

SAR TEST REPORT

For

Product Name: C2

Brand Name: DJI

Model No.: RC1A

Series Model: N/A

Test Report Number:
C180628S01-SF

Issued for

SZ DJI TECHNOLOGY CO., LTD

14th floor, West Wing, Skyworth Semiconductor Design Building NO.18 Gaoxin South 4th Ave,
Nanshan District, Shenzhen, China

Issued by

Compliance Certification Services Inc.

Kun shan Laboratory

No.10 Weiye Rd., Innovation park, Eco&Tec,
Development Zone, Kunshan City, Jiangsu, China

TEL: 86-512-57355888

FAX: 86-512-57370818



TESTING CERT #2541.01

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Revision History

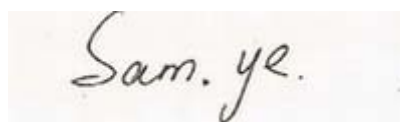
Revision	REPORT NO.	Date	Page Revised	Contents
Original	C180628S01-SF	July 17, 2018	N/A	N/A
01	C180628S01-SF	July 18, 2018	ALL	Add some test configurations
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1. CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

Product Name:	C2
Brand Name:	DJI
Model Name.:	RC1A
Series Model:	N/A
Device Category:	PORTABLE DEVICES
Exposure Category:	GENERAL POPULATION/UNCONTROLLED EXPOSURE
Date of Test:	June 22, 2018 and July 17, 2018 and July 20, 2018
Applicant:	SZ DJI TECHNOLOGY CO., LTD 14th floor, West Wing, Skyworth Semiconductor Design Building NO.18 Gaoxin South 4th Ave, Nanshan District, Shenzhen, China
Manufacturer:	SZ DJI TECHNOLOGY CO., LTD 14th floor, West Wing, Skyworth Semiconductor Design Building NO.18 Gaoxin South 4th Ave, Nanshan District, Shenzhen, China
Application Type:	Certification
APPLICABLE STANDARDS AND TEST PROCEDURES	
STANDARDS AND TEST PROCEDURES	TEST RESULT
ANSI/IEEE C95.1-2005 RSS-102 issue 5	No non-compliance noted
Deviation from Applicable Standard	
None	
The device was tested by Compliance Certification Services Inc. in accordance with the measurement methods and procedures specified in KDB 865664; RSS-102 issue 5. The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.	

Approved by:Jeff.fang
RF Manager
Compliance Certification Services Inc.**Tested by:**Sam.ye
Test Engineer
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product Name:	C2
Brand Name:	DJI
Model Name.:	RC1A
Series Model:	N/A
FCC ID:	SS3-RC1A1805
IC ID:	11805A-RC1A1805
Software version	V1.0
Hardware version	V01.00.00
Device Category:	Production unit
Frequency Range:	2.4GHz: 1.4MHz BW: 2403.5MHz ~ 2477.5MHz 10MHz BW: 2405.5MHz to 2477.5MHz 20MHz BW: 2410.5MHz to 2472.5MHz 5GHz: 1.4M BW: 5728.5MHz ~ 5846.5MHz; 10M BW: 5730.5MHz ~ 5844.5MHz; 20M BW: 5735.5MHz ~ 5839.5MHz
Modulation Technique:	1.4MHz BW: OFDM 10MHz BW: OFDM 20MHz BW: OFDM
Antenna Specification:	PCB Antenna
Antenna Gain:	2.4GHz:5dBi 5GHz:4dBi
Accessories:	Battery (rating): Capacitance: 3950mAh,3.83V
Operating Mode:	Maximum continuous output

2.1 MAXIMUM RF OUTPUT POWER WITH TEST CHANNEL

Band / Mode	Frequency	SISO Tune-up Power (dBm)
2.4GHz 1.4M	2403.5	21
	2441.5	21
	2477.5	21.5
2.4GHz 10M	2405.5	11
	2441.5	18
	2477.5	-11
2.4GHz 20M	2410.5	5
	2441.5	18
	2472.5	-6
5GHz 1.4M	5728.5	22
	5787.5	22
	5846.5	21
5GHz 10M	5730.5	22
	5787.5	22
	5844.5	22.5
5GHz 20M	5735.5	22
	5787.5	22
	5839.5	22

2.2 STATEMENT OF COMPLIANCE

The maximum results of Specific Absorption Rate (SAR) found during testing for **SZ DJI TECHNOLOGY CO., LTD, RC1A**, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary
		Hand-held 10g Extremity SAR (W/kg)
DTS	2.4GHz	2.55
NII	5.8GHz	2.07

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits 4.0W/kg for 10g Extremity SAR specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.

3. REQUIREMENTS FOR COMPLIANCE TESTING DEFINED BY THE FCC OR IC

The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 W/Kg for an uncontrolled environment and 8.0 W/Kg for an occupational/controlled environment as recommended by the FCC 47 CFR Part 2 (2.1093) ; RSS102 issue 5.

4. TEST METHODOLOGY

The Specific Absorption Rate (SAR) testing specification, method and procedure for this device is in accordance with the following standards:

- ☒ FCC 47 CFR Part 2 (2.1093)
- ☒ ANSI/IEEE C95.1-2005
- ☒ RSS-102 issue 5
- ☒ IEEE 1528-2013
- ☒ KDB 447498 D01v06 General RF Exposure Guidance
- ☒ KDB 865664 D01v01r04 Measurement 100 MHz to 6 GHz
- ☒ KDB 865664 D02 v01r02 RF Exposure Reporting

5. TEST CONFIGURATION

Duty cycle Form

Band	Mode	Duty cycle(100%)
2.4GHz	1.4M	100
	10M	100
	20M	100
5GHz	1.4M	100
	10M	100
	20M	100

6. DOSIMETRIC ASSESSMENT SETUP

These measurements were performed with the automated near-field scanning system DASY 5 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than ± 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the E-field PROBE EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [7] with accuracy of better than $\pm 10\%$. The spherical isotropy was evaluated with the procedure described in [8] and found to be better than ± 0.25 dB. IEEE1528 and CENELEC IEC 62209.

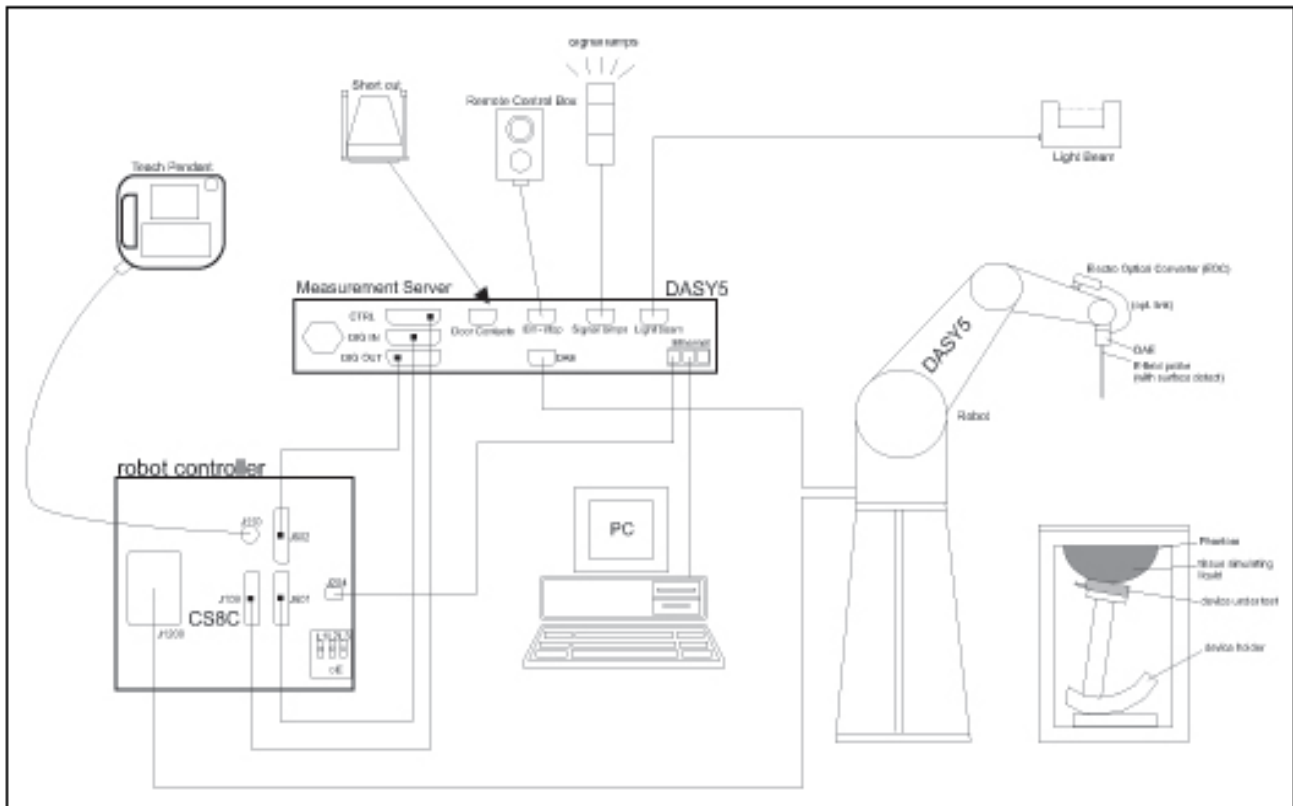
The following table gives the recipes for tissue simulating liquids.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

6.1 MEASUREMENT SYSTEM DIAGRAM



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

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected 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.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASYS software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.

