SAR TEST REPORT

Applicant	iRay Technology Co. Ltd.
FCC ID	2ACHK-01070189
Product	Wireless Digital Flat Panel Detector
Model	Mars1417V-TSI
Report No.	R1907A0426-S1
Issue Date	August 29, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **IEEE 1528- 2013, ANSI C95.1: 1992/IEEE C95.1: 1991.** The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Performed by: Yu Wang *Approved by: Guangchang Fan*

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1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
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1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

Table 1: Highest Reported SAR

Mode	Highest Reported SAR (W/kg)	
	1g SAR Head	1g Body SAR (Separation 0mm)
Wi-Fi (2.4G)	0.029	0.020
Wi-Fi (5G)	**0.130**	**0.113**
Date of Testing:	June 11, 2019 ~ June 28, 2019	
Note: The device is in compliance with SAR for Uncontrolled Environment /General Population exposure limits (1.6 W/kg) specified in ANSI C95.1: 1992/IEEE C95.1: 1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.		

Table 2: Highest Simultaneous Transmission SAR

Exposure Configuration	1g SAR Head	1g Body SAR (Separation 0mm)
Highest Simultaneous Transmission SAR (W/kg)	0.152	0.137
Note: 1. The detail for simultaneous transmission consideration is described in chapter 10.3.		

Mars1417V-TSI (Report No.R1907A0426-S1) is a variant model of P-41(Report No.R1907A0346-S1V1).

Different	**Original**	**Variant**
model	P-41	Mars1417V-TSI
Product name	DIRECT DIGITIZER SKR 4000	Wireless Digital Flat Panel Detector
Charging port	3Pin	3Pin and 4Pin
Color	Black	White
Others	The same	The same
The difference between the two Configuration is only the Charging port and Color.		

Data tested case see the table below.

Test Case	**Original P-41 (R1907A0346-S1V1)**	**Variant Mars1417V-TSI (R1907A0426-S1)**
Wi-Fi (2.4G)	Pass	Only test with the worst position of each Antenna for 4Pin
Wi-Fi (5G)	Pass	Only test with the worst position of each Antenna for 4Pin

3 Description of Equipment under Test

Client Information

Applicant	iRay Technology Co. Ltd.
Applicant address	RM 202, Building 7, No. 590, Ruiqing RD., Pudong, Shanghai, China
Manufacturer	iRay Technology Taicang Ltd.
Manufacturer address	No.33 Xinggang Road, Taicang Port Economic and Technological Development Zone, Taicang, 215434 Jiangsu, China

General Technologies

Application Purpose:	Original Grant
EUT Stage	Identical Prototype
Model:	Mars1417V-TSI
IMEI:	/
Hardware Version:	V2.2
Software Version:	ARM:Core:1.9 Kernel:1.19 FPGA microblaze:2.25 FPGA main:2.15 MCU:1.0 SDK:4.0
Antenna Type:	Internal Antenna
Wi-Fi Hotspot	Wi-Fi 2.4G Wi-Fi 5G U-NII-1&U-NII-3
EUT Accessory	
Battery	Manufacturer: iRay Technology Co. Ltd. Model: BATTERY-KV Ratings:10.8Vdc,4125mAh

The module WIFI-2-V897EA1 is a part of the EUT P-41. FCC ID duplicated from the module for the EUT.

Wireless Technology and Frequency Range

Wireless Technology		Modulation	Operating mode	Tx (MHz)
Wi-Fi	2.4G	DSSS, OFDM	802.11b/g/n HT20	2412 ~ 2462
		OFDM	802.11n HT40	2422 ~ 2452
	5G	OFDM	802.11a/n 20M/40M/ ac 20M/40M/80M	5150 ~ 5250 5725 ~ 5850
	Does this device support MIMO ☒Yes ☐No			

4 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 1528- 2013, ANSI C95.1: 1992/IEEE C95.1: 1991, the following FCC Published RF exposure KDB procedures:

248227 D01 802.11 Wi-Fi SAR v02r02
447498 D01 General RF Exposure Guidance v06
648474 D04 Handset SAR v01r03
865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
865664 D02 RF Exposure Reporting v01r02
941225 D06 Hotspot Mode v02r01
616217 D04 SAR for laptop and tablets v01r02

5 Operational Conditions during Test

5.1 Test Positions

According to KDB 616217 D04, SAR evaluation is required for back surface and edges of the devices. The back surface and edges of the tablet are tested with the tablet touching the phantom. Exposures from antennas through the front surface of the display section of a tablet are generally limited to the user's hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary. When voice mode is supported on a tablet and it is limited to speaker mode or headset operations only, additional SAR testing for this type of voice use is not required.

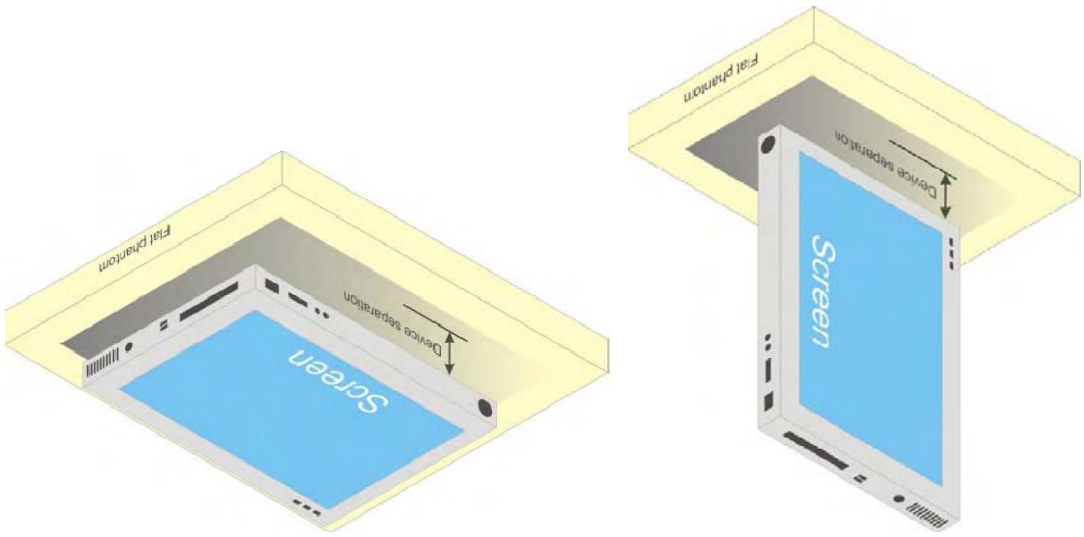


Fig-4.1 Illustration for Tablet Setup

According to KDB 447498 D01, the SAR test exclusion condition is based on source-based time-averaged maximum conducted output power, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The SAR exclusion threshold is determined by the following formula.

(1) The SAR exclusion threshold for distances ≤50mm is defined by the following equation:

$$\frac{\textbf{(max. power of channel, including tune-up tolerance, mW)}}{\textbf{(min. test separation distance, mm)}} * \sqrt{\textbf{Frequency (GHz)}} \leq \textbf{3.0}$$

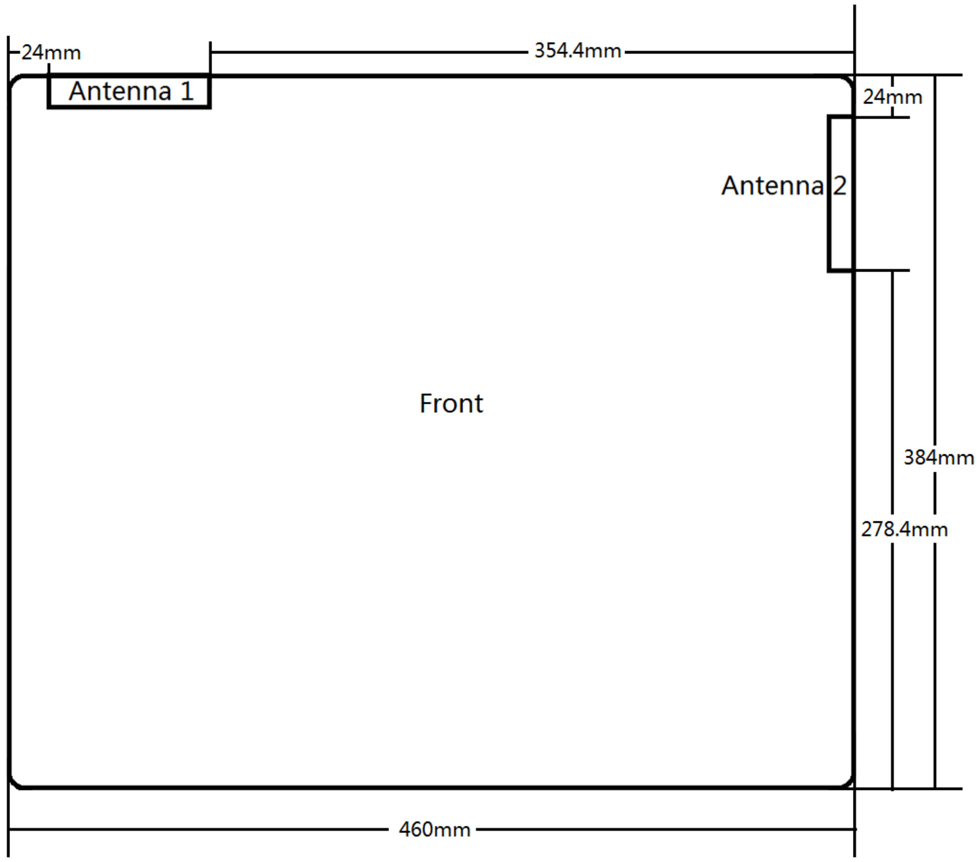
(2) The SAR exclusion threshold for distances >50mm is defined by the following equation, as illustrated in KDB 447498 D01 Appendix B:

a) at 100 MHz to 1500 MHz

[Power allowed at numeric Threshold at 50 mm in step 1) + (test separation distance - 50 mm) · ($f_{(MHz)}$/150)] mW

b) at > 1500 MHz and ≤ 6 GHz

[Power allowed at numeric Threshold at 50 mm in step 1) + (test separation distance - 50 mm) ·10] mW



Band	Frequency (MHz)	Max. Tune-up Power (dBm)	Front Side		
			Ant. To Surgace (mm)	Evaluation	Conclusion
Wi-Fi 2.4G Antenna 1	2462	13.00	5	6.26	Yes
Wi-Fi 2.4G Antenna 2	2462	14.50	5	8.84	Yes
Wi-Fi 5G Antenna 1	5240	13.50	5	10.25	Yes
	5825	14.00	5	12.12	Yes
Wi-Fi 5G Antenna 2	5240	13.50	5	10.25	Yes
	5825	14.00	5	12.12	Yes

5.2 Measurement Variability

Per FCC KDB Publication 865664 D01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:
1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

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.

5.3 Test Configuration

5.3.1 Wi-Fi Test Configuration

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

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

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

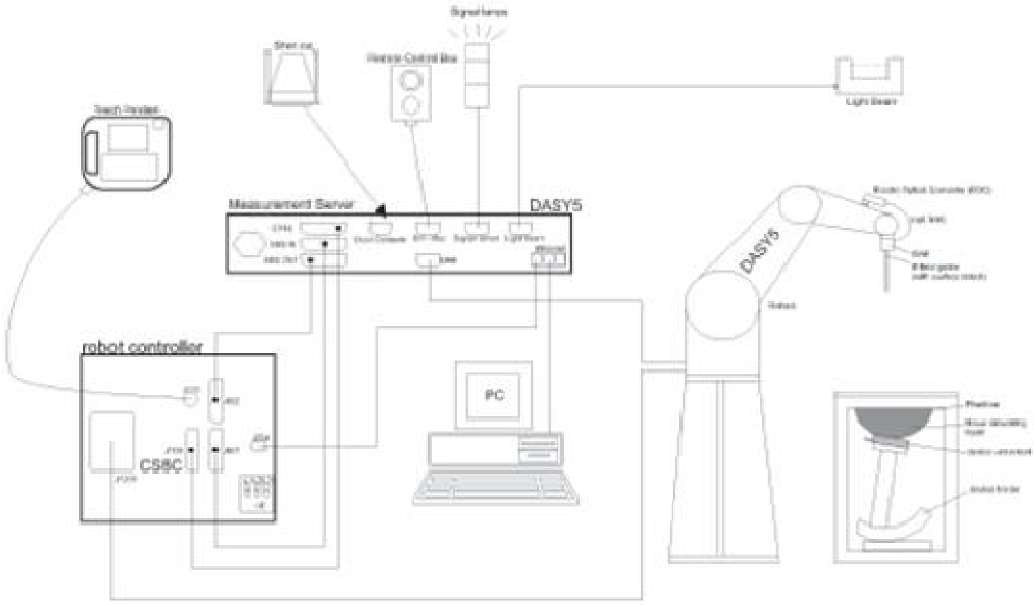
To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

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

6 SAR Measurements System Configuration

6.1 SAR Measurement Set-up

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

6.2 DASY5 E-field Probe System

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

EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in 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: ± 0.2dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure Scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

SAR=C∆T/∆t

Where: ∆t = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

∆T = Temperature increase due to RF exposure.

Or

SAR=IEI^{2}σ/ρ

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

6.3 SAR Measurement Procedure

Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

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

Zoom Scan

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

Zoom scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><td colspan="3"></td><td>≤3GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: $\triangle x_{zoom}$ $\triangle y_{zoom}$</td><td>≤2GHz: ≤8mm
2 – 3GHz: ≤5mm*</td><td>3 – 4GHz: ≤5mm*
4 – 6GHz: ≤4mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">Uniform grid: $\triangle z_{zoom}(n)$</td><td>≤5mm</td><td>3 – 4GHz: ≤4mm
4 – 5GHz: ≤3mm
5 – 6GHz: ≤2mm</td></tr>
<tr><td rowspan="2">Graded grid</td><td>$\triangle z_{zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤4mm</td><td>3 – 4GHz: ≤3mm
4 – 5GHz: ≤2.5mm
5 – 6GHz: ≤2mm</td></tr>
<tr><td>$\triangle z_{zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \triangle z_{zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">X, y, z</td><td>≥30mm</td><td>3 – 4GHz: ≥28mm
4 – 5GHz: ≥25mm
5 – 6GHz: ≥22mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4W/kg, ≤8mm, ≤7mm and ≤5mm zoom scan resolution may be applied, respectively, for 2GHz to 3GHz, 3GHz to 4GHz and 4GHz to 6GHz.</td></tr>
</table>

Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

7 Main Test Equipment

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Cal.	Cal. Due Date
Network analyzer	Agilent	E5071B	MY42404014	2019-05-19	2020-05-18
Dielectric Probe Kit	HP	85070E	US44020115	2019-05-19	2020-05-18
Power meter	Agilent	E4417A	GB41291714	2019-05-19	2020-05-18
Power sensor	Agilent	N8481H	MY50350004	2019-05-19	2020-05-18
Power sensor	Agilent	E9327A	US40441622	2019-05-19	2020-05-18
Dual directional coupler	Agilent	778D-012	50519	2019-05-19	2020-05-18
Dual directional coupler	Agilent	777D	50146	2019-05-19	2020-05-18
Amplifier	INDEXSAR	IXA-020	0401	2019-05-19	2020-05-18
Wideband radio communication tester	R&S	CMW 500	113645	2019-05-19	2020-05-18
E-field Probe	SPEAG	EX3DV4	3677	2019-06-19	2020-06-18
DAE	SPEAG	DAE4	1291	2018-12-04	2019-12-03
Validation Kit 2450MHz	SPEAG	D2450V2	786	2017-08-29	2020-08-28
Validation Kit 5GHz	SPEAG	D5GHzV2	1151	2017-01-05	2020-01-04
Temperature Probe	Tianjin jinming	JM222	AA1009129	2019-05-19	2020-05-18
Hygrothermograph	Anymetr	NT-311	20150731	2019-05-19	2020-05-18
Software for Test	Speag	DASY5	52.8.8.1222	/	/
Softwarefor Tissue	Agilent	85070	E06.01.36	/	/

8 Tissue Dielectric Parameter Measurements & System Verification

8.1 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance.

Target values

Frequency (MHz)		Water (%)	Salt (%)	Sugar (%)	Glycol (%)	Preventol (%)	Cellulose (%)	ε_r	σ(s/m)
Head	2450	62.7	0.5	0	36.8	0	0	39.2	1.80
Body	2450	73.2	0.1	0	26.7	0	0	52.7	1.95
Frequency (MHz)		**Water (%)**	**Diethylenglycol monohexylether**			**Triton X-100**		**ε_r**	**σ(s/m)**
Head	5250	65.53	17.24			17.23		35.9	4.71
	5750	65.53	17.24			17.23		35.4	5.22
Body	5250	72.52	13.74			13.74		48.9	5.36
	5750	72.52	13.74			13.74		48.3	5.94

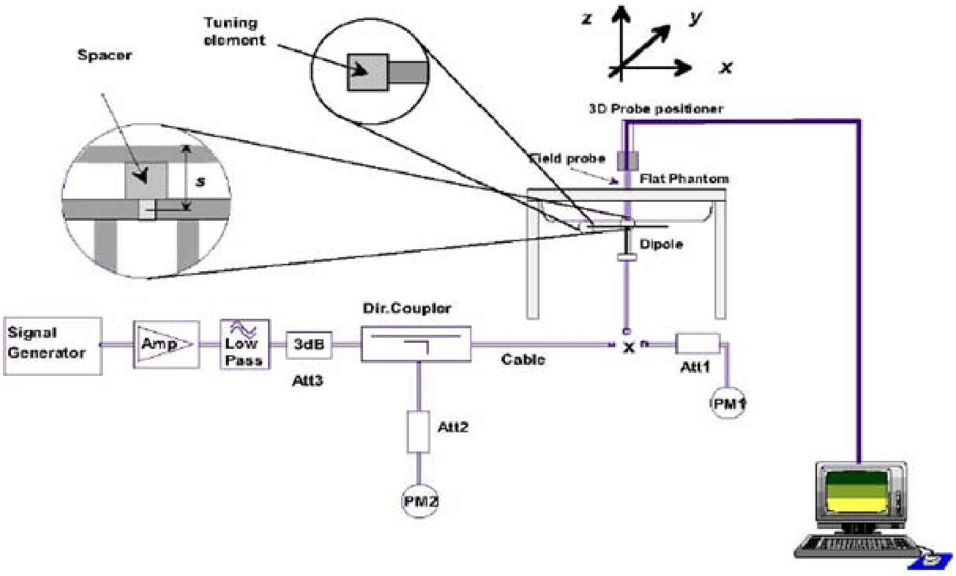
Measurements results

Frequency (MHz)		Test Date	Temp ℃	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within ±5%)	
				ε_r	σ(s/m)	ε_r	σ(s/m)	Dev ε_r(%)	Dev σ(%)
2450	Head	6/25/2019	21.5	38.6	1.81	39.2	1.80	-1.53	0.56
	Body	6/25/2019	21.5	52.5	1.98	52.7	1.95	-0.38	1.54
5250	Head	6/11/2019	21.5	35.5	4.80	35.9	4.71	-1.11	1.91
	Body	6/11/2019	21.5	48.1	5.32	48.9	5.36	-1.64	-0.75
5750	Head	6/28/2019	21.5	34.9	5.21	35.4	5.22	-1.41	-0.19
	Body	6/28/2019	21.5	47.6	6.14	48.3	5.94	-1.45	3.37
Note: The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.									

