMA 1X ; Communication System Band: EVDO BC1; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.57 mho/m; ε_r = 51.14; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.64, 7.64, 7.64); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

EVDO BC1-Faceup/Mid 15mm/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 9.638 V/m; Power Drift = 0.08 dB
Fast SAR: SAR(1 g) = 0.384 mW/g; SAR(10 g) = 0.220 mW/g
Maximum value of SAR (interpolated) = 0.429 W/kg

EVDO BC1-Faceup/Mid 15mm/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.638 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.657 mW/g
SAR(1 g) = 0.395 mW/g; SAR(10 g) = 0.231 mW/g
Maximum value of SAR (measured) = 0.432 W/kg



0 dB = 0.429 W/kg = -7.36 dB W/kg

Date:
2018.09.07.

EVDO BC1 Body Bottom Side Low 10mm

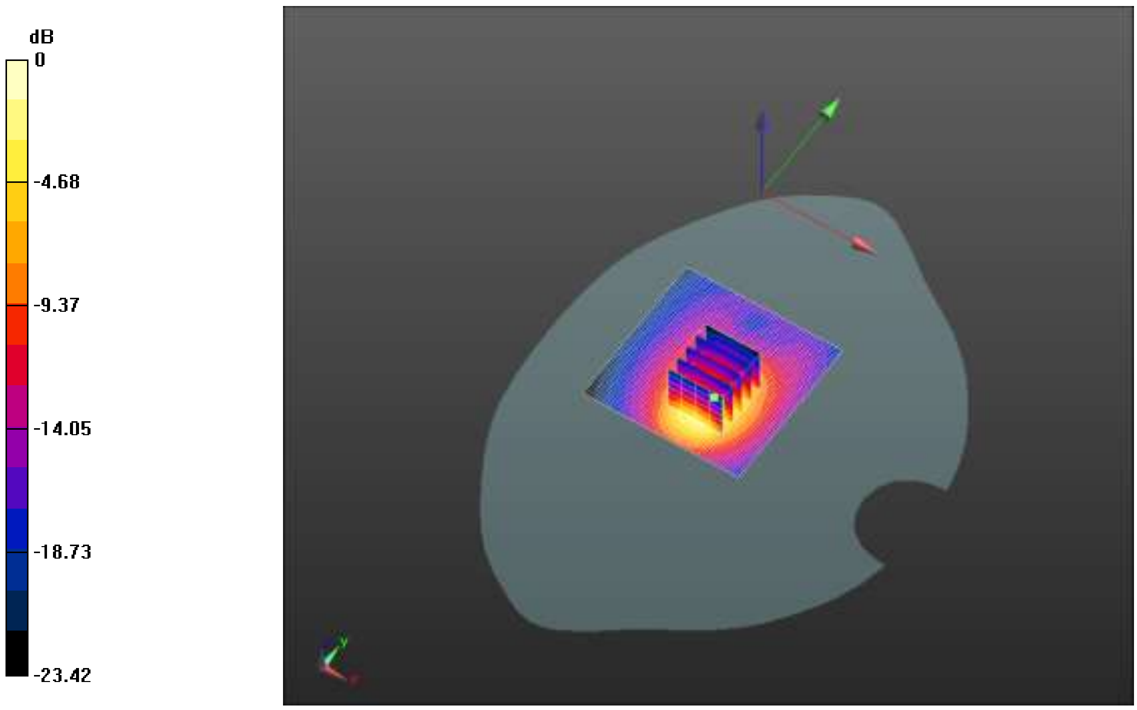
Medium: MSL1800

Communication System: CDMA 1X ; Communication System Band: EVDO BC1; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1851.25 MHz; σ = 1.531 mho/m; ε_r = 51.236; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.64, 7.64, 7.64); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

EVDO BC1-Bottom/Low/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 15.393 V/m; Power Drift = -0.03 dB
Fast SAR: SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.604 mW/g
Maximum value of SAR (interpolated) = 1.29 W/kg

EVDO BC1-Bottom/Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.393 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.982 mW/g
SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.607 mW/g
Maximum value of SAR (measured) = 1.27 W/kg



0 dB = 1.29 W/kg = 2.22 dB W/kg

Date:
2018.09.07.

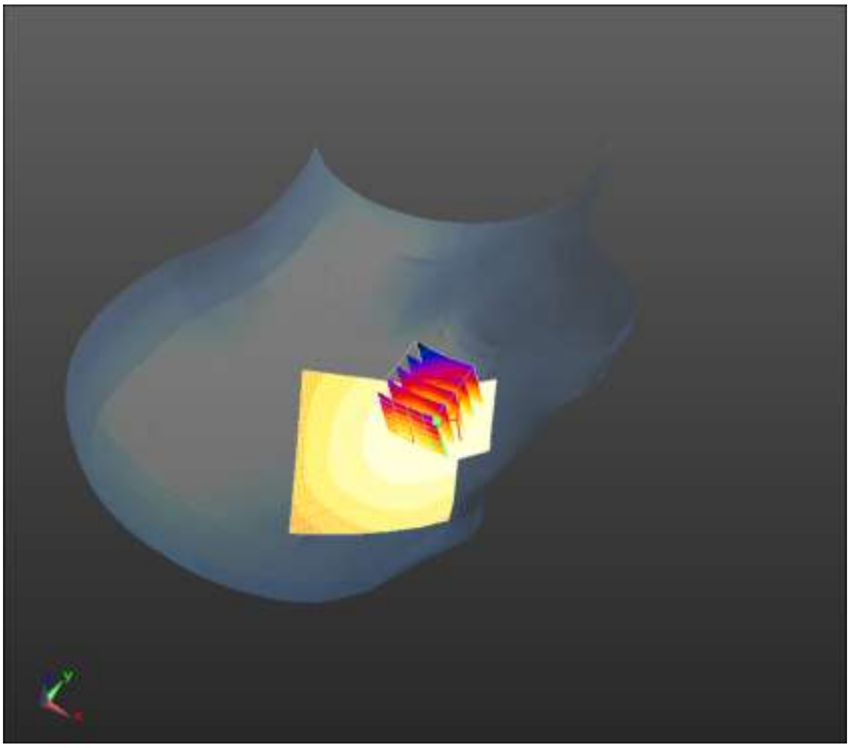
EVDO BC10 Head Right Cheek Mid

Medium: HSL1800

Communication System: CDMA 1X ; Communication System Band: EVDO BC1; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.45 mho/m; ε_r = 39.74; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.92, 7.92, 7.92); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

EVDO BC1-Right Cheek/Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 11.078 V/m; Power Drift = 0.14 dB
Fast SAR: SAR(1 g) = 0.498 mW/g; SAR(10 g) = 0.308 mW/g
Maximum value of SAR (interpolated) = 0.537 W/kg
EVDO BC1-Right Cheek/Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.078 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.607 mW/g
SAR(1 g) = 0.522 mW/g; SAR(10 g) = 0.433 mW/g
Maximum value of SAR (measured) = 0.541 W/kg



0 dB = 0.537 W/kg = -5.40 dB W/kg

Date:
2018.09.07.

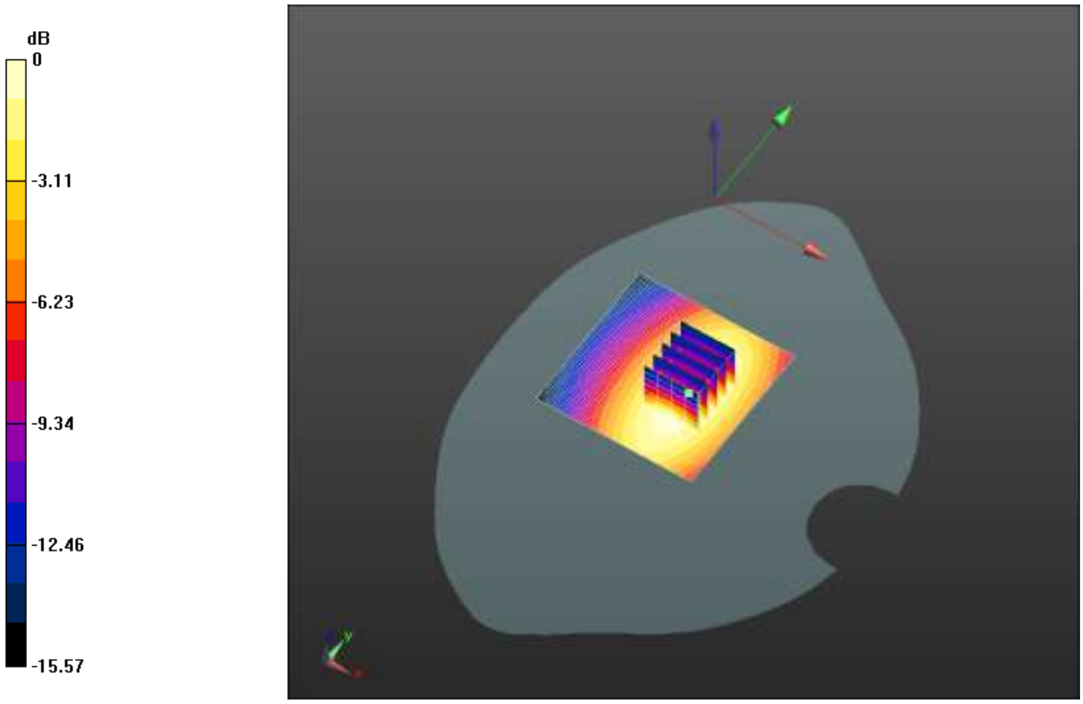
EVDO BC10 Body Right Side Mid 10mm

Medium: MSL1800

Communication System: CDMA 1X ; Communication System Band: EVDO BC1; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.57 mho/m; ε_r = 51.14; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.64, 7.64, 7.64); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

EVDO BC1-Right Side/Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 11.078 V/m; Power Drift = 0.04 dB
Fast SAR: SAR(1 g) = 0.668 mW/g; SAR(10 g) = 0.411 mW/g
Maximum value of SAR (interpolated) = 0.720 W/kg
EVDO BC1-Right Side/Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.078 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.881 mW/g
SAR(1 g) = 0.671 mW/g; SAR(10 g) = 0.489 mW/g
Maximum value of SAR (measured) = 0.710 W/kg



0 dB = 0.720 W/kg = -2.85 dB W/kg

Date:
2018.09.07.

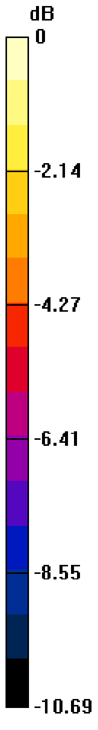
EVDO BC10 Body Front Side Mid 15mm

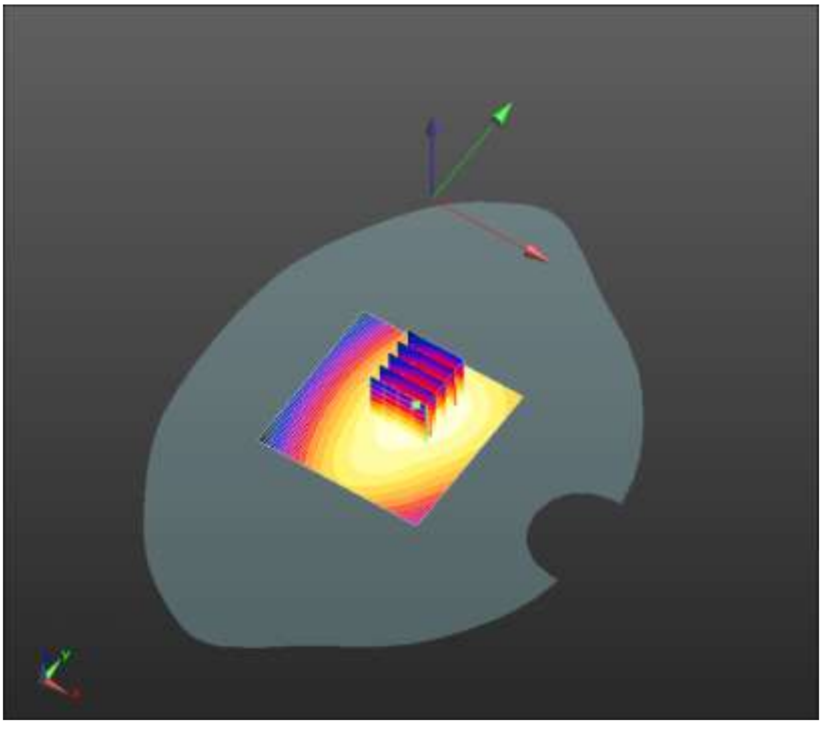
Medium: MSL1800

Communication System: CDMA 1X ; Communication System Band: EVDO BC1; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.57 mho/m; ε_r = 51.14; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.64, 7.64, 7.64); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

EVDO BC1-Facedown/Mid 2/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 18.448 V/m; Power Drift = -0.00 dB
Fast SAR: SAR(1 g) = 0.542 mW/g; SAR(10 g) = 0.345 mW/g
Maximum value of SAR (interpolated) = 0.578 W/kg
EVDO BC1-Facedown/Mid 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.448 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 0.662 mW/g
SAR(1 g) = 0.548 mW/g; SAR(10 g) = 0.435 mW/g
Maximum value of SAR (measured) = 0.570 W/kg





0 dB = 0.578 W/kg = -4.77 dB W/kg

Date:
2018.09.05.

LTE Band12 (10MHz) Head Right Cheek Mid

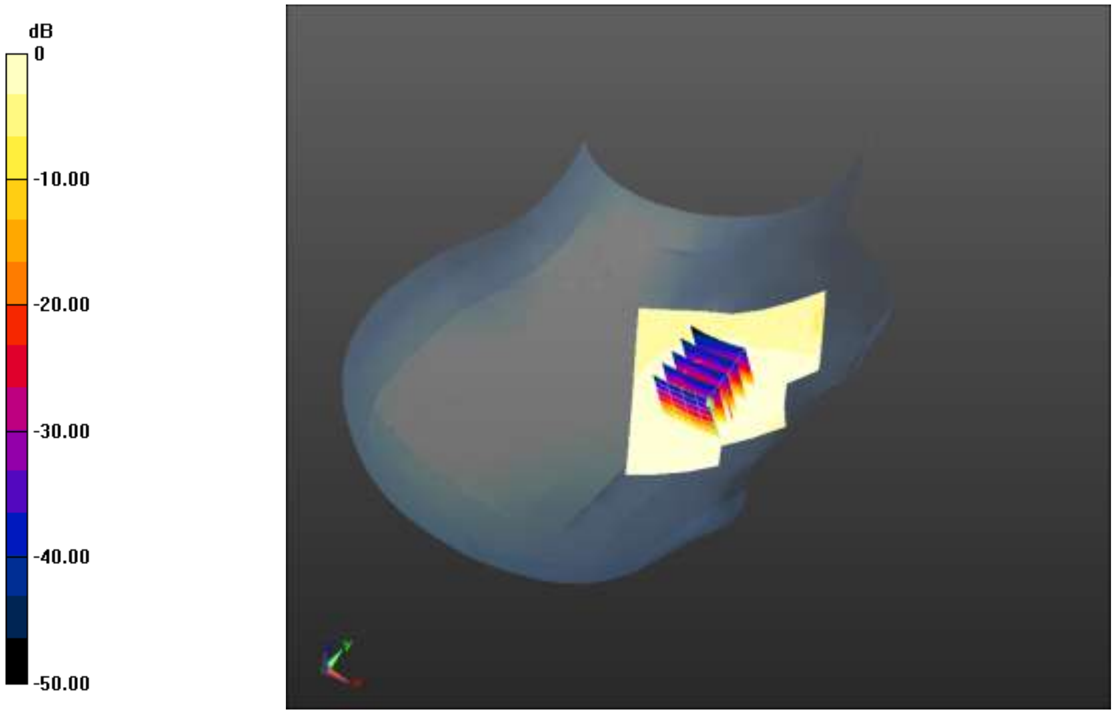
Medium: HSL750

Communication System: LTE-FDD(CE); Communication System Band: Band12(10MHz); Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 707.5 MHz; σ = 0.858 mho/m; ε_r = 42.446; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Head Right/Cheek Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 7.852 V/m; Power Drift = -0.12 dB
Fast SAR: SAR(1 g) = 0.154 mW/g; SAR(10 g) = 0.108 mW/g
Maximum value of SAR (interpolated) = 0.163 W/kg

Head Right/Cheek Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.852 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.190 mW/g
SAR(1 g) = 0.155 mW/g; SAR(10 g) = 0.123 mW/g
Maximum value of SAR (measured) = 0.162 W/kg



0 dB = 0.163 W/kg = -15.73 dB W/kg

Date:
2018.09.05.