6.2 SYSTEM COMPONENTS



The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV celeron, 128MB chip-disk and 128 MB RAM. The necessary circuits for communication with either the DAE4(or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY5 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.



The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server. Calibration: No calibration required.

Data Acquisition Electronics (DAE)



The data acquisition electronics (DAE4) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE4 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

EX3DV4 Isotropic E-Field Probe for Dosimetric Measurements



Construction: Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration: Basic Broad Band Calibration in air: 10-3000 MHz.
Conversion Factors (CF) for HSL 900 and HSL 1800
CF-Calibration for other liquids and frequencies upon request.

Frequency: 10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)

Directivity: ± 0.3 dB in HSL (rotation around probe axis)
 ± 0.5 dB in HSL (rotation normal to probe axis)

Dynamic Range: 10 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
(noise: typically < 1 μ W/g)

Dimensions: Overall length: 337 mm (Tip: 9 mm)
Tip diameter: 2.5 mm (Body: 10 mm)
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%.



Interior of probe

SAM Twin Phantom

Construction:

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50360 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.



Shell Thickness: 2 ± 0.2 mm

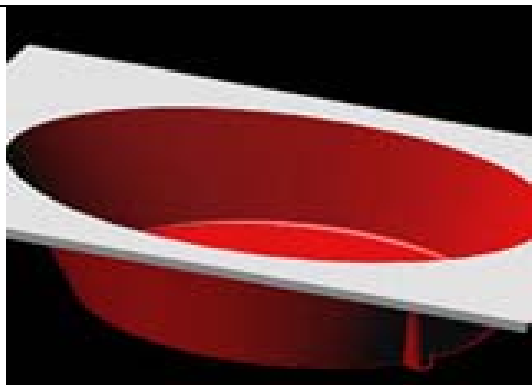
Filling Volume: Approx. 25 liters

Dimensions: Height: 850mm; Length: 1000mm; Width: 750mm

SAM Phantom (ELI4 v4.0)

Description Construction:

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4/DASY5.5 and higher and is compatible with all SPEAG dosimetric probes and dipoles



Shell Thickness: 2.0 ± 0.2 mm (sagging: <1%)

Filling Volume: Approx. 25 liters

Dimensions: Major ellipse axis: 600 mm

Minor axis: 400 mm 500mm

Device Holder for SAM Twin Phantom

Construction: In combination with the Twin SAM Phantom, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).

**System Validation Kits for SAM Twin Phantom**

Construction: Symmetrical dipole with 1/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

Frequency: 900, 1800, 2450, 5800 MHz

ReTune loss: > 20 dB at specified validation position

Power capability: > 100 W ($f < 1\text{GHz}$); > 40 W ($f > 1\text{GHz}$)

Dimensions:

D835V2: dipole length: 161 mm; overall height: 340 mm

D1800V2: dipole length: 72.5 mm; overall height: 300 mm

D1900V2: dipole length: 67.7 mm; overall height: 300 mm

D2450V2: dipole length: 51.5 mm; overall height: 290 mm

D5GHzV2: dipole length: 20.6 mm; overall height: 300mm

**System Validation Kits for ELI4 phantom**

Construction: Symmetrical dipole with 1/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

Frequency: 900, 1800, 2450, 5800 MHz

ReTune loss: > 20 dB at specified validation position

Power capability: > 100 W ($f < 1\text{GHz}$); > 40 W ($f > 1\text{GHz}$)

Dimensions:

D835V2: dipole length: 161 mm; overall height: 340 mm

D1800V2: dipole length: 72.5 mm; overall height: 300 mm

D1900V2: dipole length: 67.7 mm; overall height: 300 mm

D2450V2: dipole length: 51.5 mm; overall height: 290 mm

D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm



7. EVALUATION PROCEDURES

DATA EVALUATION

The DASY 5 post processing software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i, a_{i0}, a_{i1}, a_{i2}$
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcp_i
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or be imported into the software from the configuration files issued for the DASY 5 components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

with	V_i	= Compensated signal of channel i (i = x, y, z)
	U_i	= Input signal of channel i (i = x, y, z)
	cf	= Crest factor of exciting field (DASY 5 parameter)
	dcp_i	= Diode compression point (DASY 5 parameter)

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

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes:

$$H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

with	V_i	= Compensated signal of channel i (i = x, y, z)
	$Norm_i$	= Sensor sensitivity of channel i (i = x, y, z) $\mu V/(V/m)^2$ for E0field Probes
	$ConvF$	= Sensitivity enhancement in solution
	a_{ij}	= Sensor sensitivity factors for H-field probes
	f	= Carrier frequency (GHz)
	E_i	= Electric field strength of channel i in V/m
	H_i	= Magnetic field strength of channel i in A/m

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

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

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with SAR = local specific absorption rate in mW/g
 E_{tot} = total field strength in V/m
 σ = conductivity in [mho/m] or [Siemens/m]
 ρ = equivalent tissue density in g/cm³

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

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

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

with P_{pwe} = Equivalent power density of a plane wave in mW/cm²
 E_{tot} = total electric field strength in V/m
 H_{tot} = total magnetic field strength in A/m

SAR EVALUATION PROCEDURES

The procedure for assessing the peak spatial-average SAR value consists of the following steps:

- **Power Reference Measurement**

The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

- **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 finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY 5 software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, grid was at to 15 mm by 15 mm and can be edited by a user.

- **Zoom Scan**

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default zoom scan measures 5 x 5 x 7 points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more than one maximum, the number of Zoom Scans has to be enlarged accordingly (The default number inserted is 1).

- **Power Drift measurement**

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have DASY 5 software stop the measurements if this limit is exceeded.

- **Z-Scan**

The Z Scan job measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. A user can anchor the grid to the current probe location. As with any other grids, the local Z-axis of the anchor location establishes the Z-axis of the grid.

SPATIAL PEAK SAR EVALUATION

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard. It can be conducted for 1 g and 10 g.

The DASY 5 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maximum searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.

Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 5x5x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1 g and 10 g cubes.

Boundary effect

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosimetric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$S \approx S_o + S_b \exp\left(-\frac{z}{a}\right) \cos\left(\pi \frac{z}{\lambda}\right)$$

Since the decay of the boundary effect dominates for small probes ($a \ll \lambda$), the cos-term can be omitted. Factors S_b (parameter Alpha in the DASY 5 software) and a (parameter Delta in the DASY 5 software) are assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- the boundary curvature is small
- the probe axis is angled less than 30° to the boundary normal
- the distance between probe and boundary is larger than 25% of the probe diameter
- the probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY 5 system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during post processing.