8.2 System Performance Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured using the dielectric probe kit and the network analyzer. A system check measurement for every day was made following the determination of the dielectric parameters of the Tissue simulates, using the dipole validation kit. The dipole antenna was placed under the flat section of the twin SAM phantom.

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



Picture 1 System Performance Check setup

Picture 2 Setup Photo

Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (< - 20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB 865664 D01:

Dipole		Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
Dipole D2450V2 SN: 786	Head Liquid	8/29/2017	-25.5	/	53.4	/
		8/28/2018	-23.0	9.80	57.2	3.8
	Body Liquid	8/29/2017	-23.6	/	51.0	/
		8/28/2018	-23.7	-0.42	55.2	4.2
Dipole D5GHzV2 SN: 1151 (5250MHz)	Head Liquid	1/5/2017	-24.5	/	48.4	/
		1/4/2018	-23.8	2.86	50.0	1.6
	Body Liquid	1/5/2017	-24.7	/	50.4	/
		1/4/2018	-23.8	3.64	50.0	-0.4
Dipole D5GHzV2 SN: 1151 (5750MHz)	Head Liquid	1/5/2017	-26.5	/	52.4	/
		1/4/2018	-26.8	-1.13	52.5	0.1
	Body Liquid	1/5/2017	-24.9	/	56.0	/
		1/4/2018	-25.2	-1.20	56.4	0.4

System Check results

Frequency (MHz)		Test Date	Temp ℃	250mW Measured SAR_{1g} (W/kg)	1W Normalized SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	Δ % (Limit ±10%)	Plot No.
2450	Head	6/25/2019	21.5	13.70	54.80	52.60	4.18	1
	Body	6/25/2019	21.5	12.50	50.00	50.80	-1.57	2
5250	Head	6/11/2019	21.5	7.87	78.70	78.40	0.38	3
	Body	6/11/2019	21.5	7.46	74.60	75.60	-1.32	4
5750	Head	6/28/2019	21.5	7.66	76.60	80.50	-4.84	5
	Body	6/28/2019	21.5	7.15	71.50	74.60	-4.16	6
Note：Target Values used derive from the calibration certificate Data Storage and Evaluation.								

9 Normal and Maximum Output Power

KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

9.1 WLAN Mode

Wi-Fi 2.4G Antenna 1	Channel /Frequency(MHz)	Maximum Output Power (dBm)		
Mode		Tune-up	Meas.	TP Set Level
802.11b (1M)	1/2412	13.00	12.37	13
	6/2437	13.00	11.54	13
	11/2462	13.00	11.53	13
802.11g (6M)	1/2412	12.50	11.95	13
	6/2437	12.50	10.83	13
	11/2462	12.50	10.78	13
802.11n-HT20 (MCS0)	1/2412	12.50	11.97	13
	6/2437	12.50	10.87	13
	11/2462	12.50	10.66	13
802.11n-HT40 (MCS0)	3/2422	12.00	11.23	13
	6/2437	12.00	11.11	13
	9/2452	12.00	10.61	13
Note: Initial test configuration is 802.11b mode, since the highest maximum output power.				

Wi-Fi 2.4G Antenna 2	Channel /Frequency(MHz)	Maximum Output Power (dBm)		
Mode		Tune-up	Meas.	TP Set Level
802.11b (1M)	1/2412	14.50	14.13	14.5
	6/2437	14.50	13.94	14.5
	11/2462	14.50	13.50	14.5
802.11g (6M)	1/2412	14.00	13.30	14.5
	6/2437	14.00	12.17	14.5
	11/2462	14.00	12.32	14.5
802.11n-HT20 (MCS0)	1/2412	14.00	13.26	14.5
	6/2437	14.00	12.29	14.5
	11/2462	14.00	12.43	14.5
802.11n-HT40 (MCS0)	3/2422	13.00	12.65	14.5
	6/2437	13.00	11.91	14.5
	9/2452	13.00	11.14	14.5
Note: Initial test configuration is 802.11b mode, since the highest maximum output power.				

Wi-Fi 2.4G MIMO Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)				
		Tune-up	Meas.	Antenna 1	Antenna 2	TP Set Level
802.11b (1M)	1/2412	17.00	16.35	12.37	14.13	15
	6/2437	17.00	15.91	11.54	13.94	15
	11/2462	17.00	15.64	11.53	13.50	15
802.11g (6M)	1/2412	16.00	15.69	11.95	13.30	15
	6/2437	16.00	14.56	10.83	12.17	15
	11/2462	16.00	14.63	10.78	12.32	15
802.11n-HT20 (MCS0)	1/2412	16.00	15.67	11.97	13.26	15
	6/2437	16.00	14.65	10.87	12.29	15
	11/2462	16.00	14.64	10.66	12.43	15
802.11n-HT40 (MCS0)	3/2422	15.50	15.01	11.23	12.65	15
	6/2437	15.50	14.54	11.11	11.91	15
	9/2452	15.50	13.89	10.61	11.14	15

Wi-Fi 5G (U-NII-1) Antenna 1 Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)		
		Tune-up	Meas.	TP Set Level
802.11a (6M)	36/5180	13.50	13.12	15
	40/5200	13.50	12.75	15
	44/5220	13.50	12.14	15
	48/5240	13.50	12.20	15
802.11n-HT20 (MCS0)	36/5180	12.00	11.50	15
	40/5200	12.00	11.01	15
	44/5220	12.00	10.18	15
	48/5240	12.00	10.63	15
802.11n-HT40 (MCS0)	38/5190	12.00	10.58	15
	46/5230	12.00	10.30	15
802.11ac-VHT20 (6M)	36/5180	12.00	11.62	15
	40/5200	12.00	11.23	15
	44/5220	12.00	10.49	15
	48/5240	12.00	10.54	15
802.11ac-VHT40 (MCS0)	38/5190	12.00	10.56	15
	46/5230	12.00	10.03	15
802.11ac-VHT80 (MCS0)	42/5210	10.00	9.12	15
Note. Initial test configuration is 802.11a mode, since the highest maximum output power.				

Wi-Fi 5G (U-NII-3) Antenna 1	Channel /Frequency(MHz)	Maximum Output Power (dBm)		
Mode		Tune-up	Meas.	TP Set Level
802.11a (6M)	149/5745	14.00	13.30	15
	157/5785	14.00	13.81	15
	165/5825	14.00	13.71	15
802.11n-HT20 (MCS0)	149/5745	13.00	12.10	15
	157/5785	13.00	12.27	15
	165/5825	13.00	12.04	15
802.11n-HT40 (MCS0)	151/5755	13.00	11.98	15
	159/5795	13.00	12.60	15
802.11ac-HT20 (6M)	149/5745	13.50	12.24	15
	157/5785	13.50	12.95	15
	165/5825	13.50	12.91	15
802.11ac-HT40 (MCS0)	151/5755	13.50	12.14	15
	159/5795	13.50	12.97	15
802.11ac-HT80 (MCS0)	155/5775	12.00	11.20	15
Note. Initial test configuration is 802.11a mode, since the highest maximum output power.				

Wi-Fi 5G (U-NII-1) Antenna 2	Channel /Frequency(MHz)	Maximum Output Power (dBm)		
Mode		Tune-up	Meas.	TP Set Level
802.11a (6M)	36/5180	13.50	12.93	15
	40/5200	13.50	12.62	15
	44/5220	13.50	12.51	15
	48/5240	13.50	12.15	15
802.11n-HT20 (MCS0)	36/5180	13.50	13.05	15
	40/5200	13.50	12.73	15
	44/5220	12.00	10.77	15
	48/5240	12.00	10.60	15
802.11n-HT40 (MCS0)	38/5190	11.00	10.38	15
	46/5230	11.00	10.17	15
802.11ac-VHT20 (6M)	36/5180	12.00	11.62	15
	40/5200	12.00	11.13	15
	44/5220	11.00	10.84	15

	48/5240	11.00	10.45	15
802.11ac-VHT40 (MCS0)	38/5190	11.00	10.29	15
	46/5230	11.00	10.46	15
802.11ac-VHT80 (MCS0)	42/5210	10.00	9.75	15
Note. Initial test configuration is 802.11n-HT20 mode, since the highest maximum output power, the largest channel bandwidth, and lowest order.				

Wi-Fi 5G (U-NII-3) Antenna 2	Channel /Frequency(MHz)	Maximum Output Power (dBm)		
Mode		Tune-up	Meas.	TP Set Level
802.11a (6M)	149/5745	14.00	12.38	15
	157/5785	14.00	12.84	15
	165/5825	14.00	13.57	15
802.11n-HT20 (MCS0)	149/5745	12.50	11.05	15
	157/5785	12.50	11.24	15
	165/5825	12.50	11.91	15
802.11n-HT40 (MCS0)	151/5755	11.50	10.87	15
	159/5795	11.50	11.29	15
802.11ac-HT20 (6M)	149/5745	12.50	11.10	15
	157/5785	12.50	11.37	15
	165/5825	12.50	11.99	15
802.11ac-HT40 (MCS0)	151/5755	12.00	10.83	15
	159/5795	12.00	11.35	15
802.11ac-HT80 (MCS0)	155/5775	11.50	10.87	15
Note. Initial test configuration is 802.11a mode, since the highest maximum output power.				

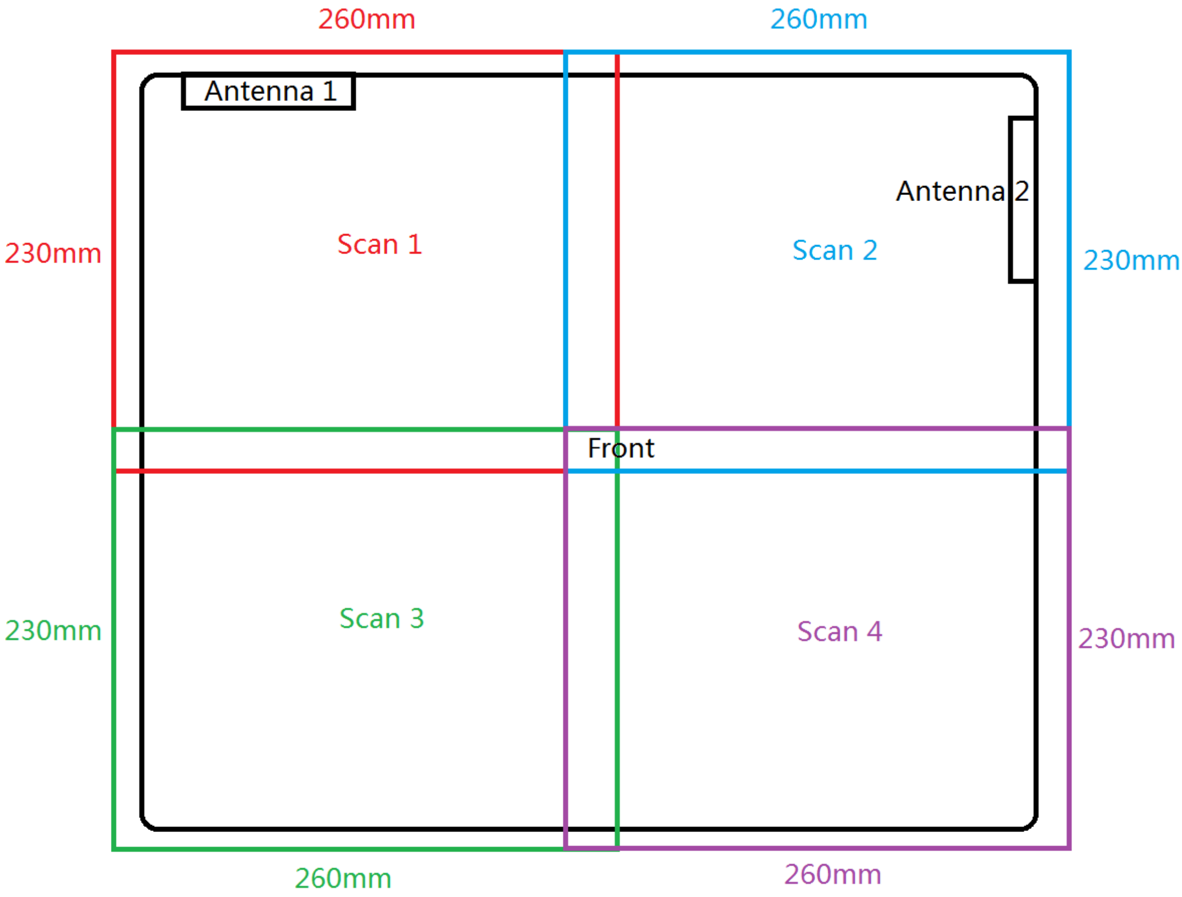
Wi-Fi 5G (U-NII-1) MIMO	Channel /Frequency(MHz)	Maximum Output Power (dBm)				
Mode		Tune-up	Meas.	Antenna 1	Antenna 2	TP Set Level
802.11a (6M)	36/5180	16.50	16.04	13.12	12.93	15
	40/5200	16.50	15.70	12.75	12.62	15
	44/5220	16.50	15.34	12.14	12.51	15
	48/5240	16.50	15.19	12.20	12.15	15
802.11n-HT20 (MCS0)	36/5180	16.00	15.35	11.50	13.05	15
	40/5200	16.00	14.96	11.01	12.73	15

	44/5220	14.00	13.50	10.18	10.77	15
	48/5240	14.00	13.63	10.63	10.60	15
802.11n-HT40 (MCS0)	38/5190	14.00	13.49	10.58	10.38	15
	46/5230	14.00	13.25	10.30	10.17	15
802.11ac-VHT20 (6M)	36/5180	15.00	14.63	11.62	11.62	15
	40/5200	15.00	14.19	11.23	11.13	15
	44/5220	15.00	13.68	10.49	10.84	15
	48/5240	15.00	13.51	10.54	10.45	15
802.11ac-VHT40 (MCS0)	38/5190	14.00	13.44	10.56	10.29	15
	46/5230	14.00	13.26	10.03	10.46	15
802.11ac-VHT80 (MCS0)	42/5210	13.00	12.46	9.12	9.75	15

Wi-Fi 5G (U-NII-3) MIMO	Channel /Frequency(MHz)	Maximum Output Power (dBm)				
Mode		Tune-up	Meas.	Antenna 1	Antenna 2	TP Set Level
802.11a (6M)	149/5745	17.00	15.87	13.30	12.38	15
	157/5785	17.00	16.36	13.81	12.84	15
	165/5825	17.00	16.65	13.71	13.57	15
802.11n-HT20 (MCS0)	149/5745	15.50	14.62	12.10	11.05	15
	157/5785	15.50	14.80	12.27	11.24	15
	165/5825	15.50	14.99	12.04	11.91	15
802.11n-HT40 (MCS0)	151/5755	15.50	14.47	11.98	10.87	15
	159/5795	15.50	15.00	12.60	11.29	15
802.11ac-HT20 (6M)	149/5745	16.00	14.72	12.24	11.10	15
	157/5785	16.00	15.24	12.95	11.37	15
	165/5825	16.00	15.48	12.91	11.99	15
802.11ac-HT40 (MCS0)	151/5755	16.00	14.54	12.14	10.83	15
	159/5795	16.00	15.25	12.97	11.35	15
802.11ac-HT80 (MCS0)	155/5775	15.00	14.05	11.20	10.87	15

10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations



Note: The location of the test is detailed in Section 5.1.

Overall (Length x Width): 460 mm x 384 mm				
Area Scan / Antenna	Scan 1	Scan 2	Scan 3	Scan 4
Antenna 1	Yes	Yes	Yes	Yes
Antenna 2	Yes	Yes	Yes	Yes

10.2 Measured SAR Results

Table 3: Wi-Fi (2.4G)

Original

Test Position	Cover Type	Mode 802.11b	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6W/kg (mW/g)								Plot No.
							1 Area Scan SAR 1g	2 Area Scan SAR 1g	3 Area Scan SAR 1g	4 Area Scan SAR 1g	Zoom Scan SAR 1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Head SAR (Distance 0mm) ANT1															
Front Side	standard	DSSS	1:1	1/2412	13.00	12.37	0.021	0.012	0.015	0.007	0.023	0.099	1.16	0.027	7
Head SAR (Distance 0mm) ANT2															
Front Side	standard	DSSS	1:1	1/2412	14.50	14.13	0.008	0.013	0.010	0.005	0.010	-0.099	1.09	0.011	8
Body SAR (Distance 0mm) ANT1															
Front Side	standard	DSSS	1:1	1/2412	13.00	12.37	0.016	0.009	0.004	0.012	0.017	0.068	1.16	0.020	9
Body SAR (Distance 0mm) ANT2															
Front Side	standard	DSSS	1:1	1/2412	14.50	14.13	0.010	0.012	0.004	0.007	0.011	0.042	1.09	0.012	10
Note: 1. The value with blue color is the maximum SAR Value of each test band.															

MAX Adjusted SAR							
Mode	Test Position	Channel/ Frequency (MHz)	MAX Reported SAR_{1g} (W/kg)	802.11b Tune-up limit (dBm)	Tune-up limit (dBm)	Scaling Factor	Adjusted SAR_{1g} (W/kg)
ANT1							
802.11g	Front Side	1/2412	0.027	13.00	12.50	0.89	0.024
802.11n HT20	Front Side	1/2412	0.027	13.00	12.50	0.89	0.024
802.11n HT40	Front Side	1/2412	0.027	13.00	12.00	0.79	0.021
ANT2							
802.11g	Front Side	1/2412	0.012	14.50	14.00	0.89	0.011
802.11n HT20	Front Side	1/2412	0.012	14.50	14.00	0.89	0.011
802.11n HT40	Front Side	1/2412	0.012	14.50	13.00	0.71	0.008
MIMO							
802.11g	Front Side	1/2412	0.038	17.00	16.00	0.79	0.030
802.11n HT20	Front Side	1/2412	0.038	17.00	16.00	0.79	0.030
802.11n HT40	Front Side	1/2412	0.038	17.00	15.50	0.71	0.027
Note: SAR is not required for OFDM 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.							