LTE Band12 (10MHz) Body Back Side Mid 15mm

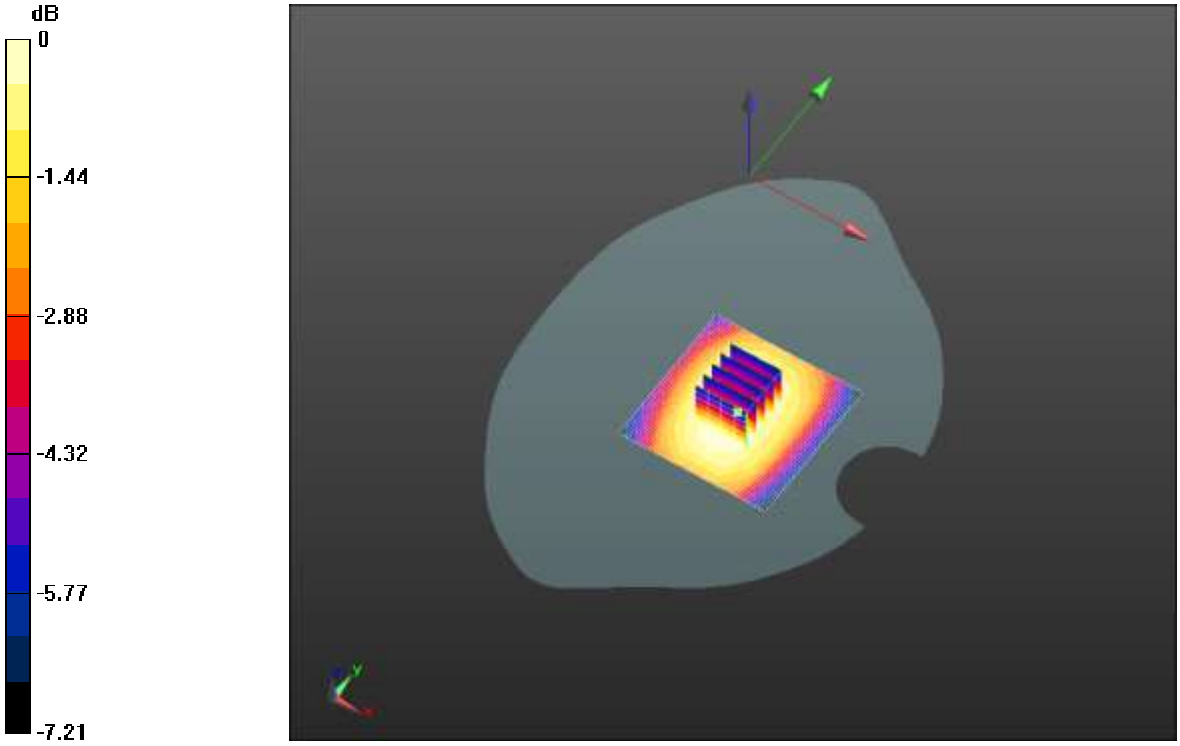
Medium: MSL750

Communication System: LTE-FDD(CE); Communication System Band: Band12(10MHz); Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 707.5 MHz; σ = 0.858 mho/m; ε_r = 42.446; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Facedown Mid 15/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 13.259 V/m; Power Drift = 0.04 dB
Fast SAR: SAR(1 g) = 0.149 mW/g; SAR(10 g) = 0.107 mW/g
Maximum value of SAR (interpolated) = 0.158 W/kg

Body/Facedown Mid 15/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.259 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.185 mW/g
SAR(1 g) = 0.150 mW/g; SAR(10 g) = 0.118 mW/g
Maximum value of SAR (measured) = 0.156 W/kg



0 dB = 0.158 W/kg = -16.05 dB W/kg

Date:
2018.09.05.

LTE Band12 (10MHz) Body Back Side Mid 10mm

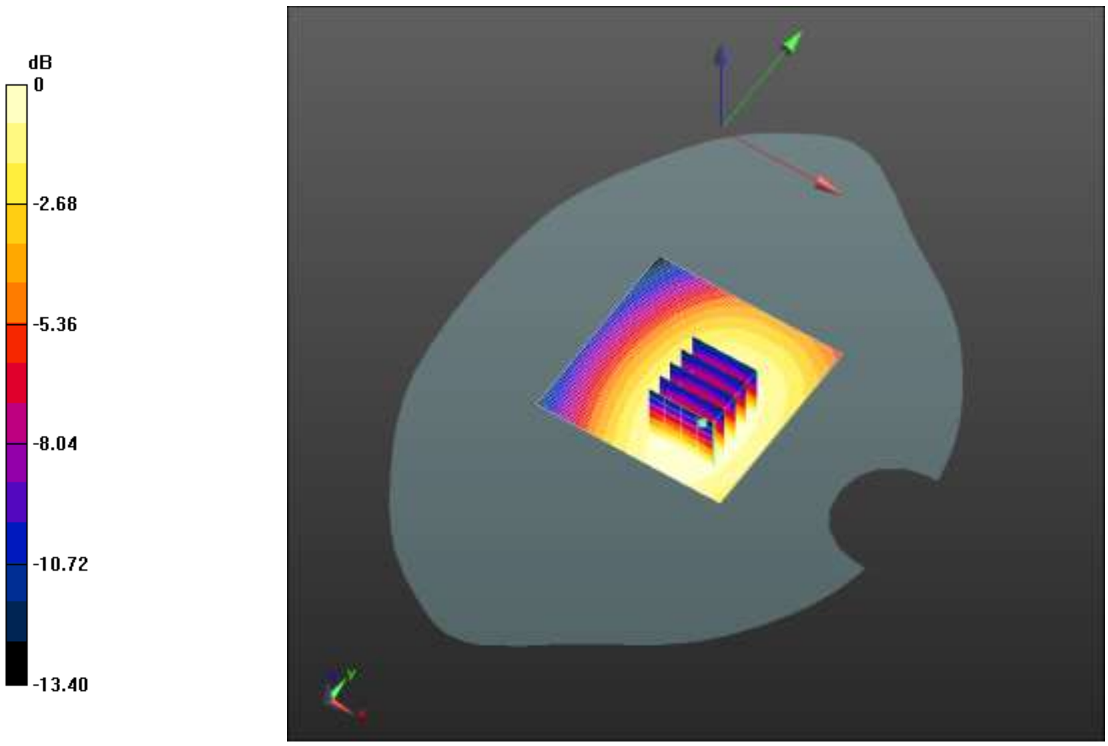
Medium: MSL750

Communication System: LTE-FDD(CE); Communication System Band: Band12(10MHz); Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 707.5 MHz; σ = 0.858 mho/m; ε_r = 42.446; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Facedown Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 13.841 V/m; Power Drift = -0.03 dB
Fast SAR: SAR(1 g) = 0.173 mW/g; SAR(10 g) = 0.124 mW/g
Maximum value of SAR (interpolated) = 0.183 W/kg

Body/Facedown Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.841 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.208 mW/g
SAR(1 g) = 0.169 mW/g; SAR(10 g) = 0.134 mW/g
Maximum value of SAR (measured) = 0.177 W/kg



0 dB = 0.183 W/kg = -14.76 dB W/kg

Date:
2018.09.05.

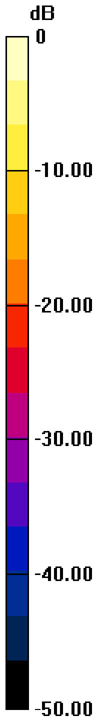
LTE Band17 (10MHz) Head Right Cheek Mid

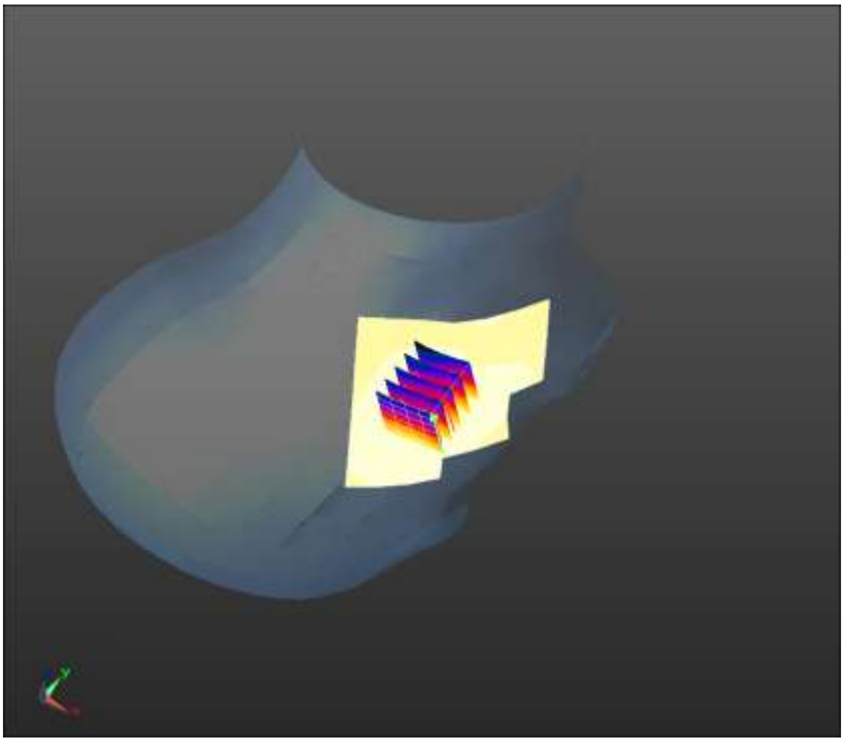
Medium: HSL750

Communication System: LTE-FDD(CE); Communication System Band: Band17(10MHz); Frequency: 710 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 710 MHz; σ = 0.86 mho/m; ε_r = 42.412; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Head Right/Cheek Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 7.082 V/m; Power Drift = -0.13 dB
Fast SAR: SAR(1 g) = 0.118 mW/g; SAR(10 g) = 0.083 mW/g
Maximum value of SAR (interpolated) = 0.125 W/kg
Head Right/Cheek Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.082 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.144 mW/g
SAR(1 g) = 0.119 mW/g; SAR(10 g) = 0.096 mW/g
Maximum value of SAR (measured) = 0.124 W/kg





0 dB = 0.125 W/kg = -18.03 dB W/kg

Date:
2018.09.05.

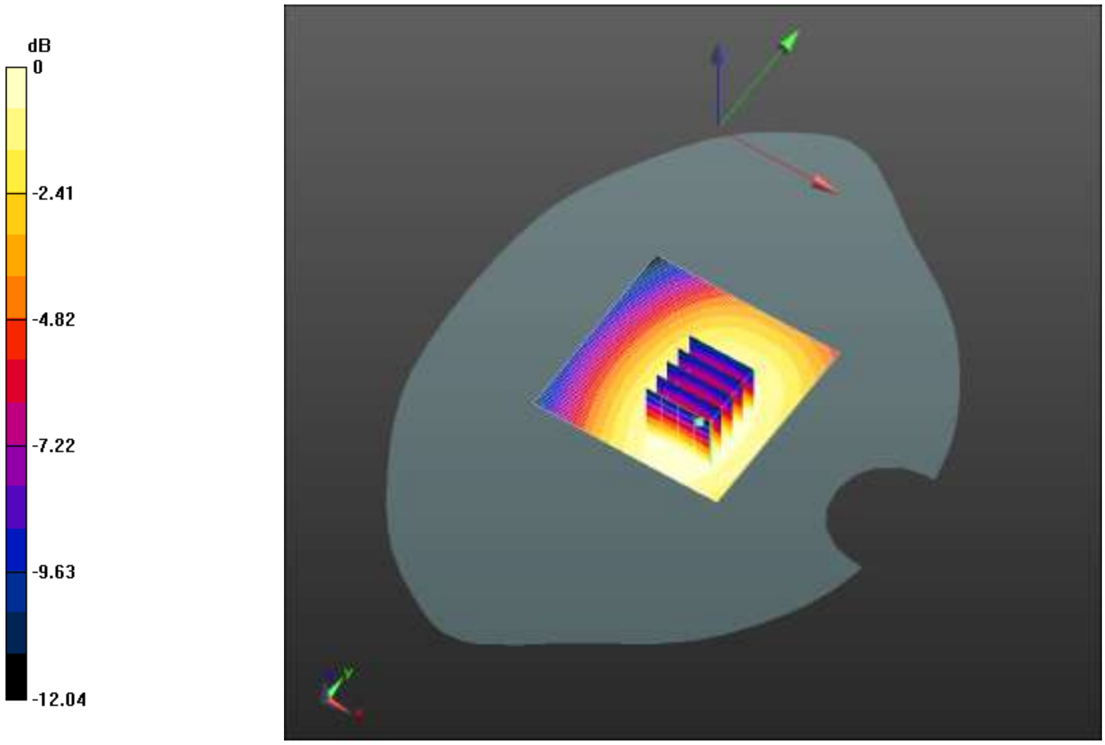
LTE Band17 (10MHz) Body Back Side Mid 15mm

Medium: MSL750

Communication System: LTE-FDD(CE); Communication System Band: Band17(10MHz); Frequency: 710 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 710 MHz; σ = 0.86 mho/m; ε_r = 42.412; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Facedown Mid 15/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 13.519 V/m; Power Drift = 0.02 dB
Fast SAR: SAR(1 g) = 0.157 mW/g; SAR(10 g) = 0.113 mW/g.
Maximum value of SAR (interpolated) = 0.166 W/kg
Body/Facedown Mid 15/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.519 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.193 mW/g
SAR(1 g) = 0.157 mW/g; SAR(10 g) = 0.123 mW/g
Maximum value of SAR (measured) = 0.164 W/kg



0 dB = 0.166 W/kg = -15.62 dB W/kg

Date:
2018.09.10.