8. MEASUREMENT UNCERTAINTY

Measurement uncertainty for 30 MHz to 3 GHz averaged

Uncertainty Component	Uncertainty	Prob.	Div.	$C_i(1g)$	Std. Unc. (1-g)	V_i or V_{eff}
Measurement System						
Probe Calibration ($k=1$)	5.50	Normal	1	1	5.50	∞
Axial Isotropy	4.70	Rectangular	$\sqrt{3}$	0.7	1.90	∞
Hemispherical Isotropy	9.60	Rectangular	$\sqrt{3}$	0.7	3.88	∞
Modulation Response	2.40	Rectangular	$\sqrt{3}$	1	1.39	∞
Boundary Effect	1.00	Rectangular	$\sqrt{3}$	1	0.58	∞
Linearity	4.70	Rectangular	$\sqrt{3}$	1	2.71	∞
System Detection Limit	1.00	Rectangular	$\sqrt{3}$	1	0.58	∞
Readout Electronics	0.30	Normal	1	1	0.30	∞
Response Time	0.80	Rectangular	$\sqrt{3}$	1	0.46	∞
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1.50	∞
RF Ambient Noise	3.00	Rectangular	$\sqrt{3}$	1	1.73	∞
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1.73	∞
Probe Positioner	0.40	Rectangular	$\sqrt{3}$	1	0.23	∞
Probe Positioning	2.90	Rectangular	$\sqrt{3}$	1	1.67	∞
Max. SAR Evaluation	2.00	Rectangular	$\sqrt{3}$	1	1.15	∞
Test sample Related						
Test sample Positioning	2.9	Normal	1	1	2.9	145
Device Holder Uncertainty	3.6	Normal	1	1	3.6	5
Power drift	5	Rectangular	$\sqrt{3}$	1	2.89	∞
Power Scaling	0	Rectangular	$\sqrt{3}$	1	0.00	∞
Phantom and Tissue Parameters						
Phantom Uncertainty	6.1	Rectangular	$\sqrt{3}$	1	3.52	∞
SAR correction	1.9	Rectangular	$\sqrt{3}$	1	1.10	∞
Liquid Conductivity (target)	5	Rectangular	$\sqrt{3}$	0.64	1.85	∞
Liquid Conductivity (meas)	-2.77	Rectangular	$\sqrt{3}$	0.78	-1.25	∞
Liquid Permittivity (target)	5	Rectangular	$\sqrt{3}$	0.6	1.73	∞
Liquid Permittivity (meas)	-4.64	Rectangular	$\sqrt{3}$	0.26	-0.70	∞
Temp. unc. - Conductivity	3.4	Rectangular	$\sqrt{3}$	0.78	1.53	∞
Temp. unc. - Permittivity	0.4	Rectangular	$\sqrt{3}$	0.23	0.05	∞
Combined Std. Uncertainty		RSS			11.21	361
Expanded STD Uncertainty		$k=2$			22.42%	
Expanded STD Uncertainty		$k=2$			1.76dB	

Measurement uncertainty for 3 GHz to 6 GHz averaged

Uncertainty Component	Uncertainty	Prob.	Div.	$C_i (1g)$	Std. Unc. (1-g)	V_i or V_{eff}
Measurement System						
Probe Calibration ($k=1$)	6.55	Normal	1	1	6.55	∞
Axial Isotropy	4.70	Rectangular	$\sqrt{3}$	0.7	1.90	∞
Hemispherical Isotropy	9.60	Rectangular	$\sqrt{3}$	0.7	3.88	∞
Modulation Response	2.40	Rectangular	$\sqrt{3}$	1	1.39	∞
Boundary Effect	2.00	Rectangular	$\sqrt{3}$	1	1.15	∞
Linearity	4.70	Rectangular	$\sqrt{3}$	1	2.71	∞
System Detection Limit	1.00	Rectangular	$\sqrt{3}$	1	0.58	∞
Readout Electronics	0.30	Normal	1	1	0.30	∞
Response Time	0.80	Rectangular	$\sqrt{3}$	1	0.46	∞
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1.50	∞
RF Ambient Noise	3.00	Rectangular	$\sqrt{3}$	1	1.73	∞
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1.73	∞
Probe Positioner	0.80	Rectangular	$\sqrt{3}$	1	0.46	∞
Probe Positioning	6.70	Rectangular	$\sqrt{3}$	1	3.87	∞
Max. SAR Evaluation	4.00	Rectangular	$\sqrt{3}$	1	2.31	∞
Test sample Related						
Test sample Positioning	2.9	Normal	1	1	2.9	145
Device Holder Uncertainty	3.6	Normal	1	1	3.6	5
Power drift	5	Rectangular	$\sqrt{3}$	1	2.89	∞
Power Scaling	0	Rectangular	$\sqrt{3}$	1	0.00	∞
Phantom and Tissue Parameters						
Phantom Uncertainty	4	Rectangular	$\sqrt{3}$	1	2.31	∞
SAR correction	1.9	Rectangular	$\sqrt{3}$	1	1.10	∞
Liquid Conductivity (target)	5	Rectangular	$\sqrt{3}$	0.64	1.85	∞
Liquid Conductivity (meas)	3.47	Rectangular	$\sqrt{3}$	0.78	1.56	∞
Liquid Permittivity (target)	5	Rectangular	$\sqrt{3}$	0.6	1.73	∞
Liquid Permittivity (meas)	-1.3	Rectangular	$\sqrt{3}$	0.26	-0.20	∞
Temp. unc. - Conductivity	3.4	Rectangular	$\sqrt{3}$	0.78	1.53	∞
Temp. unc. - Permittivity	0.4	Rectangular	$\sqrt{3}$	0.23	0.05	∞
Combined Std. Uncertainty		RSS			12.21	748
Expanded STD Uncertainty		$k=2$				24.42%
Expanded STD Uncertainty		$k=2$				1.90dB

9. EXPOSURE LIMIT

(A). Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

(B). Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Note: **Whole-Body SAR** is averaged over the entire body, **partial-body SAR** is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. **SAR for hands, wrists, feet and ankles** is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

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

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

NOTE
GENERAL POPULATION/UNCONTROLLED EXPOSURE
PARTIAL BODY LIMIT
1.6 W/kg
Hands, Wrists, Feet and Ankles LIMIT
4.0 W/kg

10. MEASUREMENT RESULTS

10.1 TEST LIQUIDS CONFIRMATION

SIMULATED TISSUE LIQUID PARAMETER CONFIRMATION

The dielectric parameters were checked prior to assessment using the SPEAG DAK3.5 dielectric probe kit. The dielectric parameters measured are reported in each correspondent section.

IEEE SCC-34/SC-2 P1528 RECOMMENDED TISSUE DIELECTRIC PARAMETERS

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in P1528

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(ϵ_r = relative permittivity, σ = conductivity and $\rho = 1000 \text{ kg/m}^3$)

10.2 LIQUID MEASUREMENT RESULTS

The following table show the measuring results for simulating liquid:

Liquid Type	Liquid Temp. (°C)	Parameters	Target	Measured	Deviation (%)	Limited (%)	Measured Date
Body2450	21.5	Permittivity(ϵ)	52.70	51.66	-1.97	± 5	2018/6/22
		Conductivity(σ)	1.95	1.90	-2.77	± 5	
Body5800	21.5	Permittivity(ϵ)	48.20	47.57	-1.30	± 5	2018/6/22
		Conductivity(σ)	6.00	6.21	3.47	± 5	
Body2450	21.5	Permittivity(ϵ)	52.70	50.26	-4.64	± 5	2018/7/17
		Conductivity(σ)	1.95	1.92	-1.74	± 5	
Body5800	21.5	Permittivity(ϵ)	48.20	48.25	0.10	± 5	2018/7/17
		Conductivity(σ)	6.00	6.04	0.67	± 5	
Body2450	21.5	Permittivity(ϵ)	52.70	50.26	-4.62	± 5	2018/7/19
		Conductivity(σ)	1.95	1.92	-1.49	± 5	
Body5800	21.5	Permittivity(ϵ)	48.20	48.27	0.15	± 5	2018/7/19
		Conductivity(σ)	6.00	6.03	0.50	± 5	

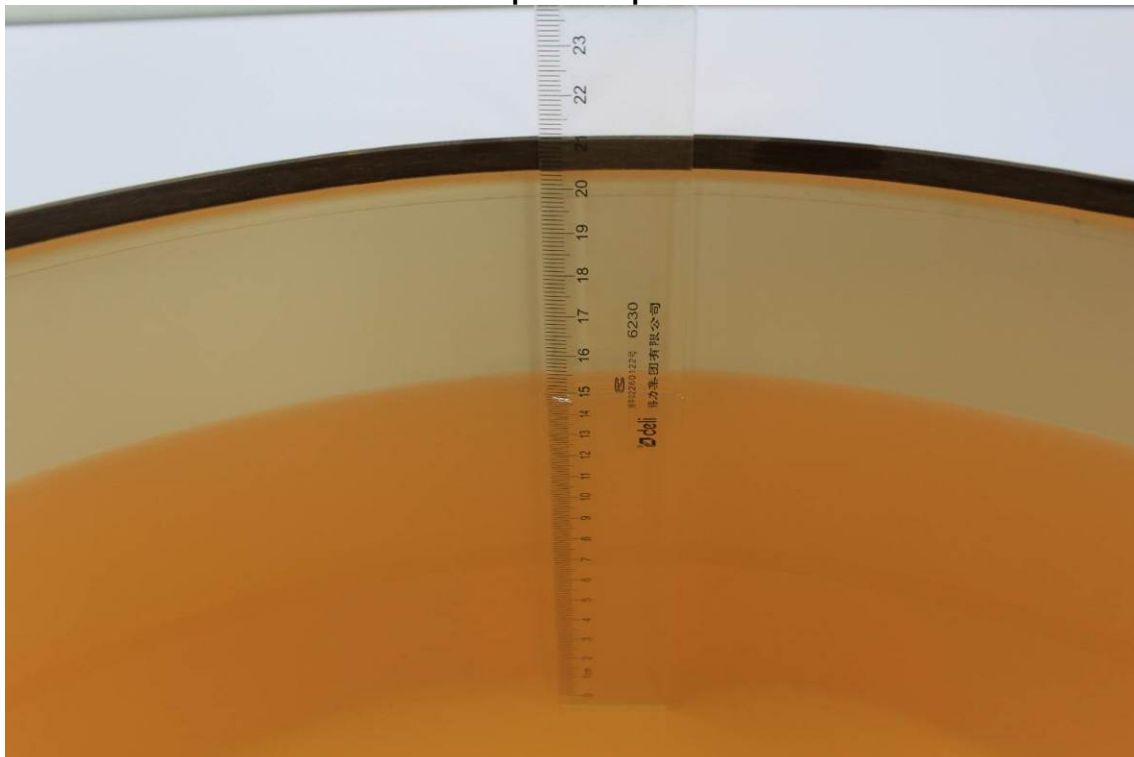
10.3 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of $\pm 10\%$. The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