Variant

Test Position	Cover Type	Mode 802.11b	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6W/kg (mW/g)								Plot No.
							1 Area Scan SAR 1g	2 Area Scan SAR 1g	3 Area Scan SAR 1g	4 Area Scan SAR 1g	Zoom Scan SAR 1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Head SAR (Distance 0mm) ANT1															
Front Side	standard	DSSS	1:1	1/2412	13.00	12.37	0.017	0.006	0.011	0.013	0.025	0.098	1.16	0.029	11
Body SAR (Distance 0mm) ANT2															
Front Side	standard	DSSS	1:1	1/2412	14.50	14.13	0.005	0.016	0.000	0.011	0.013	0.057	1.09	0.014	12

Note: 1. The value with blue color is the maximum SAR Value of each test band.

Table 4: Wi-Fi (5G, U-NII-1)

Original

Test Position	Cover Type	Mode	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6W/kg (mW/g)								Plot No.
							1 Area Scan SAR 1g	2 Area Scan SAR 1g	3 Area Scan SAR 1g	4 Area Scan SAR 1g	Zoom Scan SAR 1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Head SAR (Distance 0mm) ANT1															
Front Side	standard	802.11a	1:1	36/5180	13.50	13.12	0.024	0.012	0.015	0.080	0.020	-0.097	1.09	0.022	13
Head SAR (Distance 0mm) ANT2															
Front Side	standard	802.11n HT20	1:1	36/5180	13.50	13.05	0.044	0.094	0.062	0.031	0.117	0.028	1.11	0.130	14
Body SAR (Distance 0mm) ANT1															
Front Side	standard	802.11a	1:1	36/5180	13.50	13.12	0.034	0.012	0.013	0.009	0.022	0.147	1.09	0.024	15
Body SAR (Distance 0mm) ANT2															
Front Side	standard	802.11n HT20	1:1	36/5180	13.50	13.05	0.075	0.116	0.052	0.036	0.102	0.041	1.11	0.113	16

Note: 1. The value with blue color is the maximum SAR Value of each test band.

Table 5: Wi-Fi (5G, U-NII-3)

Original

Test Position	Cover Type	Mode	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6W/kg (mW/g)								Plot No.
							1 Area Scan SAR 1g	2 Area Scan SAR 1g	3 Area Scan SAR 1g	4 Area Scan SAR 1g	Zoom Scan SAR 1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Head SAR (Distance 0mm) ANT1															
Front Side	standard	802.11a	1:1	157/5785	14.00	13.81	0.031	0.010	0.018	0.012	0.026	-0.059	1.04	0.027	17
Head SAR (Distance 0mm) ANT2															
Front Side	standard	802.11a	1:1	165/5825	14.00	13.57	0.019	0.023	0.014	0.010	0.024	0.074	1.10	0.026	18
Body SAR (Distance 0mm) ANT1															
Front Side	standard	802.11a	1:1	157/5785	14.00	13.81	0.024	0.010	0.007	0.014	0.027	0.192	1.04	0.028	19
Body SAR (Distance 0mm) ANT2															
Front Side	standard	802.11a	1:1	165/5825	14.00	13.57	0.011	0.023	0.015	0.007	0.021	0.094	1.10	0.023	20
Note: 1. The value with blue color is the maximum SAR Value of each test band.															

Variant

Test Position	Cover Type	Mode	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6W/kg (mW/g)								Plot No.
							1 Area Scan SAR 1g	2 Area Scan SAR 1g	3 Area Scan SAR 1g	4 Area Scan SAR 1g	Zoom Scan SAR 1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Body SAR (Distance 0mm) ANT1															
Front Side	standard	802.11a	1:1	157/5785	14.00	13.81	0.019	0.012	0.005	0.009	0.022	0.192	1.04	0.023	21
Head SAR (Distance 0mm) ANT2															
Front Side	standard	802.11n HT20	1:1	36/5180	13.50	13.05	0.051	0.082	0.049	0.026	0.086	0.028	1.11	0.095	22
Note: 1. The value with blue color is the maximum SAR Value of each test band.															

10.3 Simultaneous Transmission Analysis

Simultaneous Transmission Configurations	Head	Body
Wi-Fi 2.4G Antenna 1 + Wi-Fi 2.4G Antenna 2	Yes	Yes
Wi-Fi 5G Antenna 1 + Wi-Fi 5G Antenna 2	Yes	Yes
Wi-Fi 2.4G + Wi-Fi 5G	No	No

General Note:

1. The Scaled SAR summation is calculated based on the same configuration and test position.
2. Per KDB 447498 D01, simultaneous transmission SAR is compliant if,

   i) Scalar SAR summation < 1.6W/kg, simultaneously transmission SAR measurement is not necessary.

   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.

   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.

About Wi-Fi Antenna 1 and Antenna 2

Front Side		SAR_{1g}(W/kg)		MAX. ΣSAR_{1g}
		Antenna 1	Antenna 2	
Head	Wi-Fi 2.4G	0.029	0.011	0.040
	Wi-Fi 5G U-NII-1	0.022	0.130	0.152
	Wi-Fi 5G U-NII-3	0.027	0.026	0.053
Body	Wi-Fi 2.4G	0.020	0.014	0.034
	Wi-Fi 5G U-NII-1	0.024	0.113	0.137
	Wi-Fi 5G U-NII-3	0.028	0.023	0.051

Note: 1.The value with blue color is the maximum ΣSAR_{1g} Value.

2. MAX. ΣSAR_{1g} =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}

MAX. ΣSAR_{1g} = 0.152 W/kg <1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi Antenna 1 and Antenna 2.

11 Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval.

ANNEX A: Test Layout

Tissue Simulating Liquids

For the measurement of the field distribution inside the flat phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For Head and Body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Picture 3.

Picture 3: Liquid depth in the flat Phantom

ANNEX B: System Check Results

Plot 1 System Performance Check at 2450 MHz Head TSL

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

Date: 6/25/2019

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

Medium parameters used: f = 2450 MHz; σ = 1.81 mho/m; ε_r = 38.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.50, 7.50, 7.50); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 18.2 mW/g

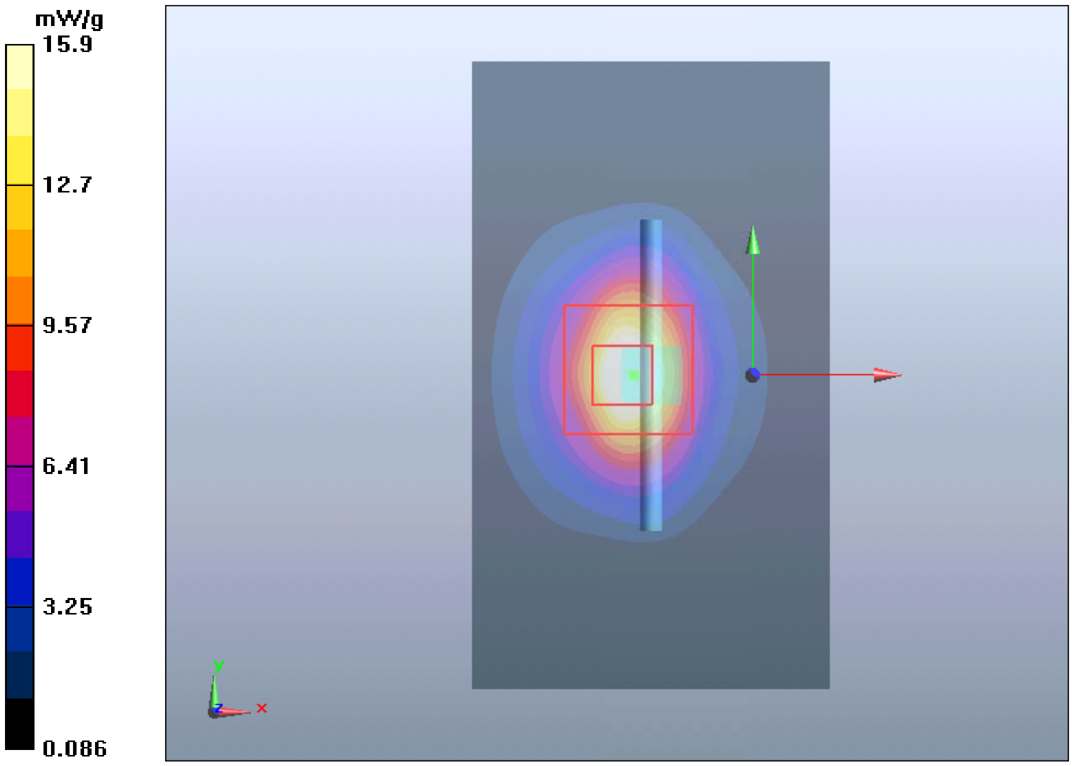
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.8 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 30 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g

Maximum value of SAR (measured) = 15.9 mW/g



Plot 2 System Performance Check at 2450 MHz Body TSL

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

Date: 6/25/2019

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

Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 16 mW/g

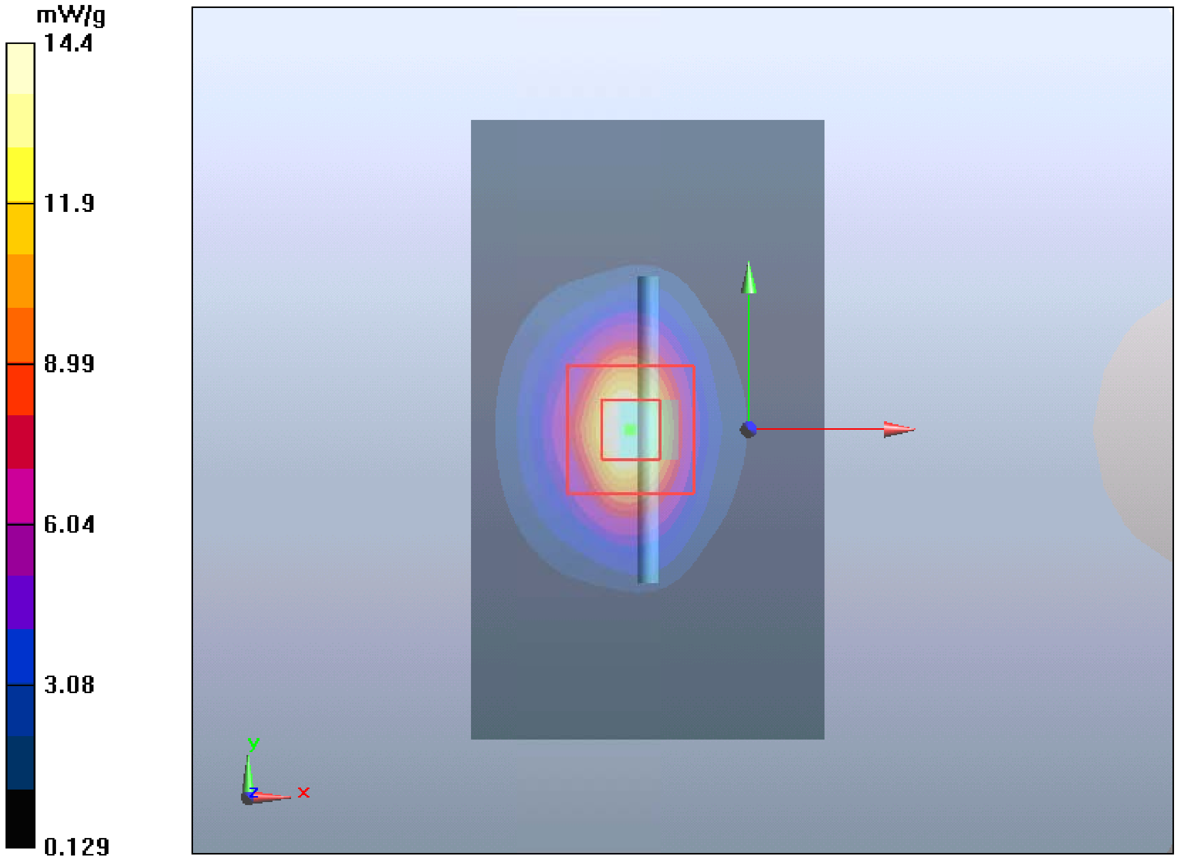
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.2 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 6.20 mW/g

Maximum value of SAR (measured) = 14.4 mW/g



Plot 3 System Performance Check at 5250 MHz Head TSL

DUT: Dipole 5250 MHz; Type: D5GHzV2; Serial: D5GHzV2

Date: 6/11/2019

Communication System: CW; Frequency: 5250 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5250 MHz; σ = 4.80 mho/m; ε_r = 35.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.56, 5.56, 5.56); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

d=10mm, Pin=100mW/Area Scan (61x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 9.14 mW/g

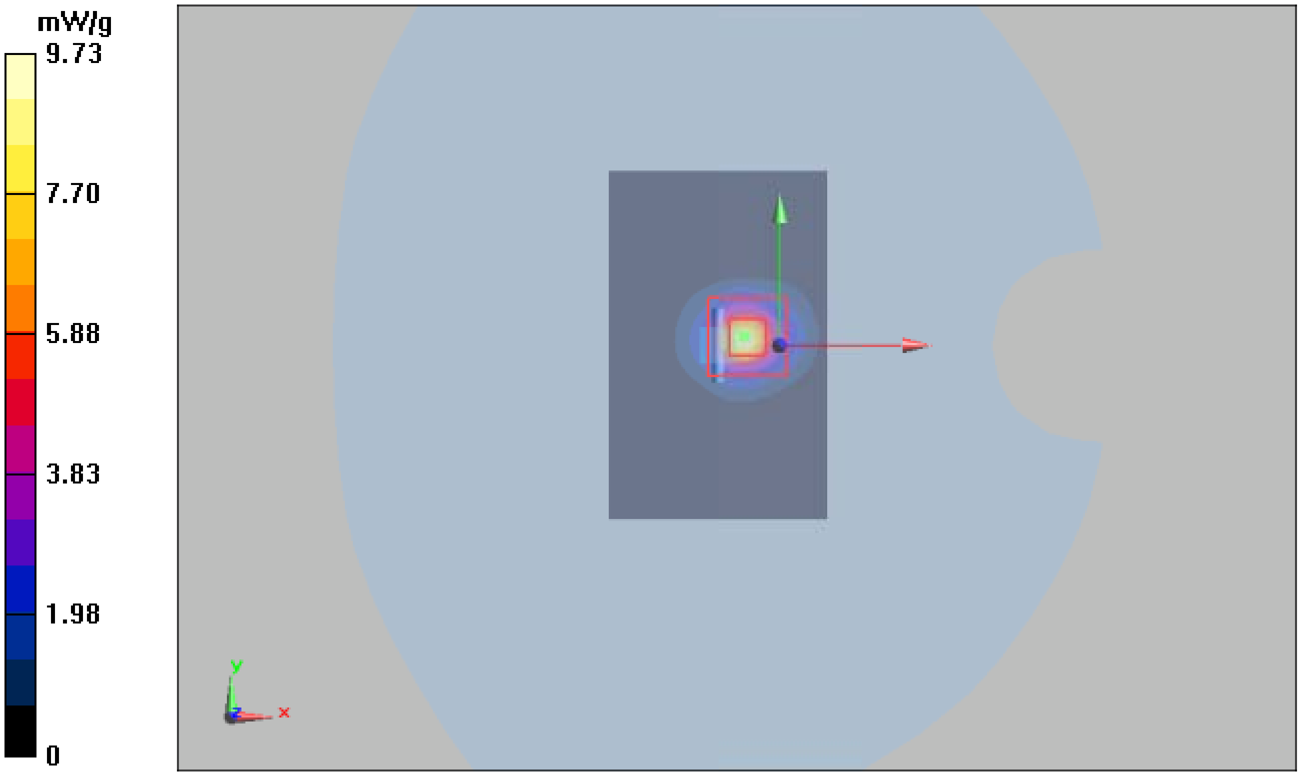
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 33.6 V/m; Power Drift = -0.095 dB

Peak SAR (extrapolated) = 52.2 W/kg

SAR(1 g) = 7.87 mW/g; SAR(10 g) = 2.25 mW/g

Maximum value of SAR (measured) = 9.73 mW/g



Plot 4 System Performance Check at 5250 MHz Body TSL

DUT: Dipole 5250 MHz; Type: D5GHzV2; Serial: D5GHzV2

Date: 6/11/2019

Communication System: CW; Frequency: 5250 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5250 MHz; σ = 5.32 mho/m; ε_r = 48.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.93, 4.93, 4.93); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

d=10mm, Pin=250mW/Area Scan (61x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 7.69 mW/g

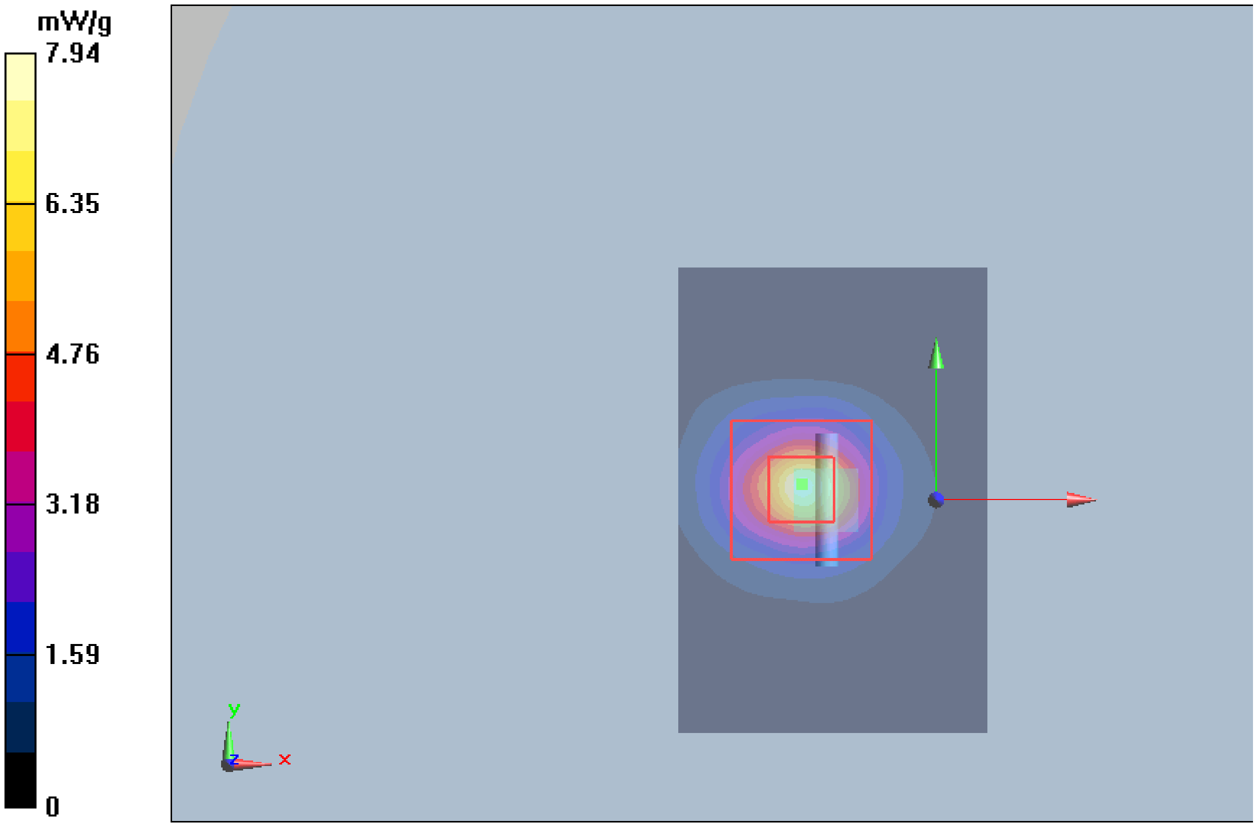
d=10mm, Pin=250mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 36.3 V/m; Power Drift = 0.0277 dB