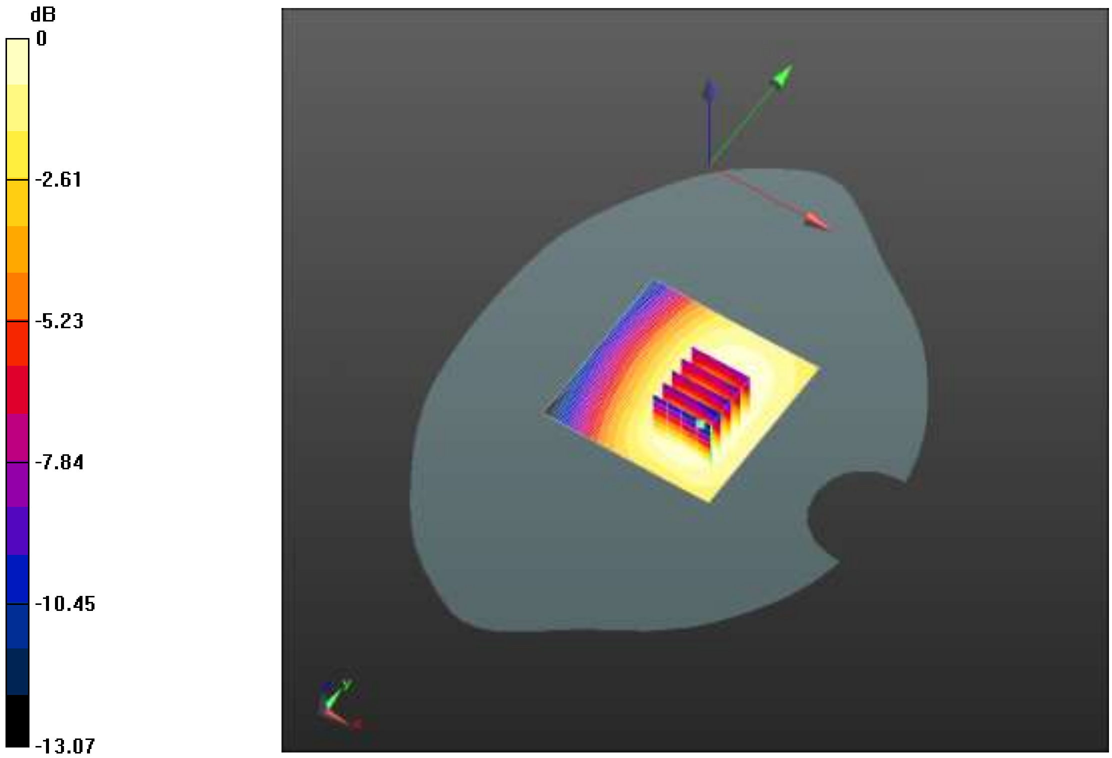
LTE Band17 (10MHz) Body Back Side Mid 10mm

Medium: MSL750

Communication System: LTE-FDD(CE); Communication System Band: Band17(10MHz); Frequency: 710 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 710 MHz; σ = 0.86 mho/m; ε_r = 42.412; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Facedown Mid/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 13.808 V/m; Power Drift = -0.03 dB
Fast SAR: SAR(1 g) = 0.168 mW/g; SAR(10 g) = 0.120 mW/g
Maximum value of SAR (interpolated) = 0.178 W/kg
Body/Facedown Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.808 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.209 mW/g
SAR(1 g) = 0.169 mW/g; SAR(10 g) = 0.133 mW/g
Maximum value of SAR (measured) = 0.176 W/kg



0 dB = 0.178 W/kg = -15.01 dB W/kg

Date: 2018.11.01.

CDMA BC0 Body Front Side Mid 0mm

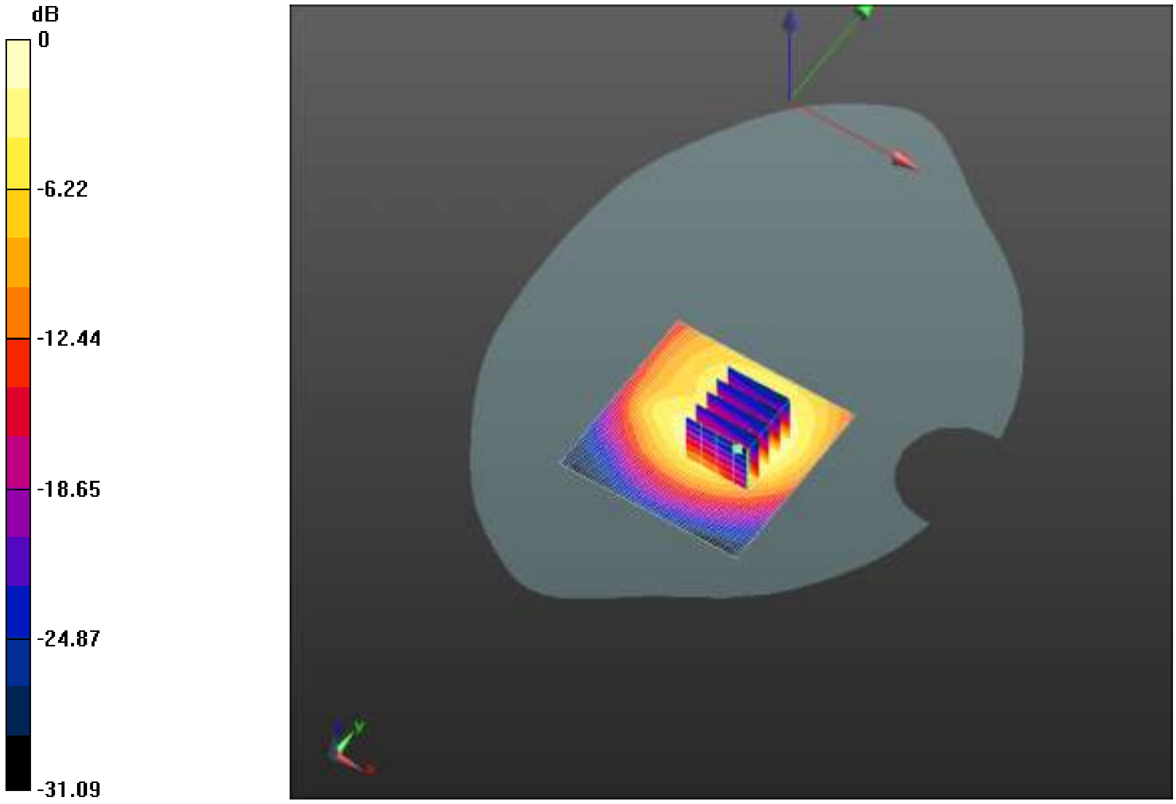
Medium: MSL900

Communication System: CDMA 1X ; Communication System Band: EVDO BC0; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; σ = 1.01 mho/m; ε_r = 55.859; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.57, 9.57, 9.57); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

CDMA BC0-Faceup/Mid 3/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 13.995 V/m; Power Drift = 0.06 dB
Fast SAR: SAR(1 g) = 0.782 mW/g; SAR(10 g) = 0.445 mW/g
Maximum value of SAR (interpolated) = 0.934 W/kg

CDMA BC0-Faceup/Mid 3/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.995 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 1.712 mW/g
SAR(1 g) = 0.785 mW/g; SAR(10 g) = 0.387 mW/g
Maximum value of SAR (measured) = 0.912 W/kg



0 dB = 0.934 W/kg = -0.60 dB W/kg

Date: 2018.11.01.

CDMA BC1 Body Bottom Side Low 0mm

Medium: MSL1800

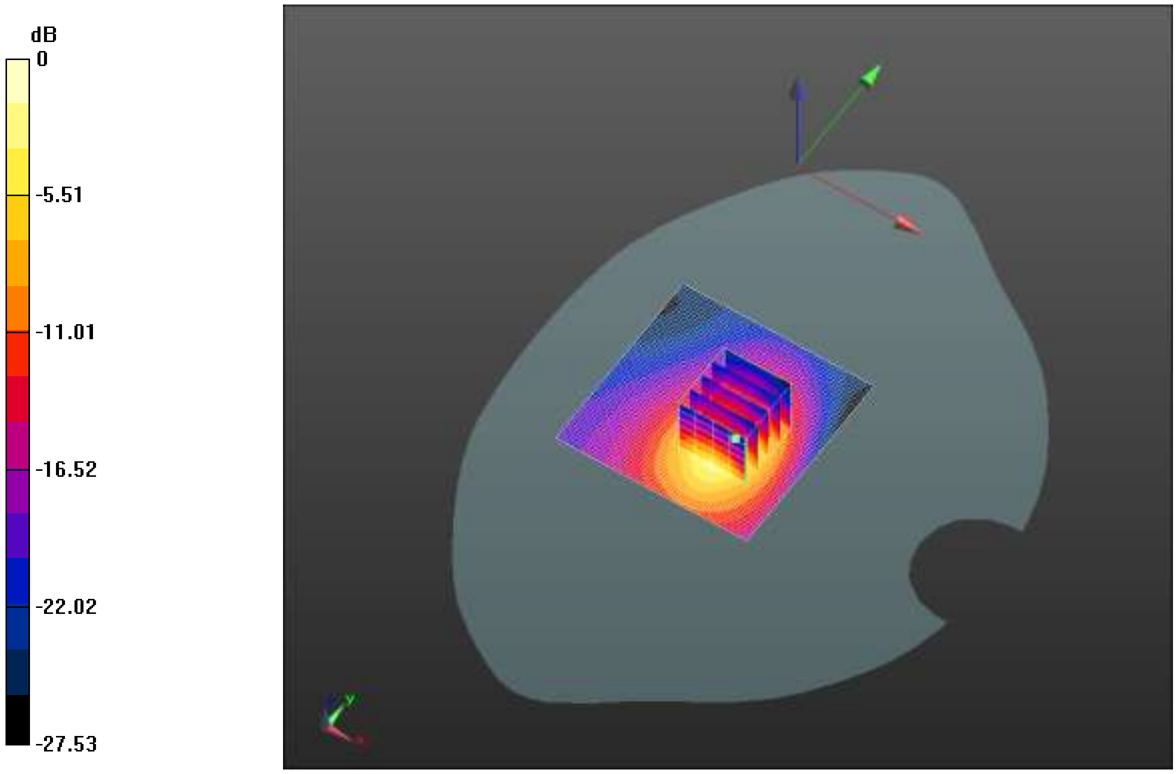
Communication System: CDMA 1X ; Communication System Band: EVDO BC1; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1851.25 MHz; σ = 1.531 mho/m; ε_r = 51.236; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(7.64, 7.64, 7.64); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

CDMA BC1-Bottom/Low/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Reference Value = 26.339 V/m; Power Drift = 0.09 dB
Fast SAR: SAR(1 g) = 3.11 mW/g; SAR(10 g) = 1.41 mW/g.
Maximum value of SAR (interpolated) = 3.64 W/kg

CDMA BC1-Bottom/Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.339 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 6.747 mW/g
SAR(1 g) = 3.24 mW/g; SAR(10 g) = 1.48 mW/g
Maximum value of SAR (measured) = 3.64 W/kg



0 dB = 3.64 W/kg = 11.22 dB W/kg

Date: 2018.11.01.

CDMA BC10 Body Back Side Mid 0mm

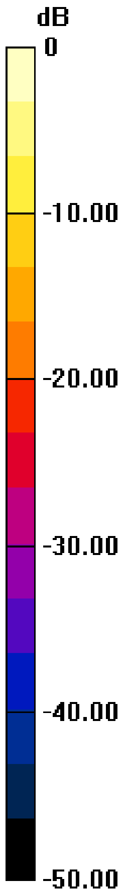
Medium: MSL750

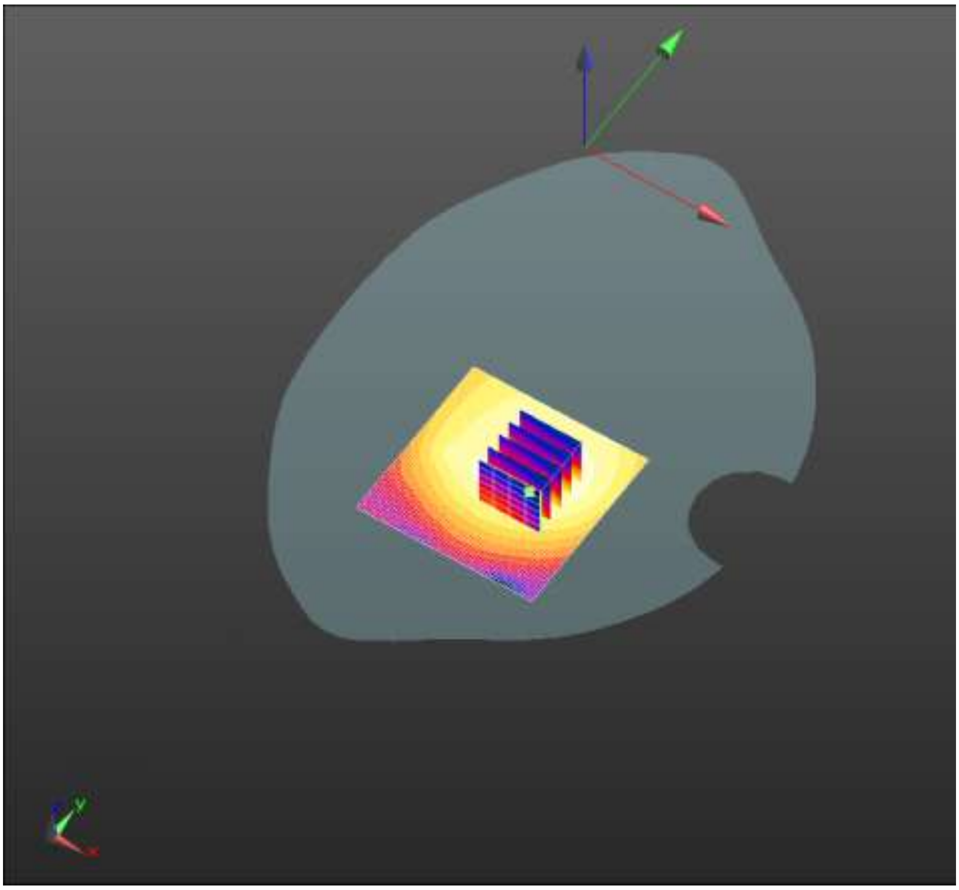
Communication System: CDMA 1X ; Communication System Band: CDMA2000 BC0; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium parameters used (extrapolated): f = 848.31 MHz; σ = 0.979 mho/m; ε_r = 40.484; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.47, 9.47, 9.47); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

CDMA BC1-Left Side/Mid 2/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 15.288 V/m; Power Drift = -0.18 dB
Fast SAR: SAR(1 g) = 0.671 mW/g; SAR(10 g) = 0.399 mW/g
Maximum value of SAR (interpolated) = 0.781 W/kg

CDMA BC1-Left Side/Mid 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.288 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 1.622 mW/g
SAR(1 g) = 0.756 mW/g; SAR(10 g) = 0.383 mW/g
Maximum value of SAR (measured) = 0.888 W/kg





0 dB = 0.781 W/kg = -2.15 dB W/kg

Date: 2018.11.01.