SYSTEM PERFORMANCE CHECK MEASUREMENT CONDITIONS

- The measurements were performed in the flat section of the SAM twin phantom filled with head and body simulating liquid of the following parameters.
- The DASY5 system with an E-field probe EX3DV4 SN: 3798 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15cm (above 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 10mm was aligned with the dipole.
- Special 7x7x7 fine cube was chosen for cube integration ($dx=5\text{ mm}$, $dy=5\text{ mm}$, $dz=5\text{ mm}$).
- Distance between probe sensors and phantom surface was set to 2 mm.
- The dipole less than 3G input power was $250\text{mW} \pm 3\%$.
- The dipole above than 3G input power was $100\text{mW} \pm 3\%$.
- The results are normalized to 1 W input power.

Depth of Liquid



- Note: For SAR testing, the depth is 15cm shown above

SYSTEM PERFORMANCE CHECK RESULTS

Liquid Type	Ambient Temp. (°C)	Liquid Temp. (°C)	Input Power (W)	Measured SAR10g (W/Kg)	1W Target SAR10g(W/Kg)	1W Normalized SAR10g(W/Kg)	Deviation (%)	Limit (%)	Date
Body2450	22	21.5	0.25	5.99	24.40	23.96	-1.80	± 10	2018/6/22
Body5800	22	21.5	0.1	2.27	21.80	22.7	4.13	± 10	2018/6/22
Body2450	22	21.5	0.25	5.85	24.40	23.40	-4.10	± 10	2018/7/17
Body5800	22	21.5	0.1	2.15	21.80	21.5	-1.38	± 10	2018/7/17
Body2450	22	21.5	0.25	5.79	24.40	23.16	-5.08	± 10	2018/7/19
Body5800	22	21.5	0.1	2.10	21.80	21	-3.67	± 10	2018/7/19

10.4 EUT TUNE-UP PROCEDURES AND TEST MODE

Conducted output power(dBm):

General Note:

- 1 Power must be measured at each transmit antenna port according to the DSSS and OFDM transmission configurations in each standalone and aggregated frequency band.
- 2 Power measurement is required for the transmission mode configuration with the highest maximum output power specified for production units.
 - 1) When the same highest maximum output power specification applies to multiple transmission modes, the largest channel bandwidth configuration with the lowest order modulation and lowest data rate is measured.
 - 2) When the same highest maximum output power is specified for multiple largest channel bandwidth configurations with the same lowest order modulation or lowest order modulation and lowest data rate, power measurement is required for all equivalent 802.11 configurations with the same maximum output power.
- 3 For each transmission mode configuration, power must be measured for the highest and lowest channels; and at the mid-band channel(s) when there are at least 3 channels. For configurations with multiple mid-band channels, due to an even number of channels, both channels should be measured.

2.4GHz

Band	Mode	Frequency (MHZ)	Target power(dBm)	Tune up tolerance (dBm)	Maximum Tune up power (dBm)	Average power (dBm)
2.4GHz	1.4M	2403.5	20	±1	21	20.76
		2441.5	20	±1	21	20.26
		2477.5	20.5	±1	21.5	21.35
2.4GHz	10M	2405.5	10	±1	11	10.80
		2441.5	17	±1	18	17.62
		2477.5	-12	±1	-11	-11.16
2.4GHz	20M	2410.5	4	±1	5	4.43
		2441.5	17	±1	18	17.99
		2472.5	-7	±1	-6	-6.06

5GHz

Band	Mode	Frequency (MHZ)	Target power(dBm)	Tune up tolerance (dBm)	Maximum Tune up power (dBm)	Average power (dBm)
5GHz	1.4M	5728.5	21	±1	22	21.52
		5787.5	21	±1	22	21.60
		5846.5	20	±1	21	20.83
5GHz	10M	5730.5	21	±1	22	21.49
		5787.5	21	±1	22	21.09
		5844.5	21.5	±1	22.5	21.76
5GHz	20M	5735.5	21	±1	22	21.42
		5787.5	21	±1	22	21.18
		5839.5	21	±1	22	21.11

10.5 SAR TEST CONFIGURATIONS

This EUT tests shall be performed if applicable in both the horizontal and vertical positions relative to the phantom, and with the antenna oriented away from the body of the DUT (Figure1) and/or with the antenna extended and retracted such as to obtain the highest exposure condition.