Peak SAR (extrapolated) = 47.7 W/kg

SAR(1 g) = 7.46 mW/g; SAR(10 g) = 2.26 mW/g

Maximum value of SAR (measured) = 7.94 mW/g



Plot 5 System Performance Check at 5750 MHz Head TSL

DUT: Dipole 5750 MHz; Type: D5GHzV2; Serial: D5GHzV2

Date: 6/28/2019

Communication System: CW; Frequency: 5750 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5750 MHz; σ = 5.21 mho/m; ε_r = 34.9; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.99, 4.99, 4.99); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

d=10mm, Pin=100mW/Area Scan (61x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 8.31 mW/g

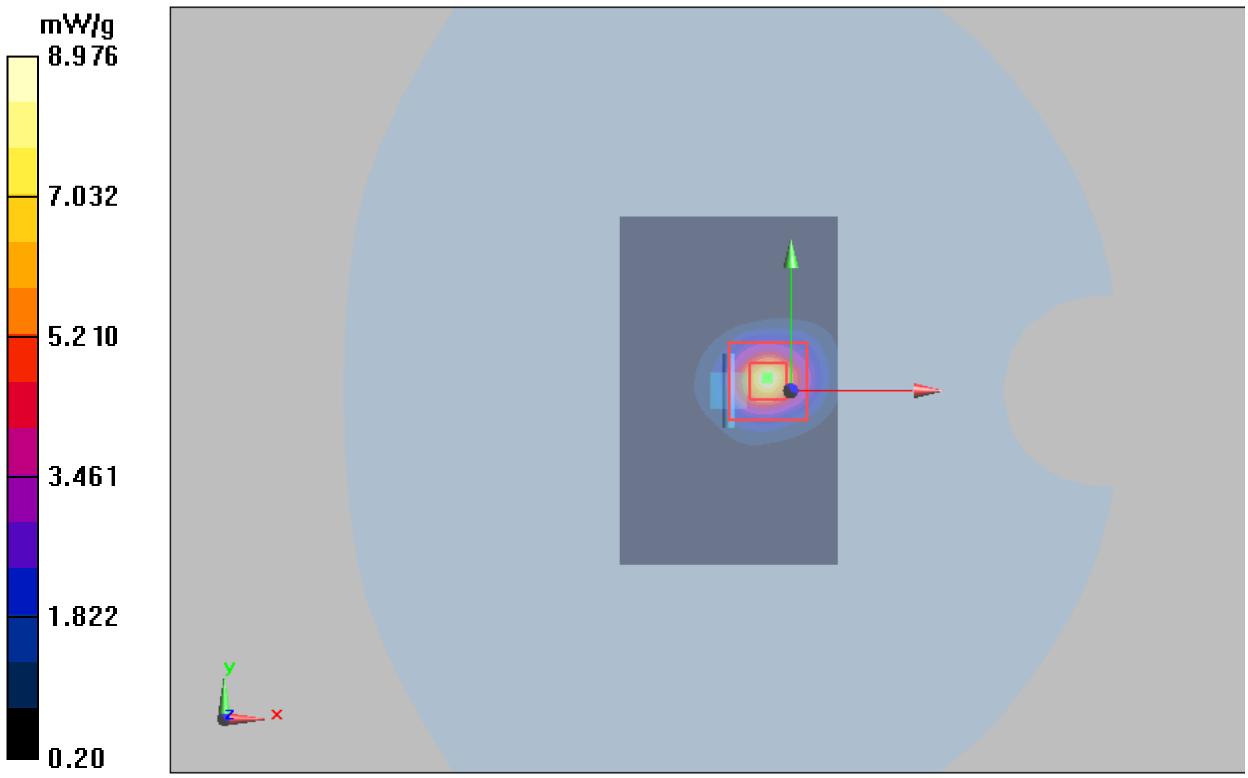
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 23.1 V/m; Power Drift = 0.044 dB

Peak SAR (extrapolated) = 23.4 W/kg

SAR(1 g) = 7.66 mW/g; SAR(10 g) = 2.27 mW/g

Maximum value of SAR (measured) = 8.976 mW/g



Plot 6 System Performance Check at 5750 MHz Body TSL

DUT: Dipole 5750 MHz; Type: D5GHzV2; Serial: D5GHzV2

Date: 6/28/2019

Communication System: CW; Frequency: 5750 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5750 MHz; σ = 6.14 mho/m; ε_r = 47.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.35, 4.35, 4.35); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

d=10mm, Pin=250mW/Area Scan (61x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 7.84 mW/g

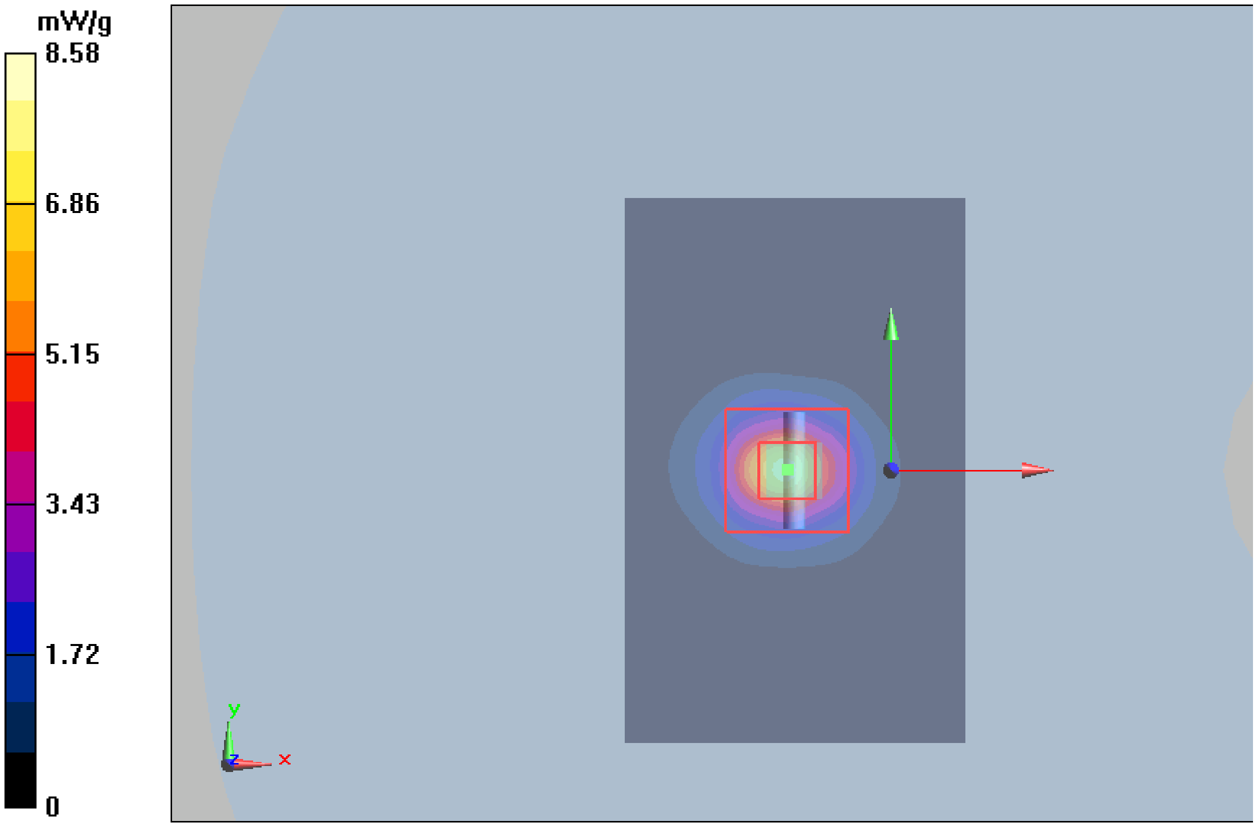
d=10mm, Pin=250mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 38 V/m; Power Drift = -0.018 dB

Peak SAR (extrapolated) = 22.6 W/kg

SAR(1 g) = 7.15 mW/g; SAR(10 g) = 1.99 mW/g

Maximum value of SAR (measured) = 8.58 mW/g



ANNEX C: Highest Graph Results

Plot 7 802.11b Front Side Low (Head, Antenna 1, Distance 0mm, 3 Pin)

Date: 6/25/2019

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.833 S/m; ε_r = 40.965; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.50, 7.50, 7.50); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side Low/Area Scan (191x221x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.0315 W/kg

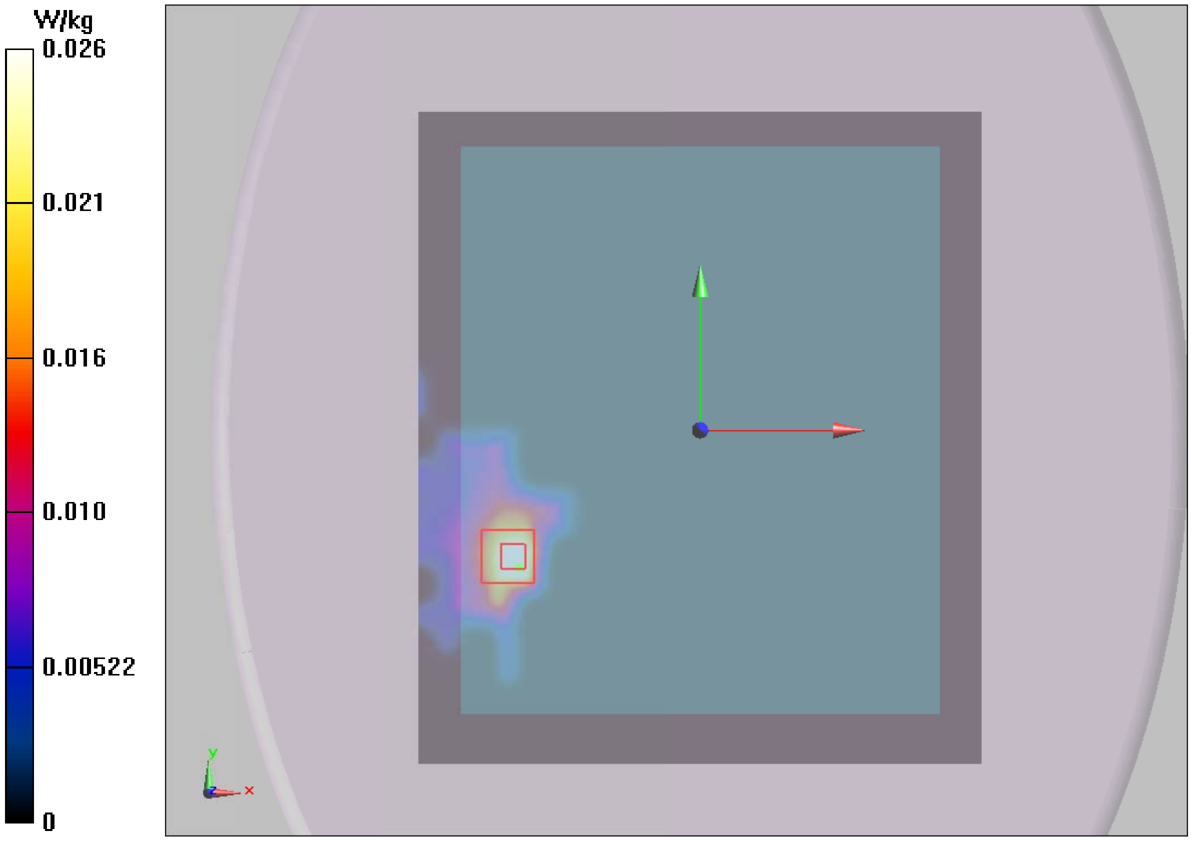
Front Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0 V/m; Power Drift = 0.099 dB

Peak SAR (extrapolated) = 0.0520 W/kg

SAR(1 g) = 0.023 W/kg; SAR(10 g) = 0.0097 W/kg

Maximum value of SAR (measured) = 0.026 W/kg



Plot 8 802.11b Front Side Low (Head, Antenna 2, Distance 0mm, 3 Pin)

Date: 6/25/2019

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.833 S/m; ε_r = 40.965; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.50, 7.50, 7.50); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side Low /Area Scan (221x191x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.0240 W/kg

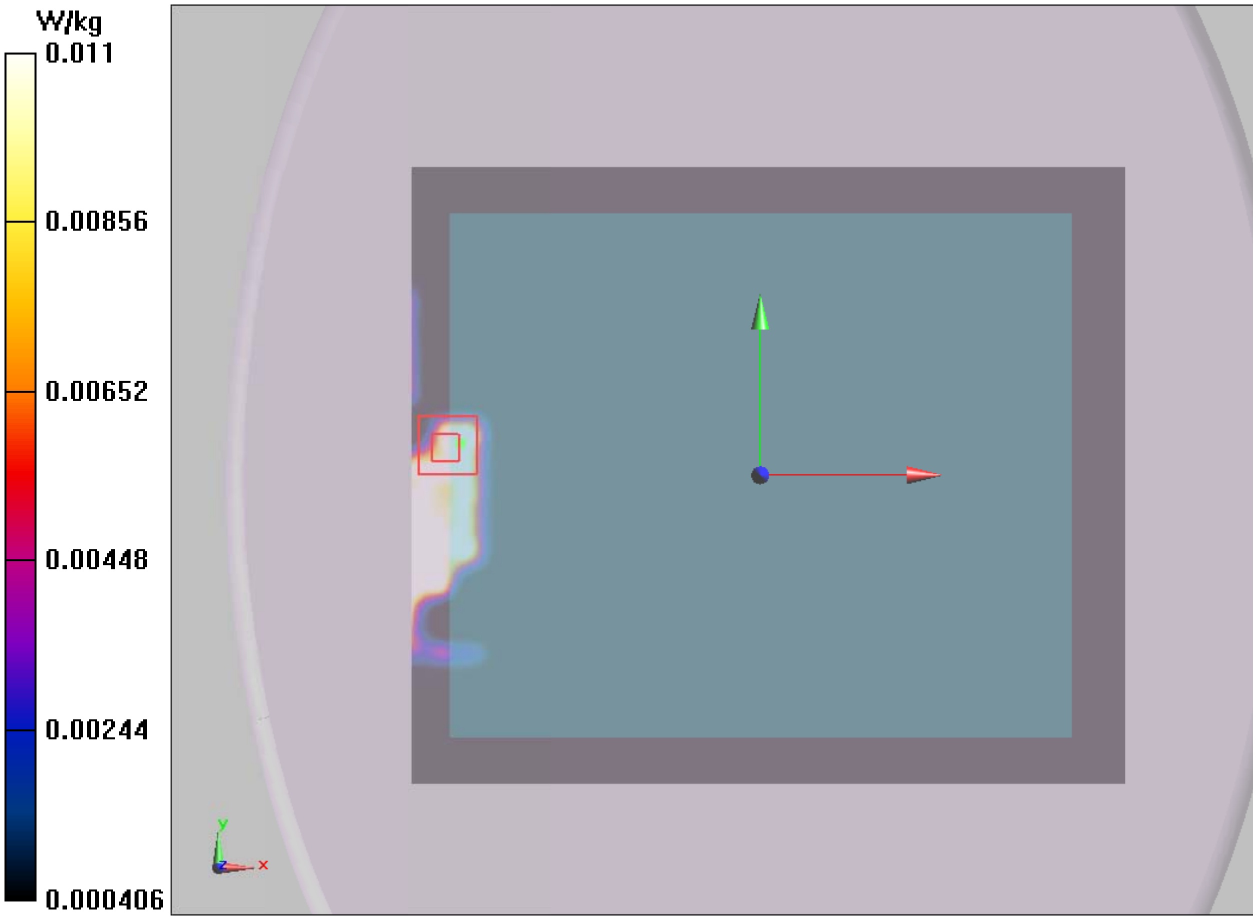
Front Side Low /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.3200 V/m; Power Drift = -0.099 dB

Peak SAR (extrapolated) = 0.0220 W/kg

SAR(1 g) = 0.01 W/kg; SAR(10 g) = 0.00426 W/kg

Maximum value of SAR (measured) = 0.011 W/kg



Plot 9 802.11b Front Side Low (Body, Antenna 1, Distance 0mm, 3 Pin)

Date: 6/25/2019

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.929 S/m; ε_r = 51.204; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side Low/Area Scan (191x221x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.0183 W/kg