LTE Band12 (10MHz) Body Back Side Mid 0mm

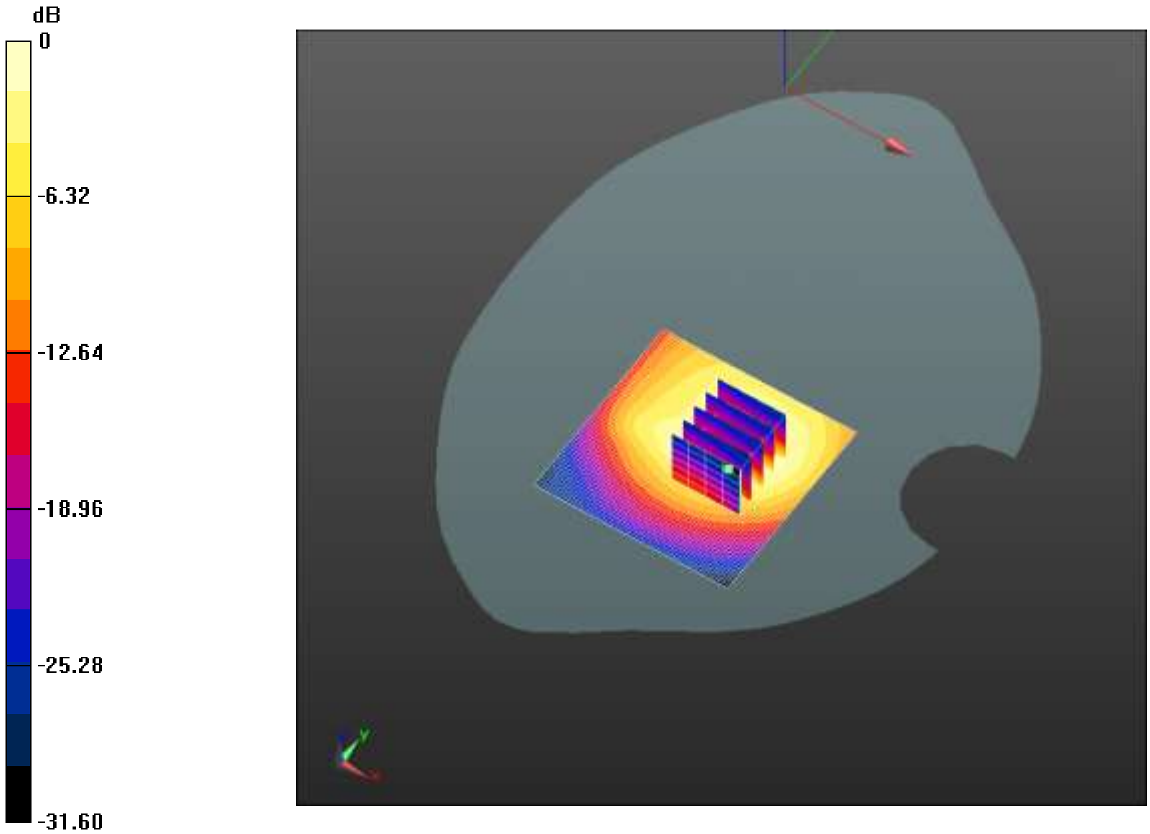
Medium: MSL750

Communication System: LTE-FDD(CE); Communication System Band: Band12(10MHz); Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 707.5 MHz; σ = 0.858 mho/m; ε_r = 42.446; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Facedown Mid 2 2/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 18.053 V/m; Power Drift = -0.07 dB
Fast SAR: SAR(1 g) = 0.808 mW/g; SAR(10 g) = 0.476 mW/g
Maximum value of SAR (interpolated) = 0.978 W/kg

Body/Facedown Mid 2 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.053 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 2.303 mW/g
SAR(1 g) = 0.951 mW/g; SAR(10 g) = 0.469 mW/g
Maximum value of SAR (measured) = 1.13 W/kg



0 dB = 0.978 W/kg = -0.19 dB W/kg

Date: 2018.11.01.

LTE Band17 (10MHz) Body Back Side Low 0mm

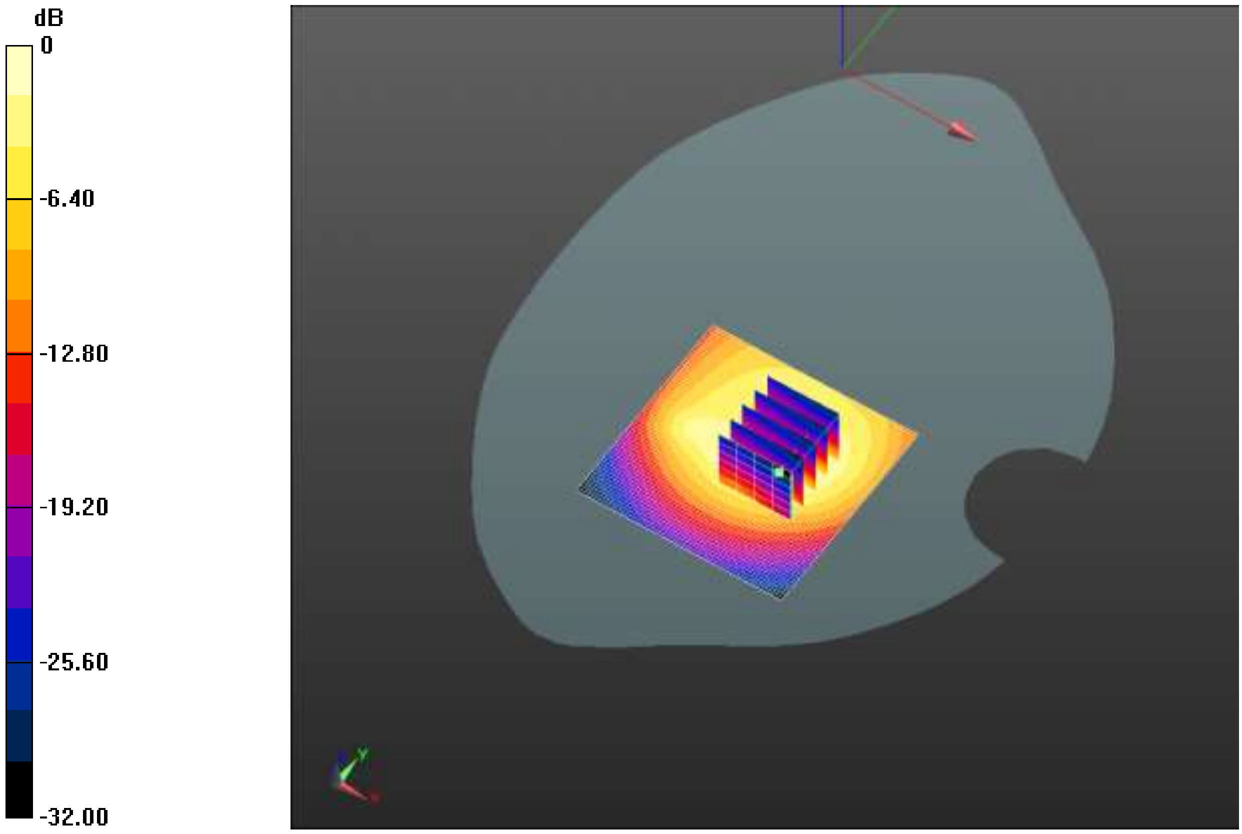
Medium: MSL750

Communication System: LTE-FDD(CE); Communication System Band: Band17(10MHz); Frequency: 709 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 709 MHz; σ = 0.859 mho/m; ε_r = 42.426; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:Probe: EX3DV4 - SN3881; ConvF(9.73, 9.73, 9.73); Calibrated: 2018.07.14.; Electronics: DAE4 Sn876; Calibrated: 2018.03.22.

Body/Facedown Low/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 17.761 V/m; Power Drift = 0.01 dB
Fast SAR: SAR(1 g) = 0.997 mW/g; SAR(10 g) = 0.586 mW/g
Maximum value of SAR (interpolated) = 1.17 W/kg

Body/Facedown Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.761 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.684 mW/g
SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.505 mW/g
Maximum value of SAR (measured) = 1.28 W/kg



0 dB = 1.17 W/kg = 1.39 dB W/kg

APPENDIX C: RELEVANT PAGES FROM PROBE CALIBRATION REPORT(S)

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CNAS L0570
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Client **SMQ** **Certificate No: Z18-60203**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3881
Calibration Procedure(s)	FF-Z11-004-01 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	July 14, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	20-Jun-18 (CTTL, No.J18X05032)	Jun-19
Power sensor NRP-Z91	101547	20-Jun-18 (CTTL, No.J18X05032)	Jun-19
Power sensor NRP-Z91	101548	20-Jun-18 (CTTL, No.J18X05032)	Jun-19
Reference10dBAttenuator	18N50W-10dB	09-Feb-18(CTTL, No.J18X01133)	Feb-20
Reference20dBAttenuator	18N50W-20dB	09-Feb-18(CTTL, No.J18X01132)	Feb-20
Reference Probe EX3DV4	SN 3846	25-Jan-18(SPEAG,No.EX3-3846_Jan18)	Jan-19
DAE4	SN 777	15-Dec-17(SPEAG, No.DAE4-777_Dec17)	Dec -18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	21-Jun-18 (CTTL, No.J18X05033)	Jun-19
Network Analyzer E5071C	MY46110673	14-Jan-18 (CTTL, No.J18X00561)	Jan -19

	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: July 16, 2018

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "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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Probe EX3DV4

SN: 3881

Calibrated: July 14, 2018

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)[A]	0.18	0.38	0.52	±10.0%
DCP(mV)[B]	95.4	105.6	101.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	87.5	±2.7%
		Y	0.0	0.0	1.0		150.3	
		Z	0.0	0.0	1.0		179.8	

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

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	9.73	9.73	9.73	0.40	0.80	±12.1%
835	41.5	0.90	9.47	9.47	9.47	0.12	1.78	±12.1%
1750	40.1	1.37	8.34	8.34	8.34	0.26	0.94	±12.1%
1900	40.0	1.40	7.92	7.92	7.92	0.24	1.02	±12.1%
2450	39.2	1.80	7.58	7.58	7.58	0.58	0.72	±12.1%
2600	39.0	1.96	7.25	7.25	7.25	0.63	0.69	±12.1%
5250	35.9	4.71	5.29	5.29	5.29	0.35	1.45	±13.3%
5600	35.5	5.07	4.64	4.64	4.64	0.35	1.40	±13.3%
5750	35.4	5.22	4.80	4.80	4.80	0.35	1.65	±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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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3881

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	55.5	0.96	9.73	9.73	9.73	0.40	0.80	±12.1%
835	55.2	0.97	9.57	9.57	9.57	0.17	1.47	±12.1%
1750	53.4	1.49	7.94	7.94	7.94	0.21	1.09	±12.1%
1900	53.3	1.52	7.64	7.64	7.64	0.19	1.26	±12.1%
2450	52.7	1.95	7.52	7.52	7.52	0.45	0.91	±12.1%
2600	52.5	2.16	7.26	7.26	7.26	0.67	0.70	±12.1%
5250	48.9	5.36	4.84	4.84	4.84	0.45	1.30	±13.3%
5600	48.5	5.77	4.07	4.07	4.07	0.45	1.65	±13.3%
5750	48.3	5.94	4.31	4.31	4.31	0.55	1.10	±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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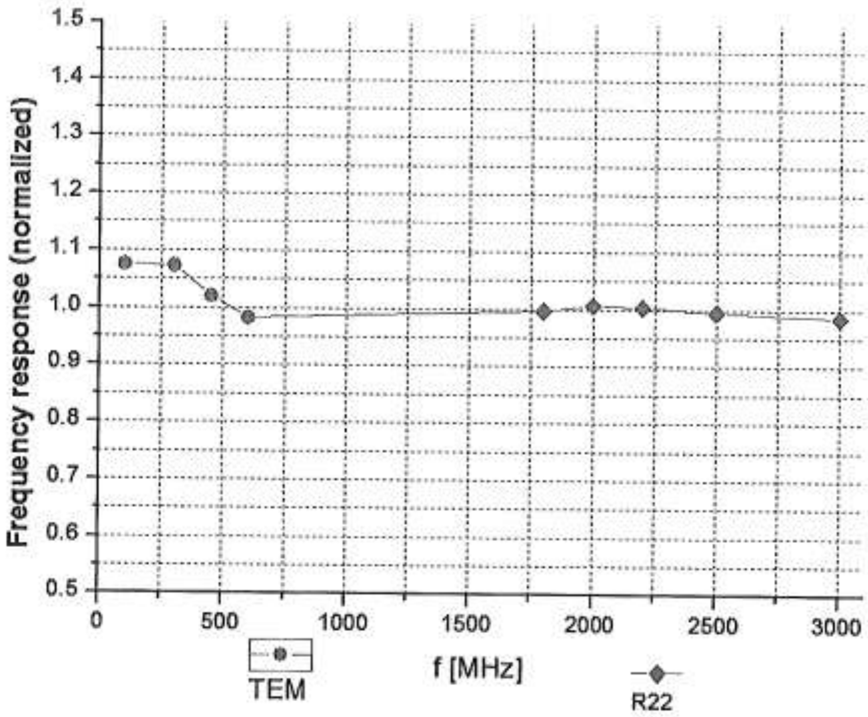
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



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

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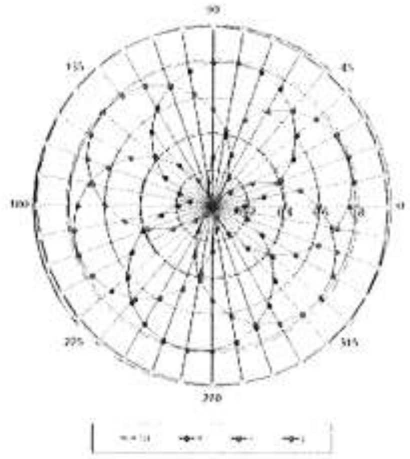
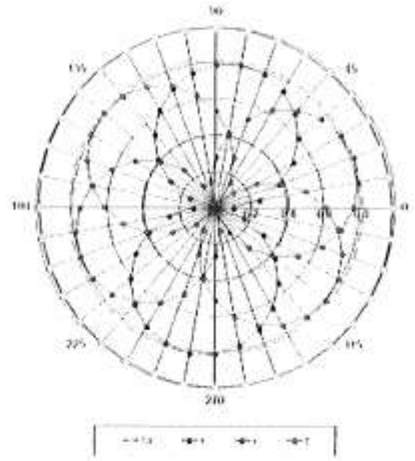
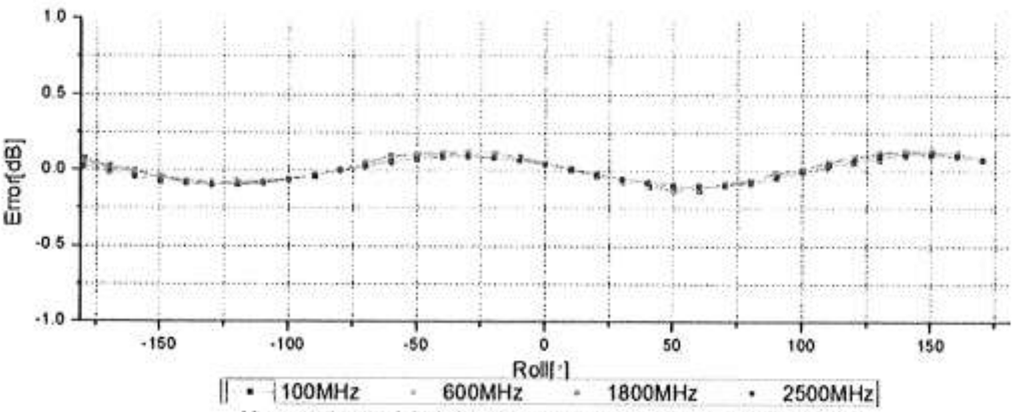
Receiving Pattern (Φ), θ=0°