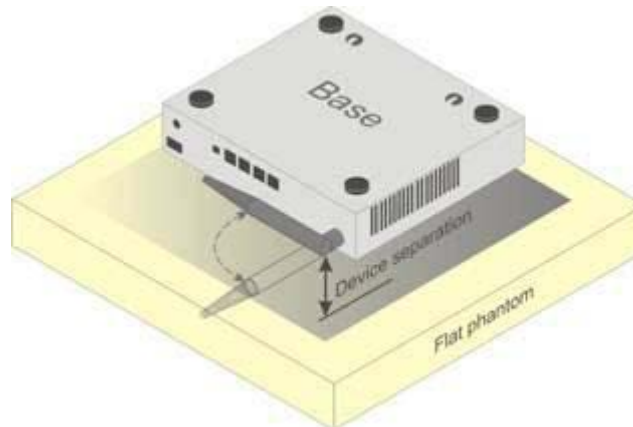


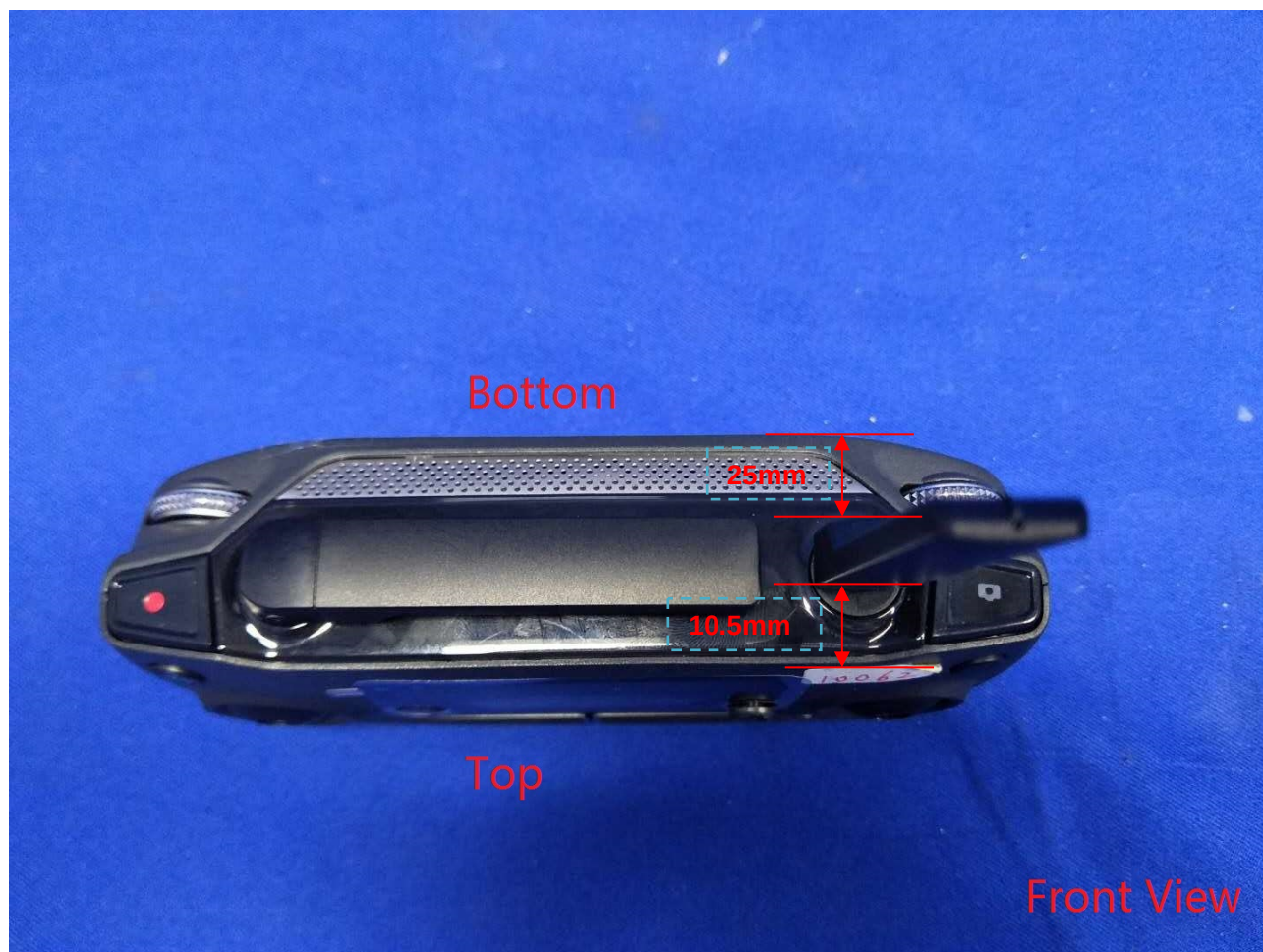
Figure1 – Device with swivel antenna

Test Distance for SAR Evaluation

For Hand-held mode(10g Extremity SAR) the EUT is set directly against the phantom and the test distance is 0mm.

10.6 ANTENNA LOCATION





Device dimensions for EUT (H x W): 148x 78 mm

Antennas	Wireless Interface
Antenna	2.4GHz 5.8GHz

Test Mode

2.4GHz	Data transmission mode 1.4M
5GHz	Data transmission mode 10M

10.7 BODY TEST EXCLUSION THRESHOLDS

The following SAR test exclusion Thresholds based on KDB 447498 D01 General RF Exposure Guidance v06) 4.3.1)

Exposure Position	Wireless Interface	DTS 2.4GHz	NII 5GHz
	Maximum power(dBm)	21.5	22.5
	Maximum rated power(mW)	141.25	177.83
Front	Antenna to user (mm)	0	0
	SAR exclusion threshold	0	0
	SAR testing required	Yes	Yes
Rear	Antenna to user (mm)	70	70
	SAR exclusion threshold	296.00	262.28
	SAR testing required	No	No
Right	Antenna to user (mm)	105	105
	SAR exclusion threshold	646.00	612.28
	SAR testing required	No	No
Left	Antenna to user (mm)	28	28
	SAR exclusion threshold	53.76	34.92
	SAR testing required	Yes	Yes
Top	Antenna to user (mm)	8	8
	SAR exclusion threshold	15.36	9.98
	SAR testing required	Yes	Yes
Bottom	Antenna to user (mm)	24	24
	SAR exclusion threshold	46.08	29.93
	SAR testing required	Yes	Yes

Note:

- Maximum power is the source-based time-average power and represents the maximum RF output power among production units
- Per KDB 447498 D01, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
- Per KDB 447498 D01, standalone SAR test exclusion threshold is applied; If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold
- Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

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

$$f(\text{GHz}) \text{ is the RF channel transmit frequency in GHz}$$

Power and distance are rounded to the nearest mW and mm before calculation
The result is rounded to one decimal place for comparison
For < 50 mm distance, we just calculate mW of the exclusion threshold value (3.0) to do compare.
This formula is $[3.0] / [\sqrt{f(\text{GHz})}] \cdot [(\text{min. test separation distance, mm})] = \text{exclusion threshold of mW.}$
- Per KDB 447498 D01, at 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following
a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm) · (f(MHz)/150)] mW, at 100 MHz to 1500 MHz
b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm) · 10] mW at > 1500 MHz and ≤ 6 GHz
- When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

The following SAR test exclusion Thresholds based on RSS-102 issue5 2.5.1

Exposure Position	Wireless Interface	DTS 2.4GHz	NII 5GHz
	Maximum EIRP power(dBm)	26.5	26.5
	Maximum EIRP power(mW)	446.68	446.68
Front	Antenna to user (mm)	0	0
	SAR exclusion threshold	10	2.5
	SAR testing required	Yes	Yes
Rear	Antenna to user (mm)	70	70
	SAR exclusion threshold	772.5	265
	SAR testing required	NO	Yes
Right	Antenna to user (mm)	105	105
	SAR exclusion threshold	772.5	265
	SAR testing required	NO	Yes
Left	Antenna to user (mm)	28	28
	SAR exclusion threshold	130	102.5
	SAR testing required	Yes	Yes
Top	Antenna to user (mm)	8	8
	SAR exclusion threshold	10	2.5
	SAR testing required	Yes	Yes
Bottom	Antenna to user (mm)	24	24
	SAR exclusion threshold	75	67.5
	SAR testing required	Yes	Yes

Note:

1. SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1
2. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5.

10.8 SAR MEASUREMENT RESULTS

Note:

- Per KDB 447498 D01, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
- Per KDB 447498 D01, for each exposure position, if the highest output channel reported SAR ≤ 0.8 W/kg, other channels SAR testing is not necessary.
- Per KDB 447498 D01, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

2.4GHz Standalone SAR Results for Test Records

Hand-held mode

Band	Mode	Test Position	Dist. (mm)	Freq. (MHZ)	max Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Duty Cycle Scaling Factor	SAR10g (W/kg)	Scaled SAR10g (W/kg)
2.4Ghz	1.4M	Front	0	2403.5	20.76	21	1.057	0.07	1	2.41	2.547
2.4Ghz	1.4M	Front	0	2441.5	20.26	21	1.186	0.18	1	1.84	2.182
2.4Ghz	1.4M	Front	0	2477.5	21.35	21.5	1.035	0.17	1	2.43	2.515
2.4Ghz	1.4M	Top	0	2477.5	21.35	21.5	1.035	-0.11	1	0.899	0.931
2.4Ghz	1.4M	Top to ANT H	0	2477.5	21.35	21.5	1.035	0.05	1	1.85	1.915
2.4Ghz	1.4M	Tip	0	2477.5	21.35	21.5	1.035	0.11	1	0.379	0.392
2.4Ghz	1.4M	Bottom	0	2477.5	21.35	21.5	1.035	-0.07	1	0.174	0.180
2.4Ghz	1.4M	Bottom to ANT H	0	2477.5	21.35	21.5	1.035	0.11	1	0.129	0.134
2.4Ghz	1.4M	Bottom to ANT V	0	2477.5	21.35	21.5	1.035	0.16	1	0.327	0.338
2.4Ghz	1.4M	Left	0	2477.5	21.35	21.5	1.035	0.11	1	0.174	0.180

Repeated SAR Test Records for 2.4GHz

Hand-held mode

Band	Mode	Test Position	Dist. (mm)	Freq. (MHZ)	max Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Duty Cycle Scaling Factor	SAR10g (W/kg)	Scaled SAR10g (W/kg)
2.4Ghz	1.4M	Front	0	2477.5	21.35	21.5	1.035	0.17	1	2.43	2.515

5GHz Standalone SAR Results for Test Records
Hand-held mode

Band	Mode	Test Position	Dist. (mm)	Freq. (MHZ)	max Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Duty Cycle Scaling Factor	SAR10g (W/kg)	Scaled SAR10g (W/kg)
5Ghz	10M	Front	0	5730.5	21.49	22	1.125	-0.08	1	1.22	1.372
5Ghz	10M	Front	0	5787.5	21.09	22	1.233	-0.03	1	1.67	2.059
5Ghz	10M	Front	0	5844.5	21.76	22.5	1.186	-0.01	1	1.65	1.957
5Ghz	10M	Top	0	5844.5	21.76	22.5	1.186	-0.07	1	0.430	0.510
5Ghz	10M	Top to ANT H	0	5844.5	21.76	22.5	1.186	-0.12	1	1.22	1.447
5Ghz	10M	Tip	0	5844.5	21.76	22.5	1.186	0.02	1	0.278	0.330
5Ghz	10M	Bottom	0	5844.5	21.76	22.5	1.186	0.09	1	0.042	0.050
5Ghz	10M	Bottom to ANT H	0	5844.5	21.76	22.5	1.186	0.09	1	0.129	0.153
5Ghz	10M	Bottom to ANT V	0	5844.5	21.76	22.5	1.186	-0.15	1	0.248	0.294
5Ghz	10M	Left	0	5844.5	21.76	22.5	1.186	-0.08	1	0.217	0.257
5Ghz	10M	Rear	0	5844.5	21.76	22.5	1.186	-0.11	1	0.026	0.031
5Ghz	10M	Right	0	5844.5	21.76	22.5	1.186	0.13	1	0.004	0.005

Repeated SAR Test Records for 5GHz**Hand-held mode**

Band	Mode	Test Position	Dist. (mm)	Freq. (MHZ)	max Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Duty Cycle Scaling Factor	SAR10g (W/kg)	Scaled SAR10g (W/kg)
5Ghz	10M	Front	0	5787.5	21.09	22	1.233	-0.06	1	1.68	2.072

10.9 REPEATED SAR MEASUREMENT

Note:

1. Per KDB 865664 D01v01, for each frequency band, repeated SAR measurement is required only when the measured SAR is $\geq 0.8\text{W/Kg}$
2. Per KDB 865664 D01v01, if the ratio of largest to smallest SAR for the original and first repeated measurement is ≤ 1.2 and the measured SAR $< 1.45\text{W/Kg}$, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated measured SAR.