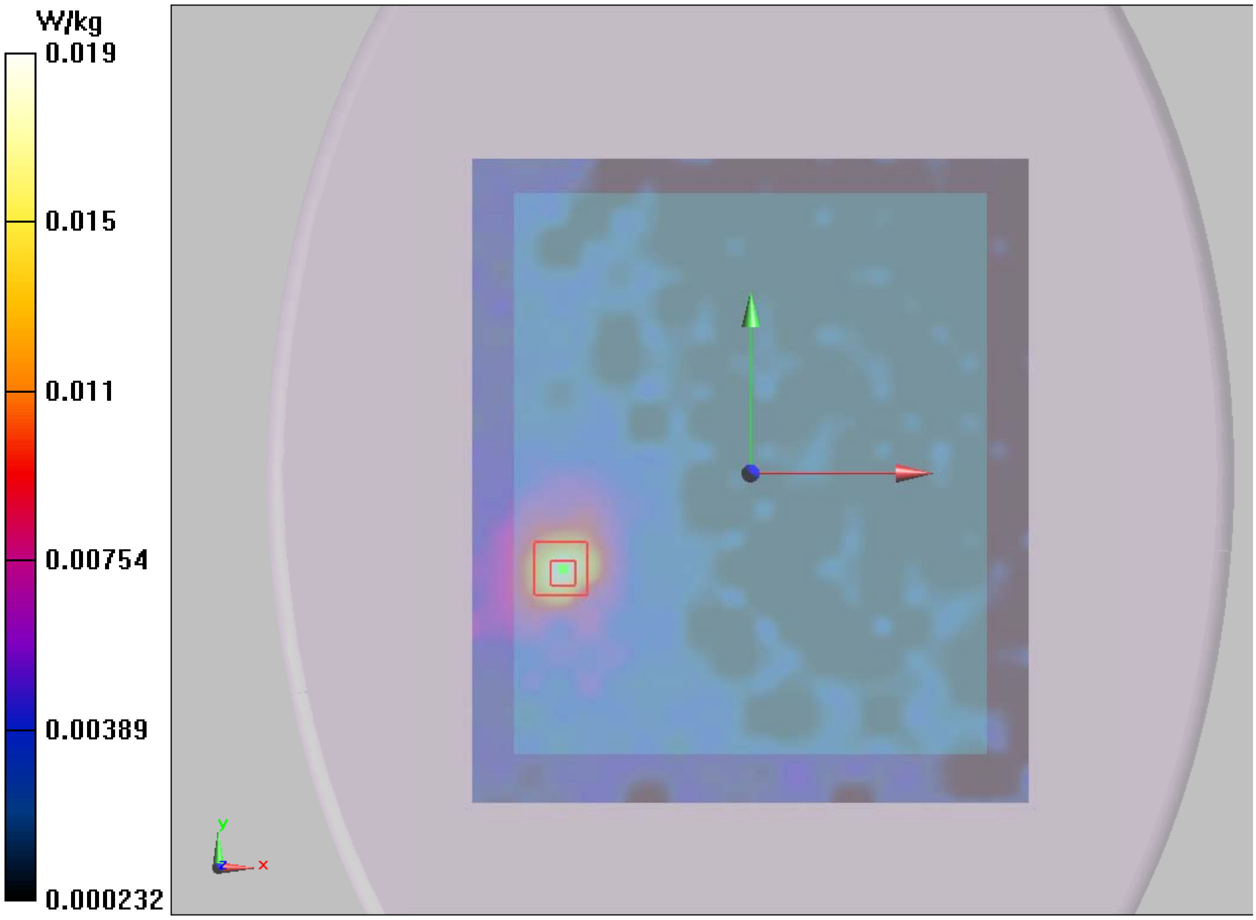
Front Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.3910 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 0.0400 W/kg

SAR(1 g) = 0.017 W/kg; SAR(10 g) = 0.00848 W/kg

Maximum value of SAR (measured) = 0.019 W/kg



Plot 10 802.11b Front Side Low (Body, Antenna 2, Distance 0mm, 3 Pin)

Date: 6/25/2019

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.929 S/m; ε_r = 51.204; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side Low /Area Scan (221x191x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.0139 W/kg

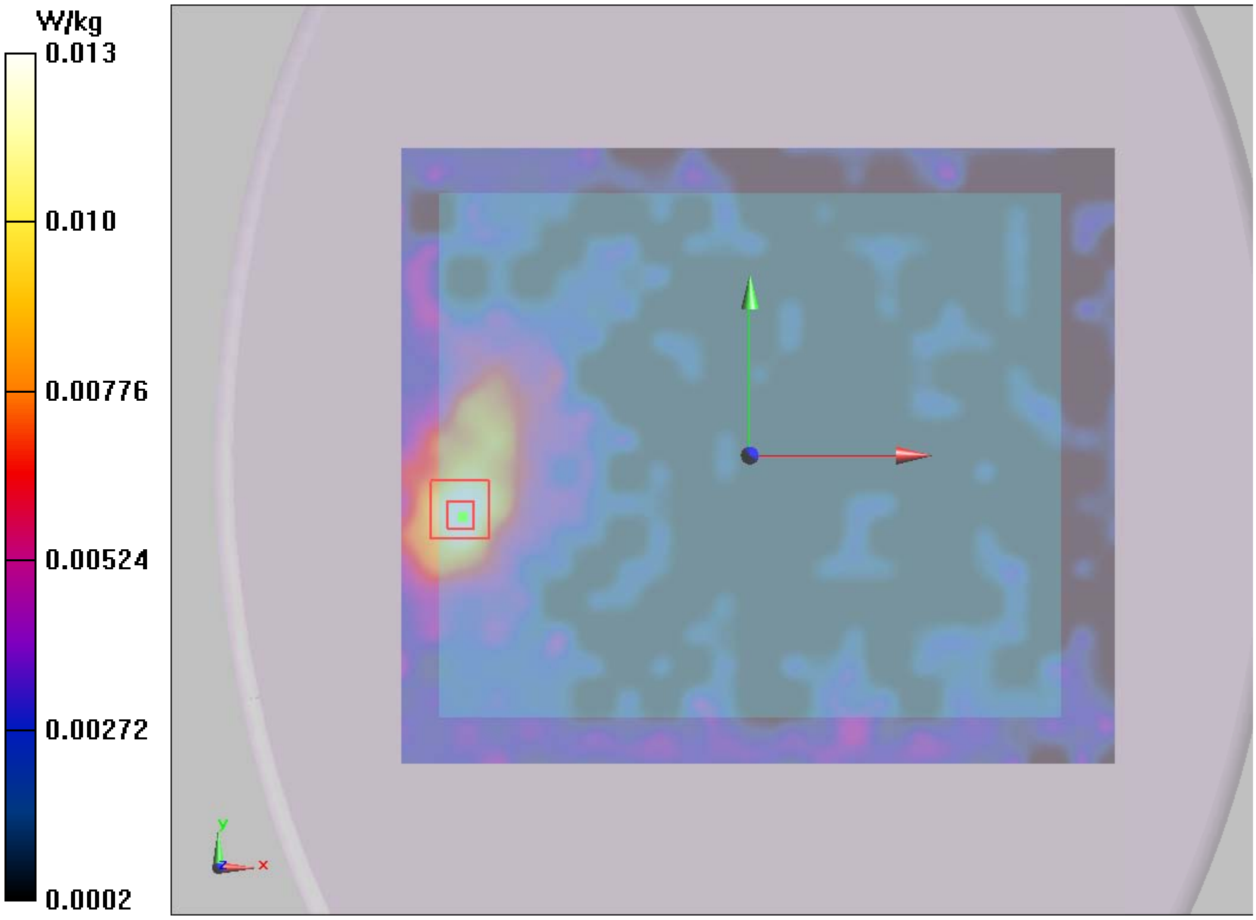
Front Side Low /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.4680 V/m; Power Drift = 0.042 dB

Peak SAR (extrapolated) = 0.0160 W/kg

SAR(1 g) = 0.011 W/kg; SAR(10 g) = 0.0053 W/kg

Maximum value of SAR (measured) = 0.013 W/kg



Plot 11 802.11b Front Side Low (Head, Antenna 1, Distance 0mm, 4 Pin)

Date: 6/25/2019

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.833 S/m; ε_r = 40.965; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.50, 7.50, 7.50); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side Low/Area Scan (191x221x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.0290 W/kg

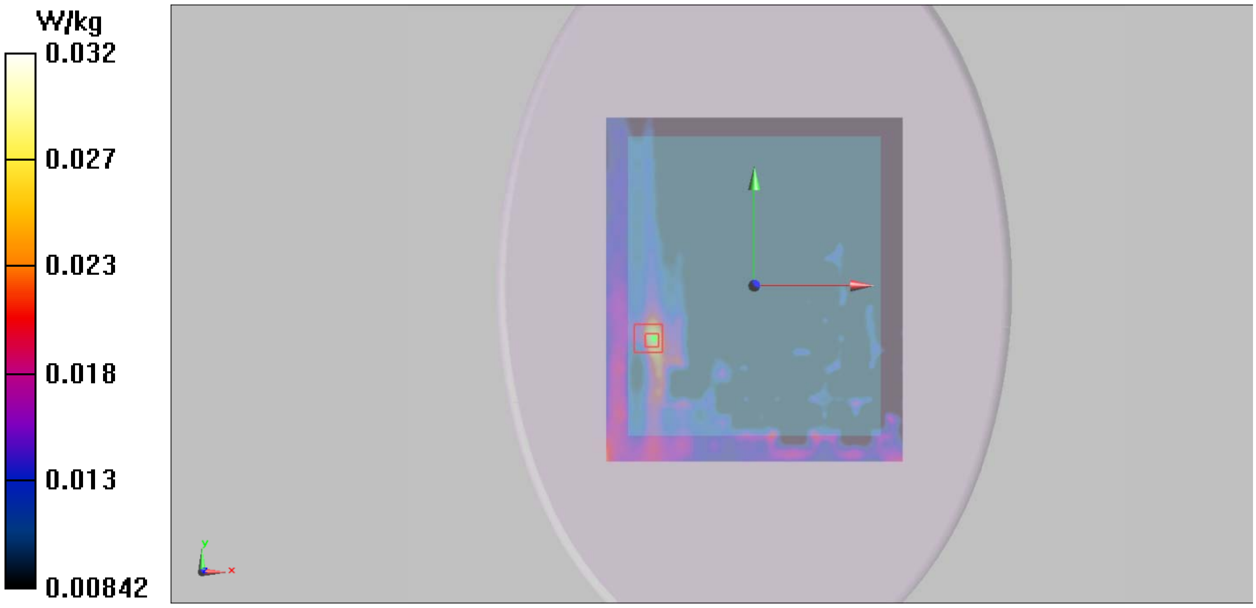
Front Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.504 V/m; Power Drift = 0.098 dB

Peak SAR (extrapolated) = 0.0650 W/kg

SAR(1 g) = 0.025 W/kg; SAR(10 g) = 0.013 W/kg

Maximum value of SAR (measured) = 0.032 W/kg



Plot 12 802.11b Front Side Low (Body, Antenna 2, Distance 0mm, 4 Pin)

Date: 6/25/2019

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.929 S/m; ε_r = 51.204; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side Low /Area Scan (221x191x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.0161 W/kg

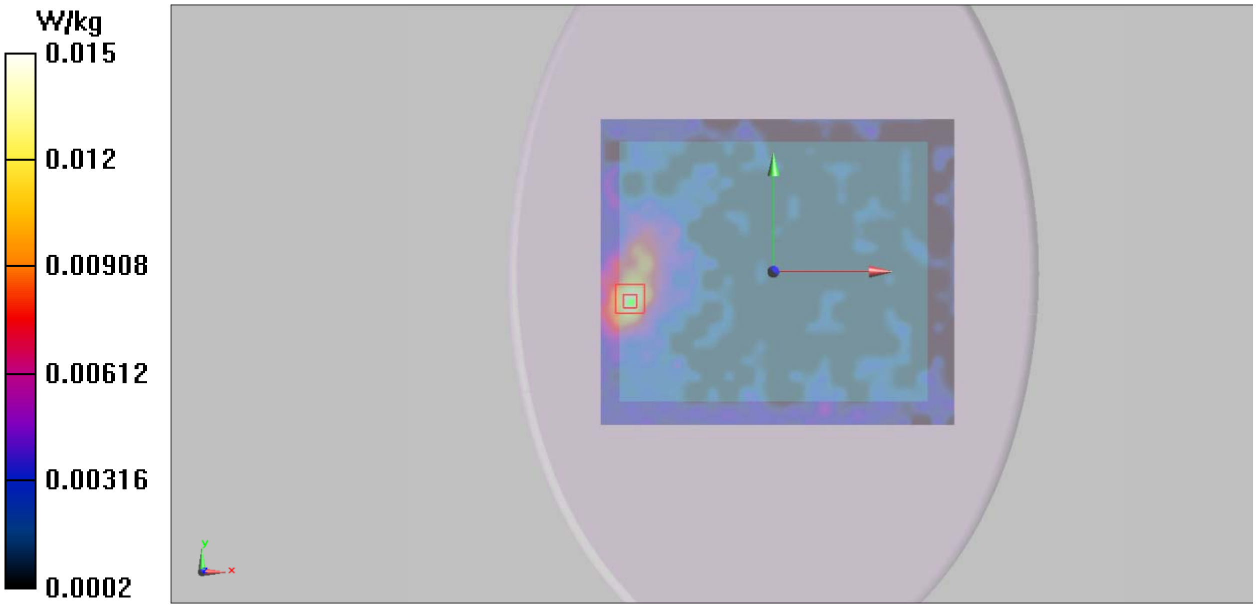
Front Side Low /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.4680 V/m; Power Drift = 0.057 dB

Peak SAR (extrapolated) = 0.0560 W/kg

SAR(1 g) = 0.013 W/kg; SAR(10 g) = 0.0053 W/kg

Maximum value of SAR (measured) = 0.015 W/kg



Plot 13 802.11a U-NII-1 Front Side CH36 (Head, Antenna 1, Distance 0mm, 3 Pin)

Date: 6/11/2019

Communication System: UID 0, 802.11a (0); Frequency: 5180 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5180 MHz; σ = 4.686 S/m; ε_r = 37.076; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.56, 5.56, 5.56); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side CH36 /Area Scan (221x271x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0302 W/kg

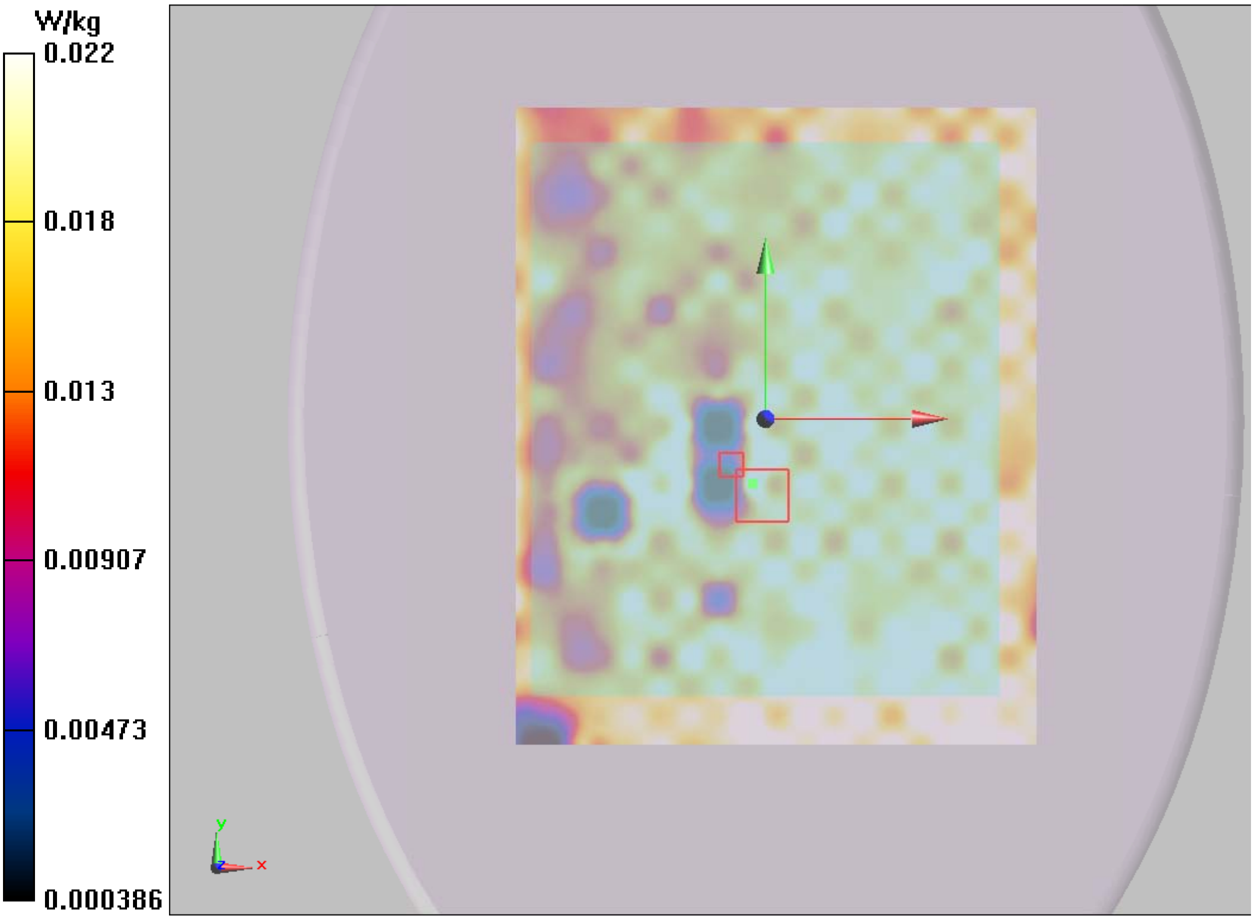
Front Side CH36 /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.405 V/m; Power Drift = -0.097 dB

Peak SAR (extrapolated) = 0.0280 W/kg

SAR(1 g) = 0.020 W/kg; SAR(10 g) = 0.015 W/kg

Maximum value of SAR (measured) = 0.022 W/kg



Plot 14 802.11n HT 20 U-NII-1 Front Side CH36 (Head, Antenna 2, Distance 0mm, 3 Pin)

Date: 6/11/2019

Communication System: UID 0, 802.11n HT20 (0); Frequency: 5180 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5180 MHz; σ = 4.686 S/m; ε_r = 37.076; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.56, 5.56, 5.56); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side CH36 /Area Scan (51x201x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.161 W/kg