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







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

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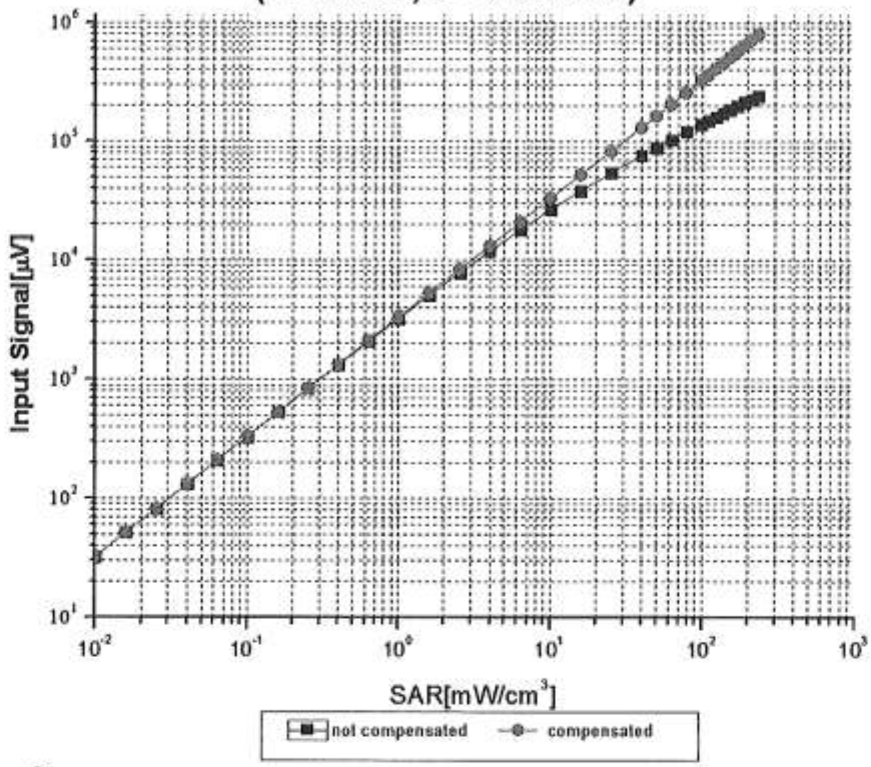
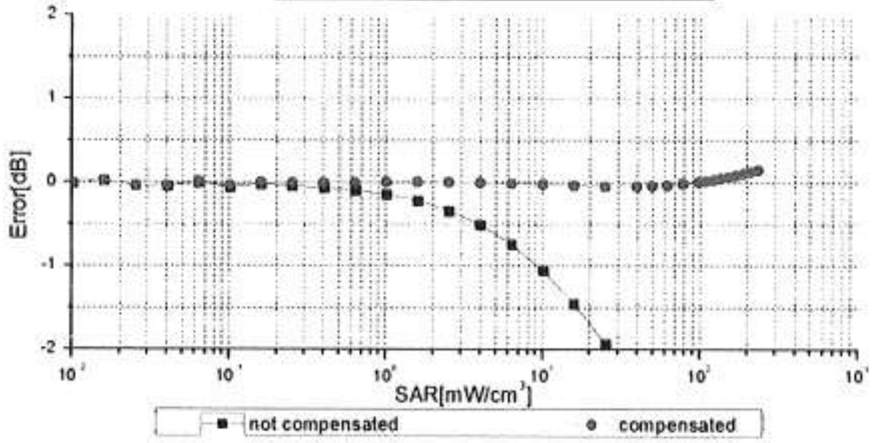
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





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

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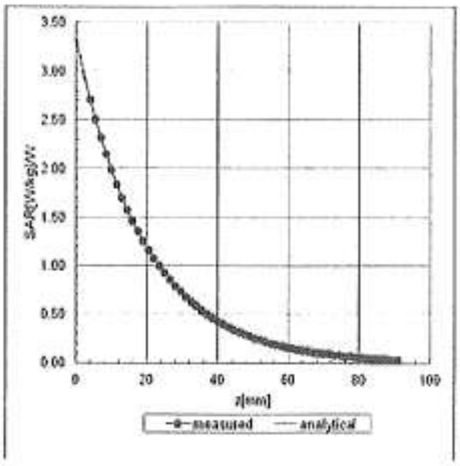
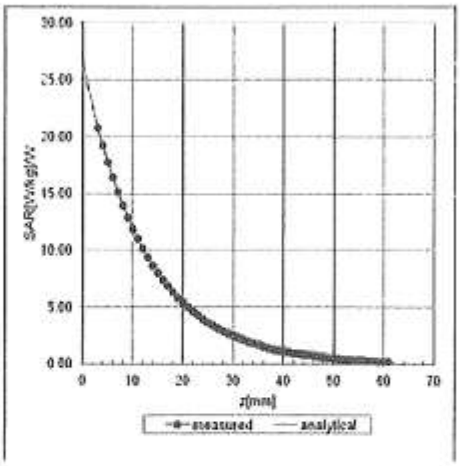
Conversion Factor Assessment

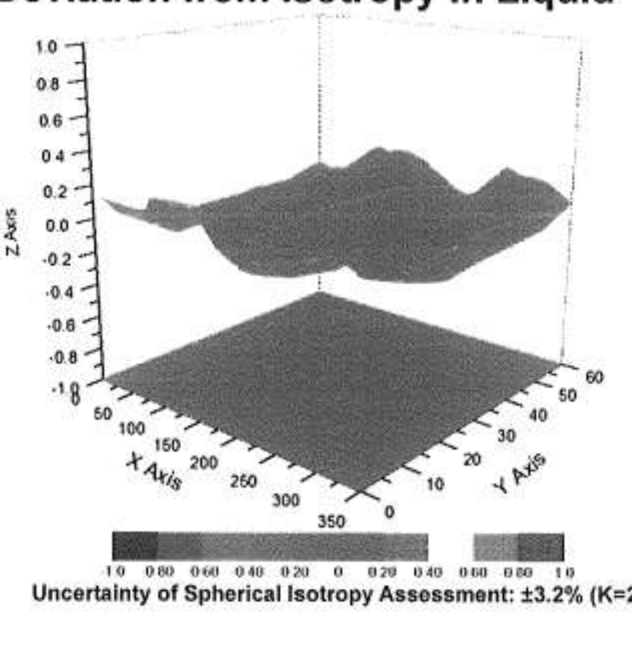
f=835 MHz, WGLS R9(H_convF)



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: 3881

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	169.7
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

APPENDIX D: RELEVANT PAGES FROM DAE& DIPOLE VALIDATION KIT REPORT(S)

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校准
CALIBRATION
CNAS L0570

Client **SMQ** **Certificate No: Z17-97005**

CALIBRATION CERTIFICATE

Object D750V3 - SN: 1103

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

Calibration date: January 10, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-16 (CTTL, No.J16X04771)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04771)	Jun-17
Reference Probe EX3DV4	SN 7307	19-Feb-16(SPEAG,No.EX3-7307_Feb16)	Feb-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

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

Issued: January 12, 2017

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
c) 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	52.8.8.1258
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	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.87 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	2.05 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**8.29 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.37 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**5.53 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.6 ± 6 %	0.94 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**8.89 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.47 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**5.97 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.0Ω- 3.23jΩ
Return Loss	- 28.6dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.1Ω- 3.34jΩ
Return Loss	- 29.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.139 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: 01.10.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1103

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: f = 750 MHz; σ = 0.871 S/m; ε_r = 40.92; ρ = 1000 kg/m^3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(10.47, 10.47, 10.47); Calibrated: 2/19/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

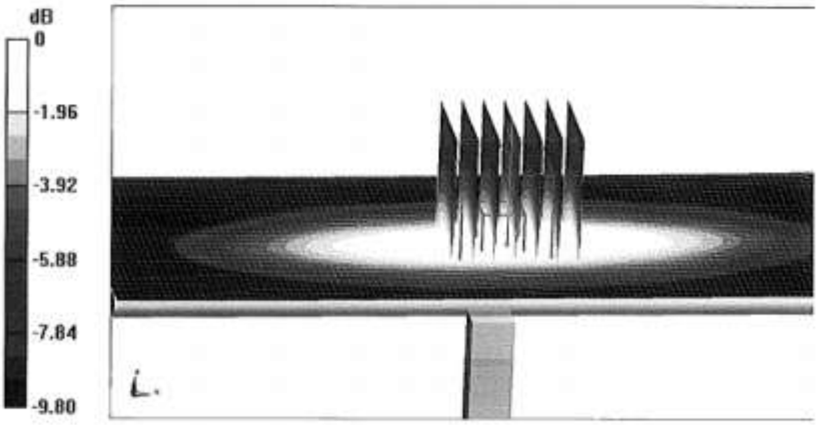
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.76 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 2.98 W/kg

SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (measured) = 2.68 W/kg



0 dB = 2.68 W/kg = 4.28 dBW/kg

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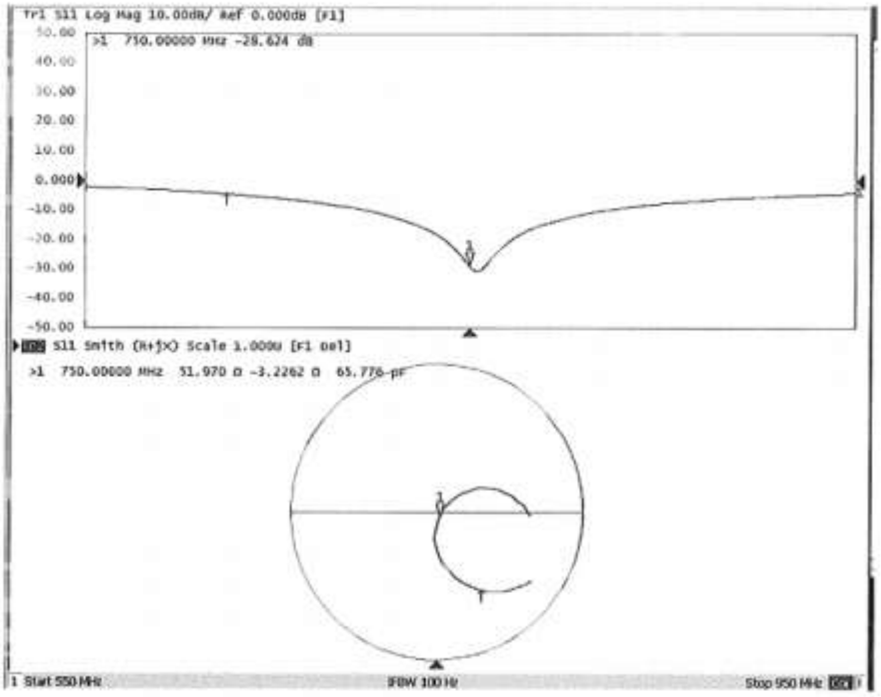
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 01.10.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1103

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: f = 750 MHz; σ = 0.936 S/m; ϵ_r = 55.59; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(9.93, 9.93, 9.93); Calibrated: 2/19/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

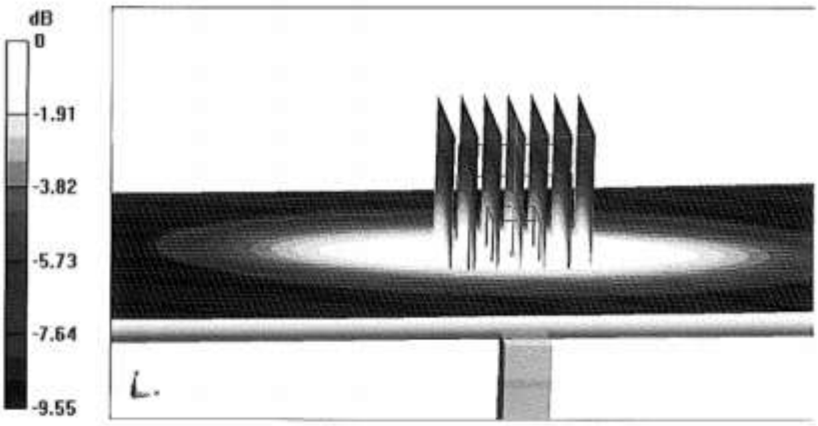
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.96 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.15 W/kg

SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.47 W/kg

Maximum value of SAR (measured) = 2.84 W/kg



0 dB = 2.84 W/kg = 4.53 dBW/kg

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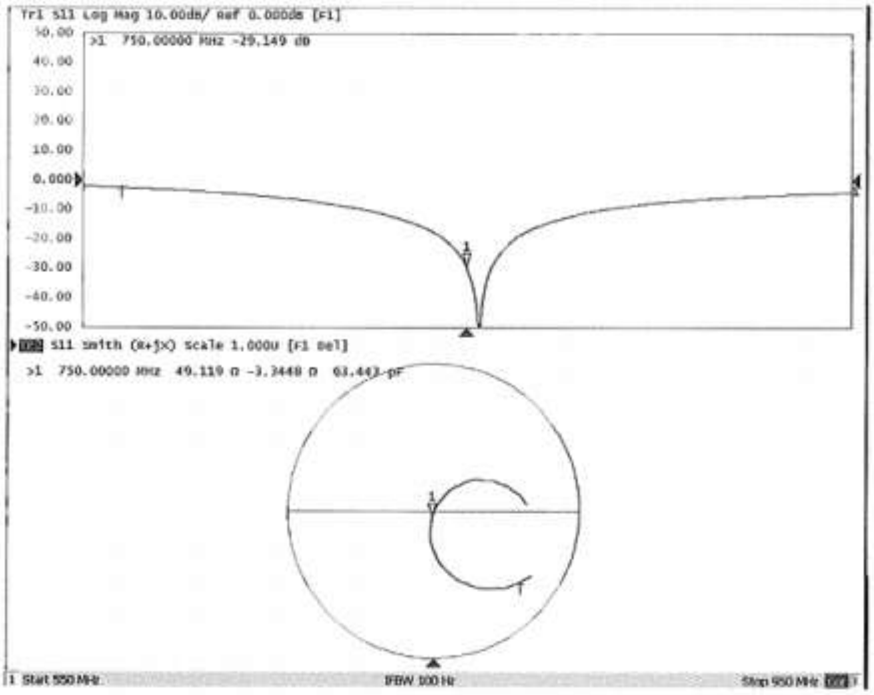
Impedance Measurement Plot for Body TSL



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CALIBRATION No. L0570

Client **SMQ** **Certificate No: Z15-97116**

CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d141

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

Calibration date: September 24, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: September 29, 2015

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.0 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

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

Body TSL parameters

The following parameters and calculations were applied.

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

SAR result with Body TSL

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

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.2Ω- 4.66jΩ
Return Loss	- 25.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.7Ω- 5.94jΩ
Return Loss	- 22.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.441 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: 09.18.2015

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: f = 835 MHz; σ = 0.886 S/m; ε_r = 41.95; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(9.18, 9.18, 9.18); Calibrated: 9/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/16/2015
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

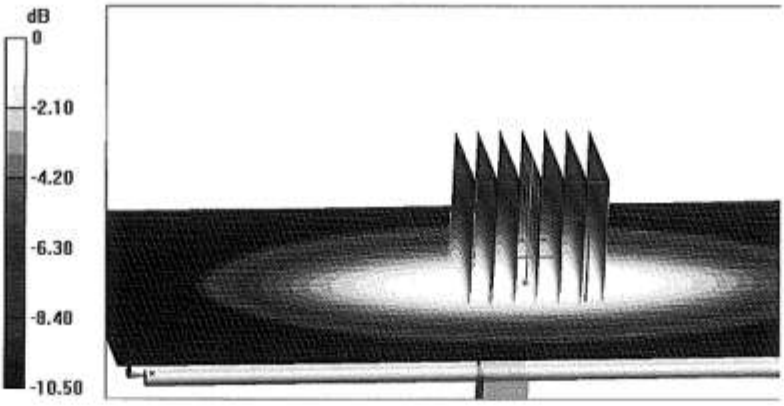
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.07 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 3.48 W/kg

SAR(1 g) = 2.33 W/kg; SAR(10 g) = 1.51 W/kg

Maximum value of SAR (measured) = 2.95 W/kg



0 dB = 2.95 W/kg = 4.70 dBW/kg

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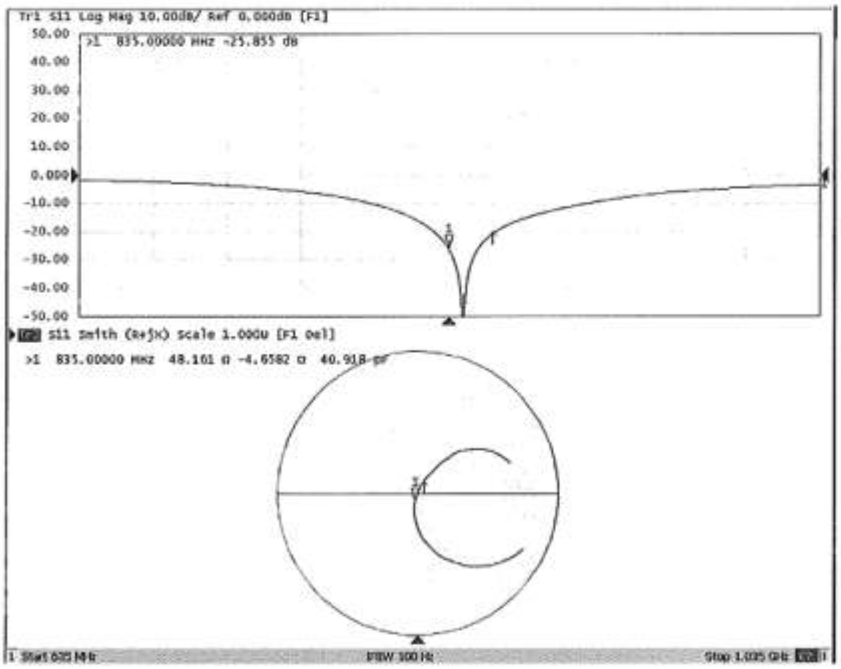
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 09.18.2015