Hand-held mode

Band	Mode	Test Position	Freq (MHZ)	Original Measured SAR10g (W/kg)	1st Repeated SAR10g (W/kg)	Ratio	Original Measured SAR10g (W/kg)	2nd Repeated SAR10g (W/kg)	Ratio
2.4Ghz	1.4M	Front	2477.5	2.43	2.43	1.000	--	--	--
5Ghz	10M	Front	5787.5	1.67	1.68	1.060	--	--	--

1.1 SAR MULTI XMITER ASSESSMENT

No.	Applicable Simultaneous Transmission Combination
1	N/A

Note:

1. 2.4GHz and 5GHz share the same antenna, and cannot transmit simultaneously.

11. EQUIPMENT LIST & CALIBRATION STATUS

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Calibration	Calibration Due
P C	HP	Core(rm)3.16G	CZCO48171H	N/A	N/A
Signal Generator	Agilent	E8257C	US37101915	02/26/2018	02/25/2019
S-Parameter Network Analyzer	Agilent	E5071B	MY42301382	02/26/2018	02/25/2019
Power meter	Anritsu	ML2495A	1445010	04/26/2018	04/25/2019
Power sensor	Anritsu	MA2411B	1339220	04/26/2018	04/25/2019
E-field PROBE	SPEAG	EX3DV4	3798	07/26/2017	07/25/2018
DAE	SPEAG	DEA4	1245	07/20/2017	07/19/2018
DIPOLE 2450MHZ ANTENNA	SPEAG	D2450V2	817	05/29/2018	05/28/2019
DIPOLE 5GHZ ANTENNA	SPEAG	D5GHzV2	1095	05/22/2018	05/21/2019
Electro Thermometer	DTM	DTM3000	3030	12/26/2017	12/25/2018
Amplifier	Mini-circuits	ZVE-8G	110405	N/A	N/A
Amplifier	Mini-circuits	ZHL-42	QA1331003	N/A	N/A
3db ATTENUATOR	MINI	MCL BW-S3W5	0533	N/A	N/A
DUMMY PROBE	SPEAG	DP_2	SPDP2001AA	N/A	N/A
Dual Directional Coupler	Woken	20W couple	DOM2BHW1A1	N/A	N/A
SAM PHANTOM (ELI4 v4.0)	SPEAG	QDOVA001BB	1102	N/A	N/A
Twin SAM Phantom	SPEAG	QD000P40CD	1609	N/A	N/A
ROBOT	SPEAG	TX60	F10/5E6AA1/A101	N/A	N/A
ROBOT KRC	SPEAG	CS8C	F10/5E6AA1/C101	N/A	N/A
LIQUID CALIBRATION KIT	ANTENNESSA	41/05 OCP9	00425167	N/A	N/A

12. FACILITIES

All measurement facilities used to collect the measurement data are located at

☒ No.10, Weiye Rd., Innovation Park, Eco & Tec. Development Part, Kunshan City, Jiangsu Province, China.

13. REFERENCES

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14. LABORATORY ACCREDITATIONS AND LISTING

FCC –Designation Number: CN1172.

Compliance Certification Services Inc. Kun shan Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Designation Number: CN1172.

In addition, the test facilities are listed with Industry Canada, Certification and Engineering Bureau, 2324E for SAR chamber.

APPENDIX A: DUT AND SAR TEST SETUP**APPENDIX B: PLOTS OF PERFORMANCE CHECK**

The plots are showing as followings.

Test Laboratory: Compliance Certification Services Inc.

Date: 6/22/2018

SystemPerformanceCheck-Body D2450**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 817**

Communication System: UID 0, CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.896$ S/m; $\epsilon_r = 51.664$; $\rho = 1000$ kg/m³

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

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

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.32, 7.32, 7.32); Calibrated: 7/26/2017;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/20/2017
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASYS 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm**(EX-Probe)/Area Scan (8x9x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 17.9 W/kg

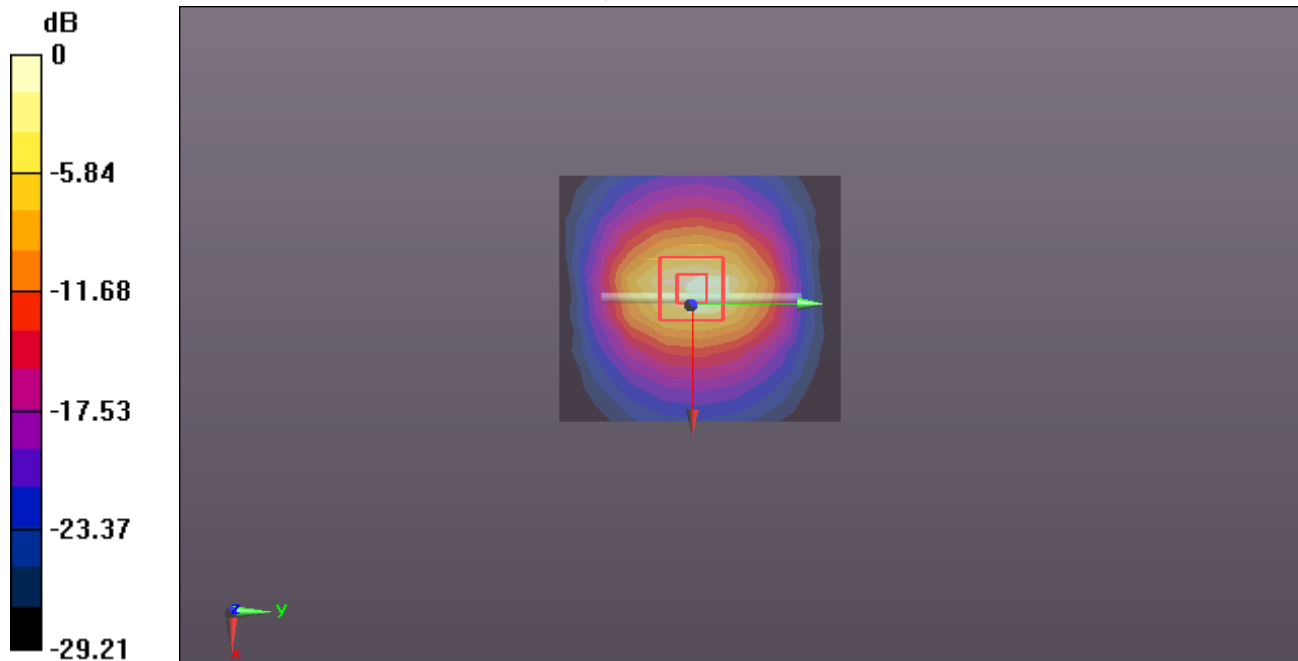
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm**(EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.6 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 32.6 W/kg

SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.99 W/kg

Maximum value of SAR (measured) = 21.2 W/kg



0 dB = 21.2 W/kg = 13.26 dBW/kg

Test Laboratory: Compliance Certification Services Inc.