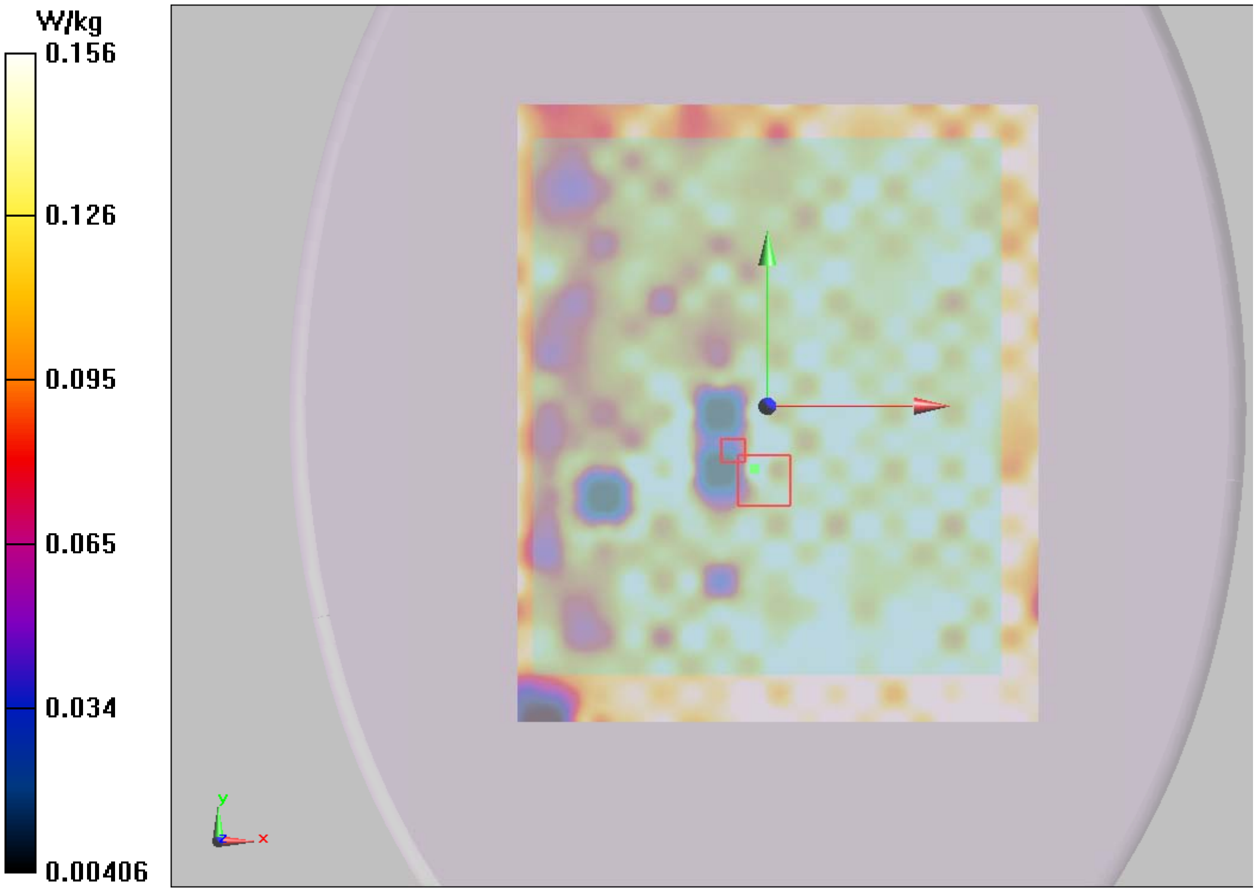
Front Side CH36 /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.033 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 0.853 W/kg

SAR(1 g) = 0.117 W/kg; SAR(10 g) = 0.054 W/kg

Maximum value of SAR (measured) = 0.156 W/kg



Plot 15 802.11a U-NII-1 Front Side CH36 (Body, Antenna 1, Distance 0mm, 3 Pin)

Date: 6/11/2019

Communication System: UID 0, 802.11a (0); Frequency: 5180 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5180 MHz; σ = 5.289 S/m; ε_r = 49.415; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.93, 4.93, 4.93); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side CH36 /Area Scan (221x271x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0745 W/kg

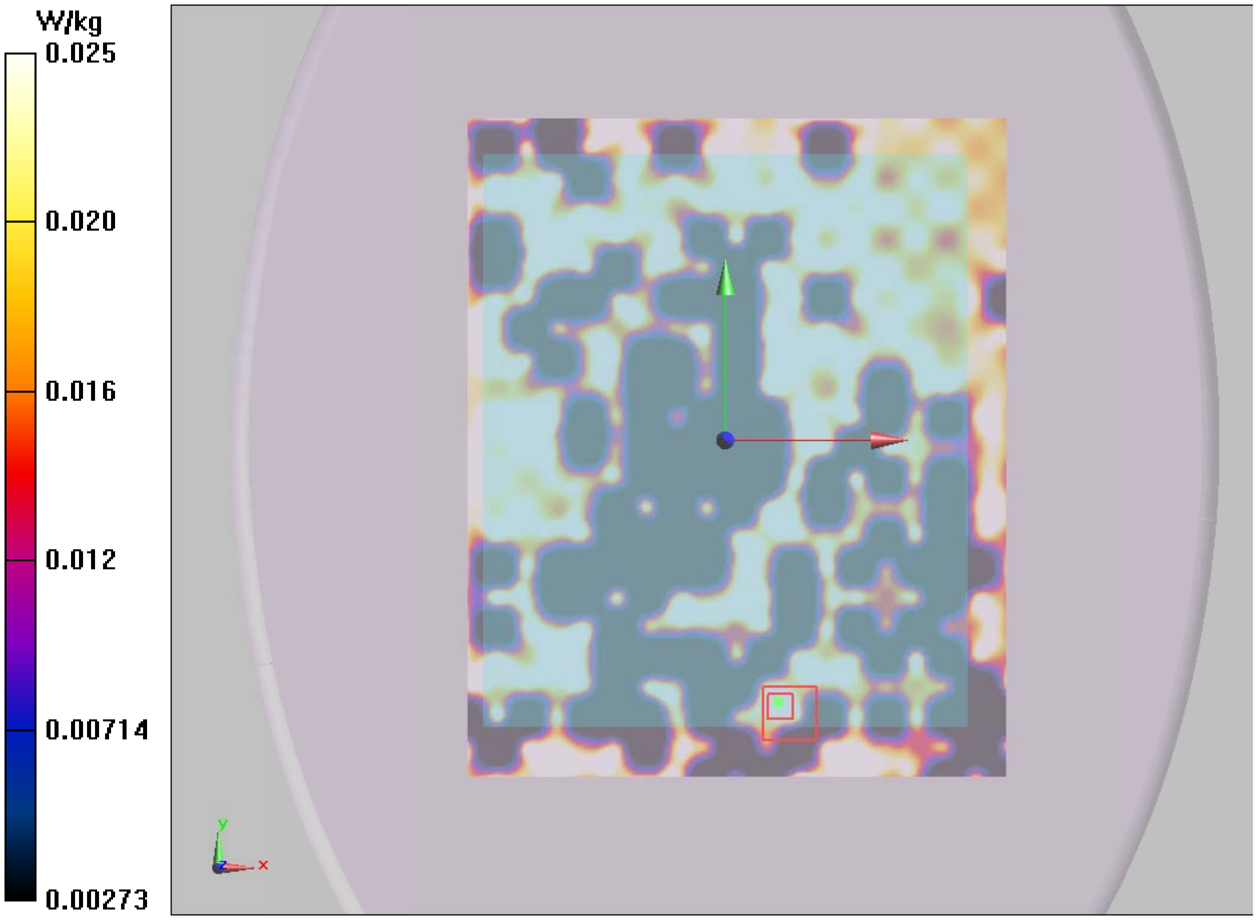
Front Side CH36 /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.2220 V/m; Power Drift = 0.147 dB

Peak SAR (extrapolated) = 0.0260 W/kg

SAR(1 g) = 0.022 W/kg; SAR(10 g) = 0.013 W/kg

Maximum value of SAR (measured) = 0.025 W/kg



Plot 16 802.11n HT 20 U-NII-1 Front Side CH36 (Body, Antenna 2, Distance 0mm, 3 Pin)

Date: 6/11/2019

Communication System: UID 0, 802.11n HT20 (0); Frequency: 5180 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5180 MHz; σ = 5.289 S/m; ε_r = 49.415; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.93, 4.93, 4.93); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side CH36 /Area Scan (221x261x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.112 W/kg

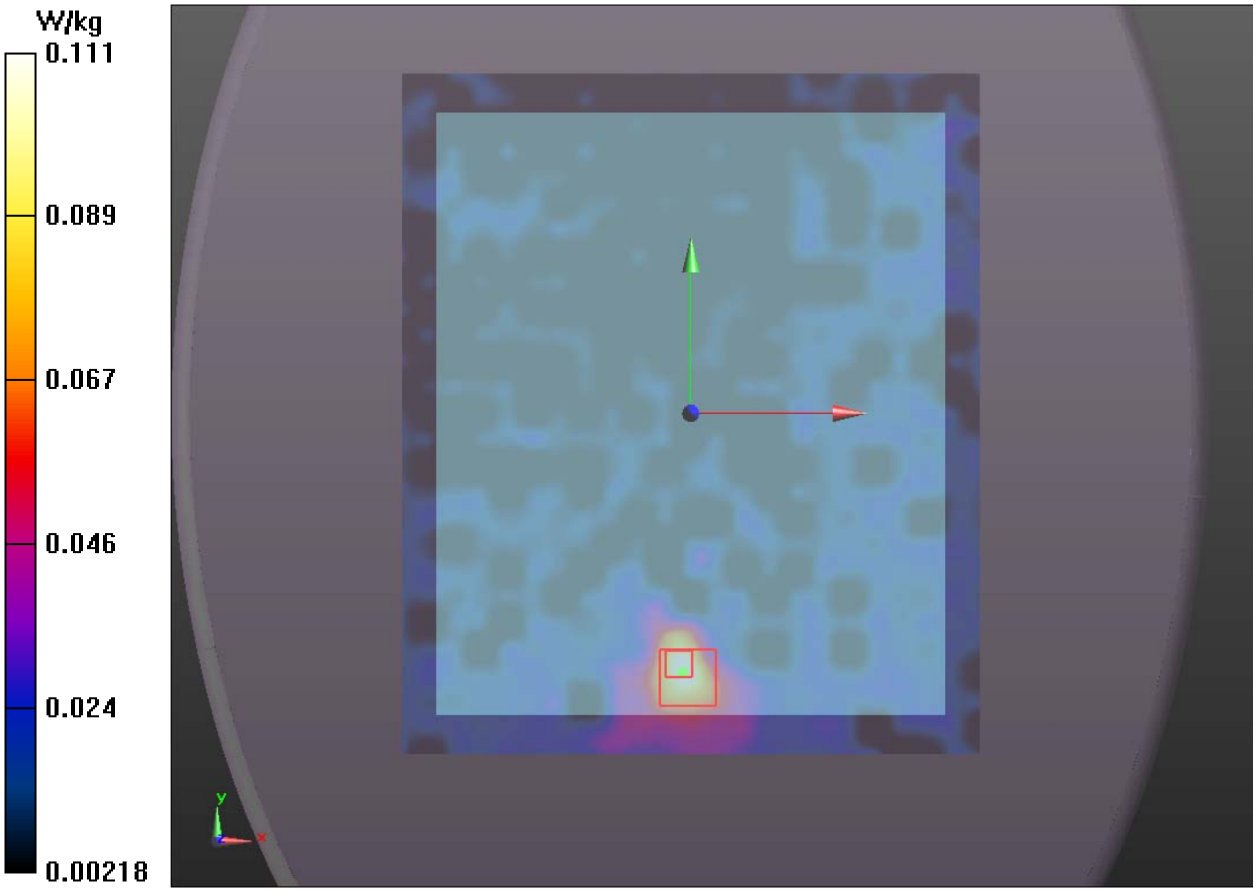
Front Side CH36 /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.286 V/m; Power Drift = 0.041 dB

Peak SAR (extrapolated) = 0.291 W/kg

SAR(1 g) = 0.102 W/kg; SAR(10 g) = 0.040 W/kg

Maximum value of SAR (measured) = 0.111 W/kg



Plot 17 802.11a U-NII-3 Front Side CH157 (Head, Antenna 1, Distance 0mm, 3 Pin)

Date: 6/28/2019

Communication System: UID 0, 802.11a (0); Frequency: 5785 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5785 MHz; σ = 5.48 S/m; ε_r = 35.442; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.99, 4.99, 4.99); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side CH157 /Area Scan (221x261x1): Interpolated grid: dx=10 mm, dy=10mm

Maximum value of SAR (interpolated) = 0.0400 W/kg

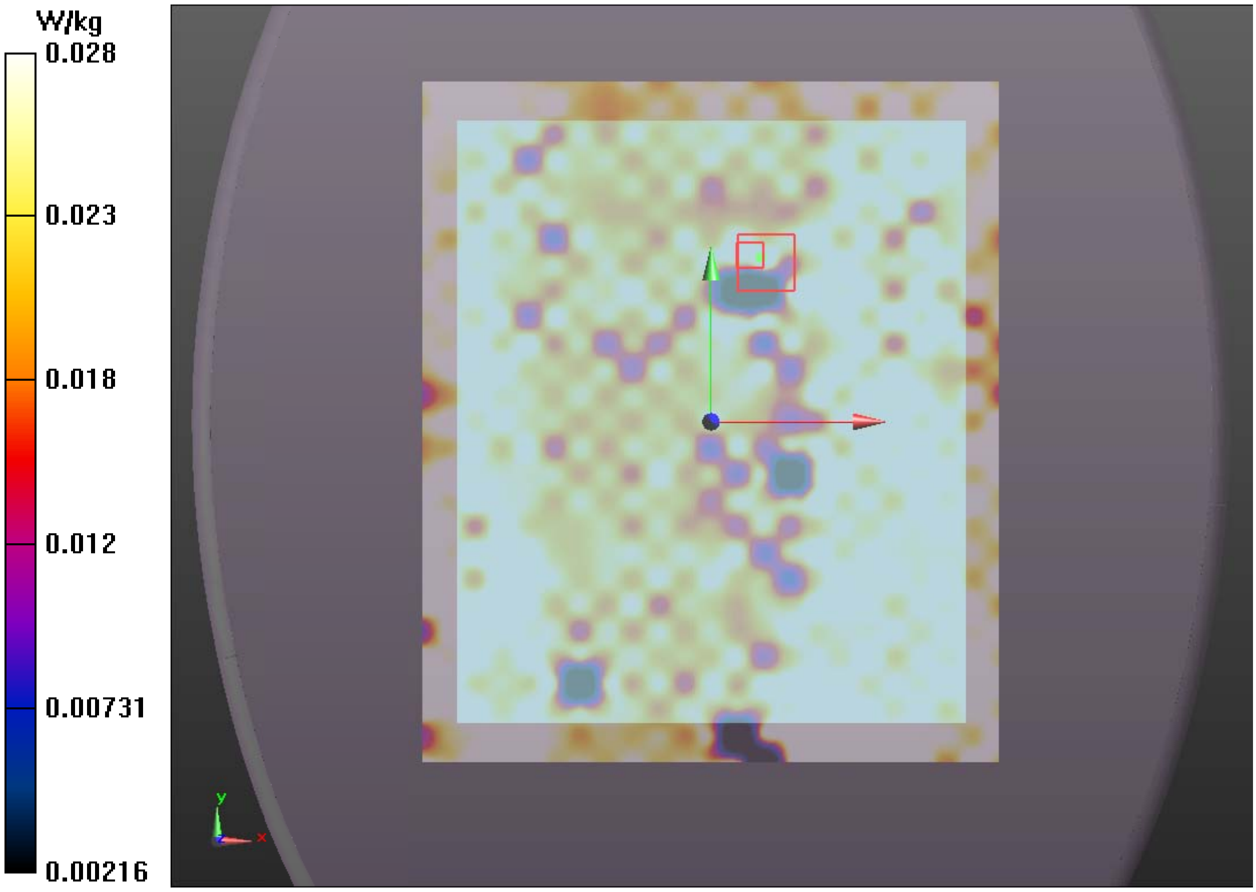
Front Side CH157 /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.746 V/m; Power Drift = -0.059 dB

Peak SAR (extrapolated) = 0.112 W/kg

SAR(1 g) = 0.0260 W/kg; SAR(10 g) = 0.013 W/kg

Maximum value of SAR (measured) = 0.0279 W/kg



Plot 18 802.11a U-NII-3 Front Side CH165 (Head, Antenna 2, Distance 0mm, 3 Pin)

Date: 6/28/2019

Communication System: UID 0, 802.11a (0); Frequency: 5825 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5825 MHz; σ = 5.48 S/m; ε_r = 35.382; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.99, 4.99, 4.99); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side CH165 /Area Scan (51x201x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0348 W/kg

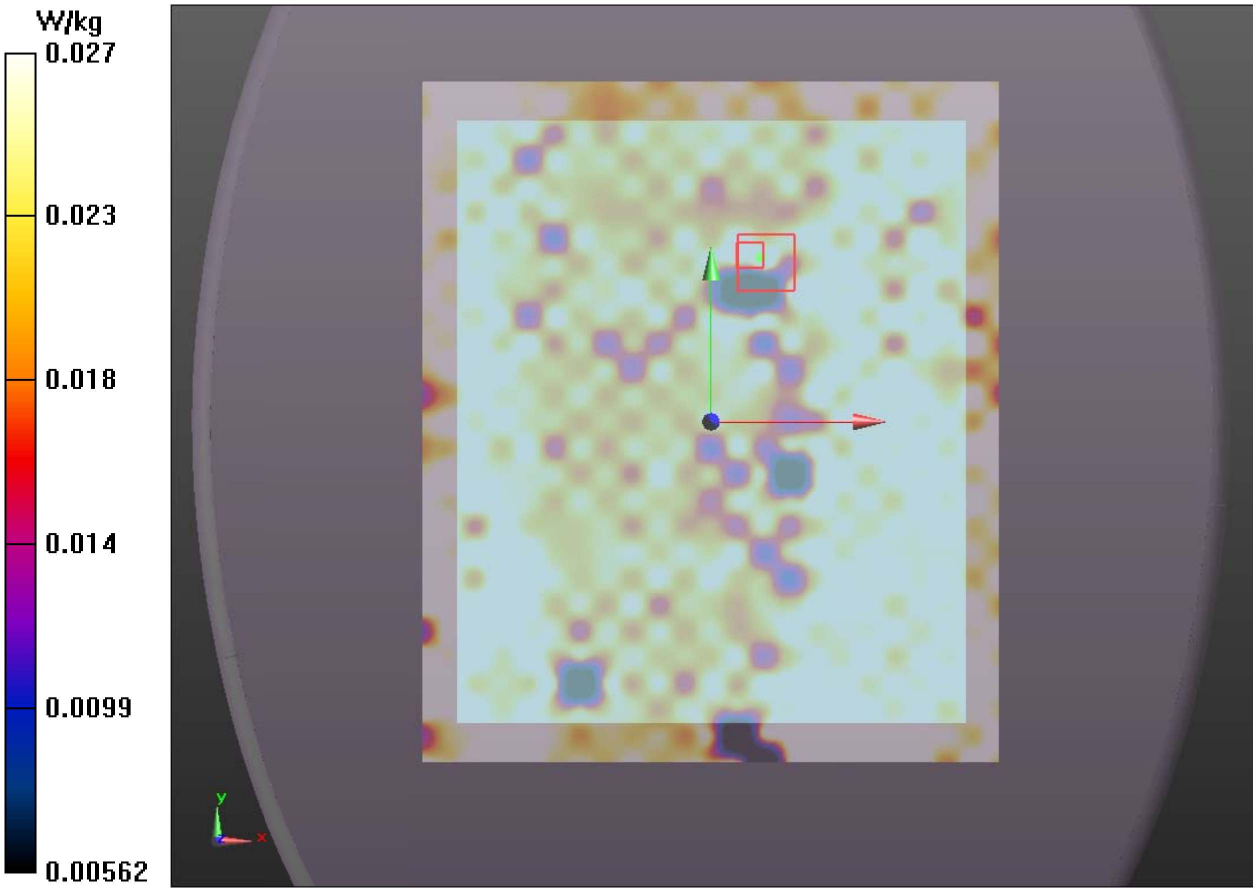
Front Side CH165 /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.6850 V/m; Power Drift = 0.074 dB