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: f = 835 MHz; σ = 0.981 S/m; ε_r = 55.99; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(9.09,9.09, 9.09); Calibrated: 9/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/16/2015
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

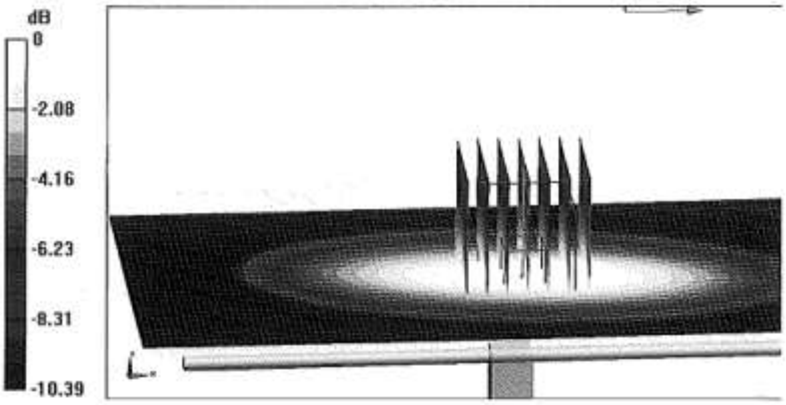
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.07 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.58 W/kg

SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 3.04 W/kg



0 dB = 3.04 W/kg = 4.83 dBW/kg

Certificate No: Z15-97116 Page 7 of 8

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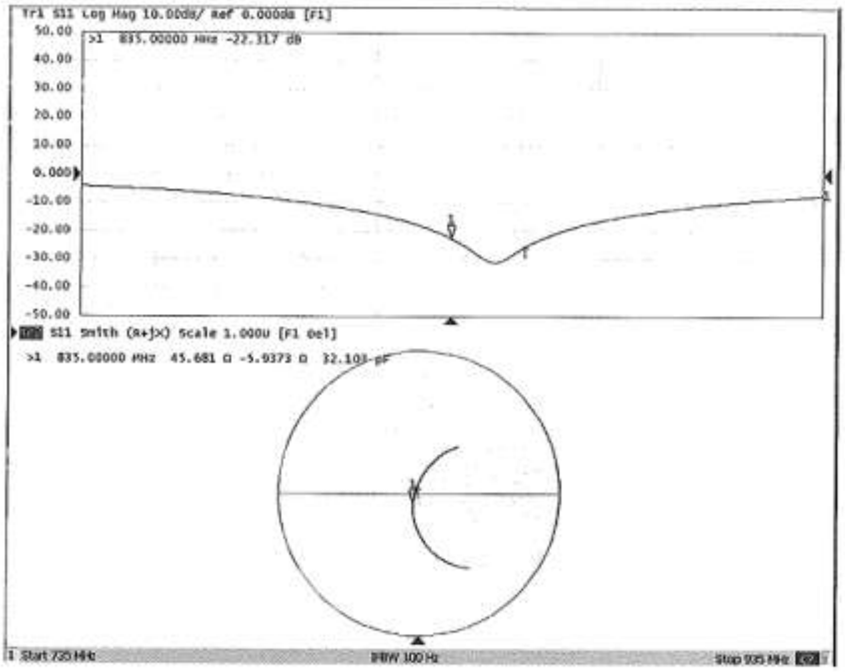
Impedance Measurement Plot for Body TSL



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ilac-MRA CNAS CALIBRATION No. L0570

Client **SMQ** **Certificate No: Z15-97117**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d162
Calibration Procedure(s)	FD-Z11-2-003-01 Calibration Procedures for dipole validation kits
Calibration date:	September 16, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: September 23, 2015

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	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	40.9 ± 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	9.96 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**40.4 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.20 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.6 ± 6 %	1.51 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**41.2 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.37 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.0Ω+2.72jΩ
Return Loss	- 30.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.4Ω+ 3.95jΩ
Return Loss	- 27.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.301 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: 09.16.2015

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: f = 1900 MHz; σ = 1.378 S/m; εr = 40.94; ρ = 1000 kg/m3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.26, 7.26, 7.26); Calibrated: 9/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/16/2015
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

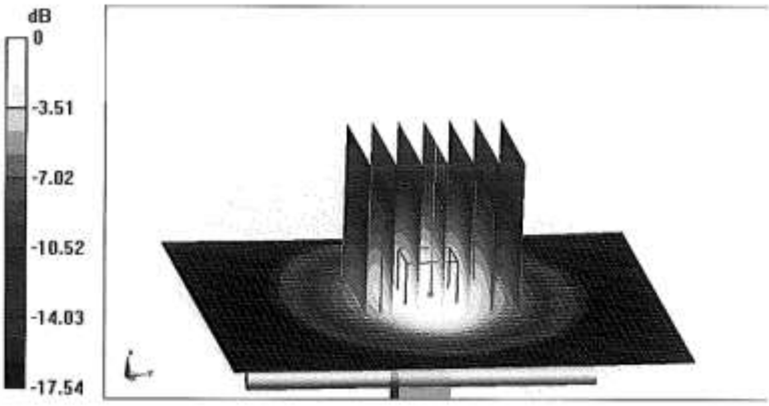
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.1V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 18.0W/kg

SAR(1 g) = 9.96 W/kg; SAR(10 g) = 5.2 W/kg

Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.52 dBW/kg

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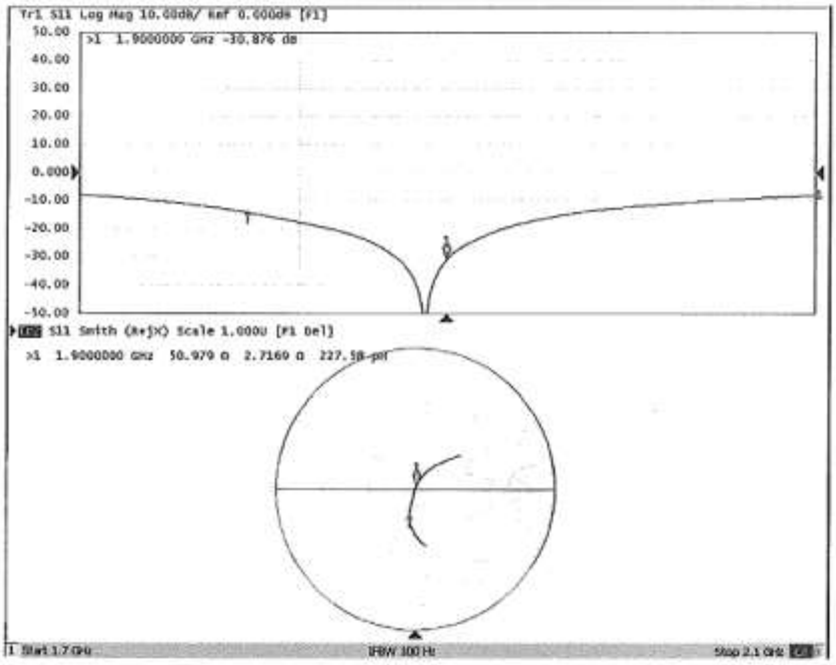
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 09.16.2015

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: f = 1900 MHz; σ = 1.507 S/m; ε_r = 54.56; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.15, 7.15, 7.15); Calibrated: 9/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/16/2015
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

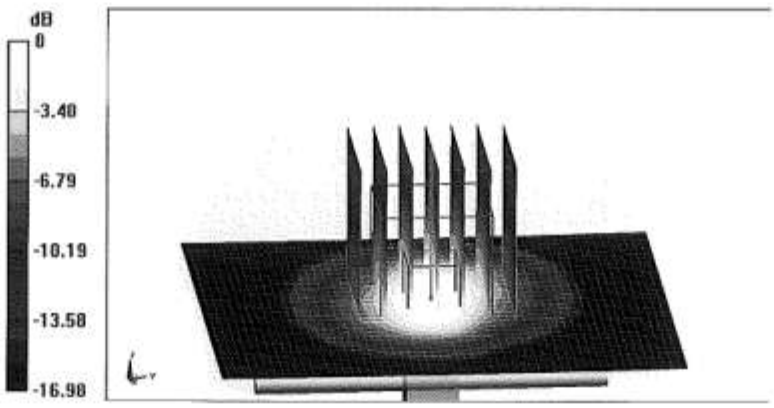
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.5 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 18.4 W/kg

SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.37 W/kg

Maximum value of SAR (measured) = 14.7 W/kg



0 dB = 14.7 W/kg = 11.67 dBW/kg

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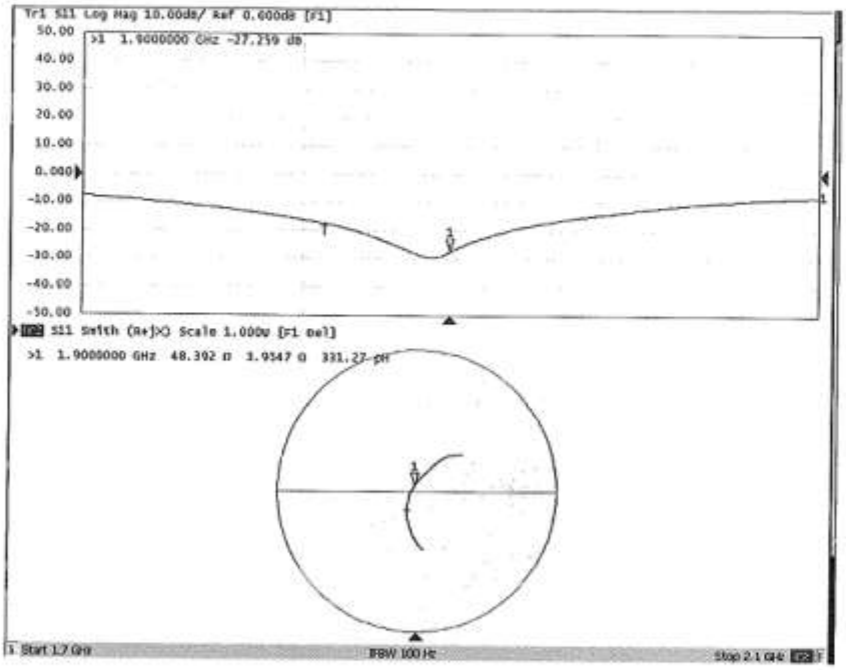
Impedance Measurement Plot for Body TSL



Certificate No: Z15-97117 Page 8 of 8

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Client **SMQ** **Certificate No: Z18-60333**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d141
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	September 6, 2018

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 NRVD	102083	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
Power sensor NRV-Z5	100542	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
Reference Probe EX3DV4	SN 7464	12-Sep-17(SPEAG,No.EX3-7464_Sep17)	Sep-18
DAE4	SN 1524	13-Sep-17(SPEAG,No.DAE4-1524_Sep17)	Sep-18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
NetworkAnalyzer E5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

	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: September 9, 2018

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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	52.10.1.1476
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.7 ± 6 %	0.90 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 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.31 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.53 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.13 mW /g ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.0 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.48 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.74 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.66 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.54 mW /g ± 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	50.3Ω- 5.68jΩ
Return Loss	- 24.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8Ω- 7.52jΩ
Return Loss	- 21.5dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.255 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: 09.04.2018

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: f = 835 MHz; σ = 0.904 S/m; ε_r = 42.71; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(10.28, 10.28, 10.28) @ 835 MHz; Calibrated: 9/12/2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

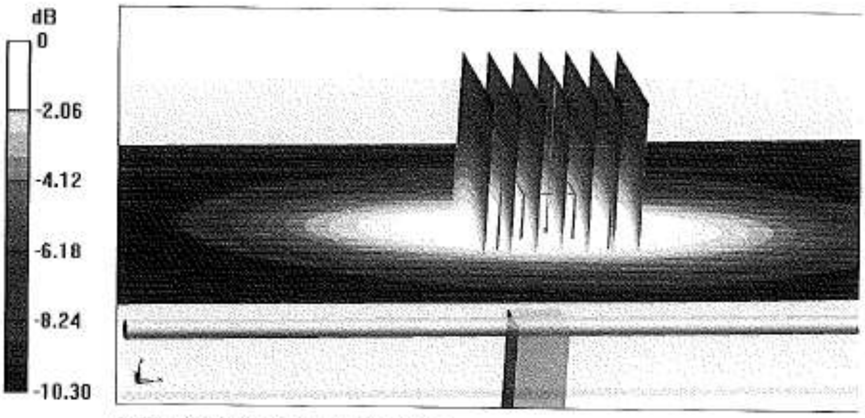
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.01 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 3.49 W/kg

SAR(1 g) = 2.32 W/kg; SAR(10 g) = 1.53 W/kg

Maximum value of SAR (measured) = 3.10 W/kg



0 dB = 3.10 W/kg = 4.91 dBW/kg

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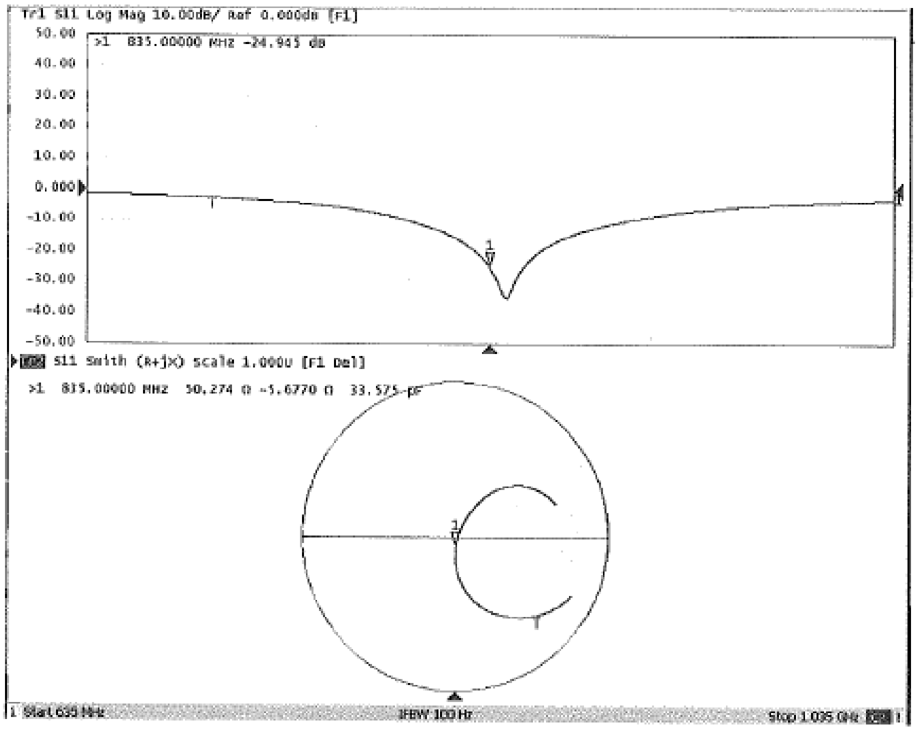
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 09.06.2018

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: f = 835 MHz; σ = 0.998 S/m; ε_r = 56.04; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(10.21, 10.21, 10.21) @ 835 MHz; Calibrated: 9/12/2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