Date: 7/17/2018

SystemPerformanceCheck-Body D2450**DUT: Dipole 2450 MHz; Type: D24500V2; Serial: 817**

Communication System: UID 0, CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.916$ S/m; $\epsilon_r = 50.256$; $\rho = 1000$ kg/m³

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

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

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.32, 7.32, 7.32); Calibrated: 7/26/2017;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/20/2017
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASYS 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm**(EX-Probe)/Area Scan (8x9x1):** Measurement grid: dx=12mm, dy=12mm

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

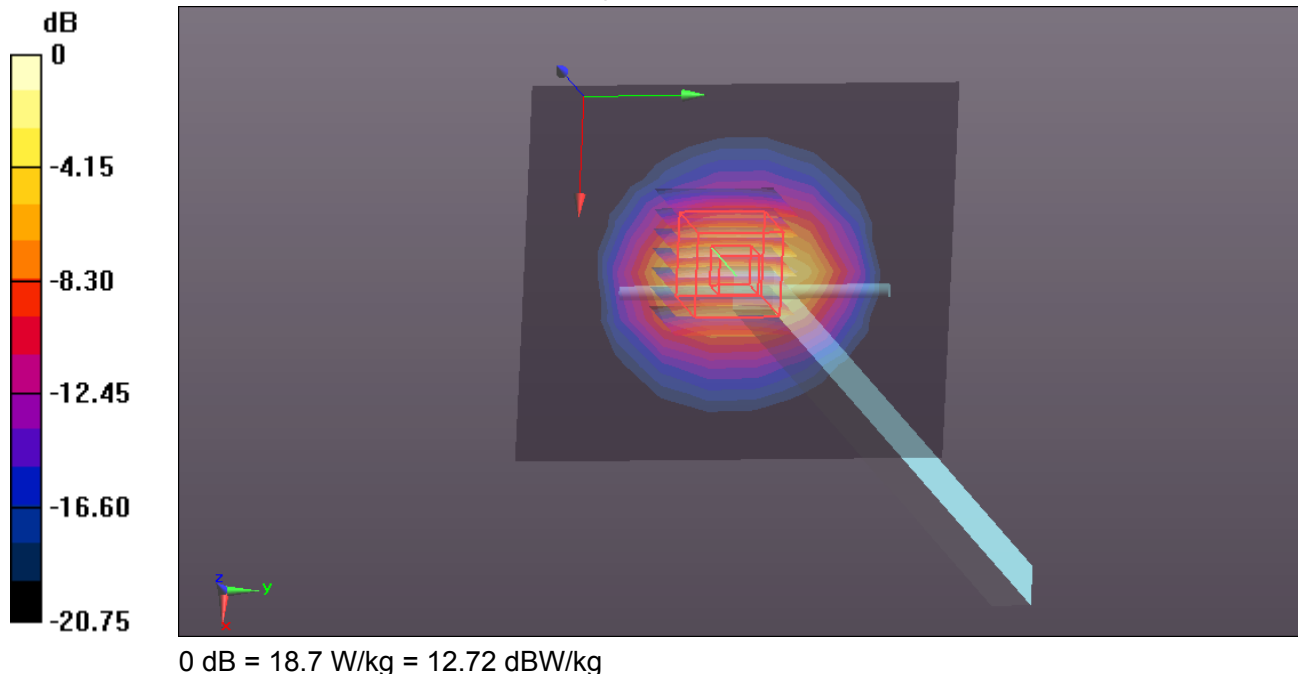
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm**(EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.9 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 24.5 W/kg

SAR(1 g) = 12.4 W/kg; SAR(10 g) = 5.85 W/kg

Maximum value of SAR (measured) = 18.7 W/kg



Test Laboratory: Compliance Certification Services Inc.

Date: 7/19/2018

SystemPerformanceCheck-Body D2450**DUT: Dipole 2450 MHz D2450V2; Type: D24500V2; Serial: 817**

Communication System: UID 0, CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.921$ S/m; $\epsilon_r = 50.263$; $\rho = 1000$ kg/m³

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

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

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.32, 7.32, 7.32); Calibrated: 7/26/2017;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/20/2017
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm**(EX-Probe)/Area Scan (8x9x1):** Measurement grid: dx=12mm, dy=12mm

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

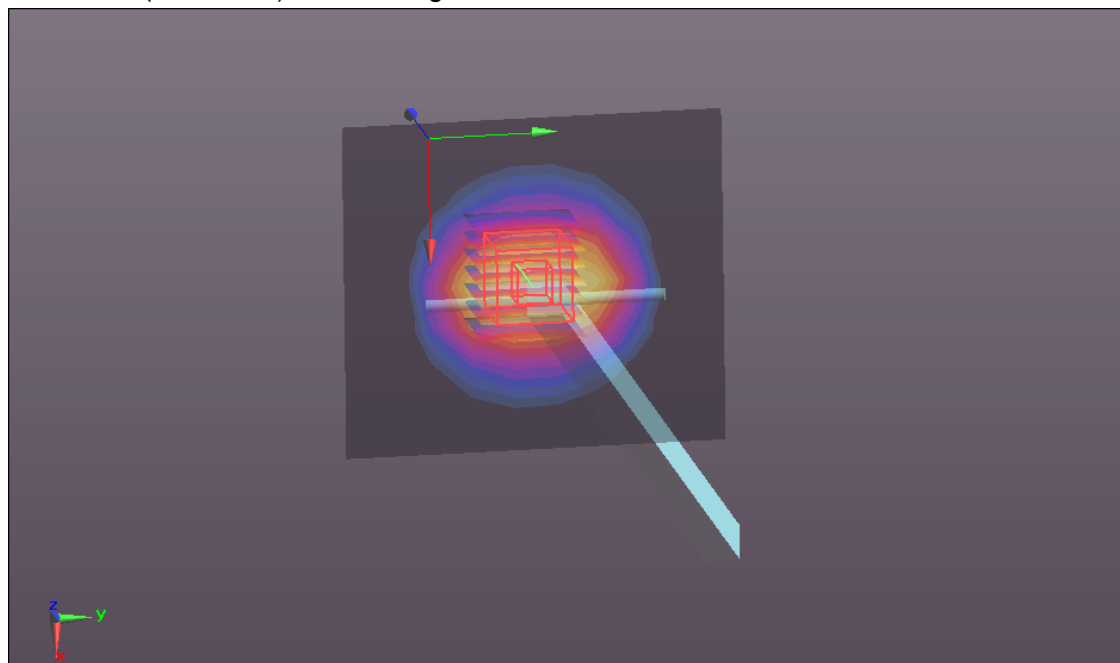
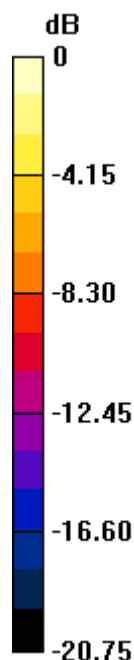
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm**(EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.9 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 24.5 W/kg

SAR(1 g) = 12.4 W/kg; SAR(10 g) = 5.79 W/kg

Maximum value of SAR (measured) = 18.1 W/kg



0 dB = 18.1 W/kg = 12.58 dBW/kg

Test Laboratory: Compliance Certification Services Inc.

Date: 6/22/2018

SystemPerformanceCheck-Body 5800**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1095**

Communication System: UID 0, CW; Communication System Band: D5GHz (5000.0 - 6000.0 MHz);

Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5800$ MHz; $\sigma = 6.208$ S/m; $\epsilon_r = 47.572$; $\rho = 1000$ kg/m³

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

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

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(4.45, 4.45, 4.45); Calibrated: 7/26/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/20/2017
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASYS 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5800**MHz/Area Scan (10x10x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 18.5 W/kg

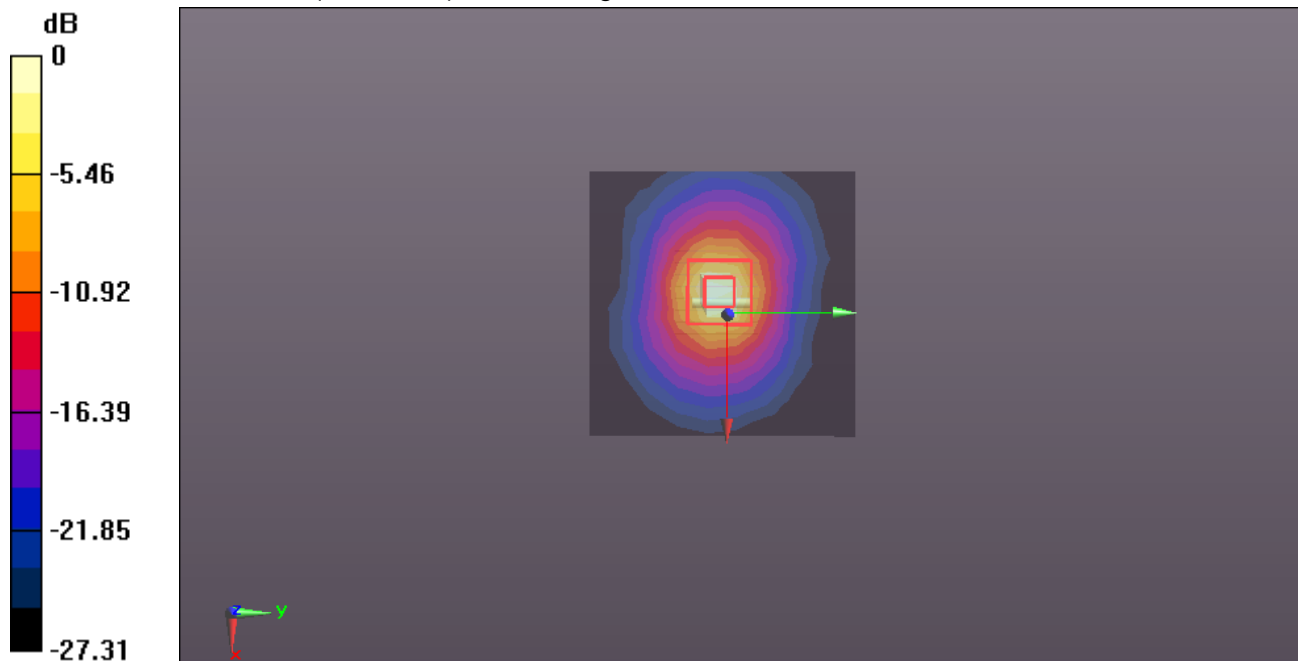
System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5800**MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 60.51 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 39.1 W/kg