Peak SAR (extrapolated) = 0.0720 W/kg

SAR(1 g) = 0.024 W/kg; SAR(10 g) = 0.016 W/kg

Maximum value of SAR (measured) = 0.0270 W/kg



Plot 19 802.11a U-NII-3 Front Side CH157 (Body, Antenna 1, Distance 0mm, 3 Pin)

Date: 6/28/2019

Communication System: UID 0, 802.11a (0); Frequency: 5785 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5785 MHz; σ = 6.24 S/m; ε_r = 47.724; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.35, 4.35, 4.35); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side CH157 /Area Scan (221x261x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0569 W/kg

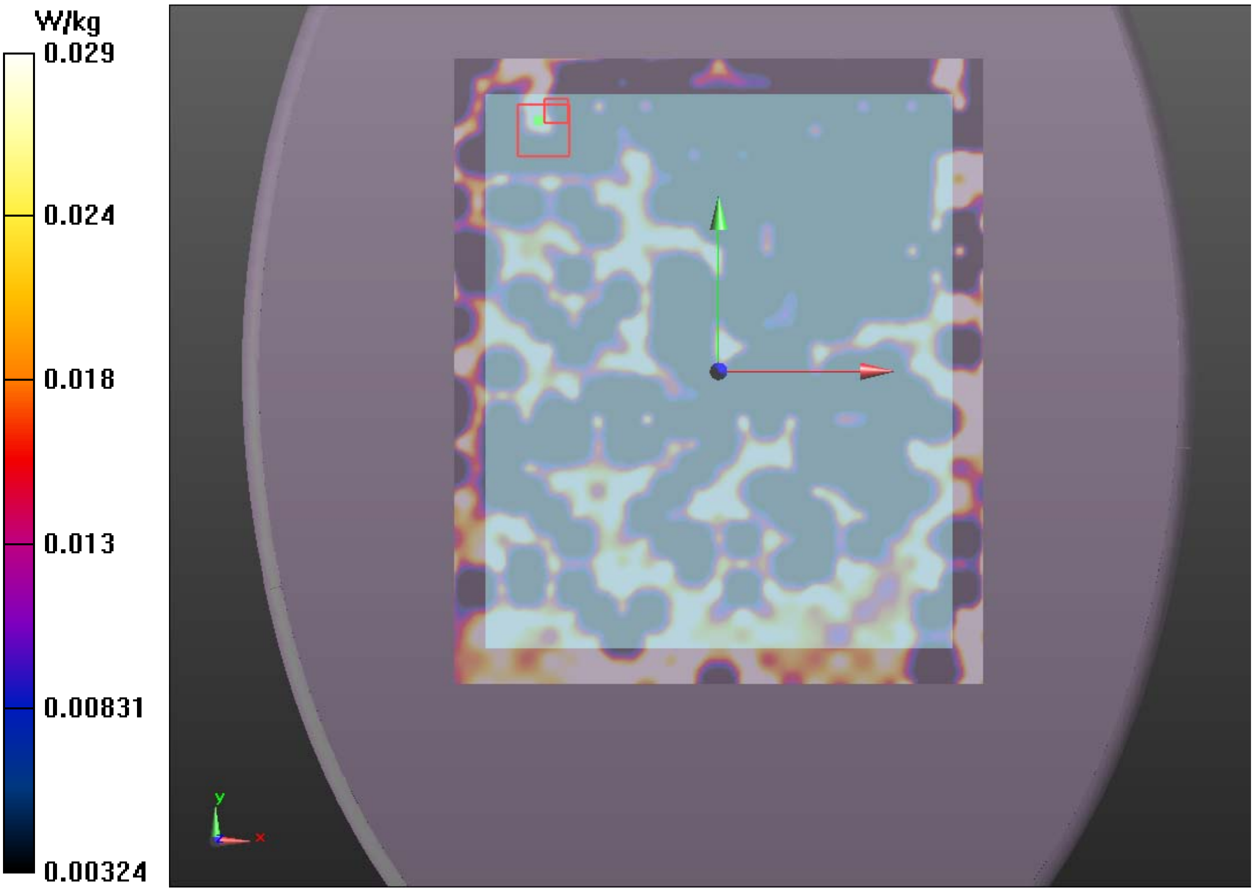
Front Side CH157 /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.153 V/m; Power Drift = 0.192 dB

Peak SAR (extrapolated) = 0.165 W/kg

SAR(1 g) = 0.027 W/kg; SAR(10 g) = 0.010 W/kg

Maximum value of SAR (measured) = 0.029 W/kg



Plot 20 802.11a U-NII-3 Front Side CH165 (Body, Antenna 2, Distance 0mm, 3 Pin)

Date: 6/28/2019

Communication System: UID 0, 802.11a (0); Frequency: 5825 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5825 MHz; σ = 6.24 S/m; ε_r = 47.627; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.35, 4.35, 4.35); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side CH165 /Area Scan (221x261x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0422 W/kg

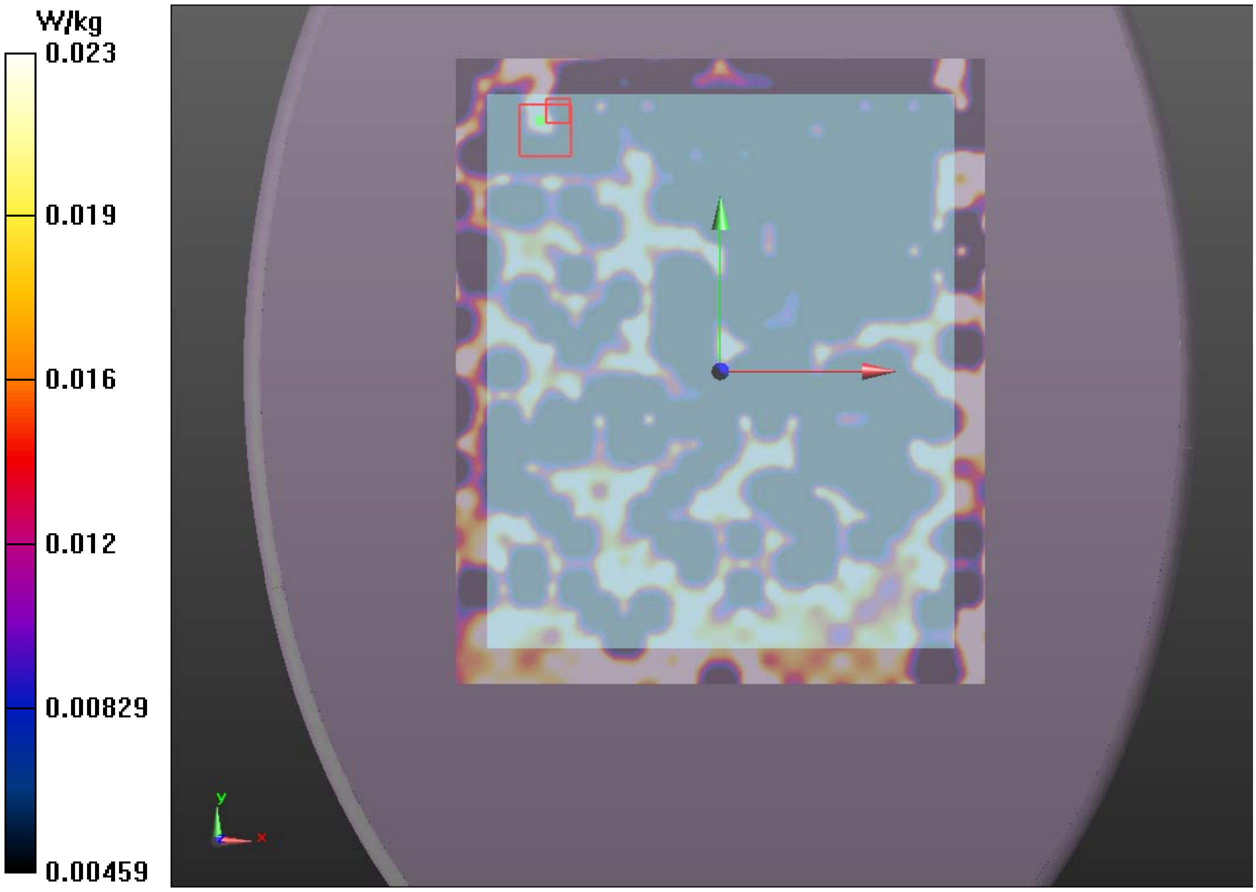
Front Side CH165 /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.5040 V/m; Power Drift = 0.094 dB

Peak SAR (extrapolated) = 0.0940 W/kg

SAR(1 g) = 0.021 W/kg; SAR(10 g) = 0.009 W/kg

Maximum value of SAR (measured) = 0.0231 W/kg



Plot 21 802.11a U-NII-3 Front Side CH157 (Body, Antenna 1, Distance 0mm, 4 Pin)

Date: 6/28/2019

Communication System: UID 0, 802.11a (0); Frequency: 5785 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5785 MHz; $\sigma = 6.24$ S/m; $\varepsilon_r = 47.724$; $\rho = 1000$ kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.35, 4.35, 4.35); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side CH157 /Area Scan (221x261x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.036 W/kg

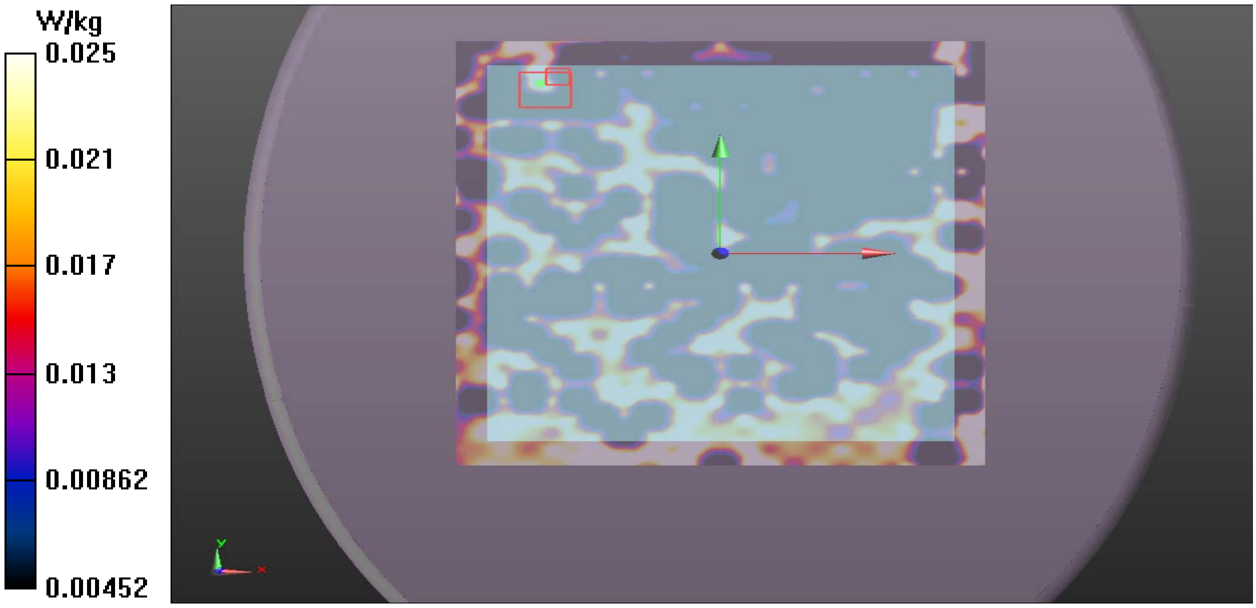
Front Side CH157 /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.5000 V/m; Power Drift = 0.192 dB

Peak SAR (extrapolated) = 0.0920 W/kg

SAR(1 g) = 0.022 W/kg; SAR(10 g) = 0.013 W/kg

Maximum value of SAR (measured) = 0.025 W/kg



Plot 22 802.11n HT 20 U-NII-1 Front Side CH36 (Head, Antenna 2, Distance 0mm, 4 Pin)

Date: 6/11/2019

Communication System: UID 0, 802.11n HT20 (0); Frequency: 5180 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5180 MHz; σ = 4.686 S/m; ε_r = 37.076; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.56, 5.56, 5.56); Calibrated: 6/19/2019;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Front Side CH36 /Area Scan (51x201x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.104 W/kg

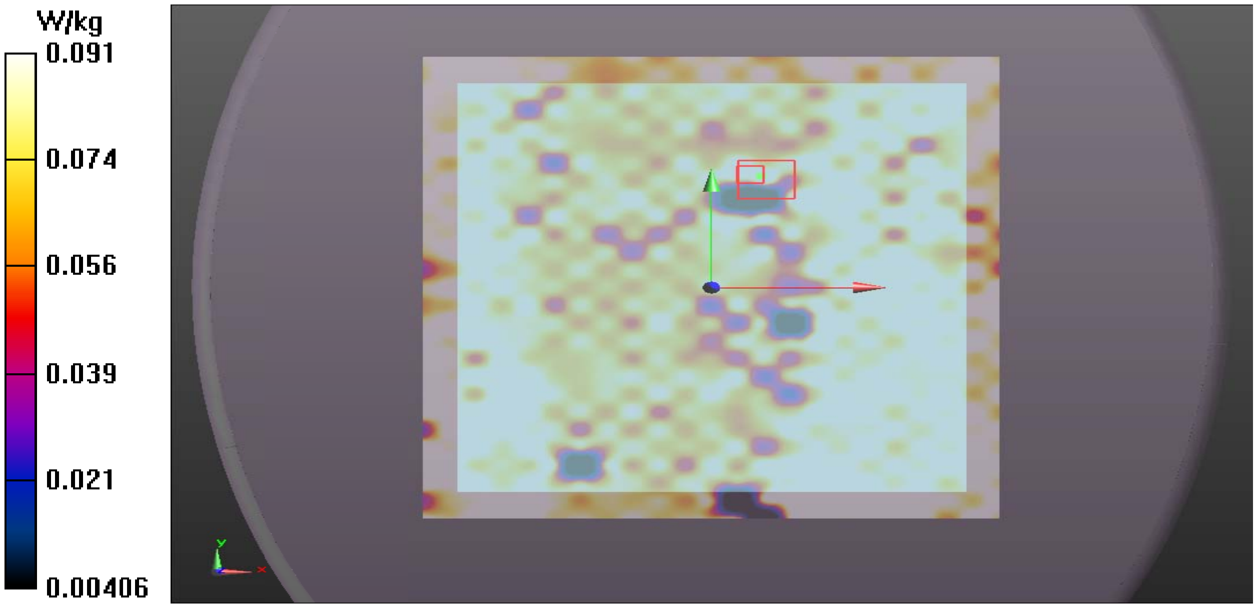
Front Side CH36 /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.033 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 0.853 W/kg

SAR(1 g) = 0.086 W/kg; SAR(10 g) = 0.034 W/kg

Maximum value of SAR (measured) = 0.091 W/kg



ANNEX D: Probe Calibration Certificate

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中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client TA(Shanghai) Certificate No: Z19-60169

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3677

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

Calibration date: June 19, 2019

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 3617	31-Jan-19(SPEAG,No.EX3-3617_Jan19)	Jan-20
DAE4	SN 1331	06-Feb-19(SPEAG, No.DAE4-1331_Feb19)	Feb -20
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	24-Jan-19 (CTTL, No.J19X00547)	Jan -20

	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: June 20, 2019

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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: 3677

Calibrated: June 19, 2019

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: Z19-60169 Page 3 of 11

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)²)[A]	0.41	0.46	0.40	±10.0%
DCP(mV)[B]	101.1	102.9	101.9	

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	152.0	±2.6%
		Y	0.0	0.0	1.0		170.1	
		Z	0.0	0.0	1.0		147.7	

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

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

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]C	Relative Permittivity F	Conductivity (S/m) F	ConvF X	ConvF Y	ConvF Z	AlphaG	DepthG (mm)	Unct. (k=2)
750	41.9	0.89	9.54	9.54	9.54	0.11	1.56	±12.1%
835	41.5	0.90	9.20	9.20	9.20	0.11	1.61	±12.1%
1750	40.1	1.37	8.21	8.21	8.21	0.22	1.11	±12.1%
1900	40.0	1.40	7.79	7.79	7.79	0.22	1.04	±12.1%
2300	39.5	1.67	7.66	7.66	7.66	0.57	0.72	±12.1%
2450	39.2	1.80	7.50	7.50	7.50	0.59	0.71	±12.1%
2600	39.0	1.96	7.20	7.20	7.20	0.65	0.68	±12.1%
5250	35.9	4.71	5.56	5.56	5.56	0.40	1.40	±13.3%
5600	35.5	5.07	4.90	4.90	4.90	0.45	1.40	±13.3%
5750	35.4	5.22	4.99	4.99	4.99	0.50	1.35	±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: 3677

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	9.75	9.75	9.75	0.40	0.75	±12.1%
835	55.2	0.97	9.40	9.40	9.40	0.18	1.38	±12.1%
1750	53.4	1.49	7.86	7.86	7.86	0.23	1.09	±12.1%
1900	53.3	1.52	7.62	7.62	7.62	0.22	1.15	±12.1%
2300	52.9	1.81	7.67	7.67	7.67	0.55	0.81	±12.1%
2450	52.7	1.95	7.57	7.57	7.57	0.59	0.75	±12.1%
2600	52.5	2.16	7.33	7.33	7.33	0.74	0.65	±12.1%
5250	48.9	5.36	4.93	4.93	4.93	0.45	1.55	±13.3%
5600	48.5	5.77	4.24	4.24	4.24	0.50	1.45	±13.3%
5750	48.3	5.94	4.35	4.35	4.35	0.50	1.50	±13.3%