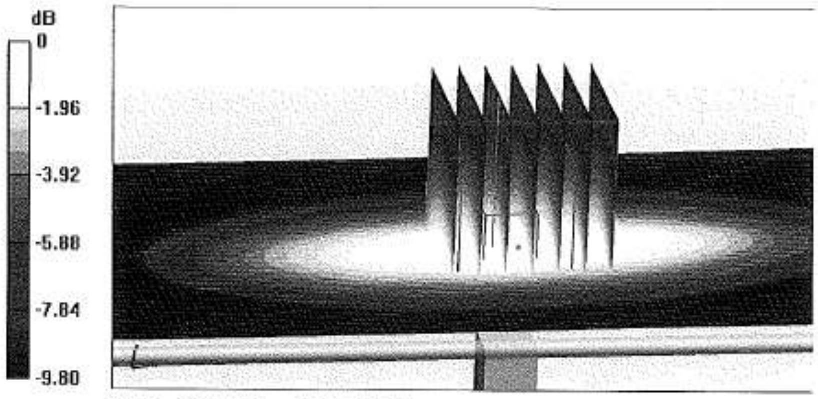
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.80 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.73 W/kg

SAR(1 g) = 2.48 W/kg; SAR(10 g) = 1.66 W/kg

Maximum value of SAR (measured) = 3.27 W/kg



0 dB = 3.27 W/kg = 5.15 dBW/kg

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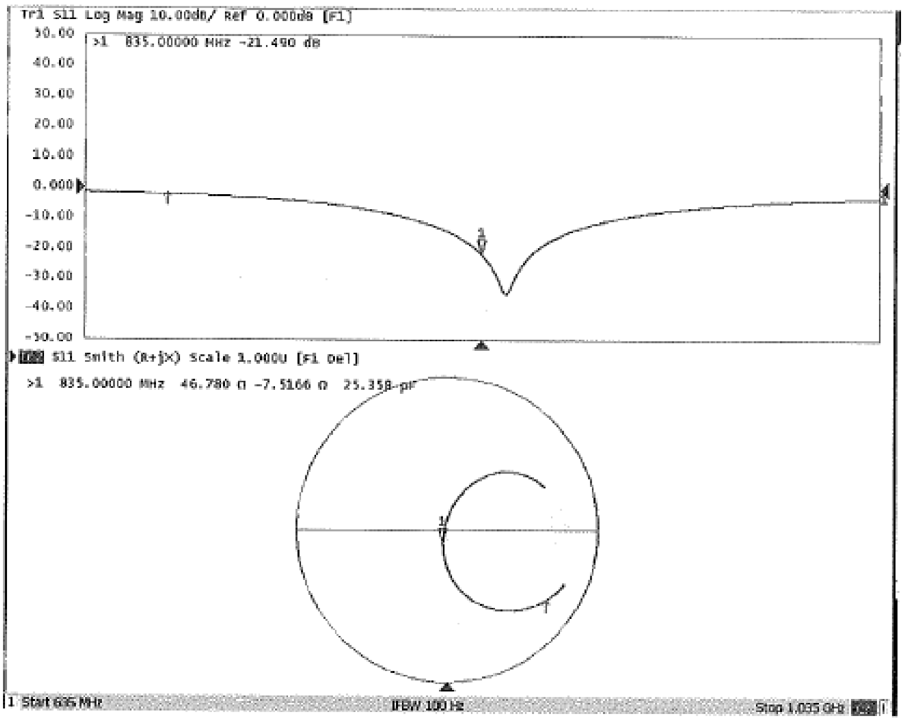
Impedance Measurement Plot for Body TSL



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CNAS L0570

Client **SMQ** Certificate No: **Z18-60336**

CALIBRATION CERTIFICATE

Object D1900V2 - SN: 5d162

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

Calibration date: September 11, 2018

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 NRVD	102083	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
Power sensor NRV-Z5	100542	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
Reference Probe EX3DV4	SN 7464	12-Sep-17(SPEAG,No.EX3-7464_Sep17)	Sep-18
DAE4	SN 1524	13-Sep-17(SPEAG,No.DAE4-1524_Sep17)	Sep-18
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
NetworkAnalyzer E5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

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

Issued: September 15, 2018

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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	52.10.1.1476
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	40.4 ± 6 %	1.44 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	10.1 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**39.8 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.33 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**21.1 mW /g ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.3 ± 6 %	1.49 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.97 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**40.3 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.38 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.7 mW /g ± 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	54.0Ω+ 5.00jΩ
Return Loss	- 24.2dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.4Ω+ 5.03jΩ
Return Loss	- 25.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.061 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: 09.10.2018

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: f = 1900 MHz; σ = 1.438 S/m; ε_r = 40.37; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.39, 8.39, 8.39) @ 1900 MHz; Calibrated: 9/12/2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

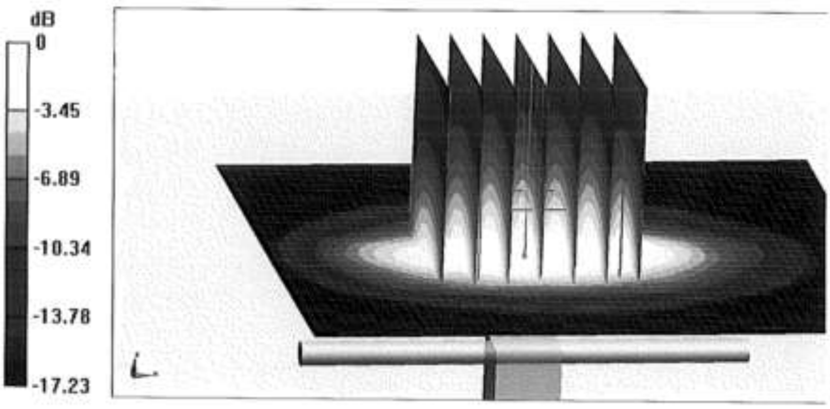
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.60 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 19.0 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.33 W/kg

Maximum value of SAR (measured) = 15.8 W/kg



0 dB = 15.8 W/kg = 11.99 dBW/kg

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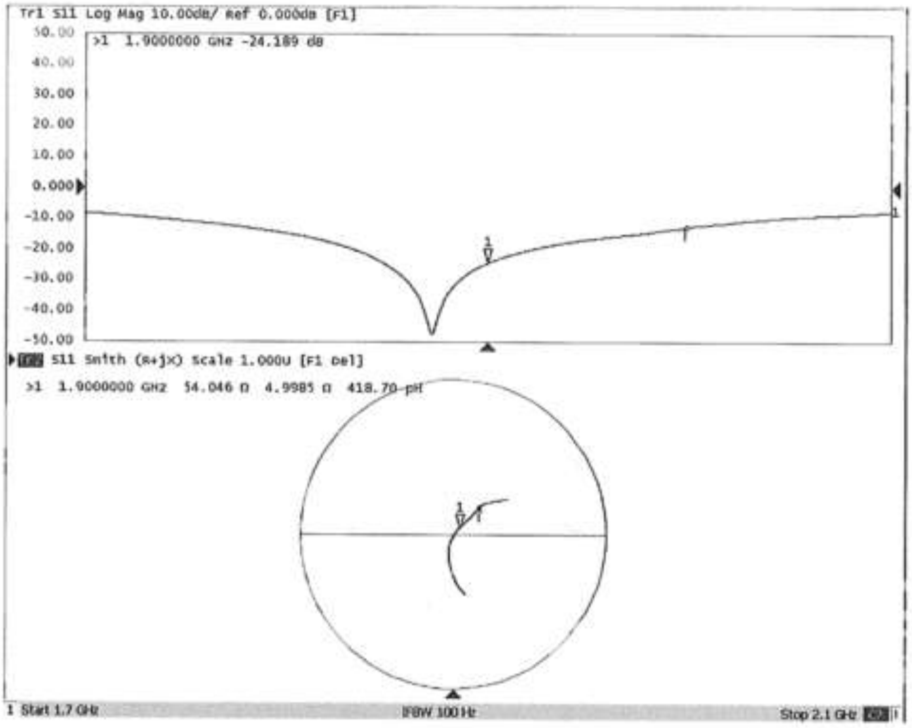
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 09.10.2018

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: f = 1900 MHz; σ = 1.493 S/m; ε_r = 53.34; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.32, 8.32, 8.32) @ 1900 MHz; Calibrated: 9/12/2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439))

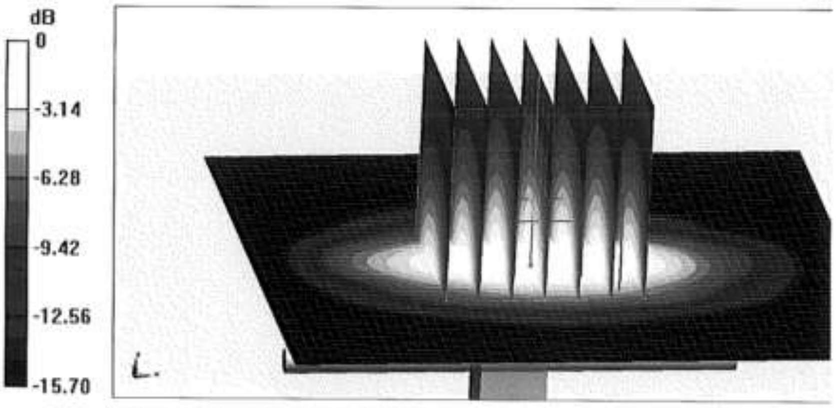
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.26 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 17.5 W/kg

SAR(1 g) = 9.97 W/kg; SAR(10 g) = 5.38 W/kg

Maximum value of SAR (measured) = 15.0 W/kg



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

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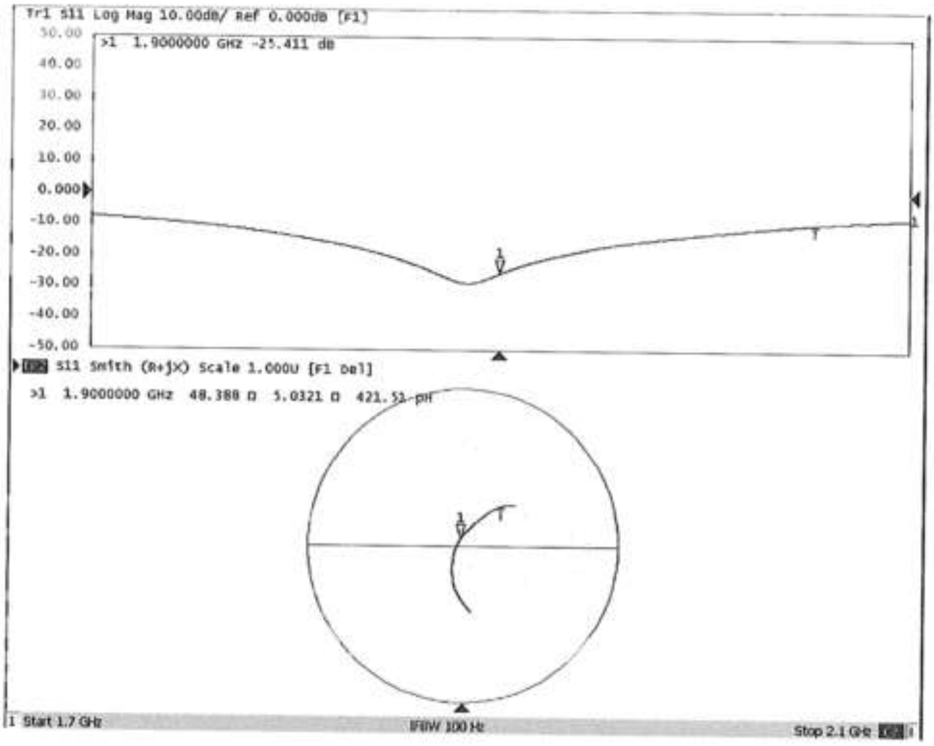
Impedance Measurement Plot for Body TSL



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Client : SMQ

Certificate No: Z18-97053

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 876
Calibration Procedure(s)	FF-Z11-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	March 22, 2018

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	27-Jun-17 (CTTL, No.J17X05859)	June-18

	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 23, 2018

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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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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	405.525 ± 0.15% (k=2)	405.181 ± 0.15% (k=2)	405.395 ± 0.15% (k=2)
Low Range	3.98865 ± 0.7% (k=2)	3.97176 ± 0.7% (k=2)	3.99799 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	181° ± 1 °

Note:

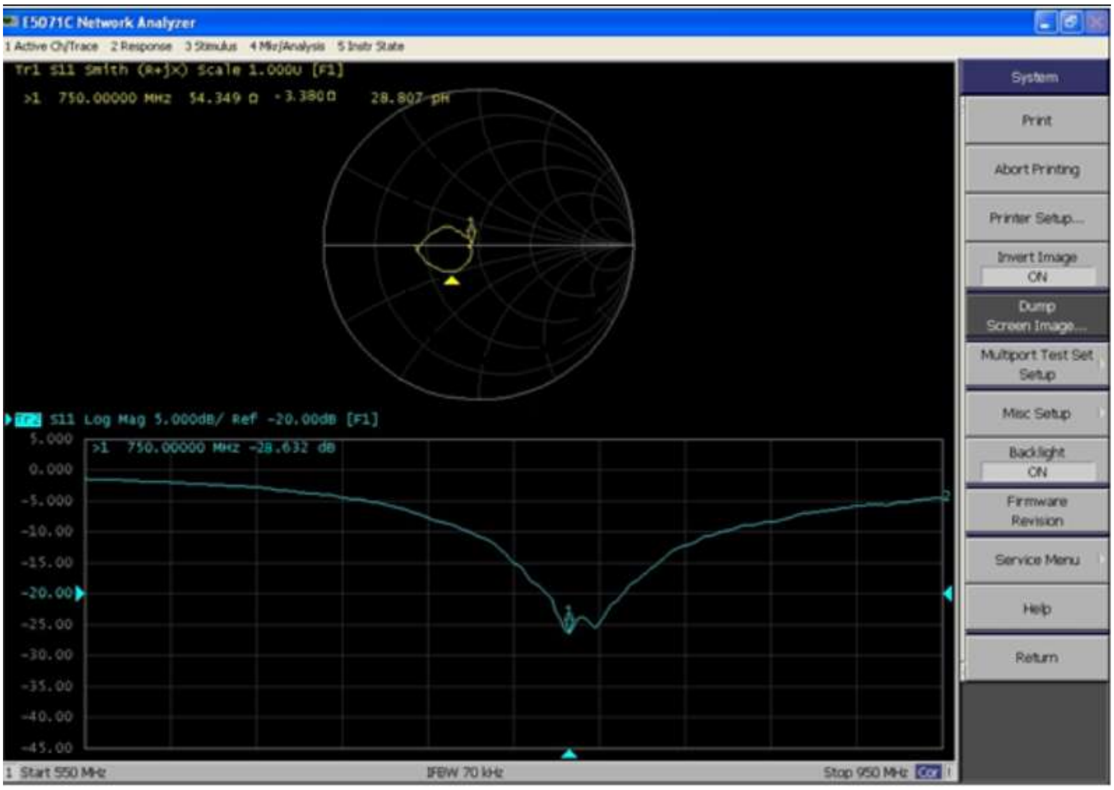
1) Per KDB865664D01 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix D.

a) There is no physical damage on the dipole;

b) System check with specific dipole is within 10% of calibrated value;