SAR(1 g) = 7.83 W/kg; SAR(10 g) = 2.27 W/kg

Maximum value of SAR (measured) = 20.2 W/kg



0 dB = 20.2 W/kg = 13.05 dBW/kg

Test Laboratory: Compliance Certification Services Inc.

Date: 7/17/2018

SystemPerformanceCheck- Body 5800**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1095**

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz);

Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5800$ MHz; $\sigma = 6.04$ S/m; $\epsilon_r = 48.25$; $\rho = 1000$ kg/m³

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

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

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(4.45, 4.45, 4.45); Calibrated: 7/26/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/20/2017
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5800**MHz/Area Scan (10x10x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 17.1 W/kg

System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5800**MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm,

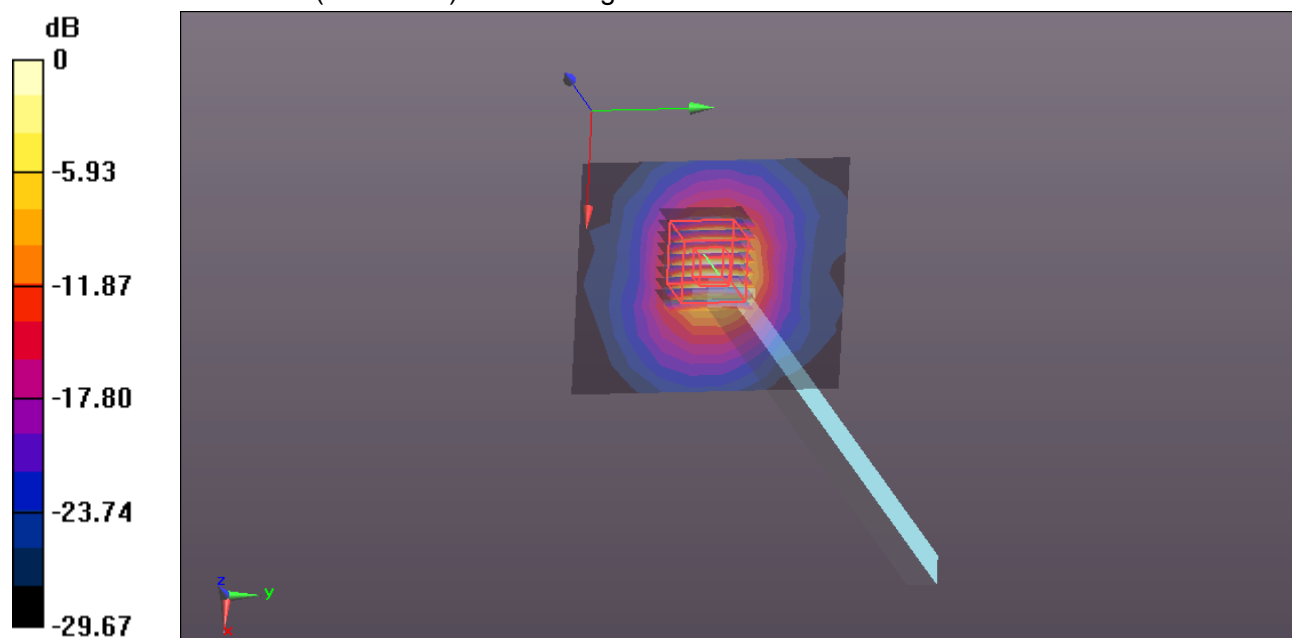
dy=4mm, dz=1.4mm

Reference Value = 63.36 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 38.6 W/kg

SAR(1 g) = 7.69 W/kg; SAR(10 g) = 2.15 W/kg

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



Test Laboratory: Compliance Certification Services Inc.

Date: 7/19/2018

SystemPerformanceCheck- Body 5800

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1095

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz);

Frequency: 5800 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 5800$ MHz; $\sigma = 6.03$ S/m; $\epsilon_r = 48.27$; $\rho = 1000$ kg/m³

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

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

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(4.45, 4.45, 4.45); Calibrated: 7/26/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/20/2017
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP: 1102
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5800

MHz/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 14.8 W/kg

System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5800

MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm,

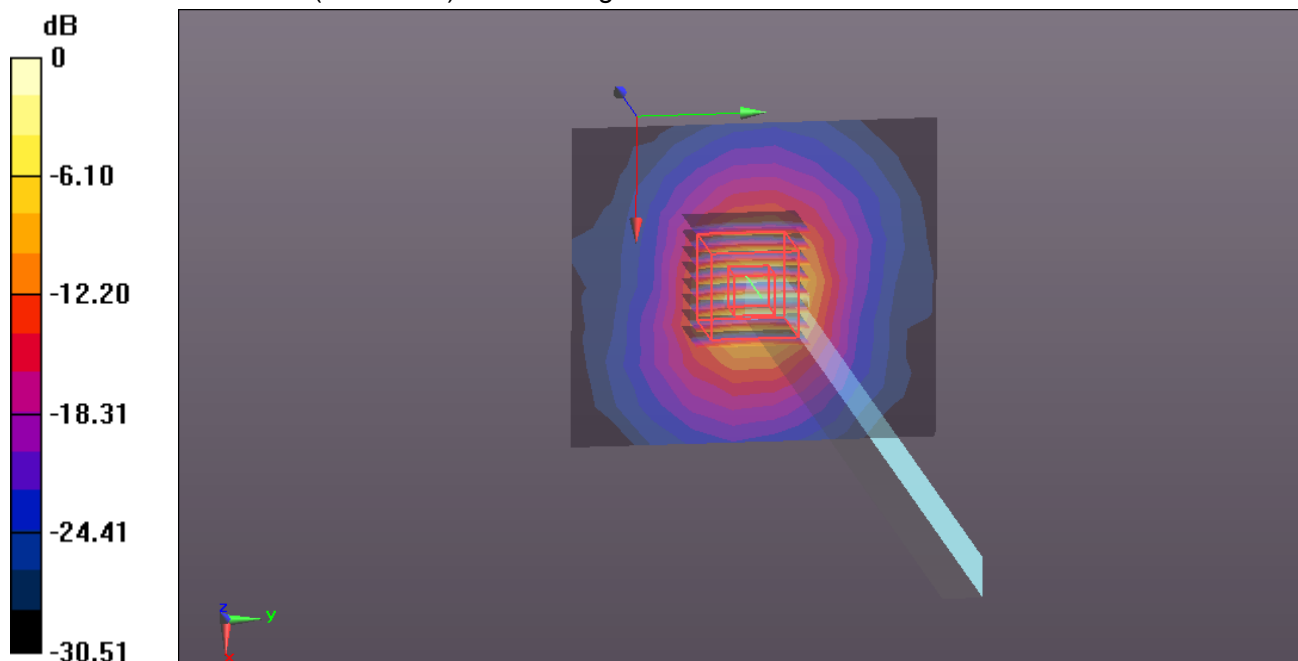
 $dy=4\text{mm}, dz=1.4\text{mm}$

Reference Value = 61.47 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 36.9 W/kg

SAR(1 g) = 7.46 W/kg; SAR(10 g) = 2.1 W/kg

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


$$0 \text{ dB} = 19.3 \text{ W/kg} = 12.86 \text{ dBW/kg}$$

APPENDIX C: DASY CALIBRATION CERTIFICATE

The DASY Calibration Certificates are showing in the file named Appendix C DASY Calibration Certificate.

APPENDIX D: PLOTS OF SAR TEST RESULT

The plots are showing in the file named Appendix D: Plots of SAR Test Result.

END REPORT