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

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

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

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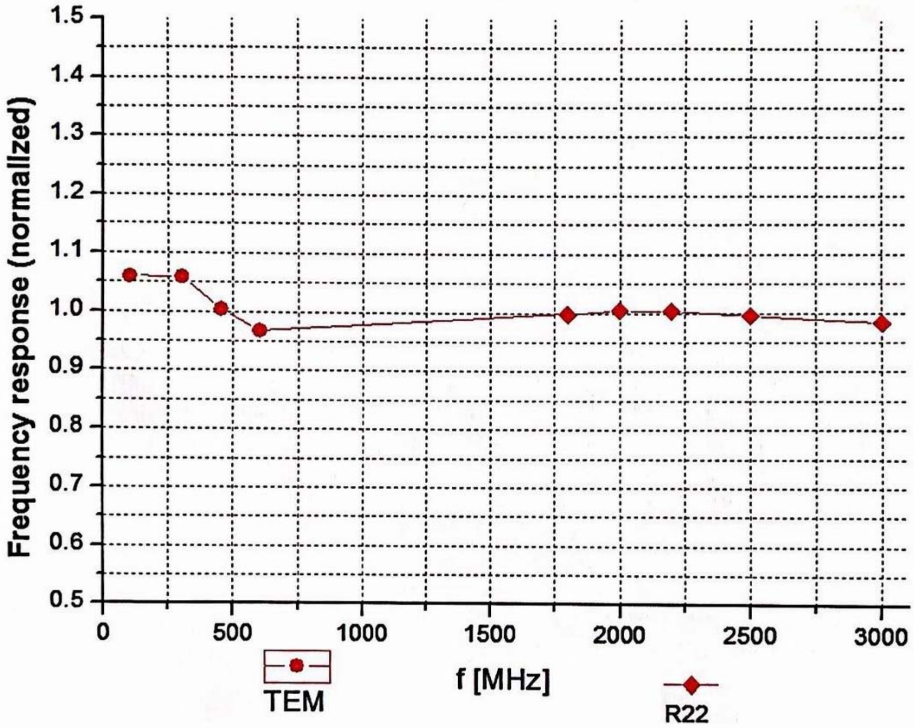
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



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

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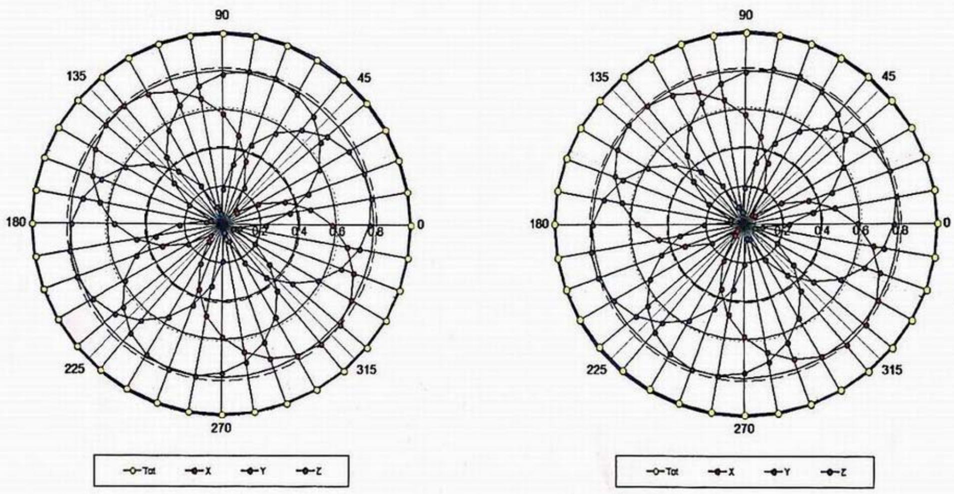
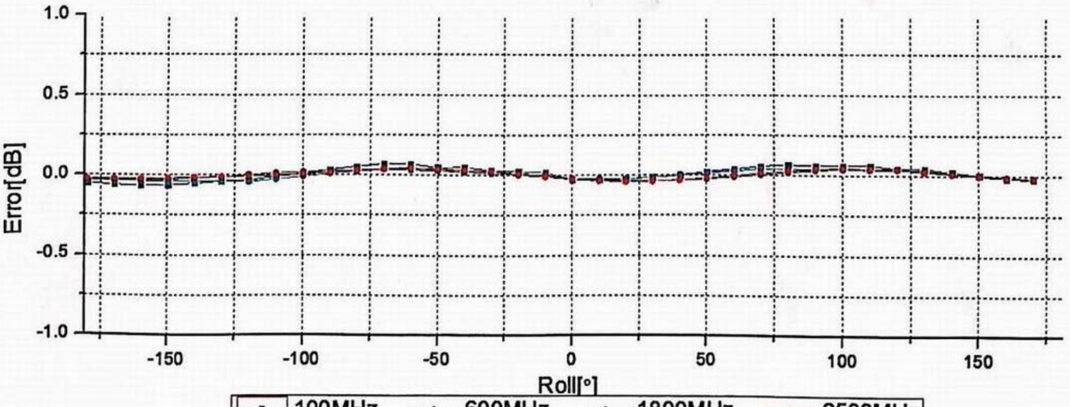
Receiving Pattern (Φ), θ=0°

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





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

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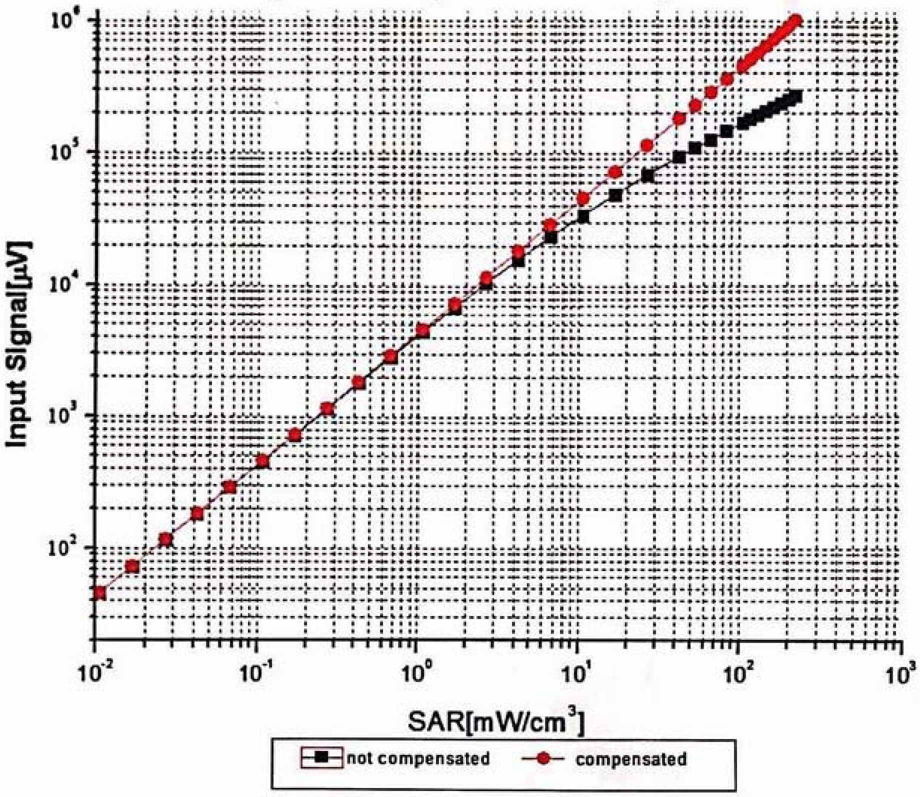
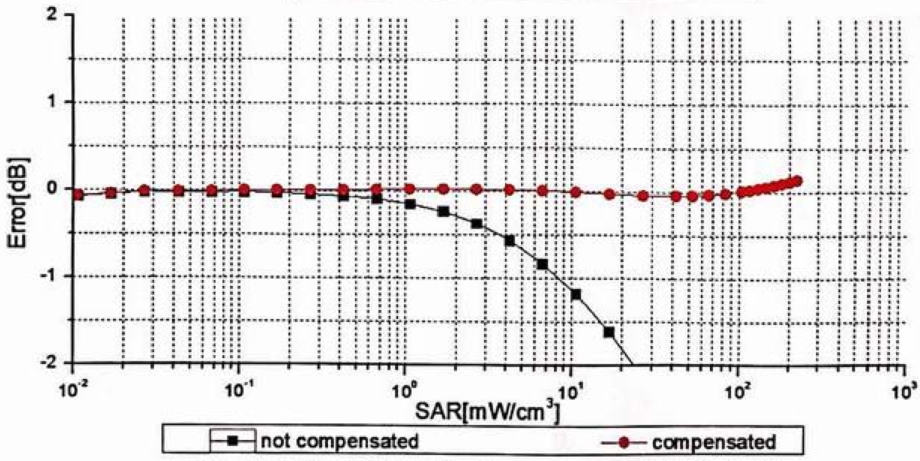
Dynamic Range f(SAR$_{head}$)
(TEM cell, f = 900 MHz)





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

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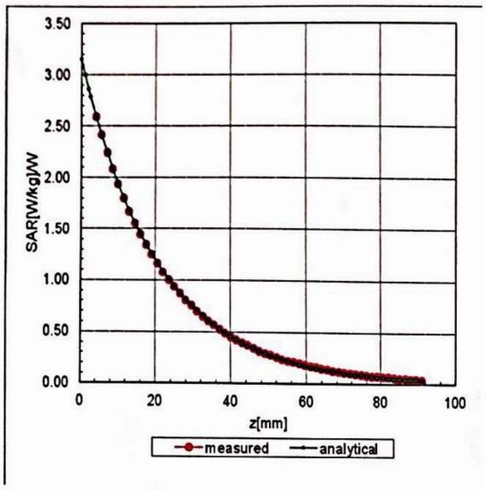
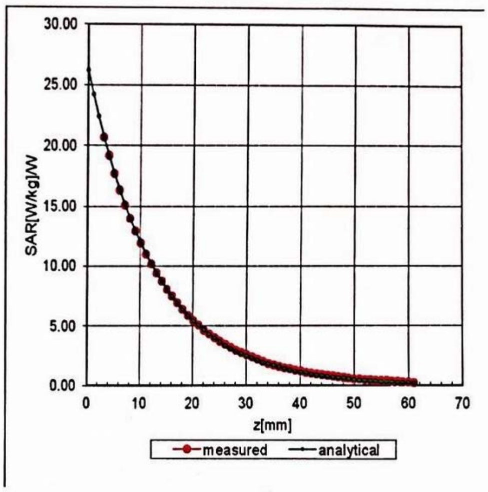
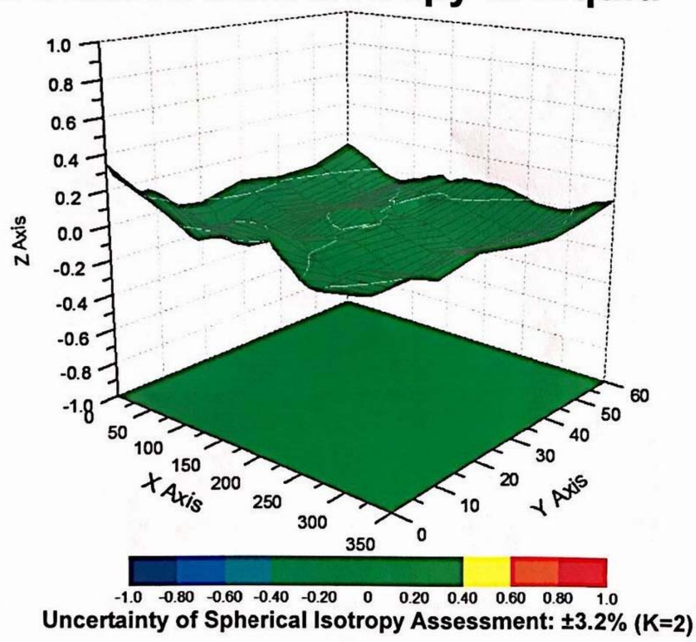
Conversion Factor Assessment

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





Deviation from Isotropy in Liquid



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

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	117.9
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

ANNEX E: D2450V2 Dipole Calibration Certificate

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国际互认
校准
CALIBRATION
CNAS L0570

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Client TA(Shanghai) Certificate No: Z17-97116

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 786

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

Calibration date: August 29, 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 NRVD	102083	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Power sensor NRV-Z5	100595	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Reference Probe EX3DV4	SN 3617	23-Jan-17(SPEAG,No.EX3-3617_Jan17)	Jan-18
DAE4	SN 1331	19-Jan-17(CTTL-SPEAG,No.Z17-97015)	Jan-18
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

	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 1, 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, "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	52.10.0.1446
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.7 ± 6 %	1.82 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**52.6 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.16 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.5 ± 6 %	1.94 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	12.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**50.8 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.87 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.5 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	53.4Ω+ 4.29jΩ
Return Loss	- 25.5dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.0Ω+ 6.61jΩ
Return Loss	- 23.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.265 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: 08.29.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

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

Medium parameters used: f = 2450 MHz; σ = 1.822 S/m; εr = 39.65; ρ = 1000 kg/m3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.74, 7.74, 7.74); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

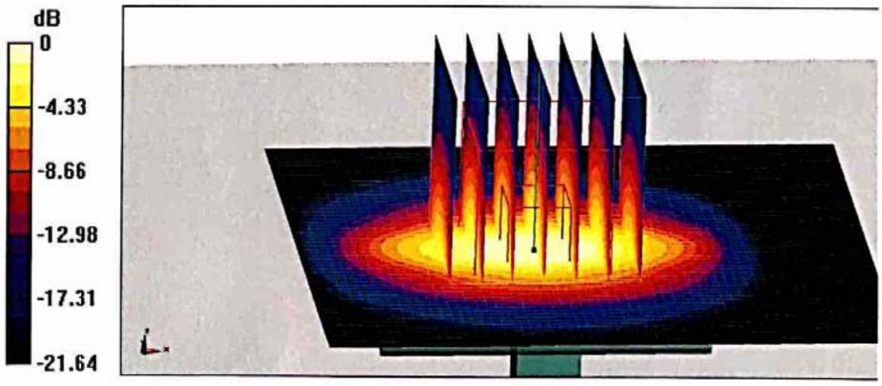
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.1 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.16 W/kg

Maximum value of SAR (measured) = 22.2 W/kg



0 dB = 22.2 W/kg = 13.46 dBW/kg

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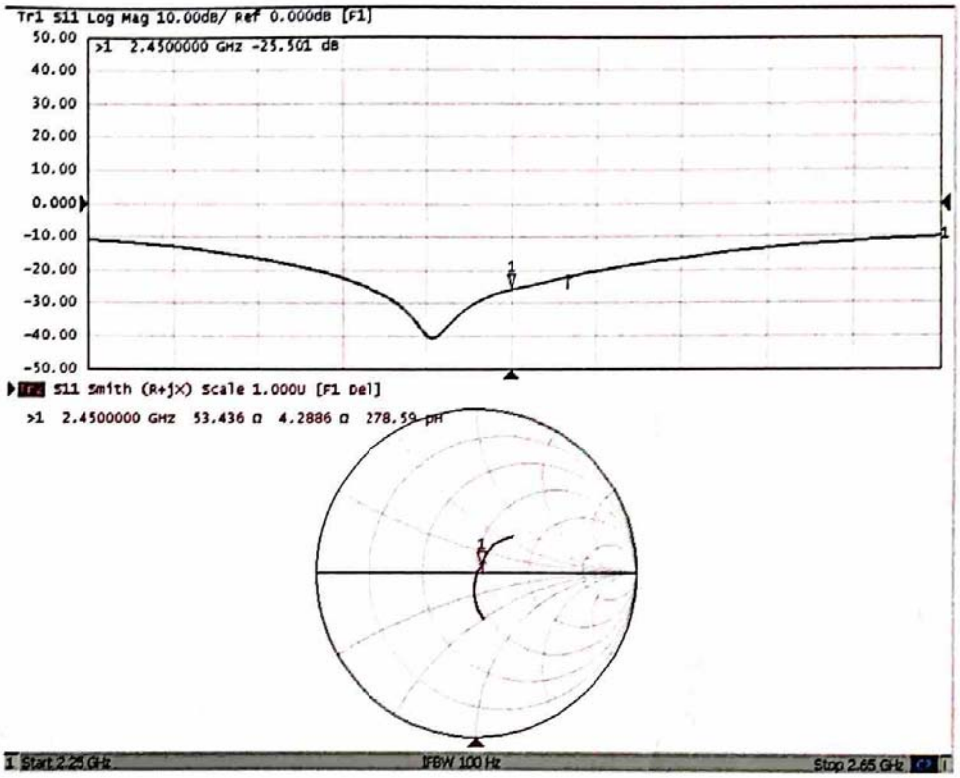
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 08.29.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

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

Medium parameters used: f = 2450 MHz; σ = 1.943 S/m; ε_r = 52.45; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.8, 7.8, 7.8); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

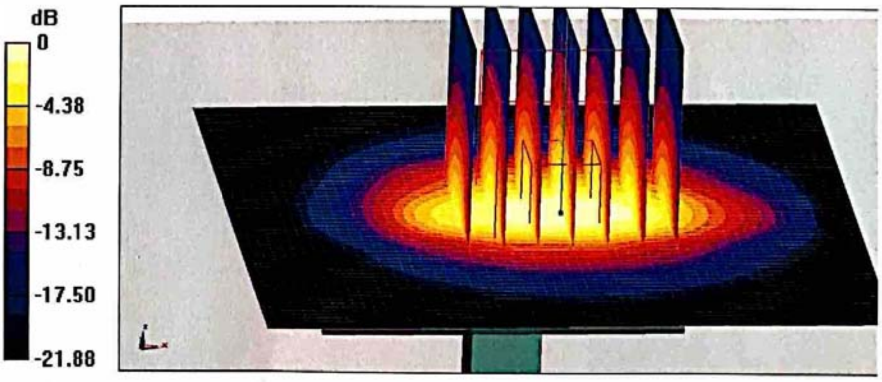
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.28 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 27.0 W/kg

SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.87 W/kg

Maximum value of SAR (measured) = 21.5 W/kg



0 dB = 21.5 W/kg = 13.32 dBW/kg