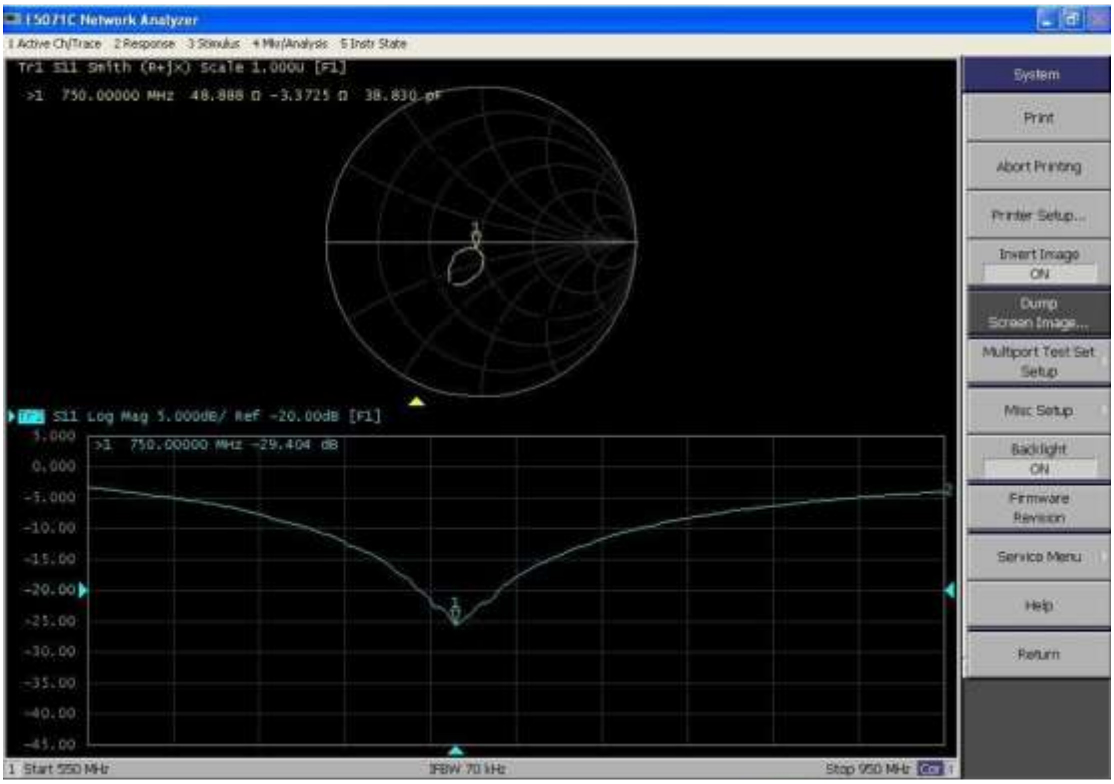
c) The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement.

d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the previous measurement.



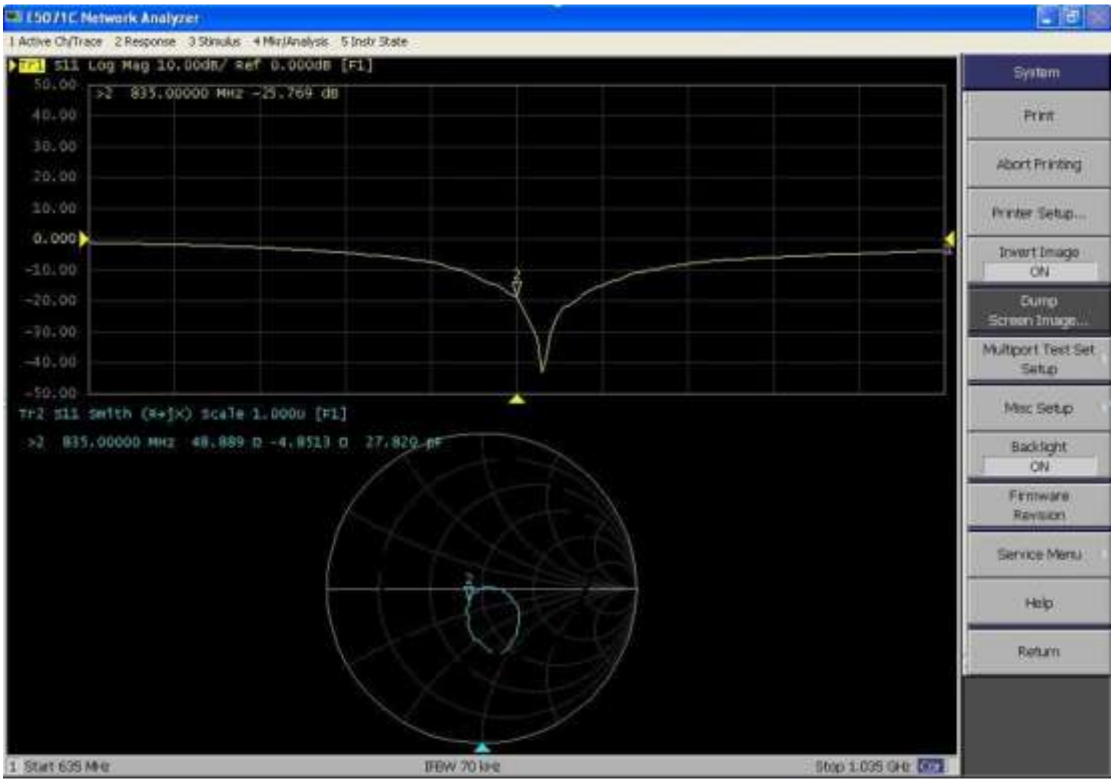
D750V2, serial No. 1103 Extended Dipole Calibrations

	835MHz Head					
Date of Measurement	Return-Loss (dB)	Delta(%)	Real Impedance(ohm)	Delta (ohm)	Imaginary Impedance(ohm)	Delta (ohm)
2017-01-10	-28.624		51.970		-3.226	
2018-01-10	-28.632	-0.03	54.349	-4.38	-3.380	-4.56



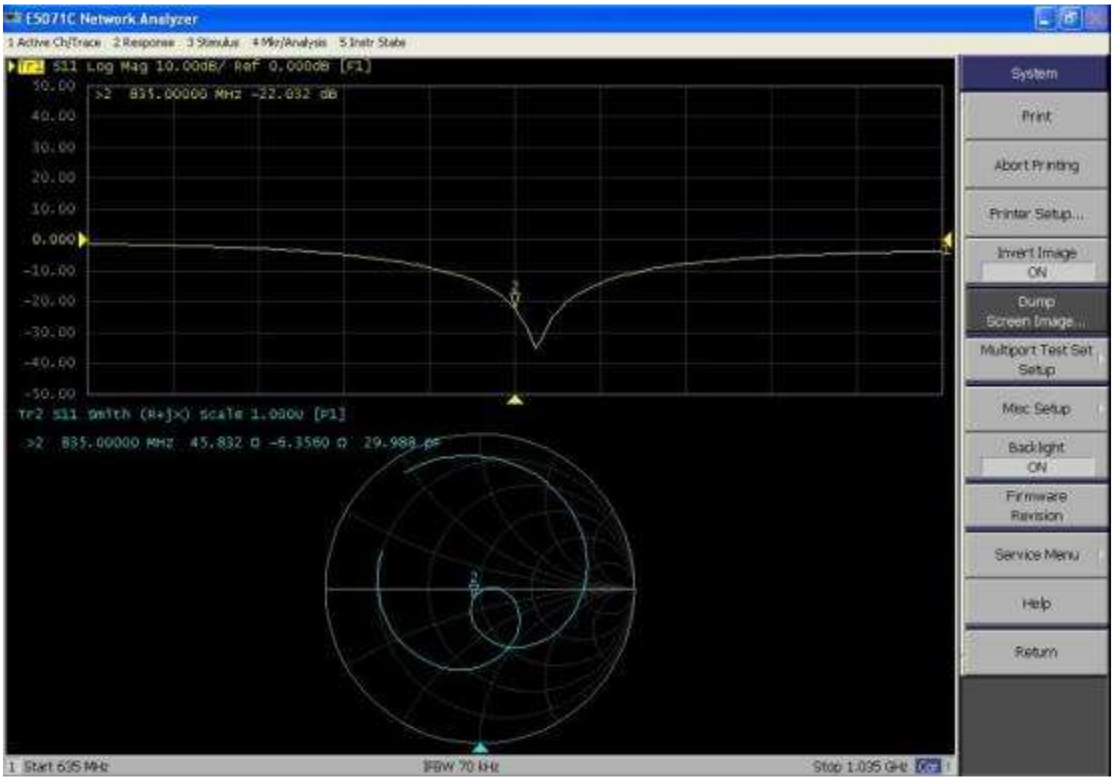
D750V2, serial No. 1103 Extended Dipole Calibrations

	750MHz Body					
Date of Measurement	Return-Loss (dB)	Delta(%)	Real Impedance(ohm)	Delta (ohm)	Imaginary Impedance(ohm)	Delta (ohm)
2017-01-10	-29.149		49.119		-3.345	
2018-01-10	-29.404	-0.87	48.888	0.48	-3.373	0.41



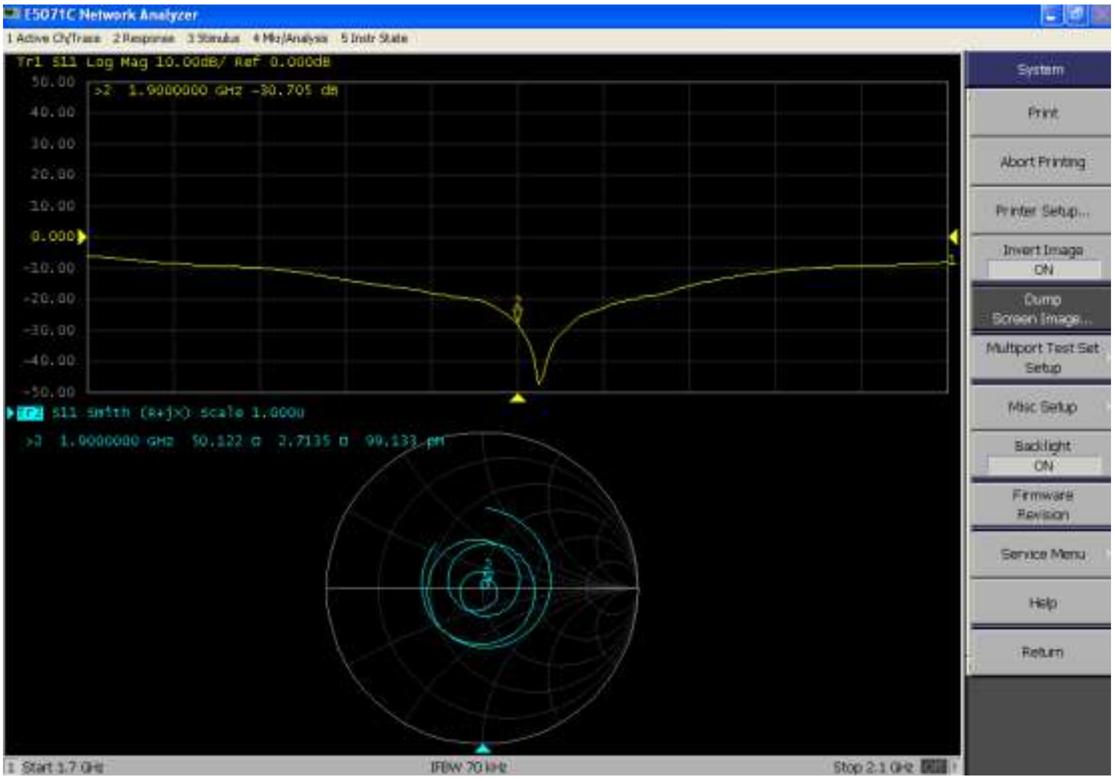
D835V2, serial No. 4d141 Extended Dipole Calibrations

	835MHz Head					
Date of Measurement	Return-Loss (dB)	Delta(%)	Real Impedance(ohm)	Delta (ohm)	Imaginary Impedance(ohm)	Delta (ohm)
2015-09-24	-25.885		48.161		-4.66	
2017-09-24	-25.769	0.46	48.889	-1.49	-4.85	-3.92



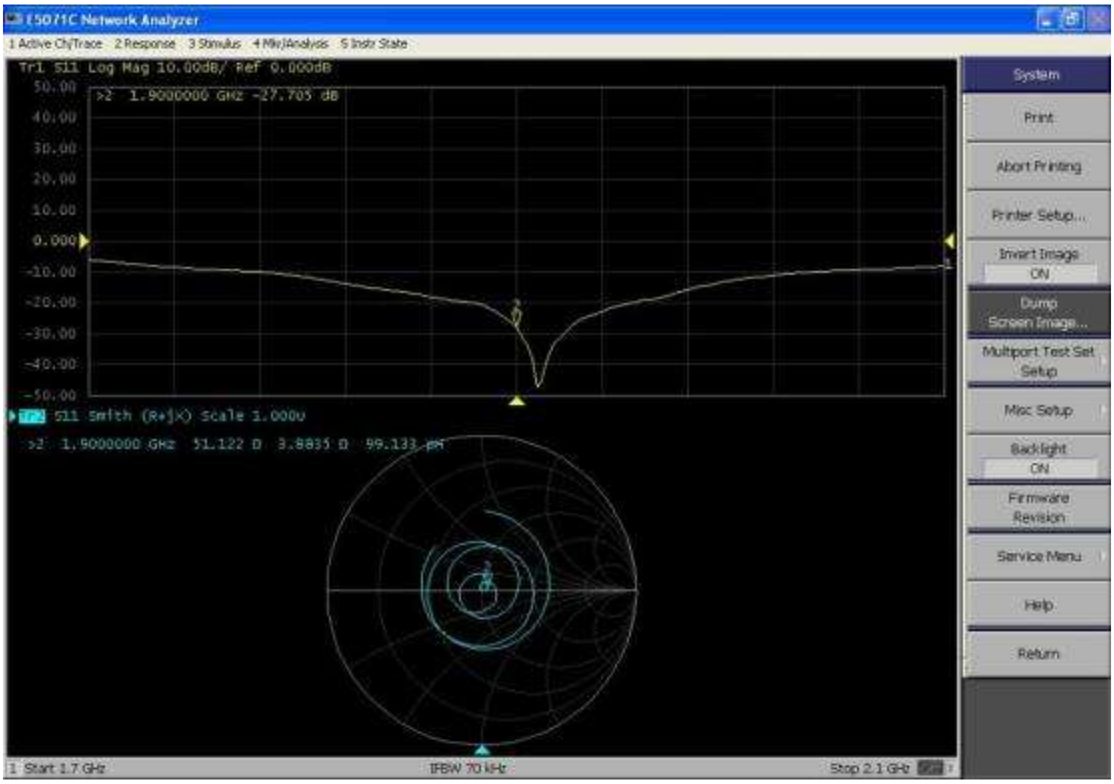
D835V2, serial No. 4d141 Extended Dipole Calibrations

	835MHz Body					
Date of Measurement	Return-Loss (dB)	Delta(%)	Real Impedance(ohm)	Delta (ohm)	Imaginary Impedance(ohm)	Delta (ohm)
2015-09-24	-22.3		45.681		-5.94	
2017-09-24	-22.0	1.36	45.832	-0.151	-6.35	0.41



D1900V2, serial No. 5d162 Extended Dipole Calibrations

	1900MHz Head					
Date of Measurement	Return-Loss (dB)	Delta(%)	Real Impedance(ohm)	Delta (ohm)	Imaginary Impedance(ohm)	Delta (ohm)
2015-09-16	-30.876		50.979		2.720	
2017-09-16	-30.705	0.56	51.122	0.28	2.714	0.23



D1900V2, serial No. 5d162 Extended Dipole Calibrations

	1900MHz Body					
Date of Measurement	Return-Loss (dB)	Delta(%)	Real Impedance(ohm)	Delta (ohm)	Imaginary Impedance(ohm)	Delta (ohm)
2015-09-16	-27.259		48.392		3.955	
2017-09-16	-27.705	-1.6	51.122	-2.73	3.884	0.071

END